Childhood Vaccines in Uganda and Zambia: Determinants and Barriers to Effective Coverage

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Abstract

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As a target of the Sustainable Development Goals, improving childhood immunization is a major priority for global health. Despite progress in recent times however, coverage (vaccination) and effective coverage (immunity) remain a challenge in low and middle-income countries (LMICs). Policy makers, public health practitioners and global organizations such as Gavi, the Vaccine Alliance focus much of their efforts on removing the barriers that prevent children from successful immunization.

Barriers to effective coverage are complex and difficult to measure though. Extensive research effort has been devoted to understanding them, but most studies and systematic reviews have been limited in bread and depth. As vaccine programs in LMICs continue progress toward effective coverage of immunizations, better understanding of determinants and barriers will be imperative to close remaining gaps and inequities. Policies and programs like Gavi's health system strengthening support would benefit from a more rigorous examination of the determinants and barriers to immunization.

The work presented here represents a small step towards better understanding of why some children remain unvaccinated, and why some vaccines fail to produce immunity. The approach, from the onset, was intended to be more integrated than conventional research. It begins with a systematic review, seeking to uncover the entire body of evidence on determinants to vaccination and immunization. Qualitative research methods were employed to synthesize that systematic review into a testable

hypothesis. Using innovative survey data, that hypothesis is immediately put to use to measure key determinants quantitatively in Uganda and Zambia. To bolster the results, a novel data processing method was developed that enhances the accuracy and utility of serological data. Finally, this study presents the results of a Bayesian structural equation model that represents determinants of vaccine coverage, and explores the implications of the findings.

The key findings give a rigorous, quantitative account that determinants of effective coverage are different depending on context. In Uganda and Zambia, the results show that there is a set of barriers to whether or not a child receives their initial dose of a vaccine, and those are largely different than the barriers to completion of the full dosage schedule. Further still, the challenges associated with newly-introduced vaccines such as pneumococcal conjugate vaccine are different than either initiation or drop-out. More specifically, this analysis finds that access-related barriers are key to vaccine initiation, demand-related determinants are key to drop-out, and supply-side constraints are key to new vaccines.

There are two important implications of these results. First, programs that seek the intervene on a particular barrier, such as demand generation activities or health system strengthening, can use this study to identify the most appropriate outcome to measure their performance. More importantly, vaccination programs in Uganda and Zambia can use these findings to better target new interventions, and continue progress against vaccine preventable diseases.

CHILDHOOD VACCINES IN UGANDA AND ZAMBIA

Determinants and Barriers to Effective Coverage

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CONTENTS

ABSTRACT

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CHAPTER 1

DETERMINANTS OF EFFECTIVE VACCINE COVERAGE IN LOW AND MIDDLE-INCOME COUNTRIES: A SYSTEMATIC REVIEW AND INTERPRETIVE SYNTHESIS

1.1 INTRODUCTION

Childhood vaccinations are among the most effective and cost effective public health interventions available.[1,2] Yet, vaccine-preventable diseases caused approximately 14% of disability-adjusted life years (DALYs) in 2015 globally, and 15% of DALYs in Sub-Saharan Africa.[3]

Many children remain unimmunized. Global coverage of diphtheria-tetanus-pertussis (DTP) vaccination ranges from 74% in Africa to 96% in Europe.[4] Despite progress, socio-economic inequalities persist as well.[5] Furthermore, vaccines do not always produce immunity. For example, vaccination against measles has been estimated to be 85% effective in the United States and 66% effective in Mozambique.[6,7]

Extensive research effort has been devoted to understanding why vaccine coverage remains low, and why vaccines sometimes fail to produce immunity. Quantitative studies have sought to measure determinants using survey and other data. Systematic reviews have been published on both vaccination and immunization in order to gather studies together.[8-14] Some have taken additional steps to develop a conceptual framework, i.e. general model for thinking about how determinants fit together.[8,11] Others assess health systems, describing bottlenecks and constraints to successful vaccine delivery from the supply-side, for example the World Health Organization's Health Systems Building Blocks framework.[15]

Most studies and systematic reviews have been limited in breadth and depth however. Studies seeking to directly measure determinants are rarely based on a grounded theoretical model such as a conceptual framework from systematic review. Systematic reviews focusing on vaccine coverage have only covered a subset of the published research. Reviews on vaccine effectiveness haven't offered a complete account of potential determinants; they instead focus on a few important factors. Conceptual frameworks are mostly untestable in a quantitative sense, and are therefore unusable to independent researchers with new data to analyze. Most conceptual frameworks rely on narrative description of determinants more than explicit depiction the pathways and interactions through which they are thought to influence immunization.

Public health practitioners and vaccine researchers would benefit from a systematic review and synthesis of determinants research. A complete listing of previous studies would be valuable as a standalone resource. One of the most challenging aspects of developing an evidence-based conceptual framework is simply amassing information to synthesize. Efforts to make sense of the literature could yield useful hypotheses, even competing hypotheses, about how determinants lead to immunization. Future studies could collect data to measure the hypothesized constructs, and model them to quantify the relative impact of different determinants in a more grounded way. Interventions could leverage such information to target determinants of greater need and evaluate programs with outcomes that are fit for purpose to enhance their efforts to improve immunization around the world.

The objectives of this study are twofold. First, we aim to document the existing evidence on determinants of childhood vaccination and determinants of immunization. Second, we aim to generate a conceptual framework. This will summarize, as succinctly as possible, determinants of effective vaccine coverage and relationships between them, and represent it in the form of a testable hypothesis. We accomplish the first goal by conducting a novel systematic review of reasons for non-vaccination and reasons for vaccine failure. For the second goal, we perform three qualitative analyses on the information in the review, using critical interpretive synthesis defined in Dixon-Woods et al. 2006.[16]

1.2 METHODS

The systematic review and synthesis involved five separate, interrelated steps. Each step is described in detail in the subsequent sections. Briefly, these are 1) literature search, 2) data extraction, 3) content analysis, 4) thematic analysis and 5) interpretive synthesis. The approach to each stage was planned in advance, including a clear objective and specifically-defined criteria in an effort to ensure rigor and reproducibility.

1.2.1 *Literature Search and Data Extraction*

The literature search procedure is described in detail in Appendix A (Chapter 4). A preliminary review was used to develop a set of search terms and otherwise inform the more structured literature search. All potential search terms (used or not) are listed in Appendix 2. Eligibility criteria were defined in advance (Appendix A (Chapter 4)). Google Scholar searches were performed sequentially and the first 500 results from each term were screened for inclusion. Additionally, two PubMed searches with multiple MeSH terms (see Appendix 2), nine special databases[17-21] (e.g. Cochrane Library, EPPI Centre) and citations from nine other systematic reviews[9,10,13,22-27] were screened in their entirety.

All articles were catalogued in a citation database and evaluated for relevance, using predetermined relevance criteria (Appendix A (Chapter 4)). Data were extracted from articles in descending order of relevance. The goal of this stage was to itemize the content of the most relevant articles, including five variables related to study characteristics and nine variables related to study content. A digital color-coding system was used to ensure transparency and reproducibility. Data were transcribed into a spreadsheet for analysis.

1.2.2 *Content Analysis*

Content analysis was performed to make sense of the itemized determinants from data extraction.[28,29] The objective of this stage was to document and organize the data, specifically focusing on the determinants and pathways identified in the literature.

All discrete determinants mentioned in the extracted data were listed and systematically examined. This was done by maintaining a running list of determinants, meaning content analysis and data extraction were concurrent with each other, rather than sequential. The list of determinants, as well as the text from which they were extracted, was repeatedly revisited to understand the context in which those determinants were described. Synonymous determinants and determinants with negligible conceptual differences were condensed into a common set of terms.

Finally, a frequency table of determinants was created, and related pathways were explored, starting with the most frequently-cited determinants.

The output from this stage was represented in a path diagram intended to represent the universe of determinants, according to the literature.

1.2.3 *Thematic Analysis*

Thematic analysis was carried out to document the broader qualitative groups (i.e. themes) within which determinants are hypothesized to reside.[28,30] The objectives of this stage were to describe the ways in which authors most commonly categorize determinants, and to bring together similar categorizations into three to five broad frameworks.

Thematic analysis was accomplished by relying on the authors' descriptions. The categories they used to group together determinants were listed along with excerpts of text in which they were described. Like content analysis, this was done in an iterative fashion, seeking patterns between studies. It was anticipated that some studies would cite a more generalized sociological or health system theory as the source for their themes. In the event that multiple studies cited the same generalized theory those citations were also examined and included in the thematic analysis.

1.2.4 *Interpretive Synthesis*

The third analysis was interpretive synthesis of the literature, following guidelines from Dixon-Woods et al 2006.[16] This stage entailed critical analysis of the determinants identified through content analysis and categorizations identified through thematic analysis. The objective of this phase was to formulate a conceptual framework that draws from other researchers' frameworks, and represent it in the form of a testable hypothesis.

Key methods in interpretive synthesis are known as reciprocal translational analysis (RTA), refutational synthesis and lines-of-argument synthesis (LOA), and are adapted from meta- ethnographical research.[16,31,32] RTA expands on the processes already described in the previous two sections (Thematic Analysis and Content Analysis). In short, RTA involves identifying broad concepts (themes) reported in each study, and identifying similarities between them. Refutational synthesis involves the opposite process; contradictions between studies (in terms of themes or descriptions of themes) are explored. This process lends insight to a conceptual framework by elucidating the gaps and discrepancies between studies in such a way that produces novel perspectives on common concepts. The final method (LOA) involves the most interpretive input on the part of the researcher. LOA entails integrating strongly-supported factors across studies and attempting to form a synthesizing argument, or a description of how they fit together, that is both succinct and understandable to commonplace audiences. The synthesizing argument often includes the generation of synthetic constructs, sometimes referred to as latent variables.

Information for interpretive synthesis came from multiple sources. Other studies which offered their own conceptual framework were used, as well as lessons from Thematic Analysis described above. In addition, broader theories which have been applied to describe health service utilization and health system strength were used.

The ultimate testable hypothesis developed in this stage was also formulated through an iterative process, repeatedly revisiting previously-documented themes as new studies were exam-

ined for further comparisons and contrasts. This stage also relied heavily on broader sociological and health systems theories to offer formalized and grounded structure.

1.3 RESULTS

1.3.1 *Literature Search*

A total of 35 web-searches were performed, including Google Scholar (14 searches), PubMed (2 searches) special databases (9 searches) and backward citations (10 articles). In total, 9,041 titles were examined for inclusion. Of those, 1,621 eligible articles were identified, 12 studies were re-publications of another article (with a different name or publisher) and were excluded.

All 1,609 included articles were assessed for relevance based on title and abstract, resulting in 105 highly relevant articles (relevance score $\geqslant 0.9$), 362 moderately relevant articles (relevance score $\geqslant 0.8$ and < 0.9) and 1,142 less-relevant articles (relevance score < 0.8). The complete list of 1,609 citations can be found in Appendix A (Chapter 4), organized by relevance.

1.3.2 *Content Analysis*

Content was extracted from 78 articles, the characteristics of which are detailed in Appendix A (Chapter 4). A wide array of determinants were documented among the extracted articles, totaling 638 uniquely-worded factors. By iteratively revisiting the list of determinants and examining the context in which they were described, a condensed framework of 69 coverage determinants and 20 effectiveness determinants was developed. By examining the described pathways between determinants, 115 pathways of influence were identified, forming a comprehensive network of vaccine coverage. An additional 22 pathways of influence were identified for vaccine effectiveness. The complete network of effective coverage determinants are listed in Tables 1 and 2, and displayed visually in Figure 1.

Table 1: List of determinants to vaccine coverage

Determinant	Description	Relationship	Evidence
Facility Readiness (Routine)	Health facility is ready to vaccinate children	Directly impacts Utilization	(40)
Service HR/Mgmt	Adequate health facility staff to meet demand	Directly impacts Facility Readiness	(11,26,35,40-48)
Training	Adequate health facility staff training	Moderates Service HR/Mgmt	(22,35,40,45,46,48-54)
Performance Assessment	Procedures for facility staff performance assessment	Moderates Service HR/Mgmt	(11,35,50,55,56)
Disbursement/ Fund Mgmt	Adequate resources and management for health facility staff	Directly impacts Service HR/Mgmt, Training, Performance Assessment	(26,35,40,45)
Waste Disposal	Procedures and equipment for vaccine waste	Directly impacts Facility Readiness	(40,52)
Facility Vaccine Supply	Health facility has vaccines to administer	Directly impacts Facility Readiness	(40,44,46-48,52-54,57,58)
Facility Storage Capacity	Health facility has sufficient capacity in refrigerators and freezers to store vaccines	Moderates Facility Vaccine Supply	(40,46,48,59-62)
Stock/Flow Awareness	Staff members know the status of vaccine inventory	Moderates Facility Vaccine Supply	(46,48)
Consumption Forecasting	Appropriate anticipation of future demand	Directly impacts Stock/Flow Awareness	(35,43)
Transaction Visibility	Adequate resources dedicated to supply chain transparency	Directly impacts Stock/Flow Awareness	(46,48)
Transaction Reporting	Adequate resources dedicated to communication of transactions	Directly impacts Stock/Flow Awareness	(46,48)
Supply LMIS	Logistics management information system for tracking supply	Moderates Transaction Reporting, Transaction Visibility	(46,48)
Inventory HR/Mgmt	Adequate resources dedicated to inventory management	Directly impacts Stock/Flow Awareness	(35,46,48)
Training	Adequate inventory management training	Moderates Inventory HR/Mgmt	(22,35,40,45,46,48-54)
Performance Assessment	Procedures for inventory management performance assessment	Moderates Inventory HR/Mgmt	(11,35,50,55,56)
Disbursement/ Fund Mgmt	Adequate resources and management for inventory management	Directly impacts Inventory HR/Mgmt, Training, Performance Assessment	(26,35,40,45)
Intermediary Vaccine Supply	Intermediate storage facility has vaccines to distribute	Directly impacts Facility Vaccine Supply	(26,43,56)

Intermediary Storage Capacity	Intermediate storage facility has sufficient capacity in refrigerators and freezers to store vaccines	Moderates Intermediary Vaccine Supply	(26,43,56)
Facility Distribution Method	Established means of transporting stock from intermediate storage to health facility	Directly impacts Facility Vaccine Supply	(26,43,56)
Distribution Equipment	Vehicles and other equipment to distribute supply from intermediate storage to health facility	Moderates Facility Distribution Method	(26,43,56)
Distribution HR/Mgmt	Adequate resources dedicated to distribution management	Moderates Facility Vaccine Supply, Intermediary Vaccine Supply	(26,40,48)
Training	Adequate distribution management training	Moderates Distribution HR/Mgmt	(22,35,40,45,46,48-54)
Performance Assessment	Procedures for distribution system performance assessment	Moderates Distribution HR/Mgmt	(11,35,50,55,56)
Disbursement/ Fund Mgmt	Adequate resources and management for distribution systems	Directly impacts Distribution HR/Mgmt, Training, Performance Assessment	(26,35,40,45)
Country Vaccine Supply	Central storage facility has vaccines to distribute	Directly impacts Intermediary Vaccine Supply	(35,40,46,48,63)
Country Storage Capacity	Central storage facility has sufficient capacity in refrigerators and freezers to store vaccines	Moderates Country Vaccine Supply	(35,40,46,48,63)
Intermediary Distribution Method	Established means of transporting stock from central to intermediate storage	Directly impacts Intermediary Vaccine Supply	(26,43,56)
Distribution Equipment	Vehicles and other equipment to distribute supply from central to intermediate storage	Moderates Intermediary Distribution Method	(26,43,56)
Leadership and Consistency	Oversight and decision-making in vaccine systems	Directly impacts Disbursement/Fund Mgmt, Outreach Protocol, Demand Generation Activities, Community Partnership, Service Cost, Supply LMIS	(8,26,40,45,64)
Political Commitment	High-level support for vaccination systems	Directly impacts Leadership and Consistency, Funding	(11,33-35,45,63,65)
Development Partner Participation	High-level engagement from development partners in vaccination systems	Directly Impacts Political Commitment, Funding, Country Vaccine Supply	(11,35)
Funding	Adequate high-level funding for vaccination systems	Directly impacts Disbursement/Fund Mgmt, Facility Infrastructure, Service Cost	(26,35,40,45)
Facility Readiness (Outreach)	Health facility is ready to vaccinate children through outreach activities	Directly impacts Utilization	(7,9,10,22,26,35,45, 47,49)

Outreach Transportation	Adequate vehicles to conduct outreach activities	Directly impacts Facility Readiness (Outreach)	(26,35)
Mobile Storage Capacity	Health facility has sufficient capacity to store vaccines during outreach activities	Directly impacts Facility Readiness (Outreach)	(26)
Outreach Protocol	Procedures and plans for outreach activities	Directly impacts Mobile Storage Capacity, Outreach Transportation	(10,56)
Community Partnership	Active and positive relationship between health facility and community	Directly impacts Quality of Care, Community Awareness, Attitude	(10,11,22,26,33,46,52,62,64,66,67)
Demand Generation Activities	Health facility encourages vaccine utilization in the community	Directly impacts Perceived Safety, Need, Effectiveness, Community Awareness, Attitude, Vaccine Awareness, Attitude	(8,26,35,40,52,66,68)
Quality of Care	Quality of care at health facility for vaccination	Directly impacts Wait Time, Perceived Quality of Care	(25,40,46)
Facility Infrastructure	Quality of health facility building and equipment	Directly impacts Wait Time, Perceived Quality of Care	(37,40,43,49,53)
Service Cost	Cost of vaccine services charged to the mother or caretaker by the health facility	Moderates Ability to Finance Service	(8-10,25,33,37,62,69)
Wait Time	Wait time at health facility for vaccination	Directly impacts Perceived Quality of Care	(8,9,22,25,41,44,50,62,70-72)
Patient Volume	Number of patients who typically visit health facility	Directly impacts Wait Time	(9)
Child Eligibility	Child meets criteria to be eligible for vaccination	Directly impacts Utilization	(9,44,65,68,73-76)
Child Health	Child is healthy enough to be vaccinated	Directly impacts Child Eligibility, Perceived Eligibility	(7,9,24,34,41,42,44,50,53,68,69,77,78)
Child Age	Child is of the appropriate age to be vaccinated	Directly impacts Child Eligibility, Perceived Eligibility	(9,44,65,68,73-76)
Decision to Vaccinate	Mother or caretaker intends to vaccinate the child	Directly impacts Utilization	(8,37,38,79)
Vaccine Awareness, Attitude	Mother or caretaker is aware of vaccine and perceives it to be beneficial	Directly impacts Decision to Vaccinate, Perceived Eligibility	(8,9,9,10,23-25,27,37,42,42,44,45,47,49,50,53,55,57,63,66,69,69-71,73,76,78,80-82,82,83)
Perceived Quality of Care	Mother or caretaker perceptions about the quality of care in the health facility	Directly impacts Vaccine Awareness, Attitude	(8,9,57,83)
Education	Mother or caretaker education	Directly impacts Vaccine Awareness, Attitude	(8-10,27,33,41,44,47,53,55,57,64,72,74,76,79,82-89)

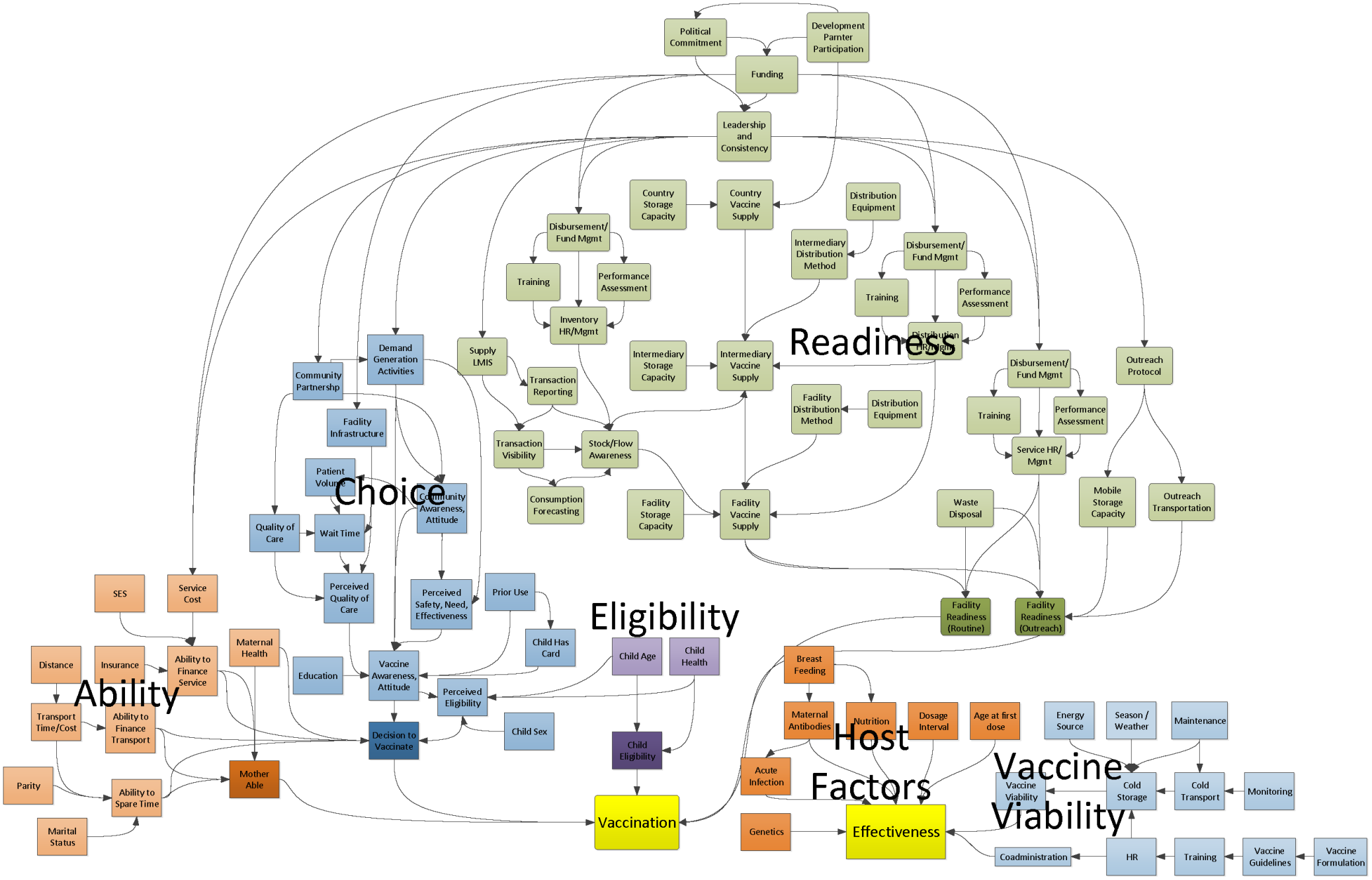
Prior Use	Child has been vaccinated previously	Directly impacts Vaccine Awareness, Attitude, Child Has Card	(8,53,64)
Child Has Card	Child has vaccine card for recording doses	Directly impacts Vaccine Awareness, Attitude	(10,27,50,69,70,78,81)
Perceived Safety, Need, Effectiveness	Mother or caretaker perceives that there is risk of disease and the vaccine is safe and effective	Directly impacts Vaccine Awareness, Attitude	(9,24,25,34,37,41,42,47,62,69,70, 72,73,76-78,90)
Community Awareness, Attitude	Influential Community members are aware of the vaccine and perceive it to be beneficial	Directly impacts Vaccine Awareness, Attitude, Perceived Safety, Need, Effectiveness, Patient Volume	(10,22,33,53,68)
Perceived Eligibility	Mother or caretaker perceives that child is eligible for vaccination	Directly impacts Decision to Vaccinate	(25,53,70,73)
Child Sex	Sex of child	Directly impacts Perceived Eligibility	(9,34,44,47,55,57,63, 65,84,88)
Mother Able	Mother or caretaker has access to the means and time to vaccinate the child	Directly impacts Utilization	(9,10,37,44,47,53,72)
Ability to Finance Service	Mother or caretaker can afford any cost of vaccine services	Directly impacts Mother Able, Decision to Vaccinate	(23,41,50,62)
Ability to Finance Transport	Mother or caretaker can afford any cost of transportation	Directly impacts Mother Able, Decision to Vaccinate	(10,25,37,44,62)
Ability to Spare Time	Mother or caretaker can take time out of other responsibilities to vaccinate the child	Directly impacts Mother Able, Decision to Vaccinate	(9,10,23-25,42,44,53,55,57,69,70)
Insurance	Whether the mother or caretaker has health insurance	Moderates Ability to Finance Service	(8,9,37,72)
SES	Socio-economic status of mother or caretaker	Directly impacts Ability to Finance Service	(10,27,33,53,65,85,88)
Transport Time/Cost	Duration and cost of transportation to health facility incurred by mother or caretaker	Moderates Ability to Finance Transport, Ability to Spare Time	(10,25,37,44,62)
Parity	Number of siblings of the child	Directly impacts Ability to Spare Time	(8-10,24,25,47,47,53,55,57,68, 72,78,79,81,83-85,88,91)
Distance	Distance from household to health facility	Directly impacts Transport Time/Cost	(10,22,25,27,41,44,50,52,53,57, 63,78,84,88,91)
Marital Status	Mother or caretaker marital status	Directly impacts Ability to Spare Time	(9,44,53,55,72,76,79,83,84,87)
Maternal Health	Mother or caretaker health	Directly impacts Mother Able, Decision to Vaccinate	(9,41,42,44,53)

Table 2: List of determinants to vaccine effectiveness

Determinant	Description	Relationship	Evidence
Vaccine Viability	Vaccine is functional	Directly impacts Effectiveness	(12-14,51,59,92,93)
Cold Storage	Adequate storage temperature at each stage of the distribution system	Directly impacts Vaccine Viability	(51,59-61,94-107)
Cold Transport	Adequate distribution temperature in distribution system	Directly impacts Cold Storage	(51,59-61,94-107)
Monitoring	Systems in place for monitoring/correcting cold storage and transport	Directly impacts Cold Transport	(97,101,103,108-111)
Maintenance	Adequate resources dedicated to cold chain maintenance and repairs	Directly impacts Cold Storage, Cold Transport	(94,97)
Energy Source	Type of energy used to power cold storage	Directly impacts Cold Storage	(94,97)
Season / Weather	Seasonal and weather-related issues that may influence transportation and temperature	Directly impacts Cold Storage	(48,53)
HR	Adequate number and cadres of health facility staff	Directly impacts Coadministration, Cold Storage	(97,100,112-114)
Training	Adequate health facility staff training	Moderates HR	(97,100,112-114)
Vaccine Guidelines	Adequate guidelines for vaccine administration	Directly impacts Training	(97,100,115)
Vaccine Formulation	Type of vaccine	Directly impacts Vaccine Guidelines	(12,92,97)
Age at first dose	Age at which child received the first dose of the vaccine	Directly impacts Effectiveness	(12,13,65,116,117)
Dosage Interval	Time between doses received	Directly impacts Effectiveness	(12,14,116-118)
Coadministration	Other vaccines administered to the child	Directly impacts Effectiveness	(116,119)
Acute Infection	Acute child health issues that may interfere with immune response	Directly impacts Effectiveness	(12,13)
Nutrition	Nutritional status of child	Directly impacts Effectiveness	(12,13)
Maternal Antibodies	Presence of maternal antibodies in child	Directly impacts Effectiveness	(12,13)
Breast Feeding	Breast feeding practices	Directly impacts Maternal Antibodies, Nutrition	(12,13)
Genetics	Genetic factors in child that may influence immune response	Directly impacts Effectiveness	(120)

Figure 1: Network of determinants to vaccine effective coverage

This figure displays the full picture of determinants to vaccination and immunity. For details on individual determants, refer to 1 and 2



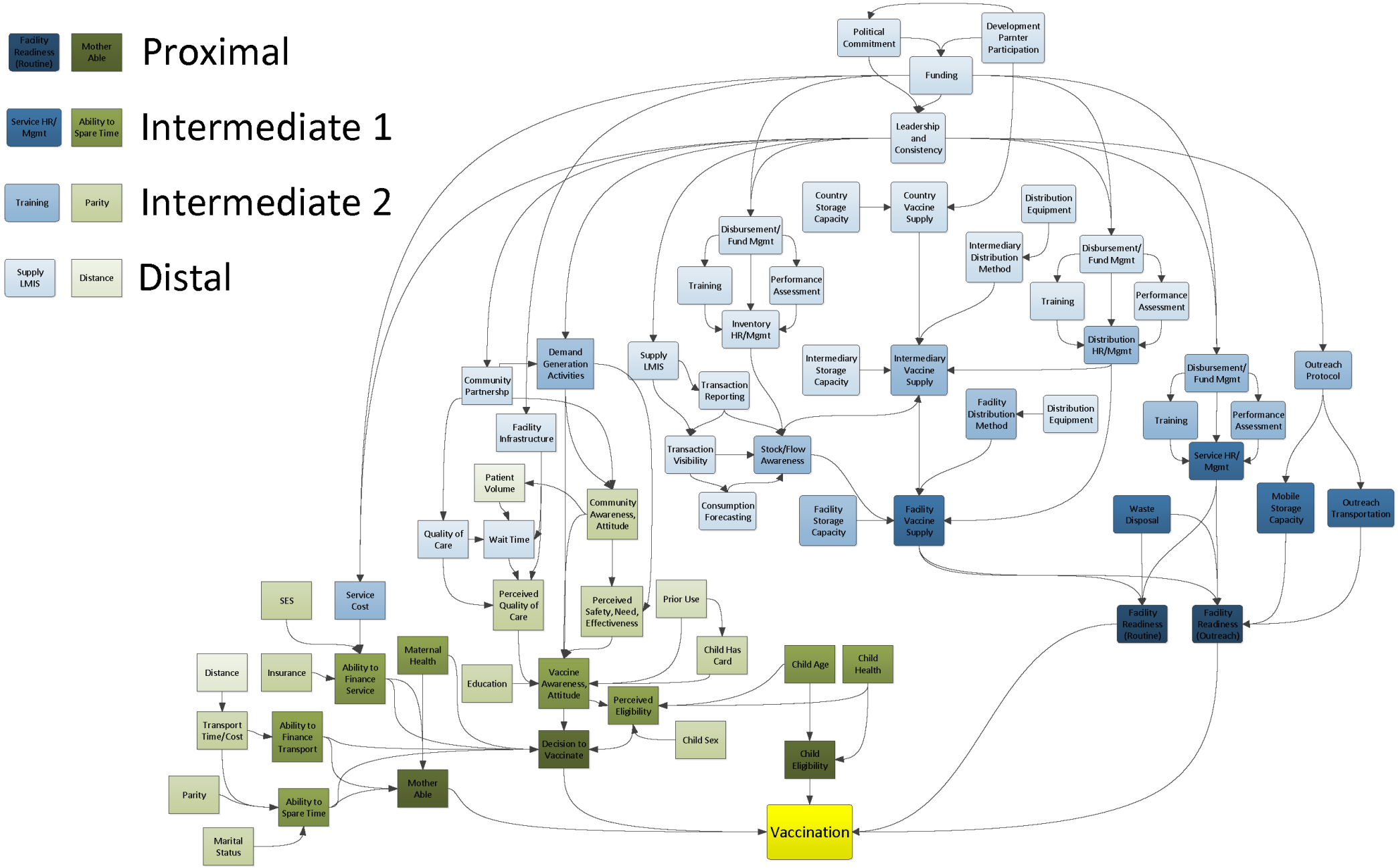
1.3.3 *Thematic Analysis*

Thematic analysis was conducted concurrent with content analysis. The ways in which authors grouped together determinants were documented, and excerpts related to those themes were examined. This especially focused on the definition and justification of each theme according to the author. Authors' descriptions regarding interactions between themes were also examined. Often, conceptualizations of thematic groups were not precisely justified. Instead, authors tended to use thematic groups as a convenient way to summarize their approach, reflecting their preconceptions about a theory of determinants. Of the 78 extracted articles, 41 relied on thematic groups.

Three major themes emerged from this analysis. One common thematic framework can be described as proximity. Authors who relied on proximity tended to group together determinants in terms of whether they were thought to directly impact vaccine coverage, or whether they were thought to impact vaccine coverage through a mediating factor. For example, Gauri and Kalenghian (2002) describe very high-level political, economic and social determinants in contrast to individual-level demand and acceptance, with accompanying description of the mechanisms of mediation.[33] A common variant of this theme was "environment" or whether determinants occurred at the point of care, in the household or in the community (or elsewhere). Another common theme can be described as patient-centric. Numerous studies went into thorough detail conceptualizing the differences between determinants on the "demand side", and tended to group all other determinants as "health system factors". Chen (1986) for example provides a useful example of patient-centric themes, in which a richness of information is provided about "biosocial" and "demand/utilization" factors, but health system factors are described with greater ambiguity, focusing on the high-level structure of the health system without any further detail.[34] In contrast, other themes can be described as health system-centric, wherein more attention is given to themes on the "supply side", and most other determinants are classified as "demand factors". One example is Naimoli et al 2008, who report four themes and 18 determinants relating to the health system, but only one theme with very little detail to describe all of demand.[35]

Some areas of overlap emerged between themes. Interestingly, it was noted that the "health system factors" from demand-centric themes, and the "demand factors" from health system-centric themes often referred to the same thing: a more intermediate class of determinants that could be described as access or ability (both physical access and resource capacity). For example, Agot 2014 duly emphasizes the health system, but describes health system factors as distance and cost incurred to the patient. While these can be considered characteristics of the health system, they may usefully described as barriers to interaction between the child's caretaker and the health workers. Figure 2 displays the proximity theme mapped to the content analysis. Appendix 2 displays the patient-centric and health system-centric themes, demonstrating the ways in which each theme is more comprehensive in certain areas than others.

Figure 2: Network of determinants to vaccine effective coverage



1.3.4 *Interpretive Synthesis*

The third analysis conducted using the information from systematic review was interpretive synthesis. Interpretive synthesis followed the approach outlined by Dixon-Woods et al. 2006[16], with the goal of generating a succinct and testable depiction of factors leading to vaccination. This entailed further comparison of themes, as well as integration of existing conceptual frameworks. This approach was used because it details suitable a process for accomplishing the primary goal, beyond that of other approaches examined.[16]

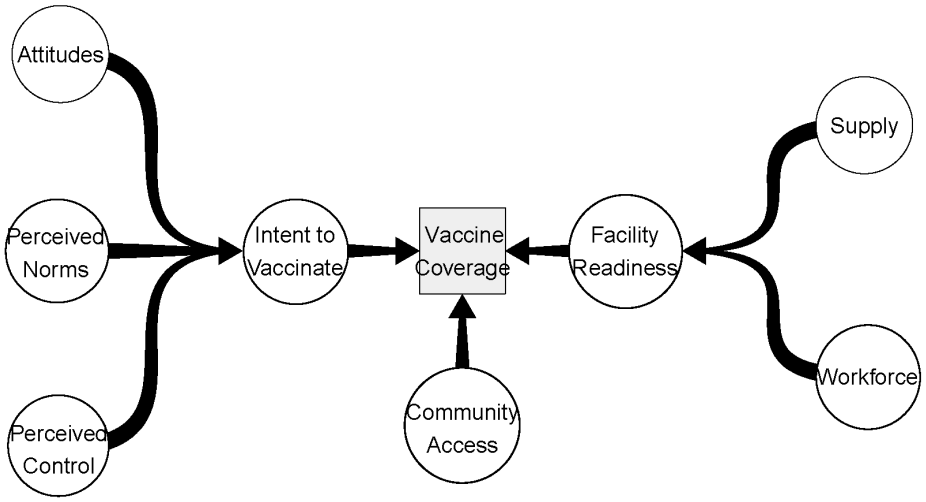
Three other conceptual frameworks were explored in depth. The earliest framework found in the literature was described by Rudner-Lugo 1993.[8] This model largely builds on the Health Belief Model[36], and describes perceived cost versus benefit of vaccination as the deciding determinant of vaccine utilization. The author depicts four demand-side factors and three supply-side factors contributing to that cost-benefit assessment. This author suggests numerous measurable indicators that can be used to measure each factor, and even carries out a regression analysis based on the framework. The second conceptual framework was put forward by Katz et al. 2010.[37] These authors used systematic review and previous health behavior theories to generate what they title the Vaccine Perceptions, Accountability and Adherence Model. This model places additional emphasis on "cultural and economic forces", while also recognizing the importance of barriers and "structural factors". The authors propose numerous contributing factors for each of the major elements in the model, but do not go so far as to suggest specific indicators that might represent them. The third framework was proposed by LaFond et al 2014.[11] These authors offer a drastically different framework, focusing heavily on community engagement, awareness and commitment from high-level institutions such as government and development partners. Based on a series of case studies, LaFond et al provide rich discussion on the pathways through which key drivers operate, but lack description of contributing factors, interdependencies and specific indicators.

The conceptual framework we present draws lessons, similarities and differences from each of the above frameworks. The Rudner-Lugo framework lays out a useful structure of demand and supply-side factors coming together to lead to utilization, each with distinct contributing factors. The Katz et al. framework adds extended background to demand-side factors, especially with emphasis on perception-related decision making rather than strictly economic choices. Further still, the LaFond model brings an emphasis on community-level factors which was captured by neither of the other two. Finally, our own thematic analysis (as discussed above) identified an important third construct between supply and demand: one relating to access and barriers to access. Taken together, we depict a framework based around three synthetic constructs: 1) health facility readiness to administer vaccines, 2) community-level access and 3) intention (on the part of the mother or caretaker) to vaccinate the child.

General theories of health service utilization were used to describe contributors to the three primary constructs. Contributing factors for Health Facility Readiness were identified using the World Health Organization's Health System Building Blocks Framework.[15] This framework describes supply of essential medicines and health workforce as the most proximal components of a successful health system.[15] Contributing factors to Intent to Vaccinate were identified based on the Theory of Planned Behavior, a highly-cited behavior change model for health service utilization.[38] According to this theory, the three contributing factors to intent are attitudes, perceived norms, and perceived control, which is sometimes described as perceived self-efficacy. The resulting framework is depicted in Figure 3.

The framework hypothesizes three principal determinants of vaccine utilization:

Figure 3: Conceptual framework for vaccine coverage



- Intent to Vaccinate - Demand for vaccines on the part of the mother that would result in vaccination in the absence of other barriers.
- Facility Readiness - Supply (by the health system) of vaccine services to adequately meet demand. Incorporates supplies (vials, syringes etc.), human resources and the consistency of their availability.
- Community Access - The ability (or inability) to successfully carry out the transaction of vaccine utilization, i.e. barriers and facilitators between Intent and Readiness.

This framework represents the three principal determinants in their most simplified form; as separate and distinct from one another. This was done in order to accomplish the main objective of producing a testable hypothesis, but does not preclude analysis of these constructs with correlation.

1.4 DISCUSSION

This study presents the most comprehensive systematic review of vaccine determinants to date. We performed three qualitative analyses and synthesized the information we gathered into an evidence-based conceptual framework. The key advantages of the conceptual framework are that it is designed to be exhaustive, succinct and testable.

This study has limitations however. Although the network of determinants (Figure 1) is intended to be comprehensive, one limitation of this study is completeness. There are four reasons why this study may not be considered complete. First, it is only complete within the context of the scientific literature. Any determinants that have been systematically overlooked by other researchers will not be present here. Second, the systematic review did not include studies of specific interventions to improve vaccine coverage, just research on determinants. Because of

this, there is potential for our analyses to exclude potentially influential information. Third, it is only complete within a certain degree of proximity to utilization. One could continue to argue that each determinant has its own preceding determinants *ad infinitum*. While this may be true, it is clearly not the goal of this research to describe the entire spectrum of socioeconomic forces, thus only reasonably proximal determinants were described. Last, despite going to great lengths to uncover as many relevant articles as possible, it may be that some research studies were simply missed. With a citation list of 1,621 articles however, we are confident that such studies are few.

Two other potential limitations stem from the implementation of the review and synthesis. First, the entire study (web searches, review, analysis and synthesis) was conducted by a single researcher. While it would have been ideal to rely on multiple reviewers and assessment of inter-rater reliability, that was not feasible for this study. Second, this review did not include a formal statistical meta-analysis. The exclusion of meta-analysis was intentional for two reasons. First it was anticipated that the studies included in the review would be heterogeneous and observational. Omitted variable bias and observer-expectancy effects in such a diverse base of studies make meta-analysis intractable. Second, a primary objective of this study was to synthesize the literature into a testable hypothesis. Some of the most informative studies for that goal were qualitative and were not fit for meta-analysis.

Limitations notwithstanding, this systematic review has a key advantages over previous reviews. First, no previous systematic review has been exhaustive. For example, Rudner Lugo 1993[8], Falagas 2008[9], Rainey 2011[10] and LaFond 2014[11] each performed systematic reviews to examine factors associated with vaccine coverage, but none of the reviews captured any of the others. Second, none of these studies examine the factors which impact the effectiveness of vaccines. On the contrary, Patriarca 1991[12], Akande 2007[13] and Cherry 2012[14] explore reasons behind the effectiveness of vaccines but not utilization, and only focus on a subset of determinants. Beyond these, there are hundreds of studies which consider factors relating to either utilization or effectiveness but are not exhaustive in terms of the reasons they explore.

The conceptual framework presented here has advantages over previous frameworks as well. First, it represents a synthesis of multiple existing frameworks. Our analysis draws the most useful characteristics from each of them to avoid gaps that disadvantage other frameworks. Second, it was designed to be applicable in low and middle-income countries (LMICs). Among the two previous systematic reviews which offer a framework[8,11], only one of them focuses on LMICs, and that framework focuses on only a select few determinants.[11] Third, the conceptual framework presented here integrates the Theory of Planned Behavior and the WHO Building Blocks models. Both are vetted, tested models, the former of which has quantitatively outperformed other theories in direct comparisons.[39] Finally, this framework was designed to be quantitatively testable, an absent characteristic in at least some other frameworks. With appropriate data, the constructs in this framework could be directly represented using latent variable analysis. Future data collection and analysis plans could take advantage of a pre-existing conceptual framework to be more grounded in existing research.

This study offers important contributions to the understanding of routine childhood vaccination in low and middle income countries. One is simply the list of studies it identified (Appendix 3). We consider this to be a useful public resource in its own right. Now that a near-complete list of studies exists, future researchers can perform their own qualitative analysis and develop competing conceptual frameworks with greater ease. Another contribution is the conceptual framework. Future quantitative researchers can use this study to identify appropriate indicators to analyze and to define their theoretical model. By bringing together the collective evidence on

the drivers of immunization, this review lends itself to better research in the future, further understanding of determinants, and greater progress against vaccine preventable diseases around the world.

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CHAPTER 2

MEASURING ANTIBODY CONCENTRATIONS USING DRIED BLOOD SPOTS: AN ALGORITHM FOR DATA PROCESSING

2.1 INTRODUCTION

Serological biomarker studies are an essential tool for understanding vaccine effectiveness and health impact.[1,2] Measuring antibodies in blood samples can allow public health professionals to understand a range of health outcomes such as disease prevalence, serotype distribution and immune response to vaccination. A popular sample collection technique is dried blood spot (DBS) samples, i.e. drops of capillary blood from a finger-stick blotted onto filter paper and dried.[3-5] DBS studies are increasingly common in resource-limited settings because they are often less expensive and logistically challenging than studies involving liquid blood.[6-8] DBS studies are limited in their comparability however, owing to a lack of standardized protocols and a range of challenges in sample collection and assaying.[9-11]

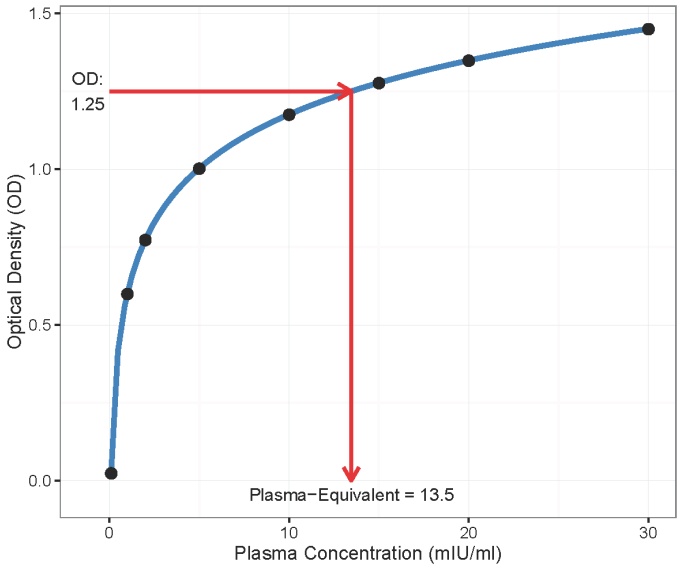
Measurement error in DBS data, i.e. largely uncontrollable differences between samples that contribute to stochastic variation, may come from a variety of sources. Importantly, some sources of measurement error impact individual samples, while others affect groups of samples or entire studies. For example, sample-specific measurement error may affect individual measurements through variability in the sample collection on a sample-by-sample basis. However, many parts of the assay protocol refer to whole assay plates, such as incubation time and mixing of fluids among others. These plate-level factors mean groups of samples could have stochastically higher or lower values. At the highest level, differences in data collection, assay protocols, laboratory facilities and data analysis may hinder comparisons between studies. Many of these challenges are compounded by the technical and logistical difficulties of multi-national studies in resource-limited settings.[12]

An important analytical step after DBS data collection is conversion from direct measurements to actual concentration of antibodies in the blood, plasma or serum of the study participant. For example, analyses conducted using enzyme-linked immunosorbent assays (ELISA) estimate optical density (OD) of color change which must be translated into a biologically-relevant metric such as plasma concentration. The common approach to conversion is to generate a "standard curve", or best-fit line between OD and plasma concentration using DBS samples for which the actual plasma concentration is reliably known.[13] The standard curve is used across all samples to find the equivalent plasma concentration for every OD value. Figure 4 demonstrates the typical use of a standard curve.

A concern in DBS studies is uncertainty in the standard curve itself though. In our study for example, the slope of one standard curve had a confidence interval of +/- 11%. Yet in a systematic review of DBS literature, we found zero studies that reported confidence intervals around estimates from a standard curve (for details on the systematic review, see Appendix 5). Neglecting uncertainty could give the false impression that the plasma-equivalent concentrations in are precisely known, and may increase Type 1 and Type 2 error in subsequent analyses.

The use of a study-wide standard curve is also problematic in light of the measurement error described above. If a single conversion equation is used across all samples, the implicit assump-

Figure 4: A typical standard curve and its application



The standard curve relates optical density values (observed measures) to plasma equivalent values (biologically-relevant measures) using samples for which both are known. An example of a sample with optical density of 1.25 is shown.

tion is that all measurement error occurs at the individual sample level. In other words, the traditional standard curve ignores plate-level and study-level measurement error. This assumption can lead to erroneous results and conclusions when measuring antibody concentrations, determining serostatus of individuals, or estimating seroprevalence in a population.

Very few serological studies and, to our knowledge, no DBS studies acknowledge uncertainty in the standard curve (Appendix 5). Fewer still take note of multi-level measurement error.[11] In this study, we argue that all DBS studies should at least report plasma-equivalent estimates with uncertainty intervals. We go on to present an algorithm to convert from OD measurements to plasma-equivalent concentrations while simultaneously standardizing measurement error at the assay plate level. We demonstrate the algorithm using immunization data from a multi-country serological study in Mozambique, Uganda and Zambia.

2.2 METHODS

2.2.1 *Data*

DBS data were collected as part of a prospective, multi-country evaluation of immunization activities called the Gavi Full Country Evaluations study. During a nationally representative household survey, children under age five were randomly selected to participate in the DBS study. 2,117 DBS samples were collected in Mozambique, 1,138 DBS samples were collected in Uganda and 990 samples were collected in Zambia. Study enumerators were equipped with portable lancet devices, and absorbed five droplets of blood from consenting participants onto Whatman 903 filter paper cards. Filter paper cards were dried in open air, photographed and stored in sealed containers before being shipped to the processing laboratory (separate laboratories for each country).

A standard protocol was used to analyze concentrations of four analytes: hepatitis B surface antibody (HBsAb), hepatitis B core antibody (HBcAb), hepatitis B surface antigen (HBsAg) and tetanus Immunoglobin G (tetanus IgG). Six 3.2mm discs were punched from each DBS card into 96-well microtiter plates and assays were performed using Diasorin ELISA kits in accordance with manufacturer instructions. The entire assay protocol included 19 steps over two days and is detailed elsewhere.[14]

A number of validation and quality control samples were used as well. Each assay plate included negative and positive controls, blank controls and assay calibrator samples provided by the ELISA manufacturer. In addition, DBS controls were created in the laboratory using whole blood with high, low, and zero antibody concentration. Identical replicates of these DBS controls were used on every assay plate. On assay plates separate from the field sample assays, a population of validation samples was analyzed which entailed serial dilution of plasma with known antibody concentrations.

2.2.2 *Traditional Standard Curve Formulation*

To demonstrate typical results and uncertainty intervals in OD-to-plasma conversion, we formulated a "traditional" standard curve (ignoring multi-level measurement error for the moment). OD was measured for DBS control samples with previously-determined plasma concentrations (samples i in the validation set v). Ordinary linear regression was then used to fit a standard curve using the known plasma concentration as the dependent variable and log-OD as the independent variable, according to the following formula:

$$plasma_{i\in v} = \beta_0 + \beta_1 log(OD)_{i\in v} \tag{1}$$

The standard curve was used to determine the equivalent plasma concentration for each field sample by evaluating equation 1 with OD values from the field samples. Uncertainty around the estimated plasma-equivalent concentrations was determined using the standard 95% confidence interval from ordinary least squares.

2.2.3 *Standardization Algorithm*

To estimate a standard curve with added variation for each assay plate, we used random effects. Using DBS controls and the validation population (the two standards for which plasma concentration and OD are both known), the model was fit with plasma concentration dependent on OD value, with plate-level slope and intercept terms (λ_{0p} and λ_{1p}) as follows:

$$plasma_{i\in vp} = \beta_0 + \beta_1 log(OD)_{i\in vp} + \lambda_{0p} + \lambda_{1p} OD_{i\in vp} \tag{2}$$

Where $plasma_{i\in vp}$ and $OD_{i\in vp}$ are the known plasma concentrations and observed OD values for individual sample i, measured on plate p (in the validation set v). The random intercepts (λ_{0p}) measure the vertical offset of each plate visible in Figure 1, and the random slopes (λ_{1p})

measure how spread out or condensed each plate's controls are. In short, equation 2 can be interpreted as a way to fitting separate standard curves for each plate while making use of all of the data.

Using the coefficients from equation 2, we estimated plasma-equivalent values for field samples (j), correcting for plate-level measurement error. This was accomplished by estimating the fitted values from equation 2 ($\widehat{plasma}_{jp}$), and then dividing and subtracting off the difference between each plate's random effects and the random effects of the validation plate, v:

$$\widehat{plasma}_{jp} = \beta_0 + \beta_1 log(OD)_{jp} + \lambda_{0p} + \lambda_{1p} OD_{jp} \tag{3}$$

$$\widehat{plasma}_{jp}{}' = \frac{\widehat{plasma}_{jp}}{\frac{\lambda_{1p=v}}{\lambda_{1p}}} - (\lambda_{0p=v} - \lambda_{0p}) \tag{4}$$

The resulting corrected estimates ($\widehat{plasma}_{jp}{}'$) represent estimated plasma-equivalent values whose location (λ_{0p}) and scale (λ_{1p}) match that of the validation population, thereby removing plate-level differences.

Uncertainty in the corrected plasma-equivalent estimates ($\widehat{plasma}_{jp}{}'$) was captured through Monte Carlo simulation and cross validation. 1,000 random variants of $\widehat{plasma}_{jp}{}'$ were estimated by drawing 1,000 variants of each model coefficient from a multivariate normal distribution. In order to incorporate data uncertainty in addition to model uncertainty, the model was evaluated out-of-sample using 100 randomly-sampled 2/3's training datasets. The root mean squared error of the predictions among the test datasets was used to add random error to the 1,000 variants of fitted values prior to plate-level standardization. The upper and lower 2.5th percentiles of 1,000 variants were used as its 95% uncertainty interval.

The model formulation in equation 2 was tested against alternative models such as log-linear and intercept-only models. Cross validation was used to assess the predictive validity of candidate models for each analyte (HBsAb, HBcAb, HBsAg and tetanus IgG) and in some cases, log-transformed OD and intercept-only models were used instead. All analyses were performed using R version 3.1.2. The code that performs the conversion and standardization has been made publicly available at the following URL: https://github.com/ihmeuw/dbs

2.2.4 *Seroprevalence*

Each estimate of plasma-equivalent concentration (from both the "traditional" approach and standardization algorithm) was dichotomized according to a set threshold, above which samples were deemed positive. The threshold for each analyte was determined either according to clinically-relevant limits or the ELISA manufacturer's instructions. We used a threshold of 5 mIU/ml to determine HBsAb serostatus, the calibration liquid included in the ELISA kit for HBcAb, 1 mIU/ml for HBsAg and 0.25 mIU/ml for tetanus IgG.[15-17] Seroprevalence was defined as the proportion of samples which were positive.

Sensitivity and specificity were estimated by comparing the known status of the control samples to the predicted status based on the two conversion techniques.

2.3.1 *Plasma-Equivalent Estimates using "Traditional" Standard Curve*

Optical density values, equivalent plasma concentration estimates and uncertainty intervals are shown in Table 3 by country and analyte. Taking HBsAb for example, the mean plasma-equivalent concentration was 10.2 mIU/ml for Uganda and 13.7 mIU/ml for Zambia (HB analytes from Mozambique were not available). Plasma-equivalent estimates varied from sample to sample, with a standard deviation of 8.27 mIU/ml for Uganda and 16.71 mIU/ml for Zambia. Table 3 also demonstrates the reporting of uncertainty. Each sample's plasma concentration was estimated with its own uncertainty interval (standard error), the mean of which is shown in column 5.

Table 3: Descriptive statistics of optical density, unstandardized and standardized plasma-equivalent values across all analytes/countries

Country	Analyte	Optical Density Mean (SD)	Unstandardized Plasma Concentration Mean (SD)	Mean Standard Error	Standardized Plasma Concentration Mean (SD)	Mean Standard Error
Uganda	HBsAb	0.29 (0.2)	10.16 (8.27)	2.91	5.92 (7.22)	1.07
	HBcAb	1.82 (1.09)	4.45 (4.59)	1.24	2.29 (3.37)	2.61
	HBsAg	0.08 (0.04)	12.47 (2.57)	3.4	1.97 (2.45)	0.31
	tetanus IgG	4.63 (2.41)	4.45 (2.33)	0.23	2.56 (1.45)	0.03
Zambia	HBsAb	0.36 (0.53)	13.74 (16.71)	1.27	13.99 (17.19)	1.54
	HBcAb	1.42 (0.35)	10.22 (12.37)	4.76	13.89 (14.96)	1.85
	HBsAg	0.05 (0.25)	2.81 (34.13)	0.46	1.36 (17.65)	1.59
	tetanus IgG	2.9 (2.16)	2.9 (2.16)	0.16	1.48 (1.29)	0.03
Mozambique	tetanus IgG	4.35 (9.2)	3.65 (5.57)	0.25	2.31 (5.16)	0.36

Regardless of whether the standardization algorithm is used, each plasma-equivalent value can be estimated with uncertainty. The Mean Standard Error columns in this table display the average width of that uncertainty interval across all samples.

Seroprevalence estimates are displayed in Table 4. Dichotomizing the unstandardized plasma-equivalent values leads to HBsAb estimates of 69.7% in Uganda and 55.2% in Zambia. Ostensibly, this would seem to indicate that Uganda has higher immunity. When considering uncertainty however, a more complete picture becomes apparent, as seroprevalence could be as low as 53.0% or as high as 86.8% in Uganda and ranged from 45.9% to 65.6% in Zambia.

Between-plate variance was found to vary by study location. Figure 5 displays plasma-equivalent concentrations (estimated using the "traditional" standard curve) for HBsAb from the Zambia study, including field samples and control samples. When displayed in this way, a moderate amount of between-plate variation can be noted. Figure 6 shows plasma-equivalent concentrations for HBsAb from the Uganda study, demonstrating the relatively inordinate amount of plate-level and individual-level variability that was observed in that analyte and study. Using the mean absolute z-score across plates as a measure of between-plate variability, this was 0.30

Table 4: Estimates of seroprevalence using "traditional" standard curve and the standardization algorithm

Country	Analyte	Unstandardized Seroprevalence (95% UI)	Standardized Seroprevalence (95% UI)
Uganda	HBsAb	69.7 (53.0-86.8)	49.0 (38.7-59.8)
	HBcAb	60.0 (51.9-67.3)	43.8 (37.9-50.7)
	HBsAg	99.7 (99.7-100)	54.0 (33.7-76.0)
	tetanus IgG	99.6 (99.5-99.6)	95.3 (93.8-96.6)
Zambia	HBsAb	55.2 (45.9-65.6)	55.1 (46.5-65.7)
	HBcAb	47.8 (30.4-66.8)	51.8 (38.0-66.2)
	HBsAg	10.7 (6.70-20.3)	16.1 (11.2-21.7)
	tetanus IgG	100 (100-100)	86.4 (81.9-90.2)
Mozambique	tetanus IgG	99.2 (98.7-99.7)	92.1 (89.6-94.2)

(minimum: 0.07, maximum: 1.08) for HBsAb in Uganda, meaning that the typical plate was nearly one-third of a standard deviation higher or lower than the average. HBsAb samples from Zamia were found to have lower, but still notable, variation between plates, where the mean absolute z-score across plates was 0.17 (minimum: 0.06, maximum: 0.49) respectively.

2.3.2 *Plasma-Equivalent Estimates using Standardization Algorithm*

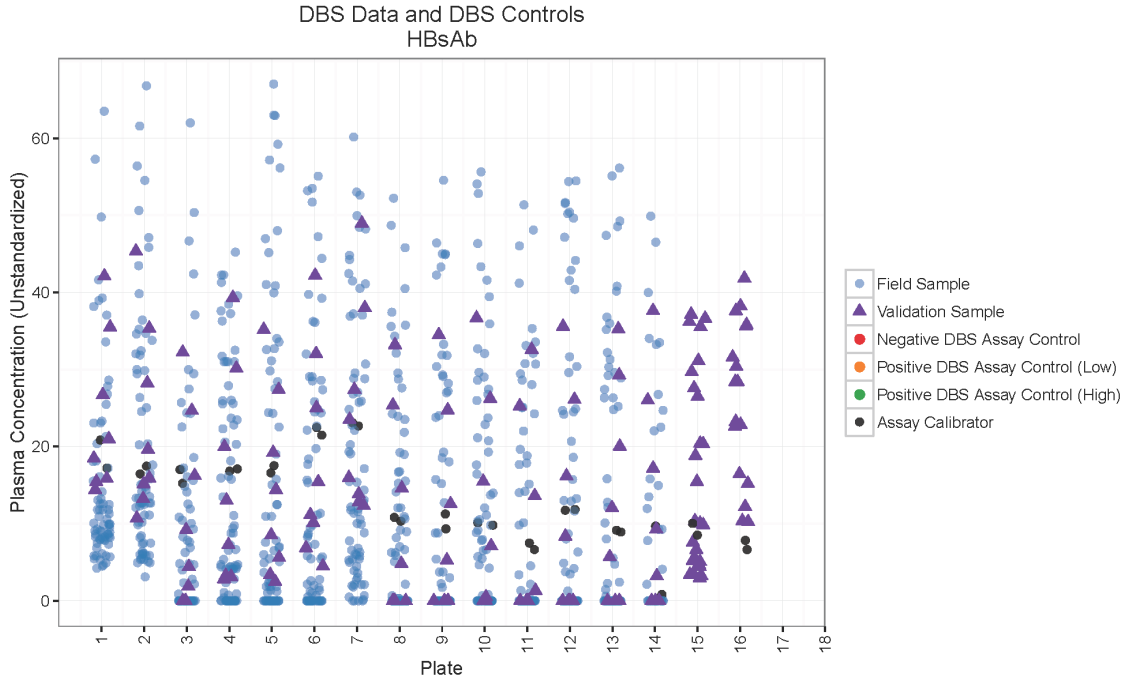
The proposed algorithm reduces between-plate variation, as shown in Figure 7. The mean absolute z-score across plates was lower for all country-analytes, indicating smaller plate-level deviations from the average plate. These z-scores were 0.13 (minimum: 0.01, maximum: 0.27) and 0.09 (minimum: 0.01, maximum: 0.18) for the Ugandan and Zambian HBsAb samples.

Standardized plasma-equivalent concentrations and seroprevalence estimates were sometimes substantially different than unstandardized estimates (as Table 3 and Table 4 show), demonstrating the effect that plate-level measurement error can have on results. Seroprevalence of HBsAb in Uganda was overestimated compared to standardized estimates, reducing from 69.7 (95% uncertainty interval: 53.0-86.8) to 49.0 (95% uncertainty interval: 38.7-59.8) after standardization. Seroprevalence of certain other analytes was virtually unchanged by standardization however, such as HBsAb in Zambia, indicating low plate-level measurement error in that case.

Sensitivity and specificity improved or remained the same across all analytes (Table 5). In some instances such as specificity of HBsAb and HBsAg, the improvement was dramatic, improving from 0.03 (95% uncertainty interval: 0.00-0.09) to 0.39 (95% uncertainty interval: 0.26-0.53) and 0.48 (95% uncertainty interval: 0.02-0.93) to 0.76 (95% uncertainty interval: 0.45-1.00) respectively.

An important additional application for this algorithm is demonstrated in Figures 8 and 9, that is the enhanced comparability between separate studies. In Figure 8, the HBsAb DBS samples from both Uganda and Zambia have been plotted side-by-side, making apparent the differences not only between plates in each study site, but between whole studies. Using the same validation population for both sites, the exact same algorithm is able standardize the two

Figure 5: Plasma-equivalent concentrations for Zambia HBsAb using the "traditional" standard curve (without standardization)



In the above figure, each column of points represents a separate ELISA plate. Points represent plasma concentration values for individuals. Blue circles identify field samples, triangles identify the "validation" samples (i.e. assays using plasma with known antibody concentration), and the red, orange and green circles (not present in Zambia) represent "DBS control" samples (i.e. DBS using whole blood with known antibody concentration).

sites (Figure 9) while estimating plasma concentrations, effectively improving comparability between the different study locations.

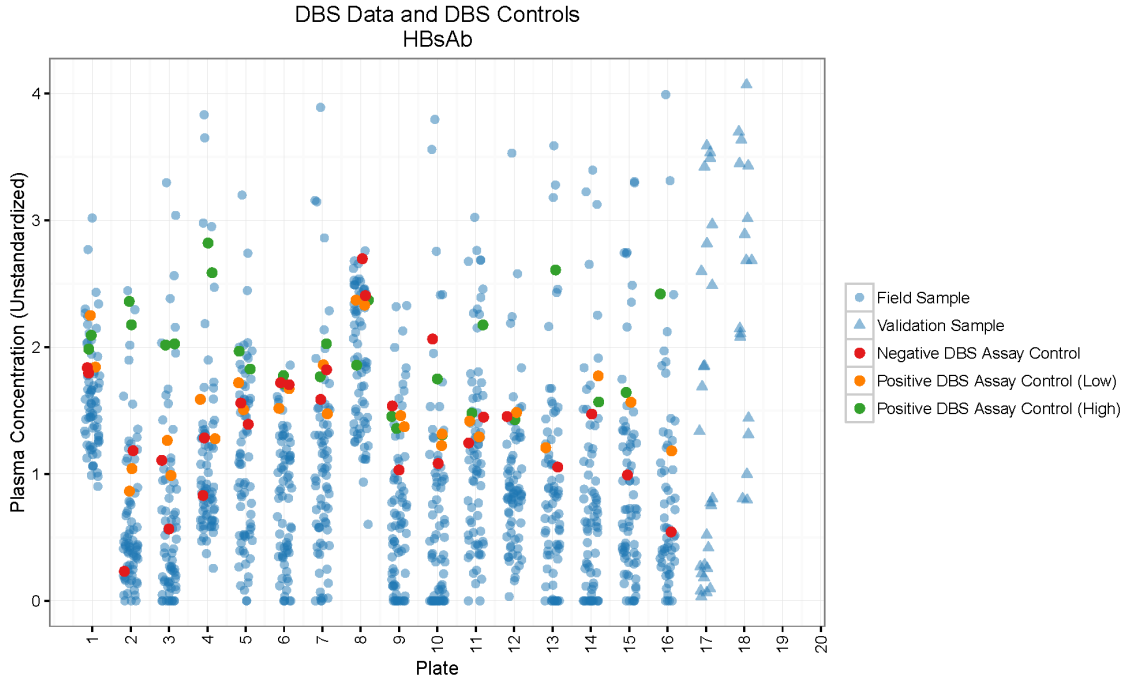
Uncertainty measured in the conversion and standardization process is displayed in Figure 10. For each sample's OD, the corresponding plasma concentration could fall within a range of values, averaging +/- 8.66% mIU/ml for HBsAb in Zambia. Uncertainty intervals appropriately capture the plate-level and individual-level variability, exhibiting much wider intervals for HBsAb in Uganda, where both sources of variance were noticeably higher.

2.4 DISCUSSION

The approach described above converts OD values to their equivalent plasma concentrations and simultaneously standardizes plate-level and study-level measurement error with uncertainty. The algorithm improved sensitivity and specificity in all studies and analytes.

Compared with traditional approaches that estimate plasma-equivalent values without standardization, our algorithm has a distinct advantages. First, plasma concentrations are often dichotomized with a simple threshold, above which study participants are considered to be positive (i.e. carriers of sufficient antibodies for immunity). If the same threshold is applied across all plates, plate-level measurement error will result in many false positives and false negatives, as shown in Table 5. Secondly, the enhanced comparability between studies (Figures 8 and 9) is very beneficial to multi-site studies and meta-analyses. Without study-level standard-

Figure 6: Plasma-equivalent concentrations for Uganda HBsAb using the "traditional" standard curve (without standardization)



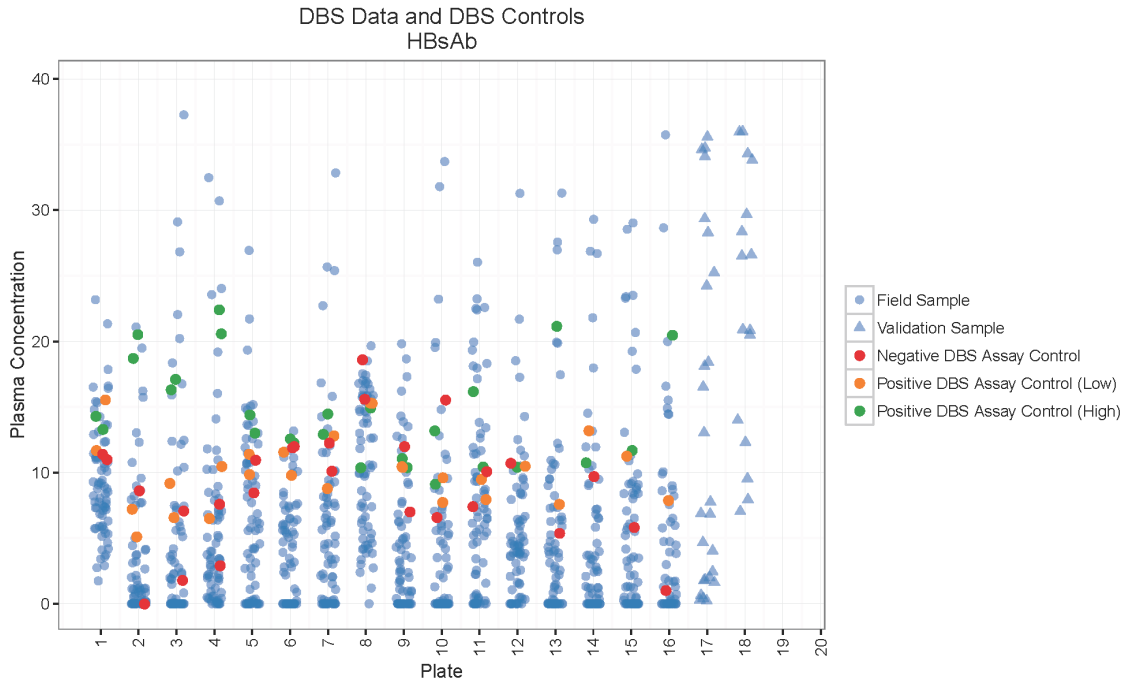
In the above figure, each column of points represents a separate ELISA plate. Points represent plasma concentration values for individuals. Blue circles identify field samples, triangles identify the "validation" samples (i.e. assays using plasma with known antibody concentration), and the red, orange and green circles represent "DBS control" samples (i.e. DBS using whole blood with known antibody concentration).

ization, biases inherent to the differences between studies could render cross-study comparisons altogether unreliable.

This approach is based on a few key assumptions. A fundamental principle is that the validation plate can be held as the gold standard to which the field samples should be corrected. Biased validation samples will naturally induce mirrored bias in the standardized field samples. A second key principle is that the sources of plate-level measurement error, whatever they may be, apply to the DBS controls and field samples similarly. In this study, we found that the DBS controls were higher on plates with generally higher field samples and vice versa, indicating that they did experience similar plate-level measurement error to the field samples. The DBS control samples correlated strongly with the field samples on the same plate, for example the low positive control for HBsAb in Uganda had a correlation coefficient of 0.74 with the mean field samples on the sample plate. Finally, the model is based on the assumption that plate-level measurement error is stochastic in nature and normally distributed.

From an alternative perspective, it may seem unnecessary to standardize measurement error at all; one could argue that more tightly-controlled DBS studies would prevent measurement error in the first place. Our philosophy is that every serological study, no matter how carefully conducted, is subject to some degree of measurement error that is outside the control of those involved. This is especially true in resource-limited settings (such as this study), where physical and logistical constraints are often irrepressible. While it is of course worthwhile to minimize measurement error, we believe that application of this technique can enhance the utility and accuracy of even the most carefully-controlled studies.

Figure 7: Plasma-equivalent concentrations for Uganda HBsAb using the standardization algorithm



The standardization algorithm uses DBS controls to adjust the level and spread of the field samples to match the validation samples.

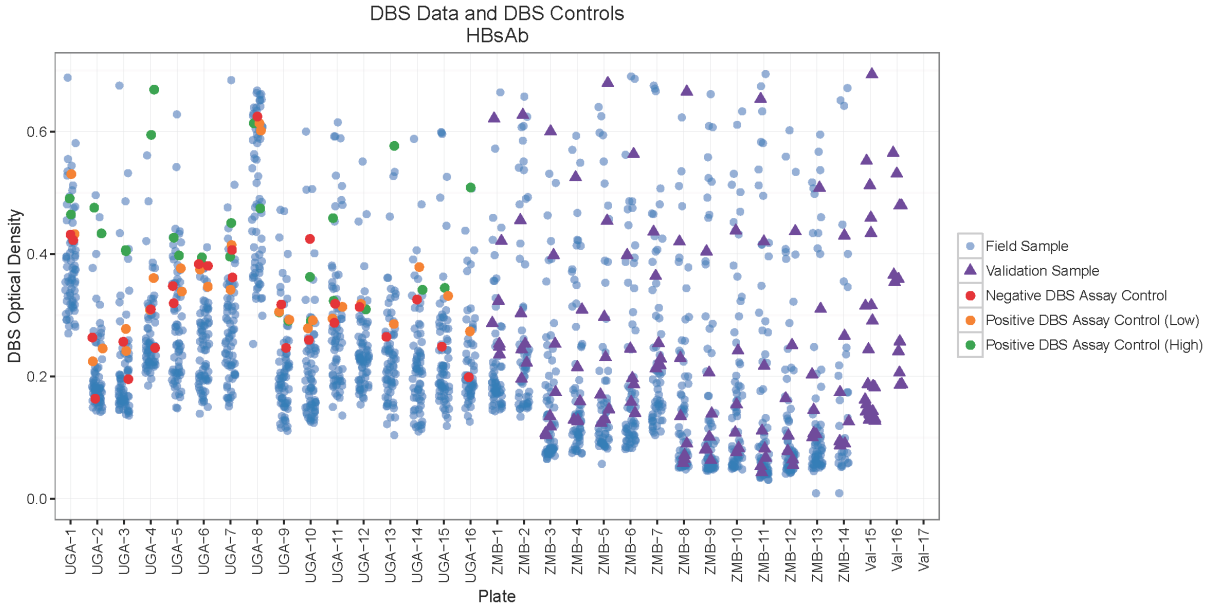
Two common practices can be seen as alternative approaches to addressing uncertainty and measurement error. First, the reporting of an "equivocal" serostatus category, representing samples that fall very near the threshold, is nearly universal. This is a useful practice in the sense that it mitigates false positives and negatives by essentially considering borderline cases as "neither". We suggest however that an uncertainty interval around the categorization of serostatus accomplishes the same effect, but is more precise since it allows (with proper interpretation) the analyst to report the probability that a particular sample is positive or negative, rather than just reporting one of three discrete categories. The second common practice in addressing measurement error is to simply discard errant samples or plates. This approach can certainly be sensible, as some assays may be too egregious to be useful, or uncorrectable based on their validation samples. One example is assay plates 1 and 2 from Zambia HBsAb (Figures 8 and 9). Because essentially no correlation was found between the control samples and the field samples, the algorithm failed to standardize the plasma-equivalent estimates. We believe our proposed algorithm offers a defensible approach to even the most extreme cases however, because they will simply be reflected in a wider uncertainty interval.

The lack of reporting on uncertainty, plate-level or any higher-level measurement error in other serological studies is alarming. Given the potential for biased results, we emphasize the importance of examining, reporting and correcting measurement error. For comparisons between studies or between laboratories of the same study (as was the case in here), reliance on a common validation population is critical to ensure the same standardization for all sites. To utilize this approach, it is necessary that assays include control samples that are comparable to the field samples on every plate. One lesson learned from this study is that control samples should be assayed in triplicate or more to ensure that the random effects coefficients are robust to sample-level error. Without proper controls at all however, standardization of measurement

Table 5: Sensitivity and specificity among control samples (Uganda)

	Sensitivity (95% UI)		**Specificity (95% UI)**	
Analyte	**Unstandardized Plasma Estimates**	**Standardized Plasma Estimates**	**Unstandardized Plasma Estimates**	**Standardized Plasma Estimates**
HBsAb	0.71 (0.70-0.73)	1.00 (0.89-1.00)	0.03 (0.00-0.09)	0.39 (0.26-0.53)
HBcAb	0.81 (0.73-0.89)	0.82 (0.71-0.93)	0.13 (0.04-0.22)	0.19 (0.06-0.32)
HBsAg	1.00 (0.97-1.00)	1.00 (0.84-1.00)	0.48 (0.02-0.93)	0.76 (0.45-1.00)
tetanus IgG	1.00 (1.00-1.00)	1.00 (0.94-1.00)	1.00 (0.95-1.00)	1.00 (0.85-1.00)

Figure 8: Optical density values for Uganda and Zambia together using the "traditional" standard curve (HBsAb)



error is impossible. At the very least, plasma estimates should always be produced and reported with uncertainty intervals.

This study presents a simple, publicly-available algorithm that corrects for important sources of measurement error while simultaneously estimating plasma antibody concentrations from DBS data. The technique could easily be expanded to other serological studies beyond vaccine effectiveness evaluation with DBS, and even applied to correct for other sources of measurement error, such as enumerator biases or other laboratory biases. The application of this technique could enhance the accuracy and utility of future studies, and enable more precise, reliable estimates of health outcomes such as disease prevalence, vaccine effectiveness and health impact.

Figure 9: Plasma-equivalent concentrations for Uganda and Zambia together using the standardization algorithm (HBsAb)

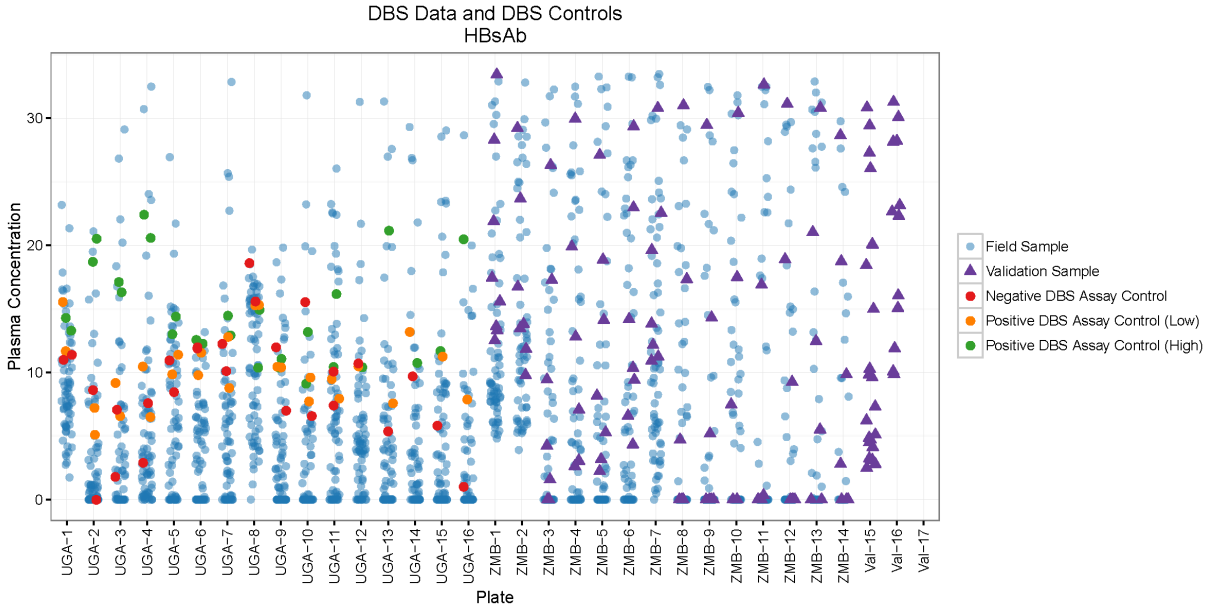
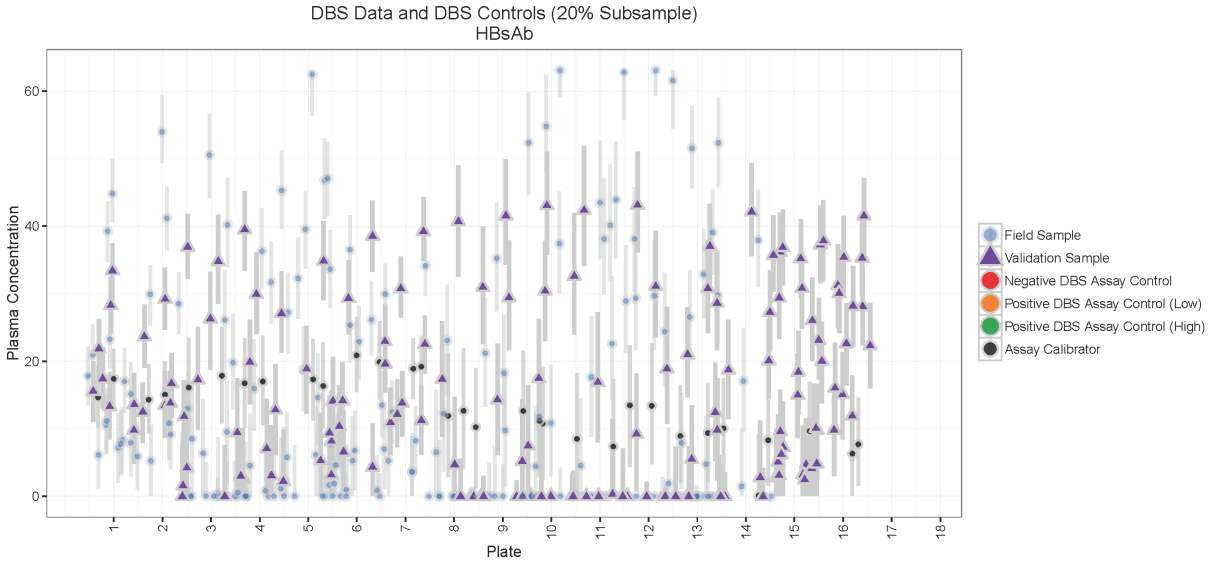


Figure 10: Plasma-equivalent concentrations for Zambia HBsAb, including uncertainty intervals (20% sample of all data)



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CHAPTER 3
CHILDHOOD VACCINES IN UGANDA AND ZAMBIA: DETERMINANTS AND BARRIERS TO EFFECTIVE COVERAGE

3.1 INTRODUCTION

Improving childhood immunization is a major priority for global health.[1] Effective coverage[2] remains a challenge in low and middle-income countries (LMICs) however; an estimated 74% of children in Africa receive vaccination[3], and vaccines do not always confer immunity.[4,5] Low immunization also raises concerns of inequity.[6] Policy makers and public health practitioners address these issues by identifying determinants and removing barriers.[7-9] Gavi, the Vaccine Alliance, for example, supports health system strengthening (HSS) with aims of improving system bottlenecks.[10] For HSS support, country stakeholders must first identify which barriers are most critical in their context.

Barriers to effective coverage are complex and difficult to measure though. A recent systematic review (Chapter 1) shows the large number of determinants and complex structure relating them.[11] Many determinants are associated with effective coverage, but their effects are mediated and confounded by others. Determinants also vary between different outcomes.[7-9] The set of barriers to initial engagement with the health system may be different than barriers to completing the dosage schedule, and new vaccines present further challenges.[13] Determinants of immunity (conditional on vaccination) are different altogether.[14] Direct measurement of immunity is difficult too. It requires serological data[4] which has been shown (Chapter 2) to include its own uncertainty.[12]

Hundreds of research studies have sought to measure determinants and barriers in LMICs.[11,15-18] Most studies face key limitations however. First, the theoretical model for analysis is often informally defined. Issues such as the universe of determinants and the structure to their relationship are rarely explicitly stated. Second, studies typically use only household survey data. These data suitably reflect maternal perceptions, and characteristics, but not community and health system factors. Third, most studies use generalized linear models to estimate odds ratios. These models have limited ability to realistically depict an underpinning theoretical model, including mediation and indirectly measurable latent constructs.[19] These limitations can be summarized as theory, confounding, directionality and construct validity.

The objective of this study is to measure determinants using a more integrated approach. This includes a clearly-defined hypothetical model. It also includes multi-faceted data and a modeling strategy that both realistically represents the hypothetical model and makes full use of the data. We use a conceptual framework from a recent systematic review and qualitative analysis (Chapter 1) to define the hypothetical model.[11] The data are four linked surveys from a prospective evaluation in Uganda and Zambia.[20] These measure child immunization using serologically-measured immunity and link child-level information to health facility information.[12] We employ Bayesian Structural Equation Modeling (BSEM) with latent variables to represent the hypothetical model using the data.[19,21] Special emphasis is placed on displaying the results in a manner which is useful to policy-makers, so that the original challenge of identifying key barriers to effective coverage can be met.

3.2 METHODS

The original framework of effective coverage defines it as the combination of utilization and effectiveness.[2] We carried out separate analyses for vaccine utilization (coverage) and immunization (effective coverage). The coverage analysis used BSEM, and the effective coverage analysis used logistic regression. Four outcomes were analyzed, chosen to reflect differences between new and routine vaccines, initiation and drop-out, and vaccines for which antibody-measured immunity was assessed (hepatitis B and tetanus). We demonstrate the results by examining regression coefficients, comparing explained variance, and using counterfactual analysis.

3.2.1 *Data*

The data come from four linked surveys conducted as part of the Gavi Full-Country Evaluation study[20] in Uganda and Zambia:

1. Household survey (HHS)
2. Health facility survey (HFS)
3. District health office (DHO) survey
4. Patient exit survey (PES)

Sampling design was a stratified, two-stage, clustered random sample described in detail elsewhere.[20] Data collection concluded with a sample size of 4,256 households, 177 facilities and 2,202 patient interviews in 19 districts in Uganda, and 1,070 households, 171 facilities and 3,319 patient interviews in 21 districts in Zambia. Further details can be found in Appendix 6.2. Household survey instruments included maternal, child and household characteristics, vaccination and pregnancy history, knowledge, attitudes and perceptions of vaccines and local vaccine services and others. Health facility and DHO instruments included facility characteristics, resources, supply chain records and others. Patient variables included maternal characteristics, services received, costs and others. A careful data processing procedure was followed, described in Appendix 6.2.

A number of outcome variables were examined. In the coverage analysis, receipt of at least 1 dose of the pentavalent vaccine (Pentavalent-1), 3 doses of the pentavalent vaccine (Pentavalent-3), 1 dose of pneumococcal conjugate vaccine (PCV1) and 3 doses of pneumococcal conjugate vaccine (PCV3) were analyzed separately for both countries. Coverage was determined based on the child's vaccine card whenever available, and maternal recall if necessary. For determinants of effective coverage, immune status for hepatitis B and tetanus were analyzed among vaccinated children. Immune status was determined based on plasma antibody concentrations above a clinically-relevance threshold, measured by a serological data collection technique known as dried blood spots (DBS).[12]

Eligible children for the analyses were any child older than 3 months, excluding children who were older than 18 months and born before introduction of PCV (for PCV analyses only), and excluding children whose caretaker was not their biological mother.

3.2.2 *Coverage Analysis*

For vaccine coverage, we used Bayesian Structural Equation Modeling (BSEM) with latent variables[19,21-23] to represent a hypothesized model[11] using the survey data. Details on the modeling approach are in Appendix 6.3. Briefly, SEM is a method for estimating simultaneous regression equations, relying on a "structural model" (theory) and measurement models (data).[19,23] Latent variable analysis uses systems of equations to represent variables that can only be indirectly measured.[19,23] Bayesian approaches to SEM have more recently been developed to incorporate prior information about parameters and estimate posterior distributions.[21]

3.2.2.1 *Structural Model*

The structural model in the coverage analysis is depicted in Figure 1. This model ties together constructs from existing theories[24,25] and was developed using systematic review and qualitative methods (Chapter 1).[11] The framework hypothesizes three principal determinants of vaccine utilization:

- Intent to Vaccinate - Demand for vaccines on the part of the mother that would result in vaccination in the absence of other barriers.
- Facility Readiness - Supply (by the health system) of vaccine services to adequately meet demand. Incorporates supplies (vials, syringes etc.), human resources and the consistency of their availability.
- Community Access - The ability (or inability) to successfully carry out the transaction of vaccine utilization, i.e. barriers and facilitators between Intent and Readiness.

The rationale, evidence base and methodology behind this hypothesized model are described in detail elsewhere (Chapter 1).[11] These three determinants are represented in the BSEM as latent variables, or constructs which are indirectly measured with the data. As shown in Figure 1, Intent to Vaccinate and Facility Readiness are themselves informed by other latent variables.

3.2.2.2 *Measurement Model*

The measurement model, i.e. specification of data to define latent variables, was also based on systematic review.[11] Survey instruments were screened for variables which matched or approximated indicators from systematic review. Candidate variables were visualized a priori to ensure adequate variance in responses and to avoid issues with complete separation. Final variable selection was as inclusive as possible. All viable data which, according to existing evidence, represented at least one latent variable were included. For more detail on the variables included in the model, see Appendix 6.3.3.

Table 6 describes the data used in the coverage analysis. Appendix Figure 17 displays histograms observed variables as well as the odds ratio associating each variable with Pentavalent-1 coverage. In all, 36 observed variables were used to represent the 8 latent variables. A combination of formative, reflective and composite latent variables were used as well as covariance terms for correlated errors.[19,23] For more detail on latent variables, see Appendix 6.3.1.

Figure 11: Structural model of latent variables

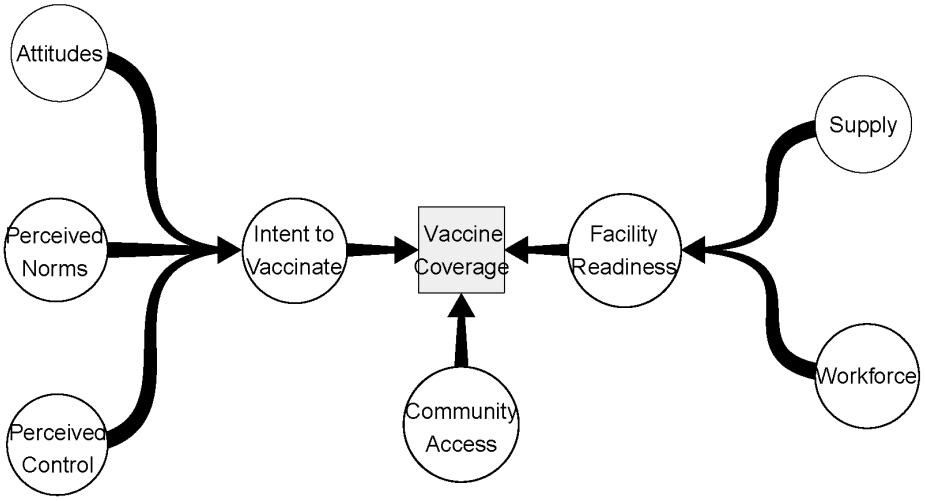


Table 6: Model variables and descriptions

Variable	Description	Unit of Analysis
Child Age	Child's age	Child
Pentavalent-3 Coverage	Either card or recall - Pentavalent3 received	Child
Vehicles	Total 3 or 4 wheel vehicles	Facility
Distance	Distance from household to facility (mean)	Household
Outreach Frequency (Com.)	Health worker travels to village for vaccination	Mother
Perceived Preventable Vaccine	Believes pneumonia preventable: By giving the PCV	Mother
Static Frequency (Fac.)	Days static vaccine services offered during typical month	Facility
Immunization Staff	How many staff providing vaccines on typical day	Facility
Perceived Purpose	Composite of vaccine purpose perceptions	Mother
Perceived Preventative	Composite of vaccine symptom prevention perceptions	Mother
Difficulty	Composite of access-related difficulties experienced while vaccinating	Last visit
Wealth	Household Wealth	Household
Parity	Number of siblings in household when child was of age to be vaccinated	Child
Cost	Average total vaccination cost across community	Community
Avoidance	Composite of avoidance-related reasons for non-vaccination across all children	Mother
Social Network	Composite of friends and family as information sources about PCV	Mother
Outreach Frequency (Fac.)	Total outreaches conducted this year	Facility
Previous Failed Attempt	Composite of control-related reasons for non-vaccination by child	Child
TBA Reliance	Composite of reliance on TBA for ANC, delivery, other services	Mother
Vaccine Stockouts	Composite of stockouts across all antigens and stockout definitions	Facility
Push Delivery	Staff member from facility does not travel to pick up vaccines	Facility
Community Coverage	Pentavalent 3 coverage across community	Community

Transport Cost	Composite of transport cost and hypothetical transport cost	Household
Perceived Availability	Reported frequency of static immunization services	Last visit
Static Frequency (Com.)	Community-level reported frequency of static immunization services	Community
Outreach Convenient	Vaccination services location convenient for mother/CT	Mother
Travel Time	Composite of travel time and hypothetical travel time	Household
Total Staff	Total number of staff members	Facility
DHO Distance	Distance from facility to district health office	Facility
Penta Delivery Prop.	Pentavalent Order Fulfillment (most recent order)	Facility
Median Order Size	Median Quantity of Vaccines Ordered from DHO	Facility
Days Between Orders	Median Number of Days between Orders	Facility
Deviation from Med. Order	Largest Ever Deviation from Median Order Quantity	Facility
Between Order Variance	Between-Order MAD Relative to Median Order Quantity	Facility
Catchment Population	Health Facility Catchment Population	Facility
Wait Time (PES)	Wait Time from HHS and PES Pooled	Facility

The complete model can be expressed by the following formulae:

Regressions

$$\mathrm{VaccineCoverage} = \mathrm{FacilityReadiness} + \mathrm{CommunityAccess} + \mathrm{IntenttoVaccinate} + \mathrm{ChildAge} \quad (5)$$

$$\mathrm{PerceivedControl} = \mathrm{StaticFrequency(Com.)} + \mathrm{Wealth} + \mathrm{Distance} + \mathrm{Cost} + \mathrm{ChildFailure} + \mathrm{Parity} \quad (6)$$

$$\mathrm{Supply} = \mathrm{Vehicles} + \mathrm{PushDelivery} + \mathrm{dhoDistance} + \mathrm{MedianOrderSize} + \mathrm{DaysBetweenOrders} \quad (7)$$

$$\mathrm{Workforce} = \mathrm{TotalStaff} + \mathrm{CommunityCoverage} + \mathrm{CatchmentPopulation} + \mathrm{ImmunizationStaff} \quad (8)$$

Composites

$$\mathrm{IntenttoVaccinate} = \mathrm{Attitudes} + \mathrm{PerceivedNorms} + \mathrm{PerceivedControl} \quad (9)$$

$$\mathrm{FacilityReadiness} = \mathrm{Supply} + \mathrm{Workforce} \quad (10)$$

$$\mathrm{CommunityAccess} = -\mathrm{Parity} + \mathrm{Cost} + \mathrm{Distance} + \mathrm{Wealth} \quad (11)$$

$$\mathrm{PerceivedNorms} = \mathrm{CommunityCoverage} + \mathrm{SocialNetwork} + \mathrm{OutreachFrequency(Com.)} \quad (12)$$

Measures (reflective factors)

$$\mathrm{PerceivedControl} = \mathrm{PerceivedAvailability} + \mathrm{OutreachConvenient} + \mathrm{Difficulty} + \mathrm{TransportCost} + \mathrm{TravelTime} \quad (13)$$

$$\mathrm{Attitudes} = \mathrm{PerceivedPurpose} + \mathrm{Avoidance} + \mathrm{PerceivedPreventative} + \mathrm{PerceivedPreventableVaccine} + \mathrm{TBAReliance} \quad (14)$$

$$\mathrm{Supply} = \mathrm{PentaDeliveryProp.} + \mathrm{VaccineStockouts} + \mathrm{DeviationfromMed.Order} + \mathrm{BetweenOrderVariance} \quad (15)$$

$$\mathrm{Workforce} = -\mathrm{WaitTime(PES)} + \mathrm{StaticFrequency(Fac.)} + \mathrm{OutreachFrequency(Fac.)} \quad (16)$$

3.2.2.3 *Prior Distributions*

Prior distributions were selected for all coefficients, intercepts and variance terms. To allow the data to influence posterior distributions, diffuse priors were used for all parameters. For the same reason, all priors in the same family and expected direction were set equal (i.e. prior distributions did not influence the relative magnitude of comparable coefficients). For coefficients relating data to latent variables (formulae 6-8 and 11-16), normal prior distributions with low precision (τ=0.01) were used. Each coefficient was given a prior mean of -1, 0 or 1, depending on the expected direction of that coefficient in the literature. Pathways in the structural model (Figure 1 and formulae 5, 9 and 10) were hypothesized to be strictly positive. That being the case, identical gamma priors were used with a shape and scale parameters equal to 1. Residual variances and covariances were modeled with gamma(1, 0.5) priors. A sensitivity analysis with different priors is shown in Appendix 6.4.

Evaluative techniques included goodness of fit statistics and predictive validity. Posterior probabilities of vaccination were computed from the model, and sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and concordance were evaluated at different thresholds to assess how well the model classified children's vaccine statuses. Further detail on performance metrics is described in Appendix 6.4.2

Effective Coverage Analysis Drivers of effective coverage, i.e. immunization, were assessed using a more straightforward modeling approach. Because determinants of immunity alone are

considerably more direct than determinants of coverage, we used logistic regression to measure coefficients.

The outcome variable for this analysis was immunity conditional on vaccination. Immunity was measured by DBS, and both hepatitis B and tetanus immunization were examined.

Ten explanatory variables were used in this analysis, and were selected based on systematic review of the causes of vaccine failure.[11] These included the child's age at first dose, interval between first and second dose, interval between second and third dose, storage temperature measured at the health facility, storage temperature measured at the district health office (DHO), distance from DHO to health facility, whether the child was vaccinated during outreach, duration of breastfeeding and controls for year and season.

Immune status is subject to uncertainty as well, since it is derived from imperfectly-measured antibody concentrations.[12] Uncertainty of immune status was propagated into this model using Monte Carlo simulation. For more detail on this issue, see Chapter 2.[12]

3.3 RESULTS

3.3.1 *Coverage Analysis*

Figure 12 displays the full model for Pentavalent-3 in Uganda. Table 2 also displays these results, including the values of the coefficients, credible intervals, and standardized values. In this figure, circles represent latent variables, squares represent observed variables and paths connecting them represent model coefficients. In other words, Figure 12 is a visual depiction of formulae 5-16. Appendix Figure 19 and Appendix Table 9 display these results for Zambia.

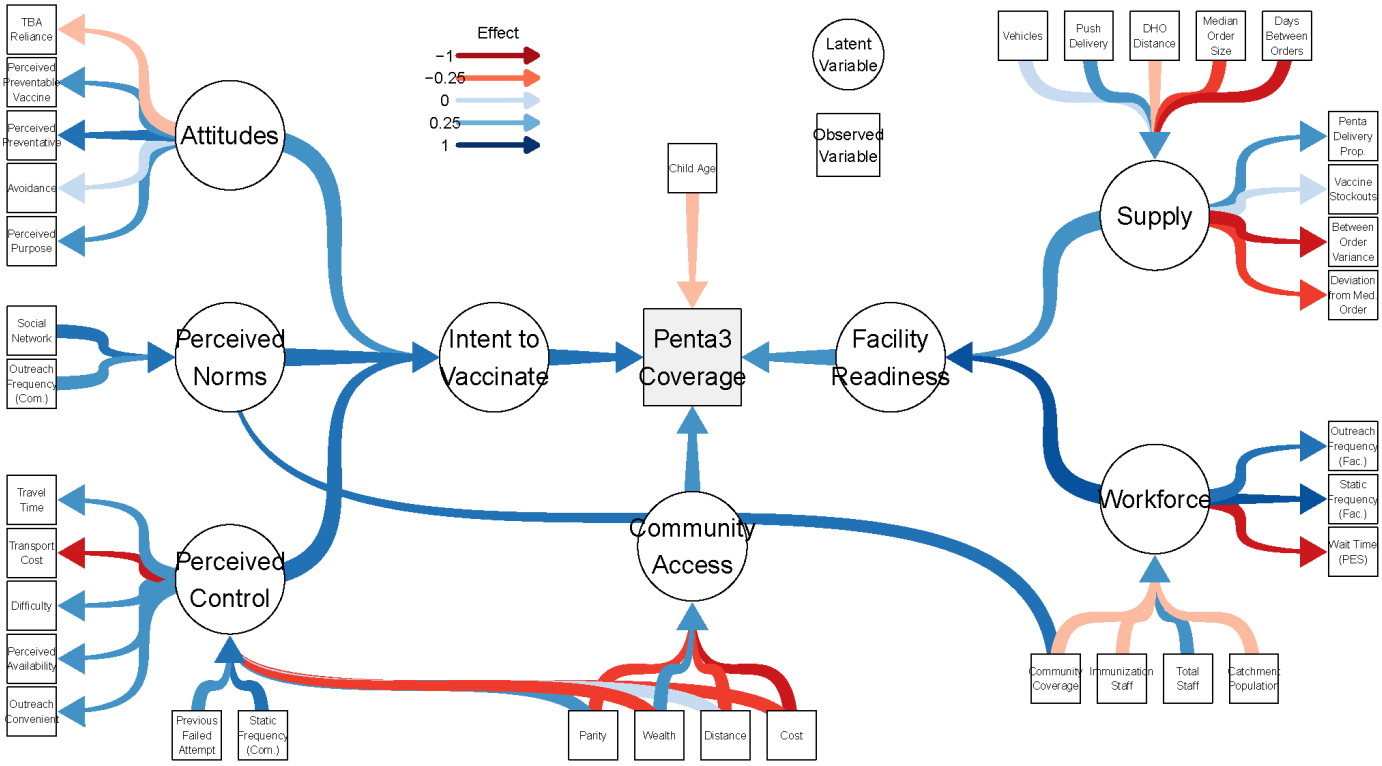
Table 7: Model coefficients, posterior credible intervals and standardized coefficients for Pentavalent-3 in Uganda

Y	Relationship	X	Estimate	Highest Posterior Density Interval	Standardized
Penta3 Coverage	Caused by	Facility Readiness	0.11	0.00 - 0.22	0.44
		Community Access	0.11	0.00 - 0.26	0.40
		Intent to Vaccinate	0.12	0.00 - 0.26	0.53
		Child Age	-0.02	-0.02 - -0.00	-0.02
Intent to Vaccinate	Composite of	Attitudes	1	NA - NA	0.37
		Perceived Norms	0.99	0.00 - 2.94	0.69
		Perceived Control	0.98	0.00 - 2.88	0.51
Facility Readiness	Composite of	Supply	1	NA - NA	0.28
		Workforce	0.98	0.00 - 2.94	0.85
Community Access	Composite of	Parity	-1	NA - NA	-0.45
		Cost	-1.19	-21.15 - 17.68	-0.53
		Distance	-0.97	-20.75 - 17.91	-0.44
		Wealth	0.78	-19.20 - 20.18	0.35

Perceived Control	Caused by	Static Frequency (Com.)	0.8	0.38 - 1.20	0.57
		Wealth	-0.19	-0.30 - -0.08	-0.13
		Distance	0.08	0.05 - 0.12	0.06
		Cost	-0.38	-0.43 - -0.32	-0.27
		Previous Failed Attempt	0.22	0.13 - 0.31	0.16
		Parity	0.29	0.20 - 0.39	0.21
	Measured by	Perceived Availability	1	NA - NA	0.41
		Outreach Convenient	0.06	0.04 - 0.08	0.16
		Difficulty	0.05	0.03 - 0.07	0.14
		Transport Cost	-1.67	-1.89 - -1.42	-0.65
		Travel Time	0.34	0.27 - 0.41	0.39
Attitudes	Measured by	Perceived Purpose	0.32	0.26 - 0.37	0.43
		Avoidance	0.02	-0.01 - 0.06	0.02
		Perceived Preventative	1.47	1.21 - 1.72	0.75
		Perceived Preventable Vaccine	0.1	0.07 - 0.12	0.21
		TBA Reliance	-0.01	-0.02 - 0.01	-0.02
Perceived Norms	Composite of	Community Coverage	1	NA - NA	0.53
		Social Network	1	-18.76 - 20.61	0.53
		Outreach Frequency (Com.)	0.77	-18.80 - 20.38	0.40
Supply	Caused by	Vehicles	0.06	0.03 - 0.09	0.09
		Push Delivery	0.26	0.20 - 0.32	0.37
		DHO Distance	-0.05	-0.06 - -0.03	-0.07
		Median Order Size	-0.19	-0.22 - -0.16	-0.27
		Days Between Orders	-0.41	-0.49 - -0.35	-0.59
	Measured by	Penta Delivery Prop.	1	NA - NA	0.24
		Vaccine Stockouts	0.21	0.05 - 0.37	0.06
		Deviation from Med. Order	-0.67	-0.75 - -0.59	-0.49
		Between Order Variance	-0.41	-0.46 - -0.38	-0.95
Workforce	Caused by	Total Staff	0.28	0.21 - 0.37	0.13
		Community Coverage	-0.21	-0.97 - 0.16	-0.10
		Catchment Population	-0.18	-0.55 - 0.00	-0.08
		Immunization Staff	-0.08	-0.14 - -0.03	-0.04
	Measured by	Wait Time (PES)	-1	NA - NA	-0.56
		Static Frequency (Fac.)	0.78	-0.02 - 1.34	0.95
		Outreach Frequency (Fac.)	0.3	-0.01 - 0.55	0.53

Using Figure 12 and Table 7, detailed observations can be made about the magnitude and uncertainty of specific coefficients. For example, the number of vehicles owned by a facility (shown in the upper-right of Figure 2) has a modest correlation with the Supply construct (mid-

Figure 12: Full model of vaccine constraints and determinants (Pentavalent-3, Uganda)

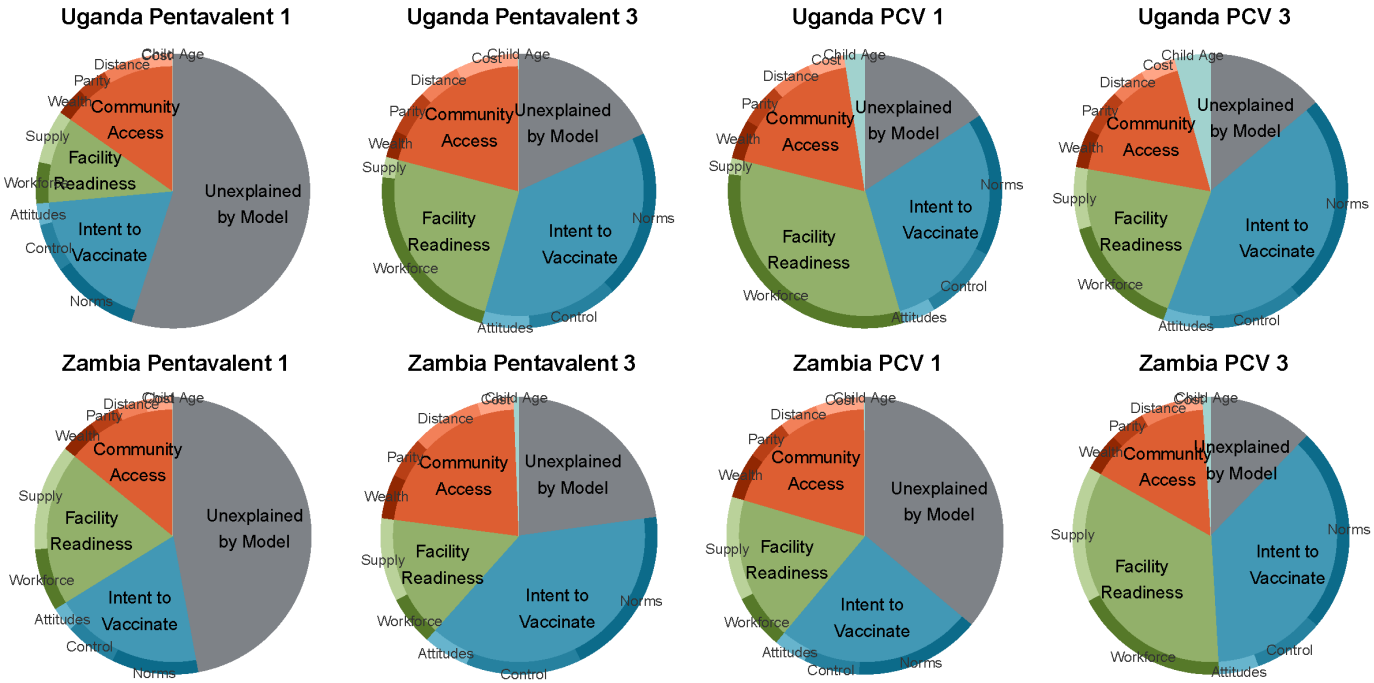


point estimate: 0.06, highest posterior density interval (HPD): 0.03-0.09). This was found to be a weaker correlation than "Push Delivery" (a binary indicator of whether vaccine supplies are sent to the facility or retrieved by a facility staff member); the estimated coefficient of that variable was 0.26 (HPD: 0.20-0.32). As another example, stated perceptions, such as perceived symptoms prevented by vaccines, were more strongly reflective of positive Attitudes toward vaccines than behaviors such as reliance on a traditional birth attendant (TBA). The estimated coefficient of the former variable was 1.47 (HPD: 1.21-1.72), while the latter was -0.01 (HPD: -0.02-0.01). Regarding uncertainty, some coefficients such as the coefficient connecting DHO distance and Supply had a relatively narrow credible interval (mid-point: -0.05, HPD: -0.03-0.06). Others, such as the coefficient connecting outreach frequency and Perceived Norms are very uncertain (mid-point: 0.77, HPD: -18.8-20.4). Comparing the full model from Uganda to Zambia (Appendix Figure 19 and Appendix Table 9), credible intervals in the Zambian estimates were on average 3.5 times wider (standard deviation 5.4), due to smaller sample size. Other important model parameters such as error terms and covariances are displayed in Appendix Tables 10 (Uganda) and 10 (Zambia).

Figure 3 displays a summary of all eight models, highlighting basic determinants of vaccine coverage according to the models and data. In these pie charts, the size of each slice represents the proportion of vaccine coverage which is explained by each of the most proximal variables. Slices are also broken down into their contributing factors. Taking Pentavalent-3 in Uganda (the second pie chart) as an example, the largest proportion of variance (36.3%) in vaccine coverage can be explained by the mother's Intent to Vaccinate (Attitudes and Perceptions). The next largest explanatory factor is Health Facility Readiness which explains 24.6% of vaccine

coverage. Community Access to vaccine services explains a further 20.9% of vaccine coverage, and a remaining 18.2% is left unexplained by the model and data.

Figure 13: Primary and secondary determinants of vaccine coverage



Comparing Pentavalent-1 to Pentavalent-3, Intent to Vaccinate explains more variance in third-dose coverage (36.3%, HPD: 10.6%-73.3%) than first-dose (18.6%, HPD: 5.5%-47.25). The magnitude of that difference indicates that Intent is a key driver of completion of the dosage schedule, but less so for initiation. Access on the other hand represents a larger proportion of the explainable variance in Pentavalent-1. Among the three primary determinants (Access, Readiness and Intent), Access represents about one third of the explained variance (33.8%, HPD: 5.9%-80.8%), compared to one quarter (25.5%, HPD: 3.2%-78.2%) for Pentavalent-3. These results are less conclusive however, since an even larger proportion of variance in Pentavalent-1 is unexplained by the model. Comparing pentavalent to PCV1, Facility Readiness explains a larger proportion of variance in PCV1 coverage (33.4%, HPD: 12.9%-62.9%) than Pentavalent-1 coverage (11.2%, HPD: 6.6%-18.2%). This indicates that Facility Readiness is a key barrier to new vaccines, more so than routine vaccines. The differences between PCV1 and PCV3 also highlight the importance of Intent as a driver of drop-out; Intent explains 29.7% (HPD: 7.7%-68.4%) of variance in PCV1 coverage, but 41.8% (HPD: 12.2%-78.8%) of PCV3 coverage.

Comparing the Ugandan and Zambian datasets, many similarities and some differences can be noted. For Pentavalent-1, the proportions are similar, though Facility Readiness explains more variance in Zambia (19.7%, HPD: 11.7%-31.1%) than Uganda (11.2%, HPD: 6.6%-18.2%). For Pentavalent-3, the reverse is true; the proportions are again similar, but Facility Readiness explains less variance in Pentavalent-3 coverage in Zambia (15.5%, HPD: 8.1%-27.6%) than Uganda (25.6%, HPD: 10.2%-48.3%). For PCV, Facility Readiness explains a larger proportion of variance in PCV3 coverage (34.1%, HPD: 17.4%-56.0%) than PCV1 (18.5%, HPD: 10.0%-31.6%), which is opposite of the patterns seen in the Ugandan data. Both are larger than the estimates from pentavalent however, again indicating that Facility Readiness represents a key barrier to new vaccines. Similar to Uganda, Intent to Vaccinate explains more variance in Pentavalent-3 (38.7%,

HPD: 12.4%-73.9%) and PCV3 (36.9%, HPD: 9.9%-75.7%) than it does for Pentavalent-1 (19.1%, HPD: 6.7%-43.6%) and PCV1 (25.0%, HPD: 7.0%-59.6%) respectively, indicating the role of Intent in drop-out.

Exploring the results deeper, Figure 13 also shows that some upstream factors explain more variance than others. Facility Readiness, for example, is often more influenced by Workforce (staff, efficiency etc.) in the Ugandan data, and vaccine Supply (stockouts, deliveries etc.) in the Zambian data. Perceived Norms about vaccinations explain a greater proportion of Intent to Vaccinate than either Attitudes toward vaccinations or Perceived Control (self-efficacy) in most models. Community Access was more evenly split among its contributing factors, with cost, distance to facility, household wealth and parity all explaining substantial portions of Community Access in most models.

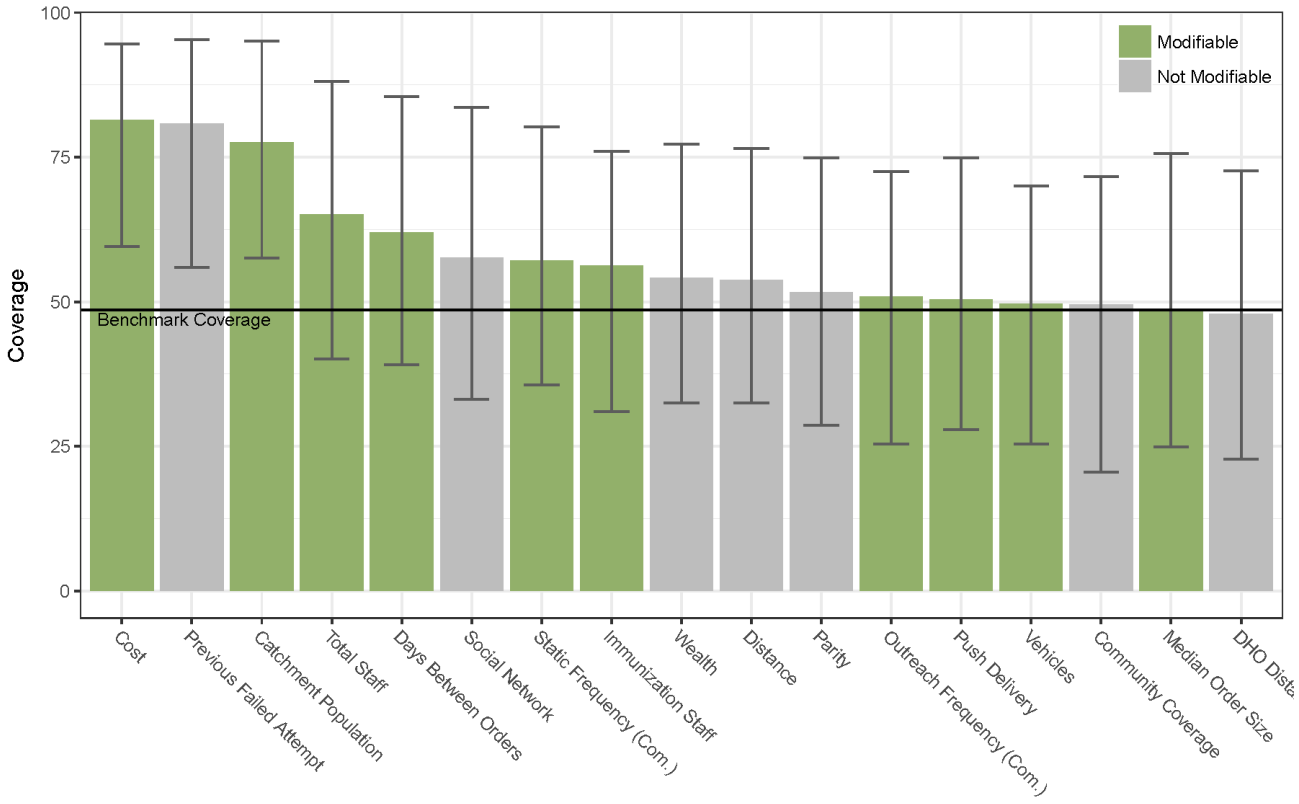
Figure 14 illustrates the results using counterfactual analysis. In this figure, the expected level of vaccine coverage is estimated under the counterfactual scenario that a particular constraint has been fully removed. In other words, the bars in Figure 14 indicate what vaccine coverage would be (predicted by the model) if the corresponding variable was held uniformly at its maximum or minimum level. For instance, cost was found to be the largest constraint. If every child in the analysis had a total vaccination cost equivalent to the lowest observed cost, predicted vaccine coverage would be an estimated 81.5% (95% prediction interval 59.5% - 94.6%). This can be compared to the "benchmark coverage", i.e. the actual vaccine coverage predicted by the model, which was 48.6%. Some large constraints, such as having a previous failed attempt at vaccination, were found to be associated with high counterfactual coverage but are qualitatively less interesting because they aren't readily modifiable. Other constraints, such as the total catchment population (77.6% simulated coverage, 95% prediction interval 57.6% - 95.1%), total facility staff (65.2% simulated coverage, prediction interval: 40.1%-88.1%) and frequency of ordering supplies, measured as the median days between orders, (62.0% simulated coverage, 95% prediction interval 39.2% - 85.5%) were also found to be large constraints to vaccination in the data. These counterfactual results provide a commonsense interpretation of the coefficients in their totality (including mediation), but are not intended to imply causality (see discussion).

Model performance, assessed by numerous separate approaches, was adequate. For Pentavalent-3 in Uganda, model coefficients were aligned with expectations based on the literature in 46 out of 56 coefficients (among coefficients with an expected direction). For example, parity, distance and cost, constraints which one would expect to be barriers to Access, all had negative coefficients while wealth had a positive coefficient. Some, such as travel time and previous difficulty were opposite of expectations; these were be expected to be barriers to Perceived Control, but had positive coefficients. See Appendix 6.4 for details. Goodness-of-fit statistics also show favorable model performance. R^2, the proportion of variance in vaccine status explained by the model, ranged from 87.8% for PCV3 in Zambia, to 45.0% for Pentavalent-1 in Uganda. In-sample predictive validity, shown in Figure 16, was high. Using the predicted probability of vaccination, performance metrics were computed at various thresholds to assess how well the model classified children's vaccine statuses. Predicted vaccine status agreed with observed vaccine status for 90% of cases, with sensitivity of 0.88, specificity of 0.93, PPV of 0.97 and NPV of 0.76 at the best threshold.

3.3.2 *Effective Coverage Analysis*

Figure 16 shows the results of the effective coverage analysis, displaying odds of immunity to hepatitis B in Uganda. Considerable uncertainty was found with regard to determinants of ef-

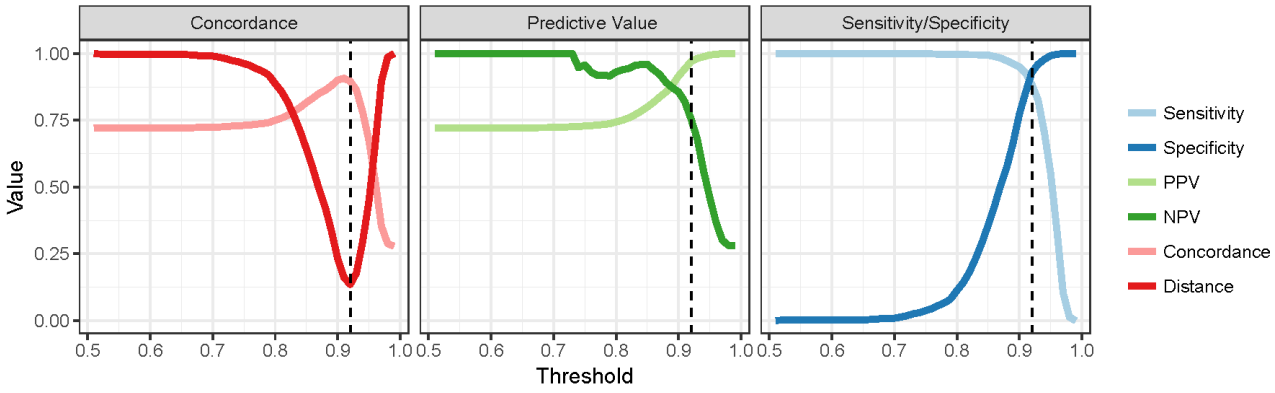
Figure 14: Counterfactual analysis: simulated coverage with selected constraints removed (PCV3)



fective coverage. Year of vaccination was positively correlated with immunity (odds ratio: 1.14, 95% confidence interval: 1.00-1.31, p-value: 0.05), indicating effective coverage has increased over time, adjusting for confounding. Children vaccinated during outreach activities had very low odds of gaining immunity (odds ratio 0.42, 95% confidence interval 0.15 - 1.02, p-value: 0.06), which indicates that children vaccinated through routine vaccine services were more likely to be effectively immunized than those vaccinated during community outreach. All other determinants were weakly correlated with immunity. For example, children vaccinated at the appropriate age had higher odds of immunity (odds ratio: 1.44), but this correlation was uncertain (95% confidence interval: 0.87-2.41, p-value: 0.15). Some determinants had correlation with immunity that was opposite than expected. For example children who were vaccinated with an appropriate interval between the first and second dose (28 days) had lower odds of immunity (odds ratio: 0.84), though the correlation was again uncertain (95% confidence interval: 0.44-1.60, p-value: 0.59).

Similarly uncertain results were found in the Zambian data. Year of vaccination was again positively correlated with immunity, with an odds ratio of 1.47 (95% confidence interval: 0.99-2.20, p-value: 0.06). Outreach was negatively correlated with immunity as well (odds ratio: 0.81), but the correlation was less certain (95% confidence interval: 0.40-1.69, p-value: 0.56) than in Uganda. Similar results were also found for immunity to tetanus instead of hepatitis B.

Figure 15: Coverage analysis model performance (Pentavalent-3, Uganda)



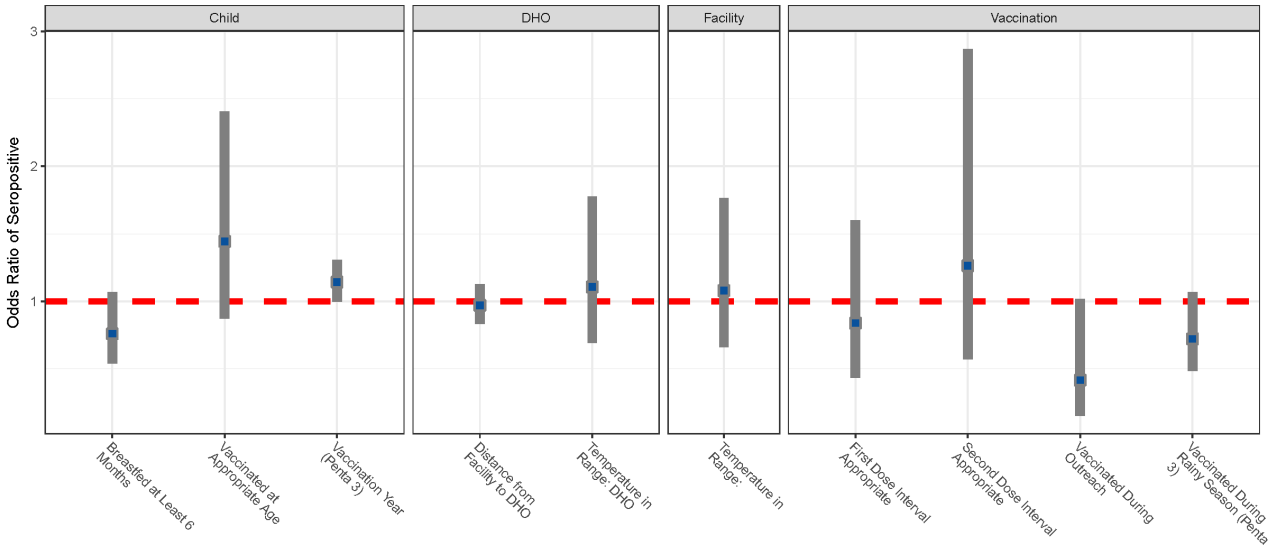
3.4 DISCUSSION

This analysis highlights the importance of considering determinants in the context of a particular outcome. In other words, there is a set of constraints to the first dose of a vaccine, a largely different set of constraints to completing the full regimen, and still others for new vaccines. To summarize the findings coarsely, access-related barriers contribute most strongly to initiation, demand-related determinants contribute most strongly to completion, and supply-side determinants contribute most strongly to new vaccines. The implication is that public health programs in Uganda and Zambia can be more targeted in their efforts, depending on the outcome they are trying to achieve. For example, the results show that the largest proportion of PCV1 and PCV3 coverage can be explained by Facility Readiness. New vaccine introduction programs should focus more heavily (though not entirely) on contributors to Readiness, like Supply and Workforce. Another implication is that programs focusing on reducing barriers can identify a metric of success that is most suitable for their target constraint. For example, the results show that a larger proportion of the third dose of each vaccine was explained by demand (Intent). Demand generation activities should use changes in drop-out as their metric of success.

Specific variables stand out as stronger correlates than others, shown in the counterfactual analysis and effective coverage analysis. Because of the complex mediation in the coverage model, the strength of the relationship between any particular variable and vaccine coverage can be obscured. The counterfactual analysis shows that, incorporating all mediating effects, certain variables like cost and health facility staff would be expected to have a large impact on vaccine coverage if improved. This has implications for policy-makers looking for effective ways to improve vaccine coverage in these countries; they should focus reducing total cost and supporting facility staff more than the other indicators in Figure 14. Other counterfactual results offer further insights. For example, facilities served by a "push delivery" system have a strong positive correlation with Supply (mentioned in the Results section). Despite this, the model predicts only a modest improvement in vaccine coverage if all facilities switched to a "push" system. This has two implications: 1) that the effects of mediation are important to consider for all vaccine determinants, and 2) other aspects of the health systems in Uganda and Zambia may be more effective targets for intervention by policy-makers.

A separate observation is the relatively high unexplained variance in Pentavalent-1 for both countries. This most likely indicates that some important determinants and barriers have been neglected. One challenge in identifying the source is that this unexplained variance is not ap-

Figure 16: Determinants of effective coverage: immunity to hepatitis B among vaccinated children in Uganda



parent in Pentavalent-3 or PCV. Some speculation on the neglected determinants may be useful, but if oversights in the model were clearly apparent, they would have been included in the first place. Perhaps the strongest argument is that Access has not been measured completely enough in this model. The results show that Access is a stronger determinant of initiation than other outcomes, but this model only measures it with the four most empirically-supported variables. Other inputs to Access, such as occupation and marital status may add further explanatory power, but were not included in the data.

In the case of the effective coverage analysis, most of the variation in immunity was not captured by the variables used here. Among the substantive findings, immunity appears to be increasing with time, and lower odds of immunity are associated with outreach vaccination. This may indicate that practices common in community outreach put vaccines at risk of failure. We recommend a focused study on outreach activities. Other variables, such as vaccine storage temperatures and the interval between doses were surprisingly uncorrelated with immunity. This may indicate that these determinants are weak drivers of vaccine effectiveness, or that they were sufficiently well-managed in these settings to register no correlation. Alternatively, uncontrolled confounding or systematic measurement error may have led to the null results. However, the set of determinants was informed by a large systematic review (Chapter 1)[11], and novel techniques were used to correct biases in the DBS data (Chapter 2)[12]. More research appears to be necessary to learn the full range of effectiveness determinants.

In comparison with previous research, this study represents a number of important advances. By using data from both the supply-side and demand-side, this analysis controls for confounding to an extent that few previous studies have.[4,11] Our methodological approach is an improvement on traditional approaches. By relying on systems of equations, this analysis is explicit about directionality. By integrating latent variables, this analysis improves construct validity and represents the hypothesized model more closely. Perhaps most importantly, the model in this analysis is based on a rigorous, evidence-based conceptual framework.

Some of these advantages can be demonstrated by reproducing other studies. We identified one study, Bbaale 2013, which quantitatively analyzed determinants of routine childhood vaccination coverage in Uganda.[26] This study used multivariate probit regression with nine explanatory variables and complete dosage of BCG, DPT, polio and measles vaccines as separate outcomes. Using Gavi FCE data, we replicated this analysis. Although both models describe the data fairly well, our model outperformed Bbaale 2013, correctly classifying the vaccine status of 90% of children as compared with 68%. We identified one study that used SEM to directly compare behavior change theories for HPV vaccination in the United States.[27] The leading model in that study (also based on the Theory of Planned Behavior) was only able to explain 39% of variance in vaccine coverage, as compared to our models which ranged from 45.0% to 87.8%.

Despite certain methodological advantages, these analyses have limitations. One key limitation of the coverage analysis is model selection.[28] The structural and measurement models we have chosen may not be the most accurate reflection of reality. We have carried out some sensitivity analyses test robustness to alternative measurement models (see Appendix 6.4). These generally conclude that the variables selected for inclusion enhance the model's explanatory ability without exerting outsized influence on the substance of the results. Sensitivity analysis of this kind is less feasible for testing the structural model, given its qualitative formulation. However, is grounded in a larger body of existing evidence than any comparable analysis to our knowledge.[11] We encourage future studies to develop alternative hypothetical models using the same systematic review, and to test the model presented here using new data.

Further limitations may be related to the data used for the analysis. First, the cross-sectional nature of these data limits our ability to assess dynamic temporal effects. This is simply a limitation that could not be address in our analysis. Second, some parts of the coverage analysis are based on data that were not collected specifically for that purpose. In some cases, the closest approximation to the ideal data was used in the absence of anything else. An example of this is the Perceived Norms construct. This construct (like others from the Theory of Planed Behavior) is typically measured by designing a survey instrument specifically to ask about norms.[29] Because our household survey was designed for a multitude of other purposes, such questions were not included. In their absence, it was necessary to identify new variables that are hypothesized to influence Perceived Norms. These included social networks, outreach frequency and community coverage (see Table 6 and Appendix 6.3.3). A third data limitation is linkage of households to facilities. Households were sampled by design to be in the catchment areas of health facilities, but mothers may choose to vaccinate their children elsewhere. This may bias the results because mothers who choose alternative facilities may have certain characteristics in common. Attempts were made to identify the actual facility of vaccination, but proved to be intractably difficult due to unstandardized, often informal, health facility names in these countries. Instead, we consider this analysis akin to intent to treat analysis. Respondents were "assigned" to their nearest facility, but the reasons for non-compliance with that assignment were beyond our ability to control. Fourth, vaccine status was based on the child's vaccine card where possible, but maternal recall when necessary. Recall was ultimately used in 37% of cases for pentavalent, and 21% for PCV. Further analysis on recall bias (see Appendix Figure 20) shows that recall is negatively correlated with dose number (i.e. mothers tended to underestimate the number of doses received when a vaccine card was also available). Further analysis has shown that ownership of a vaccine card is correlated with some explanatory variables. This is expected to bias estimates away from zero in cases where estimates and the correlation with card ownership are in the same direction. Finally, the sample size in the Zambian data is approximately a third of that in the Ugandan data, a fact which contributes to uncertainty.

We caution against making inferences beyond what is reasonable given the model and data. Low values of a model coefficient may simply be an indication that the associated indicator has low variance in our sample (and low covariance with vaccine coverage). For example, we found that supply-side constraints are critical for new vaccines. This finding could imply one of two things: 1) that demand-side determinants are not major drivers of new vaccine coverage, or 2) that these two countries are already adequately addressing them. As such, these results are most useful in context of Uganda and Zambia rather than generalizing beyond. Also, our reliance on counterfactual analysis is for intuitive explanation of the results and not an attempt to interpret them causally. Although many criteria for causality are established in this analysis, temporality (noted above) is not. While we went to great lengths to ensure the most robust analysis possible, the model results should be interpreted as cross-sectional patterns within our data, and not as causal results. These patterns should be regarded as reliably-measured however, and future researchers should use them when planning studies that are specifically designed to establish causality.

This analysis represents a number of important accomplishments. First, it presents an integrated approach for measuring determinants of effective vaccine coverage that more realistically represents real-world complexities than previous research. Second, it provides evidence that public health practitioners should approach determinants in the context of their most relevant outcomes. Third, it provides evidence (albeit cross-sectional) of the specific determinants that could have the greatest impact on vaccine coverage in these two populations, if targeted. Future studies should seek to improve upon the analytic framework we present here, to apply it in different settings, and to utilize stronger study designs.

As vaccine programs around continue progress toward effective coverage, better measurement of determinants and barriers will be imperative to close remaining gaps and inequities. Programs like Gavi HSS support that focus on a particular determinant should use these results to select an outcome that is appropriate to measure their effectiveness. Most importantly, vaccination campaigns in these two countries should use our findings to better target interventions and continue progress against vaccine preventable diseases.

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Finally, thanks to my wife, Dana, whose support and companionship I value the most.

APPENDIX A

4.1 LITERATURE SEARCH AND DATA EXTRACTION

[Referred to in section 1.2.1]

This section provides additional detail about literature search and data extraction procedures as part of the systematic review. Included herein are details about preliminary review, structured literature search, article review and data extraction. This section also describes additional details of the content analysis: tabulation of extracted data.

4.1.1 *Literature Search*

4.1.1.1 *Preliminary Review*

A preliminary review was first conducted to inform future searches and analyses. This was carried out in an unstructured manner, iteratively relying on Google Scholar search results, backward/forward citation searches, examination of highly-cited articles and expert input. Citation network diagrams were generated as an aid to locate works that web searches did not immediately uncover, but which other researchers often reference.

The objectives of the preliminary review were: 1) to identify the central and seminal works in vaccine determinants, health service utilization and effective coverage research, 2) to document the language and terminology most commonly used in these areas in order to inform a more structured review, 3) to identify key relevant databases of literature, and 4) to define a loose framework of themes as a starting point for analysis.

4.1.1.2 *Structured Literature Search*

A structured search of literature was subsequently conducted. The search strategy and procedure for identifying articles followed PRISMA guidelines.(1) The objective of the search was to uncover all electronically-available documents regarding research on determinants of vaccine coverage or effectiveness.

Eligibility criteria were established in advance, using information from the preliminary review as a guide. Table 8 lists all criteria. Any English-language article that supplied evidence for at least one determinant of vaccine coverage or effectiveness was eligible for inclusion. Articles were excluded if they specifically pertained to any of the following topics without meeting the inclusion criterion: adult vaccines besides HPV, animal vaccines, levels and trends of coverage, consequences of utilization, health impact, highly-specific subpopulations (e.g. travelers, HIV-positive populations), vaccine effectiveness/efficacy/safety, disease treatment, pathobiology, future vaccines, cost effectiveness, general health care utilization, impact of a single intervention, vaccine manufacturing, promotion of a particular vaccine technology.

A set of 112 potential search terms (mostly various synonyms) was developed based on the preliminary review, these terms are listed in Appendix 2. The search strategy was as follows:

1. Organize the potential searches according to their expected propensity to return unique and relevant results (conditional on previous searches)
2. Review the first 500 Google Scholar titles for each search term and add eligible citations to a database
3. Count the proportion of new and duplicate articles identified by the present search
4. Stop when the duplication percentage exceeds 33% for three consecutive searches
5. Conduct two PubMed searches with multiple MeSH terms and screen results in their entirety.

By this procedure, fourteen Google Scholar and 2 PubMed searches were conducted. In addition, nine special databases such as Cochrane Library, EPPI Centre and HealthSystemsEvidence.org were screened in their entirety with the keywords "Vaccine" and "Immunization".(2-6) Nine existing systematic reviews were discovered through this process, and their compete citation lists were also screened.(7-15)

4.1.2 *Data Extraction*

4.1.2.1 *Article Review*

All discovered articles and documents were catalogued in a citation database and systematically evaluated for relevance to the present study's objectives. The objective of this stage was to organize the search results so that they could be analyzed in descending order of relevance.

Articles and documents were assigned a subjective relevance score (0 - irrelevant to the present study, 1 - exactly on-topic) based on a set of five criteria: 1) comprehensiveness of determinants covered, 2) emphasis (whether determinants were the main focus or only part of it), 3) geography, 4) outcomes (e.g. vaccine coverage vs attitudes towards vaccination), 5) novelty (i.e. uniqueness among the rest of the body of literature). Relevance was determined using the title and abstract.

4.1.2.2 *Data Extraction*

Starting with the most relevant articles, the information therein was systematically extracted and stored in a database. The objectives of this stage were to find a subset of articles large enough to perform content analysis, thematic analysis and interpretive synthesis (see subsequent sections), and to itemize and understand the content of that subset of articles.

Fourteen variables were extracted from each study in the subset. Variables included study characteristics and content of study results. The study characteristics extracted were: 1) country/region, 2) whether the study was a review, 3) study design, 4) study population and 5) related studies (i.e. other articles published using the same data). Content extracted was: 1) antigen(s), 2) outcome(s), 3) determinant(s), 4) whether the list of determinants was exhaustive (according to the authors), 5) proximity of each determinant to the outcome (as assessed by the authors), 6) pathways connecting each determinant to the outcome (as assessed by the authors), 7) effect size(s), 8) theme(s), and 9) thematic excerpts. A color-coding system was used, and all coded documents were stored digitally to ensure transparency and consistency between extractions. Data were extracted from articles in descending order of relevance until a subjective level of saturation was reached, i.e. data from new articles ceased to contribute new information.

4.1.3 *Study Characteristics*

Content was extracted from 78 articles. Among these, 51 were from lower and middle-income countries, 10 were from high-income countries, and 17 were not specific to a geographic region. Many studies could be classified as more than one study design. 21 studies included systematic reviews, 2 were randomized control trials, 36 included observational quantitative data, 5 included qualitative observational methods, 10 included qualitative interviews, 10 were discussion/commentaries and 3 were none of the above. Studies often described determinants of vaccination for more than one vaccine antigen as well. In total, 15 vaccine antigens (including "fully vaccinated") were analyzed among the 78 studies, including 18 studies which focused on DTP and 6 which included PCV.

Table 8: Systematic review criteria

Inclusion	**Exclusion**	**Relevance**	**Extraction**
Supplies	Adult vaccines besides HPV	Comprehensiveness	Country/region
evidence	Animal vaccines	Emphasis	Review
for at least	Levels and trends of coverage	Geography	Study design
one	Consequences of utilization	Novelty	Study population
determinant	Health impact	Outcomes	Related studies
	Highly-specific subpopulations		Antigen(s)
English	Vaccine effectiveness/efficacy/safety		Outcome(s)
language	Disease treatment		Determinant(s)
	Pathobiology		Exhaustive
	Future vaccines		Proximity
	Cost effectiveness		Pathway(s)
	General health care utilization		Effect size(s)
	Impact of a single intervention		Theme(s)
	Vaccine manufacturing		Thematic excerpts
	Promotion of a particular vaccine technology		

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4.1.4 *List of potential search terms, searches conducted and summary of results*

Concept	Potential Search Term	Search Location	Search Number	Search Date	Search Results	Citations Examined	Articles Pulled Based on Title	Duplicates	Cumulative Articles to Screen after Duplicates Removed
Total					**4,239,321**	**9,041**	**2,031**	**20%**	**1,622**
Vaccine Utilization Factors	vaccine utilization	Google Scholar	1	2/3/2015	104,000	500	115	0%	115
	immunization utilization	Google Scholar							
	underimmunization	Google Scholar	4	2/3/2015	2,600	500	119	9%	494
	undervaccination	Google Scholar							
	vaccination factors	Google Scholar	2	2/3/2015	1,020,000	500	121	1%	235
	immunization factors	Google Scholar							
	undervaccination factors	Google Scholar							
	underimmunization factors	Google Scholar							
	vaccine coverage	Google Scholar							
	immunization coverage	Google Scholar							
	vaccination determinants	Google Scholar							
	immunization determinants	Google Scholar							
	undervaccination determinants	Google Scholar							
	underimmunization determinants	Google Scholar							
	vaccination causes	Google Scholar							
	immunization causes	Google Scholar							
	undervaccination causes	Google Scholar							
	underimmunization causes	Google Scholar							
	vaccine uptake	Google Scholar							
	immunization uptake	Google Scholar							
	vaccination risk factors	Google Scholar							
	immunization risk factors	Google Scholar							
	undervaccination risk factors	Google Scholar							
	underimmunization risk factors	Google Scholar							
	vaccination barriers	Google Scholar	3	2/3/2015	114,000	500	176	14%	386
	immunization barriers	Google Scholar							
	vaccination constraints	Google Scholar							
	immunization constraints	Google Scholar							
	vaccine consumption	Google Scholar							
	immunization consumption	Google Scholar							
	vaccine refusal	Google Scholar							
	immunization refusal	Google Scholar							
	vaccination correlates	Google Scholar							
	immunization correlates	Google Scholar							
	undervaccination correlates	Google Scholar							
	underimmunization correlates	Google Scholar							
	vaccine adherence	Google Scholar							
	immunization adherence	Google Scholar							
	vaccine compliance	Google Scholar							

Concept	Potential Search Term	Search Location	Search Number	Search Date	Search Results	Citations Examined	Articles Pulled Based on Title	Duplicates	Cumulative Articles to Screen after Duplicates Removed
	immunization compliance	Google Scholar							
	(immunization[MeSH Terms] OR vaccination[MeSH Terms]) AND (utilization[All Fields] OR adherence, patient[MeSH Terms] OR compliance[All Fields] OR coverage[All Fields] OR uptake[All Fields]) AND (risk factors[MeSH Terms] OR determinants[All Fields] OR barriers[All Fields] OR constraints[All Fields]) NOT influenza[MeSH Terms] NOT medicine, travel[MeSH Terms]	Pubmed	15	2/10/2015	982	982	341	22%	1231
Facility Readiness	health facility readiness vaccines	Google Scholar	7	2/5/2015	17,100	500	57	9%	630
	health facility readiness immunizations	Google Scholar							
Vaccine Supply	vaccine supply	Google Scholar	5	2/3/2015	183,000	500	57	14%	543
	vaccine supply chain	Google Scholar							
	vaccine administration	Google Scholar							
	vaccine supply determinants	Google Scholar							
	vaccine supply factors	Google Scholar							
	vaccine supply barriers	Google Scholar							
	vaccine supply constraints	Google Scholar							
	vaccine supply system	Google Scholar							
	vaccine distribution system	Google Scholar							
	vaccine storage system	Google Scholar							
	vaccine wastage	Google Scholar							
	vaccine health system	Google Scholar							
	immunization health system	Google Scholar							
	vaccine stock outs	Google Scholar							
	immunization stock outs	Google Scholar							
	vaccine health system factors	Google Scholar							
	immunization health system factors	Google Scholar							

Concept	Potential Search Term	Search Location	Search Number	Search Date	Search Results	Citations Examined	Articles Pulled Based on Title	Duplicates	Cumulative Articles to Screen after Duplicates Removed
	(immunization[MeSH Terms] OR vaccination[MeSH Terms]) AND (supply and distribution[MeSH Terms] OR health system[All Fields] OR financing[MeSH Terms]) AND (factors[All Fields] OR determinants[All Fields] OR barriers[All Fields] OR constraints[All Fields]) NOT influenza[MeSH Terms] NOT medicine, travel[MeSH Terms] NOT cost effectiveness[MeSH Terms]	Pubmed	16	2/10/2015	517	517	109	63%	1271
HR	human resources vaccine	Google Scholar							
	human resources immunization	Google Scholar	14	2/9/2015	490,000	240	21	33%	966
	vaccine training	Google Scholar							
	immunization training	Google Scholar							
Cost and Utilization	vaccine cost	Google Scholar	6	2/4/2015	741,000	500	51	31%	578
	immunization cost	Google Scholar							
	vaccine travel time	Google Scholar	8	2/5/2015	69,800	500	50	36%	662
	immunization travel time	Google Scholar							
	vaccine distance	Google Scholar							
	immunization distance	Google Scholar							
	vaccine insurance	Google Scholar							
	immunization insurance	Google Scholar							
Child Eligibility	child eligibility vaccination	Google Scholar							
	child eligibility immunization	Google Scholar							
Knowledge, Attitudes and Education	vaccine knowledge	Google Scholar							
	immunization knowledge	Google Scholar							
	vaccine attitudes	Google Scholar							
	immunization attitudes	Google Scholar							
	vaccine education	Google Scholar							
	immunization education	Google Scholar							
	vaccine decision	Google Scholar							
	immunization decision	Google Scholar							
	vaccine acceptability	Google Scholar							
	immunization acceptability	Google Scholar							
	vaccine demand	Google Scholar							
	immunization demand	Google Scholar							
	vaccine awareness	Google Scholar							
	immunization awareness	Google Scholar							

Concept	Potential Search Term	Search Location	Search Number	Search Date	Search Results	Citations Examined	Articles Pulled Based on Title	Duplicates	Cumulative Articles to Screen after Duplicates Removed
Effectiveness	vaccine seroconversion	Google Scholar							
	immunization seroconversion	Google Scholar							
	vaccine seroconversion factors	Google Scholar							
	immunization seroconversion factors	Google Scholar							
	vaccine response	Google Scholar							
	vaccine antibody	Google Scholar							
	vaccine antibody response	Google Scholar							
	vaccine immune response	Google Scholar	9	2/9/2015	1,300,000	500	36	6%	696
	vaccine response factors	Google Scholar							
	vaccine antibody factors	Google Scholar							
	vaccine antibody response factors	Google Scholar							
	vaccine immune response factors	Google Scholar							
	vaccine failures	Google Scholar							
	vaccine failure factors	Google Scholar							
	vaccine cold chain	Google Scholar	10	2/9/2015	134,000	500	172	13%	846
	immunization cold chain	Google Scholar							
	vaccine cold chain factors	Google Scholar							
	immunization cold chain factors	Google Scholar							
	vaccine cold chain management	Google Scholar							
	immunization cold chain management	Google Scholar							
	vaccine potency	Google Scholar							
	vaccine potency factors	Google Scholar							
	vaccine seroepidemiology	Google Scholar							
	Uganda vaccine	Google Scholar							
	Uganda immunization	Google Scholar	11	2/9/2015	23,200	240	42	10%	884
	Zambia vaccine	Google Scholar							
	Zambia immunization	Google Scholar	12	2/9/2015	11,200	240	27	11%	908
	Mozambique vaccine	Google Scholar							
	Mozambique immunization	Google Scholar							
	Bangladesh vaccine	Google Scholar							
	Bangladesh immunization	Google Scholar	13	2/9/2015	23,500	240	46	4%	952
	developing country vaccine	Google Scholar							
	developing country immunization	Google Scholar							
	low and middle income country vaccine	Google Scholar							
	low and middle income country immunization	Google Scholar							
	Africa vaccine	Google Scholar							

Concept	Potential Search Term	Search Location	Search Number	Search Date	Search Results	Citations Examined	Articles Pulled Based on Title	Duplicates	Cumulative Articles to Screen after Duplicates Removed
General	Africa immunization	Google Scholar							
	Asia vaccine	Google Scholar							
	Asia immunization	Google Scholar							
	Vaccine	Health Systems Evidence	17	3/2/2015	77	16	10	20%	1279
	Immunization	Health Systems Evidence	18	3/2/2015	54	25	19	37%	1291
	Vaccine	Cochrane	20	3/3/2015	134	134	7	14%	1328
	Immunization	Cochrane	21	3/3/2015	239	239	2	100%	1328
	Vaccine	Journal of Systematic Reviews	22	3/3/2015	13	13	2	0%	1330
	Immunization	Journal of Systematic Reviews	23	3/3/2015	9	9	2	100%	1330
	Vaccine	Agency for Healthcare Research and Quality	26	3/5/2015	2,800	50	0	0%	1334
	vaccine NOT cost-effectiveness NOT influenza	Centre for Reviews and Dissemination	24	3/3/2015	354	354	15	73%	1334
	all	EPPI Centre	25	3/3/2015	189	189	0	0%	1334
	Vaccine	MEDLINE Complete							
	Vaccine	Ovid MEDLINE							
	Vaccine	Pro Quest							
	Vaccine	ISI Web of Science							
	Vaccine	CINHAL							
	Vaccine	Science Direct							
	miscellaneous	miscellaneous					7		
		Expert Review of Vaccines							
Preliminary Review	Various	Various	19	3/3/2015	52	52	52	40%	1322
Backward Citation	NA	Falagas et al. 2008	27	5/4/2015	39	39	39	46%	1355
	NA	Akande et al. 2007	33	5/7/2015	40	40	19	16%	1595
	NA	Rainey et al. 2011	28	5/4/2015	202	202	199	21%	1513
	NA	Ryman et al. 2008	29	5/5/2015	32	32	26	15%	1535
	NA	Johri et al. 2015	30	5/6/2015	26	26	11	45%	1541
	NA	Tickner et al. 2006	31	5/7/2015	59	59	36	19%	1570
	NA	Mills et al. 2005	32	5/7/2015	39	39	15	40%	1579
	NA	Haddad et al. 2009	34	5/21/2015	35	35	15	67%	1600
	NA	Bbaale et al. 2013	35	1/11/2017	29	29	15	47%	1622

Publication Year	Author	Title	Publication Title	Relevance	iso3	Region	Review	Antigens
2007	Akande, T. M.	A review of measles vaccine failure in developing countries	Nigerian Medical Practitioner	1		Developing Countries	1	measles
2012	Cherry, James D.	Why do pertussis vaccines fail?	Pediatrics	1				pertussis
2008	Falagas, Matthew E.; Zarkadoulia, Effie	Factors associated with suboptimal compliance to vaccinations in children in developed countries: a systematic review	Current Medical Research and Opinion®	1		Developed Countries	1	bcg, diphtheria, fully vaccinated, hep, hib, measles, mumps, pertussis, polio, rubella, tetanus
2010	Katz, Ingrid T.; Ware, Norma C.; Gray, Glenda; Haberer, Jessica E.; Mellins, Claude A.; Bangsberg, David R.	Scaling up human papillomavirus vaccination: a conceptual framework of vaccine adherence	Sexual health	1			1	hpv
2014	Lafond, Anne; Kanagat, Natasha; Steinglass, Robert; Fields, Rebecca; Sequeira, Jenny; Mookherji, Sangeeta	Drivers of routine immunization coverage improvement in Africa: findings from district-level case studies	Health policy and planning	1	CMR, ETH, GHA	Sub-Saharan Africa		diphtheria, pertussis, tetanus
2013	Machingaidze, Shingai; Rehfuess, Eva; Kries, Rüdiger Von; Hussey, Gregory D.; Wiysonge, Charles S.	Understanding interventions for improving routine immunization coverage in children in low- and middle-income countries: a systematic review protocol	Systematic Reviews	1		Low and Middle Income Countries	1	
2014	Mureed, Sheh; Somrongthong, Ratana; Ghaffar, Abdul; Chapman, Robert S; Baloch, Fathe	Interventions to improve immunization coverage for the childhood cluster diseases for under five in the the developing countries: A systematic review	PROSPERO	1		Developing Countries	1	
2008	Naimoli, Joseph F.; Challa, Shilpa; Schneidman, Miriam; Kostermans, Kees	Toward a grounded theory of why some immunization programmes in sub-Saharan Africa are more successful than others: a descriptive and exploratory assessment in six countries	Health policy and planning	1	GHA, RWA, MWI, ETH, MRT, CMR	sub-Saharan Africa		
2011	Oyo-Ita, Angela; Nwachukwu, Chukwuemeka E.; Oringanje, Chioma; Meremikwu, Martin M.	Interventions for improving coverage of child immunization in low-and middle-income countries	The Cochrane Database of Systematic Reviews	1		Low and Middle Income Countries	1	fully vaccinated
1991	Patriarca, Peter A.; Wright, Peter F.; John, T. Jacob	Factors affecting the immunogenicity of oral poliovirus vaccine in developing countries: review	Review of Infectious Diseases	1		Developing Countries	1	polio
2011	Rainey, Jeanette J.; Watkins, Margaret; Ryman, Tove K.; Sandhu, Paramjit; Bo, Anne; Banerjee, Kaushik	Reasons related to non-vaccination and under-vaccination of children in low and middle income countries: findings from a systematic review of the published literature, 1999–2009	Vaccine	1			1	bcg, diphtheria, hep, hib, measles, pertussis, polio, rubella, tetanus
1993	Rudner Lugo, Nancy	The relationships among service delivery factors, community characteristics, and immunization completion by two-year-old children using county health departments.	University of Michigan	1	USA		1	
2008	Ryman, Tove K.; Dietz, Vance; Cairns, K. Lisa	Too little but not too late: results of a literature review to improve routine immunization programs in developing countries	BMC Health Services Research	1			1	
2011	Abdulraheem, I. S.; Onajole, A. T.; Jimoh, A. A. G.; Oladipo, A. R.	Reasons for incomplete vaccination and factors for missed opportunities among rural Nigerian children	J Public Health Epidemiol	0.99	NGA			bcg, diphtheria, measles, pertussis, polio, tetanus, fully vaccinated
2014	Agot, George N.	The determinants of measles vaccination in Kenya	University of Nairobi	0.99	KEN			measles
2012	Bosch-Capblanch, Xavier; Banerjee, K.; Burton, A.	Unvaccinated children in years of increasing coverage: how many and who are they? Evidence from 96 low- and middle-income countries	Tropical medicine & international health	0.99		Low and Middle Income Countries		
1995	Brugha, Ruairl; Kevany, John	Immunization determinants in the eastern region of Ghana	Health policy and planning	0.99	GHA			bcg, diphtheria, measles, pertussis, tetanus, fully vaccinated
1989	Cheyne, James	Vaccine delivery management	Reviews of infectious diseases	0.99		Developing Countries		
1991	Cutts, F. T.; Diallo, S.; Zell, E. R.; Rhodes, P.	Determinants of vaccination in an urban population in Conakry, Guinea	International journal of epidemiology	0.99	GIN			bcg, diphtheria, measles, pertussis, polio, tetanus, fully vaccinated
1989	Cutts, F. T.; Rodrigues, L. C.; Colombo, S.; Bennett, S.	Evaluation of factors influencing vaccine uptake in Mozambique	International Journal of Epidemiology	0.99	MOZ			
1994	Du Loû, A. Desgrées; Pison, Gilles	Barriers to universal child immunization in rural Senegal 5 years after the accelerated Expanded Programme on Immunization.	Bulletin of the World Health Organization	0.99	SEN			fully vaccinated
2001	Kamau, N.; Esamai, F. O.	Determinants of immunisation coverage among children in Mathare Valley, Nairobi	East African Medical Journal	0.99	KEN			fully vaccinated
2012	Kawakatsu, Yoshito; Honda, Sumihisa	Individual-, family- and community-level determinants of full vaccination coverage among children aged 12-23 months in western Kenya	Vaccine	0.99	KEN			fully vaccinated
2005	Khan, A.; Quaiyum, M. A.; Gazi, R.; Uddin, J.; Ahmed, F.; Islam, M.; El Arifeen, Shams; Breiman, Robert F.	Programmatic and non-programmatic determinants of low immunization coverage in Bangladesh	Presentation made at Forum	0.99	BGD			

Publication Year	Author	Title	Publication Title	Relevance	iso3	Region	Review	Antigens
2008	Odusanya, Olumuyiwa O.; Alufohai, Ewan F.; Meurice, Francois P.; Ahonkhai, Vincent I.	Determinants of vaccination coverage in rural Nigeria	BMC Public health	0.99	NGA			
2005	Omutanyi, R. M.; Mwanthi, M. A.	Determinants of immunisation coverage in Butere-Mumias district, Kenya	East African Medical Journal	0.99	KEN			
2013	Schoeps, A.; Ouédraogo, N.; Kagoné, M.; Sié, A.; Müller, O.; Becher, H.	Socio-demographic determinants of timely adherence to BCG, Penta3, measles, and complete vaccination schedule in Burkina Faso	Vaccine	0.99	BFA			bcg, diphtheria, measles, pertussis, tetanus
1989	Subramanyam, Krishnaswamy	Vaccine distribution: an operations research study	Review of Infectious Diseases	0.99				
2002	Szilagyi, P; Vann, J; Bordley, C; Chelminski, A; Kraus, R; Margolis, P; Rodewald, L	Interventions Aimed at Improving Immunization Rates	The Cochrane Database of Systematic Reviews	0.99			1	bcg, diphtheria, measles, pertussis, polio, tetanus, fully vaccinated
2014	Deloria Knoll, Maria; Park, Daniel E.; Johnson, T. Scott; Chandir, Subash; Nonyane, Bareng Aletta S.; Conklin, Laura; Fleming-Dutra, Katherine E.; Loo, Jennifer D.; Goldblatt, David; Whitney, Cynthia G.; O'Brien, Katherine L.	Systematic Review of the Effect of Pneumococcal Conjugate Vaccine Dosing Schedules on Immunogenicity:	The Pediatric Infectious Disease Journal	0.98			1	pneumo
2014	Gavi Full-Country Evaluation Team	Process evaluation of pneumococcal vaccine introduction in Mozambique, Uganda, and Zambia	IHME	0.98	MOZ, UGA, ZMB			pneumo
2001	Gonçalves, A.; Ferrinho, P.; Aguiar, P.	Factors associated with vaccine status and health services consultation of children from a rural area of Guinea Bissau	Acta Médica Portuguesa	0.97	GNB			
2009	Haddad, Slim; Bicaba, Abel; Feletto, Marta; Taminy, Elie; Kabore, Moussa; Ouedraogo, Boubacar; Contreras, Gisele; Larocque, Renee; Fournier, Pierre	System-level determinants of immunization coverage disparities among health districts in Burkina Faso: a multiple case study	BMC International Health and Human Rights	0.97	BFA			diphtheria, pertussis, polio, tetanus
2015	Johri, Mira; Pérez, Myriam Cielo; Arsenault, Catherine; Sharma, Jitendar K; Pai, Nitika Pant; Pahwa, Smriti; Sylvestre, Marie-Pierre	Strategies to increase the demand for childhood vaccination in low- and middle-income countries: a systematic review and meta-analysis	Bulletin of the World Health Organization	0.97		Low and Middle Income Countries	1	
2013	Maina, Lilian Chepkemoi; Karanja, Simon; Kombich, Janeth	Immunization coverage and its determinants among children aged 12 - 23 months in a peri-urban area of Kenya	The Pan African Medical Journal	0.97	KEN			bcg, diphtheria, hep, hib, measles, pertussis, polio, tetanus
1995	Andersen, Ronald M.	Revisiting the Behavioral Model and Access to Medical Care: Does it Matter?	Journal of Health and Social Behavior	0.96				
2012	Sackou, K. J.; Oga, A. S. S.; Desquith, A. A.; Houenou, Y.; Kouadio, K. L.	Complete immunization coverage and reasons for non-vaccination in a periurban area of Abidjan	Bulletin De La Société De Pathologie Exotique (1990)	0.96	CIV			
2014	Brenzel, Logan	Can investments in health systems strategies lead to changes in immunization coverage?	Expert Review of Vaccines	0.95				
2014	Calhoun, Lisa M.; Van Eijk, Anna M.; Lindblade, Kim A.; Odhiambo, Frank O.; Wilson, Mark L.; Winterbauer, Elizabeth; Slutsker, Laurence; Hamel, Mary J.	Determinants and coverage of vaccination in children in western Kenya from a 2003 cross-sectional survey	The American Journal of Tropical Medicine and Hygiene	0.95	KEN			bcg, diphtheria, hep, hib, measles, pertussis, polio, tetanus, fully vaccinated
1994	Chai, F.; Zhang, R.	Study on factors affecting vaccination effect of poliomyelitis vaccine	Zhonghua Liu Xing Bing Xue Za Zhi	0.95				polio
2000	Fasih, Z.; Hussain, E.; Ali, Z.	Risk Factors for complete un-immunization & under immunization of children under 2 years of age in third world countries	J Pak Pediatr Assoc	0.95		Developing Countries		
2014	Fleming-Dutra, Katherine E.; Conklin, Laura; Loo, Jennifer D.; Knoll, Maria Deloria; Park, Daniel E.; Kirk, Jennifer; Goldblatt, David; Whitney, Cynthia G.; O'Brien, Katherine L.	Systematic Review of the Effect of Pneumococcal Conjugate Vaccine Dosing Schedules on Vaccine-type Nasopharyngeal Carriage:	The Pediatric Infectious Disease Journal	0.95			1	pneumo
2008	Jani, Jagrati V.; De Schacht, Caroline; Jani, Ilesh V.; Bjune, Gunnar	Risk factors for incomplete vaccination and missed opportunity for immunization in rural Mozambique	BMC Public health	0.95	MOZ			
2011	Lamontagne, D. Scott; Barge, Sandhya; Thi Le, Nga; Mugisha, Emmanuel; Penny, Mary E.; Gandhi, Sanjay; Janmohamed, Amynah; Kumakech, Edward; Mosqueira, N. Rocio; Nguyen, Nghi Quy; Others	Human papillomavirus vaccine delivery strategies that achieved high coverage in low-and middle-income countries	Bulletin of the World Health Organization	0.95	IND, PER, UGA, VNM	Low and Middle Income Countries		hpv
2014	Loo, Jennifer D.; Conklin, Laura; Fleming-Dutra, Katherine E.; Deloria Knoll, Maria; Park, Daniel E.; Kirk, Jennifer; Goldblatt, David; O'Brien, Katherine L.; Whitney, Cynthia G.	Systematic Review of the Effect of Pneumococcal Conjugate Vaccine Dosing Schedules on Prevention of Pneumonia:	The Pediatric Infectious Disease Journal	0.95			1	pneumo

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2014	Loo, Jennifer D.; Conklin, Laura; Fleming-Dutra, Katherine E.; Knoll, Maria Deloria; Park, Daniel E.; Kirk, Jennifer; Goldblatt, David; O'Brien, Katherine L.; Whitney, Cynthia G.	Systematic Review of the Indirect Effect of Pneumococcal Conjugate Vaccine Dosing Schedules on Pneumococcal Disease and Colonization:	The Pediatric Infectious Disease Journal	0.95			1	pneumo
2010	Rogers, Bonnie; Dennison, Kim; Adepoju, Nikki; Dowd, Shelia; Uedoi, Kenneth	Vaccine cold chain: Part 2. Training personnel and program management.	AAOHN journal	0.95				
2009	Shea, Beverley; Andersson, Neil; Henry, David	Increasing the demand for childhood vaccination in developing countries: a systematic review	BMC international health and human rights	0.95		Developing Countries	1	
2014	Tagbo, Beckie Nnenna; Eke, Christopher Bismarck; Omotowo, Babatunde Ishola; Onwuasigwe, Chika Nwanma; Onyeka, Edelu Benedict; Mildred, Ukoha Oluchi	Vaccination Coverage and Its Determinants in Children Aged 11-23 Months in an Urban District of Nigeria	World Journal of Vaccines	0.95	NGA			bcg, diphtheria, hep, hib, measles, pertussis, polio, tetanus, yellow fever, fully vaccinated
2012	Village Reach	Starting at the Last Mile. Rethinking Medical Supply Chains in Low-Income Countries	Village Reach	0.95		Low Income Countries		
2004	Weir, Erica; Hatch, Kathy	Public health: preventing cold chain failure: vaccine storage and handling	CMAJ: Canadian Medical Association Journal	0.95	CAN			
2011	Laval, B.; Fascia, P.; Gocko, X.; Feuillet, J.; Lucht, F.	Determinants of vaccination coverage for children and teenagers	Médecine Et Maladies Infectieuses	0.94	FRA			hep
1997	Matthews, Z.; Diamond, I.	Child immunisation in Ghana: the effects of family, location and social disparity	Journal of Biosocial Science	0.94	GHA			bcg, diphtheria, measles, pertussis, polio, tetanus
2004	Norwegian Agency For Development Cooperation	Alleviating System Wide Barriers to Immunization: Issues and conclusions from the Second GAVI Consultation with Country Representatives and Global Partners	Norwegian Agency for Development Cooperation	0.94				
2013	Haidari, Leila A.; Connor, Diana L.; Wateska, Angela R.; Brown, Shawn T.; Mueller, Leslie E.; Norman, Bryan A.; Schmitz, Michelle M.; Paul, Proma; Rajgopal, Jayant; Welling, Joel S.; Others	Augmenting transport versus increasing cold storage to improve vaccine supply chains	PloS one	0.93	NER			
2005	J, Cullen	Why parents choose not to vaccinate their children against childhood diseases.	Professional nurse (London, England)	0.93	USA			
2006	Tickner, Sarah; Leman, Patrick J.; Woodcock, Alison	Factors underlying suboptimal childhood immunisation	Vaccine	0.93	GBR		1	measles, mumps, rubella
2009	Tsu, Vivien Davis	Overcoming barriers and ensuring access to HPV vaccines in low-income countries	Am. JL & Med.	0.93		Low Income Countries		hpv
2004	Alfredsson, R.; Svensson, E.; Trollfors, Birger; Borres, Magnus P.	Why do parents hesitate to vaccinate their children against measles, mumps and rubella?	Acta Paediatrica	0.92	SWE			measles, mumps, rubella
1990	Bruguera, M.; Rodicio, J. L.; Alcazar, J. M.; Oliver, A.; Del Rio, G.; Esteban-Mur, R.	Effects of different dose levels and vaccination schedules on immune response to a recombinant DNA hepatitis B vaccine in haemodialysis patients	Vaccine	0.92				hep
2011	Dowling, Paul	Healthcare Supply Chains in Developing Countries: Situational Analysis	USAID Deliver Project	0.92		Developing Countries		
2002	Gauri, Varun; Khaleghian, Peyvand	Immunization in developing countries: its political and organizational determinants	World Development	0.92		Developing Countries		
2007	Matthias, Dipika M.; Robertson, Joanie; Garrison, Michelle M.; Newland, Sophie; Nelson, Carib	Freezing temperatures in the vaccine cold chain: a systematic literature review	Vaccine	0.92			1	
2015	Mcglynn, Natalie; Wilk, Piotr; Luginaah, Isaac; Ryan, Bridget L.; Thind, Amardeep	Increased use of recommended maternal health care as a determinant of immunization and appropriate care for fever and diarrhoea in Ghana: an analysis pooling three demographic and health surveys	Health Policy and Planning	0.92	GHA			
2006	Millimouno, Dominique; Diallo, A. A.; Fairhead, J.; Leach, M.	The social dynamics of infant immunisation in Africa: the case of the republic of Guinea	IDS Working Paper	0.92	GIN			
1998	Poland, Gregory A.	Variability in immune response to pathogens: using measles vaccine to probe immunogenetic determinants of response	The American Journal of Human Genetics	0.92				measles
1996	Strobino, Donna; Keane, Virginia; Holt, Elizabeth; Hughart, Nancy; Guyer, Bernard	Parental attitudes do not explain underimmunization	Pediatrics	0.92	USA			
2014	Abdullahi, Leila H.; Kagina, Benjamin M.; Cassidy, Tali; Adebayo, Esther F.; Wiysonge, Charles S.; Hussey, Gregory D.	Knowledge, attitudes and practices on adolescent vaccination among parents, teachers and adolescents in Africa: a systematic review protocol	Systematic Reviews	0.91		Africa	1	
2009	Ayebazibwe, Nicholas	Immunization coverage and risk factors for high dropout in Rakai district.	Makerere University	0.9	UGA			
2004	Batt, Katherine; Fox-Rushby, J. A.; Castillo-Riquelme, Marianela	The costs, effects and cost-effectiveness of strategies to increase coverage of routine immunizations in low- and middle-income countries: systematic review of the grey literature	Bulletin of the World Health Organization	0.9		Low and Middle Income Countries		
2013	Bbaale, Edward	Factors influencing childhood immunization in Uganda	Journal of health, population, and nutrition	0.9	UGA			
2005	Burns, Ilene Timko; Zimmerman, Richard Kent	Immunization barriers and solutions	Journal of family practice	0.9	USA			
2006	Cassell, J. A.; Leach, M.; Fairhead, J. R.; Small, M.; Mercer, C. H.	The social shaping of childhood vaccination practice in rural and urban Gambia	Health Policy and Planning	0.9	GMB			

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1986	Chen, Lincoln C	Primary health care in developing countries: overcoming operational, technical, and social barriers	The Lancet		0.9	Developing Countries		
2009	Cockcroft, Anne; Andersson, Neil; Omer, Khalid; Ansari, Noor M.; Khan, Amir; Chaudhry, Ubaid Ullah; Ansari, Umaira	One size does not fit all: local determinants of measles vaccination in four districts of Pakistan	BMC International Health and Human Rights		0.9 PAK			
2014	Conklin, Laura; Loo, Jennifer D.; Kirk, Jennifer; Fleming-Dutra, Katherine E.; Deloria Knoll, Maria; Park, Daniel E.; Goldblatt, David; O'Brien, Katherine L.; Whitney, Cynthia G.	Systematic Review of the Effect of Pneumococcal Conjugate Vaccine Dosing Schedules on Vaccine-type Invasive Pneumococcal Disease Among Young Children:	The Pediatric Infectious Disease Journal		0.9			1 pneumo
1999	Deroeck, D.; Levin, A.	Review of Financing of Immunization Programs in Developing and Transitional Countries	Partnerships for Health Reform		0.9	Developing Countries		1
2000	Dua, A; Sachdev, Tr; Rasania, Sk	A study on community awareness on child immunisation	Indian Journal of Public Health		0.9			
2009	Dugas, Marylene; Dube, Eric; Kouyate, Bocar; Sanou, Aboubakary; Bibeau, Gilles	Portrait of a lengthy vaccination trajectory in Burkina Faso: from cultural acceptance of vaccines to actual immunization	BMC International Health and Human Rights		0.9 BFA			
2011	Ecumenical Pharmaceutical Network	Effective pharmaceutical supply chains: On the road in low income countries	EPN		0.9	Low Income Countries		
2012	Fatiregun, Akinola Ayoola; Okoro, Anselm O.	Maternal determinants of complete child immunization among children aged 12-23 months in a southern district of Nigeria	Vaccine		0.9 NGA			bcg, diphtheria,measles, pertussis, polio, tetanus, fully vaccinated
1985	Hasley, N. A.; Boulos, R.; Mode, F.; Andre, J.; Others	Response to measles vaccine in Haitian infants 6-12 months: Influence of maternal antibodies, malnutrition and concurrent illnesses	New England Journal of Medicine		0.9			
1992	Hess, G.; Hingst, V.; Cseke, J.; Bock, H. L.; Clemens, R.	Influence of vaccination schedules and host factors on antibody response following hepatitis B vaccination	European Journal of Clinical Microbiology and Infectious Diseases		0.9			hep
2010	Kamanda, Bataringaya Cos	Immunization coverage and factors associated with failure to complete childhood immunization in Kawempe Division, Uganda	University of the Western Cape		0.9 UGA			diphtheria, measles, pertussis, polio, tetanus
1998	Kaninda, Anne-Valerie; Legros, Dominique; Jataou, Idi Moussa; Malfait, Philippe; Maisonneuve, Marc; Paquet, Christophe; Moren, Alain	Measles vaccine effectiveness in standard and early immunization strategies, Niger, 1995	The Pediatric infectious disease journal		0.9 NER			
1988	Khare, S.; Dutta, M.; Lal, B.; Kumari, S.	Quality control of cold chain system. Potency testing of Oral Polio Vaccine	Comm Dis Bull		0.9			polio
2007	Kimman, T. G.; Vandebriel, R. J.; Hoebee, B.	Genetic variation in the response to vaccination.	Community genetics		0.9			
2013	Kruger, Carsten; Olsen, Oystein E.; Mighay, Emanuel; Ali, Mohammed	Immunisation coverage and its associations in rural Tanzanian infants	Rural and Remote Health		0.9 TZA			bcg, diphtheria, measles, pertussis, polio, tetanus
2009	Kruk, Margaret E.; Prescott, Marta R.; De Pinho, Helen; Galea, Sandro	Are doctors and nurses associated with coverage of essential health services in developing countries? A cross-sectional study	Human Resources for Health		0.9	Developing Countries		
2013	Le Polain De Waroux, Olivier; Schellenberg, Joanna R. Armstrong; Manzi, Fatuma; Mrisho, Mwifadhi; Shirima, Kizito; Mshinda, Hassan; Alonso, Pedro; Tanner, Marcel; Schellenberg, David M.	Timeliness and completeness of vaccination and risk factors for low and late vaccine uptake in young children living in rural southern Tanzania	International Health		0.9 TZA			
2007	Mahoney, Richard T.; Krattiger, Anatole; Clemens, John D.; Curtiss, Roy	The introduction of new vaccines into developing countries: IV: Global Access Strategies	Vaccine		0.9	Developing Countries		
1999	Marshall, Sandra; Swenssen, Hal	A qualitative analysis of parental decision making for childhood immunisation	Australian and New Zealand journal of public health		0.9			
2005	Mills, Edward; Jadad, Alejandro R.; Ross, Cory; Wilson, Kumanan	Systematic review of qualitative studies exploring parental beliefs and attitudes toward childhood vaccination identifies common barriers to vaccination	Journal of clinical epidemiology		0.9	Developed Countries		1
1990	Milstien, Julie B.; Gibson, J. J.	Quality control of BCG vaccine by WHO: a review of factors that may influence vaccine effectiveness and safety.	Bulletin of the World Health Organization		0.9			1 bcg
2009	Oluwadare, Christopher; Others	The social determinants of routine immunisation in Ekiti State of Nigeria	Studies on Ethno-Medicine		0.9 NGA			
2010	Opollo, M.-S.; Makumbi, F.; Mukanga, D.; Namusisi, O.; Ayebazibwe, N.; Tweheyo, R.	Factors associated with DPT 1-3 vaccine dropout in Kabarole district, western Uganda	International Journal of Infectious Diseases		0.9 UGA			diphtheria, pertussis, tetanus
2005	Parashar, Sangeeta	Moving beyond the mother-child dyad: women's education, child immunization, and the importance of context in rural India	Social science & medicine		0.9 IND			
2005	Pegurri, Elisabetta; Fox-Rushby, Julia A.; Damian, Walker	The effects and costs of expanding the coverage of immunisation services in developing countries: a systematic literature review	Vaccine		0.9	Developing Countries		
2007	Perry, Henry; Nurani, Sufia; Quaiyum, Md Abdul; Jinnah, S. A.; Sharma, Anjali; Others	Barriers to immunization among women and children living in slums of Zone 3 of Dhaka city, Bangladesh: a qualitative assessment	International centre for diarrhoeal disease research (ICDDR, B)		0.9 BGD			

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2009	Rahman, Mohammad Mosiur	Determinants of the Utilization of the Tetanus Toxoid (TT) Vaccination Coverage in Bangladesh: Evidence from a Bangladesh Demographic Health Survey 2004	Int J Health	0.9	BGD			tetanus
2009	Sanou, Aboubakary; Simboro, Seraphin; Kouyate, Bocar; Dugas, Marylene; Graham, Janice; Bibeau, Gilles	Assessment of factors associated with complete immunization coverage in children aged 12-23 months: a cross-sectional study in Nouna district, Burkina Faso	BMC International Health and Human Rights	0.9	BFA			
2007	Sia, Drissa; Kobiané, Jean-François; Sondo, Blaise K.; Fournier, Pierre	Individual and environmental characteristics associated with immunization of children in rural areas in Burkina Faso: a multi-level analysis	Santé (Montrouge, France)	0.9	BFA			
2003	Smailbegovic, Mirsada S.; Laing, Gabrielle J.; Bedford, Helen	Why do parents decide against immunization? The effect of health beliefs and health professionals	Child: care, health and development	0.9				
2008	Uddin, Md Jasim; Larson, Charles P.; Oliveras, Elizabeth; Khan, A. I.; Quaiyum, M. A.; Saha, Nirod Chandra; Others	Effectiveness of combined strategies to improve low coverage of child immunization in urban slums of Bangladesh	International centre for diarrhoeal disease research, Bangladesh (ICDDR, B)	0.9	BGD			
2000	Vaahtera, Merimaaria; Kulmala, Teija; Maleta, Kenneth; Cullinan, Timothy; Salin, Marja-Leena; Ashorn, Per	Childhood immunization in rural Malawi: time of administration and predictors of non-compliance	Annals of Tropical Paediatrics: International Child Health	0.9	MWI			
2003	Agadjanian, Victor; Prata, Ndola	Civil war and child health: regional and ethnic dimensions of child immunization and malnutrition in Angola	Social Science & Medicine	0.89				
2004	Altinkaynak, S.; Ertekin, V.; Guraksin, A.; Kilic, A.	Effect of several sociodemographic factors on measles immunization in children of Eastern Turkey	Public health	0.89				
2009	Babalola, Stella; Lawan, Umar	Factors predicting BCG immunization status in northern Nigeria: a behavioral-ecological perspective	Journal of Child Health Care	0.89				
1993	Briggs, Hilary; Ilett, Susan	Weak link in vaccine cold chain.	BMJ	0.89				
1981	Brown, Judith; Djogdom, P.; Murphy, K.; Kesseng, G.; Heymann, D.	Identifying the reasons for low immunization coverage. A case study of Yaounde (United Republic of Cameroon).	Revue d'epidemiologie et de sante publique	0.89				
2004	Ertekin, Vildan; Selimoglu, Mukadder A.	Effects of several socio-demographic factors on hepatitis B immunization rates	European journal of gastroenterology & hepatology	0.89				
2004	Henderson, Rob; Oates, Ken; Macdonald, Helen; Smith, W. Cairns S.; Selvaraj, Sivasubramaniam	Factors influencing the uptake of childhood immunisation in rural areas.	British journal of general practice	0.89				
2006	Ikudehin, Oa; Sokoya, Go; Awotunde, Jm; Sopeju, Jo; Omotayo, Am	Awareness, information sources and response of rural mother's towards National Programme on Immunization in Ogun State, Southwestern Nigeria	West African Journal of Nursing	0.89				
2004	Kiros, Gebre-Egzbiabher; White, Michael J.	Migration, community context, and child immunization in Ethiopia	Social Science & Medicine	0.89				
1987	Loevinsohn, B. P.; Loevinsohn, M. E.	Well child clinics and mass vaccination campaigns: an evaluation of strategies for improving the coverage of primary health care in a developing country	American Journal of Public Health	0.89				
2002	Mathew, Joseph L.; Babbar, Harsh; Yadav, Sangita	Reasons for non-immunization of children in an urban, low income group in North India	Tropical doctor	0.89				
1998	Migasena, S.; Simasathien, S.; Samakoses, R.; Pitisuttitham, P.; Heath, J.; Bellini, W.; Bennett, J.	Adverse impact of infections on antibody responses to measles vaccination	Vaccine	0.89				
2000	Pareek, Manish; Pattison, Helen M.	The two-dose measles, mumps, and rubella (MMR) immunisation schedule: factors affecting maternal intention to vaccinate.	British Journal of General Practice	0.89				
2010	Rogers, Bonnie; Dennison, Kim; Adepoju, Nikki; Dowd, Shelia; Uedoi, Kenneth	Vaccine cold chain: part 1. proper handling and storage of vaccine	AAOHN journal	0.89				
1981	Rosenblum, E. H.; Stone, E. J.; Skipper, B. E.	Maternal compliance in immunization of preschoolers as related to health locus of control, health value, and perceived vulnerability	Nursing Research	0.89				
2008	Soeung, Sann Chan; Grundy, John; Morn, Cheng; Samnang, Chham	Evaluation of Immunization Knowledge, Practices, and Service-delivery in the Private Sector in Cambodia	Journal of Health, Population, and Nutrition	0.89				
2002	Tuma, Jn; Smith, Sm; Kirk, Rh; Hagmann, Ce; Zemel, Pc	Beliefs and attitudes of caregivers toward compliance with childhood immunisations in Cameroon	Public Health	0.89				
1995	Zaffran, M.	Vaccine transport and storage: environmental challenges.	Developments in biological standardization	0.89				
2002	Ai-Hong, Y. I. N.; Zhang, Yian-Xue	A Discussion on Affecting Factors of Low and No Immune Responses after Hepatitis B Vaccination	Chinese Journal of Vaccines and Immunization	0.88				hep
2005	Anand, S.; Bärnighausen, T.	Human resources for health and vaccination coverage in developing countries	unpublished document, Oxford University	0.88		Developing Countries		
2000	Anandhi, C. L.; Nagaraj, V. K.; Sundaram, K. R.; Lobo, J.	Factors predicting the non-utilisation of immunisation services using logistic regression technique	The Indian Journal of Pediatrics	0.88				
1994	Arya, Subhash C.	Human immunization in developing countries: practical and theoretical problems and prospects	Vaccine	0.88		Developing Countries		
2016	Ataguba, John E.; Ojo, Kenneth O.; Ichoku, Hyacinth E.	Explaining socio-economic inequalities in immunization coverage in Nigeria	Health Policy and Planning	0.88	NGA			fully vaccinated
2005	Bae, Geun Ryang; Lim, Hyun Sul; Goh, Un Yeong; Yang, Byung Guk; Kim, Young Taek; Lee, Jong Koo	Seroprevalence of measles antibody and its attributable factors in elementary students of routine 2-dose schedule era with vaccination record	Journal of preventive medicine and public health	0.88				measles
1997	Bosu, William K.; Ahelegbe, Doris; Edum-Fotwe, Emmanuel; Bainson, Kobina A.; Turkson, Paa Kobina	Factors influencing attendance to immunization sessions for children in a rural district of Ghana	Acta tropica	0.88				

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1996	Coombes, A. G. A.; Lavelle, E. C.; Jenkins, P. G.; Davis, S. S.	Single dose, polymeric, microparticle-based vaccines: the influence of formulation conditions on the magnitude and duration of the immune response to a protein antigen	Vaccine	0.88				
2004	Dd, Fredrickson; Tc, Davis; Cl, Arnould; Em, Kennen; Sg, Hurniston; Jt, Cross; Jr, Bocchini Ja	Childhood immunization refusal: provider and parent perceptions.	Family medicine	0.88				
2003	Harmanci, H; Gurbuz, Y; Torun, S. D; Tumerdem, N; Erturk, T	Reasons for non-vaccination during national immunization days: a case study in Istanbul, Turkey	Public Health	0.88				
2000	Heath, P. T.; Booy, R.; Griffiths, H.; Clutterbuck, E.; Azzopardi, H. J.; Slack, M. P. E.; Fogarty, J.; Moloney, A. C.; Moxon, E. R.	Clinical and immunological risk factors associated with Haemophilus influenzae type b conjugate vaccine failure in childhood	Clinical infectious diseases	0.88				hib
2012	Holte, Jon H.; Mæstad, Ottar; Jani, Jagrati V.	The decision to vaccinate a child: an economic perspective from southern Malawi	Social Science & Medicine	0.88	MWI			
2000	Impicciatore, Piero; Bosetti, Cristina; Schiavio, Stefano; Pandolfini, Chiara; Bonati, Maurizio	Mothers as active partners in the prevention of childhood diseases: maternal factors related to immunization status of preschool children in Italy	Preventive medicine	0.88				
1996	Islam, S. M.; Islam, M. M.	Influences of selected socio-economic and demographic factors on child immunization in a rural area of Bangladesh.	Demography India	0.88	BGD			
2004	Jelleyman, Tim; Ure, Andrew	Attitudes to immunisation: a survey of health professionals in the Rotorua District	This Issue of the Journal	0.88				
2006	Klein, Jerome O.; Myers, Martin G.	Vaccine shortages: why they occur and what needs to be done to strengthen vaccine supply	Pediatrics	0.88				
1990	Mcguire, Christine	Accounting for public perceptions in the development of a childhood immunisation campaign	Health Education Journal	0.88				
2003	Odiit, A.; Amuge, B.	Comparison of vaccination status of children born in health units and those born at home	East African medical journal	0.88				
1998	Omilabu, S. A.; Oyefolu, A. O.; Ojo, O. O.; Audu, R. A.	Potency status and efficacy of measles vaccine administered in Nigeria: a case study of three EPI centres in Lagos, Nigeria.	African journal of medicine and medical sciences	0.88				
2011	Owais, Aatekah; Hanif, Beenish; Siddiqui, Amna R.; Agha, Ajmal; Zaidi, Anita Km	Does improving maternal knowledge of vaccines impact infant immunization rates? A community-based randomized-controlled trial in Karachi, Pakistan	BMC public health	0.88				
1997	Peces, Ramón; De La Torre, Miguel; Alcázar, Roberto; Urra, Josém	Prospective analysis of the factors influencing the antibody response to hepatitis B vaccine in hemodialysis patients	American journal of kidney diseases	0.88				hep
2005	Petousis-Harris, Helen; Goodyear-Smith, Felicity; Turner, Nikki; Soe, Ben	Family practice nurse views on barriers to immunising children	Vaccine	0.88				
1986	Profeta, M. L.; Ferrante, P.; Somenzi, C. Porro De'	A survey on factors affecting acceptance of measles vaccine	European Journal of Epidemiology	0.88				
1999	Richards, Alun; Sheridan, John	Reasons for delayed compliance with the childhood vaccination schedule and some failings of computerised vaccination registers	Australian and New Zealand Journal of Public Health	0.88				
1995	Richardson, G.; Linkins, R. W.; Eames, M. A.; Wood, David J.; Campbell, P. J.; Ankers, E.; Deniel, M.; Kabbaj, A.; Magrath, David I.; Minor, Phillip D.; Others	Immunogenicity of oral poliovirus vaccine administered in mass campaigns versus routine immunization programmes.	Bulletin of the World Health Organization	0.88				polio
2009	Sia, Drissa; Fournier, Pierre; Kobiané, Jean-François; Sondo, Blaise K.	Rates of coverage and determinants of complete vaccination of children in rural areas of Burkina Faso (1998-2003)	BMC public health	0.88	BFA			
2001	Sporton, Rachel K.; Francis, Sally-Anne	Choosing not to immunize: are parents making informed decisions?	Family Practice	0.88				
2001	Aston, Robert	Analysis of factors influencing vaccine uptake from various perspectives	Vaccine	0.87				
1978	Belcher, D. W.; Nicholas, D. D.; Ofosu-Amaah, S.; Wurapa, F. K.	A mass immunization campaign in rural Ghana. Factors affecting participation.	Public health reports	0.87				
2000	Briss, P. A.; Rodewald, L. E.; Hinman, A. R.; Shefer, A. M.; Strikas, R. A.; Bernier, R. R.; Carande-Kulis, V. G.; Yusuf, H. R.; Ndiaye, S. M.; Williams, S. M.	Reviews of evidence regarding interventions to improve vaccination coverage in children, adolescents, and adults. The Task Force on Community Preventive Services	American Journal of Preventive Medicine	0.87				1
2006	Chowdhury, F; Khan, Ashraful I; Hossain, Mohammad I.; Malek, M. A; Faruque, A. S. G; Ahmed, Tahmeed; Salam, Mohammad A.	Young children non-immunized against measles: Characteristics and programmatic implications	Acta Peadiatrica	0.87				
2003	Control, Centers For Disease; (Cdc, Prevention; Others	Guidelines for maintaining and managing the vaccine cold chain.	MMWR. Morbidity and mortality weekly report	0.87				
1999	Garly, M. L.; Martins, C. L.; Bale, C.; Costa, F. Da; Dias, F.; Whittle, H.; Aaby, P.	Early two-dose measles vaccination schedule in Guinea-Bissau: good protection and coverage in infancy.	International Journal of Epidemiology	0.87				
2009	Glazner, Judith E.; Beaty, Brenda; Berman, Stephen	Cost of vaccine administration among pediatric practices	Pediatrics	0.87				
2010	Groom, Holly; Kennedy, Allison; Evans, Victoria; Fasano, Nancy	Qualitative analysis of immunization programs with most improved childhood vaccination coverage from 2001 to 2004	Journal of public health management and practice	0.87				
1996	Hausdorff, William P.	Prospects for the use of new vaccines in developing countries: cost is not the only impediment	Vaccine	0.87	Developing Countries			
2006	Hilton, Shona; Petticrew, Mark; Hunt, Kate	Combined vaccines are like a sudden onslaught to the body's immune system': Parental concerns about vaccine'overload'and'immune-vulnerability	Vaccine	0.87				
1989	Hollinger, F. Blaine	Factors influencing the immune response to hepatitis B vaccine, booster dose guidelines, and vaccine protocol recommendations	The American journal of medicine	0.87				hep
2007	Ibnouf, A. H.; Van Den Borne, H. W.; Maarse, J. A. M.	Factors influencing immunisation coverage among children under five years of age in Khartoum State, Sudan	South African Family Practice	0.87	SDN			
2005	Jacobson Vann, Julie C.; Szilagyi, Peter	Patient reminder and recall systems to improve immunization rates	The Cochrane Library	0.87				

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2003	Kidane, Teklay; Tekie, Michael	Factors influencing child immunization coverage in a rural district of Ethiopia, 2000	Ethiopian journal of health development	0.87	ETH			
2002	Kulig, Judith C.; Meyer, Cathy J.; Hill, Shirley A.; Handley, Cathy E.; Lichtenberger, Sue M.; Myck, Sharon L.	Refusals and delay of immunization within Southwest Alberta: understanding alternative beliefs and religious perspectives	Canadian Journal of Public Health/Revue Canadienne de Sante'e Publique	0.87				
2006	Mast, T. C.; Kigozi, G.; Wabwire-Mangen, F.; Sewankambo, N.; Serwadda, D.; Gray, R.; Wawer, M.; Black, R.	Immunisation coverage among children born to HIV-infected women in Rakai district, Uganda: Effect of voluntary testing and counselling (VCT)	AIDS care	0.87				
2007	Munthali, Alister C.	Determinants of vaccination coverage in Malawi: evidence from the demographic and health surveys	Malawi Medical Journal	0.87				
2002	Setia, Sabeena; Mainzer, Hugh; Washington, Michael L.; Coil, Gary; Snyder, Robert; Weniger, Bruce G.	Frequency and causes of vaccine wastage	Vaccine	0.87				
2001	Tarrant, Marie; Gregory, David	Mothers' perceptions of childhood immunizations in First Nations communities of the Sioux Lookout Zone	REVUE CANADIENNE DE SANTA PUBLIQUE	0.87				
2004	Thomas, M.; Kohli, Vandana; King, Dixie	Barriers to childhood immunization: findings from a needs assessment study	Home Health Care Services Quarterly	0.87				
2005	Topuzoglu, A.; Ozaydin, G. A. N.; Cali, S.; Cebeci, D.; Kalaca, S.; Harmanci, H.	Assessment of sociodemographic factors and socio-economic status affecting the coverage of compulsory and private immunization services in Istanbul, Turkey	Public health	0.87				
2008	Uskun, Ersin; Uskun, Suha Basar; Uysalgenc, Meral; Yagiz, Mehmet	Effectiveness of a training intervention on immunization to increase knowledge of primary healthcare workers and vaccination coverage rates	Public Health	0.87				
1999	Wang, D. Y.; Yang, R. I.; Yang, Y. C.; Yeh, S. Y.; Chen, T. L.; Cheng, Hwei-Fang; Hsing, J. T.; Lin, C. P.	The relationship between the cold chain system and vaccine potency in Taiwan:(I) Live measles vaccine and MMR vaccine	J. Food Drug Anal	0.87	TWN			measles, mumps, rubella
2000	Wilson, T.	Factors influencing the immunization status of children in a rural setting	Journal of Pediatric Health Care	0.87				
2007	Bhandari, Prem; Shrestha, Sundar S.; Ghimire, Dirgha J.	Sociocultural and geographical disparities in child immunization in Nepal	Asia Pacific Population Journal	0.86	NPL			
1981	Christodoulou, J.; Clarke, S.; Buchanan, N.	Compliance with immunization programmes	Journal of Paediatrics and Child Health	0.86				
2013	De La Hoz-Restrepo, Fernando; Castaneda-Orjuela, Carlos; Paternina, Angel; Alvis-Guzman, Nelson	Systematic review of incremental non-vaccine cost estimates used in cost-effectiveness analysis on the introduction of rotavirus and pneumococcal vaccines	Vaccine	0.86			1	pneumo, rotavirus
2005	Deady, J.; Thornton, L.	Parents' knowledge of and attitude towards the primary childhood immunisations.	Irish medical journal	0.86				
1984	Ekunwe, E. O.	Expanding immunization coverage through improved clinic procedures.	World health forum	0.86				
1995	Ferson, M. J.; Fitzsimmons, G.; Christie, D.; Woollett, H.	School health nurse interventions to increase immunisation uptake in school entrants	Public Health	0.86				
1992	Glaser, Ronald; Kiecolt-Glaser, Janice K.; Bonneau, Robert H.; Malarkey, William; Kennedy, Susan; Hughes, John	Stress-induced modulation of the immune response to recombinant hepatitis B vaccine	Psychosomatic Medicine	0.86				hep
1998	Glaser, Ronald; Kiecolt-Glaser, Janice K.; Malarkey, William B.; Sheridan, John F.	The Influence of Psychological Stress on the Immune Response to Vaccinesa	Annals of the New York Academy of Sciences	0.86				
2003	Gregson, Aric L.; Edelman, Robert	Does antigenic overload exist? The role of multiple immunizations in infants	Immunology and Allergy Clinics of North America	0.86				
1998	Guérin, Nicole	Assessing immunisation coverage: how and why?	Vaccine	0.86				
2005	Gust, Deborah A.; Kennedy, Allison; Shui, Irene; Smith, Philip J.; Nowak, Glen; Pickering, Larry K.	Parent attitudes toward immunizations and healthcare providers: the role of information	American journal of preventive medicine	0.86				
2000	Kissoon, N.	Successful immunization of children: barriers and strategies	The West Indian Medical Journal	0.86				
2007	M, Chaturvedi; D, Nandan; C, Gupta S.	Rapid assessment of immunization practices in Agra district	Indian Journal of Public Health	0.86				
1992	Mcdonald, L. J.	Factors that can undermine the success of routine vaccination protocols	Veterinary medicine	0.86				
1981	Riddiough, M. A.; Willems, J. S.; Sanders, C. R.; Kemp, K.	Factors affecting the use of vaccines: considerations for immunization program planners	Public Health Reports (Washington, D.C.: 1974)	0.86				
2001	Serquina-Ramiro, Laurie; Kasniyah, Naniek; Inthusoma, Tuanchai; Higginbotham, Nick; Streiner, David; Nichter, Mark; Freeman, Sonia	Measles immunization acceptance in Southeast Asia: past patterns and future challenges.	The Southeast Asian journal of tropical medicine and public health	0.86				
2008	Shah, Harishchandra	A cluster survey for determination of regular vaccination coverage among children	Journal of Nepal Medical Association	0.86				
1998	World Health Organization; Basics; Usaid; Unicef	Safe vaccine handling, cold chain and immunizations: a manual for the Newly Independent States	WHO	0.86				
2011	Zipursky, Simona; Boualam, Liliane; Cheikh, Dah Ould; Fournier-Caruana, Jacqueline; Hamid, Djabar; Janssen, Mathias; Kartoglu, Umit; Waeterloos, Genevieve; Ronveaux, Olivier	Assessing the potency of oral polio vaccine kept outside of the cold chain during a national immunization campaign in Chad	Vaccine	0.86	TCD			polio
2006	Afsar, Ahmet; Kartoglu, Ümit	Vaccine stock management: Guidelines on stock records for immunization programme and vaccines store managers	WHO	0.85				
2007	Anand, Sudhir; Bärnighausen, Till	Health workers and vaccination coverage in developing countries: an econometric analysis	The Lancet	0.85		Developing Countries		

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1992	Anguyo, G. R.	Mothers' Knowledge and Attitude About Immunization in Vurra and Madi Counties, Arua District, Uganda	Makerere Medical Journal	0.85	UGA			
2009	Antai, Diddy	Inequitable childhood immunization uptake in Nigeria: a multilevel analysis of individual and contextual determinants	BMC infectious diseases	0.85	NGA			
2000	Austin, H.	Parents' perceptions of information on immunisations.	Journal of child health care: for professionals working with children in the hospital and community	0.85				
1993	Balraj, Vinohar; Mukundan, Satish; Samuel, Reuben; T Jacob, John	Factors affecting immunization coverage levels in a district of India	International journal of epidemiology	0.85				
1992	Barreto, Thalia Velho; Rodrigues, Laura Cunha	Factors influencing childhood immunisation in an urban area of Brazil.	Journal of epidemiology and community health	0.85				
1988	Bender, Deborah; Macauley, Rose Jallah	Immunization drop-outs and maternal behavior: evaluation of reasons given and strategies for maintaining gains made in the national vaccination campaign in Liberia	International quarterly of community health education	0.85	LBR			
2012	Blanford, Justine I.; Kumar, Supriya; Luo, Wei; Maceachren, Alan M.	It'sa long, long walk: accessibility to hospitals, maternity and integrated health centers in Niger	International journal of health geographics	0.85	NER			
2004	Borus, P. K.	Missed opportunities and inappropriately given vaccines reduce immunisation coverage in facilities that serve slum areas of Nairobi	East African medical journal	0.85				
2014	Brown, Shawn T.; Schreiber, Benjamin; Cakouros, Brigid E.; Wateska, Angela R.; Dicko, Hamadou M.; Connor, Diana L.; Jaillard, Philippe; Mvundura, Mercy; Norman, Bryan A.; Levin, Carol; Others	The benefits of redesigning Benin's vaccine supply chain	Vaccine	0.85	BEN			
1996	Brugha, R. F.; Kevany, J. P.	Maximizing immunization coverage through home visits: a controlled trial in an urban area of Ghana	Bulletin of the World Health Organization	0.85				
2011	Chinyama, Cheelo	Factors contributing to the low measles immunization coverage among under five children in sesheke district.	University of Zambia	0.85	ZMB			measles
2006	Choi, Jin Young; Lee, Sang-Hyop	Does prenatal care increase access to child immunization? Gender bias among children in India	Social Science & Medicine	0.85				
1982	Colinet, G.; Rossignol, J.; Peetermans, J.	A study of the stability of a bivalent measles-mumps vaccine	Journal of biological standardization	0.85				measles, mumps
2008	Conn, Robert; Welch, F.; Popovich, M.	Management of vaccine inventories as a critical health resource	Engineering in Medicine and Biology Magazine, IEEE	0.85				
1990	Deivanayagam, N.; Vasudevan, Sumatbi; Ashok, T. P.; Ahmed, S. Shaffi	Potency of oral polio vaccine stored at distribution centers in Madras	The Indian Journal of Pediatrics	0.85	IND			polio
1998	Emer, Matthew; Oundo, G.; Ssengooba, F.; Muru, M.; Marum, L.; Muganwa, M. K.	What led to low (70%) polio immunization coverage during the first ever national immunization days (NIDs) in Busiis subcounty Hoima district	Journal of Clinical Epidemiology	0.85	UGA			polio
2001	Evans, Maggie; Stoddart, Helen; Condon, Louise; Freeman, Elaine; Grizzell, Marg; Mullen, Rebecca	Parents' perspectives on the MMR immunisation: a focus group study.	British Journal of General Practice	0.85				
2003	Freed, Gary L.; Davis, Matthew M.; Clark, Sarah J.	Variation in public and private supply of pneumococcal conjugate vaccine during a shortage	JAMA	0.85				pneumo
2003	Garly, May-Lill; Aaby, Peter	The challenge of improving the efficacy of measles vaccine	Acta tropica	0.85				
2005	Gordeeva, L. A.; Shabaldin, A. V.; Semenova, E. M.; Glushkov, A. N.	Influence of genetic and phenotypical factors on the efficiency of the vaccination of young children against diphtheria and measles	Zhurnal mikrobiologii, epidemiologii, i immunobiologii	0.85				diphtheria, measles
1972	Gotschlich, Emil C.; Rey, Michel; Triau, Rene; Sparks, Kenneth J.	Quantitative determination of the human immune response to immunization with meningococcal vaccines	Journal of clinical investigation	0.85				mening
2014	Gram, Lu; Soremekun, Seyi; Ten Asbroek, Augustinus; Manu, Alexander; O'Leary, Maureen; Hill, Zelee; Danso, Samuel; Amenga-Etego, Seeba; Owusu-Agyei, Seth; Kirkwood, Betty R.	Socio-economic determinants and inequities in coverage and timeliness of early childhood immunisation in rural Ghana	Tropical medicine & international health	0.85	GHA			
2011	Hajjeh, Rana	Accelerating introduction of new vaccines: barriers to introduction and lessons learned from the recent Haemophilus influenzae type b vaccine experience	Philosophical Transactions of the Royal Society B: Biological Sciences	0.85				hib
1988	Hanlon, P.; Byass, P.; Yamuah, M.; Hayes, R.; Bennett, S.; M'Boge, B. H.	Factors influencing vaccination compliance in peri-urban Gambian children.	The Journal of tropical medicine and hygiene	0.85	GMB			
2004	Helman, Cecil G.; Yogeswaran, Parimalarani	Perceptions of childhood immunisations in rural Transkei-a qualitative study	South African Medical Journal	0.85				
2009	Hlsp	GAVI Health Systems Strengthening Support Evaluation 2009: Volume 2 Full Evaluation Report	GAVI	0.85				
2002	Höhler, Thomas; Reuss, Esther; Evers, Nina; Dietrich, Evi; Rittner, Christian; Freitag, Christine M.; Vollmar, Jens; Schneider, Peter M.; Fimmers, Rolf	Differential genetic determination of immune responsiveness to hepatitis B surface antigen and to hepatitis A virus: a vaccination study in twins	The Lancet	0.85				hep
1970	Koch, A.	BCG mass vaccination in developing countries	Praxis Der Pneumologie	0.85		Developing Countries		bcg
2000	Mahoney, Richard T.; Ramachandran, S.; Xu, Zhi-Yi	The introduction of new vaccines into developing countries II. Vaccine financing	Vaccine	0.85	Developing Countries			

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2010	Masilani, Rosemary Mubotu	Determinants of immunization coverage of under-five children in Kawama Compound of Ndola Urban District	University of Zambia	0.85		ZMB		
2014	Metcalf, C. J. E.; Tatem, A.; Bjornstad, O. N.; Lessler, J.; O'Reilly, K.; Takahashi, S.; Cutts, F.; Grenfell, B. T.	Transport networks and inequities in vaccination: remoteness shapes measles vaccine coverage and prospects for elimination across Africa	Epidemiology and infection	0.85		Africa		measles
2010	Moïsi, Jennifer C.; Gatakaa, Hellen; Noor, Abdisalan M.; Williams, Thomas N.; Bauni, Evasius; Tsofa, Benjamin; Levine, Orin S.; Scott, J. Anthony G.	Geographic access to care is not a determinant of child mortality in a rural Kenyan setting with high health facility density	BMC Public Health	0.85	KEN			
2006	Mugeere, Anthony	The contribution of communication in measles immunization in rural Uganda: A case study of Bugabula County, Kamuli District	Makerere University	0.85	UGA			measles
2010	Mugume, Richard	Household characteristics that determine immunization status of children 12-23 months old in Uganda	Makerere University	0.85	UGA			
2005	Namuigi, Pioto; Phuanukoonnon, Suparat	Barriers to measles immunization: the beliefs and attitudes of caregivers in Goroka, Eastern Highlands Province, Papua New Guinea	Papua and New Guinea Medical Journal	0.85	PNG			measles
1998	Nocera, Sandra, And Peter Zweifel	The demand for health: an empirical test of the Grossman model using panel data	Health, the medical profession, and regulation	0.85				
2000	Nuwaha, F.; Mulindwa, G.; Kabwongyera, E.; Barenzi, J.	Causes of low attendance at national immunization days for polio eradication in Bushenyi district, Uganda	Tropical Medicine & International Health	0.85	UGA			polio
2012	Okwaraji, Yemisrach B.; Mulholland, Kim; Schellenberg, Joannarmarmstrong; Andarge, Gashaw; Admassu, Mengesha; Edmond, Karen M.	The association between travel time to health facilities and childhood vaccine coverage in rural Ethiopia. A community based cross sectional study	BMC public health	0.85	ETH			
2009	Oladokun, R. E.; Lawoyin, T. O.; Adedokun, B. O.	Immunization status and its determinants among children of female traders in Ibadan, South-Western Nigeria	African Journal of Medicine and Medical Sciences	0.85	NGA			
2007	Oyefolu, A. O.; Nwaeke, A. C.; Audu, R. A.; Akinyemi, K. O.; Salu, O. B.; Muller, C. P.; Omilabu, S. A.	Evaluation of measles vaccine cold chain in Lagos State, Nigeria	African Journal of Clinical and Experimental Microbiology	0.85	NGA			measles
1990	Pabst, H. F.; Spady, D. W.	Effect of breast-feeding on antibody response to conjugate vaccine	The Lancet	0.85				
1983	Prince, A. M.	Use of hepatitis B virus vaccine in Africa: rationale and practical approaches for effective utilization.	IARC scientific publications	0.85		Africa		hep
2014	Privett, Natalie; Gonsalvez, David	The top ten global health supply chain issues: Perspectives from the field	Operations Research for Health Care	0.85				
1984	Robertson, R. L.; Davis, J. H.; Jobe, K.	Service volume and other factors affecting the costs of immunizations in the Gambia	Bulletin of the World Health Organization	0.85	GMB			
2009	Rwashana, Agnes S.; Williams, Ddembe W.; Neema, Stella	System dynamics approach to immunization healthcare issues in developing countries: a case study of Uganda	Health Informatics Journal	0.85	UGA			
2007	Rwashana, Agnes Semwanga; Williams, Ddembe Wileese	Enhancing immunization coverage through health information systems: a system dynamics approach	Studies in health technology and informatics	0.85				
1989	Shaw, F. E.; Guess, H. A.; Roets, J. M.; Mohr, F. E.; Coleman, P. J.; Mandel, E. J.; Roehm, R. R.; Talley, W. S.; Hadler, S. C.	Effect of anatomic injection site, age and smoking on the immune response to hepatitis B vaccination	Vaccine	0.85				hep
1990	Streatfield, Kim; Singarimbun, Masri; Diamond, Ian	Maternal education and child immunization	Demography	0.85				
2012	Tamil Nadu State Transport Corporation; National Rural Health Mission; Unicef India Country Office	Effective Vaccine Management Assessment in Tamil Nadu	UNICEF	0.85	IND			
2013	The Advisory Committee On Vaccines And Immunization	First policy brief on improving vaccine and immunization coverage in Uganda	Uganda National Academy of Sciences	0.85	UGA			
1996	Weeks, Mark	The cold chain in Zambia March 30-April 12 1996.	USAID	0.85	ZMB			
2007	Wilson, Keith T.; Crabtree, Jean E.	Immunology of Helicobacter pylori: insights into the failure of the immune response and perspectives on vaccine studies	Gastroenterology	0.85				pylori
1998	World Health Organization; Basics; Usaid; Unicef	Global programme for vaccines and immunization: expanded programme on immunization. Safe vaccine handling, cold chain and immunizations	WHO	0.85				
2001	Ambe, Jose P.; Omotara, Babatunji A.; Baba, Marycelin Mandu	Perceptions, beliefs and practices of mothers in sub-urban and rural areas towards measles and measles vaccination in Northern Nigeria	Tropical doctor	0.84				
2010	Cui, Fuqiang; Li, Li; Hadler, Stephen C.; Wang, Fuzhen; Zheng, Hui; Chen, Yuansheng; Gong, Xiaohong; Hutin, Yvan J.; Cairns, K. Lisa; Liang, Xiaofeng; Yang, Weizhong	Factors associated with effectiveness of the first dose of hepatitis B vaccine in China: 1992-2005	Vaccine	0.84	CHN			hep
2000	Deryuan, Wang; Ruohing, Yang; Yichen, Yang; Tsoling, Chen; Hweifang, Cheng; Juentian, Hsieh; Chiapo, Lin; Others	The relationship between the cold chain system and vaccine potency in Taiwan:(II) oral polio vaccine.	Journal of Food and Drug Analysis	0.84	TWN			polio
1995	Deshpande, J. M.; Rao, V. K.; Nadkarni, S. S.; Bhatia, J. P.; Rodrigues, J. J.	An evaluation of cold chain in Maharashtra & Karnataka states by potency testing of field samples of oral poliovirus vaccine.	The Indian journal of medical research	0.84	IND			polio
2009	Fourn, Leonard; Haddad, Slim; Fournier, Pierre; Gansey, Romeo	Determinants of parents' reticence toward vaccination in urban areas in Benin (West Africa)	BMC International Health and Human Rights	0.84				
1993	Gindler, Jacqueline S.; Cutts, Felicity T.; Zell, Elizabeth R.; Swint, Emmett B.; Hadler, Stephen C.; Barnett-Antinori, María E.; Rullán, John V.	Successes and failures in vaccine delivery: evaluation of the immunization delivery system in Puerto Rico	Pediatrics	0.84	PRI			

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1993	Keane, Virginia; Stanton, Bonita; Horton, Lisa; Aronson, Robert; Galbraith, Jennifer; Hughart, Nancy	Perceptions of vaccine efficacy, illness, and health among inner-city parents	Clinical pediatrics	0.84				
2004	Kim, Young O. Rhee	Access to Hepatitis B Vaccination among Korean American Children in Immigrant Families	Journal of Health Care for the Poor and Underserved	0.84				
2009	Muula, Adamson S.; Polycarpe, Martine Y.; Job, Jayakaran; Siziya, Seter; Rudatsikira, Emmanuel	Association between maternal use of traditional healer services and child vaccination coverage in Pont-Sonde, Haiti	International Journal for Equity in Health	0.84				
2010	Olusanya, Bolajoko O.	Pattern and determinants of BCG immunisation delays in a sub-Saharan African community	Health Research policy and systems	0.84	NGA			
2003	Pande, Rohini P.; Yazbeck, Abdo S.	What's in a country average? Wealth, gender, and regional inequalities in immunization in India	Social Science & Medicine	0.84				
2006	Renne, Elisha	Perspectives on polio and immunization in Northern Nigeria	Social science & medicine	0.84				
1991	Rosenbaum, S.	Vaccine supply and low income children: Barriers faced by community and migrant health center patients	The Health of America's Children, Special Report. Children's Defense Fund	0.84				
2011	Usman, Hussain R.; Rahbar, Mohammad H.; Kristensen, Sibylle; Vermund, Sten H.; Kirby, Russell S.; Habib, Faiza; Chamot, Eric	Randomized controlled trial to improve childhood immunization adherence in rural Pakistan: redesigned immunization card and maternal education	Tropical Medicine & International Health	0.84				
2008	Vandermeulen, Corinne; Roelants, Mathieu; Theeten, Heidi; Van Damme, Pierre; Hoppenbrouwers, Karel	Vaccination coverage and sociodemographic determinants of measles-mumps-rubella vaccination in three different age groups	European Journal of Pediatrics	0.84				measles, mumps, rubella
1998	Bates, Ann S.; Wolinsky, Fredric D.	Personal, financial, and structural barriers to immunization in socioeconomically disadvantaged urban children	Pediatrics	0.83				
2001	Bell, Karen N.; Hogue, Carol Jr; Manning, Claudine; Kendal, Alan P.	Risk factors for improper vaccine storage and handling in private provider offices	Pediatrics	0.83				
1997	Bichler, Karen Drabbels	The primary care provider connection to underimmunization: Knowledge, practices, and perception of barriers that impede timely administration of childhood immunizations	Dissertation Abstracts International	0.83				
2008	Blewett, Lynn A.; Davidson, Gestur; Bramlett, Matthew D.; Rodin, Holly; Messonnier, Mark L.	The impact of gaps in health insurance coverage on immunization status for young children	Health Services Research	0.83				
2003	Boulianne, Nicole; Deceuninck, Geneviève; Duval, Bernard; Lavoie, France; Dionne, Marc; Carsley, John; Valiquette, Louise; Rochette, Louis; De Serres, Gaston	Why are some children incompletely vaccinated at the age of 2?	Canadian Journal of Public Health	0.83				
2007	Brewer, Noel T.; Chapman, Gretchen B.; Gibbons, Frederick X.; Gerrard, Meg; Mccaul, Kevin D.; Weinstein, Neil D.	Meta-analysis of the relationship between risk perception and health behavior: the example of vaccination.	Health Psychology	0.83				
1988	Corrao, G.; Calleri, M.; Zotti, M.; Barral, C.; Russo, R.; Garella, D.; Ruggenini, A. Moiraghi	Immune response to anti-HBV vaccination: study of conditioning factors	European journal of epidemiology	0.83				
1990	Cutts, F. T.; Phillips, M.; Kortbeek, S.; Soares, A.	Door-to-door canvassing for immunization program acceleration in Mozambique: achievements and costs	International Journal of Health Services: Planning, Administration, Evaluation	0.83				
2002	Davis, Matthew M.; Zimmerman, Jessica L.; Wheeler, John Rc; Freed, Gary L.	Childhood vaccine purchase costs in the public sector: past trends, future expectations	American journal of public health	0.83				
2004	Degli Atti, Ml Ciofi; Rota, Maria Cristina; Bella, Antonino; Salmaso, Stefania; Group, Icona Study; Others	Do changes in policy affect vaccine coverage levels? Results of a national study to evaluate childhood vaccination coverage and reasons for missed vaccination in Italy	Vaccine	0.83				
2001	Edmunds, W. J.; Gay, N. J.; Henao Restrepo, A. M.; Olive, J. -M.; Bele, O.	Measles vaccination in Africa: by how much could routine coverage be improved?	Vaccine	0.83				
2007	Fowler, Gabrielle L.; Kennedy, Allison; Leidel, Laura; Kohl, Katrin S.; Khromava, Alena; Bizhanova, Gulnar; Shui, Irene; Gust, Deborah	Vaccine safety perceptions and experience with adverse events following immunization in Kazakhstan and Uzbekistan: a summary of key informant interviews and focus groups	Vaccine	0.83				
2008	Hennig, Branwen J.; Fielding, Katherine; Broxholme, John; Diatta, Mathurin; Mendy, Maimuna; Moore, Catrin; Pollard, Andrew J.; Rayco-Solon, Pura; Sirugo, Giorgio; Van Der Sande, Marianne A.; Others	Host genetic factors and vaccine-induced immunity to hepatitis B virus infection	PLoS One	0.83				hep
1997	Houseman, Clare; Butterfoss, Frances D.; Morrow, Ardythe L.; Rosenthal, Jorge	Focus groups among public, military, and private sector mothers: insights to improve the immunization process	Public Health Nursing	0.83				
1980	Idris, M. Z.; Mathur, A.; Sharma, P.; Chaturvedi, U. C.; Sharma, N. L.; Others	Oral polio vaccination and factors affecting its efficacy.	Indian journal of medical research	0.83				polio
2008	Jheeta, Mandip; Newell, James	Childhood vaccination in Africa and Asia: the effects of parents' knowledge and attitudes	Bulletin of the World Health Organization	0.83		Africa and Asia		
2001	Lewis, Peter R.; Reimer, Robert F.; Dixon, Andrew J.	Evaluating the efficacy of vaccine storage in the general practice setting	Australian and New Zealand journal of public health	0.83				
1994	Madlon-Kay, Diane J.; Harper, Peter G.	Too many shots? Parent, nurse, and physician attitudes toward multiple simultaneous childhood vaccinations	Archives of Family Medicine	0.83				

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1999	Mahoney, Richard T.; Maynard, James E.	The introduction of new vaccines into developing countries	Vaccine	0.83	Developing Countries			
1990	Mbindyo, J. M.	Social Mobilization Strategies for Acceleration and Sustaining Universal Child Immunization Levels in Zambia	University of Nairobi	0.83	ZMB			
2007	Milstien, J. B.; Tapia, M.; Sow, S. O.; Keita, L.; Kotloff, K.; Others	Strengthening immunization in a West African country: Mali	Education for Health	0.83				
1971	Montefiore, D. G.	Problems of poliomyelitis immunization in countries with warm climates	Proceedings of the International Conference on the Application of Vaccines against Viral, Rickettsial, and Bacterial Diseases of Man. Washington, DC: Pan American Health Organization	0.83				polio
2003	P, Talani; P, Nzaba; D, Bolanda; H, Ongouo; A, Ambedet; Hf, Mayanda; F, Yala	An immunisation coverage survey in the Kouilou area of Congo-Brazzaville	Sante (Montrouge, France)	0.83				
2004	Parve, Julie	Remove vaccination barriers for children 12 to 24 months	The Nurse Practitioner	0.83				
2011	Patel, Tushar A.; Pandit, Niraj B.	Why infants miss vaccination during routine immunization sessions? Study in a rural area of Anand District, Gujarat	Indian Journal of Public Health	0.83	IND			
2004	Petousis-Harris, Helen; Goodyear-Smith, Felicity; Turner, Nikki; Soe, Ben	Family physician perspectives on barriers to childhood immunisation	Vaccine	0.83				
1999	Rahman, M. M.; Mahalanabis, D.; Hossain, S.; Wahed, M. A.; Alvarez, J. O.; Siber, G. R.; Thompson, Claudette; Santosham, M.; Fuchs, G. J.	Simultaneous vitamin A administration at routine immunization contact enhances antibody response to diphtheria vaccine in infants younger than six months	The Journal of nutrition	0.83				diphtheria
1985	Reingold, Arthurl; Hightower, Allenw; Bolan, Gaila; Jones, Ellene; Tiendrebeogo, Hilaire; Broome, Clairev; Ajello, Gloriaw; Adamsbaum, Catherine; Phillips, Catherine; Yada, Adamou	Age-specific differences in duration of clinical protection after vaccination with meningococcal polysaccharide A vaccine	The Lancet	0.83				mening
2001	Robinson, J. Stephen; Burkhalter, Barton R.; Rasmussen, Barbie; Sugiono, Ristianto	Low-cost on-the-job peer training of nurses improved immunization coverage in Indonesia	Bulletin of the World Health Organization	0.83				
1999	Semba, Richard D.; Mohgaddam, Nasrin Eg; Munasir, Zakiuddin; Akib, Arwin; Permaesih, Dewi; Osterhaus, Albert; Others	Integration of vitamin A supplementation with the expanded program on immunization does not affect seroconversion to oral poliovirus vaccine in infants	The Journal of nutrition	0.83				polio
1992	Semba, Richard D.; Scott, Alan L.; Natadisastra, Gantira; Wirasasmita, Sopandi; Mele, Lisa; Ridwan, Endi; West Jr, K. P.; Sommer, Alfred; Others	Depressed immune response to tetanus in children with vitamin A deficiency.	The Journal of nutrition	0.83				tetanus
2005	Shaw, Kate M.; Barker, Lawrence E.	How do caregivers know when to take their child for immunizations?	BMC pediatrics	0.83				
1997	Tulchinsky, T.; Al Zeer, A. M.; Abu Mounshar, J.; Subeih, T.; Schoenbaum, M.; Roth, M.; Gamulka, B.; Abenueze, M.; Acker, C.	A successful, preventive-oriented village health worker program in Hebron, the West Bank, 1985-1996	Journal of public health management and practice: JPHMP	0.83				
2000	Ughade, S. N.; Zodpey, S. P.; Deshpande, S. G.; Jain, D.	Factors responsible for delayed immunisation among children under 5 years of age	Journal of the Indian Medical Association	0.83				
2011	Unicef India Country Office	Assessment of Effective Vaccine Management in Maharashtra	UNICEF	0.83	IND			
2001	Wilkinson, David; Gouws, Eleanor; Sach, Marlene; Karim, Salim S. Abdool	Effect of removing user fees on attendance for curative and preventive primary health care services in rural South Africa	Bulletin of the World Health Organization	0.83				
2005	Yarwood, Joanne; Noakes, Karen; Kennedy, Dorian; Campbell, Helen; Salisbury, David	Tracking mothers attitudes to childhood immunisation 1991-2001	Vaccine	0.83				
2012	Anderson, Richard; Lloyd, John; Newland, Sophie	Software for national level vaccine cold chain management	Proceedings of the Fifth International Conference on Information and Communication Technologies and Development	0.82				
2009	Andersson, Neil; Cockcroft, Anne; Ansari, Noor M.; Omer, Khalid; Baloch, Manzoor; Foster, Ari Ho; Shea, Bev; Wells, George A.; Soberanis, Jose L.	Evidence-based discussion increases childhood vaccination uptake: a randomised cluster controlled trial of knowledge translation in Pakistan	BMC international health and human rights	0.82				
2009	Antai, Diddy	Faith and child survival: the role of religion in childhood immunization in Nigeria	Journal of biosocial Science	0.82				
1999	Bailey, H. D.; Kurinczuk, J. J.; Kusel, M. M.; Plant, A. J.	Barriers to immunisation in general practice	Australian and New Zealand Journal of Public Health	0.82				
1986	Bhaskaram, P.; Radhakrishna, K. V.; Madhusudan, J.	Seroepidemiological study to determine age for measles vaccination.	The Indian journal of medical research	0.82				
1998	Bond, Lyndal; Nolan, Terry; Pattison, Pip; Carlin, John	Vaccine preventable diseases and immunisations: a qualitative study of mothers? Perceptions of severity, susceptibility, benefits and barriers	Australian and New Zealand journal of public health	0.82				
2009	Bondy, Jennifer N.; Thind, Amardeep; Koval, John J.; Speechley, Kathy N.	Identifying the determinants of childhood immunization in the Philippines	Vaccine	0.82	PHL			

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2005	Bronte-Tinkew, Jacinta; Dejong, Gordon F.	Do household structure and household economic resources predict childhood immunization? Evidence from Jamaica and Trinidad and Tobago	Population Research and Policy Review	0.82				
1990	Camacho-Amor, M. L.; Valdespino-Gomez, J. L.; Ayala-Gonzalez, M.; Diaz-Ortega, J. L.; Gonzalez-Velazquez, M. S.; Morales-Romo, A.; Chávez-San Juan, R.	Evaluation of the cold chain and follow-up of the potency of the antimeasles vaccine in the field	Boletin medico del Hospital Infantil de Mexico	0.82				measles
2009	Carr, Christine; Byles, Julie; Durrheim, David	Practice nurses best protect the vaccine cold chain in general practice	The Australian Journal of Advanced Nursing	0.82				
2008	Clements, C. John; Nshimirimanda, Deo; Gasasira, Alex	Using immunization delivery strategies to accelerate progress in Africa towards achieving the Millennium Development Goals	Vaccine	0.82		Africa		
2002	Gazmararian, Julie A.; Oster, Natalia V.; Green, Diane C.; Schuessler, Linda; Howell, Kelly; Davis, Janona; Krovisky, Marybeth; Warburton, Samuel W.	Vaccine storage practices in primary care physician offices: assessment and intervention	American journal of preventive medicine	0.82				
2007	Ghosh, Tista S.; Patnaik, Jennifer L.; Bennett, Anne; Trefren, Lynn; Vogt, Richard L.	Assessment of missing immunizations and immunization-related barriers among WIC populations at the local level	Public Health Reports	0.82				
2003	Glezen, W. Paul	Effect of maternal antibodies on the infant immune response	Vaccine	0.82				
1998	Gold, Michael S.; Kemp, Ann E.; Osbourne, Maggi	Counting the cost of disrupting the vaccine cold chain.	The Medical journal of Australia	0.82				
1972	Henderson, D. A.; Labusquire, R.; Nicholson, C. C.; Rey, M.; Ristori, C.; Dow, P. J.; Saroso, J. S.; Millar, J. D.	Design of immunization programmes for developing countries	Paediatrica Indonesiana	0.82		Developing Countries		
2003	Isik, Nilgun; Uzel, Nedret; Gokcay, Gulbin; Kilic, Ayse; Yilmaz, Gulden; Sadikoglu, Banu; Diri, Sanem	Seroconversion after measles vaccination at nine and fifteen months of age	The Pediatric infectious disease journal	0.82				
2010	Jessop, L. J.; Kelleher, C. C.; Murrin, C.; Lotya, J.; Clarke, A. T.; O'Mahony, D.; Fallon, U. B.; Johnson, H.; Bury, G.; Murphy, A. W.; Lifeways Cohort Study Steering Group	Determinants of partial or no primary immunisations	Archives of Disease in Childhood	0.82				
2004	John, Sushil; Lalitha, G.; George, Kuryan; Joseph, Abraham	Serological response to early measles vaccination	Journal of tropical pediatrics	0.82				
2011	Kachimba, Juness	Factors contributing to low tetanus toxoid immunization coverage among women of child bearing age in Luanshya district.	University of Zambia	0.82	ZMB			tetanus
1993	Konradsen, H. B.; Henrichsen, J.; Wachmann, H.; Others	The influence of genetic factors on the immune response as judged by pneumococcal vaccination of mono-and dizygotic Caucasian twins	Clinical & Experimental Immunology	0.82				pneumo
2006	Loevinsohn, Benjamin; Hong, Rathavuth; Gauri, Varun	Will more inputs improve the delivery of health services?: Analysis of district vaccination coverage in Pakistan	The International journal of health planning and management	0.82				
2003	Manjunath, U.; Pareek, R. P.; Others	Maternal knowledge and perceptions aboutthe routine immunization programme-a study in a semiurban area in Rajasthan.	Indian journal of medical sciences	0.82				
1998	Nr, Aswar; Pg, Deotale; Km, Kale; Js, Bhawalkar; Vr, Dhage	Sociomedical correlates of missed opportunities for immunisation.	Indian journal of public health	0.82				
1990	Orenstein, Walter A.; Atkinson, William; Mason, Dean; Bernier, Roger H.	Barriers to vaccinating preschool children	Journal of health care for the poor and underserved	0.82				
2007	Patel, Manish M.; Janssen, Alan P.; Tardif, Richard R.; Herring, Mark; Parashar, Umesh D.	A qualitative assessment of factors influencing acceptance of a new rotavirus vaccine among health care providers and consumers	BMC pediatrics	0.82				rotavirus
2006	Pickering, Larry K.; Wallace, Gregory; Rodewald, Lance	Too hot, too cold: Issues with vaccine storage	Pediatrics	0.82				
2003	Ray, S. K.; Dasgupta, S.; Dobe, M.; Biswas, R.; Mehta, P.; Baishya, A. C.	An evaluation of routine immunization coverage in some districts of West Bengal and Assam.	Indian journal of public health	0.82				
2007	Shah, Shaheen; Nisar, Nighat; Qadri, Majid Hafeez	Knowledge regarding hepatitis-B among EPI vaccinators working in district South, Karachi	Pakistan Journal of Medical Sciences	0.82				
2009	Sinno, Durriyah D.; Shoaib, Hikma A.; Musharrafieh, Umayyah M.; Hamadeh, Ghassan N.	Prevalence and predictors of immunization in a health insurance plan in a developing country	Pediatrics International	0.82	LBN			
2001	Smith, A.; Mccann, R.; Mckinlay, I.	Second dose of MMR vaccine: health professionals' level of confidence in the vaccine and attitudes towards the second dose.	Communicable disease and public health/PHLS	0.82				
2005	Stampi, Serena; Ricci, Rita; Ruffilli, Isa; Zanetti, Franca	Compulsory and recommended vaccination in Italy: evaluation of coverage and non-compliance between 1998-2002 in Northern Italy	BMC Public Health	0.82				
1997	Taylor, J. A.; Darden, P. M.; Slora, E.; Hasemeier, C. M.; Asmussen, L.; Wasserman, R.	The influence of provider behavior, parental characteristics, and a public policy initiative on the immunization status of children followed by private pediatricians: a study from Pediatric Research in Office Settings	Pediatrics	0.82				
2002	Taylor, James A.; Darden, Paul M.; Brooks, Dennis A.; Hendricks, J. W.; Wasserman, Richard C.; Bocian, Alison B.; Pediatric Research In Office Settings; National Medical Association	Association between parents' preferences and perceptions of barriers to vaccination and the immunization status of their children: a study from Pediatric Research in Office Settings and the National Medical Association	Pediatrics	0.82				
1992	Thakker, Yogini; Woods, Sheila	Storage of vaccines in the community: weak link in the cold chain?	BMJ	0.82				
2003	Verstraeten, Thomas; Jumaan, Aisha O.; Mullooly, John P.; Seward, Jane F.; Izurieta, Hector S.; Destefano, Frank; Black, Steven B.; Chen, Robert T.; Others	A retrospective cohort study of the association of varicella vaccine failure with asthma, steroid use, age at vaccination, and measles-mumps-rubella vaccination	Pediatrics	0.82				measles, mumps, rubella, varicella

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1996	Vk, Tohani; G, Boyle; T, Moore	Haemophilus influenzae type b (Hib) vaccination and uptake predictors in Northern Ireland.	Communicable disease report. CDR review	0.82				
1989	Alto, W. A.; Alk, S.; Pinau, D.; Polume, H.	Improving immunization coverage, a comparison between traditional MCH teams and MCH teams plus aid post orderlies	Papua and New Guinea Medical Journal	0.81				
2004	Andreae, Margie C.; Freed, Gary L.; Katz, Samuel L.	Safety concerns regarding combination vaccines: the experience in Japan	Vaccine	0.81				
2001	Caballero-Hoyos, R.; Villasenor-Farias, M.; Hidalgo-San Martin, A.; Pando-Moreno, M.	Vaccination messages foster mobilization and high coverage in Mexico	Gaceta medica de Mexico	0.81				
2009	Djibuti, Mamuka; Gotsadze, George; Zoidze, Akaki; Mataradze, George; Esmail, Laura C; Kohler, Jillian	The role of supportive supervision on immunization program outcome - a randomized field trial from Georgia	BMC International Health and Human Rights	0.81				
2012	Hyde, Terri B.; Dentz, Holly; Wang, Susan A.; Burchett, Helen E.; Mounier-Jack, Sandra; Mantel, Carsten F.; Group, New Vaccine Introduction Impact Published Literature Working; Others	The impact of new vaccine introduction on immunization and health systems: a review of the published literature	Vaccine	0.81				1
1993	Jabaaij, L.; Grosheide, P. M.; Heijtink, R. A.; Duivenvoorden, H. J.; Ballieux, R. E.; Vingerhoets, Ajjm	Influence of perceived psychological stress and distress on antibody response to low dose rDNA hepatitis B vaccine	Journal of Psychosomatic Research	0.81				hep
2006	Jackson, Ateesha D.	Health disparities and barriers to immunization	APHA Annual Meeting	0.81				
2012	Ladner, Joël; Besson, Marie-Hélène; Hampshire, Rachel; Tapert, Lisa; Chirenje, Mike; Saba, Joseph	Assessment of eight HPV vaccination programs implemented in lowest income countries	BMC public health	0.81	Low Income Countries			hpv
2009	Lindley, Megan C.; Shen, Angela K.; Orenstein, Walter A.; Rodewald, Lance E.; Birkhead, Guthrie S.	Financing the delivery of vaccines to children and adolescents: challenges to the current system	Pediatrics	0.81				
2005	May, Thomas	Public communication, risk perception, and the viability of preventive vaccination against communicable diseases	Bioethics	0.81				
2008	Mitchell, Andrew D.; Bossert, Thomas J.; Yip, Winnie; Mollahaliloglu, Salih	Health worker densities and immunization coverage in Turkey: a panel data analysis	Human resources for health	0.81				
2015	Odone, Anna; Ferrari, Antonio; Spagnoli, Francesca; Visciarelli, Sara; Shefer, Abigail; Pasquarella, Cesira; Signorelli, Carlo	Effectiveness of interventions that apply new media to improve vaccine uptake and vaccine coverage: A systematic review	Human Vaccines & Immunotherapeutics	0.81				1
2006	Ouedraogo, L.T.; Ouedraogo, S.M.; Ouedraogo, Z.T.; Traore-Ouedraogo, R.; Kam, L.; Sawadogo, A.; Sondo, B.	Factors for non-observance of the extended program timetable for vaccination in health districts: the case of Bousse in Burkina Faso	Medecine et Maladies Infectieuses	0.81				
1999	Perez-Cuevas, Ricardo; Reyes, Hortensia; Pego, Ulises; Tome, Patricia; Ceja, Karla; Flores, Sergio; Gutierrez, Gonzalo	Immunization promotion activities: are they effective in encouraging mothers to immunize their children?	Social Science & Medicine	0.81				
2008	Vivancos, Roberto; Martinez, Rebeca	Performance assessment of the Ugandan national programme of immunization in Masindi: analysis of routine data	Journal of tropical pediatrics	0.81				
1995	White, Gillian Eyres; Thomson, Alexn	As every good mother should'. Childhood immunization in New Zealand: a qualitative study	Health & Social Care in the Community	0.81				
2014	World Health Organization; Unicef	WHO and UNICEF Joint Statement: Effective Vaccine management	WHO	0.81				
1998	Alimonos, Kaliroi; Nafziger, Anne N.; Murray, James; Bertino, Joseph S.	Prediction of response to hepatitis B vaccine in health care workers: Whose titers of antibody to hepatitis B surface antigen should be determined after a three-dose series, and what are the implications in terms of cost-effectiveness?	Clinical infectious diseases	0.8				hep
2010	Amin, Ruhul; Shah, Nirali M.; Becker, Stan	Socioeconomic factors differentiating maternal and child health-seeking behavior in rural Bangladesh: A cross-sectional analysis	International Journal for Equity in Health	0.8	BGD			
2008	Andrus, Jon Kim; Sherris, Jacqueline; Fitzsimmons, John W.; Kane, Mark A.; Aguado, M. Teresa	Introduction of human papillomavirus vaccines into developing countries-international strategies for funding and procurement	Vaccine	0.8		Developing Countries		hpv
2004	Arya, Subhash C.; Agarwal, Nirmala	Efficacy of measles vaccine interlinked with potency and storage	Acta tropica	0.8				measles
2011	Assi, Tina-Marie; Brown, Shawn T.; Djibo, Ali; Norman, Bryan A.; Rajgopal, Jayant; Welling, Joel S.; Chen, Sheng-I.; Bailey, Rachel R.; Kone, Souleymane; Kenea, Hailu; Others	Impact of changing the measles vaccine vial size on Niger's vaccine supply chain: a computational model	BMC public health	0.8	NER			measles
2013	Assi, Tina-Marie; Brown, Shawn T.; Kone, Souleymane; Norman, Bryan A.; Djibo, Ali; Connor, Diana L.; Wateska, Angela R.; Rajgopal, Jayant; Slayton, Rachel B.; Lee, Bruce Y.	Removing the regional level from the Niger vaccine supply chain	Vaccine	0.8	NER			
2003	Basics, Ii; Unepi	Increasing Immunization Coverage in Uganda: The Community Problem Solving and Strategy Development Approach	UNEPI	0.8	UGA			
1995	Bhuiya, Abbas; Bhuiy, Ismat; Chowdhury, Mushtaque	Factors affecting acceptance of immunization among children in rural Bangladesh	Health policy and planning	0.8	BGD			
2002	Bishai, David; Suzuki, Emi; Mcquestion, Michael; Chakraborty, Jyostnamoy; Koenig, Michael	The role of public health programmes in reducing socioeconomic inequities in childhood immunization coverage	Health Policy and Planning	0.8				
1989	Blanchet, Therese	Perceptions of childhood diseases and attitudes towards immunization among slum dwellers Dhaka Bangladesh.	John Snow Resources for Child Health	0.8	BGD			
2003	Bonu, Sekhar; Rani, Manju; Baker, Timothy D	The impact of the national polio immunization campaign on levels and equity in immunization coverage: evidence from rural North India	Social Science & Medicine	0.8				

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2012	Briere, Elizabeth C.; Ryman, Tove K.; Cartwright, Emily; Russo, Elizabeth T.; Wannemuehler, Kathleen A.; Nygren, Benjamin L.; Kola, Steve; Sadumah, Ibrahim; Ochieng, Cliff; Watkins, Margaret L.; Others	Impact of integration of hygiene kit distribution with routine immunizations on infant vaccine coverage and water treatment and handwashing practices of Kenyan mothers	Journal of Infectious Diseases	0.8				
2004	Bundt, Thomas S.; Hu, Hsou-Mei	National examination of compliance predictors and the immunization status of children: precursor to a developmental model for health systems	Military Medicine	0.8				
1993	Cheriyan, Elias	Monitoring the vaccine cold chain.	Archives of disease in childhood	0.8				
1982	Cheyne, J.	Strengthening the vaccine cold chain.	World Health Forum	0.8				
1987	Clancy, C.; Gelfman, D.	Strategy for improved utilization of the pneumococcal vaccine	Clinical Research	0.8				pneumo
1999	Cooper, Stewart; Erickson, Ann L.; Adams, Erin J.; Kansopon, Joe; Weiner, Amy J.; Chien, David Y.; Houghton, Michael; Parham, Peter; Walker, Christopher M.	Analysis of a successful immune response against hepatitis C virus	Immunity	0.8				hep
2003	Cotter, S.; Ryan, F.; Hegarty, H.; Mccabe, T. J.; Keane, E.	Immunisation: the views of parents and health professionals in Ireland.	Euro surveillance: bulletin Europeen sur les maladies transmissibles= European communicable disease bulletin	0.8				
2003	Das, Jishnu; Das, Saumya	Trust, learning, and vaccination: a case study of a North Indian village	Social Science & Medicine	0.8				
2006	De Timoteo Mavimbe, Joao Carlos; Muquingue, Humberto Nelson; Braa, Jorn; Bjune, Gunnar	Immunization coverage in Mozambique: from concepts to decision-making	Health policy	0.8				
1994	Dennehy, Penelope H.; Peter, Georges; Saracen, Cheryl L.	Seroconversion rates to combined measles-mumps-rubella-varicella vaccine of children with upper respiratory tract infection	Pediatrics	0.8				measles, mumps, rubella, varicella
1995	Dewier, M.; Rashid, S.	A literature review on knowledge, attitudes and practices related to Expanded Programme of Immunization in Bangladesh	Dhaka: United Nations Children's Fund	0.8	BGD		1	
2003	Drain, Paul K.; Nelson, Carib M.; Lloyd, John S.	Single-dose versus multi-dose vaccine vials for immunization programmes in developing countries	Bulletin of the World Health Organization	0.8		Developing Countries		
2011	Dudley, Lilian; Garner, Paul	Strategies for integrating primary health services in low- and middle-income countries at the point of delivery	Cochrane Database of Systematic Reviews	0.8		Low and Middle Income Countries		
1991	Eng, E.; Naimoli, J.; Naimoli, G.; Parker, K. A.; Lowenthal, N.	The acceptability of childhood immunization to Togolese mothers: a sociobehavioral perspective	Health Education Quarterly	0.8	TGO			
2001	Engl, S.; Loevinsohn, B.; Melgaard, B.; Kou, U.; Jha, P.	The Evidence Base for Interventions to Reduce Mortality from Vaccine-Preventable Diseases in Low and Middle-Income Countries.	WHO Commission on Macroeconomics and Health	0.8		Low and Middle Income Countries		
2014	Esposito, Susanna; Principi, Nicola; Cornaglia, Giuseppe	Barriers to the vaccination of children and adolescents and possible solutions	Clinical Microbiology and Infection	0.8				
2001	Faustini, A.; Spadea, T.; Fano, V.; Giorgi Rossi, P.; Sangalli, M.; Franco, E.; Perucci, C. A.	Factors Associated with Hepatitis B Virus Immunization Coverage at the Beginning of a Population Campaign in the Lazio Region, Italy	Preventive Medicine	0.8				
2004	Finkelstein, Amy	Static and dynamic effects of health policy: Evidence from the vaccine industry	Quarterly Journal of Economics	0.8				
2012	Gavrielov-Yusim, Natalie; Battat, Erez; Neumann, Lily; Friger, Michael; Balicer, Ran D.	Birth order and private voluntary immunization—a study of 110,902 children	Vaccine	0.8				
2010	Gidengil, Courtney A.; Dutta-Linn, M. Maya; Messonnier, Mark L.; Rusinak, Donna; Lieu, Tracy A.	Financial barriers to the adoption of combination vaccines by pediatricians	Archives of Pediatrics & Adolescent Medicine	0.8				
2001	Goldstein, Susan T.; Cassidy, William M.; Hodgson, Wesley; Mahoney, Francis J.	Factors Associated with Student Participation in a School-Based Hepatitis B Immunization Program	Journal of School Health	0.8				
1999	Gradon, Jeremy D.; Lutwick, Larry I.	Maintaining and enhancing vaccine immunogenicity	Infectious disease clinics of North America	0.8				
2000	Harrington, Peter M.; Woodman, Catherine; Shannon, William F.	Low immunisation uptake: Is the process the problem?	Journal of epidemiology and community health	0.8				
2009	Hlsp	GAVI Health Systems Strengthening Support Evaluation 2009: Volume 1 Key Findings and Recommendations	GAVI	0.8				
1993	Houtrouw, Susan M.; Carlson, Karen L.	The relationship between maternal characteristics, maternal vulnerability beliefs, and immunization compliance	Issues in comprehensive pediatric nursing	0.8				
1993	Islam, M. H.; Islam, M. K.	A study on vaccine cold chain monitoring	J Preven Soc Med	0.8				
2004	Jacobson, R. M.; Poland, G. A.	The genetic basis for measles vaccine failure	Acta Paediatrica	0.8				measles
2009	Jacques-Carroll, Lisa; Wang, Susan; Zhao, Zhen; Malik, Tasneem; David, Felicita	Hepatitis B vaccination coverage in newborns and vaccine supply policy	Archives of pediatrics & adolescent medicine	0.8				hep
1995	Karlsen, Klaus	Threatened child health through lack of immunization: Identification of risk groups in Uganda.	University of Ottawa	0.8	UGA			
1994	Katende, Charles	The impact of access to health services on infant and child mortality in rural Uganda	African Population Studies	0.8	UGA			
2000	Kendrick, Denise; Hewitt, Michael; Dewey, Michael; Elkan, Ruth; Blair, Mitch; Robinson, Jane; Williams, Debbie; Brummell, Kathy	The effect of home visiting programmes on uptake of childhood immunization: a systematic review and meta-analysis	Journal of Public Health	0.8			1	
2008	Kim, H. Nina; Harrington, Robert D.; Van Rompaey, Stephen E.; Kitahata, Mari M.	Independent clinical predictors of impaired response to hepatitis B vaccination in HIV-infected persons	International journal of STD & AIDS	0.8				hep

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2007	Kimmel, Sanford R.; Burns, Ilene Timko; Wolfe, Robert M.; Zimmerman, Richard Kent	Addressing immunization barriers, benefits, and risks	The Journal of Family Practice	0.8				
2002	Knobler, Stacey L.; Mahmoud, Adel Af; Pray, Leslie A.	Vaccines: Research, Development, Production, and Procurement Issues	Institute of Medicine	0.8				
1992	Kruskall, M. S.; Alper, Chester A.; Awdeh, Zuheir; Yunis, Edmond J.; Marcus-Bagley, Deborah	The immune response to hepatitis B vaccine in humans: inheritance patterns in families.	The Journal of experimental medicine	0.8				hep
2003	Kubba, A. K.; Taylor, P.; Graneek, B.; Strobel, S.	Non-responders to hepatitis B vaccination: a review.	Communicable disease and public health	0.8			1	hep
2006	Levine, Orin S.; O'Brien, Katherine L.; Knoll, Maria; Adegbola, Richard A.; Black, Steven; Cherian, Thomas; Dagan, Ron; Goldblatt, David; Grange, Adenike; Greenwood, Brian; Others	Pneumococcal vaccination in developing countries	The Lancet	0.8		Developing Countries		pneumo
2009	Levy, Barbara	Integrating HPV vaccination into your practice: overcoming common barriers	The Journal of Family Practice	0.8				hpv
2000	Lieu, Tracy A.; Black, Steven B.; Ray, G. Thomas; Martin, Kathleen E.; Shinefield, Henry R.; Weniger, Bruce G.	The hidden costs of infant vaccination	Vaccine	0.8				
2003	Luman, Elizabeth T.; Mccauley, Mary Mason; Shefer, Abigail; Chu, Susan Y.	Maternal characteristics associated with vaccination of young children	Pediatrics	0.8				
2005	Masanja, Honorati; Schellenberg, Joanna Armstrong; De Savigny, Don; Mshinda, Hassan; Victora, Cesar G.	Impact of Integrated Management of Childhood Illness on inequalities in child health in rural Tanzania	Health Policy and Planning	0.8				
2003	Mash, D.; Aschenaki, K.; Kedamo, T.; Walternsperger, K.; Gebreyes, K.; Pasha, O.; Manoncourt, S.	Community and facility surveys illuminate the pathway to child survival in Liben Woreda, Ethiopia	East African medical journal	0.8				
2007	Mashal, Taufiq; Nakamura, Keiko; Kizuki, Masashi; Seino, Kaoruko; Takano, Takehito	Impact of conflict on infant immunisation coverage in Afghanistan: a countrywide study 2000-2003	International Journal of Health Geographics	0.8				
1997	Mccormick, L. K.; Bartholomew, L. K.; Lewis, M. J.; Brown, M. W.; Hanson, I. C.	Parental perceptions of barriers to childhood immunization: results of focus groups conducted in an urban population	Health Education Research	0.8				
2005	Meyerhoff, A. S.; Jacobs, R. J.	Do too many shots due lead to missed vaccination opportunities? Does it matter?	Preventive medicine	0.8				
2007	Minh Thang, Nguyen; Bhushan, Indu; Bloom, Erik; Bonu, Sekhar	Child immunization in Vietnam: situation and barriers to coverage	Journal of Biosocial Science	0.8	VNM			
2008	Mugarura, Stephen; Rutaremwa, Gideon; Atuhaire, Lk	Knowledge, attitude and practices towards measles immunization in Bushenyi District, Uganda	Makerere University	0.8	UGA			measles
2002	Muhwezi, E.	What factors determine the coverage of national immunisation days (NIDS) and routine immunization?: the case of Busia District	Uganda Health Bulletin	0.8	KEN			
2007	Mulumba, Jose Gaby Tshikuka; Daoud, Saada; Kabang, Bande	Raising parents' awareness of the benefits of immunization by using a visual aid tool	Tropical Doctor	0.8				
2009	Muzumdar, Jagannath M.; Cline, Richard R.	Vaccine supply, demand, and policy: A primer	Journal of the American Pharmacists Association	0.8				
2003	Nagdeve, D; Bharati, D	Urban-rural differentials in maternal and child health in Andhra Pradesh, India	Rural and remote health	0.8				
2010	Nankabirwa, Victoria; Tylleskär, Thorkild; Tumwine, James K.; Sommerfelt, Halvor; Others	Maternal education is associated with vaccination status of infants less than 6 months in Eastern Uganda: a cohort study	BMC pediatrics	0.8	UGA			
2006	Ndiritu, Moses; Cowgill, Karen D.; Ismail, Amina; Chiphatsi, Salome; Kamau, Tatu; Fegan, Gregory; Feikin, Daniel R.; Newton, Charles Rjc; Scott, J. Anthony G.	Immunization coverage and risk factors for failure to immunize within the Expanded Programme on Immunization in Kenya after introduction of new Haemophilus influenzae type b and hepatitis b virus antigens	BMC Public Health	0.8				
2014	Ogembo, Javier Gordon; Manga, Simon; Nulah, Kathleen; Foglabenchi, Lily H.; Perlman, Stacey; Wamai, Richard G.; Welty, Thomas; Welty, Edith; Tih, Pius	Achieving high uptake of human papillomavirus vaccine in Cameroon: Lessons learned in overcoming challenges	Vaccine	0.8	CMR			hpv
2009	Okoko, Brown J.; Idoko, Olubukola T.; Adegbola, Richard A.	Prospects and challenges with introduction of a mono-valent meningococcal conjugate vaccine in Africa	Vaccine	0.8	Africa			mening
2010	Oladokun, R. E.; Adedokun, B. O.; Lawoyin, T. O.	Children not receiving adequate immunization in Ibadan, Nigeria: what reasons and beliefs do their mothers have?	Nigerian journal of clinical practice	0.8	NGA			
2005	Organization, World Health; Others	Study protocol for temperature monitoring in the vaccine cold chain (WHO document WHO/IVB/05.01)	Geneva: WHO	0.8				
2003	Padgett, David A.; Glaser, Ronald	How stress influences the immune response	Trends in immunology	0.8				
1996	Perry, Henry B.; Nurani, Sufia; Quaiyum, A.; Jinnah, Sharma A.	Morbidity and Vaccine Research II Barriers to Immunization in the Slums of Dhaka City	Bangladesh: International Centre for Diarrhoeal Disease Reseach	0.8	BGD			
2006	Peter, Georges	Tailoring the strategies to specific shortages: pneumococcal conjugate vaccine	Clinical infectious diseases	0.8				pneumo
2010	Pettit, Natasha N.; Depestel, Daryl D.; Malani, Preeti N.; Riddell Iv, James	Factors associated with seroconversion after standard dose hepatitis B vaccination and high-dose revaccination among HIV-infected patients	HIV clinical trials	0.8				hep
1992	Pillai, Vijayan K.; Conaway, Mark	Immunisation coverage in Lusaka, Zambia; implications of the social setting	Journal of biosocial science	0.8	ZMB			
1990	Plotkin, S. A.	Of underimmunization and underfunding.	Hospital practice (Office ed.)	0.8				

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2013	Ports, Katie A.; Reddy, Diane M.; Rameshbabu, Anjali	Barriers and facilitators to HPV vaccination: perspectives from Malawian women	Women & health	0.8	MWI			hpv
1981	Rahman, Makhlisur; Chen, L. C.; Chakroborty, L.; Yunus, Md; Faruque, A. S.; Chowdhury, A. I.	Factors related to acceptance of tetanus toxoid immunization among pregnant women in a maternal-child health programme in rural Bangladesh.	International centre for diarrhoeal disease research (ICDDR, B)	0.8	BGD			tetanus
2011	Rajgopal, Jayant; Connor, Diana L.; Assi, Tina-Marie; Norman, Bryan A.; Chen, Sheng-I.; Bailey, Rachel R.; Long, Adrienne R.; Wateska, Angela R.; Bacon, Kristina M.; Brown, Shawn T.; Burke, Donald S.; Lee, Bruce Y.	The optimal number of routine vaccines to order at health clinics in low or middle income countries	Vaccine	0.8	Low and Middle Income Countries			
2002	Ray, G. Thomas; Butler, Jay C.; Black, Steven B.; Shinefield, Henry R.; Fireman, Bruce H.; Lieu, Tracy A.	Observed costs and health care use of children in a randomized controlled trial of pneumococcal conjugate vaccine	The Pediatric infectious disease journal	0.8				pneumo
2013	Robertson, Laura; Mushati, Phyllis; Eaton, Jeffrey W.; Dumba, Lovemore; Mavise, Gideon; Makoni, Jeremiah; Schumacher, Christina; Crea, Tom; Monasch, Roeland; Sherr, Lorraine; Others	Effects of unconditional and conditional cash transfers on child health and development in Zimbabwe: a cluster-randomised trial	The Lancet	0.8				
1997	Rodewald, Lance E.; Szilagyi, Peter G.; Holl, Jane; Shone, Laura R.; Zwanziger, Jack; Raubertas, Richard F.	Health insurance for low-income working families: effect on the provision of immunizations to preschool-age children	Archives of pediatrics & adolescent medicine	0.8				
2008	Rodríguez-Cobo, Iria; Chen, Yen-Fu; Olowokure, Babatunde; Litchfield, Ian	Clinical and economic assessment of different general population strategies of pertussis vaccine booster regarding number of doses and age of application for reducing whooping cough disease burden: a systematic review	Vaccine	0.8			1	pertussis
2014	Root, Elisabeth Dowling; Lucero, Marilla; Nohynek, Hanna; Anthamatten, Peter; Thomas, Deborah Sk; Tallo, Veronica; Tanskanen, Antti; Quiambao, Beatriz P.; Puumalainen, Taneli; Lupisan, Socorro P.; Others	Distance to health services affects local-level vaccine efficacy for pneumococcal conjugate vaccine (PCV) among rural Filipino children	Proceedings of the National Academy of Sciences	0.8	PHL			pneumo
2006	Rwashana, A. S.; Williams, D. W.	An evaluation of healthcare policy in immunization coverage in Uganda. A case study on Uganda healthcare provision	Proceedings of the 24th International System Dynamics, 23-27 July, 2006, Nijmegen, The Netherlands	0.8	UGA			
2014	Ryan, Rebecca; Santesso, Nancy; Lowe, Dianne; Hill, Sophie; Grimshaw, Jeremy; Prictor, Megan; Kaufman, Caroline; Cowie, Genevieve; Taylor, Michael	Interventions to improve safe and effective medicines use by consumers: an overview of systematic reviews	Cochrane Database of Systematic Reviews	0.8			1	
2000	S, Chaturvedi; Op, Aggarwal	Measles, immunisation and disease: rapid epidemiological assessment in two trans-Yamuna villages of Delhi	Journal of the Indian Medical Association	0.8				
2007	Samant, Y.; Lanjewar, H.; Block, L.; Parker, D.; Stein, B.; Tomar, G.	Relationship between vaccine vial monitors and cold chain infrastructure in a rural district of India	Rural and remote health	0.8	IND			
2005	Sc, Soeung; Bm, Grundy; Ck, Ly; C, Samnang; M, Boreland; A, Brooks; J, Maynard; Ba, Biggs	Improving immunization coverage through budgeted microplans and sub-national performance agreements: early experience from Cambodia.	Asia-Pacific journal of public health / Asia-Pacific Academic Consortium for Public Health	0.8				
2004	Sharma, Rashmi; Sharma, C. L.; Khajuria, Ruchi	The knowledge, attitude and practices regarding HBV infection of married women in the reproductive Age group living in cantonment Area Sunjawan Jammu	J Med Educ Res	0.8				
1994	Simba, D. O.; Msamanga, G. I.	Use of cold-chain to assess vaccine exposure to adverse temperatures in rural Tanzania.	East African medical journal	0.8	TZA			
2004	Stokley, Shannon; Maurice, Emmanuel; Smith, Philip J.; Klevens, R. Monina	Evaluation of invalid vaccine doses	American journal of preventive medicine	0.8				
2005	Sturm, Lynne A.; Mays, Rose M.; Zimet, Gregory D.	Parental beliefs and decision making about child and adolescent immunization: from polio to sexually transmitted infections	Journal of Developmental & Behavioral Pediatrics	0.8				polio
2006	Suckling, R. M.; Taegtmeyer, Miriam; Nguku, P. M.; Al-Abri, S. S.; Kibaru, J.; Chakaya, J. M.; Tukei, P. M.; Gilks, C. F.	Susceptibility of healthcare workers in Kenya to hepatitis B: new strategies for facilitating vaccination uptake	Journal of Hospital Infection	0.8	KEN			hep
2014	Thornton, Daniel; Schreiber, Benjamin	Report to the GAVI Alliance Board: GAVI Alliance immunisation supply chain strategy	GAVI	0.8				
1999	Tiwari, R. R.; Kulkarni, P. N.; Others	Delayed immunisation against vaccine preventable diseases-factors responsible among children under 5 years of age	Indian journal of medical sciences	0.8				
2011	Tobin-West, C. I.; Alex-Hart, B. A.	Identifying Barriers and Sustainable Solution to Childhood Immunization in Khana Local Government Area of Rivers State, Nigeria	International quarterly of community health education	0.8	NGA			
2007	Topuzo?Lu, Ahmet; Ay, Pinar; Hidiroglu, Seyhan; Gurbuz, Yucel	The barriers against childhood immunizations: a qualitative research among socio-economically disadvantaged mothers	The European Journal of Public Health	0.8				
2002	Tugumisirize, F.; Tumwine, J. K.; Mworozi, E. A.	Missed opportunities and caretaker constraints to childhood vaccination in a rural area in Uganda	East African Medical Journal	0.8	UGA			
2012	Uddin, Md Jasim; Saha, Nirod Chandra; Islam, Ziaul; Khan, Iqbal Ansary; Quaiyum, M. A.; Koehlmoos, Tracey Perez; Others	Improving low coverage of child immunization in rural hard-to-reach areas of Bangladesh: findings from a project using multiple interventions	Vaccine	0.8	BGD			

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2007	Unicef; National Rural Health Mission	Assessment cum training of vaccine and cold chain management in Odisha	UNICEF	0.8	IND			
1992	Von Hedenström, Michael; Kahler, Wolfgang	The cold chain from manufacturer to vaccinator: experiments and experiences	Vaccine	0.8				
2014	Wagenaar, Bradley H.; Gimbel, Sarah; Hoek, Roxanne; Pfeiffer, James; Michel, Cathy; Manuel, João Luis; Cuembelo, Fatima; Quembo, Titos; Afonso, Pires; Gloyd, Stephen; Others	Stock-outs of essential health products in Mozambique–longitudinal analyses from 2011 to 2013	Tropical Medicine & International Health	0.8	MOZ			
2004	Waters, Hugh R.; Dougherty, Leanne; Tegang, Simon-Pierre; Nhan, Tran; Wiysonge, Charles Shey; Kanya, Long; Wolfe, Nathan D.; Burke, Donald S.	Coverage and costs of childhood immunizations in Cameroon	Bulletin of the World Health Organization	0.8	CMR			
2009	Weiss, William M.; Winch, Peter J.; Burnham, Gilbert	Factors associated with missed vaccination during mass immunization campaigns	Journal of health, population, and nutrition	0.8				
1999	Wenger, Jay D.; Difabio, Jose-Luis; Landaverde, Jose Mauricio; Levine, Orin S.; Gaafar, Taki	Introduction of Hib conjugate vaccines in the non-industrialized world: experience in four 'newly adopting'countries	Vaccine	0.8		Developing Countries		hib
1996	White, C.; Lines, D.	Barriers to hepatitis B immunization in infancy	Journal of Paediatrics and Child Health	0.8				hep
2013	Wigle, Jannah; Coast, Ernestina; Watson-Jones, Deborah	Human papillomavirus (HPV) vaccine implementation in low and middle-income countries (LMICs): health system experiences and prospects	Vaccine	0.8	Low and Middle Income Countries			hpv
1995	Wong, E. K.; Bodsworth, Neil J.; Slade, Margaret A.; Mulhall, Brian P.; Donovan, Basil	Response to hepatitis B vaccination in a primary care setting: influence of HIV infection, CD4+ lymphocyte count and vaccination schedule.	International journal of STD & AIDS	0.8				hep
2005	Wroe, Abigail L.; Bhan, Angela; Salkovskis, Paul; Bedford, Helen	Feeling bad about immunising our children	Vaccine	0.8				
2005	Xie, Jipan; Dow, William H.	Longitudinal study of child immunization determinants in China	Social Science & Medicine	0.8	CHN			
2007	Y, Solis; L, Bolte; J, Johnson; J, Cerda; M, Potin	Adherence to immunization among children with special health care needs.	Revista chilena de infectologia : organo oficial de la Sociedad Chilena de Infectologia	0.8				
2013	Zheng, Wang; Chun-Yue, Zhou; Xiang-Pei, Hu	A simulation-based method for evaluating the reliability of vehicle routing schemes in the vaccine delivery with vehicle breakdown	Management Science and Engineering (ICMSE), 2013 International Conference on	0.8				
1994	Zimicki, S.; Hornik, R. C.; Verzosa, C. C.; Hernandez, J. R.; De Guzman, E.; Dayrit, M.; Fausto, A.; Lee, M. B.; Abad, M.	Improving vaccination coverage in urban areas through a health communication campaign: the 1990 Philippine experience	Bulletin of the World Health Organization	0.8				
2011	Zuber, Patrick Lf; El-Ziq, Ibrahim; Kaddar, Miloud; Ottosen, Ann E.; Rosenbaum, Katinka; Shirey, Meredith; Kamara, Lidija; Duclos, Philippe	Sustaining GAVI-supported vaccine introductions in resource-poor countries	Vaccine	0.8		Low Income Countries		
1996	Acu, F. D.; Adedeji, A. A.; Esan, J. S.; Odusanya, O. G.	Live viral vaccine potency: an index for assessing the cold chain system	Public health	0.79				
2007	Agosti, Jan M.; Goldie, Sue J.	Introducing HPV vaccine in developing countries—key challenges and issues	New England Journal of Medicine	0.79		Developing Countries		hpv
2007	Allred, Norma J.; Wooten, Karen G.; Kong, Yuan	The association of health insurance and continuous primary care in the medical home on vaccination coverage for 19- to 35-month-old children	Pediatrics	0.79				
2002	Ayala Cerna, Carlos; Kroeger, Axel	Health sector reform in Colombia and its effects on tuberculosis control and immunization programs	Cadernos de Saude Publica	0.79				
2004	Bardenheier, Barbara H.; Yusuf, Hussain R.; Rosenthal, Jorge; Santoli, Jeanne M.; Shefer, Abigail M.; Rickert, Donna L.; Chu, Susan Y.	Factors associated with underimmunization at 3 months of age in four medically underserved areas.	Public health reports	0.79				
2013	Barman, Debjani; Dutta, Arijita	Access and barriers to immunization in West Bengal, India: quality matters	Journal of Health, Population, and Nutrition	0.79	IND			
1992	Bennett, P.; Smith, C.	Parents attitudinal and social influences on childhood vaccination	Health Education Research	0.79				
2009	Biellik, Robin; Levin, Carol; Mugisha, Emmanuel; Lamontagne, D. Scott; Bingham, Allison; Kaipilyawar, Satish; Gandhi, Sanjay	Health systems and immunization financing for human papillomavirus vaccine introduction in low-resource settings	Vaccine	0.79				hpv
1992	Bishai, David M.; Bhatt, Sucheta; Miller, Lee T.; Hayden, Gregory F.	Vaccine storage practices in pediatric offices	Pediatrics	0.79				
2003	Bosu, William K.; Essel-Hun, Mercy; Adjei, Sam; Strebel, Peter	Progress in the Control of Measles in Ghana, 1980-2000	Journal of Infectious Diseases	0.79				
2004	Brad Schwartz, J.; Bhushan, Indu	Improving immunization equity through a public-private partnership in Cambodia	Bulletin of the World Health Organization	0.79				
2001	Brenner, Ruth A.; Simons-Morton, Bruce G.; Bhaskar, Brinda; Das, Abhik; Clemens, John D.; Others	Prevalence and predictors of immunization among inner-city infants: a birth cohort study	Pediatrics	0.79				

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2012	Chaudhri, Rohit; Borriello, Gaetano; Anderson, Richard	Pervasive computing technologies to monitor vaccine cold chains in developing countries	IEEE Pervasive Computing. Special issue on Information and Communication Technologies for Development	0.79		Developing Countries		
1999	Committee, National Vaccine Advisory; Others	Strategies to sustain success in childhood immunizations	JAMA	0.79				
2010	Danis, K.; Georgakopoulou, T.; Stavrou, T.; Laggas, D.; Panagiotopoulos, T.	Socioeconomic factors play a more important role in childhood vaccination coverage than parental perceptions: a cross-sectional study in Greece	Vaccine	0.79	GRC			
2006	Dayan, Gustavo H.; Shaw, Kate M.; Baughman, Andrew L.; Orellana, Liliana C.; Forlenza, Raul; Ellis, Alejandro; Chaui, Jorge; Kaplan, Silvia; Strebel, Peter	Assessment of Delay in Age-appropriate Vaccination Using Survival Analysis	American Journal of Epidemiology	0.79				
2003	De Courval, François P.; De Serres, Gaston; Duval, Bernard	Varicella vaccine: factors influencing uptake	Canadian Journal of Public Health = Revue Canadienne De Santé Publique	0.79				varicella
1998	Evans, M. R.; Thomas, D. R.	A retrospective cohort study of risk factors for missing preschool booster immunisation	Archives of Disease in Childhood	0.79				
2013	Gill, Christopher J.; Young, Mark; Schroder, Kate; Carvajal-Velez, Liliana; Mcnabb, Marion; Aboubaker, Samira; Qazi, Shamim; Bhutta, Zulfiqar A.	Bottlenecks, barriers, and solutions: results from multicountry consultations focused on reduction of childhood pneumonia and diarrhoea deaths	The Lancet	0.79				pneumo
2000	Goodman, Karen J.; Wu, Judy S.; Frerichs, Ralph R.	Compliance with Childhood Immunizations in Kern County, California	Journal of Immigrant Health	0.79				
1999	Gore, P.; Madhavan, S.; Curry, D.; Mcclung, G.; Castiglia, M.; Rosenbluth, S. A.; Smego, R. A.	Predictors of childhood immunization completion in a rural population	Social Science & Medicine	0.79				
1993	Gyorkos, Theresa W.; Tannenbaum, Terry N.; Abrahamowicz, Michal; Bédard, Lucie; Carsley, John; Franco, Eliane D.; Delage, Gilles; Miller, Mark A.; Lamping, Donna L.; Grover, Steven A.	Evaluation of the effectiveness of immunization delivery methods.	Canadian Journal of Public Health	0.79				
2013	Isenor, Jennifer; Bowles, Susan; Edwards, Nicholas	Impact of pharmacists as immunizers on vaccination rates, vaccine-preventable morbidity and mortality, safety, and cost effectiveness: a systematic review of the literature	PROSPERO	0.79				1
2011	Jauregui, Barbara; Sinha, Anushua; Clark, Andrew D.; Bolanos, Brenda M.; Resch, Stephen; Toscano, Cristiana M.; Matus, Cuauhtemoc Ruiz; Andrus, Jon K.	Strengthening the technical capacity at country-level to make informed policy decisions on new vaccine introduction: lessons learned by PAHO's ProVac Initiative	Vaccine	0.79				
1992	Jones, K.; Fasher, B.; Hanson, R.; Burgess, M.; Isaacs, D.; Joshi, P.; Blanch, R.; Byrne, J.	Immunization status of Casualty attenders: Risk factors for non-compliance and attitudes to'on the spot' immunization	Journal of Paediatrics and Child Health	0.79				
1992	Kaan, J. A.; Van Vlokhoven, P. C. A.; Schneeberger, P. M.; Nijhof, W.	Immunogenicity of measles vaccine from a hospital based and outreach programme in rural Kenya	Tropical doctor	0.79				
1991	Kambarami, R. A.; Nathoo, K. J.; Nkrumah, F. K.; Pirie, D. J.	Measles epidemic in Harare, Zimbabwe, despite high measles immunization coverage rates.	Bulletin of the World Health Organization	0.79				
2011	Kaufmann, Judith R.; Miller, Roger; Cheyne, James	Vaccine supply chains need to be better funded and strengthened, or lives will be at risk	Health Affairs	0.79				
2004	Kurian, Seira; Sherin, Kevin M.	Optimizing vaccine availability and utilization: Position statement of the American College of Preventive Medicine	American journal of preventive medicine	0.79				
2013	Lantos, John D.	Why money will not cure under-immunization	Human vaccines & immunotherapeutics	0.79				
1994	Lieu, T. A.; Black, S. B.; Ray, P.; Chellino, M.; Shinefield, H. R.; Adler, N. E.	Risk factors for delayed immunization among children in an HMO	American Journal of Public Health	0.79				
2002	Lieu, Tracy A.; Finkelstein, Jonathan A.; Adams, Melissa M.; Miroshnik, Irina L.; Lett, Susan M.; Palfrey, Sean; Freed, Gary L.; Kleinman, Ken; Ray, G. Thomas; Platt, Richard	Pediatricians' views on financial barriers and values for pneumococcal vaccine for children	Ambulatory pediatrics	0.79				pneumo
2004	Mcmurray, Robert; Cheater, Francine M.; Weighall, Anna; Nelson, Carolyn; Schweiger, Martin; Mukherjee, Suzanne	Managing controversy through consultation: a qualitative study of communication and trust around MMR vaccination decisions	The British Journal of General Practice: The Journal of the Royal College of General Practitioners	0.79				measles, mumps, rubella
1999	Middleman, Amy B.; Robertson, Laura M.; Young, Connie; Durant, Robert H.; Emans, S. Jean	Predictors of time to completion of the hepatitis B vaccination series among adolescents	Journal of adolescent health	0.79				hep
2004	Morris, Saul S; Flores, Rafael; Olinto, Pedro; Medina, Juan Manuel	Monetary incentives in primary health care and effects on use and coverage of preventive health care interventions in rural Honduras: cluster randomised trial	The Lancet	0.79				
1990	Nasseri, K.; Latifi, M.; Azordegan, F.; Shafii, F.; All-E-Agha, R.	Determinants of partial participation in the immunization programmes in Iran	Social Science & Medicine	0.79	IRN			

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2007	Niederhauser, Victoria P.; Markowitz, Malama	Barriers to immunizations: Multiethnic parents of under-and unimmunized children speak	Journal of the American Academy of nurse practitioners	0.79				
1990	Organization, World Health; Others	TT vaccine—safer out of the cold chain	Geneva: World Health Organization	0.79				
2002	Partha, De; Bhattacharya, B. N.	Determinants of child immunization in four less-developed states of north India	Journal of Child Health Care	0.79	IND			
2013	Path; World Health Organization	Integrating the supply chains of vaccines and other health commodities	WHO	0.79				
1977	Peckham, Catherine S.; Marshall, W. C.; Dudgeon, J. A.	Rubella vaccination of schoolgirls: factors affecting vaccine uptake.	BMJ	0.79				rubella
2012	Pereira, Jennifer A.; Quach, Susan; Heidebrecht, Christine L.; Quan, Sherman D.; Kolbe, Faron; Finkelstein, Michael; Kwong, Jeffrey C.; Public Health Agency Of Canada/Canadian Institutes Of Health Research Influenza Research Network (Pcirn) Vaccine Coverage Theme Group	Barriers to the use of reminder/recall interventions for immunizations: a systematic review	BMC medical informatics and decision making	0.79				1
2010	Prinja, Shankar; Gupta, Madhu; Singh, Amarjeet; Kumar, Rajesh	Effectiveness of planning and management interventions for improving age-appropriate immunization in rural India	Bulletin of the World Health Organization	0.79	IND			
2002	Prislin, Radmila; Sawyer, Mark H.; Nader, Philip R.; Goerlitz, Maureen; De Guire, Michelle; Ho, Sandy	Provider-staff discrepancies in reported immunization knowledge and practices	Preventive medicine	0.79				
2011	Sabot, Oliver; Yadav, Prashant; Zaffran, Michel	Maximizing every dose and dollar: the imperative of efficiency in vaccine delivery	Impact and innovation series. Seattle, WA: National Bureau of Asian Research	0.79				
1993	Salsberry, Pamela J.; Nickel, Jennie T.; Mitch, Roberta	Why aren't preschoolers immunized? A comparison of parents' and providers' perceptions of the barriers to immunizations	Journal of community health nursing	0.79				
1997	Senanayake, Manouri P.; De Silva, T. U.	Vaccine storage conditions in clinics in Colombo.	The Ceylon medical journal	0.79	LKA			
2000	Sezer, S.; Özdemir, F. N.; Güz, G.; Arat, Z.; Colak, T.; Sengul, S.; Turan, M.; Haberal, A.; Erdal, R.	Factors influencing response to hepatitis B virus vaccination in hemodialysis patients	Transplantation proceedings	0.79				hep
2013	Shahab, Faseeh; Hussain, Hamid; Gul, Hamdan	Vaccination status and causes of under vaccination in paediatric patients admitted at Khyber teaching hospital Peshawar	Journal of Postgraduate Medical Institute	0.79	PAK			
2005	Stefanacci, Richard G.	Creating artificial barriers to vaccinations	Journal of the American Medical Directors Association	0.79				
2000	Suresh, K.; Saxena, Deepak	Trends and determinants of immunisation coverage in India.	Journal of the Indian Medical Association	0.79				
2000	Szilagyi, Peter G.; Humiston, Sharon G.; Shone, Laura Pollard; Barth, Richard; Kolasa, Maureen S.; Rodewald, Lance E.	Impact of vaccine financing on vaccinations delivered by Health Department clinics.	American journal of public health	0.79				
1994	Szilagyi, Peter G.; Roghmann, Klaus J.; Campbell, James R.; Humiston, Sharon G.; Winter, Nancy L.; Raubertas, Richard F.; Rodewald, Lance E.	Immunization practices of primary care practitioners and their relation to immunization levels	Archives of pediatrics & adolescent medicine	0.79				
2011	Takum, Tana; Padung, D.; Joshua, Vasna; Manickam, P.; Murhekar, Manoj V.	Programmatic and beneficiary-related factors for low vaccination coverage in Papum Pare district, Arunachal Pradesh, India	Journal of Tropical Pediatrics	0.79	IND			
2007	Techathawat, Sirirat; Varinsathien, Porpit; Rasdjarmrearnsook, Aimorn; Tharmaphornpilas, Piyanit	Exposure to heat and freezing in the vaccine cold chain in Thailand	Vaccine	0.79	THA			
2007	Ungulkraiwit, Prayut; Jongjirawisan, Yongyuth; Atamasirikul, Kalayanee; Sungkanuparph, Somnuek	Factors for predicting successful immune response to hepatitis B vaccination in HIV-1 infected patients.	Southeast Asian Journal of Tropical Medicine and Public Health	0.79				hep
2011	Unicef India Country Office	A Report on Effective Vaccine Management in Gujarat	UNICEF	0.79	IND			
2009	Wallace, A.; Dietz, V.; Cairns, K. L.	Integration of immunization services with other health interventions in the developing world: what works and why? Systematic literature review	Tropical Medicine & International Health	0.79		Developing Countries		1
2009	Wei, Feifei; Mullooly, John P.; Goodman, Mike; Mccarty, Maribet C.; Hanson, Ann M.; Crane, Bradley; Nordin, James D.	Identification and characteristics of vaccine refusers	BMC pediatrics	0.79				
1988	Anderson, Porter; Insel, Richard A.	Prospects for overcoming maturational and genetic barriers to the human antibody response to the capsular polysaccharide of Haemophilus influenzae type b	Vaccine	0.78				hib
2002	Baker, D. J.; Jeram, J.; Reid, L. A.	Failure of the vaccine cold chain following modification of a domestic refrigerator.	The New Zealand medical journal	0.78				
1985	Bamisaiye, A.	Utilisation of child health services in developing countries	Child Health in the Tropics	0.78	Developing Countries			
2012	Banura, Cecily; Mirembe, Florence M.; Katahoire, Anne R.; Namujju, Proscovia B.; Mbidde, Edward K.	Universal routine HPV vaccination for young girls in Uganda: a review of opportunities and potential obstacles	Infectious agents and cancer	0.78	UGA			1 hpv
1994	Batson, Amie; Evans, Peter; Milstien, Julie B.	The crisis in vaccine supply: a framework for action	Vaccine	0.78				
2001	Bautista-Lopez, Norma L.; Vaisberg, Abraham; Kanashiro, Rosa; Hernandez, Herminio; Ward, Brian J.	Immune response to measles vaccine in Peruvian children	Bulletin of the World Health Organization	0.78				

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1999	Bjornson, Gordean L.; Scheifele, David W.; Lajeunesse, Carol; Bell, Alison	Effect of reminder notices on the timeliness of early childhood immunizations	Paediatrics & child health	0.78				
2008	Chopra, Mickey; Munro, Salla; Lavis, John N.; Vist, Gunn; Bennett, Sara	Effects of policy options for human resources for health: an analysis of systematic reviews	The Lancet	0.78				1
2003	Chowdhury, A. Mushtaque R.; Bhuiya, Abbas; Mahmud, Simeen; Salam, Akm Abdus; Karim, Fazlul	Immunization divide: Who do get vaccinated in Bangladesh?	Journal of Health, Population and Nutrition	0.78	BGD			
1992	Clancy, Carolyn M.; Gelfman, Daniel; Poses, Roy M.	A strategy to improve the utilization of pneumococcal vaccine	Journal of general internal medicine	0.78				pneumo
1990	Coetzee, N.; Yach, D.; Blignaut, R.; Fisher, S. A.	Measles vaccination coverage and its determinants in a rapidly growing peri-urban area	South African Medical Journal	0.78				measles
2000	Dicko, M.; Oni, A.-Qo; Ganivet, S.; Kone, S.; Pierre, L.; Jacquet, B.	Safety of immunization injections in Africa: not simply a problem of logistics	Bulletin of the World Health Organization	0.78		Africa		
2002	Emond, Alan; Pollock, Jon; Costa, Nilma Da; Maranhao, Tecia; Macedo, Albanita	The effectiveness of community-based interventions to improve maternal and infant health in the Northeast of Brazil	Revista Panamericana de Salud Publica	0.78				
1996	Falvo, Cathey; Win, Pe Thet; Horowitz, Harold W.	Assessment of an Adult Population's Knowledge Regarding Vaccine-Preventable Diseases	Journal of travel medicine	0.78				
2011	Fernandez, Renae C.; Awofeso, Niyi; Rammohan, Anu	Determinants of apparent rural-urban differentials in measles vaccination uptake in Indonesia	Rural and Remote Health	0.78	IDN			measles
1995	Finnegan, P.; Howell, F.	Storage and handling of vaccines by family doctors.	Irish medical journal	0.78				
2009	Ford, Carol A.; English, Abigail; Davenport, Amy F.; Stinnett, Amy J.	Increasing adolescent vaccination: barriers and strategies in the context of policy, legal, and financial issues	Journal of Adolescent Health	0.78				
2012	Gargano, Lisa M.; Thacker, Naveen; Choudhury, Panna; Weiss, Paul S.; Pazol, Karen; Bahl, Sunil; Jafari, Hamid S.; Arora, Manisha; Orenstein, Walter A.; Hughes, James M.; Omer, Saad B.	Attitudes of pediatricians and primary health center physicians in India concerning routine immunization, barriers to vaccination, and missed opportunities to vaccinate	The Pediatric Infectious Disease Journal	0.78	IND			
2006	Gaudin, Sylvestre; Yazbeck, Abdo S.	Immunization in india 1993-1999: Wealth, gender, and regional inequalities revisited	Social Science & Medicine	0.78				
2000	Glaser, Ronald; Sheridan, John; Malarkey, William B.; Maccallum, Robert C.; Kiecolt-Glaser, Janice K.	Chronic stress modulates the immune response to a pneumococcal pneumonia vaccine	Psychosomatic medicine	0.78				pneumo
2012	Glatman-Freedman, Aharona; Nichols, Katherine	The effect of social determinants on immunization programs	Human Vaccines & Immunotherapeutics	0.78				
2013	Guthmann, Jean-Paul; Chauvin, Pierre; Le Strat, Yann; Soler, Marion; Fonteneau, Laure; Lévy-Bruhl, Daniel	Family history of immigration from a tuberculosis endemic country and low family income are associated with a higher BCG vaccination coverage in Ile-de-France region, France	Vaccine	0.78	FRA			bcg
1960	Ianni, Francis Aj; Albrecht, Robert M.; Boek, Walter E.; Polan, Adele K.	Age, social, and demographic factors in acceptance of polio vaccination	Public health reports	0.78				polio
2006	Jacobson, Sheldon H.; Sewell, Edward C.; Proano, Ruben A.	An analysis of the pediatric vaccine supply shortage problem	Health care management science	0.78				
2011	Jeong, Y. W.; Park, B. H.; Kim, K. H.; Han, Y. R.; Go, U. Y.; Choi, W. S.; Kong, K. A.; Park, H.	Timeliness of MMR vaccination and barriers to vaccination in preschool children	Epidemiology and Infection	0.78				measles, mumps, rubella
2010	Kaplan, David W.	Barriers and potential solutions to increasing immunization rates in adolescents	Journal of adolescent health	0.78				
1990	Kuhn, L.; Zwarenstein, M.	Evaluation of a village health worker programme: the use of village health worker retained records	International Journal of Epidemiology	0.78				
2010	Kumar, Devendra; Aggarwal, Anju; Gomber, Sunil	Immunization status of children admitted to a tertiary-care hospital of north India: reasons for partial immunization or non-immunization	Journal of health, population, and nutrition	0.78	IND			
2010	Kusuma, Yadlapalli S.; Kumari, Rita; Pandav, Chandrakant S.; Gupta, Sanjeev K.	Migration and immunization: determinants of childhood immunization uptake among socioeconomically disadvantaged migrants in Delhi, India	Tropical medicine & international health	0.78	IND			
2009	Lehmann, Corinne; Benson, Paul A. S.	Vaccine adherence in adolescents	Clinical Pediatrics	0.78				
2011	Lewin, Simon; Hill, Sophie; Abdullahi, Leyla H.; De Castro Freire, Sara Bensaude; Bosch-Capblanch, Xavier; Glenton, Claire; Hussey, Gregory D.; Jones, Catherine M.; Kaufman, Jessica; Lin, Vivian; Mahomed, Hassan; Rhoda, Linda; Robinson, Priscilla; Waggie, Zainab; Willis, Natalie; Wiysonge, Charles S.	'Communicate to vaccinate' (COMMVAC). building evidence for improving communication about childhood vaccinations in low- and middle-income countries: protocol for a programme of research	Implementation science: IS	0.78		Low and Middle Income Countries		
2008	Logullo, Patricia; Carvalho, Heráclito Barbosa De; Saconi, Renata; Massad, Eduardo	Factors affecting compliance with the measles vaccination schedule in a Brazilian city	Sao Paulo Medical Journal	0.78	BRA			measles
1972	Lorenz, R.	Effects of the inadequate consideration of time factors in measles vaccination	Zeitschrift Für Die Gesamte Hygiene Und Ihre Grenzgebiete	0.78				measles
2001	Maral, I.; Baykan, Z.; Aksakal, F. N.; Kayikcioglu, F.; Bumin, M. A.	Tetanus immunization in pregnant women: evaluation of maternal tetanus vaccination status and factors affecting rate of vaccination coverage	Public health	0.78				tetanus
1979	Marks, James S.; Halpin, Thomas J.; Irvin, John J.; Johnson, Deane A.; Keller, John R.	Risk factors associated with failure to receive vaccinations	Pediatrics	0.78				
1999	Mayer, M. L.; Clark, S. J.; Konrad, T. R.; Freeman, V. A.; Slifkin, R. T.	The role of state policies and programs in buffering the effects of poverty on children's immunization receipt	American Journal of Public Health	0.78				
1999	Mcdermott, A. B.; Madrigal, J. A.; Sabin, C. A.; Zuckerman, J. N.; Cohen, S. B. A.	The influence of host factors and immunogenetics on lymphocyte responses to Hepagene® vaccination	Vaccine	0.78				hep

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2006	Milstien, Julie B.; Kaddar, Miloud; Kieny, Marie Paule	The impact of globalization on vaccine development and availability	Health Affairs	0.78				
2000	Mittal, Suresh K.; Aggarwal, Neeraj; Sailaja, G.; Van Olphen, Alberto; Hogenesch, Harm; North, Adam; Hays, John; Moffatt, Stanley	Immunization with DNA, adenovirus or both in biodegradable alginate microspheres: effect of route of inoculation on immune response	Vaccine	0.78				
2010	Moïsi, Jennifer C.; Kabuka, Jonathan; Mitingi, Dorah; Levine, Orin S.; Scott, J. Anthony G.	Spatial and socio-demographic predictors of time-to-immunization in a rural area in Kenya: Is equity attainable?	Vaccine	0.78	KEN			
2013	Murhekar, Manoj V.; Dutta, Srihari; Kapoor, Ambujam Nair; Bitragunta, Sailaja; Dodum, Raja; Ghosh, Pramit; Swamy, Karumanagounder Kolanda; Mukhopadhyay, Kalyanranjan; Ningombam, Somorjit; Parmar, Kamlesh; Others	Frequent exposure to suboptimal temperatures in vaccine cold-chain system in India: results of temperature monitoring in 10 states	Bulletin of the World Health Organization	0.78	IND			
1987	Oruamabo, R. S.; Okoji, G. O.	Immunisation status of children in Port Harcourt before and after commencing the expanded programme on immunisation	Public Health	0.78				
2014	Perlman, Stacey; Wamai, Richard G.; Bain, Paul A.; Welty, Thomas; Welty, Edith; Ogembo, Javier Gordon	Knowledge and awareness of HPV vaccine and acceptability to vaccinate in sub-Saharan Africa: a systematic review	PloS one	0.78		Sub-Saharan Africa	1	hpv
2003	Pielak, Karen L.; Hilton, Ann	University students immunized and not immunized for measles: a comparison of beliefs, attitudes, and perceived barriers and benefits	Canadian Journal of Public Health	0.78				measles
2007	Poland, G. A.; Ovsyannikova, I. G.; Jacobson, R. M.; Smith, D. I.	Heterogeneity in vaccine immune response: the role of immunogenetics and the emerging field of vaccinomics	Clinical Pharmacology & Therapeutics	0.78				
2010	Rahman, Mosiur; Obaida-Nasrin, Sarker	Factors affecting acceptance of complete immunization coverage of children under five years in rural Bangladesh	Salud pública de méxico	0.78	BGD			
1993	Rodewald, L. E.; Szilagyi, P. G.; Humiston, S. G.; Others	Factors associated with undervaccination of preschool-age children: a case-control study	33rd Annual Meeting of the Ambulatory Pediatric Association. Pediatr Res	0.78				
2002	Rodewald, Lance E.	Closing the gap: strategies for increasing immunization levels among at-risk populations	Ethnicity & Disease	0.78				
2012	Rosenkötter, Nicole; Van Dongen, Martien C. J. M.; Hellmeier, Wolfgang; Simon, Klaus; Dagnelie, Pieter C.	The influence of migratory background and parental education on health care utilisation of children	European Journal of Pediatrics	0.78				
1998	Rosenstein, Nancy; Levine, Orin; Taylor, Jeffery P.; Evans, Deborah; Plikaytis, Brian D.; Wenger, Jay D.; Perkins, Bradley A.	Efficacy of meningococcal vaccine and barriers to vaccination	Jama	0.78				mening
1959	Rosenstock, Irwin M.; Derryberry, Mayhew; Carriger, Barbara K.	Why people fail to seek poliomyelitis vaccination	Public Health Reports	0.78				polio
2013	Sadaf, Alina; Richards, Jennifer L.; Glanz, Jason; Salmon, Daniel A.; Omer, Saad B.	A systematic review of interventions for reducing parental vaccine refusal and vaccine hesitancy	Vaccine	0.78			1	
2009	Schönberger, K.; Grote, V.; Von Kries, R.; Kalies, H.	Risk factors for delayed or missed measles vaccination in young children	Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz	0.78				measles
2007	Senessie, Charles; Gage, George N.; Von Elm, Erik	Delays in childhood immunization in a conflict area: a study from Sierra Leone during civil war	Conflict and health	0.78				
1976	Slesinger, D. P.; Tessler, R. C.; Mechanic, D.	The effects of social characteristics on the utilization of preventive medical services in contrasting health care programs	Medical Care	0.78				
2008	Sullivan, Janet; Kinnear, Benjamin; Koehn, Kristin	The effect of patient education on tetanus, diphtheria, and pertussis (Tdap) immunization rates in post-partum women	The 42nd National Immunization Conference	0.78				diphtheria, pertussis, tetanus
1992	The Interagency Committee To Improve Access To Immunization Services	The Public Health Service action plan to improve access to immunization services.	Public Health Reports (Washington, D.C.: 1974)	0.78				
2014	Van Lier, Alies; Van De Kassteele, Jan; De Hoogh, Pieter; Drijfhout, Ingrid; De Melker, Hester	Vaccine uptake determinants in The Netherlands	European Journal of Public Health	0.78	NLD			
2007	Vijayaraghavan, Maya; Martin, Rebecca M.; Sangrujee, Nalinee; Kimani, Geoffrey N.; Oyombe, Sammy; Kalu, Akpaka; Runyago, Alfred; Wanjau, George; Cairns, Lisa; Muchiri, Steven N.	Measles supplemental immunization activities improve measles vaccine coverage and equity: Evidence from Kenya, 2002	Health Policy	0.78	KEN			measles
1995	Volkin, D. B.; Burke, C. J.; Sanyal, G.; Middaugh, C. R.	Analysis of vaccine stability.	Developments in biological standardization	0.78				
1995	Weese, Coleen Baird; Krauss, Margot R.	A'barrier-free'health care system does not ensure adequate vaccination of 2-year-old children	Archives of pediatrics & adolescent medicine	0.78				
2011	Widdice, Lea E.; Bernstein, David I.; Leonard, Anthony C.; Marsolo, Keith A.; Kahn, Jessica A.	Adherence to the HPV vaccine dosing intervals and factors associated with completion of 3 doses	Pediatrics	0.78				hpv
1998	Wood, David; Schuster, Mark; Donald-Sherbourne, Cathy; Duan, Naihua; Mazel, Rabecca; Halfon, Neal	Reducing missed opportunities to vaccinate during child health visits: how effective are parent education and case management?	Archives of pediatrics & adolescent medicine	0.78				
2000	Yawn, Barbara P.; Xia, Zhisen; Edmonson, Larry; Jacobson, Robert M.; Jacobsen, Steven J.	Barriers to immunization in a relatively affluent community	The Journal of the American Board of Family Practice	0.78				
2013	Zaffran, Michel; Vandelaer, Jos; Kristensen, Debra; Melgaard, Bjørn; Yadav, Prashant; Antwi-Agyei, K. O.; Lasher, Heidi	The imperative for stronger vaccine supply and logistics systems	Vaccine	0.78				

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2014	Zhu, Dawei; Wang, Jian; Wangen, Knut Reidar	Hepatitis B vaccination coverage rates among adults in rural China: Are economic barriers relevant?	Vaccine	0.78	CHN			hep
1991	Zimmerman, R. K.; Street, H. B.; Gieblnk, G. S.	Physician barriers to vaccine coverage: vaccine cost and overinterpretation of vaccine contraindications	Centers for Disease Control, National Center for Prevention of Diseases, Division of Immunization, ed. 25th National Immunization Conference Proceedings	0.78				
1996	Zimmerman, Richard Kent; Ahwesh, Ellen R.; Mieczkowski, Tammy A.; Block, Bruce; Janosky, Janine E.; Barker, David W.	Influence of family functioning and income on vaccination in inner-city health centers	Archives of pediatrics & adolescent medicine	0.78				
2007	Akmatov, Manas K.; Kretzschmar, Mirjam; Krämer, Alexander; Mikolajczyk, Rafael T.	Determinants of childhood vaccination coverage in Kazakhstan in a period of societal change: implications for vaccination policies	Vaccine	0.77	KAZ			
1994	American Journal Of Hospital Pharmacy	Childhood immunizations: studies shed light on risk, parents' behavior	American Journal of Hospital Pharmacy	0.77				
1984	Black, F. L.; Berman, L. L.; Libel, Marlo; Reichelt, C. A.; Pinheiro, F. De P.; Da Rosa, A. Travassos; Figueira, F.; Gonzales, E. Siqueira	Inadequate immunity to measles in children vaccinated at an early age: effect of revaccination	Bulletin of the World Health Organization	0.77				
2012	Brown, David W.	Child immunization cards: essential yet underutilized in national immunization programmes	Open Vaccine J	0.77				
1996	Caldeon Ortiz, Ruben; Mejia Mejia, Jesus	Estrategia de contratacian permanente dentro del Programa de Vacunacian Universal	Salud publica Max	0.77				
2009	Chen, Dexiang; Tyagi, Anil; Carpenter, John; Perkins, Shalimar; Sylvester, David; Guy, Mark; Kristensen, Debra D.; Jones Braun, Latoya	Characterization of the freeze sensitivity of a hepatitis B vaccine	Human vaccines	0.77				hep
2006	Chen, Hua; Ron Cantrell, C.	Prevalence and factors associated with self-reported vaccination rates among US adults at high risk of vaccine-preventable hepatitis*	Current Medical Research and Opinion®	0.77	USA			hep
1999	Cisse, Badara; Aaby, Peter; Simondon, Francois; Samb, Badara; Soumare, Masserigne; Whittle, Hilton	Role of schools in the transmission of measles in rural senegal implications for measles control in developing countries	American journal of epidemiology	0.77				
2003	Cochran, Clarke E.; Smith, David R.; Reid, Glen; Morrow, Helen; Ramirez, Jennifer	Protecting Texas children: evidence-based recommendations for improving childhood vaccination rates	Texas Medicine	0.77	USA			
1998	Coninx, R.; Dupuy, C.; Hermann, C.; Ribeiro, G. Cruz Pires; Margot, M.; Lucic, K.	Vaccination of the Civilian Population in a Country at War: It Can be Done; It Can Also be Evaluated. The ICRC Experience in Mozambique	Journal of Tropical Pediatrics	0.77				
2012	Connors, John; Arushanyan, Elena; Bellanca, Gregory; Racine, Ruth; Hoeffler, Andrew; Delgado, Allan; Gibbons, Susanne	A description of barriers and facilitators to childhood vaccinations in the military health system	Journal of the American Academy of Nurse Practitioners	0.77				
2007	Cui, Fu-Qiang; Gofin, Rosa	Immunization coverage and its determinants in children aged 12-23 months in Gansu, China	Vaccine	0.77	CHN			
2012	Daku, Mark; Raub, Amy; Heymann, Jody	Maternal leave policies and vaccination coverage: a global analysis	Social Science & Medicine	0.77				
2005	Danzon, Patricia M.; Pereira, Nuno Sousa; Tejwani, Sapna S.	Vaccine supply: a cross-national perspective	Health Affairs	0.77				
2002	De Serres, Gaston; Duval, Bernard; Boulianne, Nicole	Impact of vaccine cost and information about complications of varicella on parental decision regarding varicella vaccine	Canadian Journal of Public Health	0.77				varicella
2000	Dietz, Vance J.; Baughman, Andrew L.; Dini, Eugene F.; Stevenson, John M.; Pierce, Bennett K.; Hersey, James C.	Vaccination practices, policies, and management factors associated with high vaccination coverage levels in Georgia public clinics	Archives of pediatrics & adolescent medicine	0.77	GEO			
2004	Disis, Mary L.; Schiffman, Kathy; Guthrie, Katherine; Salazar, Lupe G.; Knutson, Keith L.; Goodell, Vivian; Dela Rosa, Corazon; Cheever, Martin A.	Effect of dose on immune response in patients vaccinated with an her-2/neu intracellular domain protein—based vaccine	Journal of clinical oncology	0.77				
2004	Dombkowski, Kevin J.; Lantz, Paula M.; Freed, Gary L.	Risk factors for delay in age-appropriate vaccination.	Public Health Reports	0.77				
2009	Feinberg, Mark B.; Gordon, Lance	Industry perspectives: ensuring vaccination of children and adolescents without financial barriers	Pediatrics	0.77				
1995	Fine, Paul Em	Variation in protection by BCG: implications of and for heterologous immunity	The Lancet	0.77				bcg
1992	Fosu, G. B.	The use of injections for treating childhood diseases: determinants and consequences for preventive health care in developing countries	Sociological Focus	0.77		Developing Countries		
2012	Gargano, Lisa M.; Thacker, Naveen; Choudhury, Panna; Weiss, Paul S.; Pazol, Karen; Bahl, Sunil; Jafari, Hamid S.; Arora, Manisha; Orenstein, Walter A.; Hughes, James M.; Omer, Saad B.	Predictors of administration and attitudes about pneumococcal, Haemophilus influenzae type b and rotavirus vaccines among pediatricians in India: a national survey	Vaccine	0.77	IND			hib, pneumo, rotavirus
2009	Giraudon, Isabelle; Permalloo, Nadia; Nixon, Grainne; Charlett, Andre; Cohuet, Sandra; Mandal, Sema; Ramsay, Mary; Patel, Bharat C.; Maguire, Helen	Factors associated with incomplete vaccination of babies at risk of perinatal hepatitis B transmission: a London study in 2006	Vaccine	0.77	GBR			hep

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2009	Gottlieb, Scott	Vaccine Readiness in a Time of Pandemic	American Enterprise Institute for Public Policy Research	0.77				
2011	Grant, Cameron C.; Petousis-Harris, Helen; Turner, Nikki; Goodyear-Smith, Felicity; Kerse, Ngaire; Jones, Rhys; York, Deon; Desmond, Natalie; Stewart, Joanna	Primary care practice and health professional determinants of immunisation coverage	Journal of Paediatrics and Child Health	0.77				
2010	Grant, Cameron C.; Turner, Nikki M.; York, Deon G.; Goodyear-Smith, Felicity; Petousis-Harris, Helen A.	Factors associated with immunisation coverage and timeliness in New Zealand	The British Journal of General Practice: The Journal of the Royal College of General Practitioners	0.77	NZL			
2006	Griffin, J. F. T.; Mackintosh, C. G.; Rodgers, C. R.	Factors influencing the protective efficacy of a BCG homologous prime-boost vaccination regime against tuberculosis	Vaccine	0.77				bcg
2006	Guttmann, Astrid; Manuel, Doug; Dick, Paul T.; To, Teresa; Lam, Kelvin; Stukel, Therese A.	Volume matters: physician practice characteristics and immunization coverage among young children insured through a universal health plan	Pediatrics	0.77				
2014	Harper, Diane M.; Verdenius, Inge; Harris, George D.; Barnett, Angela L.; Rosemergey, Beth E.; Arey, Anne M.; Wall, Jeffrey; Malnar, Gerard J.	The influence of free quadrivalent human papillomavirus vaccine (HPV4) on the timely completion of the three dose series	Preventive medicine	0.77				hpv
2004	Haynes, Kerry; Stone, Christine	Predictors of incomplete immunisation in Victorian children	Australian and New Zealand Journal of Public Health	0.77				
1996	Hsu, Li-Ching; Lin, Sheue-Rong; Hsu, Hsu-Mei; Chao, Wan-Hwa; Hsieh, Jung-Tian; Wang, Ming-Ching; Lu, Chih-Feng; Chang, Yao-Hsiung; Ho, Mei-Shang	Ethnic differences in immune responses to hepatitis B vaccine	American journal of epidemiology	0.77				hep
2011	Humphreys, Gary	Vaccination: Rattling the Supply Chain: The Introduction of New Vaccines, Combined with a Push to Expand Immunization Globally to Reach Every Child, Is Straining Vaccine Supply Chains to the Limit. New Thinking on the Way Vaccines Are Delivered Is Needed	Bulletin of the World Health Organization	0.77				
2010	Hurley, Laura P.; Lindley, Megan C.; Harpaz, Rafael; Stokley, Shannon; Daley, Matthew F.; Crane, Lori A.; Dong, Fran; Beaty, Brenda L.; Tan, Litjen; Babbel, Christine; Others	Barriers to the use of herpes zoster vaccine	Annals of internal medicine	0.77				
1996	Jeremijenko, Andrew; Kelly, Heath; Sibthorpe, Beverly; Attewell, Robyn; Others	Improving vaccine storage in general practice refrigerators	BMJ	0.77				
2005	Karim, F.; Rafi, M.; Begum, S. A.	Inequitable access to immunization and vitamin A capsule services: a case of ethnic minorities in three hill districts of Bangladesh	Public Health	0.77				
1981	Kimati, V. P.; Loretu, K.; Munube, G. M. R.; Kimboi, F.	The problem of measles virus response with reference to vaccine viability, age, protein energy malnutrition and malaria in the tropics	Journal of tropical pediatrics	0.77				measles
2009	Komara, Francis A.	Herpes zoster vaccination: benefits and barriers	Journal of the American Osteopathic Association	0.77				
2012	Kriwy, P.	Similarity of parents and physicians in the decision to vaccinate children against measles, mumps and rubella	International journal of public health	0.77				measles, mumps, rubella
1996	Lieu, Tracy A.; Black, Steven B.; Sorel, Michael E.; Ray, Paula; Shinefield, Henry R.	Would better adherence to guidelines improve childhood immunization rates?	Pediatrics	0.77				
2000	Lutwick, Suzanne M.	Pediatric vaccine compliance	Pediatric Clinics of North America	0.77				
2006	M, Rahman; M, Banerjee; M, Rahman; Fu, Akhter	Vaccination status of tribal mothers and their under five children.	Mymensingh medical journal : MMJ	0.77				
2010	Masebe, Esther Mukokomena	Acceptability of Oral Immunization Against Cholera and Typhod Fever among School Children in Lusaka	University of Zambia	0.77	ZMB			cholera, typhoid
2002	Moxness, Gayle	Which factors make a difference when identifying pockets of under-immunization?	The 2002 Immunization Registry Conference of CDC	0.77				
2007	Nath, Bhola; Singh, J. V.; Awasthi, Shally; Bhushan, Vidya; Kumar, Vishwajeet; Singh, S. K.	A study on determinants of immunization coverage among 12-23 months old children in urban slums of Lucknow district, India	Indian Journal of Medical Sciences	0.77	IND			
2007	Nelson, Carib; Froes, Paulo; Van Dyck, Anne Mie; Chavarría, Jeaneth; Boda, Enrique; Coca, Alberto; Crespo, Gladys; Lima, Heinz	Monitoring temperatures in the vaccine cold chain in Bolivia	Vaccine	0.77	BOL			
2013	Nelson, E. Anthony S.; De Quadros, Ciro A.; Santosham, Mathuram; Parashar, Umesh D.; Steele, Duncan	Overcoming perceptions of financial barriers to rotavirus vaccine introduction in Asia	Human Vaccines & Immunotherapeutics	0.77		Asia		rotavirus
2003	Obaro, S. K.; Palmer, A.	Vaccines for children: policies, politics and poverty	Vaccine	0.77				
2010	Ozkaya, Emin; Eker, Hüseyin H.; Aycan, N.; Samanci, N.	Impact of maternal anxiety level on the childhood vaccination coverage	European Journal of Pediatrics	0.77				
2005	Pauly, Mark V.	Improving vaccine supply and development: Who needs what?	Health Affairs	0.77				

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1992	Pennie, Ross A.; O'Connor, Annette M.; Dulberg, Corinne S.; Bottiglia, Anna; Manga, Pranlal; Kang, C. Yong	Low-cost hepatitis B vaccine improves uptake among self-paying health-care students	Journal of medical virology	0.77				hep
2001	Petrovic, Marko; Roberts, Richard; Ramsay, Mary	Second dose of measles, mumps, and rubella vaccine: questionnaire survey of health professionals	BMJ	0.77				
1996	Roberts, Christine L.; Roome, Aaron; Algert, Charles S.; Walsh, Stephen J.; Kurland, Michael; Lawless, Kimberly; Cartter, Matthew L.	A meningococcal vaccination campaign on a university campus: vaccination rates and factors in nonparticipation.	American journal of public health	0.77				mening
2011	Sakou, Irine-Ikbale; Tsitsika, Artemis K.; Papaevangelou, Vassiliki; Tzavela, Eleni C.; Greydanus, Donald E.; Tsolia, Maria N.	Vaccination coverage among adolescents and risk factors associated with incomplete immunization	European Journal of Pediatrics	0.77				
2004	Samoff, Erika; Dunn, Alan; Vandevanter, Nancy; Blank, Susan; Weisfuse, Isaac B.	Predictors of acceptance of hepatitis B vaccination in an urban sexually transmitted diseases clinic	Sexually transmitted diseases	0.77				hep
2010	Sampat, Manan; Mirtcheva, D.	Factors Affecting Immunization Coverage, 1999-2008: A Nationwide Assessment Using Adelay-Based Approach	The College of New Jersey	0.77				
2011	Sarnaik, Amod A.; Yu, Bin; Yu, Daohai; Morelli, Dawn; Hall, Maclean; Bogle, Dilip; Yan, Lulu; Targan, Stephan; Solomon, Jolie; Nichol, Geoff; Others	Extended dose ipilimumab with a peptide vaccine: immune correlates associated with clinical benefit in patients with resected high-risk stage IIIc/IV melanoma	Clinical Cancer Research	0.77				
2006	Scheurer, Danielle B.; Cawley, Patrick J.; Brown, Shirley B.; Heffner, John E.	Overcoming barriers to pneumococcal vaccination in patients with pneumonia	American Journal of Medical Quality	0.77				pneumo
2001	Schmitt, Heinz-J.	Factors influencing vaccine uptake in Germany	Vaccine	0.77	DEU			
2012	Shearer, Jessica C.; Walker, Damian G.; Risko, Nicholas; Levine, Orin S.	The impact of new vaccine introduction on the coverage of existing vaccines: a cross-national, multivariable analysis	Vaccine	0.77				
1994	Singh, R.; John, T. J.; Cherian, T.; Raghupathy, P.	Immune response to measles, mumps & rubella vaccine at 9, 12 & 15 months of age.	The Indian journal of medical research	0.77				measles, mumps, rubella
2002	Sinisalo, Marjatta; Aittoniemi, Janne; Käyhty, Helena; Vilpo, Juhani	Haemophilus influenzae type b (Hib) antibody concentrations and vaccination responses in patients with chronic lymphocytic leukaemia: predicting factors for response	Leukemia & lymphoma	0.77				hib
1998	Tamblyn, S. E.	Pneumococcal vaccine: overcoming barriers to use	CMAJ: Canadian Medical Association Journal	0.77				pneumo
2012	Tate, Jacqueline E.; Patel, Manish M.; Cortese, Margaret M.; Lopman, Benjamin A.; Gentsch, Jon R.; Fleming, Jessica; Steele, A. Duncan; Parashar, Umesh D.	Remaining issues and challenges for rotavirus vaccine in preventing global childhood diarrheal morbidity and mortality	Expert Review of Vaccines	0.77				rotavirus
2000	Taylor, James A.; Newman, Robert D.	Parental attitudes toward varicella vaccination	Archives of pediatrics & adolescent medicine	0.77				varicella
2009	Trevena, Lyndal; Leask, Julie	Decision aids for MMR vaccination	Shared Decision-making in Health Care: Achieving Evidence-based Patient Choice	0.77				measles, mumps, rubella
2000	Tupasi, T. E.; Radhakrishna, S.; Pascual, M. L.; Quelapio, M. I. D.; Villa, M. L.; Co, V. M.; Sarol, J.; Mangubat, N.; Reyes, A. C.; Sarmiento, A.; Others	BCG coverage and the annual risk of tuberculosis infection over a 14-year period in the Philippines assessed from the nationwide prevalence surveys	The International Journal of Tuberculosis and Lung Disease	0.77				
2009	Uddin, Md Jasim; Larson, Charles P.; Oliveras, Elizabeth; Khan, Azharul Islam; Quaiyum, Ma Md Abdul; Saha, Nirod Chandra	Child immunization coverage in rural hard-to-reach Haor areas of Bangladesh: possible alternative strategies	Asia-Pacific Journal of Public Health	0.77	BGD			
2010	Usman, Hussain R.; Kristensen, Sibylle; Rahbar, M. Hossein; Vermund, Sten H.; Habib, Faiza; Chamot, Eric	Determinants of third dose of diphtheria-tetanus-pertussis (DTP) completion among children who received DTP1 at rural immunization centres in Pakistan: a cohort study	Tropical medicine & international health	0.77	PAK			diphtheria, pertussis, tetanus
2008	Usman, Hussain R; Kristensen, Sibylle; Rahbar, M. Hossein; Vermund, Sten H.; Kirby, Russell S; Chamot, Eric	Factors Associated With Delay at First Diphtheria-Tetanus-Pertussis (DTP1) Immunization in Rural Pakistan	Randomized Controlled Trial of Low Cost Interventions to Reduce Childhood Immunization Dropouts in Pakistan	0.77	PAK			diphtheria, pertussis, tetanus
2012	Walhart, T.	Parents, adolescents, children and the human papillomavirus vaccine: a review	International nursing review	0.77			1	hpv
2004	Wallace, L. A.; Bramley, J. C.; Ahmed, S.; Duff, R.; Hutchinson, S. J.; Carman, W. F.; Kitchin, N. R. E.; Goldberg, D. J.	Determinants of universal adolescent hepatitis B vaccine uptake	Archives of Disease in Childhood	0.77				hep
2013	Walter, D.; Atzpodien, K.; Pins, C.; Wichmann, O.; Reiter, S.	Factors influencing the uptake of vaccines by adolescents with migration background. A qualitative study of adolescents, mothers, and physicians	Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz	0.77				
2013	Wang, Susan A.; Hyde, Terri B.; Mounier-Jack, Sandra; Brenzel, Logan; Favin, Michael; Gordon, W. Scott; Shearer, Jessica C.; Mantel, Carsten F.; Arora, Narendra; Durrheim, David	New vaccine introductions: assessing the impact and the opportunities for immunization and health systems strengthening	Vaccine	0.77				
1997	Wawryk, Andrew; Mavromatis, Chris; Gold, Michael	Electronic monitoring of vaccine cold chain in a metropolitan area	BMJ	0.77				

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2013	Weiss, William M.; Rahman, M. D. Hafizur; Solomon, Roma; Ward, Dora	Determinants of performance of supplemental immunization activities for polio eradication in Uttar Pradesh, India: social mobilization activities of the Social mobilization Network (SM Net) and Core Group Polio Project (CGPP)	BMC infectious diseases	0.77	IND			polio
2009	Wexler, Deborah L.; Randall, Lisa H.; Pisani, Amy	Ensuring access to vaccines without financial barriers: view of consumers	Pediatrics	0.77				
1993	Wood, Rachel C.; Macdonald, Kristine L.; White, Karen E.; Hedberg, Craig W.; Hanson, Margaret; Osterholm, Michael T.	Risk factors for lack of detectable antibody following hepatitis B vaccination of Minnesota health care workers	Jama	0.77	USA			hep
2007	Wooten, Karen G.; Luman, Elizabeth T.; Barker, Lawrence E.	Socioeconomic factors and persistent racial disparities in childhood vaccination	American journal of health behavior	0.77				
1994	Yuan, L.	Measles outbreak in 31 schools: risk factors for vaccine failure and evaluation of a selective revaccination strategy	CMAJ: Canadian Medical Association journal	0.77				measles
1999	Zimmerman, R. K.; Mieczkowski, T. A.; Raymund, M.	Relationship between primary payer and use of proactive immunization practices: a national survey	The American Journal of Managed Care	0.77				
2003	Adem, Arä°; Tacettin, Inandi; Sevin, Altä°Nkaynak; Vildan, Ertekin	Diphtheria immunization rates and the effect of several sociodemographic factors on immunization of children in eastern Turkey	Pediatrics international	0.76				
2007	Anah, M. U.; Etuk, I. S.; Udo, J. J.	Opportunistic immunization with in-patient programme: eliminating a missed opportunity in Calabar, Nigeria	Annals of African Medicine Society	0.76				
2010	Banerjee, Abhijit Vinayak; Duflo, Esther; Glennerster, Rachel; Kothari, Dhruva; Others	Improving immunisation coverage in rural India: clustered randomised controlled evaluation of immunisation campaigns with and without incentives	Bmj	0.76				
2012	Bhat-Schelbert, Kavitha; Lin, Chyongchiou Jeng; Matambanadzo, Annamore; Hannibal, Kristin; Nowalk, Mary Patricia; Zimmerman, Richard K.	Barriers to and facilitators of child influenza vaccine–perspectives from parents, teens, marketing and healthcare professionals	Vaccine	0.76				influenza
2007	Centers For Disease Control And Prevention (Cdc)	Progress in hepatitis B prevention through universal infant vaccination--China, 1997-2006	MMWR. Morbidity and mortality weekly report	0.76				
2010	Christie, Celia Dc; Duncan, Newton D.; Thame, Kirk A.; Onorato, Matthew T.; Smith, Hyacinth D.; Malcolm, Lavern G.; Itzler, Robbin F.; Dinubile, Mark J.; Heaton, Penny M.	Pentavalent rotavirus vaccine in developing countries: safety and health care resource utilization	Pediatrics	0.76		Developing Countries		rotavirus
1998	Connors, Christine M.; Miller, Nan C.; Krause, Vicki L.	Universal hepatitis B vaccination: hospital factors influencing first-dose uptake for neonates in Darwin	Australian and New Zealand journal of public health	0.76	AUS			hep
1998	Coreil, Jeannine; Wilson, Frances; Wood, Deril; Liller, Karen	Maternal employment and preventive child health practices	Preventive medicine	0.76				
2013	Elkin, Zachary; Cohen, Elisabeth J.; Goldberg, Judith D.; Gillespie, Colleen; Li, Xiaochun; Jung, Jesse; Cohen, Michael; Park, Lisa; Perskin, Michael H.	Studying physician knowledge, attitudes, and practices regarding the herpes zoster vaccine to address perceived barriers to vaccination	Cornea	0.76				
2011	Ernst, Edzard	Anthroposophy: a risk factor for noncompliance with measles immunization	The Pediatric Infectious Disease Journal	0.76				measles
1996	Goldstein, Karen P.; Philipson, Tomas J.; Joo, Hyeseon; Daum, Robert S.	The effect of epidemic measles on immunization rates	JAMA	0.76				measles
1998	Gramzinski, Robert A.; Millan, C. L.; Obaldia, Nicanor; Hoffman, Stephen L.; Davis, Heather L.	Immune response to a hepatitis B DNA vaccine in Aotus monkeys: a comparison of vaccine formulation, route, and method of administration.	Molecular Medicine	0.76				hep
1993	Guyer, B.; Holt, E.; Strobino, D.; Hughart, N.; Keane, V.	The Baltimore Immunization Study: immunization coverage and causes of underimmunization among inner-city children in Baltimore	Final report for contract	0.76	USA			
2002	Hackley, Barbara K.	Controversies in immunization practices: vaccine safety and implications for midwifery practice	Journal of Midwifery & Women's Health	0.76				
2010	Hammer, Lawrence D.; Curry, E. S.; Harlor, A. D.; Laughlin, J. J.; Leeds, A. J.; Lessin, H. R.; Rodgers, C. T.; Granado-Villar, D. C.; Brown, J. M.; Cotton, W. H.; Others	Increasing immunization coverage.	Pediatrics	0.76				
2006	Hjorthøj, Carsten	Determinanter for undervaccination af børn	Københavns Universitet	0.76				
2014	Kattan, Jessica A.; Kudish, Kathy S.; Cadwell, Betsy L.; Soto, Kristen; Hadler, James L.	Effect of vaccination coordinators on socioeconomic disparities in immunization among the 2006 connecticut birth cohort	American journal of public health	0.76	USA			
2011	Kristensen, Debra; Chen, Dexiang; Cummings, Ray	Vaccine stabilization: research, commercialization, and potential impact	Vaccine	0.76				
1990	Lugosi, Laszlo; Battersby, Anthony	Transport and storage of vaccines in Hungary: the first cold chain monitor study in Europe.	Bulletin of the World Health Organization	0.76	HUN			
2009	Marino, Maria Giulia; Pandolfi, Elisabetta; Carloni, Emanuela; Ciofi Degli Atti, Marta; Tozzi, Alberto E.; Gruppo Di Lavoro V+	V+: strategies improving vaccination coverage among children with chronic diseases	Igiene E Sanità Pubblica	0.76				
1998	Metersky, M. L.; Mennone, J. Z.; Fine, J. M.	Factors inhibiting use of the pneumococcal polysaccharide vaccine: a survey of Connecticut physicians.	Connecticut medicine	0.76	USA			hib, pneumo
2000	Miller, Mark A.; Flanders, W. Dana	A model to estimate the probability of hepatitis B-and Haemophilus influenzae type b-vaccine uptake into national vaccination programs	Vaccine	0.76				hep, hib
2013	Naik, Ashish K.; Rupani, Mihir P.; Bansal, R. K.	Evaluation of Vaccine Cold Chain in Urban Health Centers of Municipal Corporation of Surat City, Western India	International journal of preventive medicine	0.76	IND			
2009	Ndirangu, James; Bärnighausen, Till; Tanser, Frank; Tint, Khin; Newell, Marie-Louise	Levels of childhood vaccination coverage and the impact of maternal HIV status on child vaccination status in rural KwaZulu-Natal, South Africa	Tropical Medicine & International Health	0.76	ZAF			

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2004	Nelson, Carib M.; Wibisono, Hariadi; Purwanto, Hary; Mansyur, Isa; Moniaga, Vanda; Widjaya, Anton	Hepatitis B vaccine freezing in the Indonesian cold chain: evidence and solutions	Bulletin of the World Health Organization	0.76	IDN			hep
1990	Olivola, Kenneth	Universal child immunization: reaching the urban poor	UNICEF	0.76				
2001	Opstelten, Wim; Hak, Eelko; Verheij, Theo Jm; Van Essen, Gerrit A.	Introducing a pneumococcal vaccine to an existing influenza immunization program: vaccination rates and predictors of noncompliance	The American journal of medicine	0.76				influenza, pneumo
2002	Ortega Molina, Paloma; Astasio Arbiza, Paloma; Albaladejo Vicente, Romana; Gómez Rábago, M.; Juanes Pardo, José Ramón De; Domínguez Rojas, Vicente	Vaccine storage cold chain at primary care centers in one area of Madrid: keeping the chain intact and degree of knowledge	Revista Española de Salud Pública	0.76	ESP			
2005	Oster, Natalia Vukshich; Mcphillips-Tangum, Carol A.; Averhoff, Francisco; Howell, Kelly	Barriers to adolescent immunization: a survey of family physicians and pediatricians	The Journal of the American Board of Family Practice	0.76				
2014	Parez, N.; Giaquinto, C.; Du Roure, C.; Martinon-Torres, F.; Spoulou, V.; Van Damme, P.; Vesikari, T.	Rotavirus vaccination in Europe: drivers and barriers	The Lancet infectious diseases	0.76		Europe		rotavirus
2008	Pearce, Anna; Law, Catherine; Elliman, David; Cole, Tim J.; Bedford, Helen; Millennium Cohort Study Child Health Group	Factors associated with uptake of measles, mumps, and rubella vaccine (MMR) and use of single antigen vaccines in a contemporary UK cohort: prospective cohort study	BMJ (Clinical research ed.)	0.76	GBR			measles, mumps, rubella
2011	Rossignol, L.; Guthmann, J.-P.; Kerneis, S.; Aubin-Auger, I.; Lasserre, A.; Chauvin, P.; Pelat, C.; Hanslik, T.; Levy-Bruhl, D.; Blanchon, T.	Barriers to implementation of the new targeted BCG vaccination in France: a cross sectional study	Vaccine	0.76	FRA			bcg
2012	Shrivastava, Ashutosh; Gupta, Neeraj; Upadhyay, Pramod; Puliyel, Jacob	Caution needed in using oral polio vaccine beyond the cold chain: Vaccine vial monitors may be unreliable at high temperatures	The Indian journal of medical research	0.76				polio
2005	Thind, Amardeep	Determinants of tetanus toxoid immunization in pregnancy in rural Bihar	Tropical Doctor	0.76	IND			tetanus
2010	Topuridze, M.; Butsashvili, M.; Kamkamidze, G.; Kajaia, M.; Morse, D.; Mcnutt, L. A.	Barriers to hepatitis B vaccine coverage among healthcare workers in the Republic of Georgia: An international perspective	Infection Control	0.76	GEO			hep
2013	Tsui, Jennifer; Singhal, Rita; Rodriguez, Hector P.; Gee, Gilbert C.; Glenn, Beth A.; Bastani, Roshan	Proximity to safety-net clinics and HPV vaccine uptake among low-income, ethnic minority girls	Vaccine	0.76				hpv
1992	Van Noort, Rbjc	The Children's Vaccine Initiative and vaccine supply: the role of the public sector	Vaccine	0.76				
1998	Wan, T. T.; Pai, C. W.; Wan, G. J.	Organizational and market determinants of HMOs' performance of preventive practices	Journal for Healthcare Quality: Official Publication of the National Association for Healthcare Quality	0.76				
2000	Woodle, Dian	Vaccine procurement and self-sufficiency in developing countries	Health policy and planning	0.76		Developing Countries		
2014	World Health Organization	Principles and considerations for adding a vaccine to a national immunization programme: from decision to implementation and monitoring	WHO	0.76				
2013	World Health Organization	Small incentives improve vaccine coverage in Pakistan: IRD's interactive alerts	WHO	0.76	PAK			
2010	World Health Organization Regional Office For Africa	Regional Committee For Africa Sixtieth Session Provisional Agenda Item 7.8. Current status routine immunization and polio eradication in the African region: Challenges and recommendation	WHO	0.76		Africa		polio
2004	Zucs, A. P.; Crispin, A.; Eckl, E.; Weitkunat, R.; Schlipköter, U.	Risk factors for undervaccination against measles in a large sample of preschool children from rural Bavaria	Infection	0.76				measles
1999	Ab, Biswas; Nk, Mitra; S, Nandy; Rn, Sinha; S, Kumar	Missed opportunities for immunisation in children.	Indian journal of public health	0.75				
1997	Abuwa, P. N.; Alikor, E. A.; Gbaraba, P. V.; Mung, K. S.; Oruamabo, R. S.	Determinants of tetanus toxoid immunization of parturient women: a community-based study in Rivers State of Nigeria	West African Journal of Medicine	0.75	NGA			tetanus
2011	Adorador, Anita; Mcnulty, Rita; Hart, Dynnette; Fitzpatrick, Joyce J.	Perceived barriers to immunizations as identified by Latino mothers	Journal of the American Academy of Nurse Practitioners	0.75				
1999	Ahmad, Nisar; Akhtar, Tasleem; Roghani, Mehr Taj; Ilyas, H. M.; Ahmad, M.	Immunization coverage in three districts of North West Frontier Province (NWFP)	JOURNAL-PAKISTAN MEDICAL ASSOCIATION	0.75				
1999	Al Sheikh, O. G.; Al Samarrai, J. I.; Al Sumaidaie, M. M.; Mohammad, S. A.; Al Dujaily, A. A.	Immunization coverage among children born between 1989 and 1994 in Saladdin Governorate, Iraq	WHO	0.75				
2013	Al-Lela, O. Q. B.; Bahari, M. B.; Al-Abbassi, M. G.; Salih, M. R. M.; Basher, A. Y.	Iraqi parents' views of barriers to childhood immunization	Eastern Mediterranean Health Journal = La Revue De Santé De La Méditerranée Orientale = Al-Majallah Al-?i???yah Li-Sharq Al-Mutawassi?	0.75	IRQ			
1997	Amin, R.; Li, Y.	NGO-promoted women's credit program, immunization coverage, and child mortality in rural Bangladesh	Women & Health	0.75				
2006	Amon, Joseph J.; Darling, Natalie; Fiore, Anthony E.; Bell, Beth P.; Barker, Lawrence E.	Factors associated with hepatitis A vaccination among children 24 to 35 months of age: United States, 2003	Pediatrics	0.75	USA			hep
2009	Araújo, Ana Catarina Melo; Silva, Maria Rejane Ferreira; Frias, Paulo Germano	Avaliação da rede de frio do programa municipal de imunização do distrito sanitário IV do município do Recife; Assessing the vaccine cold chain of a municipal immunization program: IV sanitary district, Recife	Rev. APS	0.75	BRA			

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2010	Austvoll-Dahlgren, Astrid; Helseth, Sølvi	What informs parents' decision-making about childhood vaccinations?	Journal of advanced nursing	0.75				
1992	Avila-Figueroa, C.; Navarrete-Navarro, S.; Ramirez-Galvan, L.; Baltazar-Lopez, A.; Lopez-Serrano, M.; Santos-Preciado, J. I.	Inmunizaciones en ninos hospitalizados y de consulta externa: reduccian de las oportunidades perdidas de vacunacian	Boletan Medico del Hospital Infantil de Mexico	0.75				
2012	Balogun, M. R.; Sekoni, A. O.; Okafor, I. P.; Odukoya, O. O.; Ezeiru, S. S.; Ogunnowo, B. E.; Campbell, P. C.	Access to information technology and willingness to receive text message reminders for childhood immunisation among mothers attending a tertiary facility in Lagos, Nigeria	South African Journal of Child Health	0.75	NGA			
1998	Banda, Dorothy Hsm	Incorporation of child survival strategies among mothers in Zambia: a knowledge, attitude and practice survey	University of Zambia	0.75	ZMB			
2012	Bouhamam, N.; Laporte, R.; Boutin, A.; Uters, M.; Bremond, V.; Noel, G.; Rodier, P.; Minodier, P.	Relationship between precariousness, social coverage, and vaccine coverage: survey among children consulting in pediatric emergency departments in France	Archives De Pédiatrie: Organe Officiel De La Sociéte Française De Pédiatrie	0.75	FRA			
2004	Calvo, Nidia; Morice, Ana; Saenz, Elizabeth; Navas, Lissette	Using surveys of schoolchildren to evaluate coverage with and opportunity for vaccination in Costa Rica	Revista Panamericana de Salud Publica	0.75				
2006	Cavailler, Philippe; Lucas, Marcelino; Perroud, Valerie; Mcchesney, Margaret; Ampuero, Sonia; Guérin, Philippe J.; Legros, Dominique; Nierle, Thomas; Mahoudeau, Claude; Lab, Bruno; Others	Feasibility of a mass vaccination campaign using a two-dose oral cholera vaccine in an urban cholera-endemic setting in Mozambique	Vaccine	0.75	MOZ			cholera
2010	Cheng, Po-Jen; Huang, Shang-Yu; Shaw, Sheng-Wen; Kao, Chuan-Chi; Chueh, Ho-Yen; Chang, Shuenn-Dhy; Hsu, Te-Yao; Kung, Fu-Tsai; Others	Factors influencing women's decisions regarding pertussis vaccine: A decision-making study in the Postpartum Pertussis Immunization Program of a teaching hospital in Taiwan	Vaccine	0.75	TWN			pertussis
1998	Chilowa, Wycliffe; Munthali, Alister C.	A Study of Vaccination Cultures, Social Demand for Immunization, and Practices of Vaccination Regimes: Chitipa District Report	University of Malawi	0.75	MWI			
1994	Costa Tadeo, X.; Rodriguez Arce, A.; Pérez Padura, N.; Begines Corral, M.; Cabello Ortega, R. C.; Romero Gómez, A.	Influenza vaccination in high-risk groups. Role of the nursing staff	Atencion Primaria / Sociedad Española De Medicina De Familia Y Comunitaria	0.75				influenza
2000	D, Bolanda; P, Talani; P, Nzaba; H, Moudzeo; M, Biahoua; H, Mayanda; F, Yala	Survey of measles vaccine coverage in Brazzaville	Bulletin de la Societe de pathologie exotique (1990)	0.75				
2003	Daly, A. D.; Nxumalo, M. P.; Biellik, R. J.	Missed opportunities for vaccination in health facilities in Swaziland: original article	South African Medical Journal	0.75				
2007	Davaalkham, Dambadarjaa; Ojima, Toshiyuki; Wiersma, Steven; Lkhagvasuren, Tserenkhuu; Nymadawa, Pagvajav; Uehara, Ritei; Watanabe, Makoto; Oki, Izumi; Nakamura, Yosikazu	Administration of hepatitis B vaccine in winter as a significant predictor of the poor effectiveness of vaccination in rural Mongolia: evidence from a nationwide survey	Journal of epidemiology and community health	0.75	MNG			hep
1999	Davis, R. L.; Rubanowice, D.; Shinefield, H. R.; Lewis, N.; Gu, D.; Black, S. B.; Destefano, F.; Gargiullo, P.; Mullooly, J. P.; Thompson, R. S.; Chen, R. T.	Immunization levels among premature and low-birth-weight infants and risk factors for delayed up-to-date immunization status. Centers for Disease Control and Prevention Vaccine Safety Datalink Group	JAMA	0.75				
1998	De Campo, M. P.; Lester, Rosemary	Maintenance of the vaccine cold chain by councils and general practices in Victoria.	The Medical journal of Australia	0.75				
2005	De La Hoz, Fernando; Perez, Ligia; Wheeler, Jeremy G.; De Neira, Marlen; Hall, Andrew J.	Vaccine coverage with hepatitis B and other vaccines in the Colombian Amazon: do health worker knowledge and perception influence coverage?	Tropical medicine & international health	0.75	COL			hep
1987	De Swardt, R.; Ijsselmuiden, C. B.; Edginton, M. E.	Vaccine cold-chain status in the Elim health ward of Gazankulu.	South African medical journal	0.75	ZAF			
2010	Dempsey, Amanda F.; Mendez, David	Examining future adolescent human papillomavirus vaccine uptake, with and without a school mandate	Journal of Adolescent Health	0.75				hpv
2001	Deshpande, Renu; Nimbalkar, Somashekhar; Banker, Nilesh; Kapoor, Anju	Prevalence of missed opportunities for measles immunization in rural areas of Gujarat	The Indian Journal of Pediatrics	0.75				
2009	Duclos, Philippe; Okwo-Bele, Jean-Marie; Gacic-Dobo, Marta; Cherian, Thomas	Global immunization: status, progress, challenges and future	BMC International Health and Human Rights	0.75				
2000	Durrheim, D. N.; Ogunbanjo, G. A.	Measles elimination-is it achievable? Lessons from an immunisation coverage survey.	South African medical journal= Suid-Afrikaanse tydskrif vir geneeskunde	0.75				
2004	Edstam, James S.; Dulmaa, Nyamkhuu; Tsendjav, Orgil; Dambasuren, Baasandorj; Densmaa, Batochir	Exposure of hepatitis B vaccine to freezing temperatures during transport to rural health centers in Mongolia	Preventive medicine	0.75	MNG			hep
2006	Elliott, C.; Farmer, K.	Immunization status of children under 7 years in the Vikas Nagar area, North India	Child: Care, Health and Development	0.75				
2007	Fantahun, Mesganaw; Berhane, Yemane; Wall, Stig; Byass, Peter; Hogberg, Ulf	Women's involvement in household decision-making and strengthening social capital-crucial factors for child survival in Ethiopia	Acta Peadiatrica	0.75				
2008	Freed, Gary L.; Cowan, Anne E.; Gregory, Sashi; Clark, Sarah J.	Variation in provider vaccine purchase prices and payer reimbursement	Pediatrics	0.75				
2007	Galhotra, Abhiruchi; Goel, Naveen K.; Pathak, Rambha; Kumar, Rajinder; Swami, H. M.	Surveillance of cold chain system during intensified pulse polio programme-2006 in Chandigarh	The Indian Journal of Pediatrics	0.75	IND			polio

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1993	Grabowsky, Mark	Studies to Increase Immunization In Inner-City Areas: Principal Lessons Learned from the Diagnostic Phase Mark Grabowsky, MD, Vance Dietz, MD, Gail King, MD, Lauri Markowitz, MD Surveillance, Investigations, and Research Branch	National Immunization Conference Proceedings	0.75				
1980	Greenwood, B. M.; Bradley, A. K.; Blakebrough, I. S.; Whittle, H. C.; Marshall, Tf De C.; Gilles, H. M.	The immune response to a meningococcal polysaccharide vaccine in an African village	Transactions of the Royal Society of Tropical Medicine and Hygiene	0.75	NGA			mening
2003	Gust, Debbie A.	Who Are the Parents of Children Missing Two or More of the Following Vaccines: DTP, MMR and Hepatitis B?	The 37th National Immunization Conference of CDC	0.75				diphtheria, hep, measles, mumps, pertussis, rubella, tetanus
2004	Gust, Deborah A.; Strine, Tara W.; Maurice, Emmanuel; Smith, Philip; Yusuf, Hussain; Wilkinson, Marilyn; Battaglia, Michael; Wright, Robert; Schwartz, Benjamin	Underimmunization among children: effects of vaccine safety concerns on immunization status	Pediatrics	0.75				
2010	Guthmann, J. P.; Fonteneau, L.; Antona, D.; Levy-Bruhl, D.	Factors associated with tetanus vaccination coverage in adults in France and with knowledge of vaccination status	Medecine et maladies infectieuses	0.75	FRA			tetanus
1991	Habimana, P.; Bararwandika, A.	Knowledge, attitudes and behavior of parents concerning immunization	Imbonezamuryango = Famille, santé, développement / République rwandaise, Office national de la population (ONAPO)	0.75				
2004	Hampton, Tracy	Undervaccination of Children	JAMA	0.75				
1996	Hanjeet, K.; Lye, M. S.; Sinniah, M.; Schnur, A.	Evaluation of cold chain monitoring in Kelantan, Malaysia.	Bulletin of the World Health Organization	0.75	MYS			
2006	Heininger, Ulrich; Zuberbuhler, Mirjam	Immunization rates and timely administration in pre-school and school-aged children	European journal of pediatrics	0.75				
2013	Hendry, Maggie; Lewis, Ruth; Clements, Alison; Damery, Sarah; Wilkinson, Clare	"HPV? Never heard of it!": A systematic review of girls' and parents' information needs, views and preferences about human papillomavirus vaccination	Vaccine	0.75			1	hpv
1985	Hilleman, Maurice R.	Newer directions in vaccine development and utilization	Journal of Infectious Diseases	0.75				
2013	Hofstetter, Annika M.; Vargas, Celibell Y.; Kennedy, Allison; Kitayama, Ken; Stockwell, Melissa S.	Parental and provider preferences and concerns regarding text message reminder/recall for early childhood vaccinations	Preventive Medicine	0.75				
2013	Hu, Yu; Li, Qian; Chen, Enfu; Chen, Yaping; Qi, Xiaohua	Determinants of childhood immunization uptake among socio-economically disadvantaged migrants in East China	International Journal of Environmental Research and Public Health	0.75	CHN			
2013	Hu, Yu; Li, Qian; Luo, Shuying; Lou, Linqiao; Qi, Xiaohua; Xie, Shuyun	Timeliness vaccination of measles containing vaccine and barriers to vaccination among migrant children in East China	PloS one	0.75	CHN			measles
1992	Hughart, N.; Silimperi, D. R.; Khatun, J.; Stanton, B.	A new EPI strategy to reach high risk urban children in Bangladesh: urban volunteers	Tropical and Geographical Medicine	0.75				
2002	Jain, Ram B.; Mokdad, Ali H.; Barker, Lawrence E.; Chu, Susan	Risk Factors for Under-Immunization in Urban and Non-Urban Areas, NIS 1999	The 36th National Immunization Conference of CDC	0.75				
2014	Jaiswal, Nishant P; Singh, Meenu; Agarwal, Amit; Thumburu, Kiran K; Mathew, Joseph; Bharti, Bhavneet	Implementation strategies for public health interventions like immunization	PROSPERO	0.75				
1999	Jamil, Kanta; Bhuiya, Abbas; Streatfield, Kim; Chakrabarty, Nitai	The Immunization Programme in Bangladesh: Impressive Gains in Coverage, But Gaps Remain	Health Policy and Planning	0.75				
1992	Jones, K.; Fasher, B.; Hanson, R.; Burgess, M.; Isaacs, D.; Joshi, P.; Blanch, R.; Byrne, J.	Immunization status of casualty attenders: risk factors for non-compliance and attitudes to 'on the spot' immunization	Journal of Paediatrics and Child Health	0.75				
2012	Karlsson, Simon	Routine Child Vaccination in Uganda: Designing a vaccination service delivery model	Blekinge Institute of Technology	0.75	UGA			
2006	Khatun, Jahanara; Roy, Nikhil Chandra	Missed Opportunities for Reproductive and Child Health Services of Clients in Urban NGO Clinics of Bangladesh	Maternal and Child Health Journal	0.75				
2011	Khowaja, Asif Raza; Zaman, Umber; Feroze, Asher; Rizvi, Arjumand; Zaidi, Anita Km	Routine EPI coverage: subdistrict inequalities and reasons for immunization failure in a rural setting in Pakistan	Asia-Pacific Journal of Public Health	0.75	PAK			
1985	Kirkman-Liff, Bradford; Dandoy, S.; Kallet, G.	The hepatitis B vaccine: utilization decision process and outcomes in community hospitals.	Health services research	0.75				hep
2013	Kochhar, Sonali; Rath, Barbara; Seeber, Lea D.; Rundblad, Gabriella; Khamesipour, Ali; Ali, Mohammad	Introducing new vaccines in developing countries	Expert review of vaccines	0.75		Developing Countries		
2009	Koumare, Abdel K.; Traore, Drissa; Haidara, Fatouma; Sissoko, Filifing; Traore, Issa; Drame, Sekou; Sangare, Karim; Diakite, Karim; Coulibaly, Brehima; Togola, Birama; Others	Evaluation of immunization coverage within the Expanded Program on Immunization in Kita Circle, Mali: a cross-sectional survey	BMC international health and human rights	0.75				
1995	Kum-Nji, Philip; James, David; Herrod, Henry G.	Immunization status of hospitalized preschool children: risk factors associated with inadequate immunization	Pediatrics	0.75				

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1993	Laston, Sandra L.; Baqui, Abdullah Hel; Paljor, Ngudup; Silimperi, Diana R.	Immunization beliefs and coverage in Dhaka urban slums.	International centre for diarrhoeal disease research (ICDDR, B)	0.75	BGD			
2012	Lee, Bruce Y.; Cakouros, Brigid E.; Assi, Tina-Marie; Connor, Diana L.; Welling, Joel; Kone, Souleymane; Djibo, Ali; Wateska, Angela R.; Pierre, Lionel; Brown, Shawn T.	The impact of making vaccines thermostable in Niger's vaccine supply chain	Vaccine	0.75	NER			
2005	Lieu, Tracy A.; Mcguire, Thomas G.; Hinman, Alan R.	Overcoming economic barriers to the optimal use of vaccines	Health Affairs	0.75				
1992	Loevinsohn, B. P.; Gareaballah, E.	Missed opportunities for immunization during visits for curative care: a randomized cross-over trial in Sudan	Bulletin of the World Health Organization	0.75				
1994	Majumder, A. K.; Aziz, S.; Paul, J. C.	Impact of socio-economic factors on immunisation among children and mothers in an urban area of Bangladesh.	Journal of family welfare	0.75	BGD			
1996	Meszaros, Jacqueline R.; Asch, David A.; Baron, Jonathan; Hershey, John C.; Kunreuther, Howard; Schwartz-Buzaglo, Joanne	Cognitive processes and the decisions of some parents to forego pertussis vaccination for their children	Journal of clinical epidemiology	0.75				pertussis
2004	Middleman, Amy B.	Race/ethnicity and gender disparities in the utilization of a school-based hepatitis B immunization initiative	Journal of adolescent health	0.75				hep
2005	Middleton, Donald B.; Fox, Dwight E.; Nowalk, Mary Patricia; Skledar, Susan J.; Sokos, Denise R.; Zimmerman, Richard K.; Ervin, Kelly A.; Lin, Chyongchiou J.	Overcoming barriers to establishing an inpatient vaccination program for pneumococcus using standing orders	Infection Control and Hospital Epidemiology	0.75				pneumo
2013	Moniz, Michelle H.; Vitek, Wendy S.; Akers, Aletha; Meyn, Leslie A.; Beigi, Richard H.	Perceptions and acceptance of immunization during pregnancy	The Journal of Reproductive Medicine	0.75				
2011	Mutua, Martin K.; Kimani-Murage, Elizabeth; Ettarh, Remare R.	Childhood vaccination in informal urban settlements in Nairobi, Kenya: Who gets vaccinated?	BMC public health	0.75	KEN			
2001	Naficy, Abdollah B.; Trach, Dang Duc; Ke, Nguyen Thi; Chuc, Nguyen Thi Kim; Sorkin, Alan; Rao, Malla R.; Sy, Trinh Hung; Thiem, Vu Dinh; Mahoney, Richard T.; Holmgren, Jan; Others	Cost of immunization with a locally produced, oral cholera vaccine in Viet Nam	Vaccine	0.75	VNM			cholera
2013	Namuhaywa, Mangeni Mathias	Knowledge of Health Workers on Cold Chain and Logistics Management for Expanded Program on Immunization in Busia and Namayingo Districts-Eastern Uganda	Open Science Repository Medicine	0.75	UGA			
2009	Nath, Bhola; Singh, Jai V.; Awasthi, Shally; Bhushan, Vidya; Singh, Shivendra K.; Kumar, Vishwajeet	Client satisfaction with immunization services in urban slums of Lucknow district	Indian Journal of Pediatrics	0.75	IND			
2005	Norlijah, O.; Menon, B. S.; Azlyna, M. Y. Y.	Risk factors associated with incomplete immunisation in hospitalised infants	The Medical Journal of Malaysia	0.75				
1997	Omaswa, F.; Burnham, G.; Baingana, G.; Mwebesa, H.; Morrow, R.	Introducing quality management into primary health care services in Uganda.	Bulletin of the World Health Organization	0.75	UGA			
1992	Onoja, A. L.; Adu, F. D.; Tomori, O.	Evaluation of measles vaccination programme conducted in two separate health centres	Vaccine	0.75				
2013	Opel, Douglas J.; Taylor, James A.; Zhou, Chuan; Catz, Sheryl; Myaing, Mon; Mangione-Smith, Rita	The relationship between parent attitudes about childhood vaccines survey scores and future child immunization status: a validation study	JAMA pediatrics	0.75				
2009	Osaki, K.; Hattori, T.; Kosen, Soewarta; Singgih, Budihardja	Investment in home-based maternal, newborn and child health records improves immunization coverage in Indonesia	Transactions of the Royal Society of Tropical Medicine and Hygiene	0.75	IDN			
2007	Overton, E. T.; Nurutdinova, D.; Sungkanuparph, S.; Seyfried, W.; Groger, R. K.; Powderly, W. G.	Predictors of immunity after hepatitis A vaccination in HIV-infected persons	Journal of viral hepatitis	0.75				hep
2000	P, Talani; J, Nkounkou-Pika; H, Mayanda; F, Yala	Missed vaccination opportunities in Brazzaville	Bulletin de la Societe de pathologie exotique	0.75				
2013	Park, Boyoung; Choi, Kui Son; Lee, Hoo-Yeon; Kwak, Min-Son; Jun, Jae Kwan; Park, Eun-Cheol	Determinants of suboptimal hepatitis B vaccine uptake among men in the Republic of Korea: where should our efforts be focused: results from cross-sectional study	BMC infectious diseases	0.75	KOR			hep
1998	Perry, H.; Weierbach, R.; Hossain, I.; Islam, R.	Tetanus toxoid immunization coverage among women in zone 3 of Dhaka city: the challenge of reaching all women of reproductive age in urban Bangladesh.	Bulletin of the World Health Organization	0.75	BGD			tetanus
2009	Piso, B.; Wild, C.	Decision support in vaccination policies	Vaccine	0.75				
2009	Porter, Basil; Rosen, Bruce; Rishpon, Shmuel	Development and implementation of vaccine policy	Health policy monitor	0.75				
2001	Pulido, M. J.; Alvarado, E. A.; Berger, W.; Nelson, A.; Todoroff, C.	Vaccinating Asian Pacific Islander children against hepatitis B: ethnic-specific influences and barriers	Asian American and Pacific Islander Journal of Health	0.75				hep
2011	Quaiyum, Md Abdul; Gazi, Rukhsana; Khan, Azharul I.; Uddin, Jasim; Islam, Meghla; Ahmed, Faiz; Saha, Nirod C.	Programmatic aspects of dropouts in child vaccination in Bangladesh: findings from a prospective study	Asia-Pacific Journal of Public Health	0.75	BGD			
1995	Rahman, M. Mujibur; Islam, M. Aminul; Mahalanabis, D.	Mothers' knowledge about vaccine preventable diseases and immunization coverage of a population with high rate of illiteracy	Journal of tropical pediatrics	0.75				
2001	Reading, Richard	Routine vaccinations and child survival: follow up study in Guinea-Bissau, West Africa.	Ambulatory Child Health	0.75				
2010	Redsell, Sarah A.; Bedford, Helen; Siriwardena, A. Niroshan; Collier, Jacqueline; Atkinson, Philippa	Exploring communication strategies to use with parents on childhood immunisation	Nursing Times	0.75				

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1997	Reichler, Mary R.; Kharabsheh, Sa'Ad; Rhodes, Philip; Otoum, Haider; Bloch, Samir; Majid, Mazen Abdel; Pallansch, Mark A.; Patriarca, Peter A.; Cochi, Stephen L.	Increased immunogenicity of oral poliovirus vaccine administered in mass vaccination campaigns compared with the routine vaccination program in Jordan	Journal of Infectious Diseases	0.75	JOR			polio
2009	Ren, Qian; Xiong, Hongyan; Li, Yafei; Xu, Rufu; Zhu, Caizhong	Evaluation of an outside-the-cold-chain vaccine delivery strategy in remote regions of western China	Public health reports	0.75	CHN			
2002	Rhodes, Scott D.; Hergenrather, Kenneth C.	Exploring hepatitis B vaccination acceptance among young men who have sex with men: facilitators and barriers	Preventive Medicine	0.75				hep
2014	Roblin, Douglas W.; Ritzwoller, Debra P.; Rees, Daniel I.; Carroll, Nikki M.; Chang, Anping; Daley, Matthew F.	The influence of deductible health plans on receipt of the human papillomavirus vaccine series	Journal of Adolescent Health	0.75				hpv
2003	S, Dasgupta; I, Saha; Sk, Ray; R, Ram; S, Kumar	Missed opportunities for immunization: study in three medical teaching institutions	Indian journal of public health	0.75				
2012	Saeterdal, Ingvil; Glenton, Claire; Austvoll-Dahlgren, Astrid; Munabi-Babigumira, Susan; Lewin, Simon	Community-directed interventions for informing and/or educating about early childhood vaccination	Cochrane Database of Systematic Reviews	0.75				
2014	Saeterdal, Ingvil; Lewin, Simon; Austvoll-Dahlgren, Astrid; Glenton, Claire; Munabi-Babigumira, Susan	Interventions aimed at communities to inform and/or educate about early childhood vaccination	The Cochrane Database of Systematic Reviews	0.75				
2013	Saindou, Maoulide; Voirin, Nicolas; Troalen, Didier; Abaine, Abdoulkarim; Chevallier-Queyron, Philippe; Ecochard, René; Vanhems, Philippe	Socio-demographic and behavioral determinants of hepatitis B vaccination and infection in pregnant women on Mayotte Island, Indian Ocean	Vaccine	0.75	MYT			hep
2007	Samant, Yogindra; Lanjewar, Hemant; Parker, David; Block, Lester; Tomar, Gajendra S.; Stein, Ben	Evaluation of the cold-chain for oral polio vaccine in a rural district of India	Public health reports	0.75	IND			polio
2004	Santoli, Jeanne M.; Huet, Natalie J.; Smith, Philip J.; Barker, Lawrence E.; Rodewald, Lance E.; Inkelas, Moira; Olson, Lynn M.; Halfon, Neal	Insurance status and vaccination coverage among US preschool children	Pediatrics	0.75	USA			
1997	Sellors, J.; Pickard, L.; Mahony, J. B.; Jackson, K.; Nelligan, P.; Zimic-Vincetic, M.; Chernesky, M.	Understanding and enhancing compliance with the second dose of hepatitis B vaccine: a cohort analysis and a randomized controlled trial	CMAJ: Canadian Medical Association Journal	0.75				hep
2000	Singh, Padam; Yadav, R. J.	Immunization status of children of India.	Indian pediatrics	0.75				
2012	Small, Stephanie L.; Patel, Divya A.	Impact of HPV vaccine availability on uptake	The Journal for Nurse Practitioners	0.75				hpv
2001	Sokhey, Jotna; Jain, D. C.; Harit, A. K.; Dhariwal, A. C.	Moderate Immunization Coverage Levels in East Delhi: Implications for Disease Control Programmes and Introduction of New Vaccines	Journal of Tropical Pediatrics	0.75				
2000	Szilagyi, Peter G.; Bordley, Clayton; Vann, Julie C.; Chelminski, Ann; Kraus, Ronald M.; Margolis, Peter A.; Rodewald, Lance E.	Effect of patient reminder/recall interventions on immunization rates: a review	Jama	0.75				1
2002	Szilagyi, Peter G.; Schaffer, Stanley; Shone, Laura; Barth, Richard; Humiston, Sharon G.; Sandler, Mardy; Rodewald, Lance E.	Reducing geographic, racial, and ethnic disparities in childhood immunization rates by using reminder/recall interventions in urban primary care practices	Pediatrics	0.75				
2011	Tertuliano, Gisele Cristina; Stein, Airton Tetelbom	Immunization delay determinants: a study in a place attended by Family Health Strategy	Ciência & Saúde Coletiva	0.75				
2005	Trama, Annalisa; Walker, Damian; Fox-Rushby, Julia	Introducing hepatitis B virus vaccine into the Expanded Programme on Immunization in Bangladesh: a proposed method to evaluate whether the existing infrastructure has the capacity	Journal of Health, Population and Nutrition	0.75	BGD			hep
1988	Van Zwanenberg, T. D.; Hull, C.	Improving immunisation: coverage in a province in Papua New Guinea	British Medical Journal (Clinical Research Ed.)	0.75				
2004	Viviani, Simonetta; Mendy, Maimuna; Jack, Abdoulie D.; Hall, Andrew J.; Montesano, Ruggero; Whittle, Hilton C.	EPI vaccines-induced antibody prevalence in 8-9 year-olds in The Gambia	Tropical Medicine & International Health	0.75				
1995	Watson, J. M.; Kemper, K. J.	Maternal factors and child's health care use	Social Science & Medicine	0.75				
2013	Wehby, George L.	Child health insurance and early preventive care in three South American countries	Health Policy and Planning	0.75		South America		
2002	Whittaker, Karen	Lay workers for improving the uptake of childhood immunization	British journal of community nursing	0.75				
1978	Williamson, W. A.; Greenwood, B. M.	Impairment of the immune response to vaccination after acute malaria	The Lancet	0.75				
2007	Wirkas, Theo; Toikilik, Steven; Miller, Nan; Morgan, Chris; Clements, C. John	A vaccine cold chain freezing study in PNG highlights technology needs for hot climate countries	Vaccine	0.75	PNG			
2004	Witter, Sophie; Osiga, Gamba	Health service quality and users' perceptions in West Nile, Uganda	The International journal of health planning and management	0.75	UGA			
1995	Wood, David; Donald-Sherbourne, Cathy; Halfon, Neal; Tucker, M. Belinda; Ortiz, Vilma; Hamlin, Julie Shea; Duan, Naihua; Mazel, Rebecca M.; Grabowsky, Mark; Brunell, Philip; Others	Factors related to immunization status among inner-city Latino and African-American preschoolers	Pediatrics	0.75	USA			
1995	Woodyard, Erika; Woodyard, Lance; Alto, William A.	Vaccine storage in the physician's office: a community study	The Journal of the American Board of Family Practice	0.75				
2010	World Health Organization; Unicef; Gavi Alliance; Path	Effective Vaccine Management Initiative	WHO	0.75				

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2006	Wright, Thomas C.; Van Damme, Pierre; Schmitt, Heinz-Josef; Meheus, André	HPV vaccine introduction in industrialized countries	Vaccine	0.75	High Income Countries			hpv
1997	Wylie, A.	Development of immunization training materials in Zambia October 4-16 1997.	USAID	0.75	ZMB			
2014	Yadav, Prashant; Lydon, Patrick; Oswald, Julianna; Dicko, Modibo; Zaffran, Michel	Integration of vaccine supply chains with other health commodity supply chains: A framework for decision making	Vaccine	0.75				
2007	Yahya, Maryam	Polio vaccines—"no thank you!" barriers to polio eradication in Northern Nigeria	African Affairs	0.75	NGA			polio
2000	Zhu, X.; Zhang, X.; Wang, L.	National EPI vaccination and hepatitis B vaccine coverage rate and the related factors: Results from the 1999 nationwide survey	Chin J Vacc Immun	0.75				hep
1993	Zimmerman, R. K.; Janosky, J. E.	Immunization barriers in Minnesota private practices: the influence of economics and training on vaccine timing.	Family practice research journal	0.75	USA			
1999	Zimmerman, R. K.; Mieczkowski, T. A.; Michel, M.	Are vaccination rates higher if providers receive free vaccines and follow contraindication guidelines?	Family Medicine	0.75				
2005	Agarwal, Siddharth; Bhanot, Arti; Goindi, Geetanjali; Others	Understanding and addressing childhood immunization coverage in urban slums	Indian pediatrics	0.74				
2009	Akmatov, Manas K.; Mikolajczyk, Rafael T.; Kretzschmar, Mirjam; Krämer, Alexander	Attitudes and beliefs of parents about childhood vaccinations in post-soviet countries: the example of Kyrgyzstan	The Pediatric Infectious Disease Journal	0.74	KGZ			
2005	Alio, Amina P.; Salihu, Hamisu M.	Maternal determinants of pediatric preventive care utilization among blacks and whites	Journal of the National Medical Association	0.74				
1999	Angelillo, I. F.; Ricciardi, G.; Rossi, P.; Pantisano, P.; Langiano, E.; Pavia, M.	Mothers and vaccination: knowledge, attitudes, and behaviour in Italy	Bulletin of the World Health Organization	0.74	ITA			
2007	Arya, S. C.; Agarwal, N.	Re: Relationship between vaccine vial monitors and cold chain infrastructure in a rural district of India.	Rural and remote health	0.74	IND			
2008	Austin, Helen; Campion-Smith, Charles; Thomas, Sarah; Ward, William	Parents' difficulties with decisions about childhood immunisation	Community Practitioner: The Journal of the Community Practitioners' & Health Visitors' Association	0.74				
2010	Ba'Amer, A. A.	Coverage of and barriers to routine child vaccination in Mukalla district, Hadramout governorate, Yemen	Eastern Mediterranean Health Journal = La Revue De Santé De La Méditerranée Orientale = Al-Majallah Al-?i???yah Li-Sharq Al-Mutawassi?	0.74	YEM			
2010	Basaleem, Huda O.; Al-Sakkaf, Khaled A.; Shamsuddin, Khadijah	Immunization coverage and its determinants among children 12-23 months of age in Aden, Yemen	Saudi Medical Journal	0.74	YEM			
2005	Batson, Amie	The problems and promise of vaccine markets in developing countries	Health Affairs	0.74		Developing Countries		
2011	Bednarczyk, Robert A.; Birkhead, Guthrie S.	Reducing financial barriers to vaccinating children and adolescents in the USA	Current Opinion in Pediatrics	0.74	USA			
1996	Chappel, D.; Fernandes, V.	Improving the coverage of neonatal BCG vaccination	Journal of Public Health Medicine	0.74				bcg
2014	Charland, Katia M.; Montigny, Luc; Brownstein, John S.; Buckeridge, David L.	Clinic accessibility and clinic-level predictors of the geographic variation in 2009 pandemic influenza vaccine coverage in Montreal, Canada	Influenza and other respiratory viruses	0.74	CAN			influenza
2007	Chhabra, Dr Pragti; Nair, Parvathy; Gupta, Anita; Sandhir, Meenakshi; Kannan, A. T.	Immunization in urbanized villages of Delhi	The Indian Journal of Pediatrics	0.74				
1979	Cummings, K. M.; Jette, A. M.; Brock, B. M.; Haefner, D. P.	Psychosocial determinants of immunization behavior in a swine influenza campaign	Medical Care	0.74				influenza
1998	Cutts, F. T.	Advances and challenges for the expanded programme on immunization	British medical bulletin	0.74				
2010	Dempsey, Amanda F.; Freed, Gary L.	Health care utilization by adolescents on medicaid: implications for delivering vaccines	Pediatrics	0.74	USA			
2005	Ew, Nacoulma; L, Kam; Ee, Gue; E, Kafando; J, Ayereroue; I, Blot	Vaccination status of children with sickle cell disease in Ouagadougou (Burkina Faso).	Sante (Montrouge, France)	0.74				
2000	Forrest, J. M.; Burgess, M. A.; Mcintyre, P. B.	Factors influencing vaccination uptake. Workshop report. Current Australian research on the behavioural, social and demographic factors influencing immunisation, Royal Alexandra Hospital for Children, Sydney, March 1998.	Communicable diseases intelligence	0.74	AUS			
1995	Frank, Richard G.; Dewa, Carolyn S.; Holt, Elizabeth; Hughart, Nancy; Strobino, Donna; Guyer, Bernard	The demand for childhood immunizations: results from the Baltimore Immunization Study	Inquiry	0.74	USA			
2013	Ganczak, Maria; Dmytrzyk-Dani?Ów, Gabriela; Karakiewicz, Beata; Korze?, Marcin; Szych, Zbigniew	Determinants influencing self-paid vaccination coverage, in 0-5 years old Polish children	Vaccine	0.74	POL			
2012	Gaudino, James A.; Robison, Steve	Risk factors associated with parents claiming personal-belief exemptions to school immunization requirements: community and other influences on more skeptical parents in Oregon, 2006	Vaccine	0.74	USA			
2007	Goel, N; Abrol, A; Pathak, R; Sharma, M; Gulati, S; Swami, H	Status Of Routine Immunisation In Chandigarh , India	The Internet Journal of Health	0.74				
1995	Guendelman, Sylvia; English, Paul; Chavez, Gilberto	The effects of maternal health behaviors and other risk factors on immunization status among Mexican-American infants	Pediatrics	0.74	USA			

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2007	Jin, S. M.; Lee, S. G.	Vaccination status in school entry aged-children and associated factors on timeliness of vaccinations	J Korean Soc Matern Child Health	0.74				
2000	Kahane, Shellie M.; Watt, James P.; Newell, Kevin; Kellam, Steffi; Wight, Suzanne; Smith, Natalie J.; Reingold, Arthur; Adler, Robert	Immunization levels and risk factors for low immunization coverage among private practices	Pediatrics	0.74				
2007	L, Sheng; Sy, Zuo; J, Xie; Yl, Qi; Yb, Tong; Gp, Tang; J, Zhou; Dy, Zhang; Cb, Long; W, Du; Zj, Feng	Feasibility study of enforcing immunization certificate check before primary school or kindergarten enrollment in Guizhou Province, China.	Biomedical and environmental sciences : BES	0.74				
2014	Lazcano-Ponce, Eduardo; Stanley, Margaret; Munoz, Nubia; Torres, Leticia; Cruz-Valdez, Aurelio; Salmerón, Jorge; Rojas, Rosalba; Herrero, Rolando; Hernández-Ávila, Mauricio	Overcoming barriers to HPV vaccination: non-inferiority of antibody response to human papillomavirus 16/18 vaccine in adolescents vaccinated with a two-dose vs. a three-dose schedule at 21 months	Vaccine	0.74				hpv
2007	Lee, Grace M.; Santoli, Jeanne M.; Hannan, Claire; Messonnier, Mark L.; Sabin, James E.; Rusinak, Donna; Gay, Charlene; Lett, Susan M.; Lieu, Tracy A.	Gaps in vaccine financing for underinsured children in the United States	Jama	0.74	USA			
2007	Ma, Grace X.; Fang, Carolyn Y.; Shive, Steven E.; Toubbeh, Jamil; Tan, Yin; Siu, Philip	Risk perceptions and barriers to hepatitis B screening and vaccination among Vietnamese immigrants	Journal of Immigrant and Minority Health	0.74	VNM			hep
2008	Ma, Grace X.; Shive, Steven E.; Toubbeh, Jamil I.; Tan, Yin; Wu, Dunli	Knowledge, attitudes, and behaviors of Chinese hepatitis B screening and vaccination	American journal of health behavior	0.74	CHN			hep
2011	Miller, Brady L.; Kretsinger, Katrina; Euler, Gary L.; Lu, Peng-Jun; Ahmed, Faruque	Barriers to early uptake of tetanus, diphtheria and acellular pertussis vaccine (Tdap) among adults-United States, 2005-2007	Vaccine	0.74	USA			diphtheria, pertussis, tetanus
1999	Money, Meera Karunakaran; Mohan, Pavitra	Measles immunisation coverage in urban slums	The Indian Journal of Pediatrics	0.74				
2000	Moraes, Jose Cassio De; Barata, Rita De Cassia Barradas; Ribeiro, Manoel Carlos De Sampaio De Almeida; Castro, Paulo Carrara De	Immunization coverage in the first year of life in four cities in the state of Sao Paulo, Brazil	Revista Panamericana de Salud Publica	0.74				
2005	Morgenroth, H.; Hellenbrand, W.; Dreja, I.; Kahl, J.; Terhardt, M.; Vogel, M.; Schroten, H.	The vaccination coverage among children aged 24 - 30 months in pediatric offices November 1999 - May 2001. The influence of socio-demographic characteristics	Gesundheitswesen (Bundesverband Der Ärzte Des Öffentlichen Gesundheitsdienstes (Germany))	0.74				
2008	Murakami, Hitoshi; Van Cuong, Nguyen; Huynh, Lynn; Hipgrave, David Barry	Implementation of and costs associated with providing a birth-dose of hepatitis B vaccine in Viet Nam	Vaccine	0.74	VNM			hep
2006	Ozcirpici, B.; Sahinoz, S.; Ozgur, S.; Bozkurt, A. I.; Sahinoz, T.; Ceylan, A.; Ilcin, E.; Saka, G.; Acemoglu, H.; Palanci, Y.; Others	Vaccination coverage in the South-East Anatolian Project (SEAP) region and factors influencing low coverage	Public Health	0.74	TUR			
2010	Parmar, Divya; Baruwa, Elaine M.; Zuber, Patrick; Kone, Souleymane	Impact of wastage on single and multi-dose vaccine vials: Implications for introducing pneumococcal vaccines in developing countries	Human vaccines	0.74		Developing Countries		pneumo
2010	Patel, Amit R.; Nowalk, Mary P.	Expanding immunization coverage in rural India: a review of evidence for the role of community health workers	Vaccine	0.74	IND		1	
2014	Perry, Rachel; Rankin, Kristin; Yu, Miao Crystal; Harwood, Bryna	Factors associated with human papillomavirus vaccination completion on a catch-up schedule	Obstetrics and Gynecology	0.74				hpv
2004	Poland, Gregory A.; Marcuse, Edgar K.	Vaccine availability in the US: problems and solutions	Nature immunology	0.74	USA			
1998	Reichler, M. R.; Darwish, A.; Stroh, G.; Stevenson, J.; Al Nasr, M. A.; Oun, S. A.; Wahdan, M. H.	Cluster survey evaluation of coverage and risk factors for failure to be immunized during the 1995 National Immunization Days in Egypt	International Journal of Epidemiology	0.74	EGY			
2003	Rhodes, Scott D.; Hergenrather, Kenneth C.	Using an integrated approach to understand vaccination behavior among young men who have sex with men: stages of change, the health belief model, and self-efficacy	Journal of Community Health	0.74				
2014	Rossmann Beel, Elizabeth; Rench, Marcia A.; Montesinos, Diana P.; Healy, C. Mary	Acceptability of immunization in adult contacts of infants: possibility of expanding platforms to increase adult vaccine uptake	Vaccine	0.74				
2007	Rousseau, Louise; Guay, Maryse; Archambault, Denis; El M'Ala, Zahra; Abdelaziz, Nadia	Do organizational barriers to pneumococcal and influenza vaccine access exist?	Canadian Journal of Public Health	0.74				influenza, pneumo
1992	Rr, Bourne; Va, Ivanov; Sa, Mckenzie	Sir John McNee bequest summary of a report on a period of elective study immunization rates in Moscow preschool children.	Transactions of the Medical Society of London	0.74				
2012	Sabarwal, Shagun; Mccormick, Marie C.; Silverman, Jay G.; Subramanian, S. V.	Association between maternal intimate partner violence victimization and childhood immunization in India	Journal of tropical pediatrics	0.74	IND			
2009	Salmon, Daniel A.; Smith, Philip J.; Pan, William Ky; Navar, Ann Marie; Omer, Saad B.; Halsey, Neal A.	Disparities in preschool immunization coverage associated with maternal age	Human vaccines	0.74				
2009	Shen, Angela K.; Hunsaker, John; Gazmararian, Julie A.; Lindley, Megan C.; Birkhead, Guthrie S.	Role of health insurance in financing vaccinations for children and adolescents in the United States	Pediatrics	0.74	USA			
2001	Singh, Padam; Yadav, R. J.	Immunisation status of children in BIMARU states	The Indian Journal of Pediatrics	0.74				
2011	Smith, Jon; Lipsitch, Marc; Almond, Jeffrey W.	Vaccine production, distribution, access, and uptake	The Lancet	0.74				
2006	Sotelo, Jcr; Alvarado, Pef	Pentavalent vaccine and vaccination coverage in children aged less than one in Colombia 2000-2003	Revista de Salud Publica	0.74				
2004	Stanton, Bonita F.	Assessment of relevant cultural considerations is essential for the success of a vaccine	Journal of Health, Population and Nutrition	0.74				

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1998	Stronegger, W. J.; Freidl, W.; Rásky, E.; Berghold, A.	Educational status and resources for child care as predictors of TBE vaccination coverage in schoolchildren of an endemic area in Austria	International Journal of Hygiene and Environmental Medicine	0.74	AUT			
2010	Stronegger, Willibald J.; Freidl, Wolfgang	A hierarchical analysis of social determinants of measles vaccination coverage in Austrian schoolchildren	European Journal of Public Health	0.74	AUT			measles
1992	Tandon, B. N.; Gandhi, N.	Immunization coverage in India for areas served by the Integrated Child Development Services programme. The Integrated Child Development Services Consultants	Bulletin of the World Health Organization	0.74				
1996	Taylor, James A.; Cufley, Davonna	The association between parental health beliefs and immunization status among children followed by private pediatricians	Clinical pediatrics	0.74				
2008	Vandermeulen, Corinne; Roelants, Mathieu; Theeten, Heidi; Depoorter, Anne-Marie; Van Damme, Pierre; Hoppenbrouwers, Karel	Vaccination coverage in 14-year-old adolescents: documentation, timeliness, and sociodemographic determinants	Pediatrics	0.74				
2010	Weston, Andrea L.; Enger, Kyle S.	Factors associated with hepatitis A vaccination receipt in one-year-olds in the state of Michigan	Journal of Biomedicine & Biotechnology	0.74	USA			hep
2004	Yadav, R. J.; Singh, Padam	Immunisation of children and mothers in north-eastern states	Health and Population-Perspectives and Issues	0.74				
1997	Zimmerman, R. K.; Bradford, B. J.; Janosky, J. E.; Mieczkowski, T. A.; Desensi, E.; Grufferman, S.	Barriers to measles and pertussis immunization: the knowledge and attitudes of Pennsylvania primary care physicians	American Journal of Preventive Medicine	0.74	USA			measles, pertussis
2007	Adler, Amos; Herring, Eli; Babilsky, Hanan; Gazala, Eli; Cohen, Avner; Levy, Itzhak	Parent-dependent barriers to varicella immunization in Israel: the importance of adequate information	Acta Paediatrica	0.73	ISR			varicella
2012	Al-Dharrab, Ayman A.; Al-Samadani, Khalid H.	Assessment of hepatitis B vaccination and compliance with infection control among dentists in Saudi Arabia	Saudi Medical Journal	0.73	SAU			hep
1996	Alemi, F.; Alemagno, S. A.; Goldhagen, J.; Ash, L.; Finkelstein, B.; Lavin, A.; Butts, J.; Ghadiri, A.	Computer reminders improve on-time immunization rates	Medical Care	0.73				
2004	Anjum, Qudsia; Omair, Aamir; Inam, S. N.; Ahmed, Yousuf; Usman, Yaseen; Shaikh, Shazia	Improving vaccination status of children under five through health education.	The Journal of the Pakistan Medical Association	0.73				
1997	Aristegui, Javier; Garrote, Elisa; González, Antonio; Arrate, Juan-Pedro; Perez, Alberto; Vandepapelière, Pierre	Immune response to a combined hepatitis B, diphtheria, tetanus and whole-cell pertussis vaccine administered to infants at 2, 4 and 6 months of age	Vaccine	0.73				diphtheria, hep, pertussis, tetanus
2010	Baker, Dian L.; Dang, Michelle T.; Ly, May Ying; Diaz, Rafael	Perception of barriers to immunization among parents of Hmong origin in California	American journal of public health	0.73	USA			
1994	Bates, Ann S.; Fitzgerald, John F.; Dittus, Robert S.; Wolinsky, Fredric D.	Risk factors for underimmunization in poor urban infants	JAMA	0.73				
2010	Becker-Dreps, Sylvia; Otieno, Walter Agingu; Brewer, Noel T.; Agot, Kawango; Smith, Jennifer S.	HPV vaccine acceptability among Kenyan women	Vaccine	0.73	KEN			hpv
1993	Berhane, Y.; Pickering, J.	Are reminder stickers effective in reducing immunization dropout rates in Addis Ababa, Ethiopia?	The Journal of Tropical Medicine and Hygiene	0.73	ETH			
2014	Bhattacharya, Sangeeta Das; Bhattacharyya, Subhasish; Chatterjee, Devlina; Niyogi, Swapan Kumar; Chauhan, Nageshwar; Sudar, A.	Risk Factors for Incomplete Immunization in Children with HIV Infection	The Indian Journal of Pediatrics	0.73				
1998	Bhattacharyya, Karabi; Khanam, Rokeya	Process evaluation of the first national immunization day in Bangladesh	USAID	0.73	BGD			
2014	Block, Lauren; Pitts, Samantha; Perl, Trish M.	Barriers and facilitators of implementation of a mandate for influenza vaccination among healthcare personnel	Infection Control and Hospital Epidemiology	0.73				influenza
1986	Bodenheimer Jr, Henry C.; Fulton, John P.; Kramer, Peter D.	Acceptance of hepatitis B vaccine among hospital workers.	American Journal of Public Health	0.73				hep
2005	Bonn, Dorothy	Filling the vaccine gap	The Lancet Infectious Diseases	0.73				
2014	Clouston, S.; Kidman, R.; Palermo, T.	Social inequalities in vaccination uptake among children aged 0-59 months living in Madagascar: an analysis of Demographic and Health Survey data from 2008 to 2009	Vaccine	0.73	MDG			
2003	Cohen, Nicole J.; Lauderdale, Diane S.; Shete, Priya B.; Seal, John B.; Daum, Robert S.	Physician knowledge of catch-up regimens and contraindications for childhood immunizations	Pediatrics	0.73				
2011	Coleman, Maame Aba; Levison, Judy; Sangi-Haghpeykar, Haleh	HPV vaccine acceptability in Ghana, West Africa	Vaccine	0.73	GHA			hpv
2000	Coronado, V. G.; Maes, E. F.; Rodewald, L. E.; Chu, S.; Battaglia, M. P.; Hoaglin, D. C.; Merced, N. L.; Yusuf, H.; Cordero, J. F.; Orenstein, W. A.	Risk factors for underimmunization among 19-35 month-old children in the United States: National Immunization Survey, July 1996-June 1998	Unpublished manuscript, Centers for Disease Control and Prevention, Atlanta	0.73	USA			
2004	Davis, Matthew M.; Szilagyi, Peter G.	Can quality improvement reach into pockets of need for childhood immunizations?	Ambulatory Pediatrics	0.73				
2013	Decade Of Vaccines Collaboration Leadership Council	Global vaccine action plan	WHO	0.73				
2009	Dempsey, Amanda F.; Singer, Dianne; Clark, Sarah J.; Davis, Matthew M.	Parents' views on 3 shot-related visits: implications for use of adolescent vaccines like human papillomavirus vaccine	Academic pediatrics	0.73				hpv
2003	Deroeck, Denise; Deen, Jacqueline; Clemens, John D.	Policymakers' views on dengue fever/dengue haemorrhagic fever and the need for dengue vaccines in four southeast Asian countries	Vaccine	0.73		Southeast Asia		dengue
2012	Diekema, Douglas S.	Improving childhood vaccination rates	New England Journal of Medicine	0.73				

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2012	Djingarey, Mamoudou H.; Barry, Rodrigue; Bonkoungou, Mete; Tiendrebeogo, Sylvestre; Sebgo, Rene; Kandolo, Denis; Lingani, Clement; Preziosi, Marie-Pierre; Zuber, Patrick Lf; Perea, William; Others	Effectively introducing a new meningococcal A conjugate vaccine in Africa: the Burkina Faso experience	Vaccine	0.73	BFA			mening
1999	Fine, Paul Em; Carneiro, Ilona Am; Milstien, Julie B.; Clements, C. John	Issues relating to the use of BCG in immunization programmes	A discussion document. Geneva: World Health Organization	0.73				bcg
1997	Fredrickson, Doren D.; Kies, Kim M.; Burbach, Cindy A.	Immunization Compliance Among Public and Private School Children	Journal of School Health	0.73				
2009	Fu, Linda Y.; Cowan, Nuala; Mclaren, Rosie; Engstrom, Ryan; Teach, Stephen J.	Spatial accessibility to providers and vaccination compliance among children with medicaid	Pediatrics	0.73	USA			
1996	Grabowsky, Mark; Orenstein, Walter A.; Marcuse, Edgar K.	The critical role of provider practices in undervaccination	Pediatrics	0.73				
2010	Guichard, Stephane; Hymbaugh, Karen; Burkholder, Brent; Diorditsa, Serguei; Navarro, Christine; Ahmed, Selina; Rahman, Mohd Mahbubur	Vaccine wastage in Bangladesh	Vaccine	0.73	BGD			
1999	Hambidge, S. J.; Easter, S. A.; Martin, S.; Melinkovich, P.; Brown, J.; Siegel, C. D.	Characteristics of families who attend free vaccine fairs	Pediatrics	0.73				
2006	Hamilton-West, Kate	Factors influencing MMR vaccination decisions following a mumps outbreak on a university campus	Vaccine	0.73				measles, mumps, rubella
1975	Hendrickse, R. G.	Problems of future measles vaccination in developing countries	Transactions of the Royal Society of Tropical Medicine and Hygiene	0.73		Developing Countries		measles
2004	Hinds, A.; Cameron, J. C.	Acceptability of universal hepatitis B vaccination among school pupils and parents	Communicable disease and public health	0.73				hep
2006	Hipgrave, David B.; Maynard, James E.; Biggs, Beverley-Ann	Improving birth dose coverage of hepatitis B vaccine	Bulletin of the World Health Organization	0.73				hep
2005	Humiston, Sharon G.; Rosenthal, Susan L.	Challenges to vaccinating adolescents: vaccine implementation issues	The Pediatric infectious disease journal	0.73				
2013	Kaljee, Linda M.; Pach, Alfred; Thriemer, Kamala; Ley, Benedikt; Jiddawi, Mohamed; Puri, Mahesh; Ochiai, Leon; Wierzba, Thomas; Clemens, John; Ali, Said M.	Desirability for a typhoid fever vaccine among rural residents, Pemba Island, Tanzania	Vaccine	0.73	TZA			typhoid
2006	Kane, Mark A.; Sherris, Jacqueline; Coursaget, Pierre; Aguado, Teresa; Cutts, Felicity	HPV vaccine use in the developing world	Vaccine	0.73		Developing Countries		hpv
1997	Kendal, Alan P.; Snyder, Robert; Garrison, Paul J.	Validation of cold chain procedures suitable for distribution of vaccines by public health programs in the USA	Vaccine	0.73	USA			
1996	Kimmel, S. R.; Madlon-Kay, D.; Burns, I. T.; Admire, J. B.	Breaking the barriers to childhood immunization.	American family physician	0.73				
2008	Lamden, Kenneth H.; Gemmell, Islay	General practice factors and MMR vaccine uptake: structure, process and demography	Journal of Public Health	0.73				measles, mumps, rubella
2011	Lechuga, Julia; Swain, Geoffrey R.; Weinhardt, Lance S.	The cross-cultural variation of predictors of human papillomavirus vaccination intentions	Journal of Women's Health	0.73				hpv
2009	Lindley, M. C.; Orenstein, W. A.; Shen, A. K.; Rodewald, L.; Birkhead, G. S.	Assuring vaccination of children and adolescents without financial barriers: recommendations from the National Vaccine Advisory Committee (NVAC)	Washington, DC: US Department of Health and Human Services	0.73				
1996	Lopreiato, J. O.; Ottolini, M. C.	Assessment of immunization compliance among children in the Department of Defense health care system	Pediatrics	0.73				
1999	Mack, R. W.; Darden, P. M.	Children's immunizations: the gap between parents and providers	Health Marketing Quarterly	0.73				
2005	Matsumura, Takayo; Nakayama, Takeo; Okamoto, Shigeru; Ito, Hideko	Measles vaccine coverage and factors related to uncompleted vaccination among 18-month-old and 36-month-old children in Kyoto, Japan	BMC Public Health	0.73	JPN			measles
1981	Maynard, J. E.	Hepatitis B vaccine: strategies for utilization	Hepatitis B vaccine. INSERM symposium	0.73				hep
2011	Mccolloster, Patrick J.	US vaccine refrigeration guidelines: loose links in the cold chain	Human vaccines	0.73	USA			
1993	Miles, Thais A.	The integrity of the vaccine cold chain in the Hunter area of New South Wales	Australian journal of public health	0.73	AUS			
2003	Milledge, J. T.; Cooper, C. D.; Woolfenden, S. R.	Barriers to immunization: attitudes of general practitioners to varicella, the disease and its vaccine	Journal of paediatrics and child health	0.73				varicella
1999	Nace, N. B.; Larson, C.; Lester, T.; Kosinski, J.	Perceived barriers to childhood immunization: a physician and parent survey in a southeastern urban/rural community	Tennessee Medicine: Journal of the Tennessee Medical Association	0.73				
2012	Nasiru, Sani-Gwarzo; Aliyu, Gambo G.; Gasasira, Alex; Aliyu, Muktar H.; Zubair, Mahmud; Mandawari, Sunusi U.; Waziri, Hassana; Nasidi, Abdulsalami; El-Kamary, Samer S.	Breaking community barriers to polio vaccination in Northern Nigeria: the impact of a grass roots mobilization campaign (Majigi)	Pathogens and global health	0.73	NGA			polio

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2008	Okamoto, Shigeru; Slingsby, Brian Taylor; Nakayama, Takeo; Nakamura, Kanae; Fukuda, Risa; Gomi-Yano, Harumi; Ohno, Hiroshi; Matsumura, Tadashi	Barriers to vaccination among Japanese medical students: Focus group interviews	Pediatrics International	0.73	JPN			
2014	Okeibunor, Joseph; Gasasira, Alex; Mihigo, Richard; Salla, Mbaye; Poy, Alain; Orkeh, Godwin; Shaba, Keith; Nshimirimana, Deo	Trend in proportions of missed children during polio supplementary immunization activities in the African Region: evidence from independent monitoring data 2010–2012	Vaccine	0.73		Africa		polio
2002	Palmowski, Michael J.; Choi, Ed Man-Lik; Hermans, Ian F.; Gilbert, Sarah C.; Chen, Ji-Li; Gileadi, Uzi; Salio, Mariolina; Van Pel, Aline; Man, Stephen; Bonin, Eivor; Others	Competition between CTL narrows the immune response induced by prime-boost vaccination protocols	The Journal of Immunology	0.73				
2006	Plotkin, Stanley A.	Mass Vaccination: Global Aspects-Progress and Obstacles	Springer Science & Business Media	0.73				
1982	Rahman, Makhlisur; Chen, Lincoln C.; Chakraborty, J.; Yunus, Md; Faruque, A. S.; Chowdhury, A. I.	Use of tetanus toxoid for the prevention of neonatal tetanus. 2. Immunization acceptance among pregnant women in rural Bangladesh.	Bulletin of the World Health organization	0.73	BGD			tetanus
1991	Rees, H.; Buch, E.; Ferrinho, P. D.; Groenewald, H. T.; Neethling, A.	Immunisation coverage and reasons associated with non-immunisation in Alexandra township, September 1988	South African Medical Journal	0.73	ZAF			
2014	Rickert, Vaughn I.; Auslander, Beth A.; Cox, Dena S.; Rosenthal, Susan L.; Rickert, Jeffrey A.; Rupp, Richard; Zimet, Gregory D.	School-based vaccination of young US males: impact of health beliefs on intent and first dose acceptance	Vaccine	0.73	USA			
2001	Rizvi, N.; Hussain, M.	Survey of knowledge about tuberculosis amongst family physicians	JOURNAL-PAKISTAN MEDICAL ASSOCIATION	0.73				
2006	Rodewald, Lance E.; Orenstein, Walter A.; Mason, Dean D.; Cochi, Stephen L.	Vaccine supply problems: a perspective of the Centers for Disease Control and Prevention	Clinical infectious diseases	0.73				
2003	Rudy, Ellen T.; Detels, Roger; Douglas, Wendy; Greenland, Sander	Factors affecting hepatitis vaccination refusal at a sexually transmitted disease clinic among men who have sex with men	Sexually transmitted diseases	0.73				hep
2000	S, Dasgupta; D, Pal; Rn, Sinha; Nk, Mandal; Pr, Karmakar; I, Saha; Ak, Mandal	Declining trend in routine UIP coverage	Indian journal of public health	0.73				
1994	Salsberry, P. J.; Nickel, J. T.; Mitch, R.	Inadequate immunization among 2-year-old children: a profile of children at risk	Journal of Pediatric Nursing	0.73				
2003	Santoli, J. M.; Peter, G.; Arvin, A. M.; Davis, J. P.; Decker, M. D.; Fast, P.; Guerra, F. A.; Helms, C. M.; Hinman, A. R.; Katz, R.; Others	Strengthening the supply of routinely recommended vaccines in the United States: recommendations from the National Vaccine Advisory Committee.	JAMA	0.73	USA			
2002	Scott, Tracy L.; Gazmararian, Julie A.; Williams, Mark V.; Baker, David W.	Health literacy and preventive health care use among Medicare enrollees in a managed care organization	Medical Care	0.73	USA			
2010	Semali, Innocent A.	Trends in immunization completion and disparities in the context of health reforms: the case study of Tanzania	BMC health services research	0.73	TZA			
2005	Slonim, Amy B.; Roberto, Anthony J.; Downing, Christi R.; Adams, Inez F.; Fasano, Nancy J.; Davis-Satterla, Loretta; Miller, Mark A.	Adolescents' knowledge, beliefs, and behaviors regarding hepatitis B: Insights and implications for programs targeting vaccine-preventable diseases	Journal of adolescent health	0.73				hep
2008	Smith, Michael J.; Ellenberg, Susan S.; Bell, Louis M.; Rubin, David M.	Media coverage of the measles-mumps-rubella vaccine and autism controversy and its relationship to MMR immunization rates in the United States	Pediatrics	0.73	USA			measles, mumps, rubella
2005	Smith, Philip J.; Santoli, Jeanne M.; Chu, Susan Y.; Ochoa, Dianne Q.; Rodewald, Lance E.	The association between having a medical home and vaccination coverage among children eligible for the vaccines for children program	Pediatrics	0.73				
1971	Stanfield, J. P.; Bracken, P. M.	Measles vaccination: studies in methods and cost reduction in developing countries	Transactions of the Royal Society of Tropical Medicine and Hygiene	0.73		Developing Countries		measles
2014	Stockwell, Melissa S.; Irigoyen, Matilde; Martinez, Raquel Andres; Findley, Sally E.	Failure to Return Parental, Practice, and Social Factors Affecting Missed Immunization Visits for Urban Children	Clinical pediatrics	0.73				
2012	Stojanovski, Kristefer; Mcweeney, Gerry; Emiroglu, Nedret; Ostlin, Piroska; Koller, Theadora; Licari, Lucianne; Kaluski, Dorit Nitzan	Risk factors for low vaccination coverage among Roma children in disadvantaged settlements in Belgrade, Serbia	Vaccine	0.73	SRB			
1996	Szilagyi, P. G.; Rodewald, L. E.; Humiston, S. G.; Pollard, L.; Klossner, K.; Jones, A. M.; Barth, R.; Woodin, K. A.	Reducing missed opportunities for immunizations. Easier said than done	Archives of Pediatrics & Adolescent Medicine	0.73				
2009	Theeten, Heidi; Hens, Niel; Aerts, Marc; Vandermeulen, Corinne; Roelants, Mathieu; Hoppenbrouwers, Karel; Van Damme, Pierre; Beutels, Philippe	Common attitudes about concomitant vaccine injections for infants and adolescents in Flanders, Belgium	Vaccine	0.73	BEL			
2006	Torun, Sebahat D.; Bak?Rc?, Nadi	Vaccination coverage and reasons for non-vaccination in a district of Istanbul	BMC Public Health	0.73	TUR			
2014	Vet, Raymond; De Wit, John B. F.; Das, Enny	The role of implementation intention formation in promoting hepatitis B vaccination uptake among men who have sex with men	International journal of STD & AIDS	0.73				hep
2011	Vitek, Wendy S.; Akers, Aletha; Meyn, Leslie A.; Switzer, Galen E.; Lee, Bruce Y.; Beigi, Richard H.	Vaccine eligibility and acceptance among ambulatory obstetric and gynecologic patients	Vaccine	0.73				
2011	Wenger, Olivia K.; Mcmanus, Mark D.; Bower, John R.; Langkamp, Diane L.	Underimmunization in Ohio's Amish: parental fears are a greater obstacle than access to care	Pediatrics	0.73	USA			
2007	Whitehead, Sara J.; Cui, Kate X.; De, Anindya K.; Ayers, Tracy; Effler, Paul V.	Identifying risk factors for underimmunization by using geocoding matched to census tracts: A statewide assessment of children in Hawaii	Pediatrics	0.73	USA			

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2007	Winston, Carla A.; Mims, Adrienne D.; Leatherwood, Kecia A.	Increasing pneumococcal vaccination in managed care through telephone outreach	The American Journal of Managed Care		0.73			pneumo
2006	Winston, Carla A.; Wortley, Pascale M.; Lees, Karen A.	Factors associated with vaccination of medicare beneficiaries in five US communities: results from the racial and ethnic adult disparities in immunization initiative survey, 2003	Journal of the American Geriatrics Society		0.73	USA		
1995	Wood, David; Pereyra, Margaret; Halfon, Neal; Hamlin, Julie; Grabowsky, Mark	Vaccination levels in Los Angeles public health centers: the contribution of missed opportunities to vaccinate and other factors.	American journal of public health		0.73	USA		
2013	Yokokura, Ana Valéria Carvalho Pires; Silva, Antônio Augusto Moura Da; Bernardes, Ariane Cristina Ferreira; Lamy Filho, Fernando; Alves, Maria Tereza Seabra Soares De Brito; Cabra, Nayra Anielly Lima; Alves, Rosângela Fernandes Lucena Batista	Vaccination coverage and factors associated with incomplete basic vaccination schedule in 12-month-old children, São Luís, Maranhão State, Brazil, 2006	Cadernos De Saúde Pública		0.73	BRA		
1999	Zhang, Xinglu; Wang, Lixia; Zhu, Xu; Wang, Kean	Knowledge, attitude and practice survey on immunization service delivery in Guangxi and Gansu, China	Social Science & Medicine		0.73	CHN		
2004	Zhao, Zhen; Mokdad, Ali H.; Barker, Lawrence	Impact of health insurance status on vaccination coverage in children 19-35 months old, United States, 1993-1996	Public Health Reports (Washington, D.C.: 1974)		0.73	USA		
2008	Abrol, A; Galhotra, A; Agarwal, N; Bala, A; Goel, N	Immunization Status In A Slum In Chandigarh (U.T) India: A Perspective To Enhance The Service	The Internet Journal of Health		0.72			
2012	Al-Lela, Omer Q. B.; Baidi Bahari, Mohd; Al-Abbassi, Mustafa G.; Salih, Muhannad R. M.; Basher, Amena Y.	Influence of health providers on pediatrics' immunization rate	Journal of Tropical Pediatrics		0.72			
1998	Anderson, Lynda A.; Janes, Gail R.; Jenkins, Carolyn	Implementing preventive services: to what extent can we change provider performance in ambulatory care? A review of the screening, immunization, and counseling literature	Annals of Behavioral Medicine		0.72			1
2010	Babatsikou, Fotoula; Vorou, Rengina; Vardaki, Z.; Galani, S.; Ktenas, E.; Koutis, C.	Childhood vaccination uptake and factors affecting this in Athens, Greece	Health Science Journal		0.72	GRC		
2003	Bardenheier, Barbara; González, Idalia M.; Washington, Michael L.; Bell, Beth P.; Averhoff, Francisco; Massoudi, Mehran S.; Hyams, Insu; Simard, Edgar P.; Yusuf, Hussain	Parental knowledge, attitudes, and practices associated with not receiving hepatitis A vaccine in a demonstration project in Butte County, California	Pediatrics		0.72	USA		hep
2014	Bottino, Clement J.; Cox, Joanne E.; Kahlon, Prerna Singh; Samuels, Ronald C.	Improving Immunization Rates in a Hospital-Based Primary Care Practice	Pediatrics		0.72			
2001	Bovier, P. A.; Chamot, E.; Bouvier Gallacchi, M.; Loutan, L.	Importance of patients' perceptions and general practitioners' recommendations in understanding missed opportunities for immunisations in Swiss adults	Vaccine		0.72	CHE		
1993	Butz, Arlene M.; Funkhouser, Ann; Caleb, Leila; Rosenstein, Beryl J.	Infant health care utilization predicted by pattern of prenatal care	Pediatrics		0.72			
2014	Chan, J. Y. C.; Leung, K. M.; Tam, W. W. S.; Lee, A.	Varicella vaccine uptake and associated factors in children in Hong Kong	Epidemiology and Infection		0.72	HKG		varicella
1999	Chapman, Gretchen B.; Coups, Elliot J.	Predictors of influenza vaccine acceptance among healthy adults	Preventive medicine		0.72			influenza
2011	Choudhury, Panna; Thacker, Naveen; Gargano, Lisa M.; Weiss, Paul S.; Vashishtha, Vipin M.; Amladi, Tanmay; Pazol, Karen; Orenstein, Walter A.; Omer, Saad B.; Hughes, James M.	Attitudes and perceptions of private pediatricians regarding polio immunization in India	Vaccine		0.72	IND		polio
2006	Clements, Cjohn; Morgan, Christopher; Posanai, Enoch; Polume, Hilda; Sakamoto, Chieko; Others	A qualitative evaluation of the immunization program in Papua New Guinea	Papua New Guinea Medical Journal		0.72			
2007	Constantine, Norman A.; Jerman, Petra	Acceptance of human papillomavirus vaccination among Californian parents of daughters: a representative statewide analysis	Journal of Adolescent Health		0.72	USA		hpv
2009	Corsi, Daniel J; Diego, Bassani G; Kumar, Rajesh; Awasthi, Shally; Jotkar, Raju; Kaur, Navkiran; Jha, Prabhat	Gender inequity and age-appropriate immunization coverage in India from 1992 to 2006	BMC International Health and Human Rights		0.72			
2007	Creati, Mick; Saleh, Asmaniar; Ruff, Tilman A.; Stewart, Tony; Otto, Bradley; Sutanto, Agustinus; Clements, C. John	Implementing the birth dose of hepatitis B vaccine in rural Indonesia	Vaccine		0.72	IDN		hep
2005	Crockett, Maryanne; Keystone, Jay	“I hate needles” and other factors impacting on travel vaccine uptake	Journal of travel medicine		0.72			
2010	Danis, K.; Georgakopoulou, T.; Stavrou, T.; Laggas, D.; Panagiotopoulos, T.	Predictors of childhood vaccination uptake: a cross-sectional study in Greece	Procedia in Vaccinology		0.72	GRC		
2004	Dayan, Gustavo H.; Orellana, Liliana C.; Forlenza, Raul; Ellis, Alejandro; Chaui, Jorge; Kaplan, Silvia; Strebel, Peter	Vaccination coverage among children aged 13 to 59 months in Buenos Aires, Argentina, 2002	Revista Panamericana de Salud Publica		0.72			
1999	Dufour, Annie; Remis, Robert S.; Alary, Michel; Otis, Joanne; Mâsse, Benoît; Turmel, Bruno; Vincelette, Jean; Lavoie, René; Leclerc, Roger; Parent, Raymond; Others	Factors associated with hepatitis B vaccination among men having sexual relations with men in Montreal, Quebec, Canada	Sexually transmitted diseases		0.72	CAN		hep
2013	Ferrinho, Paulo; Dramé, Mohammed; Tumusiime, Prosper	Perceptions of the usefulness of external support to immunization coverage in Chad: an analysis of the GAVI-Alliance cash-based support	The Pan African Medical Journal		0.72	TCD		
2013	Fisher, William A.; Laniado, Hila; Shoval, Hila; Hakim, Marwan; Bornstein, Jacob	Barriers to human papillomavirus vaccine acceptability in Israel	Vaccine		0.72	ISR		hpv

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1994	Gamertsfelder, Debra A.; Zimmerman, Richard Kent; Desensi, Elizabeth G.	Immunization barriers in a family practice residency clinic	The Journal of the American Board of Family Practice	0.72				
1999	Grasso, M.; Ripabelli, G.; Sammarco, M. L.; Manfredi Selvaggi, T. M.; Quaranta, A.	Vaccine storage in the community: a study in central Italy	Bulletin of the World Health Organization	0.72	ITA			
1994	Green, Manfred S.; Shohat, Tamy; Lerman, Yehuda; Cohen, Dani; Slepon, Raphael; Duvdevani, Poriya; Varsano, Noemi; Dagan, Ron; Mendelson, Ella	Sex differences in the humoral antibody response to live measles vaccine in young adults	International journal of epidemiology	0.72				measles
2008	Hafeez-Ur-Rehman Mengal, Nopporn Howteerakul; Suwannapong, Nawarat; Rajatanun, Thitipat	Factors relating to acceptance of hepatitis B virus vaccination by nursing students in a tertiary hospital, Pakistan	Journal of health, population, and nutrition	0.72	PAK			hep
2005	Hak, E.; Schönbeck, Y.; De Melker, H.; Van Essen, G. A.; Sanders, E. A. M.	Negative attitude of highly educated parents and health care workers towards future vaccinations in the Dutch childhood vaccination program	Vaccine	0.72	NLD			
2006	Hambidge, Simon J.; Phibbs, Stephanie L.; Davidson, Arthur J.; Lebaron, Charles W.; Chandramouli, Vijayalaxmi; Fairclough, Diane L.; Steiner, John F.	Individually significant risk factors do not provide an accurate clinical prediction rule for infant underimmunization in one disadvantaged urban area	Ambulatory Pediatrics	0.72				
1997	Hanna, J. N.; Faoagali, J. L.; Buda, P. J.; Sheridan, J. W.	Further observations on the immune response to recombinant hepatitis B vaccine after administration to aboriginal and Torres Strait Island children	Journal of paediatrics and child health	0.72	AUS			hep
1988	Henderson, Ralph H.; Keja, Jk; Hayden, Gregory; Galazka, A.; Clements, John; Chan, Carole	Immunizing the children of the world: progress and prospects.	Bulletin of the World Health Organization	0.72				
1999	Hughart, Nancy; Strobino, Donna; Holt, Elizabeth; Guyer, Bernard; Hou, William; Huq, Ashraful; Ross, Alan	The relation of parent and provider characteristics to vaccination status of children in private practices and managed care organizations in Maryland	Medical care	0.72	USA			
2005	Hyatt, Raymond R.; Allen, Susan M.	Disability as a "family affair": parental disability and childhood immunization	Medical Care	0.72				
2004	Jain, Nidhi; Yusuf, Hussain; Wortley, Pascale M.; Euler, Gary L.; Walton, Sabrina; Stokley, Shannon	Factors associated with receiving hepatitis B vaccination among high-risk adults in the United States: an analysis of the National Health Interview Survey, 2000	Family Medicine	0.72	USA			hep
2001	Jiles, Ruth B.; Daniels, Danni; Yusuf, Hussain R.; Mccauley, Mary M.; Chu, Susan Y.	Undervaccination with hepatitis B vaccine: missed opportunities or choice?	American journal of preventive medicine	0.72				hep
2013	Jumaan, Aisha O.; Ghanem, Soha; Taher, Jalaa; Braikat, Mhammed; Al Awaidy, Salah; Dbaibo, Ghassan S.	Prospects and challenges in the introduction of human papillomavirus vaccines in the extended Middle East and North Africa region	Vaccine	0.72		North Africa and the Middle East		hpv
2005	Jutavijittum, Prapan; Jiviriyawat, Yupa; Yousukh, Amnat; Hayashi, Shigeki; Toriyama, Kan	Evaluation of a hepatitis B vaccination program in Chiang Mai, Thailand	Southeast Asian J Trop Med Public Health	0.72				
2009	Katz, Mira L.; Reiter, Paul L.; Kluhsman, Brenda C.; Kennedy, Stephenie; Dwyer, Sharon; Schoenberg, Nancy; Johnson, Andy; Ely, Gretchen; Roberto, Karen A.; Lengerich, Eugene J.; Others	Human papillomavirus (HPV) vaccine availability, recommendations, cost, and policies among health departments in seven Appalachian states	Vaccine	0.72	USA			hpv
2000	Kerpelman, Larry C.; Connell, David B.; Gunn, Walter J.	Effect of a monetary sanction on immunization rates of recipients of aid to families with dependent children	JAMA	0.72				
2005	Khan, M. N. A.; Rahman, M. L.; Awal Miah, A.; Islam, M. S.; Musa, S. A. J. M.; Tofail, F.	Vaccination coverage survey in Dhaka District.	http://www.banglajol.info/index.php/BMRCB/index	0.72				
2011	Konstantyner, Tulio; Taddei, José Augusto De Aguiar Carrazedo; Rodrigues, Laura Cunha	Risk factors for incomplete vaccination in children less than 18 months of age attending the nurseries of day-care centres in Sao Paulo, Brazil	Vaccine	0.72	BRA			
2003	Lawrence, Glenda L.; Macintyre, C. Raina; Hull, Brynley P.; Mcintyre, Peter B.	Measles vaccination coverage among five-year-old children: implications for disease elimination in Australia	Australian and New Zealand Journal of Public Health	0.72				
1997	Lin, W. C.; Ball, C.	Factors affecting the decision of nursing students in Taiwan to be vaccinated against hepatitis B infection	Journal of Advanced Nursing	0.72	TWN			hep
1998	Lowery, N. Elaine; Belansky, Elaine S.; Siegel, Carol D.; Goodspeed, Jennifer R.; Harman, Cathleen Patrick; Steiner, John F.	Rural childhood immunization. Rates and demographic characteristics.	The Journal of family practice	0.72				
2002	Maglione, Margaret A.; Stone, Erin G.; Shekelle, Paul G.	Mass mailings have little effect on utilization of influenza vaccine among Medicare beneficiaries	American journal of preventive medicine	0.72	USA			influenza
1994	Miller, Lisa A.; Barón, Anna E.; Marine, William M.; Hoffman, Richard E.; Melinkovich, Paul	Risk factors for delayed immunization against measles, mumps, and rubella in Colorado two-year-olds	Pediatrics	0.72	USA			measles, mumps, rubella
1991	Mj, Stine	Immunization status of 2-year-olds in a prepaid health care system.	Indiana medicine : the journal of the Indiana State Medical Association	0.72				
2009	Mohanty, S. K.; Pathak, Praveen K.	Rich-poor gap in utilization of reproductive and child health services in India, 1992-2005	Journal of Biosocial Science	0.72				
1998	Monath, Thomas P.; Giesberg, Judith A.; Fierros, Edward Garcia	Does restricted distribution limit access and coverage of yellow fever vaccine in the United States?	Emerging infectious diseases	0.72	USA			yellow
1998	Morrow, Ardythe L.; Rosenthal, Jorge; Lakkis, Hassan D.; Bowers, Jeanne C.; Butterfoss, Frances D.; Crews, R. Clinton; Sirotkin, Barry	A population-based study of access to immunization among urban Virginia children served by public, private, and military health care systems	Pediatrics	0.72	USA			
2012	Muhsen, Khitam; El-Hai, Reem Abed; Amit-Aharon, Anat; Nehama, Haim; Gondia, Mervat; Davidovitch, Nadav; Goren, Sophy; Cohen, Dani	Risk factors of underutilization of childhood immunizations in ultraorthodox Jewish communities in Israel despite high access to health care services	Vaccine	0.72	ISR			

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2013	Orr, Nate; Elliott, Marc N.; Burkhart, Q.; Haviland, Amelia; Weinick, Robin M.	Racial/Ethnic differences in Medicare experiences and immunization: the role of disease burden	Medical Care	0.72	USA			
1996	Pebley, A. R.; Goldman, N.; Rodríguez, G.	Prenatal and delivery care and childhood immunization in Guatemala: do family and community matter?	Demography	0.72	GTM			
1993	Redlener, Irwin	Overcoming barriers to health care access for medically underserved children.	The Journal of ambulatory care management	0.72				
1999	Rothman, Alexander J.; Kiviniemi, Marc T.	Treating people with information: an analysis and review of approaches to communicating health risk information	JNCI monographs	0.72				
2008	Ruiz-Rodríguez, Myriam; Vera-Cala, Lina M.; López-Barbosa, Nahyr	Health insurance for infants and infant vaccination related to forced-displacement in Colombia	Revista De Salud Pública	0.72	COL			
2010	Sachdeva, S.; Datta, U.; Others	Status of vaccine cold chain maintenance in Delhi, India	Indian journal of medical microbiology	0.72	IND			
2011	Stockwell, Melissa S.; Irigoyen, Matilde; Martinez, Raquel Andres; Findley, Sally	How parents' negative experiences at immunization visits affect child immunization status in a community in New York City	Public Health Reports	0.72	USA			
1999	Sutanto, A.; Suarnawa, I. M.; Nelson, C. M.; Stewart, T.; Soewarso, T. Indijati	Home delivery of heat-stable vaccines in Indonesia: outreach immunization with a prefilled, single-use injection device	Bulletin of the World Health Organization	0.72	IDN			
2010	Tickner, Sarah; Leman, P. J.; Woodcock, A.	Parents' views about pre-school immunization: an interview study in southern England	Child: Care, Health and Development	0.72	GBR			
2003	Tierney, Cheryl D.; Yusuf, Hussain; Mcmahon, Shawn R.; Rusinak, Donna; O' Brien, Megan A.; Massoudi, Mehran S.; Lieu, Tracy A.	Adoption of reminder and recall messages for immunizations by pediatricians and public health clinics	Pediatrics	0.72				
2000	Virtanen, Martti; Peltola, Heikki; Paunio, Mikko; Heinonen, Olli P.	Day-to-day reactogenicity and the healthy vaccinee effect of measles-mumps-rubella vaccination	Pediatrics	0.72				measles, mumps, rubella
1995	Yuan, Lilain; Daniels, Stacy; Naus, Monika; Brcic, Branimir	Vaccine storage and handling. Knowledge and practice in primary care physicians' offices.	Canadian family physician	0.72				
2007	A, Datar; A, Mukherji; N, Sood	Health infrastructure & immunization coverage in rural India.	The Indian journal of medical research	0.71				
1988	Bhopal, R. S.; Samim, A. K.	Immunization uptake of Glasgow Asian children: paradoxical benefit of communication barriers?	Community Medicine	0.71	GBR			
1994	Briggs, M. J.; Thomas, J.	Obstacles to hepatitis B vaccine uptake by health care staff	Public Health	0.71				hep
2004	Butraporn, Piyarat; Pach, Alfred; Pack, Robert P.; Masngarmmeung, Rungwit; Maton, Thavorn; Sri-Aroon, Pusadee; Nyamete, Andrew; Chaicumpa, Wanpen	The health belief model and factors relating to potential use of a vaccine for shigellosis in Kaeng Koi district, Saraburi province, Thailand	Journal of Health, Population and Nutrition	0.71	THA			
2010	Cho, Hee-Yeon; Kim, Chang-Hoon; Go, Un-Yeong; Lee, Hoan-Jong	Immunization decision-making in the Republic of Korea: the structure and functioning of the Korea Advisory Committee on Immunization Practices	Vaccine	0.71	KOR			
1999	Da Silva, A. A.; Gomes, U. A.; Tonial, S. R.; Da Silva, R. A.	Vaccination coverage and risk factors associated to non-vaccination in a urban area of northeastern Brazil, 1994	Revista De Saúde Pública	0.71	BRA			
2013	Dorell, Christina; Yankey, David; Kennedy, Allison; Stokley, Shannon	Factors That Influence Parental Vaccination Decisions for Adolescents, 13 to 17 Years Old National Immunization Survey–Teen, 2010	Clinical pediatrics	0.71				
2003	Drain, Paul K.; Ralaivao, Josoa S.; Rakotonandrasana, Alexander; Carnell, Mary A.	Introducing auto-disable syringes to the national immunization programme in Madagascar	Bulletin of the World Health Organization	0.71				
2005	Erickson, L. J.; De Wals, P.; Farand, L.	An analytical framework for immunization programs in Canada	Vaccine	0.71	CAN			
2006	Hinman, Alan R.; Orenstein, Walter A.; Santoli, Jeanne M.; Rodewald, Lance E.; Cochi, Stephen L.	Vaccine shortages: History, impact, and prospects for the future*	Annu. Rev. Public Health	0.71				
2013	Lahariya, Chandrakant; Subramanya, B. P.; Sosler, Stephen; Others	An assessment of hepatitis B vaccine introduction in India: Lessons for roll out and scale up of new vaccines in immunization programs	Indian journal of public health	0.71	IND			hep
2007	Ma, Grace Xueqin; Shive, Steven E.; Fang, Carolyn Y.; Feng, Ziding; Parameswaran, Lalitha; Pham, Anny; Khanh, Che	Knowledge, attitudes, and behaviors of hepatitis B screening and vaccination and liver cancer risks among Vietnamese Americans	Journal of Health Care for the Poor and Underserved	0.71	VNM			hep
1998	Masserey, E.; Bouvier, P.; Brenner, E.; Vaudaux, B.; Cardia-Vonèche, L.; Bastard, B.; Bourquin, C.; Méan, F.	Vaccinal coverage and its determinants in preschool children in Vaud canton in 1996	Revue Médicale De La Suisse Romande	0.71	CHE			
1990	Mccusker, J.; Hill, E. M.; Mayer, K. H.	Awareness and use of hepatitis B vaccine among homosexual male clients of a Boston community health center	Public Health Reports (Washington, D.C.: 1974)	0.71	USA			hep
2004	Msuya, J. M.; Kaswahili, J.; Others	Does preventative health care have a chance in the changing health sector in Tanzania?	East African medical journal	0.71				
1999	Neighbors, Katie; Oraka, Chinwe; Shih, Linda; Lurie, Peter	Awareness and utilization of the hepatitis B vaccine among young men in the Ann Arbor area who have sex with men	Journal of American College Health	0.71	USA			hep
1991	New, S. J.; Senior, M. L.	I don't believe in needles: qualitative aspects of a study into the uptake of infant immunisation in two English health authorities	Social Science & Medicine	0.71	GBR			
2005	Orenstein, Walter A.; Douglas, R. Gordon; Rodewald, Lance E.; Hinman, Alan R.	Immunizations in the United States: success, structure, and stress	Health Affairs	0.71	USA			
2013	Owais, Aatekah; Khowaja, Asif Raza; Ali, Syed Asad; Zaidi, Anita K. M.	Pakistan's expanded programme on immunization: an overview in the context of polio eradication and strategies for improving coverage	Vaccine	0.71	PAK			polio
2009	Paschal, Angelia M.; Maryman, J'Vonnah; Oler-Manske, Julie	How can immunization coverage in urban counties be improved? A pilot study of a Kansas county	American Journal of Infection Control	0.71	USA			

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2006	Poethko-Müller, C.; Kuhnert, R.; Schlaud, M.	Vaccination coverage and predictors for vaccination level. Results of the German Health Interview and Examination Survey for Children and Adolescents (KiGGS)	Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz	0.71	DEU			
2012	Riccardo, Flavia; Dente, Maria Grazia; Kojouharova, Mira; Fabiani, Massimo; Alfonsi, Valeria; Kurchatova, Anna; Vladimirova, Nadezhda; Declich, Silvia	Migrant's access to immunization in Mediterranean Countries	Health Policy	0.71				
1988	Rowe, T. K.; Douglass, C. W.	Compliance with a voluntary hepatitis B vaccination program	Journal of Dental Education	0.71				hep
2004	Santibanez, Tammy A.; Zimmerman, Richard Kent; Nowalk, Mary Patricia; Jewell, Ilene Katz; Bardella, Inis J.	Physician attitudes and beliefs associated with patient pneumococcal polysaccharide vaccination status	Annals of Family Medicine	0.71				pneumo
2000	Thakur, J. S.; Swami, H. M.; Bhatia, S. P. S.	Staff awareness of oral polio vaccine vial monitor in Chandigarh	The Indian Journal of Pediatrics	0.71	IND			polio
2009	Usman, Hussain R.; Akhtar, Saeed; Habib, Faiza; Jehan, Imtiaz	Redesigned immunization card and center-based education to reduce childhood immunization dropouts in urban Pakistan: a randomized controlled trial	Vaccine	0.71	PAK			
2007	Wang, Lixia; Li, Junhua; Chen, Haiping; Li, Fangjun; Armstrong, Gregory L.; Nelson, Carib; Ze, Wenyuan; Shapiro, Craig N.	Hepatitis B vaccination of newborn infants in rural China: evaluation of a village-based, out-of-cold-chain delivery strategy	Bulletin of the World Health Organization	0.71	CHN			hep
2011	Widgren, Katarina; Simonsen, Jacob; Valentiner-Branth, Palle; Mølbak, Kåre	Uptake of the human papillomavirus-vaccination within the free-of-charge childhood vaccination programme in Denmark	Vaccine	0.71	DNK			hpv
1991	Abed, F. H.; Mckee, N.; Chowdhury, A.; Chowdhury, M.; Rahman, R.	Social mobilization for EPI in Bangladesh.	Near Miracle in Bangladesh	0.7	BGD			
1999	Achat, Helen; Mcintyre, Peter; Burgess, Margaret	Health care incentives in immunisation	Australian and New Zealand Journal of Public Health	0.7				
2005	Acosta-Ramírez, Naydú; Durán-Arenas, Luis G.; Eslava-Rincón, Julia I.; Campuzano-Rincón, Julio C.	Determinants of vaccination after the Colombian health system reform	Revista De Saúde Pública	0.7	COL			
2012	Ahlers-Schmidt, Carolyn Rose; Chesser, Amy K.; Paschal, Angelia M.; Hart, Traci A.; Williams, Katherine S.; Yaghmai, Beryl; Shah-Haque, Sapna	Parent opinions about use of text messaging for immunization reminders	Journal of Medical Internet Research	0.7	REU			
2008	Amesty, S.; Ompad, D. C.; Galea, S.; Fuller, C. M.; Wu, Y.; Koblin, B.; Vlahov, D.	Prevalence and correlates of previous hepatitis B vaccination and infection among young drug-users in New York City	Journal of Community Health	0.7	USA			hep
2006	Andrus, Jon Kim; De Quadros, Ciro A.; Tambini, G.; Khan, P.; Gust, I.; Koff, W.	Global access: deployment, use, and acceptance	Accelerating AIDS vaccine development: challenges and opportunities. Norfolk: Horizon Scientific Press. Forthcoming	0.7				
1986	Arita, I.; Wickett, J.; Fenner, F.	Impact of population density on immunization programmes	Journal of hygiene	0.7				
1999	Ashby-Hughes, B.; Nickerson, N.	Provider endorsement: the strongest cue in prompting high-risk adults to receive influenza and pneumococcal immunizations	Clinical excellence for nurse practitioners: the international journal of NPACE	0.7				influenza, pneumo
1994	Atkinson, Sarah J.; Cheyne, J.	Immunization in urban areas: issues and strategies.	Bulletin of the World Health Organization	0.7				
2012	Ayissi, Claudine Akono; Wamai, Richard G.; Oduwo, Geofrey O.; Perlman, Stacey; Welty, Edith; Welty, Thomas; Manga, Simon; Ogembo, Javier Gordon	Awareness, acceptability and uptake of human papilloma virus vaccine among Cameroonian school-attending female adolescents	Journal of community health	0.7	CMR			hpv
2012	Babirye, Juliet N.; Engebretsen, Ingunn Ms; Makumbi, Frederick; Fadnes, Lars T.; Wamani, Henry; Tylleskar, Thorkild; Nuwaha, Fred	Timeliness of childhood vaccinations in Kampala Uganda: a community-based cross-sectional study	PLoS One	0.7	UGA			
2009	Beasley, R. Palmer	Rocks along the road to the control of HBV and HCC	Annals of Epidemiology	0.7				
2006	Berlinger, Nancy	Parental Resistance to Childhood Immunizations: Clinical, Ethical, and Policy Considerations	Virtual Mentor	0.7				
2004	Bhatia, Vikas; Swami, H. M.; Rai, Sanjay K.; Gulati, Sangeeta; Verma, Anita; Parashar, Anupam; Kumari, Renu	Immunization status in children	The Indian Journal of Pediatrics	0.7				
2007	Brewer, Noel T.; Fazekas, Karah I.	Predictors of HPV vaccine acceptability: a theory-informed, systematic review	Preventive medicine	0.7			1	hpv
2008	Cakir, Banu; Uner, Sarp; Temel, Fehminaz; Akin, Levent	Lot quality survey: an appealing method for rapid evaluation of vaccine coverage in developing countries-experience in Turkey	BMC Public Health	0.7				
2004	Calandrillo, Steve P.	Vanishing vaccinations: why are so many Americans opting out of vaccinating their children?	University of Michigan Journal of Law Reform. University of Michigan. Law School	0.7	USA			
2013	Chando, Shingisai; Tiro, Jasmin A.; Harris, T. Robert; Kobrin, Sarah; Breen, Nancy	Effects of socioeconomic status and health care access on low levels of human papillomavirus vaccination among Spanish-speaking Hispanics in California	American journal of public health	0.7	USA			hpv
2009	Chao, Chun; Velicer, Christine; Slezak, Jeff M.; Jacobsen, Steven J.	Correlates for completion of 3-dose regimen of HPV vaccine in female members of a managed care organization	Mayo Clinic Proceedings	0.7				hpv

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2010	Chao, Chun; Velicer, Christine; Slezak, Jeff M.; Jacobsen, Steven J.	Correlates for human papillomavirus vaccination of adolescent girls and young women in a managed care organization	American Journal of Epidemiology	0.7				hpv
2014	Charles, Baguma; Babirye, Juliet; Atuyambe, Lynn	The Level and Determinants of Male Partner Involvement in Routine Child Immunization Care in Hoima District Uganda: A cross-Sectional study	Makerere University	0.7	UGA			
2009	Chileshe, Emmelia	Knowledge and practice of women in the child bearing age on tetanus toxoid immunisation in lusaka district.	University of Zambia	0.7	ZMB			tetanus
1997	Chindedza, K.	Technical assistance to Zambia NIDs cold chain logistics consultant July 2-25 1997.	USAID	0.7	ZMB			
2013	Ciglenecki, Iza; Sakoba, Keita; Luquero, Francisco J.; Heile, Melat; Itama, Christian; Mengel, Martin; Grais, Rebecca F.; Verhoustraeten, Francois; Legros, Dominique	Feasibility of mass vaccination campaign with oral cholera vaccines in response to an outbreak in Guinea	PLoS medicine	0.7	GIN			cholera
2005	Ciorlia, Luiz As; Zanetta, Dirce Mt	Hepatitis B in healthcare workers: prevalence, vaccination and relation to occupational factors	Brazilian Journal of Infectious Diseases	0.7				hep
1989	Cm, Whiting; Re, Schabas; Mj, Ashley	Hib vaccine coverage in children attending day care/nursery school in East York.	Canadian journal of public health = Revue canadienne de sante publique	0.7				
2010	Cook, Robert L.; Zhang, Jianyi; Mullins, Jocelyn; Kauf, Teresa; Brumback, Babette; Steingraber, Heather; Mallison, Chris	Factors associated with initiation and completion of human papillomavirus vaccine series among young women enrolled in Medicaid	The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine	0.7	USA			hpv
1999	Cunningham, Sandra J.	Providing immunizations in a pediatric emergency department: underimmunization rates and parental acceptance.	Pediatric emergency care	0.7				
2005	Cunningham-Rundles, Susanna; Mcneeley, David F.; Moon, Aeri	Mechanisms of nutrient modulation of the immune response	Journal of Allergy and Clinical Immunology	0.7				
2001	Daniels, Danni; Jiles, Ruth B; Klevens, R. Monina; Herrera, Guillermo A	Undervaccinated African-American preschoolers: A case of missed opportunities	American Journal of Preventive Medicine	0.7				
2007	Davaalkham, Dambadarjaa; Ojima, Toshiyuki; Uehara, Ritei; Watanabe, Makoto; Oki, Izumi; Wiersma, Steven; Nymadawa, Pagvajav; Nakamura, Yosikazu	Impact of the universal hepatitis B immunization program in Mongolia: achievements and challenges	J Epidemiol	0.7				
2005	Davis, Matthew M.; Gaglia, Michael A.	Associations of daycare and school entry vaccination requirements with varicella immunization rates	Vaccine	0.7				varicella
2011	Diangi, Yumi Taylor; Panozzo, Catherine A.; Ramogola-Masire, Doreen; Steenhoff, Andrew P.; Brewer, Noel T.	A cross-sectional study of HPV vaccine acceptability in Gaborone, Botswana	PloS one	0.7	BWA			hpv
2007	Elliott, Alison M.; Kizza, Moses; Quigley, Maria A.; Ndibazza, Juliet; Nampijja, Margaret; Muhangi, Lawrence; Morison, Linda; Namujju, Proscovia B.; Muwanga, Moses; Kabatereine, Narcis; Others	The impact of helminths on the response to immunization and on the incidence of infection and disease in childhood in Uganda: design of a randomized, double-blind, placebo-controlled, factorial trial of deworming interventions delivered in pregnancy and early childhood	Clinical Trials	0.7	UGA			
2008	Estivariz, Concepcion F.; Watkins, Margaret A.; Handoko, Darmawali; Rusipah, Rusipah; Deshpande, Jagadish; Rana, Bardan J.; Irawan, Eveline; Widhiastuti, Dyah; Pallansch, Mark A.; Thapa, Arun; Others	A large vaccine-derived poliovirus outbreak on Madura Island-Indonesia, 2005	Journal of Infectious Diseases	0.7				
2014	Ezeanochie, Michael C.; Olagbuji, Biodun N.	Human Papilloma Virus Vaccine: Determinants of Acceptability by Mothers for Adolescents in Nigeria	African journal of reproductive health	0.7	NGA			hpv
1998	Feilden, R.; Nielson, O. F.	Immunization and health sector reform: developing guidelines based on experience from Zambia and Uganda September 1997 to January 1998.	USAID	0.7	UGA, ZMB			
2013	Ferrinho, Paulo; Dramé, Mohamed; Biai, Sidu; Lopes, Orlando; Sousa Jr, Fernando De; Van Lerberghe, Wim	Perceptions of the usefulness of external support to immunization coverage in Guinea-Bissau: a Delphi analysis of the GAVI-Alliance cash-based support	Revista Da Sociedade Brasileira De Medicina Tropical	0.7	GNB			
2014	Fiks, Alexander G.; Center For Clinical Effectiveness, Policylab, And The Center For Biomedical Informatics, The Children'S Hospital Of Philadelphia	Improving HPV vaccination rates	LDI issue brief	0.7				hpv
2004	Fitch, Pamela; Racine, Andrew	Parental beliefs about vaccination among an ethnically diverse inner-city population.	Journal of the National Medical Association	0.7				
1989	Foege, W. H.	Prospects for universal immunization: strategies for achievement	Reviews of Infectious Diseases	0.7				
2008	Freed, Gary L.; Cowan, Anne E.; Clark, Sarah J.	Primary care physician perspectives on reimbursement for childhood immunizations	Pediatrics	0.7				
2013	Gerend, Mary A.; Shepherd, Melissa A.; Shepherd, Janet E.	The multidimensional nature of perceived barriers: Global versus practical barriers to HPV vaccination.	Health Psychology	0.7				hpv
2002	Gokhale, Medha K.; Rao, Shobha S.; Garole, Varsha R.	Infant Mortality in India: Use of Maternal and Child Health Services in Relation to Literacy Status	Journal of Health, Population and Nutrition	0.7				
2012	Grgic-Vitek, Marta; Klavs, Irena	Low coverage and predictors of vaccination uptake against tick-borne encephalitis in Slovenia	European Journal of Public Health	0.7	SVN			encephalitis

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1975	Griffith, A. H.	Measles vaccination in tropical countries	Transactions of the Royal Society of Tropical Medicine and Hygiene	0.7				measles
2006	Gupta, R. S.; Gupta, A.; Gupta, H. O.; Venkatesh, S.; Lal, Shiv	Mothers and Child Service Coverage: Reproductive and Child Health Programme in Alwar District, Rajasthan state	Journal of Communicable Diseases	0.7				
2012	Gupta, Satish Kumar; Sosler, Stephen; Lahariya, Chandrakant	Introduction of Haemophilus influenzae type b (Hib) as pentavalent (DPT-HepB-Hib) vaccine in two states of India	Indian pediatrics	0.7	IND			diphtheria, hep, hib, pertussis, tetanus
2010	Hajjeh, R. A.; Privor-Dumm, L.; Edmond, K.; O'Loughlin, R.; Shetty, S.; Griffiths, U. K.; Bear, A. P.; Cohen, A. L.; Chandran, A.; Schuchat, A.; Others	Supporting new vaccine introduction decisions: lessons learned from the Hib Initiative experience	Vaccine	0.7				hib
2010	Halm, Ariane; Yalcouyé, Idrissa; Kamissoko, Mady; Keïta, Tenemakan; Modjirom, Ndoutabé; Zipursky, Simona; Kartoglu, Umit; Ronveaux, Olivier	Using oral polio vaccine beyond the cold chain: a feasibility study conducted during the national immunization campaign in Mali	Vaccine	0.7	MLI			polio
1990	Heggenhougen, H. K.; Clements, C. J.	An anthropological perspective on the acceptability of immunization services	Scandinavian Journal of Infectious Diseases. Supplementum	0.7				
2006	Heininger, Ulrich	An internet-based survey on parental attitudes towards immunization	Vaccine	0.7				
2005	Helms, Charles M.; Guerra, Fernando A.; Klein, Jerome O.; Schaffner, William; Arvin, Ann M.; Peter, Georges	Strengthening the nation's influenza vaccination system: a National Vaccine Advisory Committee assessment	American journal of preventive medicine	0.7				influenza
1984	Hinman, Alan R.; Koplan, Jeffrey P.	Pertussis and pertussis vaccine: reanalysis of benefits, risks, and costs	JAMA	0.7				pertussis
1999	Huffstutter, Lisa; Kassuba, Diane; Beschoner, Kelly	Health Care Provider Knowledge of the Immunization Schedule and the Contraindications to Vaccinate	Grand Valley State University	0.7				
2008	Islam, Ziaul; Maskery, Brian; Nyamete, Andrew; Horowitz, Mark S.; Yunus, Mohammad; Whittington, Dale	Private demand for cholera vaccines in rural Matlab, Bangladesh	Health Policy	0.7	BGD			cholera
2006	Jain, S. K.; Chawla, Uma; Gupta, Neeru; Gupta, R. S.; Venkatesh, S.; Lal, Shiv	Child survival and safe motherhood program in Rajasthan	The Indian Journal of Pediatrics	0.7				
2001	Jha, N.; Kannan, A. T.; Paudel, I. S.; Niraula, S.	EPI vaccination in Nepal	Southeast Asian Journal of Tropical Medicine & Public Health	0.7				
2012	Johansen, Laurie Jo; Stenvig, Thomas; Wey, Howard	The decision to receive influenza vaccination among nurses in North and South Dakota	Public Health Nursing	0.7	USA			influenza
1991	Jones, K.; Moon, G.	Multilevel assessment of immunisation uptake as a performance measure in general practice	BMJ (Clinical research ed.)	0.7				
2010	Kane, Mark A.	Global implementation of human papillomavirus (HPV) vaccine: lessons from hepatitis B vaccine	Gynecologic oncology	0.7				hep, hpv
2001	Kapikian, Albert Z.	A rotavirus vaccine for prevention of severe diarrhoea of infants and young children: development, utilization and withdrawal	Novartis Foundation Symposium	0.7				rotavirus
2010	Karto?Lu, Ümit; Nelaj, Erida; Maire, Denis	Improving temperature monitoring in the vaccine cold chain at the periphery: An intervention study using a 30-day electronic refrigerator temperature logger (Fridge-tag®)	Vaccine	0.7				
2001	Kempe, Allison; Lowery, N. Elaine; Pearson, Kellyn A.; Renfrew, Brenda L.; Jones, Jennifer S.; Steiner, John F.; Berman, Stephen	Immunization recall: effectiveness and barriers to success in an urban teaching clinic	The Journal of pediatrics	0.7				
1992	Kim-Farley, R.	Global immunization	Annual Review of Public Health	0.7				
2009	Kwong, Enid Wai-Yung; Lam, Ivy Oi-Yi; Chan, Tony Moon-Fai	What factors affect influenza vaccine uptake among community-dwelling older Chinese people in Hong Kong general outpatient clinics?	Journal of Clinical Nursing	0.7	HKG			influenza
2001	Langkamp, D. L.; Hoshaw-Woodard, S.; Boye, M. E.; Lemeshow, S.	Delays in receipt of immunizations in low-birth-weight children: a nationally representative sample	Archives of Pediatrics & Adolescent Medicine	0.7				
1995	Lannon, C.; Brack, V.; Stuart, J.; Caplow, M.; Mcneill, A.; Bordley, W. C.; Margolis, P.	What mothers say about why poor children fall behind on immunizations. A summary of focus groups in North Carolina	Archives of Pediatrics & Adolescent Medicine	0.7	USA			
2011	Lee, Bruce Y.; Assi, Tina-Marie; Rookkapan, Korngamon; Wateska, Angela R.; Rajgopal, Jayant; Sornsrivichai, Vorasith; Chen, Sheng-I.; Brown, Shawn T.; Welling, Joel; Norman, Bryan A.; Others	Maintaining vaccine delivery following the introduction of the rotavirus and pneumococcal vaccines in Thailand	PloS one	0.7	THA			pneumo, rotavirus
2008	Lessler, J.; Lowther, S.; Moss, W.; Cummings, D.	Achieving and maintaining high coverage of measles immunization in Zambia	AMERICAN JOURNAL OF EPIDEMIOLOGY	0.7	ZMB			measles
2013	Levin, Carol E.; Van Minh, Hoang; Odaga, John; Rout, Swampa Sarit; Ngoc, Diep Nguyen Thi; Menezes, Lysander; Araujo, Maria Ana Mendoza; Lamontagne, D. Scott	Delivery cost of human papillomavirus vaccination of young adolescent girls in Peru, Uganda and Viet Nam	Bulletin of the World Health Organization	0.7	PER, UGA, VNM			hpv
2010	Lopalco, P. L.; Martin, R.	Measles still spreads in Europe: who is responsible for the failure to vaccinate?	Euro Surveillance: Bulletin Européen Sur Les Maladies Transmissibles = European Communicable Disease Bulletin	0.7		Europe		measles

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2006	Luman, Elizabeth T.; Ching, Pamela Lyh; Jumaan, Aisha O.; Seward, Jane F.	Uptake of varicella vaccination among young children in the United States: a success story in eliminating racial and ethnic disparities	Pediatrics	0.7	USA			varicella
2008	Mangrio, Nawab Khan; Alam, Muhammad Mazhar; Shaikh, Babar Tasneem	Is Expanded Programme on Immunization doing enough? Viewpoint of health workers and managers in Sindh, Pakistan	JPMA. The Journal of the Pakistan Medical Association	0.7				
2012	Markowitz, Lauri E.; Tsu, Vivien; Deeks, Shelley L.; Cubie, Heather; Wang, Susan A.; Vicari, Andrea S.; Brotherton, Julia Ml	Human papillomavirus vaccine introduction–the first five years	Vaccine	0.7				hpv
2002	Martínez, Javier; Martineau, Tim	Human resources in the health sector: an international perspective	London: DFID Health Systems Resource Centre	0.7				
2013	Merten, Sonja; Schaetti, Christian; Manianga, Cele; Lapika, Bruno; Hutubessy, Raymond; Chaignat, Claire-Lise; Weiss, Mitchell	Sociocultural determinants of anticipated vaccine acceptance for acute watery diarrhea in early childhood in Katanga Province, Democratic Republic of Congo	The American Journal of Tropical Medicine and Hygiene	0.7	COD			
1994	Miller, N. C.; Harris, M. F.	Are childhood immunization programmes in Australia at risk? Investigation of the cold chain in the Northern Territory.	Bulletin of the World Health Organization	0.7	AUS			
2006	Mogobe, Dintle K.; Tshiamo, Wananani	Botswana's immunisation strategy: strengths and weaknesses.	Neonatal, Paediatric & Child Health Nursing	0.7				
2011	Naeem, Mohammad; Adil, Muhammad; Abbas, Syed Hussain; Khan, Muhammad Zia-Ul-Islam; Naz, Syeda Maria; Khan, Ayasha; Khan, Muhammad Usman	Coverage and causes of missed oral polio vaccine in urban and rural areas of Peshawar	Journal of Ayub Medical College, Abbottabad: JAMC	0.7	PAK			polio
2010	Nelson, E. Anthony S.; Glass, Roger I.	Rotavirus: realising the potential of a promising vaccine	The Lancet	0.7				rotavirus
2013	Newman, Peter A.; Logie, Carmen H.; Doukas, Nick; Asakura, Kenta	HPV vaccine acceptability among men: a systematic review and meta-analysis	Sexually transmitted infections	0.7			1	hpv
2001	Niederhauser, Victoria P.; Baruffi, Gigliola; Heck, Ronald	Parental decision-making for the varicella vaccine	Journal of Pediatric Health Care	0.7				varicella
2003	Odusanya, O. O.; Alufohai, J. E.; Meurice, F. P.; Clemens, R.; Ahonkhai, V. I.	Short term evaluation of a rural immunization program in Nigeria.	Journal of the National Medical Association	0.7	NGA			
2003	Pande, Rohini P.	Selective gender differences in childhood nutrition and immunization in rural India: the role of siblings	Demography	0.7	IND			
2009	Plowman, Beth A; Abramson, Wendy B	Final Synthesis Report: Health Systems Strengthening Tracking Study	GAVI	0.7				
1998	Prislin, Radmila; Dyer, James A.; Blakely, Craig H.; Johnson, Charles D.	Immunization status and sociodemographic characteristics: the mediating role of beliefs, attitudes, and perceived control.	American Journal of Public Health	0.7				
1999	Qureshi, Mahmooda; Gordon, Steven M.; Yen-Lieberman, Belinda; Litaker, David G.	Controlling Varicella in the Healthcare Setting Barriers to Varicella Vaccination Among Healthcare Workers	Infection Control	0.7				varicella
1982	Rahman, M.; Chen, Lc; Chakraborty, J.; Yunus, Md; Faroque, G.; Chowdhury, Ai	Tetanus toxoid: 11. Factors related to immunization acceptance among pregnant women in a maternal-child health program m rural Bangladesh	Bulletin of the World Health Organization	0.7	BGD			tetanus
2009	Rahman, Mosiur	Tetanus toxoid vaccination coverage and differential between urban and rural areas of Bangladesh	East African Journal of Public Health	0.7	BGD			tetanus
1998	Reimer, Robert F.; Lewis, Peter R.	Vaccine storage in pharmacies on the Central Coast of New South Wales	Australian and New Zealand journal of public health	0.7	AUS			
2006	Reluga, Timothy C.; Bauch, Chris T.; Galvani, Alison P.	Evolving public perceptions and stability in vaccine uptake	Mathematical biosciences	0.7				
1999	Rhew, David C.; Glassman, Peter A.; Goetz, Matthew Bidwell	Improving pneumococcal vaccine rates	Journal of general internal medicine	0.7				pneumo
2010	Robbins, Spring Chenoa Cooper; Bernard, Diana; Mccaffery, Kirsten; Skinner, S. Rachel	'It's a logistical nightmare!' Recommendations for optimising human papillomavirus school-based vaccination experience	Sexual Health	0.7				hpv
2007	Rossi, Isabelle A.; Zuber, Patrick Lf; Dumolard, Laure; Walker, Damian G.; Watt, James	Introduction of Hib vaccine into national immunization programmes: a descriptive analysis of global trends	Vaccine	0.7				hib
2001	Rotily, M.; Guagliardo, V.; Fontaine, D.; Garros, B.; Mayer, C.; Arrighi, J.; Woronoff, A. S.; Ledesert, B.; Lepec, R.; Chabaud, F.; Others	Evaluation of measles, mumps and rubella vaccine coverage in 3 year old children in twelve French counties. Time-trends and related factors	Revue d'epidemiologie et de sante publique	0.7	FRA			measles, mumps, rubella
2005	Salmon, Daniel A.; Moulton, Lawrence H.; Omer, Saad B.; Patricia Dehart, M.; Stokley, Shannon; Halsey, Neal A.	Factors associated with refusal of childhood vaccines among parents of school-aged children: a case-control study	Archives of pediatrics & adolescent medicine	0.7				
2012	Schaetti, Christian; Ali, Said M.; Chaignat, Claire-Lise; Khatib, Ahmed M.; Hutubessy, Raymond; Weiss, Mitchell G.	Improving community coverage of oral cholera mass vaccination campaigns: lessons learned in Zanzibar	PloS One	0.7	TZA			cholera
2011	Schaetti, Christian; Chaignat, Claire-Lise; Hutubessy, Raymond; Khatib, Ahmed M.; Ali, Said M.; Schindler, Christian; Weiss, Mitchell G.	Social and cultural determinants of anticipated acceptance of an oral cholera vaccine prior to a mass vaccination campaign in Zanzibar	Human Vaccines	0.7	TZA			cholera
2007	Schelling, Esther; Bechir, Mahamat; Ahmed, Mahamat Abdoulaye; Wyss, Kaspar; Randolph, Thomas F.; Zinsstag, Jakob	Human and animal vaccination delivery to remote nomadic families, Chad	Emerging infectious diseases	0.7	TCD			
2001	Sebastian, Miguel San; Goicolea, Isabel; Aviles, Jaime; Narvaez, Mauricio	Improving Immunization Coverage in Rural Areas of Ecuador: A Cost-Effectiveness Analysis	Tropical Doctor	0.7				

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2006	Setse, Rosanna W.; Cutts, Felicity; Monze, Mwaka; Ryon, Judith J.; Quinn, Thomas C.; Griffin, Diane E.; Moss, William J.	HIV-1 infection as a risk factor for incomplete childhood immunization in Zambia	Journal of Tropical Pediatrics	0.7	ZMB			
2004	Smith, Philip J.; Chu, Susan Y.; Barker, Lawrence E.	Children who have received no vaccines: who are they and where do they live?	Pediatrics	0.7				
1988	Sokhey, Jaspal; Gupta, Chander Kanta; Sharma, Bhuvneshwari; Singh, H.	Stability of oral polio vaccine at different temperatures	Vaccine	0.7				polio
2012	Sotiriadis, Alexandros; Dagklis, Themistoklis; Siamanta, Vaia; Chatzigeorgiou, Konstantinos; Agorastos, Theodoros; Group, Lysistrata Study; Others	Increasing fear of adverse effects drops intention to vaccinate after the introduction of prophylactic HPV vaccine	Archives of gynecology and obstetrics	0.7				hpv
2001	Stokley, Shannon; Smith, Philip J; Klevens, R. Monina; Battaglia, Michael P	Vaccination status of children living in rural areas in the United States: Are they protected?	American Journal of Preventive Medicine	0.7				
1991	Sutter, R. W.; Patriarca, P. A.; Cochi, S. L.; Pallansch, M. A.; Kew, O. M.; Hall, D. B.; Brogan, S.; Malankar, P. G.; Al-Ghassany, A. A. K.; Suleiman, A. J. M.; Others	Outbreak of paralytic poliomyelitis in Oman: evidence for widespread transmission among fully vaccinated children	The Lancet	0.7	OMN			polio
2007	Theeten, Heidi; Hens, Niel; Vandermeulen, Corinne; Depoorter, Anne-Marie; Roelants, Mathieu; Aerts, Marc; Hoppenbrouwers, Karel; Van Damme, Pierre	Infant vaccination coverage in 2005 and predictive factors for complete or valid vaccination in Flanders, Belgium: an EPI-survey	Vaccine	0.7	BEL			
2014	Tsu, Vivien D.; Cernuschi, Tania; Lamontagne, D. Scott	Lessons learned from HPV vaccine delivery in low-resource settings and opportunities for HIV prevention, treatment, and care among adolescents	JAIDS Journal of Acquired Immune Deficiency Syndromes	0.7				hpv
2000	Vivier, Patrick M.; Alario, Anthony J.; O'Haire, Christen; Dansereau, Lynne M.; Jakum, Erin B.; Peter, Georges	The impact of outreach efforts in reaching underimmunized children in a Medicaid managed care practice	Archives of pediatrics & adolescent medicine	0.7	USA			
2013	Wamai, Richard G.; Ayissi, Claudine Akono; Oduwo, Geofrey O.; Perlman, Stacey; Welty, Edith; Welty, Thomas; Manga, Simon; Onyango, Monica A.; Ogembo, Javier Gordon	Awareness, knowledge and beliefs about HPV, cervical cancer and HPV vaccines among nurses in Cameroon: An exploratory study	International journal of nursing studies	0.7	CMR			hpv
2009	Westrick, Salisa C.; Watcharadamrongkun, Suntaree; Mount, Jeanine K.; Breland, Michelle L.	Community pharmacy involvement in vaccine distribution and administration	Vaccine	0.7				
1994	Wiecha, J. M.; Gann, P.	Does maternal prenatal care use predict infant immunization delay?	Family Medicine	0.7				
2006	Zimet, Gregory D.; Liddon, Nicole; Rosenthal, Susan L.; Lazcano-Ponce, Eduardo; Allen, Betania	Psychosocial aspects of vaccine acceptability	Vaccine	0.7				
2010	Zimet, Gregory D.; Rosenthal, Susan L.	HPV vaccine and males: issues and challenges	Gynecologic oncology	0.7				hpv
1995	Zimmerman, Richard Kent; Giebink, G. Scott; Street, Heidi Bosch; Janosky, Janine E.	Knowledge and attitudes of Minnesota primary care physicians about barriers to measles and pertussis immunization	The Journal of the American Board of Family Practice	0.7	USA			measles, pertussis
1997	Zimmerman, Richard Kent; Medsger, Anne R.; Ricci, Edmund M.; Raymund, Mahlon; Mieczkowski, Tammy A.; Grufferman, Seymour	Impact of free vaccine and insurance status on physician referral of children to public vaccine clinics	JAMA	0.7				
2009	Zuber, Patrick Lf; Dumolard, Laure; Shirey, Meredith; Rizzo, Ivone; Marshall, John	Forecasting demand for Hib-containing vaccine in the world's poorest countries: A 4-year prospective experience	Vaccine	0.7		Low Income Countries		hib
2000	Acharya, Laxmi Bilas; Cleland, John	Maternal and child health services in rural Nepal: does access or quality matter more?	Health Policy and Planning	0.69				
2006	Agtini, M. D.; Ochiai, R. L.; Soeharno, R.; Lee, H. J.; Sundoro, J.; Hadinegoro, S. R.; Han, O. P.; Tana, L.; Halim, F. X. S.; Ghani, L.; Others	Introducing Vi polysaccharide typhoid fever vaccine to primary school children in North Jakarta, Indonesia, via an existent school-based vaccination platform	Public health	0.69	IDN			typhoid
2009	Al-Tawfiq, Jaffar A.; Antony, Amalraj; Abed, Mahmoud S.	Attitudes towards influenza vaccination of multi-nationality health-care workers in Saudi Arabia	Vaccine	0.69	SAU			influenza
2011	Amarasinghe, Ananda; Mahoney, Richard T.	Estimating potential demand and supply of dengue vaccine in Brazil	Human vaccines	0.69	BRA			dengue
1995	Askew, George L.; Finelli, Lyn; Lutz, James; Degraaf, Janet; Siegel, Bruce; Spitalny, Kenneth	Beliefs and practices regarding childhood vaccination among urban pediatric providers in New Jersey	Pediatrics	0.69	JEY			
2009	Black, Lora L.; Zimet, Gregory D.; Short, Mary B.; Sturm, Lynne; Rosenthal, Susan L.	Literature review of human papillomavirus vaccine acceptability among women over 26 years	Vaccine	0.69			1	hpv
2005	De Wit, John Bf; Vet, Raymond; Schutten, Merel; Van Steenbergen, Jim	Social-cognitive determinants of vaccination behavior against hepatitis B: an assessment among men who have sex with men	Preventive medicine	0.69				hep
2000	Ehresmann, Kristen R.; Mills, Wendy A.; Loewenson, Peter R.; Moore, Kristine A.	Attitudes and practices regarding varicella vaccination among physicians in Minnesota: implications for public health and provider education.	American journal of public health	0.69	USA			varicella
2005	Eser, Erhan; Dinc, Gonul; Oral, Ahmet Murat; Ozcan, Cemil	Contrasting children and women's health and the determinants of health in a small-sized city	Journal of Urban Health	0.69				
1991	Hinman, A. R.	What will it take to fully protect all American children with vaccines?	American Journal of Diseases of Children (1960)	0.69	USA			
2014	Holman, Dawn M.; Benard, Vicki; Roland, Katherine B.; Watson, Meg; Liddon, Nicole; Stokley, Shannon	Barriers to human papillomavirus vaccination among US adolescents: a systematic review of the literature	JAMA pediatrics	0.69	USA		1	hpv

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2007	Huq, Mohammed Nazmul; Tasnim, Tarana	Maternal Education and Child Healthcare in Bangladesh	Maternal and Child Health Journal	0.69				
2014	Kar, Shantanu K.; Pach, Alfred; Sah, Binod; Kerketta, Anna S.; Patnaik, Bikash; Mogasale, Vijayalaxmi; Kim, Yang Hee; Rath, Shyam Bandhu; Shin, Sunheang; Khuntia, Hemant K.; Others	Up-take during an oral cholera vaccine pilot demonstration program, Odisha India	Human vaccines & immunotherapeutics	0.69	IND			cholera
2012	Kessels, Sharon Jm; Marshall, Helen S.; Watson, Maureen; Braunack-Mayer, Annette J.; Reuzel, Rob; Tooher, Rebecca L.	Factors associated with HPV vaccine uptake in teenage girls: a systematic review	Vaccine	0.69			1	hpv
2006	Matsumura, Takayo; Nakayama, Takeo; Hamagashira, Naoko	Promoting measles vaccination in attendees not yet immunized at day-care centers in Kyoto City	Pediatrics International: Official Journal of the Japan Pediatric Society	0.69	JPN			measles
1999	Otto, Bradley F.; Suarnawa, I. Made; Stewart, Tony; Nelson, Carib; Ruff, Tilman A.; Widjaya, Anton; Maynard, James E.	At-birth immunisation against hepatitis B using a novel pre-filled immunisation device stored outside the cold chain	Vaccine	0.69				hep
2007	Puri, Sonia; Bhatia, Vikas; Singh, Amarjit; Swami, H. M.; Kaur, Amrit	Uptake of newer vaccines in Chandigarh	Indian Journal of Pediatrics	0.69	IND			
2003	Rhodes, Scott D.; Yee, Leland J.; Hergenrather, Kenneth C.	Hepatitis A vaccination among young African American men who have sex with men in the deep south: psychosocial predictors	Journal of the National Medical Association	0.69	USA			hep
2011	Trim, Kristina; Nagji, Naushin; Elit, Laurie; Roy, Katherine	Parental knowledge, attitudes, and behaviours towards human papillomavirus vaccination for their children: a systematic review from 2001 to 2011	Obstetrics and gynecology international	0.69			1	hpv
1999	Vivier, Patrick M.; Alario, Anthony J.; Simon, Peter; Flanagan, Patricia; O'Haire, Christen; Peter, Georges	Immunization status of children enrolled in a hospital-based Medicaid managed care practice: the importance of the timing of vaccine administration	The Pediatric infectious disease journal	0.69	USA			
2001	Wenger, Jay	Vaccines for the developing world: current status and future directions	Vaccine	0.69	Developing Countries			
2005	Allred, Norma J.; Shaw, Kate M.; Santibanez, Tammy A.; Rickert, Donna L.; Santoli, Jeanne M.	Parental vaccine safety concerns: results from the National Immunization Survey, 2001–2002	American journal of preventive medicine	0.68				
2012	Barata, Rita Barradas; Ribeiro, Manoel Carlos Sampaio De Almeida; De Moraes, José Cássio; Flannery, Brendan; Vaccine Coverage Survey 2007 Group	Socioeconomic inequalities and vaccination coverage: results of an immunisation coverage survey in 27 Brazilian capitals, 2007-2008	Journal of Epidemiology and Community Health	0.68	BRA			
2012	Bingham, Allison; Gaspar, Felisbela; Lancaster, Kathryn; Conjera, Juliana; Collymore, Yvette; Ba-Nguz, Antoinette	Community perceptions of malaria and vaccines in two districts of Mozambique	Malar J	0.68	MOZ			
2011	Brewer, Noel T.; Gottlieb, Sami L.; Reiter, Paul L.; Mcree, Annie-Laurie; Liddon, Nicole; Markowitz, Lauri; Smith, Jennifer S.	Longitudinal predictors of HPV vaccine initiation among adolescent girls in a high-risk geographic area	Sexually transmitted diseases	0.68				hpv
1997	Browngoehl, Kevin; Kennedy, Kathleen; Krotki, Karol; Mainzer, Hugh	Increasing immunization: a Medicaid managed care model	Pediatrics	0.68	USA			
2008	Cesar, Juraci A.; Matijasevich, Alicia; Santos, Ina S.; Barros, Aluisio J. D.; Dias-Da-Costa, Juvenal S.; Barros, Fernando C.; Victora, Cesar G.	The use of maternal and child health services in three population-based cohorts in Southern Brazil, 1982-2004	Cadernos de Saude Publica	0.68				
2014	Chien, Yin-Chu; Jan, Chyi-Feng; Chiang, Chun-Ju; Kuo, Hsu-Sung; You, San-Lin; Chen, Chien-Jen	Incomplete hepatitis B immunization, maternal carrier status, and increased risk of liver diseases: a 20-year cohort study of 3.8 million vaccinees	Hepatology	0.68				hep
2008	De Oliveira, Lucia Helena; Danovaro-Holliday, M. Carolina; Matus, Cuauhtemoc Ruiz; Andrus, Jon Kim	Rotavirus vaccine introduction in the Americas: progress and lessons learned	Expert Review of Vaccines	0.68		North America, South America		rotavirus
2010	Dempsey, Amanda; Cohn, Lisa; Dalton, Vanessa; Ruffin, Mack	Patient and clinic factors associated with adolescent human papillomavirus vaccine utilization within a university-based health system	Vaccine	0.68				hpv
1995	Dobson, Simon; Scheifele, David; Bell, Alison	Assessment of a universal, school-based hepatitis B vaccination program	Jama	0.68				hep
2013	Gold, Rachel; Naleway, Allison; Riedlinger, Karen	Factors predicting completion of the human papillomavirus vaccine series	The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine	0.68				hpv
2006	Hipgrave, David B.; Tran, Trung Nam; Huong, Vu Minh; Do Tuan, Dat; Nga, Nguyen Tuyet; Long, Hoang Thuy; Van, Nguyen Thu; Maynard, James E; Biggs, Beverley-Ann	Immunogenicity of a locally produced hepatitis B vaccine with the birth dose stored outside the cold chain in rural Vietnam	The American journal of tropical medicine and hygiene	0.68	VNM			hep
1984	Johnson, S.; Schoub, B. D.; Mcanerney, J. M.; Gear, J. S. S.; Moodie, J. M.; Garrity, S. L.; Klaassen, K. I. M.; Küstner, H. G. V.	Poliomyelitis outbreak in South Africa, 1982. II. Laboratory and vaccine aspects	Transactions of the Royal Society of Tropical Medicine and Hygiene	0.68	ZAF			polio
1995	Kahn, J. G.; Mokdad, A. H.; Deming, M. S.; Roungou, J. B.; Boby, A. M.; Excler, J. L.; Waldman, R. J.	Avoiding missed opportunities for immunization in the Central African Republic: potential impact on vaccination coverage	Bulletin of the World Health Organization	0.68	CAF			
2004	Kapp, Clare	Nigerian states again boycott polio-vaccination drive.	Lancet	0.68	NGA			polio
2008	Keating, Katie M.; Brewer, Noel T.; Gottlieb, Sami L.; Liddon, Nicole; Ludema, Christina; Smith, Jennifer S.	Potential barriers to HPV vaccine provision among medical practices in an area with high rates of cervical cancer	Journal of Adolescent Health	0.68				hpv

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1996	Lewis, Owen; Others	Immunisation-Urban Difficulties & Missed Opportunities: A Review in Adelaide	Aboriginal and Islander Health Worker Journal	0.68	AUS		1	
2010	Liddon, Nicole; Hood, Julia; Wynn, Bridget A.; Markowitz, Lauri E.	Acceptability of human papillomavirus vaccine for males: a review of the literature	Journal of Adolescent Health	0.68			1	hpv
2001	Main, Barbara; Lower, Tony; James, Ross; Rouse, Ian	Changes in Expanded Program for Immunization coverage for mother and child in Krakor, Cambodia 1996-1998	Tropical Medicine & International Health	0.68				
2013	Malo, Teri L.; Hassani, Donna; Staras, Stephanie A. S.; Shenkman, Elizabeth A.; Giuliano, Anna R.; Vadaparampil, Susan T.	Do Florida Medicaid providers' barriers to HPV vaccination vary based on VFC program participation?	Maternal and Child Health Journal	0.68	USA			hpv
2006	Mok, Esther; Yeung, Shuk Hing; Chan, Moon Fai	Prevalence of influenza vaccination and correlates of intention to be vaccinated among Hong Kong Chinese	Public Health Nursing	0.68	HKG			influenza
1977	Nightingale, Elena O.	Recommendations for a national policy on poliomyelitis vaccination.	The New England journal of medicine	0.68				polio
2007	Ramayani, Oke Rina; Daulay, Ridwan M.; Sofyani, Sri; Lubis, Iskandar Z.	Factors related to missed opportunities for immunization at urban and suburban primary health centers in Medan	Paediatrica Indonesiana	0.68	IDN			
2001	Rowe, Alexander K.; Onikpo, Faustin; Lama, Marcel; Cokou, Francois; Deming, Michael S.	Management of Childhood Illness at Health Facilities in Benin: Problems and Their Causes	American Journal of Public Health	0.68				
2012	Termrungruanglert, Wichai; Havanond, Piyalamporn; Khemapech, Nipon; Lertmaharit, Somrat; Pongpanich, Sathirakorn; Khorprasert, Chonlakiet; Taneepanichskul, Surasak	Cost and effectiveness evaluation of prophylactic HPV vaccine in developing countries	Value in Health	0.68	Developing Countries			hpv
2013	Van Keulen, Hilde M.; Otten, Wilma; Ruiter, Robert A. C.; Fekkes, Minne; Van Steenbergen, Jim; Dusseldorp, Elise; Paulussen, Theo W. G. M.	Determinants of HPV vaccination intentions among Dutch girls and their mothers: a cross-sectional study	BMC public health	0.68	NLD			hpv
1998	Weniger, B. G.; Chen, R. T.; Jacobson, S. H.; Sewell, E. C.; Deuson, R.; Livengood, J. R.; Orenstein, W. A.	Addressing the challenges to immunization practice with an economic algorithm for vaccine selection	Vaccine	0.68				
2013	World Health Organization	A Guide to Introducing a 2nd Dose of Measles Vaccine into Routine Immunization Schedules	WHO	0.68				measles
2009	Zimet, Gregory D.	Potential barriers to HPV immunization: from public health to personal choice	Am. JL & Med.	0.68				hpv
1997	Zimmerman, Richard Kent; Schlesselman, James J.; Baird, Allison L.; Mieczkowski, Tammy A.	A national survey to understand why physicians defer childhood immunizations	Archives of pediatrics & adolescent medicine	0.68				
1982	Brownlee, H. J.; Brown, D. L.; D'Angelo, R. J.	Utilization of pneumococcal vaccine in a family practice residency.	The Journal of family practice	0.67				pneumo
2011	Date, Kashmira A.; Vicari, Andrea; Hyde, Terri B.; Mintz, Eric; Danovaro-Holliday, M. Carolina; Henry, Ariel; Tappero, Jordan W.; Roels, Thierry H.; Abrams, Joseph; Burkholder, Brenton T.; Others	Considerations for oral cholera vaccine use during outbreak after earthquake in Haiti, 2010–2011	Emerg Infect Dis	0.67	HTI			cholera
2012	Gowda, Charitha; Schaffer, Sarah E.; Dombkowski, Kevin J.; Dempsey, Amanda F.	Understanding attitudes toward adolescent vaccination and the decision-making dynamic among adolescents, parents and providers	BMC Public Health	0.67				
2013	Ivers, Louise C.; Teng, Jessica E.; Lascher, Jonathan; Raymond, Max; Weigel, Jonathan; Victor, Nadia; Jerome, J. Gregory; Hilaire, Isabelle J.; Almazor, Charles P.; Ternier, Ralph; Others	Use of oral cholera vaccine in Haiti: a rural demonstration project	The American journal of tropical medicine and hygiene	0.67	HTI			cholera
2008	Kwan, Tracy Tc; Chan, Karen Kl; Yip, Ann Mw; Tam, K. F.; Cheung, Annie Ny; Young, Phyllis Mc; Lee, Peter Wh; Ngan, Hextan Ys	Barriers and facilitators to human papillomavirus vaccination among Chinese adolescent girls in Hong Kong: a qualitative–quantitative study	Sexually transmitted infections	0.67	HKG			hpv
2010	Licht, Andrea S.; Murphy, Jill M.; Hyland, Andrew J.; Fix, Brian V.; Hawk, Larry W.; Mahoney, Martin C.	Is use of the human papillomavirus vaccine among female college students related to human papillomavirus knowledge and risk perception?	Sexually Transmitted Infections	0.67				hpv
1996	Mark, Tami L.; Paramore, L. Clark	Pneumococcal pneumonia and influenza vaccination: access to and use by US Hispanic Medicare beneficiaries.	American Journal of Public Health	0.67	USA			influenza, pneumo
1994	Melman, Shoshana T.; Chawla, Tejpal; Kaplan, J. Martin; Anbar, Ran D.	Multiple immunizations: ouch!	Archives of family medicine	0.67				
2005	Mohan, Pavitra	Inequities in Coverage of Preventive Child Health Interventions: The Rural Drinking Water Supply Program and the Universal Immunization Program in Rajasthan, India	American Journal of Public Health	0.67				
2009	Neubrand, Tara P. L.; Breitkopf, Carmen Radecki; Rupp, Richard; Breitkopf, Daniel; Rosenthal, Susan L.	Factors associated with completion of the human papillomavirus vaccine series	Clinical Pediatrics	0.67				hpv
2014	Rambout, Lisa; Tashkandi, Mariam; Hopkins, Laura; Tricco, Andrea C.	Self-reported barriers and facilitators to preventive human papillomavirus vaccination among adolescent girls and young women: a systematic review	Preventive Medicine	0.67			1	hpv
2001	Rendi-Wagner, Pamela; Kundi, Michael; Stemberger, Heinrich; Wiedermann, Gerhard; Holzmann, Heidemarie; Hofer, Michael; Wiesinger, Karin; Kollaritsch, Herwig	Antibody-response to three recombinant hepatitis B vaccines: comparative evaluation of multicenter travel-clinic based experience	Vaccine	0.67				hep
2007	Siddiqi, Nazish; Khan, Altaf; Nisar, Nighat; Siddiqi, Azfar-E.-Alam	Assessment of EPI (expanded program of immunization) vaccine coverage in a peri-urban area	The Journal of the Pakistan Medical Association	0.67				
2003	Tarrant, Marie; Gregory, David	Exploring childhood immunization uptake with First Nations mothers in north-western Ontario, Canada	Journal of advanced nursing	0.67	CAN			

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2001	Vivier, Patrick M.; Alario, Anthony J.; Peter, Georges; Leddy, Tricia; Simon, Peter; Mor, Vincent	An analysis of the immunization status of preschool children enrolled in a statewide Medicaid managed care program	The Journal of pediatrics	0.67	USA			
1948	Yamaoka, Yoshiro; Okayasu, Keizaburo	The Intraperitoneal Inoculation of BCG-Vaccine in Infants	The Japanese Medical Journal	0.67				bcg
2007	Avis, Kyla; Tan, Leonard; Anderson, Cathy; Tan, Ben; Muhajarine, Nazeem	Taking a closer look: an examination of measles, mumps, and rubella immunization uptake in Saskatoon	Canadian Journal of Public Health	0.66	CAN			measles, mumps, rubella
1999	Bresee, Joseph S.; Glass, Roger I.; Ivanoff, Bernard; Gentsch, Jon R.	Current status and future priorities for rotavirus vaccine development, evaluation and implementation in developing countries	Vaccine	0.66		Developing Countries		rotavirus
2010	Brown, Brandon; Carcamo, Cesar; Blas, Magaly M.; Valderrama, Maria; Halsey, Neal	Peruvian FSWs: understanding HPV and barriers to vaccination	Vaccine	0.66	PER			hpv
2012	Chan, Zenobia Cy; Chan, Tak Sing; Ng, Ka Kui; Wong, Man Lai	A systematic review of literature about women's knowledge and attitudes toward human papillomavirus (HPV) vaccination	Public Health Nursing	0.66			1	hpv
2011	Chen, Kai-Ying; Shaw, Yi-Cheng	Applying back propagation network to cold chain temperature monitoring	Advanced Engineering Informatics	0.66				
2010	Chien, Alyna T.; Li, Zhonghe; Rosenthal, Meredith B.	Improving timely childhood immunizations through pay for performance in Medicaid-managed care	Health Services Research	0.66	USA			
2010	Cooper Robbins, Spring Chenoa; Bernard, Diana; Mccaffery, Kirsten; Brotherton, Julia Ml; Skinner, S. Rachel	"I just signed": Factors influencing decision-making for school-based HPV vaccination of adolescent girls.	Health Psychology	0.66				hpv
2008	Corrigall, Joanne; Coetzee, David; Cameron, Neil	Is the Western Cape at risk of an outbreak of preventable childhood diseases? Lessons from an evaluation of routine immunisation coverage	SAMJ: South African Medical Journal	0.66				
2010	Downs, Levi S.; Scarinci, Isabel; Einstein, Mark H.; Collins, Yvonne; Flowers, Lisa	Overcoming the barriers to HPV vaccination in high-risk populations in the US	Gynecologic Oncology	0.66	USA			hpv
2014	Fu, Linda Y.; Bonhomme, Lize-Anne; Cooper, Spring Chenoa; Joseph, Jill G.; Zimet, Gregory D.	Educational interventions to increase HPV vaccination acceptance: A systematic review	Vaccine	0.66			1	hpv
2012	Garcini, L. M.; Galvan, T.; Barnack-Tavlaris, J. L.	The study of human papillomavirus (HPV) vaccine uptake from a parental perspective: a systematic review of observational studies in the United States	Vaccine	0.66	USA		1	hpv
2013	Head, Katharine J.; Vanderpool, Robin C.; Mills, Laurel A.	Health care providers' perspectives on low HPV vaccine uptake and adherence in Appalachian Kentucky	Public Health Nursing	0.66	USA			hpv
2012	Javanbakht, Marjan; Stahlman, Shauna; Walker, Susan; Gottlieb, Sami; Markowitz, Lauri; Liddon, Nicole; Plant, Aaron; Guerry, Sarah	Provider perceptions of barriers and facilitators of HPV vaccination in a high-risk community	Vaccine	0.66				hpv
2011	Smith, Leah M.; Brassard, Paul; Kwong, Jeffrey C.; Deeks, Shelley L.; Ellis, Anne K.; Lévesque, Linda E.	Factors associated with initiation and completion of the quadrivalent human papillomavirus vaccine series in an Ontario cohort of grade 8 girls	BMC Public Health	0.66	CAN			hpv
2006	Zimet, Gregory D.	Understanding and overcoming barriers to human papillomavirus vaccine acceptance	Current Opinion in Obstetrics and Gynecology	0.66				hpv
1986	Aaby, Peter; Bukh, Jette; Leerhoy, Jorgen; Lisse, Ida Maria; Mordhorst, Carl H.; Pedersen, Ib Rode	Vaccinated children get milder measles infection: a community study from Guinea-Bissau	Journal of infectious diseases	0.65				
1990	Aboda, Anthony; Zirabamuzaale, Christine; Weeks, Mark	A Study of Missed Opportunities for Immunization in Uganda	Makerere University	0.65	UGA			
2010	Aids Patient Care And Stds	HIV/AIDS and STD Updates	AIDS patient care and STDs	0.65				
2010	Bartolini, Rosario M.; Drake, Jennifer Kidwell; Creed-Kanashiro, Hilary M.; Díaz-Otoya, Margarita M.; Mosqueira-Lovón, Nelly Rocío; Penny, Mary E.; Winkler, Jennifer L.; Lamontagne, D. Scott; Bingham, Allison	Investigación formativa relacionada con el diseño de estrategias para introducir la vacuna contra el VPH en Perú	Salud Pública de México	0.65	PER			
2009	Bingham, Allison; Janmohamed, Amynah; Bartolini, Rosario; Creed-Kanashiro, Hilary M.; Katahoire, A.; Khan, Irfan; Lyazi, Ivan; Menezes, Lysander; Murokora, Dan; Quy, Nghi Nguyen; Others	An approach to formative research in HPV vaccine introduction planning in low-resource settings	Open Vaccine J	0.65				hpv
1988	Clancy, Carolyn M.; Cebul, Randall D.; Williams, Sankey V.	Guiding individual decisions: a randomized, controlled trial of decision analysis	The American journal of medicine	0.65				
2009	Conroy, Kathleen; Rosenthal, Susan L.; Zimet, Gregory D.; Jin, Yan; Bernstein, David I.; Glynn, Susan; Kahn, Jessica A.	Human papillomavirus vaccine uptake, predictors of vaccination, and self-reported barriers to vaccination	Journal of women's health	0.65				hpv
2006	Cutts, Felicity T.; Enwere, Godwin; Zaman, Syed Ma; Yallop, Fred G.	Operational challenges in large clinical trials: Examples and lessons learned from the Gambia pneumococcal vaccine trial	PLoS clinical trials	0.65	GMB			pneumo
2003	Enquselassie, F.; Ayele, W.; Dejene, A.; Messele, T.; Abebe, A.; Cutts, F. T.; Nokes, D. J.	Seroepidemiology of measles in Addis Ababa, Ethiopia: implications for control through vaccination	Epidemiology and Infection	0.65	ETH			measles
2012	Fisher, William A.	Understanding human papillomavirus vaccine uptake	Vaccine	0.65				hpv
2013	Galagan, Sean R.; Paul, Proma; Menezes, Lysander; Lamontagne, D. Scott	Influences on parental acceptance of HPV vaccination in demonstration projects in Uganda and Vietnam	Vaccine	0.65	UGA, VNM			hpv
2010	Gamble, Heather L.; Klosky, James L.; Parra, Gilbert R.; Randolph, Mary E.	Factors influencing familial decision-making regarding human papillomavirus vaccination	Journal of pediatric psychology	0.65				hpv
2008	Gatchell, Melissa; Thind, Amardeep; Hagigi, Fred	Informing state-level health policy in India: The case of childhood immunizations in Maharashtra and Bihar	Acta Peadiatrica	0.65				
2012	Hamlish, Tamara; Clarke, Laura; Alexander, Kenneth A.	Barriers to HPV immunization for African American adolescent females	Vaccine	0.65	USA			hpv

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1992	Israsena, Sachapan; Kamolratanakul, Pirom; Sakulramrung, Reutai	Factors influencing acceptance of hepatitis B vaccination by hospital personnel in an area hyperendemic for hepatitis B.	The American journal of gastroenterology	0.65				hep
2013	Jeudin, Patricia; Liveright, Elizabeth; Del Carmen, Marcela G.; Perkins, Rebecca B.	Race, ethnicity and income as factors for HPV vaccine acceptance and use	Human Vaccines & Immunotherapeutics	0.65				hpv
1999	Kahn, M. M.; Yoder, R. A.	Bangladesh: actions for sustainable immunization services	Health reform and priority services / PHR	0.65	BGD			
2013	Kumar, Abhishek; Ram, Faujdar	Influence of family structure on child health: evidence from India	Journal of Biosocial Science	0.65	IND			
2013	Larson, Heidi J.	Negotiating vaccine acceptance in an era of reluctance	Human Vaccines & Immunotherapeutics	0.65				
2007	Mitchell, Andrew David; Bossert, Thomas J.	Measuring dimensions of social capital: evidence from surveys in poor communities in Nicaragua	Social Science & Medicine	0.65				
1998	Noe, Cherie A.; Markson, Lawrence J.	Pneumococcal vaccination: perceptions of primary care physicians	Preventive medicine	0.65				pneumo
1983	Ofosu-Amaah, Samuel	The control of measles in tropical Africa: a review of past and present efforts	Review of Infectious Diseases	0.65		Africa	1	measles
2012	Oscarsson, Marie G.; Hannerfors, Anna-Karin; Tydén, Tanja	Young women's decision-making process for HPV vaccination	Sexual & Reproductive Healthcare: Official Journal of the Swedish Association of Midwives	0.65				hpv
1998	Perry, Henry; Robison, Nathan; Chavez, Dardo; Taja, Orlando; Hilari, Carolina; Shanklin, David; Wyon, John	The census-based, impact-oriented approach: its effectiveness in promoting child health in Bolivia	Health Policy and Planning	0.65				
1998	Perry, Henry; Weierbach, Robert; Hossain, Iqbal; Islam, Rafiq-Ul	Childhood immunization coverage in zone 3 of Dhaka City: the challenge of reaching impoverished households in urban Bangladesh.	Bulletin of the World Health Organization	0.65	BGD			
2008	Roy, Swapan Kumar; Bilkes, Farzana; Islam, Khaleda; Ara, Gulshan; Tanner, Phillip; Wosk, Irena; Rahman, Ahmed Shafiqur; Chakraborty, Barnali; Jolly, Saira Parveen; Khatun, Wahjiah	Impact of pilot project of Rural Maintenance Programme (RMP) on destitute women: CARE, Bangladesh	Food & Nutrition Bulletin	0.65				
2008	Rwashana, Agnes Semwanga; Williams, Ddembe Wileese	Modeling the dynamics of immunization healthcare systems-the Ugandan case study	The 26th International Conference of the System Dynamics Society; July 20-July	0.65	UGA			
2006	Sherris, Jacqueline; Friedman, Allison; Wittet, Scott; Davies, Philip; Steben, Marc; Saraiya, Mona	Education, training, and communication for HPV vaccines	Vaccine	0.65				hpv
2012	Simone, B.; Carrillo-Santisteve, P.; Lopalco, P. L.	Healthcare workers role in keeping MMR vaccination uptake high in Europe: a review of evidence	Euro Surveillance: Bulletin Européen Sur Les Maladies Transmissibles = European Communicable Disease Bulletin	0.65		Europe	1	measles, mumps, rubella
2011	Tate, Jacqueline E.; Cortese, Margaret M.; Payne, Daniel C.; Curns, Aaron T.; Yen, Catherine; Esposito, Douglas H.; Cortes, Jennifer E.; Lopman, Benjamin A.; Patel, Manish M.; Gentsch, Jon R.; Others	Uptake, impact, and effectiveness of rotavirus vaccination in the United States: review of the first 3 years of postlicensure data	The Pediatric infectious disease journal	0.65	USA		1	rotavirus
2013	Williams, Walter W.; Lu, Peng-Jun; Saraiya, Mona; Yankey, David; Dorell, Christina; Rodriguez, Juan L.; Kepka, Deanna; Markowitz, Lauri E.	Factors associated with human papillomavirus vaccination among young adult women in the United States	Vaccine	0.65	USA			hpv
2008	Zimet, Gregory D.; Perkins, Susan M.; Winston, Yvette; Kee, Romina	Predictors of first and second dose acceptance of hepatitis B vaccine among STD clinic patients	International journal of STD & AIDS	0.65				hep
1994	Zimmerman, R. K.	Reliability of survey about immunization barriers in Minnesota	Family Practice Research Journal	0.65	USA			
2010	Allen, Jennifer D.; Othus, Megan Kd; Shelton, Rachel C.; Li, Yi; Norman, Nancy; Tom, Laura; Del Carmen, Marcela G.	Parental decision making about the HPV vaccine	Cancer Epidemiology Biomarkers & Prevention	0.64				hpv
2011	Al-Nuaimi, N. S.; Al-Ghas, Y. S.; Al-Owais, A. H.; Grivna, M.; Schneider, J.; Nagelkerke, N. J.; Bernsen, R. M.	Human papillomavirus vaccination uptake and factors related to uptake in a traditional desert city in the United Arab Emirates	International journal of STD & AIDS	0.64	ARE			hpv
2010	Barnack, Jessica L.; Reddy, Diane M.; Swain, Carolyne	Predictors of parents' willingness to vaccinate for human papillomavirus and physicians' intentions to recommend the vaccine	Women's Health Issues	0.64				hpv
2008	Blumenthal, Jill; Heyman, Katherine P.; Trocola, Robin M.; Slomovitz, Brian M.	Barriers to acceptance of the human papillomavirus prophylactic vaccine	Journal of Pediatric Infectious Diseases	0.64				hpv
2011	Bynum, Shalanda A.; Brandt, Heather M.; Sharpe, Patricia A.; Williams, Michelle S.; Kerr, Jelani C.	Working to close the gap: Identifying predictors of HPV vaccine uptake among young African American women	Journal of Health Care for the Poor and Underserved	0.64	USA			hpv
1988	Cutts, Ft; Kortbeek, S.; Malalane, R.; Penicele, P.; Gingell, K.	Developing appropriate strategies for EPI: a case study from Mozambique	Health Policy and Planning	0.64				
2006	Daley, Matthew F.; Liddon, Nicole; Crane, Lori A.; Beaty, Brenda L.; Barrow, Jennifer; Babbel, Christine; Markowitz, Lauri E.; Dunne, Eileen F.; Stokley, Shannon; Dickinson, L. Miriam; Others	A national survey of pediatrician knowledge and attitudes regarding human papillomavirus vaccination	Pediatrics	0.64				hpv

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2009	Dempsey, Amanda F.; Abraham, Leah M.; Dalton, Vanessa; Ruffin, Mack	Understanding the reasons why mothers do or do not have their adolescent daughters vaccinated against human papillomavirus	Annals of epidemiology	0.64				hpv
2013	Fisher, William A.; Kohut, Taylor; Salisbury, Claire; Salvadori, Marina I.	Understanding human papillomavirus vaccination intentions: Comparative utility of the theory of reasoned action and the theory of planned behavior in vaccine target age women and men	The journal of sexual medicine	0.64				hpv
2012	Gainforth, Heather L.; Cao, Wei; Latimer-Cheung, Amy E.	Determinants of human papillomavirus (HPV) vaccination intent among three Canadian target groups	Journal of Cancer Education	0.64	CAN			hpv
2009	Jain, Nidhi; Euler, Gary L.; Shefer, Abigail; Lu, Pengjun; Yankey, David; Markowitz, Lauri	Human papillomavirus (HPV) awareness and vaccination initiation among women in the United States, National Immunization Survey—Adult 2007	Preventive medicine	0.64	USA			hpv
2010	Mccave, Emily L.	Influential factors in HPV vaccination uptake among providers in four states	Journal of community health	0.64				hpv
2010	Mortensen, Gitte L.	Drivers and barriers to acceptance of human-papillomavirus vaccination among young women: a qualitative and quantitative study	BMC Public Health	0.64				hpv
2009	Wagner, Janelle	Barriers for Hispanic Women in Receiving the Human Papillomavirus Vaccine	Clinical journal of oncology nursing	0.64				hpv
2005	Wilson, Stephen J.	Factors affecting implementation of the U.S. smallpox vaccination program, 2003	Public Health Reports (Washington, D.C.: 1974)	0.64	USA			smallpox
2011	Zimet, Gregory D.; Stupiansky, Nathan W.; Weiss, Thomas W.; Rosenthal, Susan L.; Good, Margaret B.; Vichnin, Michelle D.	Influence of patient's relationship status and HPV history on physicians' decisions to recommend HPV vaccination	Vaccine	0.64				hpv
2011	Bednarczyk, Robert A.; Birkhead, Guthrie S.; Morse, Dale L.; Doleyres, Helene; Mcnutt, Louise-Anne	Human papillomavirus vaccine uptake and barriers: association with perceived risk, actual risk and race/ethnicity among female students at a New York State university, 2010	Vaccine	0.63	USA			hpv
2012	Binagwaho, Agnes; Wagner, Claire M.; Gatera, Maurice; Karema, Corine; Nutt, Cameron T.; Ngabo, Fidele	Achieving high coverage in Rwanda's national human papillomavirus vaccination programme	Bulletin of the World Health Organization	0.63	RWA			hpv
2011	Brabin, Loretta; Stretch, Rebecca; Roberts, Stephen A.; Elton, Peter; Baxter, David; Mccann, Rosemary	The school nurse, the school and HPV vaccination: A qualitative study of factors affecting HPV vaccine uptake	Vaccine	0.63				hpv
2007	Chan, Symphorosa Shing Chee; Cheung, Tak Hong; Lo, Wing Kit; Chung, Tony Kwok Hung	Women's attitudes on human papillomavirus vaccination to their daughters	Journal of Adolescent Health	0.63				hpv
2014	Cullen, Karen A.; Stokley, Shannon; Markowitz, Lauri E.	Uptake of human papillomavirus vaccine among adolescent males and females: immunization information system sentinel sites, 2009–2012	Academic pediatrics	0.63				hpv
2011	Dempsey, Amanda F.; Butchart, Amy; Singer, Dianne; Clark, Sarah; Davis, Matthew	Factors associated with parental intentions for male human papillomavirus vaccination: results of a national survey	Sexually transmitted diseases	0.63				hpv
2011	Ford, Jodi L.	Racial and ethnic disparities in human papillomavirus awareness and vaccination among young adult women	Public Health Nursing	0.63				hpv
2012	Gerend, Mary A.; Shepherd, Janet E.	Predicting human papillomavirus vaccine uptake in young adult women: Comparing the health belief model and theory of planned behavior	Annals of Behavioral Medicine	0.63				hpv
2012	He, Yuan; Zarychta, Alan; Ranz, Joseph B.; Carroll, Mary; Singleton, Lori M.; Wilson, Paria M.; Schlaudecker, Elizabeth P.	Childhood immunization rates in rural Intibucá, Honduras: an analysis of a local database tool and community health center records for assessing and improving vaccine coverage	BMC public health	0.63	HND			
2004	Jacobs, R. Jake; Meyerhoff, Allen S.	Effect of middle school entry requirements on hepatitis B vaccination coverage	Journal of adolescent health	0.63				hep
2011	Katz, Mira L.; Krieger, Janice L.; Roberto, Anthony J.	Human papillomavirus (HPV): college male's knowledge, perceived risk, sources of information, vaccine barriers and communication	Journal of men's health	0.63				hpv
2011	Kim, Hae Won	Factors influencing mothers' acceptance of human papillomavirus vaccination to prevent cervical cancer in their daughters	Korean Journal of Women Health Nursing	0.63				hpv
2012	Lau, May; Lin, Hua; Flores, Glenn	Factors associated with human papillomavirus vaccine-series initiation and healthcare provider recommendation in US adolescent females: 2007 National Survey of Children's Health	Vaccine	0.63	USA			hpv
2012	Liddon, Nicole C.; Hood, Julia E.; Leichliter, Jami S.	Intent to receive HPV vaccine and reasons for not vaccinating among unvaccinated adolescent and young women: findings from the 2006-2008 National Survey of Family Growth	Vaccine	0.63				hpv
2015	Lieu, Tracy A.; Ray, G. Thomas; Klein, Nicola P.; Chung, Cindy; Kulldorff, Martin	Geographic Clusters in Underimmunization and Vaccine Refusal	Pediatrics	0.63				
2007	Marlow, Laura Av; Waller, Jo; Wardle, Jane	Parental attitudes to pre-pubertal HPV vaccination	Vaccine	0.63				hpv
2005	Mayneux, Edward J.	Overcoming barriers to HPV vaccine acceptance	The Journal of Family Practice	0.63				hpv
2011	Niccolai, Linda M.; Mehta, Niti R.; Hadler, James L.	Racial/ethnic and poverty disparities in human papillomavirus vaccination completion	American journal of preventive medicine	0.63				hpv
2009	Reiter, Paul L.; Brewer, Noel T.; Gottlieb, Sami L.; Mcree, Annie-Laurie; Smith, Jennifer S.	Parents' health beliefs and HPV vaccination of their adolescent daughters	Social science & medicine	0.63				hpv
2011	Rosenthal, S. L.; Weiss, Thomas W.; Zimet, Gregory D.; Ma, Lei; Good, M. B.; Vichnin, M. D.	Predictors of HPV vaccine uptake among women aged 19–26: importance of a physician's recommendation	Vaccine	0.63				hpv
2008	Rosenthal, Susan L.; Rupp, Richard; Zimet, Gregory D.; Meza, Heather M.; Loza, Melissa L.; Short, Mary B.; Succop, Paul A.	Uptake of HPV vaccine: demographics, sexual history and values, parenting style, and vaccine attitudes	Journal of Adolescent Health	0.63				hpv

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2006	Smith, Philip J.; Kennedy, Allison M.; Wooten, Karen; Gust, Deborah A.; Pickering, Larry K.	Association between health care providers' influence on parents who have concerns about vaccine safety and vaccination coverage	Pediatrics	0.63				
2011	Sobel, Howard L.; Mantaring, Jacinto Blas; Cuevas, Francisca; Ducusin, Joyce V.; Thorley, Margaret; Hennessey, Karen A.; Nyunt-U, Soe	Implementing a national policy for hepatitis B birth dose vaccination in Philippines: lessons for improved delivery	Vaccine	0.63	PHL			hep
2014	Suwantika, Auliya A.; Zakiyah, Neily; Lestari, Keri; Postma, Maarten J.	Accelerating the introduction of rotavirus immunization in Indonesia	Expert review of vaccines	0.63	IDN			rotavirus
2012	Tiro, Jasmin A.; Pruitt, Sandi L.; Bruce, Corinne M.; Persaud, Donna; Lau, May; Vernon, Sally W.; Morrow, Jay; Skinner, Celette Sugg	Multilevel correlates for human papillomavirus vaccination of adolescent girls attending safety net clinics	Vaccine	0.63				hpv
2013	Vadaparampil, Susan T.; Staras, Stephanie A. S.; Malo, Teri L.; Eddleton, Katie Z.; Christie, Juliette; Rodriguez, Maria; Giuliano, Anna R.; Shenkman, Elizabeth A.	Provider factors associated with disparities in human papillomavirus vaccination among low-income 9- to 17-year-old girls	Cancer	0.63				hpv
2013	Van Malderen, Carine; Ogali, Irene; Khasakhala, Anne; Muchiri, Stephen N.; Sparks, Corey; Van Oyen, Herman; Speybroeck, Niko	Decomposing Kenyan socio-economic inequalities in skilled birth attendance and measles immunization	International Journal for Equity in Health	0.63	KEN			measles
2013	Wong, Martin Cs; Lee, Albert; Ngai, Karry Lk; Chor, Josette Cy; Chan, Paul Ks	Knowledge, attitude, practice and barriers on vaccination against human papillomavirus infection: a cross-sectional study among primary care physicians in Hong Kong	PloS one	0.63	HKG			hpv
2007	Zeeshan, Mohammad; Jabeen, Kauser; Ali, Anita Na; Ali, Ailia W.; Farooqui, Saadia Z.; Mehraj, Vikram; Zafar, Afia	Evaluation of immune response to Hepatitis B vaccine in health care workers at a tertiary care hospital in Pakistan: an observational prospective study	BMC infectious diseases	0.63	PAK			hep
2010	Zimet, Gregory D.; Weiss, Thomas W.; Rosenthal, Susan L.; Good, Margaret B.; Vichnin, Michelle D.	Reasons for non-vaccination against HPV and future vaccination intentions among 19-26 year-old women	BMC women's health	0.63				hpv
2010	Al-Dubai, S. A.; Alshagga, Mustafa Ahmed; Al-Naggar, Redhwan Ahmed; Al-Jashamy, Karim; Baobaid, Mohammed Faez; Tuang, Chua Pie; Others	Knowledge, attitudes and barriers for human papilloma virus (HPV) vaccines among Malaysian women	Asian Pacific Journal of Cancer Prevention	0.62	MYS			hpv
2012	Arrossi, Silvina; Maceira, Veronica; Paolino, Melisa; Sankaranarayanan, Rengaswamy	Acceptability and uptake of HPV vaccine in Argentina before its inclusion in the immunization program: a population-based survey	Vaccine	0.62	ARG			hpv
2007	Bair, Rita M.; Mays, Rose M.; Sturm, Lynne A.; Zimet, Gregory D.	1: Acceptability of human papillomavirus vaccine among Latina mothers	Journal of Adolescent Health	0.62				hpv
2011	Bang, Kyung-Sook; Sung, Sumi; Koo, Boyeon; Kim, Minji; Kim, Yuna; Kim, Jinsook; Ryu, Sumi	Female university students' HPV-related knowledge and influencing factors on HPV vaccination	Journal of Korean Oncology Nursing	0.62				hpv
2011	Bastani, Roshan; Glenn, Beth A.; Tsui, Jennifer; Chang, L. Cindy; Marchand, Erica J.; Taylor, Victoria M.; Singhal, Rita	Understanding suboptimal human papillomavirus vaccine uptake among ethnic minority girls	Cancer Epidemiology Biomarkers & Prevention	0.62				hpv
2011	Bendik, Megan K.; Mayo, Rachel M.; Parker, Veronica G.	Knowledge, perceptions, and motivations related to HPV vaccination among college women	Journal of Cancer Education	0.62				hpv
2003	Boehner, Constance W.; Howe, Steven R.; Bernstein, David I.; Rosenthal, Susan L.	Viral sexually transmitted disease vaccine acceptability among college students	Sexually Transmitted Diseases	0.62				
2009	Cates, Joan R.; Brewer, Noel T.; Fazekas, Karah I.; Mitchell, Cicely E.; Smith, Jennifer S.	Racial differences in HPV knowledge, HPV vaccine acceptability, and related beliefs among rural, southern women	The Journal of Rural Health	0.62				hpv
2013	Choi, Horace C. W.; Leung, Gabriel M.; Woo, Pauline P. S.; Jit, Mark; Wu, Joseph T.	Acceptability and uptake of female adolescent HPV vaccination in Hong Kong: a survey of mothers and adolescents	Vaccine	0.62	HKG			hpv
2008	Choi, Kyoung A.; Kim, Jung Hye; Lee, Kyoung Soon; Oh, Jin Kyoung; Liu, Shan Ni; Shin, Hai Rim	Knowledge of human papillomavirus infection and acceptability of vaccination among adult women in Korea	Korean Journal of Obstetrics and Gynecology	0.62	KOR			hpv
2010	Chow, Song-Nan; Soon, Ruey; Park, Jong Sup; Pancharoen, Chitsanu; Qiao, You Lin; Basu, Partha; Ngan, Hextan Yuen Sheung	Knowledge, attitudes, and communication around human papillomavirus (HPV) vaccination amongst urban Asian mothers and physicians	Vaccine	0.62				hpv
2004	Davis, Kristin; Dickman, Eileen D.; Ferris, Daron; Dias, James K.	Human papillomavirus vaccine acceptability among parents of 10-to 15-year-old adolescents	Journal of lower genital tract disease	0.62				hpv
2010	Dempsey, Amanda F.; Patel, Divya A.	HPV vaccine acceptance, utilization and expected impacts in the US: Where are we now?	Human vaccines	0.62	USA			hpv
2006	Dempsey, Amanda F.; Zimet, Gregory D.; Davis, Robert L.; Koutsky, Laura	Factors that are associated with parental acceptance of human papillomavirus vaccines: a randomized intervention study of written information about HPV	Pediatrics	0.62				hpv
2010	Dillard, James Price; Spear, Margaret E.	Knowledge of human papillomavirus and perceived barriers to vaccination in a sample of US female college students	Journal of American College Health	0.62	USA			hpv
2009	Do, Hoai; Seng, Paularita; Talbot, Jocelyn; Acorda, Elizabeth; Coronado, Gloria D.; Taylor, Victoria M.	HPV vaccine knowledge and beliefs among Cambodian American parents and community leaders	Asian Pacific Journal of Cancer Prevention	0.62	KHM			hpv
2012	Do, Young Kyung; Wong, Ker Yi	Awareness and acceptability of human papillomavirus vaccine: an application of the instrumental variables bivariate probit model	BMC public health	0.62				hpv
2014	Donahue, Kelly L.; Stupiansky, Nathan W.; Alexander, Andreia B.; Zimet, Gregory D.	Acceptability of the human papillomavirus vaccine and reasons for non-vaccination among parents of adolescent sons	Vaccine	0.62				hpv
2008	Fazekas, Karah I.; Brewer, Noel T.; Smith, Jennifer S.	HPV vaccine acceptability in a rural Southern area	Journal of Women's Health	0.62				hpv

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2008	Ferris, Daron G.; Waller, Jennifer L.; Miller, Jeremiah; Patel, Pratik; Jackson, Lanier; Price, George A.; Wilson, Courtesia	Men's attitudes toward receiving the human papillomavirus vaccine	Journal of Lower Genital Tract Disease	0.62				hpv
2010	Ferris, Daron; Horn, Leslie; Waller, Jennifer L.	Parental acceptance of a mandatory human papillomavirus (HPV) vaccination program	The Journal of the American Board of Family Medicine	0.62				hpv
2009	Gerend, Mary A.; Barley, Jessica	Human papillomavirus vaccine acceptability among young adult men	Sexually transmitted diseases	0.62				hpv
2013	Gerend, Mary A.; Shepherd, Melissa A.; Lustria, Mia Liza A.	Increasing human papillomavirus vaccine acceptability by tailoring messages to young adult women's perceived barriers	Sexually Transmitted Diseases	0.62				hpv
2010	Giede, Christopher; Mcfadden, L.; Komonoski, Pam; Agrawal, A.; Stauffer, A.; Pierson, R.	Acceptabililty of HPV vaccination among women attending the University of Saskatchewan student health services	Gynecologic Oncology	0.62	CAN			hpv
2013	Gowda, Charitha; Schaffer, Sarah E.; Kopec, Kristin; Markel, Arielle; Dempsey, Amanda F.	A pilot study on the effects of individually tailored education for MMR vaccine-hesitant parents on MMR vaccination intention	Human vaccines & immunotherapeutics	0.62				measles, mumps, rubella
2007	Han, You Jung; Lee, Sa Ra; Kang, Eun Ji; Kim, Mi Kyoung; Kim, Nam Hee; Kim, Hyun Jin; Ju, Woong; Kim, Seung Cheol	Knowledge regarding cervical cancer, human papillomavirus and future acceptance of vaccination among girls in their late teens in Korea	Korean Journal of Obstetrics and Gynecology	0.62	KOR			hpv
2012	Hanley, Sharon J. B.; Yoshioka, Eiji; Ito, Yoshiya; Konno, Ryo; Hayashi, Yuri; Kishi, Reiko; Sakuragi, Noriaki	Acceptance of and attitudes towards human papillomavirus vaccination in Japanese mothers of adolescent girls	Vaccine	0.62	JPN			hpv
2010	Hopfer, Suellen; Clippard, Jessie R.	College women's HPV vaccine decision narratives	Qualitative Health Research	0.62				hpv
2011	Jaspers, L.; Budiningsih, S.; Wolterbeek, R.; Henderson, F. C.; Peters, A. A. W.	Parental acceptance of human papillomavirus (HPV) vaccination in Indonesia: a cross-sectional study	Vaccine	0.62	IDN			hpv
2012	Joseph, Natalie Pierre; Clark, Jack A.; Bauchner, Howard; Walsh, Jared P.; Mercilus, Glory; Figaro, Jean; Bibbo, Caroline; Perkins, Rebecca B.	Knowledge, attitudes, and beliefs regarding HPV vaccination: ethnic and cultural differences between African-American and Haitian immigrant women	Women's Health Issues	0.62	HTI			hpv
2003	Kahn, Jessica A.; Rosenthal, Susan L.; Hamann, Tara; Bernstein, David I.	Attitudes about human papillomavirus vaccine in young women	International journal of STD & AIDS	0.62				hpv
2008	Kahn, Jessica A.; Rosenthal, Susan L.; Jin, Yan; Huang, Bin; Namakydoust, Azadeh; Zimet, Gregory D.	Rates of human papillomavirus vaccination, attitudes about vaccination, and human papillomavirus prevalence in young women	Obstetrics & Gynecology	0.62				hpv
2011	Kang, Hee Sun; Moneyham, Linda	Attitudes, intentions, and perceived barriers to human papillomavirus vaccination among Korean high school girls and their mothers	Cancer nursing	0.62	KOR			hpv
2006	Karim, F.; Tripura, A.; Gani, M. S.; Chowdhury, A. M. R	Poverty status and health equity: Evidence from rural Bangladesh	Public Health	0.62				
2009	Katz, Mira L.; Reiter, Paul L.; Heaner, Sarah; Ruffin, Mack T.; Post, Douglas M.; Paskett, Electra D.	Acceptance of the HPV vaccine among women, parents, community leaders, and healthcare providers in Ohio Appalachia	Vaccine	0.62	USA			hpv
2013	Kester, Laura M.; Zimet, Gregory D.; Fortenberry, J. Dennis; Kahn, Jessica A.; Shew, Marcia L.	A national study of HPV vaccination of adolescent girls: rates, predictors, and reasons for non-vaccination	Maternal and child health journal	0.62				hpv
2010	Krupp, Karl; Marlow, Laura Av; Kielmann, Karina; Doddaiah, Narayanappa; Mysore, Shekar; Reingold, Arthur L.; Madhivanan, Purnima	Factors associated with intention-to-recommend human papillomavirus vaccination among physicians in Mysore, India	Journal of Adolescent Health	0.62	IND			hpv
2009	Lengerich, Eugene J.; Huey, Nicole L.; Clark, Allison D.; Force, Action Health Cancer Task; Kluhsman, Brenda C.	Peer Reviewed: HPV Vaccine Attitudes and Practices Among Primary Care Providers in Appalachian Pennsylvania	Preventing chronic disease	0.62	USA		1	hpv
2013	Mammas, Ioannis N.; Theodoridou, Maria	Financial crisis and childhood immunization: when parents disagree	Acta Paediatrica	0.62				
2009	Marlow, Laura A. V.; Wardle, Jane; Waller, Jo	Attitudes to HPV vaccination among ethnic minority mothers in the UK: an exploratory qualitative study	Human Vaccines	0.62	GBR			hpv
2009	Marlow, Laura Av; Wardle, Jane; Forster, Alice S.; Waller, Jo	Ethnic differences in human papillomavirus awareness and vaccine acceptability	Journal of Epidemiology and Community Health	0.62				hpv
2012	Nguyen, Giang T.; Chen, Bei; Chan, Melvin	Pap testing, awareness, and acceptability of a human papillomavirus (HPV) vaccine among Chinese American women	Journal of Immigrant and Minority Health and Center for Minority Public Health	0.62	USA			hpv
2010	Ogilvie, Gina; Anderson, Maureen; Marra, Fawziah; Mcneil, Shelly; Pielak, Karen; Dawar, Meena; Mcivor, Marilyn; Ehlen, Thomas; Dobson, Simon; Money, Deborah; Others	A population-based evaluation of a publicly funded, school-based HPV vaccine program in British Columbia, Canada: parental factors associated with HPV vaccine receipt	PLoS medicine	0.62	CAN			hpv
2010	Oh, Jin-Kyoung; Lim, Min Kyung; Yun, E. Hwa; Lee, Eun-Hye; Shin, Hai-Rim	Awareness of and attitude towards human papillomavirus infection and vaccination for cervical cancer prevention among adult males and females in Korea: a nationwide interview survey	Vaccine	0.62	KOR			hpv
2014	Paul, Proma; Tanner, Amanda E.; Gravitt, Patti E.; Vijayaraghavan, K.; Shah, Keerti V.; Zimet, Gregory D.; Study Group, Catch	Acceptability of HPV vaccine implementation among parents in India	Health Care for Women International	0.62	IND			hpv
2014	Pierre Joseph, Natalie; Clark, Jack A.; Mercilus, Glory; Wilbur, Maryann; Figaro, Jean; Perkins, Rebecca	Racial and ethnic differences in HPV knowledge, attitudes, and vaccination rates among low-income African-American, Haitian, Latina, and Caucasian young adult women	Journal of Pediatric and Adolescent Gynecology	0.62	HTI			hpv

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2012	Remes, Pieter; Selestine, Veronica; Changalucha, John; Ross, David A.; Wight, Daniel; De Sanjosé, Silvia; Kapiga, Saidi; Hayes, Richard J.; Watson-Jones, Deborah	A qualitative study of HPV vaccine acceptability among health workers, teachers, parents, female pupils, and religious leaders in northwest Tanzania	Vaccine	0.62	TZA			hpv
2014	Sacks, Rachel J.; Copas, Andrew J.; Wilkinson, Dawn M.; Robinson, Angela J.	Uptake of the HPV vaccination programme in England: a cross-sectional survey of young women attending sexual health services	Sexually Transmitted Infections	0.62	GBR			hpv
2007	Scarinci, Isabel C.; Garces-Palacio, Isabel C.; Partridge, Edward E.	An examination of acceptability of HPV vaccination among African American women and Latina immigrants	Journal of Women's Health	0.62	USA			hpv
2011	Schluterman, Nicholas H.; Terplan, Mishka; Lydecker, Alison D.; Tracy, J. Kathleen	Human papillomavirus (HPV) vaccine uptake and completion at an urban hospital	Vaccine	0.62				hpv
2011	Thompson, Vetta L. Sanders; Arnold, Lauren D.; Notaro, Sheri R.	African American parents' attitudes toward HPV vaccination	Ethnicity & disease	0.62	USA			hpv
2008	Wong, Li Ping	Young multiethnic women's attitudes toward the HPV vaccine and HPV vaccination	International Journal of Gynecology & Obstetrics	0.62				hpv
2014	World Health Organization	WHO-UNICEF guidelines for comprehensive multi-year planning for immunization: Update September 2013	WHO	0.62				
2010	Yeganeh, Nava; Curtis, Donna; Kuo, Alice	Factors influencing HPV vaccination status in a Latino population; and parental attitudes towards vaccine mandates	Vaccine	0.62				hpv
2005	Zimet, Gregory D.; Mays, Rose M.; Sturm, Lynne A.; Ravert, April A.; Perkins, Susan M.; Juliar, Beth E.	Parental attitudes about sexually transmitted infection vaccination for their adolescent children	Archives of pediatrics & adolescent medicine	0.62				
2012	Almeida, Cristina M.; Tiro, Jasmin A.; Rodriguez, Michael A.; Diamant, Allison L.	Evaluating associations between sources of information, knowledge of the human papillomavirus, and human papillomavirus vaccine uptake for adult women in California	Vaccine	0.61	USA			hpv
2011	Bynum, Shalanda A.; Brandt, Heather M.; Annang, Lucy; Friedman, Daniela B.; Tanner, Andrea; Sharpe, Patricia A.	Do health beliefs, health care system distrust, and racial pride influence HPV vaccine acceptability among African American college females?	Journal of health psychology	0.61	USA			hpv
2006	Dempsey, Amanda F.; Davis, Matthew M.	Overcoming barriers to adherence to HPV vaccination recommendations	Am J Manag Care	0.61				hpv
2008	Di Giuseppe, G.; Abbate, R.; Liguori, G.; Albano, L.; Angelillo, I. F.	Human papillomavirus and vaccination: knowledge, attitudes, and behavioural intention in adolescents and young women in Italy	British journal of cancer	0.61	ITA			hpv
2010	Hsu, Yu-Yun; Hsu, Keng-Fu; Cheng, Ya-Min; Fetzer, Susan Jane; Chou, Cheng-Yang	Health beliefs of Taiwanese women seeking HPV vaccination	Vaccine	0.61	TWN			hpv
2010	Jacob, Martha; Mawar, Nita; Menezes, Lysander; Kaipilyawar, Satish; Gandhi, Sanjay; Khan, Irfan; Patki, Manoj; Bingham, Allison; Lamontagne, D. Scott; Bagul, Rajani; Others	Assessing the environment for introduction of human papillomavirus vaccine in India	Open Vaccine J	0.61	IND			hpv
2013	Lions, C.; Pulcini, C.; Verger, P.	Papillomavirus vaccine coverage and its determinants in South-Eastern France	Médecine Et Maladies Infectieuses	0.61	FRA			hpv
2009	Marlow, Laura Av; Waller, Jo; Evans, Ruth Ec; Wardle, Jane	Predictors of interest in HPV vaccination: A study of British adolescents	Vaccine	0.61	GBR			hpv
2006	Moraros, John; Bird, Yelena; Barney, David D.; King, Sasha C.; Banegas, Matthew; Suarez-Toriello, Enrique	A pilot study: HPV infection knowledge & HPV vaccine acceptance among women residing in Ciudad Juárez, México	Californian Journal of Health Promotion	0.61	MEX			hpv
2014	Wisk, Lauren E.; Allchin, Adelyn; Witt, Whitney P.	Disparities in human papillomavirus vaccine awareness among US parents of preadolescents and adolescents	Sexually transmitted diseases	0.61	USA			hpv
2010	Wong, Charlene	National HPV Vaccine Uptake and Vaccination Predictors and Barriers for Girls 8-17 Years Old—United States, 2008	National STD Prevention Conference	0.61	USA			hpv
1992	Adu, F. D.; Akinwolere, O. A.; Tomori, O.; Uche, L. N.	Low seroconversion rates to measles vaccine among children in Nigeria.	Bulletin of the World Health Organization	0.6	NGA			measles
2012	Al-Naggar, Redhwan Ahmed; Bobryshev, Yuri V.; Al-Jashamy, Karim; Al-Musli, Mahfoudh	Practice of HPV vaccine and associated factors among school girls in Melaka, Malaysia	Asian Pacific Journal of Cancer Prevention	0.6	MYS			hpv
1989	Amin, Sajeda; Ali, Kamar; Streatfield, Kim	Vaccine Uptake in Bangladesh: An Analysis of the Expanded Program on Immunization	Cleland et al.(eds) Bangladesh Fertility Survey	0.6	BGD			
2008	Andrus, Jon Kim; Lewis, Merle J.; Goldie, Sue J.; García, Patricia J.; Winkler, Jennifer L.; Ruiz-Matus, Cuauhtémoc; De Quadros, Ciro A.	Human papillomavirus vaccine policy and delivery in Latin America and the Caribbean	Vaccine	0.6		Latin America and the Caribbean		hpv
2014	Arencibia Jiménez, Mercedes; Navarro Gracia, Juan Francisco; Delgado De Los Reyes, José Antonio; Pérez Torregrosa, Gerardo; López Parra, David; López García, Pilar	Missed opportunities in antipneumococcal vaccination. Can something more be done for prevention?	Archivos De Bronconeumología	0.6				pneumo
1997	Ballard, J. E.; Liu, J.; Uberuagua, D.; Mustin, H. D.; Sugarman, J. R.	Assessing influenza immunization rates in Medicare managed care plans: a comparison of three methods	The Joint Commission Journal on Quality Improvement	0.6	USA			influenza
2013	Bhatta, M. P.; Phillips, L.; Frew, S.; Burns, J.; Cascarelli, N.	Human Papillomavirus Vaccine Knowledge and Uptake among Adolescent Boys and Girls in an Appalachian Ohio County	Cancer Epidemiology Biomarkers & Prevention	0.6	USA			hpv
2013	Black, Steven	The role of health economic analyses in vaccine decision making	Vaccine	0.6				
2010	Bryson, Maggie; Duclos, Philippe; Jolly, Ann; Cakmak, Niyazi	A global look at national Immunization Technical Advisory Groups	Vaccine	0.6				

Publication Year	Author	Title	Publication Title	Relevance	iso3	Region	Review	Antigens
2014	Bynum, Shalanda A.; Staras, Stephanie A. S.; Malo, Teri L.; Giuliano, Anna R.; Shenkman, Elizabeth; Vadaparampil, Susan T.	Factors associated With Medicaid providers' recommendation of the HPV vaccine to low-income adolescent girls	The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine	0.6	USA			hpv
2009	Caskey, Rachel; Lindau, Stacy Tessler; Alexander, G. Caleb	Knowledge and early adoption of the HPV vaccine among girls and young women: results of a national survey	Journal of Adolescent Health	0.6				hpv
2012	Chadambuka, Addmore; Chimusoro, Anderson; Apollo, Tsitsilina; Tshimanga, Mufuta; Namusisi, Olivia; Luman, Elizabeth T.	The need for innovative strategies to improve immunisation services in rural Zimbabwe	Disasters	0.6	ZWE			
2011	Chou, Betty; Krill, Lauren S.; Horton, Bernice B.; Barat, Christopher E.; Trimble, Cornelia L.	Disparities in human papillomavirus vaccine completion among vaccine initiators	Obstetrics & Gynecology	0.6				hpv
2011	Daley, Ellen M.; Marhefka, Stephanie; Buhi, Eric; Hernandez, Natalie D.; Chandler, Rasheeta; Vamos, Cheryl; Kolar, Stephanie; Wheldon, Christopher; Papenfuss, Mary R.; Giuliano, Anna R.	Ethnic and racial differences in HPV knowledge and vaccine intentions among men receiving HPV test results	Vaccine	0.6				hpv
2003	Davis, Matthew M.; Ndiaye, Serigne M.; Freed, Gary L.; Clark, Sarah J.	One-year uptake of pneumococcal conjugate vaccine: a national survey of family physicians and pediatricians	The Journal of the American Board of Family Practice	0.6				pneumo
2010	Dempsey, Amanda F.; Cohn, Lisa; Dalton, Vanessa; Ruffin, Mack T.	HPV vaccine utilization by young adult women: are the highest risk populations being vaccinated?	Journal of Womens Health	0.6				hpv
2014	Donadiki, E. M.; Jiménez-García, R.; Hernández-Barrera, V.; Sourtzi, P.; Carrasco-Garrido, P.; López De Andrés, A.; Jimenez-Trujillo, I.; Velonakis, E. G.	Health Belief Model applied to non-compliance with HPV vaccine among female university students	Public Health	0.6				hpv
2014	Friedman, Allison L.; Oruko, Kelvin O.; Habel, Melissa A.; Ford, Jessie; Kinsey, Jennine; Odhiambo, Frank; Phillips-Howard, Penelope A.; Wang, Susan A.; Collins, Tabu; Laserson, Kayla F.; Others	Preparing for human papillomavirus vaccine introduction in Kenya: implications from focus-group and interview discussions with caregivers and opinion leaders in Western Kenya	BMC public health	0.6	KEN			hpv
1993	Haworth, E. A.; Booy, R.; Stirzaker, L.; Wilkes, S.; Battersby, A.	Is the cold chain for vaccines maintained in general practice?	BMJ	0.6				
2013	Hechter, Rulin C.; Chao, Chun; Sy, Lina S.; Ackerson, Bradley K.; Slezak, Jeff M.; Sidell, Margo A.; Jacobsen, Steven J.	Quadrivalent human papillomavirus vaccine uptake in adolescent boys and maternal utilization of preventive care and history of sexually transmitted infections	American journal of public health	0.6				hpv
2000	Hennessey, Karen A.; Marx, Arthur; Hafiz, Rehan; Ashgar, Humayun; Hadler, Stephen C.; Jafari, Hamid; Sutter, Roland W.	Widespread paralytic poliomyelitis in Pakistan: A case-control study to determine risk factors and implications for poliomyelitis eradication	Journal of infectious diseases	0.6				
2000	Hoover, Donald R.; Carfioli, Beth; Moench, Elizabeth A.	Attitudes of adolescent/young adult women toward human papillomavirus vaccination and clinical trials	Health Care for Women International	0.6				hpv
2006	Hull, Brynley P.; Mcintyre, Peter B.	Timeliness of childhood immunisation in Australia	Vaccine	0.6	AUS			
2009	Kahn, Jessica A.; Cooper, H. Paul; Vadaparampil, Susan T.; Pence, Barbara C.; Weinberg, Armin D.; Lococo, Salvatore J.; Rosenthal, Susan L.	Human papillomavirus vaccine recommendations and agreement with mandated human papillomavirus vaccination for 11-to-12-year-old girls: a statewide survey of Texas physicians	Cancer Epidemiology Biomarkers & Prevention	0.6	USA			hpv
2006	Kaoma, Mary; Mwale, Hilary; Chirwa, Anna	Reaching every child in Every District strategy improves Community Participation in immunization of children: The Zambian Experience	APHA Annual Meeting	0.6	ZMB			
2013	Kaufman, Jessica; Synnot, Anneliese; Ryan, Rebecca; Hill, Sophie; Horey, Dell; Willis, Natalie; Lin, Vivian; Robinson, Priscilla	Face to face interventions for informing or educating parents about early childhood vaccination	The Cochrane Database of Systematic Reviews	0.6				
1976	Kavet, J.	Vaccine utilization: Trends in the implementation of public policy in the USA	Influenza: Virus, vaccines, strategy	0.6	USA			
2014	Lernout, Tinne; Theeten, Heidi; Hens, Niel; Braeckman, Tessa; Roelants, Mathieu; Hoppenbrouwers, Karel; Van Damme, Pierre	Timeliness of infant vaccination and factors related with delay in Flanders, Belgium	Vaccine	0.6	BEL			
2009	Li, Jing; Li, Lian-Kun; Ma, Jun-Fei; Wei, Li-Hui; Niyazi, Mayinuer; Li, Chang-Qing; Xu, Ai-Di; Wang, Jian-Bin; Liang, Hao; Belinson, Jerome; Others	Knowledge and attitudes about human papillomavirus (HPV) and HPV vaccines among women living in metropolitan and rural regions of China	Vaccine	0.6	CHN			hpv
2003	Linton, Leslie S.; Peddecord, K. Michael; Seidman, Robert L.; Edwards, Christine; Ross, Sandra; Gustafson, Kathleen; Averhoff, Francisco; Fishbein, Daniel B.	Implementing a seventh grade vaccination law: school factors associated with completion of required immunizations	Preventive medicine	0.6				
1986	Loevinsohn, Benjaminp; Loevinsohn, Michaele	Improvement in coverage of primary health care in a developing country through use of food incentives	The Lancet	0.6				
2013	Marchant, T.	Maternal and newborn health care. Baseline findings from Ethiopia. Interactions between families and frontline workers (their frequency, quality, and equity), and coverage of interventions for mothers and newborns.	Project Report	0.6	ETH			
1987	Mccartan, B. E.; Samaranayake, L. P.	Awareness and acceptance of hepatitis B vaccine by Irish dental practitioners.	Journal of the Irish Dental Association	0.6		Irish		hep
1997	Medzhitov, Ruslan; Janeway, Charles A.	Innate immunity: impact on the adaptive immune response	Current opinion in immunology	0.6				

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2013	Misra, Ranjita; Jiobu, Karen; Zhang, Johnathan; Liu, Qihui; Li, Feng; Kirkpatrick, Robert; Ho, Jason	Racial disparities in hepatitis B infection in Ohio: screening and immunization are critical for early clinical management	Journal of Investigative Medicine: The Official Publication of the American Federation for Clinical Research	0.6	USA			hep
2011	Mpabalwani, E. M.; Menon, J. A.; Phiri, G.; Malambo, A.; Mbozi, E. K.; Kalesha, P.; Ngosa, C. C.; Louw, G.; Seddon, P.; Ngoma, M. P. S.	Assessing the Delivery and Effectiveness of a New Immunisation Training Initiative at District Level in Zambia	Medical Journal of Zambia	0.6	ZMB			
2011	Opwora, Antony S.; Laving, Ahmed M. R.; Nyabola, Lambert O.; Olenja, Joyce M.	Who is to blame? Perspectives of caregivers on barriers to accessing healthcare for the under-fives in Butere District, Western Kenya	BMC public health	0.6	KEN			
2010	Pace, Anne C.; Flowers, Schwanda K.; Hastings, Jan K.	Arkansas community pharmacists' opinions on providing immunizations	Journal of Pharmacy Practice	0.6	REU			
1996	Pavia, M.; Indovino, A.; Talarico, F.; Angelillo, I. F.	Seroepidemiological survey on diphtheria and tetanus immunization coverage in adolescents in Calabria	Annali Di Igiene: Medicina Preventiva E Di Comunità	0.6	ITA			diphtheria, tetanus
2002	Pediatrics, Committee On Infectious Diseases American Academy Of; Others	Smallpox vaccine.	Pediatrics	0.6				smallpox
2012	Ratanasiripong, Nop T.	A review of human papillomavirus (HPV) infection and HPV vaccine–related attitudes and sexual behaviors among college-aged women in the United States	Journal of American College Health	0.6	USA		1	hpv
2003	Rhodes, Scott D.; Grimley, Diane M.; Hergenrather, Kenneth C.	Integrating behavioral theory to understand hepatitis B vaccination among men who have sex with men	American Journal of Health Behavior	0.6				hep
2008	Seward, Jane F.; Marin, Mona; Vázquez, Marietta	Varicella vaccine effectiveness in the US vaccination program: a review	Journal of Infectious Diseases	0.6	USA		1	varicella
2008	Shefer, Abigail; Markowitz, Lauri; Deeks, Shelley; Tam, Theresa; Irwin, Kathleen; Garland, Suzanne M.; Schuchat, Anne	Early experience with human papillomavirus vaccine introduction in the United States, Canada and Australia	Vaccine	0.6	AUS, CAN, USA			hpv
2006	Srinivasan, R.; Menon, L.; Stevens, P.; Campbell, I.; Alfaham, M.	Ethnic differences in selective neonatal BCG immunisation: white British children miss out	Thorax	0.6	GBR			bcg
2010	Staples, J. Erin; Gershman, Mark; Fischer, Marc	Yellow fever vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP).	MMWR. Morbidity and mortality weekly report	0.6				yellow
1967	Suchman, Edward A.	Preventive health behavior: A model for research on community health campaigns	Journal of health and social behavior	0.6				
2004	Taira, Al V.; Neukermans, Christopher P.; Sanders, Gillian D.	Evaluating human papillomavirus vaccination programs	Emerging infectious diseases	0.6				hpv
2005	Taylor, Laura; Tan, Christina G.; Liu, Suoqun; Miro, Suzanne; Genese, Carol A.; Bresnitz, Eddy A.	New Jersey's smallpox vaccination clinic experiences, 2003	Journal of Public Health Management and Practice	0.6	JEY			smallpox
2009	Theeten, Heidi; Hens, Niel; Aerts, Marc; Vandermeulen, Corinne; Roelants, Mathieu; Hoppenbrouwers, Karel; Van Damme, Pierre; Beutels, Philippe	Caregivers' willingness to pay to reduce the number of vaccine injections in infants	The Pediatric Infectious Disease Journal	0.6				
2014	Vernaz, A.; Gaudart, J.; Sallah, K.; Casanova, L.; Debroise, A.; Laporte, R.; Minodier, P.	BCG vaccination: survey among children less than 5 years of age in an emergency department	Archives De Pédiatrie: Organe Officiel De La Sociéte Française De Pédiatrie	0.6				bcg
2010	Wittet, Scott	Implementation of HPV vaccination in India, Peru, Uganda and Vietnam	Cervical Cancer Action Global Webinar October	0.6	IND, PER, UGA, VNM			hpv
2010	Wong, Li Ping; Sam, I.-Ching	Ethnically diverse female university students' knowledge and attitudes toward human papillomavirus (HPV), HPV vaccination and cervical cancer	European Journal of Obstetrics & Gynecology and Reproductive Biology	0.6				hpv
1997	Zola, Janet; Smith, Nicole; Goldman, Samuel; Woodruff, Bradley A.	Attitudes and educational practices of obstetric providers regarding infant hepatitis B vaccination.	Obstetrics & Gynecology	0.6				hep
2012	Bhadoria, Vikas; Gobinath, Arjun; Mitra, Palash; Narayan, Meghana	Transforming India's vaccine market: Saving lives, creating value	McKinsey and Company	0.59	IND			
1967	Dandoy, Suzanne	Measles epidemiology and vaccine use in Los Angeles County, 1963 and 1966.	Public health reports	0.59	USA			measles
2007	Enger, Kyle S.	Geographic analysis of immunization patterns in Michigan using MCIR data	APHA Annual Meeting	0.59	USA			
2009	Myers, Catherine; Posfay-Barbe, Klara M.; Aebi, Christoph; Cheseaux, Jean-Jacques; Kind, Christian; Rudin, Christoph; Nadal, David; Siegrist, Claire-Anne; Pediatric Infectious Disease Group Of Switzerland (Pigs); Swiss Mother And Child Hiv Cohort Study (Mochiv)	Determinants of vaccine immunity in the cohort of human immunodeficiency virus-infected children living in Switzerland	The Pediatric Infectious Disease Journal	0.59	CHE			
2010	Nghi, Nguyen Quy; Lamontagne, D. Scott; Bingham, Allison; Rafiq, Mirriam; Lien, Nguyen Thi Phuong; Khanh, Nguyen Cong; Hong, Duong Thi; Huyen, Dang Thi Thanh; Tho, Nguyen Thi Thi; Hien, Nguyen Tran; Others	Human papillomavirus vaccine introduction in Vietnam: formative research findings	Sexual Health	0.59	VNM			hpv
2001	Vryheid, R. E.	A survey of vaccinations of immigrants and refugees in San Diego County, California	Asian American and Pacific Islander Journal of Health	0.59	USA			

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2011	Attaullah, Sobia; Khan, Sanaullah; Naseemullah, Ayaz S.; Khan, Shahid Niaz; Ali, Ijaz; Hoti, Naseruddin; Siraj, Sami	Prevalence of HBV and HBV vaccination coverage in health care workers of tertiary hospitals of Peshawar, Pakistan	Virol J	0.58	PAK			
2005	Butler, Lesley M.; Mills, Paul K.; Yang, Richard C.; Chen Jr, Moon S.	Hepatitis B knowledge and vaccination levels in California Hmong youth: implications for liver cancer prevention strategies	Asian Pacific Journal of Cancer Prevention	0.58	USA			hep
2007	Christie, C. D. C.; Duncan, N. D.; Thame, K. T.; Onorato, M. T.; Smith, H.; Malcolm, L.; Others	Pentavalent Human-Bovine Reassortant Rotavirus Vaccine (PRV) Reduced Healthcare Resource Utilization (HCRU) in Jamaican Infants of African Descent from Low-Middle Income Families	Vaccines for Enteric Diseases Conference, Pestana Palace Hotel, Lisbon, Portugal	0.58	JAM			rotavirus
2008	Gupta, Madhu; Thakur, Jarnail S.; Kumar, Rajesh	Reproductive and Child Health Inequities in Chandigarh Union Territory of India	Journal of Urban Health	0.58				
2012	Mccormick, Emily V.; Durfee, Josh; Vogt, Tara M.; Daley, Matthew F.; Hambidge, Simon J.; Shlay, Judith	Physician attitudes regarding school-located vaccinations	Pediatrics	0.58				
1995	Newman, J. F. E.; Tirrell, S.; Ullman, C.; Piatti, P. G.; Brown, F.	Stabilising oral poliovaccine at high ambient temperatures	Vaccine	0.58				polio
1998	Sabnis, Svapna S.; Pomeranz, Albert J.; Lye, Patricia S.; Amateau, Margaret M.	Do missed opportunities stay missed? A 6-month follow-up of missed vaccine opportunities in inner city Milwaukee children	Pediatrics	0.58	USA			
2011	Shen-Gunther, Jane; Shank, Jessica J.; Ta, Vulihn	Gardasil™ HPV vaccination: Surveillance of vaccine usage and adherence in a military population	Gynecologic oncology	0.58				hpv
2013	Vanderpool, Robin C.; Cohen, Elisia L.; Crosby, Richard A.; Jones, Maudella G.; Bates, Wallace; Casey, Baretta R.; Collins, Tom	1-2-3 Pap Intervention Improves HPV Vaccine Series Completion Among Appalachian Women	Journal of Communication	0.58	USA			hpv
2012	Wallace, Aaron S.; Ryman, Tove K.; Dietz, Vance	Experiences integrating delivery of maternal and child health services with childhood immunization programs: systematic review update	Journal of Infectious Diseases	0.58			1	
2009	Watson, Maureen; Shaw, Douglas; Molchanoff, Luda; Mcinnes, Cathy	Challenges, lessons learned and results following the implementation of a human papilloma virus school vaccination program in South Australia	Australian and New Zealand journal of public health	0.58	AUS			hpv
2008	World Health Organization	Sixty-First World Health Assembly Agenda Item 11.7: Global immunization strategy	WHO	0.58				
2010	Bartolini, Rosario M.; Drake, Jennifer Kidwell; Creed-Kanashiro, Hilary M.; Díaz-Otoya, Margarita M.; Mosqueira-Lovón, Nelly Rocío; Penny, Mary E.; Winkler, Jennifer L.; Lamontagne, D. Scott; Bingham, Allison	Formative research to shape HPV vaccine introduction strategies in Peru	Salud pública de México	0.57	PER			hpv
2010	Daley, Matthew F.; Crane, Lori A.; Markowitz, Lauri E.; Black, Sandra R.; Beaty, Brenda L.; Barrow, Jennifer; Babbel, Christine; Gottlieb, Sami L.; Liddon, Nicole; Stokley, Shannon; Others	Human papillomavirus vaccination practices: a survey of US physicians 18 months after licensure	Pediatrics	0.57	USA			hpv
2012	Etter, Dillon J.; Zimet, Gregory D.; Rickert, Vaughn I.	Human papillomavirus vaccine in adolescent women: a 2012 update	Current Opinion in Obstetrics and Gynecology	0.57				hpv
2012	Ivers, Louise C.; Farmer, Paul E.; Pape, William J.	Oral cholera vaccine and integrated cholera control in Haiti	The Lancet	0.57	HTI			cholera
2012	Taylor, Victoria M.; Burke, Nancy; Do, Hoai; Liu, Qi; Yasui, Yutaka; Bastani, Roshan	HPV vaccination uptake among Cambodian mothers	Journal of Cancer Education	0.57	KHM			hpv
2007	Alazraqui, Marcio; Mota, Eduardo; Spinelli, Hugo; Guevel, Carlos	Inequalities in health and socioeconomics: an epidemiological undertaking in an urban area of Argentina	Revista Panamericana de Salud Publica	0.55				
2007	Cook, Joseph; Whittington, Dale; Canh, Do Gia; Johnson, F.; Nyamete, Andrew	Reliability of stated preferences for cholera and typhoid vaccines with time to think in Hue, Vietnam	Economic Inquiry	0.55	VNM			cholera, typhoid
2000	Evers, D. B.	Insights on immunizations from caregivers of children receiving Medicaid-funded services	Journal of the Society of Pediatric Nurses	0.55		USA		
2000	Froehlich, H.; West, D. J.	Compliance with hepatitis B virus vaccination in a high-risk population.	Ethnicity & disease	0.55				hep
2008	Halder, Amal K.; Kabir, M.	Inequalities in infant immunization coverage in Bangladesh	Health Services Insights	0.55	BGD			
1991	Johnston, M.	Vaccination programmes: a new idea	Vibro	0.55				
2006	Kroneman, Madelon; Van Essen, Gerrit A.; Paget, W. John	Influenza vaccination coverage and reasons to refrain among high-risk persons in four European countries	Vaccine	0.55		Europe		influenza
2001	Lebaron, Charles W.; Massoudi, Mehran; Stevenson, John; Lyons, Bridget	Vaccination coverage and physician distribution in the United States, 1997	Pediatrics	0.55	USA			
2001	Lloyd, A. J.	The extent of patients' understanding of the risk of treatments	Quality in Health Care	0.55				
2006	Mukanga, David O.; Kiguli, Sarah	Factors affecting the retention and use of child health cards in a slum community in Kampala, Uganda, 2005	Maternal and child health journal	0.55	UGA			
2010	Ojo, Linda R.; O'Loughlin, Rosalyn E.; Cohen, Adam L.; Loo, Jennifer D.; Edmond, Karen M.; Shetty, Sharmila S.; Bear, Allyson P.; Privor-Dumm, Lois; Griffiths, Ulla K.; Hajjeh, Rana	Global use of Haemophilus influenzae type b conjugate vaccine	Vaccine	0.55				hib
1995	Petrie, Keith J.; Booth, Roger J.; Pennebaker, James W.; Davison, Kathryn P.; Thomas, Mark G.	Disclosure of trauma and immune response to a hepatitis B vaccination program.	Journal of consulting and clinical psychology	0.55				hep
2013	Roland, Damian; Ellis, Catherine; Blair, Mitch E.	Assisting healthcare professionals in understanding drivers and barriers to improving pre-school immunisation uptake	Community Practitioner: The Journal of the Community Practitioners' & Health Visitors' Association	0.55				

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2011	Sheinfeld Gorin, Sherri N.; Glenn, Beth A.; Perkins, Rebecca B.	The human papillomavirus (HPV) vaccine and cervical cancer: uptake and next steps	Advances in Therapy	0.55				hpv
1998	Skinner, S. Rachel; Nolan, Terry; Bowes, Glen	Measles-mumps-rubella and hepatitis B vaccination uptake in adolescents: a survey in metropolitan Melbourne.	The Medical journal of Australia	0.55	AUS			hep, measles, mumps, rubella
2010	Stein, Judith A.; Nyamathi, Adeline M.	Completion and subject loss within an intensive hepatitis vaccination intervention among homeless adults: the role of risk factors, demographics, and psychosocial variables	Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association	0.55				hep
1990	Sulekha, C.; Sujamol, Susan; Bai, Ns Suguna; Cherian, Thomas; T Jacob, John	An epidemic of poliomyelitis in southern Kerala	International journal of epidemiology	0.55	IND			polio
1999	Turner, D. P.; Finch, G.	Pneumococcal vaccine uptake in medical patients discharged from a district hospital	Communicable disease and public health	0.55				pneumo
2012	Zaman, K.; Yunus, M.; El Arifeen, Shams; Azim, Tasnim; Faruque, A. S. G.; Huq, Ehsanul; Hossain, Ilias; Luby, Stephen P.; Victor, John C.; Dallas, Michael J.; Others	Methodology and lessons-learned from the efficacy clinical trial of the pentavalent rotavirus vaccine in Bangladesh	Vaccine	0.55	BGD			rotavirus
2008	Schellenberg, Joanna Rm Armstrong; Mrisho, Mwifadhi; Manzi, Fatuma; Shirima, Kizito; Mbuya, Conrad; Mushi, Adiel K.; Ketende, Sosthenes C.; Alonso, Pedro L.; Mshinda, Hassan; Tanner, Marcel; Others	Health and survival of young children in southern Tanzania	BMC public health	0.54				
2009	Mitchell, Steven; Andersson, Neil; Ansari, Noor M.; Omer, Khalid; Soberanis, José L.; Cockcroft, Anne	Equity and vaccine uptake: a cross-sectional study of measles vaccination in Lasbela District, Pakistan	BMC International Health and Human Rights	0.51	PAK			measles
2002	Ms, Friedman; J, Somani	Health conditions in the tribal villages of South Bihar: an epidemiologic survey.	The Journal of the Association of Physicians of India	0.51				
1989	Aaby, P.; Clements, C. John	Measles immunization research: a review.	Bulletin of the World Health Organization	0.5			1	measles
2005	Alper, Zuleyha; Ozdemir, Hakan; Bilgel, Nazan	The knowledge of" Facts for Life".	Education for health (Abingdon, England)	0.5				
2009	Braun, Latoya Jones; Jezek, Jan; Peterson, Sabrina; Tyagi, Anil; Perkins, Shalimar; Sylvester, David; Guy, Mark; Lal, Manjari; Priddy, Scott; Plzak, Heidi; Others	Characterization of a thermostable hepatitis B vaccine formulation	Vaccine	0.5				hep
2005	Dalal, Ashwin; Silveira, M. P.	Immunization status of children in Goa	Indian pediatrics	0.5	IND			
2011	Dorell, Christina G.; Yankey, David; Santibanez, Tammy A.; Markowitz, Lauri E.	Human papillomavirus vaccination series initiation and completion, 2008–2009	Pediatrics	0.5				hpv
2010	Doyle, J.; Baumgartner, J.; Bell, J.	PIN43 Meningitis Vaccine Coverage and Adoption across the United States	Value in Health	0.5	USA			mening
2013	Eberth, Jan M.; Hossain, Md Monir; Tiro, Jasmin A.; Zhang, Xingyou; Holt, James B.; Vernon, Sally W.	Human papillomavirus vaccine coverage among females aged 11 to 17 in Texas counties: an application of multilevel, small area estimation	Women's Health Issues	0.5	USA			hpv
2010	Francis, Shelley A.; Nelson, Jennifer; Liverpool, Joan; Soogun, Soji; Mofammere, Nokuthula; Thorpe, Roland J.	Examining attitudes and knowledge about HPV and cervical cancer risk among female clinic attendees in Johannesburg, South Africa	Vaccine	0.5	ZAF			hpv
2015	Fu, Linda Y.; Zook, Kathleen; Gingold, Janet; Gillespie, Catherine W.; Briccetti, Christine; Cora-Bramble, Denice; Joseph, Jill G.; Moon, Rachel Y.	Frequent Vaccination Missed Opportunities at Primary Care Encounters Contribute to Underimmunization	The Journal of pediatrics	0.5				
2010	Gaudelus, J.	Vaccine coverage in children	Archives de pédiatrie: organe officiel de la Société française de pédiatrie	0.5				
2010	Gautret, Philippe; Yong, Winnie; Soula, Georges; Parola, Philippe; Brouqui, Philippe; Delvecchio Good, Mary-Jo	Determinants of tetanus, diphtheria and poliomyelitis vaccinations among Hajj pilgrims, Marseille, France	European Journal of Public Health	0.5	FRA			diphtheria, polio, tetanus
1991	Gbedonou, P.; Ndiaye, J. M.; Levy-Bruhl, D.; Josse, R.; Yarou, M.	Enlarged program of vaccination and community participation in Benin	Bulletin De La Société De Pathologie Exotique (1990)	0.5	BEN			
2009	Harries, Jane; Moodley, Jennifer; Barone, Mark A.; Mall, Sumaya; Sinanovic, Edina	Preparing for HPV vaccination in South Africa: key challenges and opinions	Vaccine	0.5	ZAF			hpv
2010	Hasan, Q.; Bosan, A. H.; Bile, K. M.	A review of EPI progress in Pakistan towards achieving coverage targets: present situation and the way forward	WHO	0.5	PAK		1	
1985	Henderson, Donald A.; Arita, Isao	Utilization of vaccine in the global eradication of smallpox	Vaccinia Viruses as Vectors for Vaccine Antigens (ed. GV Quinnan, Jr.)	0.5				smallpox
1984	Henderson, Ralph H.	The expanded programme on immunization of the World Health Organization	Review of Infectious Diseases	0.5				
2008	Kamara, Lidija; Milstien, Julie B.; Patyna, Maria; Lydon, Patrick; Levin, Ann; Brenzel, Logan	Strategies for financial sustainability of immunization programs: a review of the strategies from 50 national immunization program financial sustainability plans	Vaccine	0.5			1	

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2012	Laz, Tabassum H.; Rahman, Mahbubur; Berenson, Abbey B.	An update on human papillomavirus vaccine uptake among 11–17 year old girls in the United States: National Health Interview Survey, 2010	Vaccine	0.5	USA			hpv
2013	Laz, Tabassum H.; Rahman, Mahbubur; Berenson, Abbey B.	Human papillomavirus vaccine uptake among 18-to 26-year-old women in the United States	Cancer	0.5	USA			hpv
1999	Legros, Dominique; Paquet, Christophe; Perea, William; Marty, I.; Kenya Mugisha, N.; Royer, H.; Neira, M.; Ivanoff, Bernard	Mass vaccination with a two-dose oral cholera vaccine in a refugee camp	Bulletin of the World Health Organization	0.5				cholera
2010	Madhavi, Y.; Puliyel, Jacob M.; Mathew, Joseph L.; Raghuram, N.; Phadke, Anant; Shiva, Mira; Srinivasan, S.; Paul, Yash; Srivastava, R. N.; Parthasarathy, A.; Others	Evidence-based national vaccine policy	The Indian journal of medical research	0.5				
2012	Marchand, Erica; Glenn, Beth A.; Bastani, Roshan	Low HPV vaccine coverage among female community college students	Journal of community health	0.5				hpv
1976	Mcbean, A. Marshall; Foster, Stanley O.; Herrmann, Kenneth L.; Gateff, Claude	Evaluation of a mass measles immunization campaign in Yaounde, Cameroun	Transactions of the Royal Society of Tropical Medicine and Hygiene	0.5	CMR			measles
2002	Organization, World Health; Others	Vaccine Assessment and Monitoring Team. Generic protocols for (i) hospital-based surveillance to estimate the burden of rotavirus gastroenteritis in children and (ii) a community-based survey on utilization of health care services for gastroenteritis in children. Field test ed. Geneva: Vaccines and Biologicals	World Health Organization	0.5				rotavirus
2007	Pandey, Priyanka; Sehgal, Ashwini R.; Riboud, Michelle; Levine, David; Goyal, Madhav	Informing resource-poor populations and the delivery of entitled health and social services in rural India: a cluster randomized controlled trial	Jama	0.5				
1999	Plotkina, Stanley A.	Vaccination against the major infectious diseases	Comptes Rendus de l'Académie des Sciences-Series III-Sciences de la Vie	0.5				
1999	Rashid, Mahbubur; Tayakkanonta, Korpchoot; Chongsuvivatwong, Virasakdi; Geater, Alan; Bechtel, Gregory A.	Traditional birth attendants' advice toward breast-feeding, immunization and oral rehydration among mothers in rural Bangladesh	Women & health	0.5	BGD			
1994	Salsberry, P. J.; Nickel, J. T.; Mitch, R.	Immunization status of 2-year-olds in middle/upper- and lower-income populations: a community survey	Public Health Nursing	0.5				
1996	Steele, Fiona; Diamond, Ian; Amin, Sajeda	Immunization uptake in rural Bangladesh: a multilevel analysis	Journal of the Royal Statistical Society. Series A (Statistics in Society)	0.5	BGD			
2012	Tiro, Jasmin A.; Tsui, Jennifer; Bauer, Heidi M.; Yamada, Eileen; Kobrin, Sarah; Breen, Nancy	Human papillomavirus vaccine use among adolescent girls and young adult women: an analysis of the 2007 California health interview survey	Journal of Women's Health	0.5	USA			hpv
2014	Zipursky, Simona; Djingarey, Mamoudou Harouna; Lodjo, Jean-Claude; Olodo, Laifoya; Tiendrebeogo, Sylvestre; Ronveaux, Olivier	Benefits of using vaccines out of the cold chain: delivering meningitis A vaccine in a controlled temperature chain during the mass immunization campaign in Benin	Vaccine	0.5	BEN			mening
2004	Levine, Myron M.; Sztein, Marcelo B.	Vaccine development strategies for improving immunization: the role of modern immunology	Nature immunology	0.48				
2007	Brotherton, Julie; Wang, Han; Schaffer, Andrea; Quinn, Helen; Menzies, Robert; Hull, Brynley; Lawrence, Glenda; Wood, James; Wood, Nicholas; Rosewell, Alexander; Others	Vaccine preventable diseases and vaccination coverage in Australia, 2003 to 2005.	Communicable diseases intelligence quarterly report	0.47	AUS			
2005	Owen, Erin C.; Peddecord, K. Michael; Wang, Wenrong Wendy; Vryheid, Robert; Picardal, Michelle; Deguire, Michelle; Gustafson, Kathleen W.; Ross, Sandra; Brodine, Stephanie K.; Sawyer, Mark H.	Hepatitis A vaccine uptake in San Diego County: Hispanic children are better immunized	Archives of pediatrics & adolescent medicine	0.47	USA			hep
2011	Cortes, Jennifer E.; Curns, Aaron T.; Tate, Jacqueline E.; Cortese, Margaret M.; Patel, Manish M.; Zhou, Fangjun; Parashar, Umesh D.	Rotavirus vaccine and health care utilization for diarrhea in US children	New England Journal of Medicine	0.45	USA			rotavirus
2008	Dempsey, Amanda F.; Zimet, Gregory D.	Human papillomavirus vaccine and adolescents	Current Opinion in Obstetrics and Gynecology	0.45				hpv
2008	Diaz, M.; Kim, J. J.; Albero, G.; De Sanjosé, S.; Clifford, G.; Bosch, F. X.; Goldie, S. J.	Health and economic impact of HPV 16 and 18 vaccination and cervical cancer screening in India	British Journal of Cancer	0.45	IND			hpv
2012	Gefenaite, Giedre; Smit, Marieke; Nijman, Hans W.; Tami, Adriana; Drijfhout, Ingrid H.; Pascal, Astrid; Postma, Maarten J.; Wolters, Bert A.; Van Delden, Johannes J. M.; Wilschut, Jan C.; Hak, Eelko	Comparatively low attendance during Human Papillomavirus catch-up vaccination among teenage girls in the Netherlands: Insights from a behavioral survey among parents	BMC public health	0.45	NLD			hpv
2004	Katahoire, Anne; Scheutz, Flemming; Sabroe, Svend; Whyte, Susan Reynolds	The importance of maternal schooling for child morbidity and mortality and maternal health behavior in southeastern Uganda.	Journal of Health and Population in Developing Countries	0.45	UGA			
2004	Kiwanuka, Noah; Robb, Merlin; Kigozi, Godfrey; Birx, Deborah; Philips, James; Wabwire-Mangen, Fred; Wawer, Maria J.; Nalugoda, Fred; Sewankambo, Nelson K.; Serwadda, David; Others	Knowledge about vaccines and willingness to participate in preventive HIV vaccine trials: a population-based study, Rakai, Uganda	JAIDS Journal of Acquired Immune Deficiency Syndromes	0.45	UGA			

Publication Year	Author	Title	Publication Title	Relevance	iso3	Region	Review	Antigens
2013	Li, Qian; Hu, Yu; Qi, Xiao-Hua; Lou, Ling-Qiao; Luo, Shu-Ying; Tang, Xue-Wen; Chen, En-Fu	Analysis on coverage rate of primary immunization of measles vaccine among migrant children in Yiwu, Zhejiang province from 2007 to 2010	Chinese Journal of Preventive Medicine	0.45	CHN			measles
2008	Menzies, R.; Turnour, C.; Chiu, C.; Mcintyre, P.	Vaccine preventable diseases and vaccination coverage in Aboriginal and Torres Strait Islander people, Australia 2003 to 2006.	Communicable diseases intelligence quarterly report	0.45	AUS			
2012	Moss, Jennifer L.; Gilkey, Melissa B.; Reiter, Paul L.; Brewer, Noel T.	Trends in HPV vaccine initiation among adolescent females in North Carolina, 2008–2010	Cancer Epidemiology Biomarkers & Prevention	0.45	USA			hpv
1988	Orenstein, Walter A.; Bernier, Roger H; Hinman, Alan R.	Assessing vaccine efficacy in the field further observations	Epidemiologic reviews	0.45				
2009	Power, Michael L.; Leddy, Meaghan A.; Anderson, Britta L.; Gall, Stanley A.; Gonik, Bernard; Schulkin, Jay	Obstetrician-gynecologists' practices and perceived knowledge regarding immunization	American Journal of Preventive Medicine	0.45				
2008	Semba, Richard D.; De Pee, Saskia; Sun, Kai; Sari, Mayang; Akhter, Nasima; Bloem, Martin W.	Effect of parental formal education on risk of child stunting in Indonesia and Bangladesh: a cross-sectional study	The Lancet	0.43				
2007	Zhou, Fangjun; Kyaw, Moe H.; Shefer, Abigail; Winston, Carla A.; Nuorti, J. Pekka	Health care utilization for pneumonia in young children after routine pneumococcal conjugate vaccine use in the United States	Archives of pediatrics & adolescent medicine	0.42	USA			pneumo
2011	Ae, Sadoh; Odunvbun, M. E.; Onyiriuka, A. N.; Enabudoso, E.; Okolo, A. A.; Okpere, E. E.	Tracking of immunization in Nigeria: a community based approach.	Journal of Medicine and Biomedical Research	0.4	NGA			
2002	Akramuzzaman, Syed M.; Cutts, Felicity T.; Hossain, Md J.; Wahedi, Obaidullah K.; Nahar, Nazmun; Islam, Darul; Shaha, Narayan C.; Mahalanabis, Dilip	Measles vaccine effectiveness and risk factors for measles in Dhaka, Bangladesh	Bulletin of the World Health Organization	0.4	BGD			measles
1992	Collinson, M. A.; Tollman, S. M.; Maluleke, F. R.	Vaccination coverage in Mhala and Elim in 1990--a health systems approach	South African Medical Journal	0.4	ZAF			
1990	Cutts, F.; Soares, A.; Jecque, A. V.; Cliff, J.; Kortbeek, S.; Colombo, S.	The use of evaluation to improve the Expanded Programme on Immunization in Mozambique	Bulletin of the World Health Organization	0.4	MOZ			
2013	Dye, C.	Making wider use of the world's most widely used vaccine: Bacille Calmette-Guerin revaccination reconsidered	Journal of The Royal Society Interface	0.4				bcg
2014	Hoque, M. E.; Monokoane, S.; Van Hal, G.	Knowledge of and attitude towards human papillomavirus infection and vaccines among nurses at a tertiary hospital in South Africa	Journal of Obstetrics & Gynaecology	0.4	ZAF			hpv
2007	Jegede, Ayodele Samuel	What led to the Nigerian boycott of the polio vaccination campaign?	PLoS Medicine	0.4	NGA			polio
2009	Lu, Ying; Jacobson, Denise L.; Ashworth, Lori A.; Grand, Richard J.; Meyer, Anthony L.; Mcneal, Monica M.; Gregas, Matt C.; Burchett, Sandra K.; Bousvaros, Athos	Immune response to influenza vaccine in children with inflammatory bowel disease	The American journal of gastroenterology	0.4				influenza
1995	Macauley, Rose	Expanded Program on Immunization Program Review Asmara, Eritrea May 22 to June 16, 1995	USAID	0.4	ERI		1	
1980	Mcaleer, William J.; Markus, Henry Z.; Mclean, Arlene A.; Buynak, Eugene B.; Hilleman, Maurice R.	Stability on storage at various temperatures of live measles, mumps and rubella virus vaccines in new stabilizer	Journal of biological standardization	0.4				measles, mumps, rubella
2011	Phillips-Howard, Penelope; Laserson, Kayla; Mills, Lisa; Odhiambo, Frank; Nduba, Videlis; Otieno, Frederic; Mason, Linda; Chesang, Kipruto; Mwandi, Zebedee; Muttai, Hellen; Diana Karanja; Hopkins, Jan; Vandenhoudt, Hilde; Mwinzi, Pauline; Others	An adolescent-young people's health platform in western Kenya to develop preventive and treatment programmes for Africa	KEMRI and CDC	0.4	KEN			
2012	Rubin, Rochelle F.; Kuttab, Huda-Marie; Rihani, Rami S.; Reutzel, Thomas J.	Patient adherence to three dose completion of the Quadrivalent Human Papillomavirus (HPV) vaccine in a private practice	Journal of community health	0.4				hpv
2008	Stein, A. N.; Macintyre, C. R.; Britt, H.; Harrison, C.; Conway, E. L.; Cunningham, A.	Vaccine Preventable Zoster Burden of Illness and Health Care Resourse Utilization: An Australian Perspective	International Journal of Infectious Diseases	0.4	AUS			
2003	Talley, Leisel; Salama, Peter	Short report: assessing field vaccine efficacy for measles in famine-affected rural Ethiopia	The American journal of tropical medicine and hygiene	0.4	ETH			measles
2011	Wong, Charlene A.; Berkowitz, Zahava; Dorell, Christina G.; Anhang Price, Rebecca; Lee, Jennifer; Saraiya, Mona	Human papillomavirus vaccine uptake among 9-to 17-year-old girls	Cancer	0.4				hpv
1990	Cutts, F. T.; Smith, P. G.; Colombo, S.; Mann, G.; Ascherio, A.; Soares, A. C.	Field evaluation of measles vaccine efficacy in Mozambique	American journal of epidemiology	0.35	MOZ			measles
1989	Hinman, Alan R.	Vaccine development and utilization: summary of the symposium	Reviews of Infectious Diseases	0.35				
1998	Prevots, D. Rebecca; Degli Atti, Marta L. Ciofi; Sallabanda, Alexander; Diamante, Eleni; Aylward, R. Bruce; Kakariqqi, Eduard; Fiore, Lucia; Ylli, Alban; Van Der Avoort, Harrie; Sutter, Roland W.; Others	Outbreak of paralytic poliomyelitis in Albania, 1996: high attack rate among adults and apparent interruption of transmission following nationwide mass vaccination	Clinical Infectious Diseases	0.35	ALB			polio
1991	De Silva, R.; Herm, H.; Khan, M.; Chowdhury, J. H.	Bangladesh national immunization cluster survey: 1991.	Near Miracle in Bangladesh	0.3	BGD			
1996	Douglas, R. Gordon	The heritage of hepatitis B vaccine	JAMA	0.3				hep
2005	Glass, Roger I.; Bresee, Joseph S.; Turcios, Reina; Fischer, Thea K.; Parashar, Umesh D.; Steele, A. Duncan	Rotavirus vaccines: targeting the developing world	Journal of Infectious Diseases	0.3		Developing Countries		rotavirus

Publication Year	Author	Title	Publication Title	Relevance	iso3	Region	Review	Antigens
2010	Heinsbroek, Ellen; Ruitenberg, E. Joost	The global introduction of inactivated polio vaccine can circumvent the oral polio vaccine paradox	Vaccine	0.3				polio
1995	Herceg, A.; Daley, C.; Schubert, P.; Hall, R.; Longbottom, H.	A population-based survey of immunisation coverage in two-year-old children	Australian Journal of Public Health	0.3				
2000	King, James C.; Treanor, John; Fast, Patricia E.; Wolff, Mark; Yan, Lihan; Iacuzio, Dominic; Readmond, Bernard; O'Brien, Diane; Mallon, Kenneth; Highsmith, William E.; Others	Comparison of the safety, vaccine virus shedding, and immunogenicity of influenza virus vaccine, trivalent, types A and B, live cold-adapted, administered to human immunodeficiency virus (HIV)-infected and non-HIV-infected adults	Journal of Infectious Diseases	0.3				influenza
2005	Lieberman, Samuel S.; Capuno, Joseph J.; Van Minh, Hoang	Decentralizing health: lessons from Indonesia, the Philippines, and Vietnam	East Asia decentralizes: Making local government work	0.3	IDN, PHL, VNM			
2012	Lu, Chunling; Chin, Brian; Lewandowski, Jiwon Lee; Basinga, Paulin; Hirschhorn, Lisa R.; Hill, Kenneth; Murray, Megan; Binagwaho, Agnes	Towards universal health coverage: an evaluation of Rwanda Mutuelles in its first eight years	PLoS One	0.3	RWA			
1987	Malison, M. D.; Sekeito, P.; Henderson, P. L.; Hawkins, R. V.; Okware, Samuel I.; Jones, T. S.	Estimating health service utilization, immunization coverage, and childhood mortality: a new approach in Uganda.	Bulletin of the World Health Organization	0.3	UGA			
2012	Schellenberg, J. A.	Evidence to improve maternal and newborn health in Ethiopia, North-Eastern Nigeria and Uttar Pradesh, India	Presentation slides	0.3	ETH, IND, NGA			
2010	Mariani, Luciano; Venuti, Aldo	HPV vaccine: an overview of immune response, clinical protection, and new approaches for the future	J Transl Med	0.25				hpv
2004	Cutts, F. T.; Hall, A. J.	Vaccines for neonatal viral infections: hepatitis B vaccine	Expert Review of Vaccines	0.2				hep
1997	Dietz, Vance J.; Lewin, Michael; Zell, Elizabeth; Rodewald, Lance	Evaluation of failure to follow vaccination recommendations as a marker for failure to follow other health recommendations	The Pediatric infectious disease journal	0.2				
2008	Kim, Jung-Soo; Baek, Yong Soo; Chung, Moon-Hyun; Lee, Jin-Soo; Oh, Kyung Sun	The pattern of vaccine administration accessed by vaccine consumption in a university hospital	Infection and Chemotherapy	0.2				
1974	World Health Organization	Twenty-Seventh World Health Assembly Resolution 27.57: WHO Expanded programme on Immunization	WHO	0.2				
2004	Timmermans, Danielle; Molewijk, Bert; Stiggelbout, Anne; Kievit, Job	Different formats for communicating surgical risks to patients and the effect on choice of treatment	Patient education and counseling	0.15				
2005	American Public Health Association	Developing a Comprehensive Public Health Approach to Influenza	APHA Policy Statement Database	0.1				
1989	Bart, Kenneth J.; Hinman, Alan R.; Jordan, William S.	International Symposium on Vaccine Development and Utilization	University of Chicago Press	0.1				
2009	Chicamisse, Manuel; Harun, Mohamed; Alders, Robyn G.; Young, Mary	Evaluation of the cold chain encountered by 'wet'l-2 Newcastle disease vaccine from the vaccine production department to the village chicken in Mozambique	Village chickens, poverty alleviation and the sustainable control of newcastle disease	0.1	MOZ			
2011	Kaljee, Linda; Pach, Alfred; Stanton, Bonita	Applied anthropology, vaccine trials and feasibility studies: Intersections of local knowledge, biomedicine, and policy	Practicing Anthropology	0.1				
2006	Nambaziira, S.	An online tool for Monitoring and tracking vaccines and vaccine logistics utilization at district level in Uganda	Makerere University	0.1	UGA			
1986	Preblud, Stephen R.	Varicella: complications and costs	Pediatrics	0.1				varicella
2009	Wang, Li; Jason, X. Nie; Upshur, Ross E. G.	Determining use of preventive health care in Ontario: comparison of rates of 3 maneuvers in administrative and survey data	Canadian Family Physician Médecin De Famille Canadien	0.1	CAN			

APPENDIX B

5.1 DRIED BLOOD SPOT SYSTEMATIC REVIEW

[Referred to in section 3.1]

We conducted a systematic review of DBS literature following PRISMA methodology. The search was performed in 5 major databases of peer-reviewed articles (For example, SCOPUS, Google Scholar, and PubMed). In each database, two search strategies were performed. The first search strategy used in each of the databases was to employ a structured keyword bank in order to focus the search. The second strategy in each database use text words (in the title and in the abstract) in order to capture articles not yet included in the sample. We focused on two major keywords: Dried Blood Spot and Enzyme-linked Immunosorbent Assay(ELISA). Additionally, we included search terms such as Sero-Status, Anti-Tetanus Toxoid Immunoglobulin G(IgG), Anti-Hepatitis-B Surface Antibody(HBsAb), Anti-Hepatitis-B Core Antibody(HBcAb), Hepatitis-B Surface Antigen(HBsAg), and Optical Density.

We reviewed titles, abstracts, and full-length articles to identify potentially relevant articles. Only studies published in peer-reviewed literature which outlined methods of Dried Blood Spot analysis were included in the review. We reviewed 824,302 citations of peer-reviewed articles, of which 65 articles of the 824,302 articles were eligible for full review upon analyzing the title and abstract. Of the eligible articles(n=65), they covered the time period from 1981 - 2016. Collected variables included ISO codes, antigen analyzed, and tested regions.

Below are the relevant studies that were identified:

1. Andersen NJ, Mondal TK, Preissler MT, Freed BM, Stockinger S, Bell E, et al. Detection of immunoglobulin isotypes from dried blood spots. Journal of immunological methods. 2014;404:24-32.

2. Bland JM, Altman D. Statistical methods for assessing agreement between two methods of clinical measurement. The lancet. 1986;327(8476):307-10.

3. Bland JM, Altman DG. Measuring agreement in method comparison studies. Statistical methods in medical research. 1999;8(2):135-60.

4. Brambilla D, Jennings C, Aldrovandi G, Bremer J, Comeau AM, Cassol SA, et al. Multicenter evaluation of use of dried blood and plasma spot specimens in quantitative assays for human immunodeficiency virus RNA: measurement, precision, and RNA stability. Journal of clinical microbiology. 2003;41(5):1888-93.

5. Bwogi J, Braka F, Makumbi I, Mishra V, Bakamutumaho B, Nanyunja M, et al. Hepatitis B infection is highly endemic in Uganda: findings from a national serosurvey. African health sciences [Internet]. 2009 [cited 2016 Oct 6];9(2). Available from: http://www.ajol.info/index.php/ahs/article/view/43770

6. Choi DH, Katakura Y, Matsuda R, Hayashi Y, Ninomiya K, Shioya S. Simulation model for predicting limit of detection and range of quantitation of competitive enzyme-linked immunosorbent assay. Journal of bioscience and bioengineering. 2007;103(5):427-31.

7. Colson K, Potter A, Conde-Glez C, Hernandez B, Ríos-Zertuche D, Zúñiga-Brenes P, et al. Use of a commercial ELISA for the detection of measles-specific immunoglobulin G (IgG) in dried blood spots collected from children living in low-resource settings. Journal of medical virology. 2015;87(9):1491-9.

8. Condorelli F, Scalia G, Stivala A, Gallo R, Marino A, Battaglini CM, et al. Detection of immunoglobulin G to measles virus, rubella virus, and mumps virus in serum samples and in microquantities of whole blood dried on filter paper. Journal of virological methods. 1994;49(1):25-36.

9. Corran PH, Cook J, Lynch C, Leendertse H, Manjurano A, Griffin J, et al. Dried blood spots as a source of anti-malarial antibodies for epidemiological studies. Malaria Journal. 2008;7(1):1.

10. Croom HA, Richards KM, Best SJ, Francis BH, Johnson EI, Dax EM, et al. Commercial enzyme immunoassay adapted for the detection of antibodies to hepatitis C virus in dried blood spots. Journal of clinical virology. 2006;36(1):68-71.

11. De Crignis E, Re MC, Cimatti L, Zecchi L, Gibellini D. HIV-1 and HCV detection in dried blood spots by SYBR Green multiplex real-time RT-PCR. Journal of virological methods. 2010;165(1):51-6.

12. Delem AD. Comparison of modified HAVAB and ELISA for determination of vaccine-induced anti-HAV response. Biologicals. 1992;20(4):289-91.

13. Demirev PA. Dried blood spots: analysis and applications. Analytical chemistry. 2012;85(2):779-89.

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15. Farzadegan H, Noori KH, Ala F. Detection of Hepatitis-B Surface Antigen in Blood and Blood Products Dried on Filter Paper. The Lancet. 1978 Feb 18;311(8060):362-3.

16. Forbi JC, Obagu JO, Gyar SD, Pam CR, Pennap GR, Agwale SM, et al. Application of dried blood spot in the sero-diagnosis of hepatitis B infection (HBV) in an HBV hyper-endemic nation. Annals of African medicine. 2010;9(1):44.

17. Gil A, Gonzalez A, Dal-Re R, Dominguez V, Astasio P, Aguilar L. Detection of antibodies against hepatitis A in blood spots dried on filter paper. Is this a reliable method for epidemiological studies? Epidemiology and infection. 1997;118(02):189-91.

18. Gupta BP, Jayasuryan N, Jameel S. Direct detection of hepatitis B virus from dried blood spots by polymerase chain reaction amplification. Journal of clinical microbiology. 1992;30(8):1913-6.

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21. Helfand RF, Cabezas C, Abernathy E, Castillo-Solorzano C, Ortiz AC, Sun H, et al. Dried blood spots versus sera for detection of rubella virus-specific immunoglobulin M (IgM) and IgG in samples collected during a rubella outbreak in Peru. Clinical and Vaccine Immunology. 2007;14(11):1522-5.

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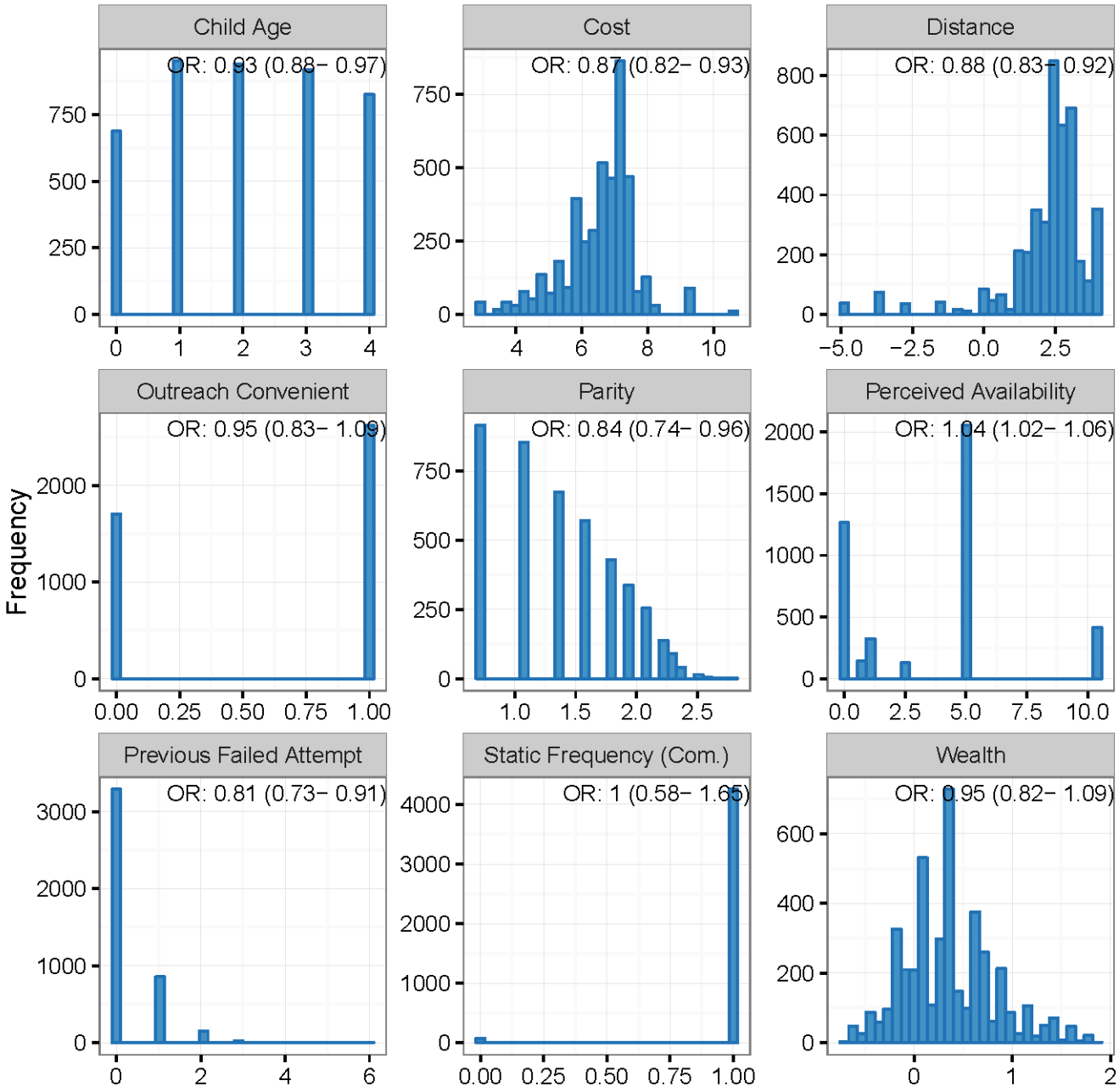
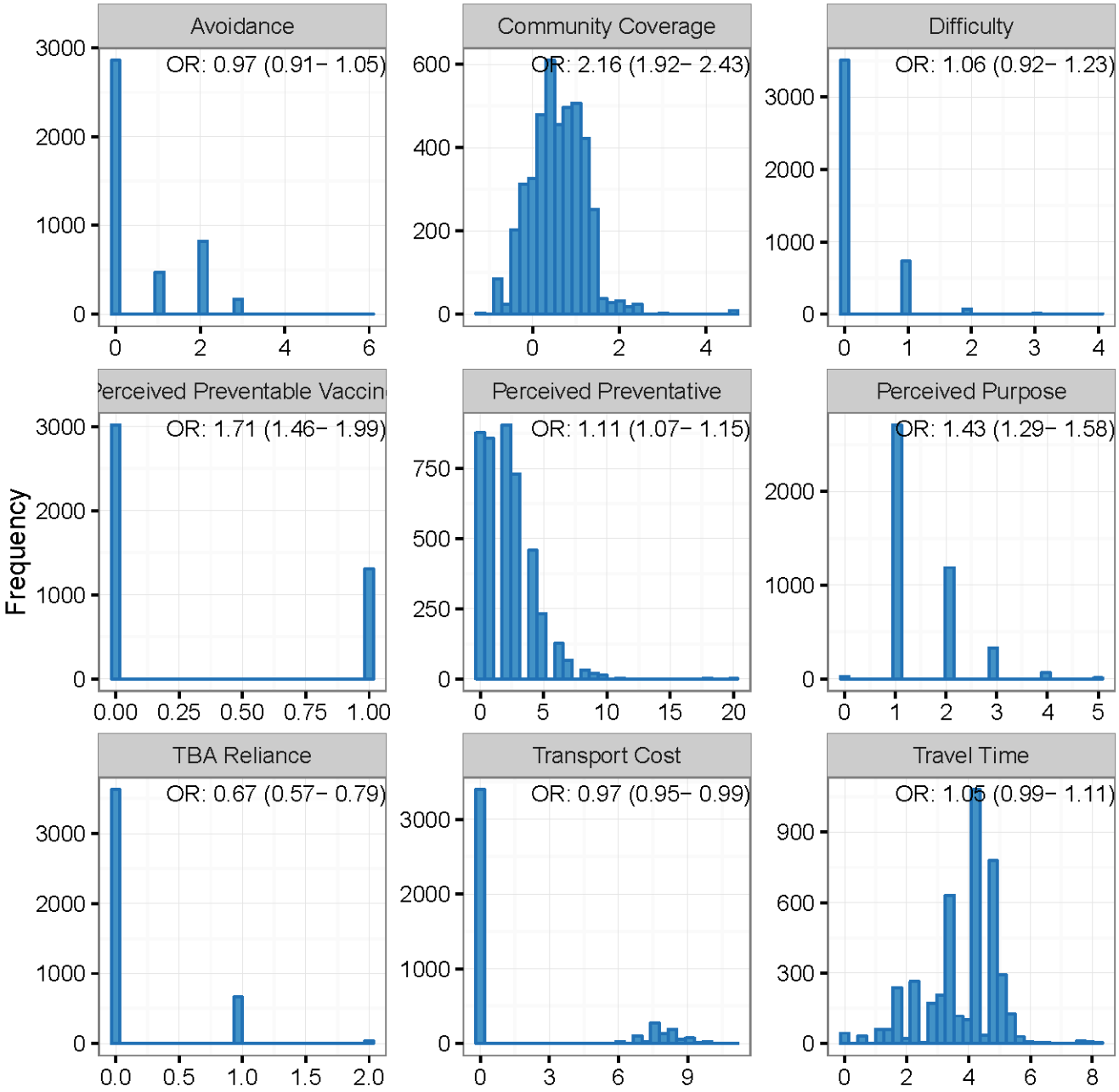
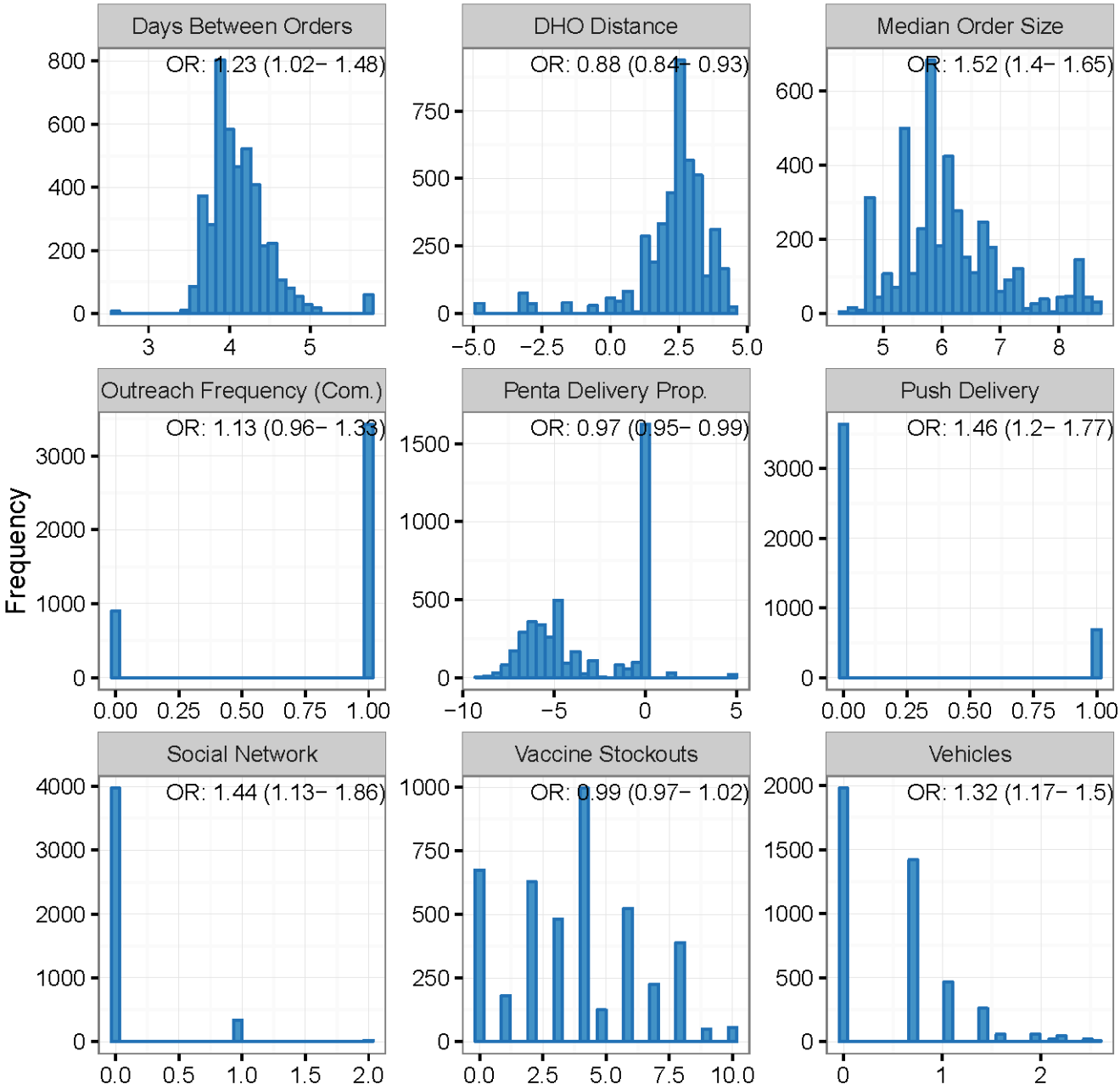
APPENDIX C

6.1 ADDITIONAL FIGURES AND TABLES

Figure 17: Histograms and univariate odds ratios of variables used in model (Uganda Pentavalent-3)




Avoidance
OR: 0.97 (0.91− 1.05)
Community Coverage
OR: 2.16 (1.92− 2.43)
Difficulty
OR: 1.06 (0.92− 1.23)
erceived Preventable Vaccin
OR: 1.71 (1.46− 1.99)
Perceived Preventative
OR: 1.11 (1.07− 1.15)
Perceived Purpose
OR: 1.43 (1.29− 1.58)
TBA Reliance
OR: 0.67 (0.57− 0.79)
Transport Cost
OR: 0.97 (0.95− 0.99)
Travel Time
OR: 1.05 (0.99− 1.11)
Frequency


Days Between Orders
OR: 1.23 (1.02− 1.48)
DHO Distance
OR: 0.88 (0.84− 0.93)
Median Order Size
OR: 1.52 (1.4− 1.65)
Outreach Frequency (Com.)
OR: 1.13 (0.96− 1.33)
Penta Delivery Prop.
OR: 0.97 (0.95− 0.99)
Push Delivery
OR: 1.46 (1.2− 1.77)
Social Network
OR: 1.44 (1.13− 1.86)
Vaccine Stockouts
OR: 0.99 (0.97− 1.02)
Vehicles
OR: 1.32 (1.17− 1.5)
Frequency

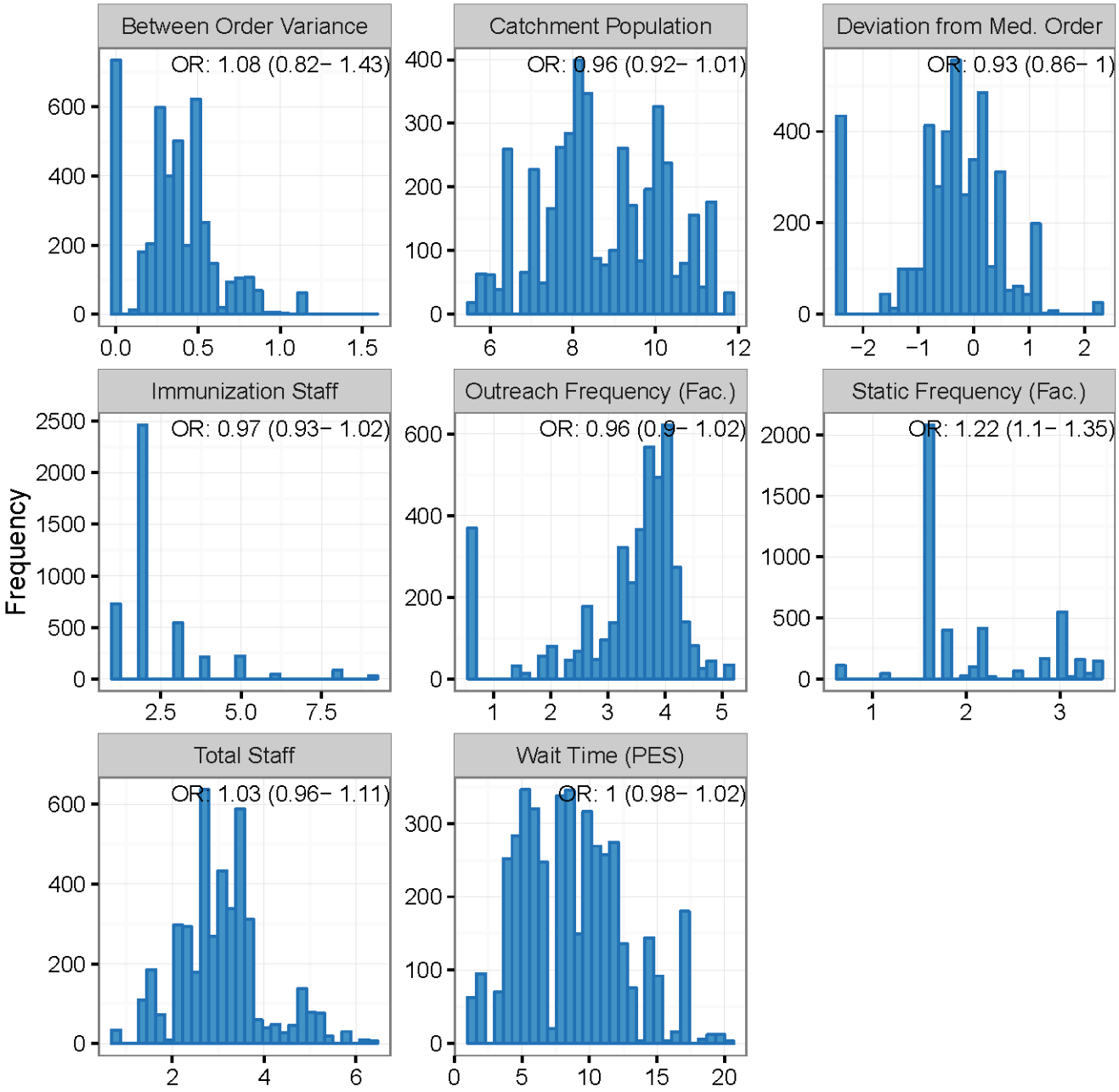
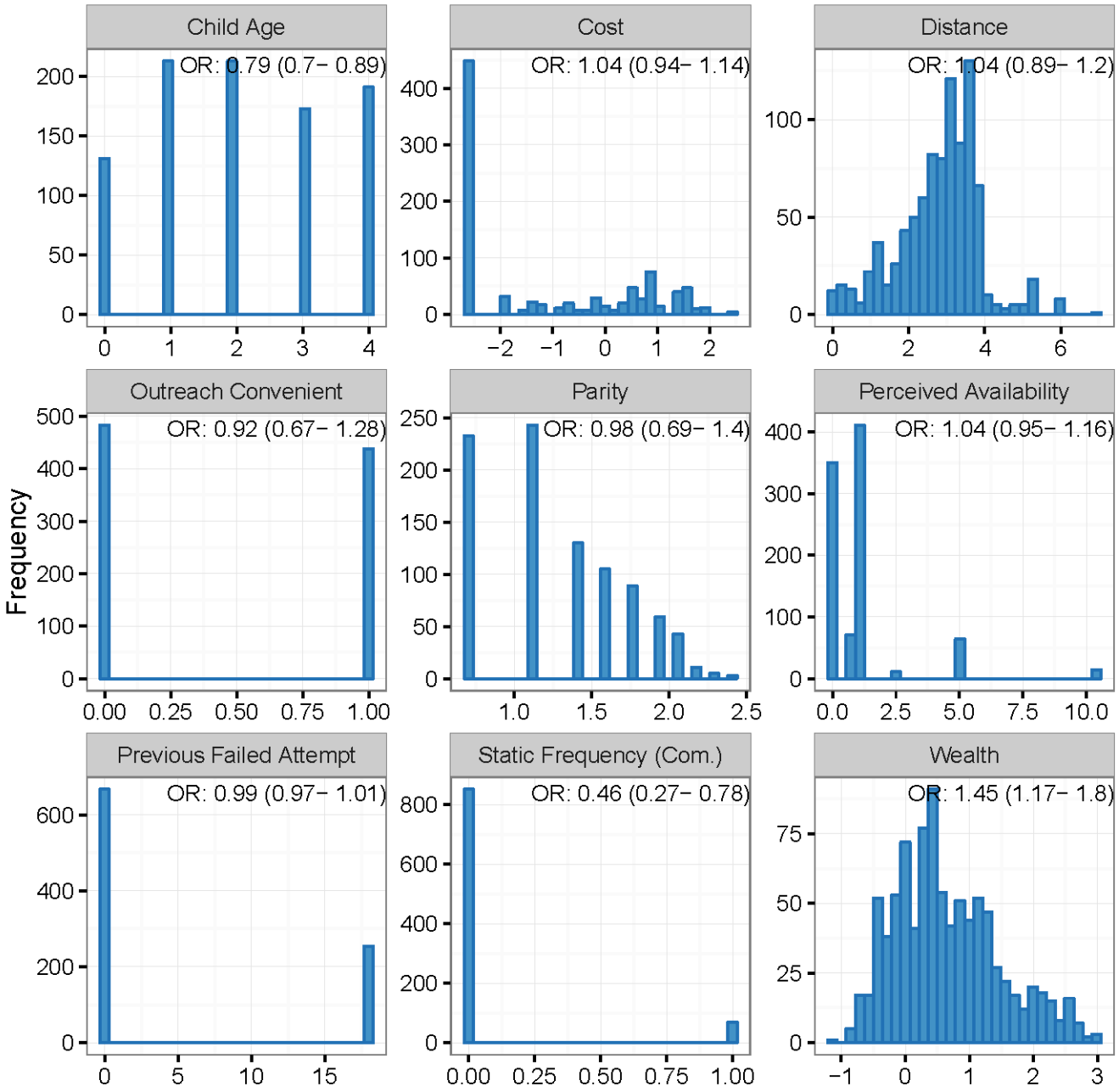
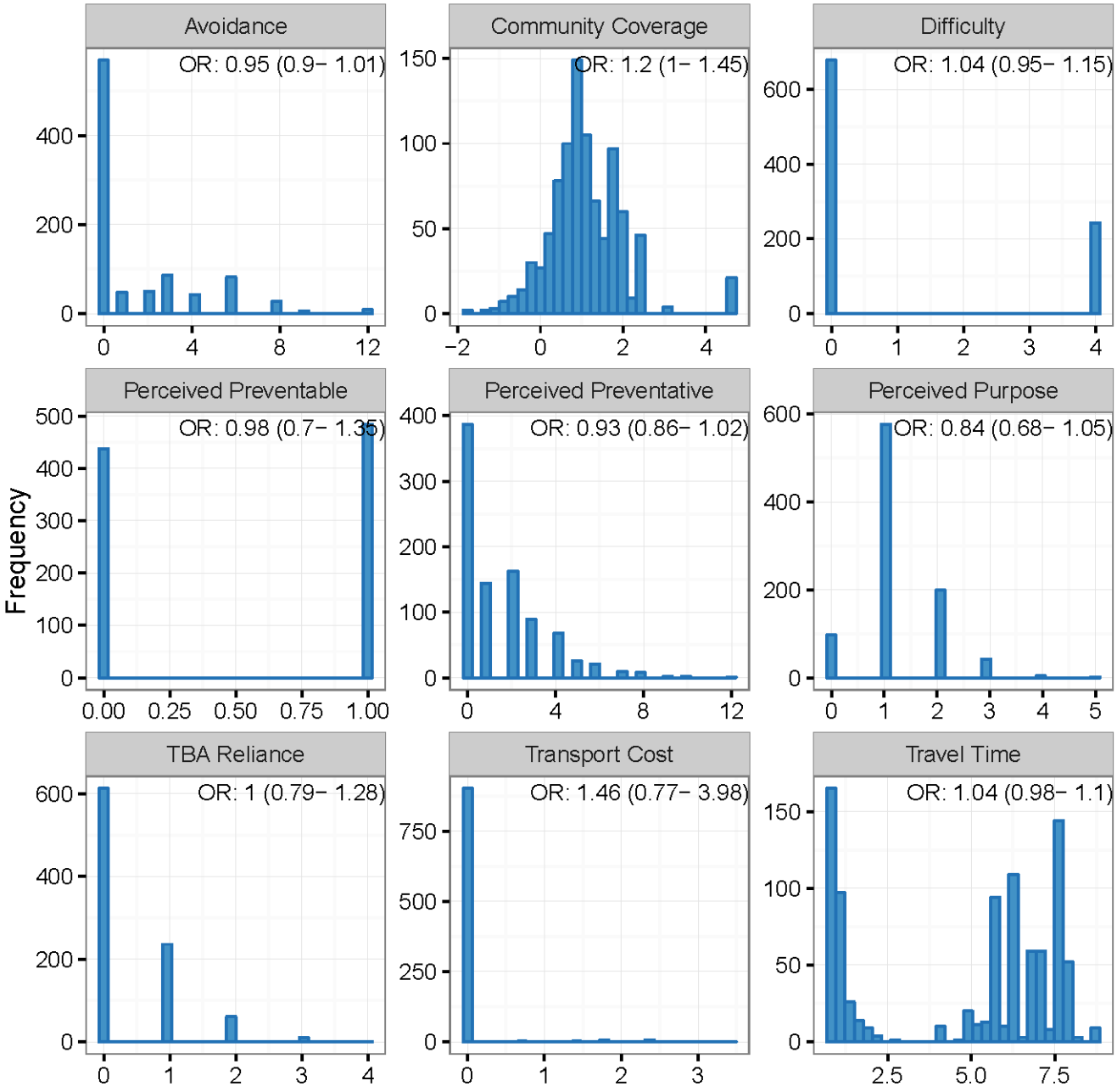
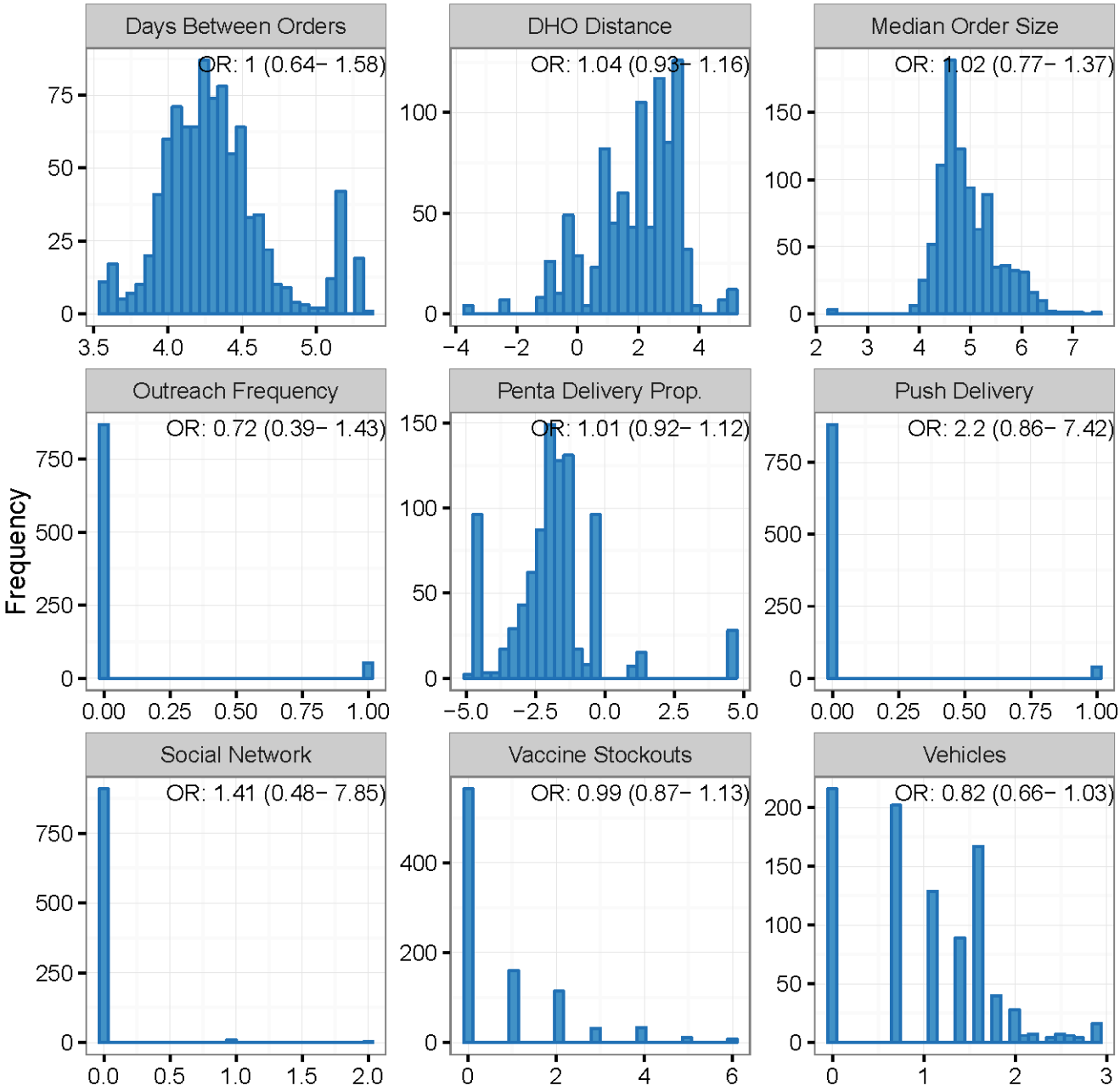

Between Order Variance
OR: 1.08 (0.82− 1.43)
Catchment Population
OR: 0.96 (0.92− 1.01)
Deviation from Med. Order
OR: 0.93 (0.86− 1)
Immunization Staff
OR: 0.97 (0.93− 1.02)
Outreach Frequency (Fac.)
OR: 0.96 (0.9− 1.02)
Static Frequency (Fac.)
OR: 1.22 (1.1− 1.35)
Total Staff
OR: 1.03 (0.96− 1.11)
Wait Time (PES)
OR: 1 (0.98− 1.02)
Frequency

Figure 18: Histograms and univariate odds ratios of variables used in model (Zambia Pentavalent-3)




Avoidance
OR: 0.95 (0.9− 1.01)
Community Coverage
OR: 1.2 (1− 1.45)
Difficulty
OR: 1.04 (0.95− 1.15)
Perceived Preventable
OR: 0.98 (0.7− 1.35)
Perceived Preventative
OR: 0.93 (0.86− 1.02)
Perceived Purpose
OR: 0.84 (0.68− 1.05)
TBA Reliance
OR: 1 (0.79− 1.28)
Transport Cost
OR: 1.46 (0.77− 3.98)
Travel Time
OR: 1.04 (0.98− 1.1)
Frequency


Days Between Orders
OR: 1 (0.64− 1.58)
DHO Distance
OR: 1.04 (0.93− 1.16)
Median Order Size
OR: 1.02 (0.77− 1.37)
Outreach Frequency
OR: 0.72 (0.39− 1.43)
Penta Delivery Prop.
OR: 1.01 (0.92− 1.12)
Push Delivery
OR: 2.2 (0.86− 7.42)
Social Network
OR: 1.41 (0.48− 7.85)
Vaccine Stockouts
OR: 0.99 (0.87− 1.13)
Vehicles
OR: 0.82 (0.66− 1.03)
Frequency

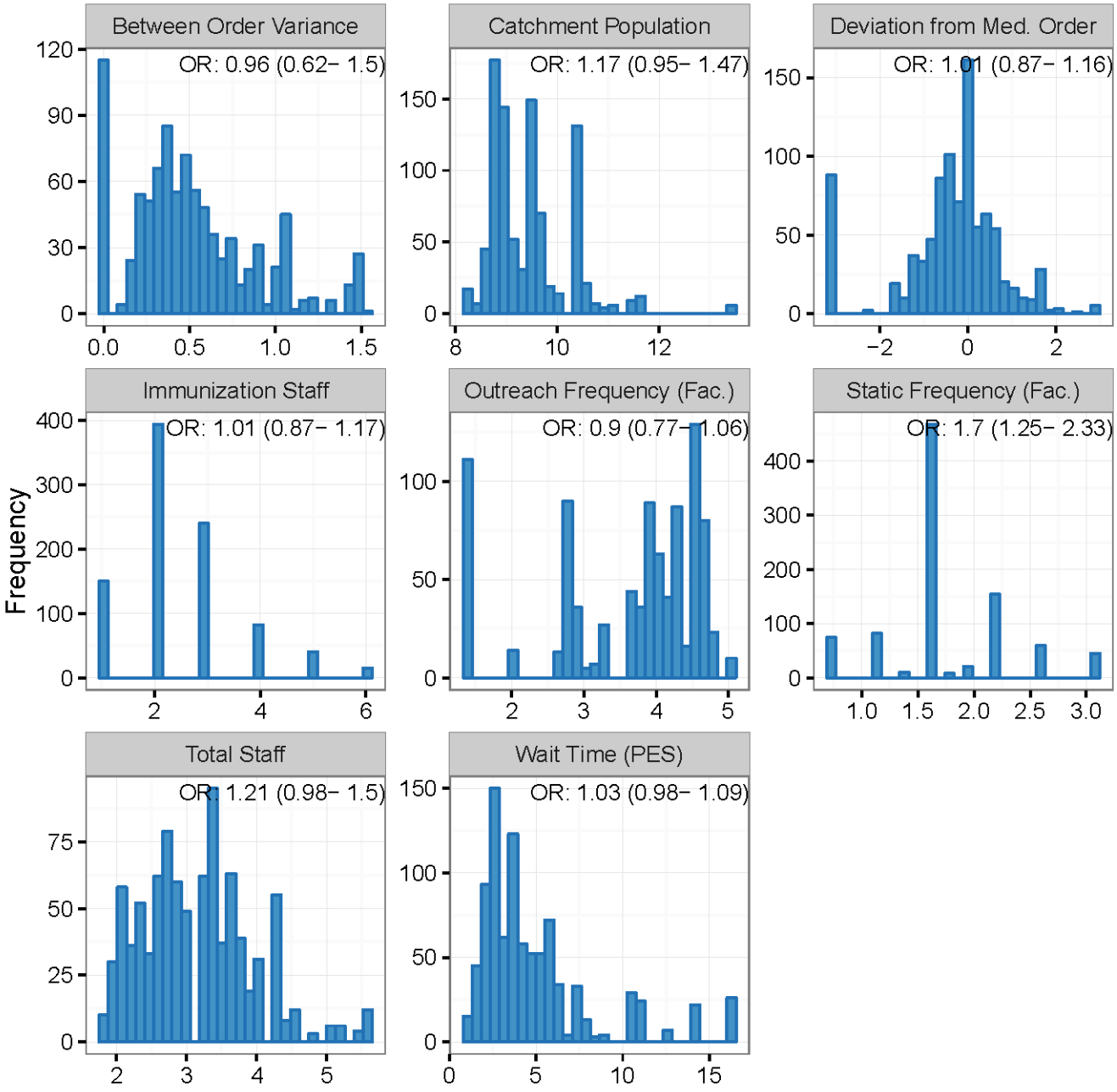

Between Order Variance
OR: 0.96 (0.62− 1.5)
Catchment Population
OR: 1.17 (0.95− 1.47)
Deviation from Med. Order
OR: 1.01 (0.87− 1.16)
Immunization Staff
OR: 1.01 (0.87− 1.17)
Outreach Frequency (Fac.)
OR: 0.9 (0.77− 1.06)
Static Frequency (Fac.)
OR: 1.7 (1.25− 2.33)
Total Staff
OR: 1.21 (0.98− 1.5)
Wait Time (PES)
OR: 1.03 (0.98− 1.09)
Frequency

Figure 19: Full model of vaccine constraints and determinants (Pentavalent-3, Zambia)

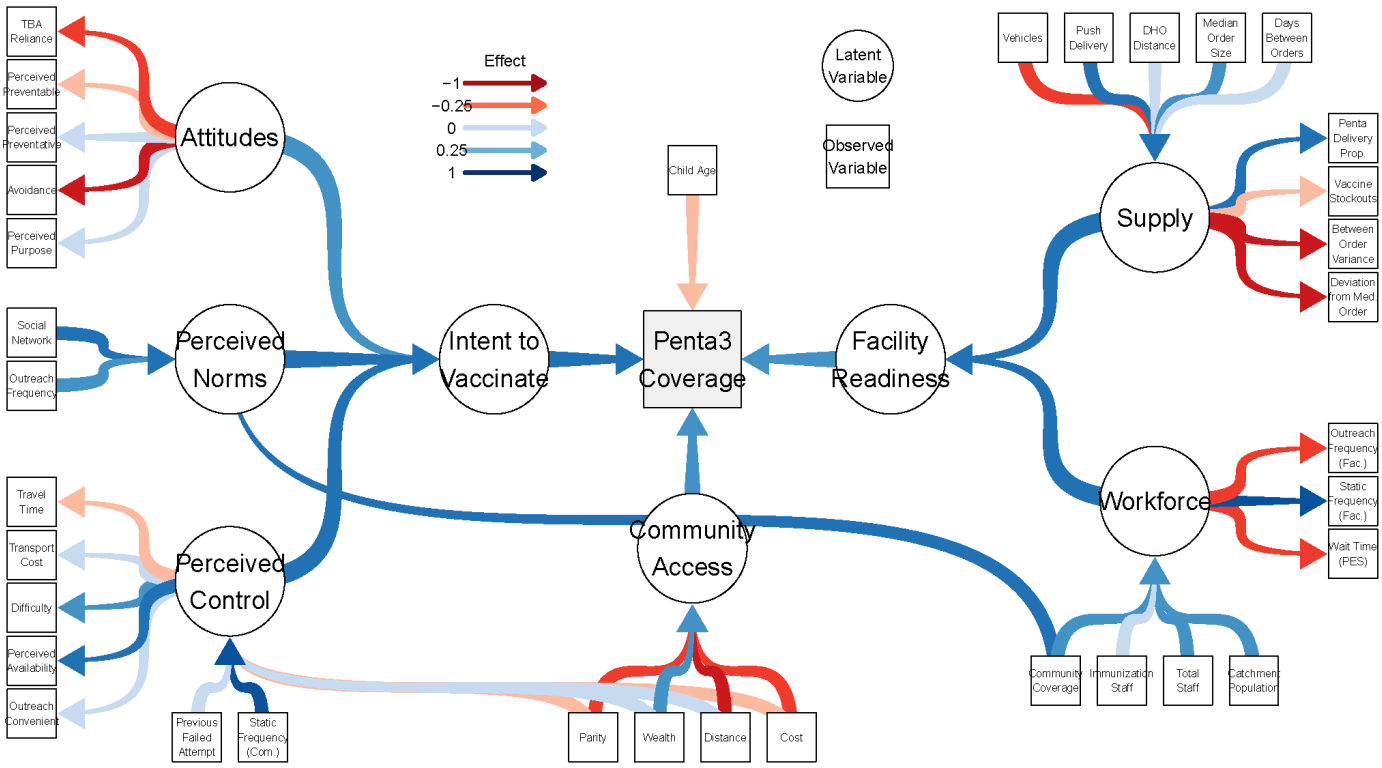


Table 9: Model coefficients, posterior credible intervals and standardized coefficients for Pentavalent-3 in Zambia

Y	Relationship	X	Estimate	Highest Posterior Density Interval	Standardized
Penta3 Coverage	Caused by	Facility Readiness	0.08	0.00 - 0.21	0.34
		Community Access	0.09	0.00 - 0.23	0.4
		Intent to Vaccinate	0.1	0.00 - 0.22	0.53
		Child Age	-0.04	-0.06 - -0.02	-0.07
Intent to Vaccinate	Composite of	Attitudes	1	NA - NA	0.35
		Perceived Norms	1	0.00 - 3.07	0.67
		Perceived Control	1	0.00 - 3.06	0.55
Facility Readiness	Composite of	Supply	1	NA - NA	0.71
		Workforce	0.98	0.00 - 2.91	0.55
Community Access	Composite of	Parity	-1	NA - NA	-0.42
		Cost	-0.94	-20.19 - 18.24	-0.39
		Distance	-1.3	-21.42 - 18.37	-0.55
		Wealth	1.04	-18.06 - 21.17	0.44

Perceived Control	Caused by	Static Frequency (Com.)	1.22	0.77 - 1.63	0.77
		Wealth	0.05	-0.12 - 0.21	0.03
		Distance	-0.01	-0.11 - 0.10	0
		Cost	-0.03	-0.10 - 0.04	-0.02
		Previous Failed Attempt	0.01	-0.00 - 0.03	0.01
		Parity	-0.1	-0.34 - 0.12	-0.06
	Measured by	Perceived Availability	1	NA - NA	0.75
		Outreach Convenient	0.02	-0.03 - 0.08	0.07
		Difficulty	0.17	-0.02 - 0.39	0.15
		Transport Cost	0.01	-0.02 - 0.04	0.03
		Travel Time	-0.08	-0.39 - 0.26	-0.05
Attitudes	Measured by	Perceived Purpose	0	-0.06 - 0.06	0
		Avoidance	-2.21	-2.56 - -1.73	-0.87
		Perceived Preventative	0.07	-0.08 - 0.22	0.04
		Perceived Preventable Vaccine	-0.02	-0.06 - 0.01	-0.05
		TBA Reliance	-0.24	-0.32 - -0.18	-0.36
Perceived Norms	Composite of	Community Coverage	1	NA - NA	0.52
		Social Network	1.03	-18.31 - 20.12	0.54
		Outreach Frequency (Com.)	0.78	-19.00 - 20.46	0.41
Supply	Caused by	Vehicles	-0.22	-0.42 - -0.06	-0.14
		Push Delivery	1.13	0.57 - 1.86	0.71
		DHO Distance	0.02	-0.07 - 0.10	0.01
		Median Order Size	0.47	-0.66 - 1.08	0.29
		Days Between Orders	0.05	-1.20 - 0.78	0.03
	Measured by	Penta Delivery Prop.	1	NA - NA	0.69
		Vaccine Stockouts	-0.06	-0.51 - 0.21	-0.09
		Deviation from Med. Order	-0.58	-1.02 - 0.20	-0.75
		Between Order Variance	-0.16	-0.25 - 0.00	-0.62
Workforce	Caused by	Total Staff	0.59	0.44 - 0.73	0.47
		Community Coverage	0.21	0.12 - 0.29	0.16
		Catchment Population	0.41	0.28 - 0.56	0.33
		Immunization Staff	0.1	0.02 - 0.16	0.08
	Measured by	Wait Time (PES)	-1	NA - NA	-0.33
		Static Frequency (Fac.)	0.4	0.37 - 0.43	0.9
		Outreach Frequency (Fac.)	-0.18	-0.24 - -0.12	-0.21

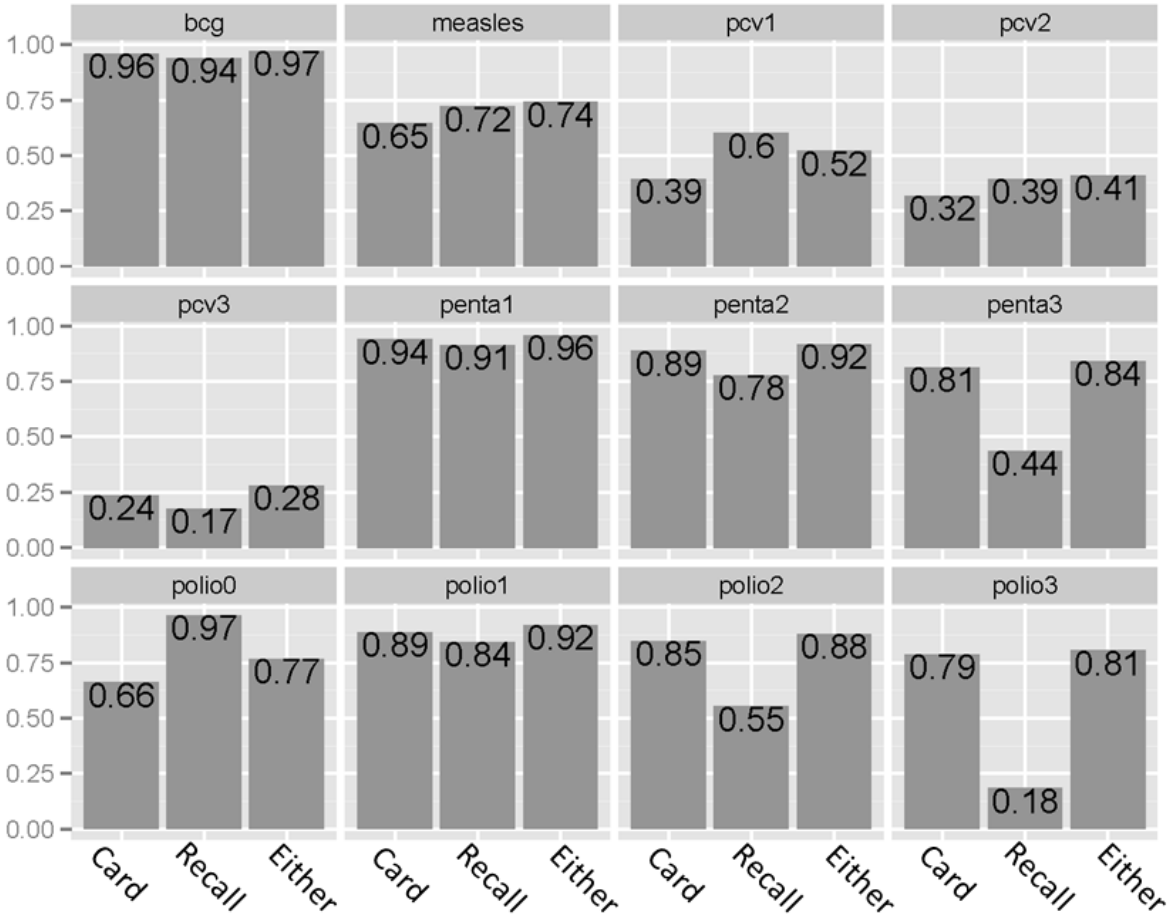
Table 10: Variance, covariance and intercept terms, standard errors and p-values for Pentavalent-3 in Uganda

Y	Term	X	Estimate	95% Credible Interval	Standardized
Supply	Residual Covariance with	Workforce	0.1	0.05 - 0.20	0.1
Difficulty	Residual Covariance with	Previous Failed Attempt	0.02	0.00 - 0.03	0.04
Transport Cost	Residual Covariance with	Travel Time	0.41	0.23 - 0.59	0.13
Total Staff	Residual Covariance with	Immunization Staff	0.23	0.19 - 0.27	0.23
Perceived Availability	Residual Variance		9.65	9.22 - 10.11	0.83
Outreach Convenient	Residual Variance		0.24	0.22 - 0.24	0.97
Difficulty	Residual Variance		0.23	0.22 - 0.24	0.98
Transport Cost	Residual Variance		7.51	6.62 - 8.34	0.58
Travel Time	Residual Variance		1.26	1.18 - 1.33	0.85
Perceived Purpose	Residual Variance		0.43	0.39 - 0.47	0.81
Avoidance	Residual Variance		0.87	0.84 - 0.91	1
Perceived Preventative	Residual Variance		1.7	0.97 - 2.42	0.44
Perceived Preventable	Residual Variance		0.2	0.19 - 0.21	0.96
TBA Reliance	Residual Variance		0.16	0.15 - 0.16	1
Penta Delivery Prop.	Residual Variance		8.16	7.80 - 8.50	0.94
Vaccine Stockouts	Residual Variance		6.66	6.38 - 6.93	1
Deviation from Med. Order	Residual Variance		0.68	0.65 - 0.71	0.76
Between Order Variance	Residual Variance		0.01	0.01 - 0.01	0.1
Wait Time (PES)	Residual Variance		9.83	0.18 - 14.96	0.68
Static Frequency (Fac.)	Residual Variance		0.32	0.24 - 0.46	0.1
Outreach Frequency (Fac.)	Residual Variance		1.03	0.98 - 1.08	0.72
Penta3 Coverage	Residual Variance		0.14	0.09 - 0.20	0.38
Supply	Residual Variance		0.21	0.17 - 0.24	0.43
Workforce	Residual Variance		4.43	0.04 - 13.60	0.97
Perceived Availability	Intercept		4.72	4.22 - 5.18	1.39
Outreach Convenient	Intercept		0.67	0.63 - 0.70	1.36
Difficulty	Intercept		0.26	0.23 - 0.30	0.55

Transport Cost	Intercept	-0.1	-1.02 - 0.83	-0.03
Travel Time	Intercept	4.14	3.97 - 4.31	3.4
Perceived Purpose	Intercept	1.47	1.45 - 1.50	2.02
Avoidance	Intercept	0.61	0.58 - 0.64	0.65
Perceived Preventative	Intercept	2.25	2.19 - 2.31	1.15
Perceived Preventable	Intercept	0.3	0.29 - 0.32	0.66
TBA Reliance	Intercept	0.17	0.16 - 0.18	0.43
Penta Delivery Prop.	Intercept	-0.24	-0.56 - 0.02	-0.08
Vaccine Stockouts	Intercept	4.36	3.93 - 4.85	1.69
Deviation from Med. Order	Intercept	-2.33	-2.53 - -2.15	-2.46
Between Order Variance	Intercept	-0.83	-0.92 - -0.74	-2.74
Wait Time (PES)	Intercept	7.65	4.03 - 9.50	2.02
Static Frequency (Fac.)	Intercept	1.5	1.14 - 2.03	0.85
Outreach Frequency (Fac.)	Intercept	3.14	2.96 - 3.39	2.62
Penta3 Coverage	Intercept	0.75	0.73 - 0.78	1.22
Child Age	Intercept	2.06	2.03 - 2.09	2.06
Parity	Intercept	1.4	1.37 - 1.43	1.4
Cost	Intercept	6.54	6.51 - 6.57	6.54
Distance	Intercept	2.22	2.19 - 2.25	2.22
Wealth	Intercept	0.36	0.33 - 0.39	0.36
Static Frequency (Com.)	Intercept	0.98	0.95 - 1.01	0.98
Previous Failed Attempt	Intercept	0.29	0.26 - 0.32	0.29
Community Coverage	Intercept	0.58	0.55 - 0.61	0.58
Social Network	Intercept	0.09	0.06 - 0.12	0.09
Outreach Frequency	Intercept	0.79	0.76 - 0.82	0.79
Vehicles	Intercept	0.52	0.49 - 0.55	0.52
Push Delivery	Intercept	0.16	0.13 - 0.19	0.16
DHO Distance	Intercept	2.29	2.26 - 2.32	2.29
Median Order Size	Intercept	6.12	6.09 - 6.15	6.12
Days Between Orders	Intercept	4.12	4.09 - 4.15	4.12
Total Staff	Intercept	3.07	3.04 - 3.10	3.07
Catchment Population	Intercept	8.7	8.67 - 8.73	8.7

Immunization Staff	Intercept	2.41	2.37 - 2.46	2.41

Figure 20: Card-based vaccine coverage compared with recall



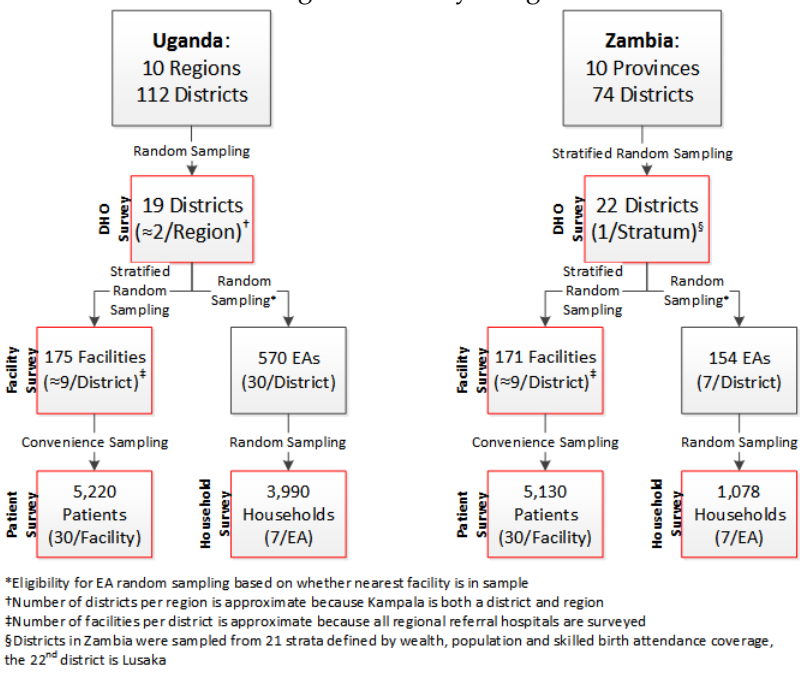
This section provides additional detail about the sampling procedure and data. For a complete description, see the 2016 Annual Dissemination Report of the Gavi Full Country Evaluation:

GAVI Full-Country Evaluation Team. GAVI Full Country Evaluation 2016 Dissemination Report. Seattle, WA: IHME; 2017.

6.2.1 *Sample*

The sampling design was a stratified, two-stage, clustered random sample. Health facilities were randomly selected, stratified by district in Uganda and Province. Households were randomly selected within catchment areas of health facilities included in the study. Patients were selected as a convenience sample upon exiting facilities on the date of data collection of the HFS. The sampling frame used official facility lists from the Bureau of Statistics of Uganda and Zambia, and a community census of households. Resulting design effects were incorporated into all analyses. Figure 21 displays a diagram of the sampling strategy, and Figure 25 displays maps of the sampled districts.

Figure 21: Study design



*Eligibility for EA random sampling based on whether nearest facility is in sample
†Number of districts per region is approximate because Kampala is both a district and region
‡Number of facilities per district is approximate because all regional referral hospitals are surveyed
§Districts in Zambia were sampled from 21 strata defined by wealth, population and skilled birth attendance coverage, the 22nd district is Lusaka

The effect of study design was considered. Because households were not a simple random sample, the appropriate measures would include adjustment for design effects. We were unable to do so during this analysis. Although techniques for estimating design-adjusted coefficients and standard errors are well established in frequentist approaches to structural equation modeling, they are not in the Bayesian context. For details on the frequentist approach, see: Muthen, Bengt O., and Albert Satorra. "Complex sample data in structural equation modeling." Sociological methodology (1995): 267-316. Leading researchers in Bayesian statistics (Gelman, Andrew, et al. Bayesian data analysis. Vol. 2. Boca Raton, FL, USA: Chapman Hall/CRC, 2014.) suggest the use of multi-level random effects for design effects in Bayesian models. Such alterations to our

model were computationally infeasible. Instead, we carried out a sensitivity analysis to explore the impact that this omission may have had on the estimates. We fit the model represented in 12 using maximum likelihood estimation (ML) instead Bayesian methods. This enabled us to employ te methods cited above to adjust for study design. Comparing the unadjusted ML estimates to the adjusted ML estimates gives some sense about biases that may be present in the BSEM model. Figure 23 shows how the model parameters and standard errors change as a result of design-adjustment. The mid-points were found to change very little, though the standard errors generally increased by a factor of 1.5 to 2. This would be expected, as design-adjustment often effects uncertainty more than point estimates. Figure 24 shows how the rank order of model parameters and standard errors changes as a result of design-adjustment. This figure indicates that while some change occurs, interpretations of model coefficients that make comparisons of their relative magnitude will generally be unaffected by design-adjustment.

6.2.2 *Data Processing*

Data processing included a series of steps. Continuous variables were systematically screened for obvious outliers. Missing data were handled in one of two ways: 1) if a value was missing but the correct value was implied by another variable, it was deterministically imputed with that value (e.g. if a child was not vaccinated, the number of doses was set to zero) 2) multiple imputation otherwise. A total of 57 child-level variables and 43 household-level variables were imputed. Imputation was found to rarely be necessary, because an average of 1.4% (SD: 1.6%) of observations per variable were missing in the child-level variables, and 2.3% (SD: 7.1%) of observations per variable were missing in the household-level variables. Uncertainty from multiple imputation was propagated into all subsequent analysis. Continuous and count variables were log-transformed, and proportions were logit-transformed, when necessary for univariate normality. An offset equal to the minimum non-zero value was added to avoid log of zero. The choice of the minimum was compared to an alternative offset of the 5th percentile. In nearly every case, the model coefficients were negligibly different. It was noted that the coefficient related to Workforce was substantially less negative under the alternative offset. While notable, this did not seem to have a substantive effect on the variance explained by Facility Readiness. Figure 3 displays this sensitivity analysis. In certain circumstances, similar binary variables were combined into count variables, representing the number of positive responses among the set of binary variables. See Appendix 2 for more details. DBS data were corrected for bias using a novel data correction algorithm, described in Chapter 2.

6.3 Bayesian structural equation modeling: further details

6.3.1 *Latent Variable Analysis*

Section 3.2.2.2 displays the formulae for the complete BSEM of vaccine determinants. This model includes both observed variables and "latent" variables. Latent variables are described (among other places) in Kenneth Bollen's seminal 1989 text *Structural Equations with Latent Variables* (page 11). A latent variable is an unobserved or unmeasurable construct in a model that is hypothesized to be the actual explanatory factor for another variable. Bollen describes a latent variable as a "pure concept" (page 11), that can only be indirectly measured with data. Examples range from intelligence (which can be indirectly measured with various tests, but never direct known) to the strength of a country's political democracy (which can be indirectly mea-

sured with characteristics of a political system, but is quite abstract on its own). In this context, structural equations are a tool for measuring an underlying latent variable *with error*. This is comparatively preferable to ordinary least squares (OLS) for example, in which the researcher must explain why a variable is an appropriate representation of the true latent construct of interest through narrative description. In fact, all OLS models implicitly assume that the variables in the model are a *perfect* representation of their corresponding construct, a fact which is surely untrue for more complex or abstract constructs.

The model presented in this study incorporates three different ways of measuring latent variables with structural equations. We borrow language used by prominent authors such as Rex Kline to describe these as "reflective", "formative" and "composite" latent variables. A reflective latent variable is one which is hypothesized to be the cause of variance in its corresponding observed variables. In a typical path diagram, this is represented as arrows from the latent variable to the observed variables. Each reflective variable's coefficient is estimated with a different error term. An important assumption is that the covariance between the observed variables is because they all represent the same underlying construct. In other words, it is assumed that reflective variables are independent of each other, conditional on their common latent variable. Other latent variables are the result of their corresponding observed variables however. These are termed formative latent variables, and are represented in a path diagram with an arrow from the observed variables to the latent variable. Under this formulation, no assumptions are made about correlation between formative variables, and only one error term is estimated in the equation; one relating to the latent variable instead of the observed variables. Often, formative and reflective equations are used in combination to measure a single latent variable. Doing so is usually advantageous because it allows more data to be incorporated into a single latent construct. Such formulations were termed "MIMIC" models by Bollen 1989, referring to multiple indicators and multiple causes for a latent variable. The model used in this study can be called a MIMIC model as well, since many of the latent variables have formative and reflective equations. The final approach to defining a latent variable is known as a composite. This approach is well known to statisticians outside of the SEM world as principal components analysis. A composite latent variable is estimated by finding the orthogonal vector to a hyperplane defined by multiple observed variables. Some of the latent variables in this study were measured as composites as well.

The decision to represent latent variables as reflective, formative or composite variables was strictly driven by theory. If the hypothesized relationship was reflective, then the latent variable was modeled as such (and vice versa) with no exceptions.

6.3.2 *Bayesian Structural Equation Modeling*

The core methodology for the coverage analysis was Bayesian Structural Equation Modeling (BSEM). BSEM is a relatively new approach to traditional SEM, having been first introduced by Bengt Muthén and Tihomir Asparouhov in 2011's *Bayesian SEM: A more flexible representation of substantive theory* (Psychological Methods).

Superficially, there are two main differences between BSEM and SEM. One is that prior distributions are used for all parameter estimates, and the other is that Markov-Chain Monte Carlo (rather than linear or non-linear optimization) is used to find parameter estimates. These two differences have very meaningful consequences however. Most importantly, the application of priors changes the interpretation of the estimates from frequentist probabilities (relating to hypothetical alternate realizations of the data) to Bayesian posteriors which relate more directly to

the probability of interest (in this case, probability of vaccination). The other consequence is that entire posterior distributions of model parameters are numerically estimated, rather than just midpoints and standard errors. This is useful for continued analysis of model results well after basic observations have been made about the posterior modes. Briefly, Bayesian data analysis can be summarized as:

$$\mathrm{posterior} = \frac{\mathrm{P}(\mathrm{data}|\mathrm{parameters})\mathrm{P}(\mathrm{parameters})}{\mathrm{P}(\mathrm{data})} \tag{17}$$

Where $\mathrm{P}(\mathrm{data}|\mathrm{parameters})$ is the likelihood function, estimated from the data and model, $\mathrm{P}(\mathrm{data})$ is the prior distribution, specified by the researcher, and $\mathrm{P}(\mathrm{data})$ is a normalizing constant that can be discarded (resulting in proportionality of the posterior and likelihood/priors, not equality).

Muthen and Asparouhov describe four advantages of BSEM of SEM:

1. More can be learned about parameter estimates and model fit
2. Better small-sample performance can be obtained and large-sample theory is not needed
3. Analysis can be made less computationally demanding
4. New types of models can be analyzed

One important point is number 2, better small-sample performance. This, the authors argue, means that the model is less prone to "Heywood cases", or nuisance model convergence issues common in complex frequentist SEMs. Indeed, during this analysis, we noted occasional Heywood cases (also termed improper solutions) such as slightly-negative variance terms and non-invertible covariance matrices which render computation of standard errors impossible. Such improper solutions were never found in BSEM models. Observation number 4 was also seen to be a benefit in this analysis. Because prior distributions could come from any family, we could more closely approximate our hypothetical model by specifying that certain model coefficients were gamma-distributed and no normally-distributed, meaning they were strictly positive. Although frequentist SEM allows equality constraints, pre-specifying the distribution of a parameter was found to be much more robust.

The model was fit using the blavaan software package for R (https://cran.r-project.org/web/packages/blavaan/index.html), which relies on JAGS for MCMC. All models were fit with three MCMC chains and assessed for convergence. All models converged with an MCMC adaptation phase of 1,000 steps, burn-in of 14,000 steps, sample of 6,000 steps and thinning interval of 3.

6.3.2.1 *Estimation of Explained Variance*

Section 3.3.1 displays and discusses explained variance statistics for the primary endogenous variable in each model, vaccine coverage. As a commonsense definition, *explained variance* is the proportion of the overall variation in one variable that is accounted for by one of its explanatory variables. To abuse causal terminology for a moment, *explained variance* indicates how much of the variability in vaccine coverage is the result of a particular determinant. Being at the heart of the research question, this is often a useful statistic to estimate.

Explained variance is inherently estimated in every structural equation model. This is because SEMs estimate coefficients using the variance-covariance structure of the variables, not the mean

structure like generalized linear models. Explained variance in a SEM is related to what are known as standardized coefficients, or coefficients relating a standard deviation change in one variable to a standard deviation change in another. In *Structural Equations with Latent Variables*, Kenneth Bollen shows (on page 349) that standardized coefficients can be obtained directly from typical SEM model output. Bollen represents (on page 319) a general SEM with a latent model (termed "structural model" this work):

$$\eta = \beta\eta + \Gamma\xi + \zeta \tag{18}$$

and a measurement model:

$$y = \Lambda_y\eta + \epsilon \qquad\qquad x = \Lambda_x\xi + \delta \tag{19}$$

Bollen 1989 goes (page 349) on to show that to standardize any of the Λ, β, or Γ coefficients, a simple formula can be followed:

$$\hat{\lambda^s_{ij}} = \hat{\lambda_{ij}}(\frac{\hat{\sigma_{jj}}}{\hat{\sigma_{ii}}})^{1/2} \tag{20}$$

Where i indexes a dependent variable, j indexes explanatory variable(s), and $\hat{\sigma_{jj}}$ and $\hat{\sigma_{ii}}$ are the model-predicted variances of the ith and jth variables. As Bollen puts it: "the standardized coefficient is the expected shift in standard deviation units of the dependent variable that is due to a one standard deviation shift in the independent variable when the other variables are held constant."

The important implication of this is most succinctly described in Rex Kline's 2012 text *Principles and Practices of Structural Equation Modeling* (page 160). Kline makes two observations about explained variance. First, because coefficients are estimated based on variance structure, the unstandardized error (disturbance) term on a particular endogenous variable directly represents the unexplained variance of the variable. The ratio of the error term's variance to the variable's observed variance is thus the proportion of variance left unexplained by the model. Kline also points out that the standardized coefficients sum to 1 minus the unexplained variance *by definition*. Therefore, understanding the proportion of variance in an outcome that is explained by each predictor variable is simply a matter of standardization.

Computing uncertainty intervals for explained variance requires slightly more effort. Standard errors of standardized coefficients can readily be obtained from model variances as well, as Bollen shows on page 350. Because the explained variance statistics are constrained to the [0,1] interval however, these standard errors cannot be directly used to compute 95% upper and lower uncertainty intervals. As with any typical analysis of coefficients on the [0,1] interval (typically probabilities), uncertainty intervals were computed in logit-space, then back-transformed to "natural" space afterward

6.3.3 *Variables Used in Model*

In section 3.2.2.2, a number of observed variables are introduced, and 12 equations are presented to relate them together. Here, we offer description of the formulation and rational for each observed variable. Variables are discussed in the order they appear in table 6. The precise evidence based for each of these variables (among others) is presented in 1.

Child Age Child age was included in this model primarily as a control for time. Numerous studies have shown that vaccine coverage tends to increase over time, and this was found to be true in Uganda and Zambia. In order to avoid confounding, we computed child age in years based on the date of survey and date of birth.

Vehicles The number of vehicles owned by a health facility was hypothesized to be a key driver of Supply. In many circumstances, it was found that facility staff were responsible for retrieving vaccine supplies from their corresponding district health office. This was represented as a count variable in the model.

Distance Distance from a child's household to their nearest health facility was hypothesized to be a key barrier to Access and Perceived control. This variable was measured as straight-line distance using GPS coordinates collected at both facility and household.

Outreach Frequency (Com.) The frequency of outreach activities was hypothesized to influence Perceived Norms, because heightened health system presence may impact perceptions about the number of other children in the community who are being vaccinated. This indicator was measured at the community-level by asking mothers how often they see outreaches in their area. This variable was represented as a categorical variable (dummy variables) in the model.

Perceived Preventable Vaccine This variable represents whether or not the mother perceives that pneumonia is preventable by PCV. This was hypothesized to be reflective of attitudes about vaccines, since is inherently reflects beliefs about PCV. This was represented as a binary variable.

Static Frequency (Fac.) The frequency of static vaccine services was hypothesized to be reflective of the facility Workforce, since a larger workforce will be able to offer more services. This variable was represented as a categorical variable (dummy variables) in the model.

Immunization Staff The number of immunization staff was hypothesized to be formative of Workforce, since more staff should (all else equal) be able to vaccinate more children. This was represented as a count variable in the model.

Perceived Purpose This variable represents a composite of a "select all that apply" type question from the household survey. Mothers were asked what they believe is the purpose of vaccination, and all responses (true or not) were tallied. This variable is hypothesized to be reflective of Attitudes because a mother who believes that vaccines hold many purposes is likely to have a more positive attitude about vaccines. This was represented as a count variable in the model.

Perceived Preventative This variable also represents a composite of a "select all that apply" type question from the household survey. Mothers were asked which disease symptoms could be prevented by vaccines, and all responses (true or not) were tallied. This variable is hypothesized to be reflective of Attitudes because a mother who believes that vaccines prevent many diseases is likely to have a more positive attitude about vaccines. This was represented as a count variable in the model.

Difficulty This variable also represents a composite of a "select all that apply" type question from the household survey. Mothers were asked what difficulties they faced while vaccinating their most recent child, and all Access-related difficulties were tallied. This variable is hypothesized to be reflective of Perceived Control because if a mother recalls more difficulties, she is more likely to perceive that she has little control over successfully vaccinating her child. This was represented as a count variable in the model.

Wealth Household wealth was hypothesized to be a component of Access, since household with more means are more likely to be able to overcome certain barriers. This variable was

measured as a composite of 27 wealth-related variables such as asset ownership, home size and education. This variable was represented as a continuous variable in the model.

Parity The number of children a mother has in the household was hypothesized to be a component of Access, since the ability to spare time from child care may be a barrier to vaccination. This was represented as a count variable in the model.

Cost The total cost of vaccination (including transportation) was hypothesized to be a component of Access, since cost is often a key barrier to health service utilization. Cost was measured as a community-wide average to avoid endogeneity with vaccine status (i.e. unvaccinated children incurred no cost, but that doesn't imply that there is a strong positive correlation between cost and vaccination). This variable was measured by self-report by respondents, and was represented as a continuous variable in the model.

Avoidance This variable also represents a composite of a "select all that apply" type question from the household survey. Mothers were asked multiple questions about why they did not vaccinate, why they might not vaccinate, or why they experienced difficulty vaccinating their child. All responses related to fears and concerns about vaccines themselves were tallied. This variable was hypothesized to be reflective of Attitudes because mother who report more avoidance-related beliefs are less likely to have a positive attitude towards vaccines. This was represented as a count variable in the model.

Social Network This variable also represents a composite of a "select all that apply" type question from the household survey. Mothers were asked multiple questions about their sources of information about PCV and other vaccines, and the number of responses related to friends and family members were tallied. This variable was hypothesized to be formative of Perceived Norms, because respondents who hear about vaccines through their social networks are more likely to perceive that their peers are vaccinating their children. This was represented as a count variable in the model.

Outreach Frequency (Fac.) The frequency of outreach vaccine services (reported by the facility) was hypothesized to be reflective of the facility Workforce, since a larger workforce will be able to offer more services. This variable was represented as a categorical variable (dummy variables) in the model.

Previous Failed Attempt This variable also represents a composite of a "select all that apply" type question from the household survey. Mothers were asked multiple questions about why they did not vaccinate, why they might not vaccinate, or why they experienced difficulty vaccinating their child. All responses related to aspects beyond their control (stock-outs, facility closures etc.) were tallied. This variable was hypothesized to be formative of Perceived Control because mothers who experience such circumstances in a previous failed attempt at vaccination are less likely to perceive that they have self-efficacy. This was represented as a count variable in the model.

TBA Reliance This variable represents a composite of multiple health services utilization questions such as antenatal care and birth attendance. The number of health services that were performed by a traditional birth attendant or traditional health care provider (e.g. traditional healers) were tallied. This was hypothesized to be reflective of Attitudes since mothers who rely on traditional birth attendants are less likely to hold positive attitudes towards established health systems. This was represented as a count variable in the model.

Vaccine Stockouts This variable represents a composite of multiple stock-out related questions asked at health facilities. Respondents were asked about which supplies were stocked out for varying lengths of time in the previous three months, and the number of positive responses

was tallied. This is hypothesized to be reflective of Supply, since a consistent and high-quality supply chain will have fewer stockouts. This was represented as a count variable in the model.

Push Delivery This variable represents whether vaccines supplies are delivered to a health facility or retrieved by facility health workers. This was hypothesized to be formative of Supply since delivery logistics may impact supply chain quality. This was represented as a binary variable in the model.

Community Coverage This variable represents the proportion of children vaccinated in a child's community, besides the child him/herself. This variable was hypothesized to be formative of Perceived Norms because if more children in a community are vaccinated, a mother may perceive that it is normal to do so. It was also hypothesized to by formative of Workforce, because the effects of staff and catchment population (other Workforce indicators) are confounded by patient volume. This variable was represented as a logit-transformed fraction in the model.

Transport Cost This variable was hypothesized to be reflective of Perceived Control because it is a self-report of how expensive transportation *would* be. Mothers who believe (correctly or not) that transportation to the health facility would be expensive are less likely to believe they have control over vaccination of their child. This was represented as a continuous variable in the model.

Perceived Availability This variable was hypothesized to be reflective of Perceived Control because mothers who believe that vaccine services are more-frequently offered at their health facility are more likely to believe that they have control of vaccination of their child. This variable was represented as a categorical variable (dummy variables) in the model.

Static Frequency (Com.) This variable was hypothesized to be

Outreach Convenient The frequency of static vaccine services was hypothesized to influence Perceived Control, because heightened health system presence may impact perceptions about accessibility of health services. This indicator was measured at the community-level by asking mothers how often they see outreaches in their area. This variable was represented as a categorical variable (dummy variables) in the model.

Travel Time This variable was hypothesized to be reflective of Perceived Control because it is a self-report of how time-consuming transportation *would* be. Mothers who believe (correctly or not) that transportation to the health facility would be time-consuming are less likely to believe they have control over vaccination of their child. This was represented as a continuous variable in the model.

Total Staff The total number of staff in a facility was hypothesized to be formative of Workforce, since more staff should (all else equal) be able to vaccinate more children. This was represented as a count variable in the model.

DHO Distance Distance from the DHO to the facility was hypothesized to be formative of Supply, since facilities that are farther away from their corresponding DHO may face more logistical challenges in obtaining vaccine supplies. This was measured as straight-line distance using GPS coordinates collected at both facility and DHO.

Penta Delivery Prop. The proportion of vaccine supply requests (from facility to DHO) that were ultimately fulfilled (by the DHO) was hypothesized to be reflective of Supply, since a consistent and high-quality supply chain will have higher order fulfillment. This was represented as a logit-transformed fraction in the model.

Median Order Size The median size of vaccine supply requests (from facility to DHO) was hypothesized to be formative of Supply, because it was noted that some facilities place large,

infrequent order while others place small, frequent orders, and patterns of ordering have been shown to be drivers of supply chain quality. This was represented as a continuous variable in the model.

Days Between Orders The frequency of vaccine supply requests (from facility to DHO) was hypothesized to be formative of Supply, because it was noted that some facilities place large, infrequent order while others place small, frequent orders, and patterns of ordering have been shown to be drivers of supply chain quality. This was represented as a continuous variable in the model.

Deviation from Med. Order The maximum deviation from the median vaccine supply request (from facility to DHO) was hypothesized to be reflective of Supply, because it was noted that some facilities respond to an unexpected stock out by placing a single, large compensating order. Facilities which had a large maximum deviation were therefore hypothesized to have had stock outs in recent times. This was represented as a continuous variable in the model.

Between Order Variance The variability from one vaccine supply request (from facility to DHO) to the next was hypothesized to be reflective of Supply, because it may either indicate a certain level of disorganization in the facility, or that a facility is more responsive to recent consumption of supplies. This was represented as a continuous variable in the model.

Catchment Population The size of the community served by a health facility was hypothesized to be formative of Workforce, because the effects of staff (another Workforce) is confounded by patient volume. This was represented as a count variable in the model.

Wait Time (PES) Average patient wait time at a health facility was hypothesized to be reflective of Workforce, because a facility with sufficient staff to meet patient volume is expected to have lower average wait times. This variable was measured through patient self-report upon exiting health facilities. Patients reported experienced wait times, and reported wait times were averaged across health facilities. This was represented as a continuous variable in the model.

6.4 ROBUSTNESS CHECKS

6.4.1 *Sensitivity to Prior Specification*

One potential area of concern in any Bayesian model is the influence of the priors distributions over the posterior distributions. As described in section 3.2.2.3, priors were in the gamma distribution for all parameters which were constrained to be positive, and normal distribution otherwise. If a normally-distributed parameter was expected to be positive, its mean was set to 1, if a normally-distributed parameter was expected to be negative, its mean was set to -1, and 0 otherwise. Both normal and gamma priors were set with wide (diffuse) dispersion in order to allow the data to drive the ultimate parameter estimates.

In order to test robustness to specification of priors, five alternative priors were tested:

- **More Narrow** A model with the same gamma distributions, same normal means, but more narrow normal dispersion. The precision parameter of 0.01 was changed to 0.5 to form reasonably-narrow prior distribution.
- **More Positive** A model with the same normal distributions, but gamma distributions of gamma(2,1) instead of gamma(1,1). This forms a distribution with a high density interval that is more positive than gamma(1,1).

- **More Narrow and Positive** A combination of the previous two models. Gamma distributions set to gamma(2,1) and normal distribution precision set to 0.5.
- **More Informative** A model with even more narrow and positive distributions than the previous model. Gamma distributions set to gamma(2,4), and normal distribution precision set to 2.
- **Different Distribution** A model which used an alternative positive-bound distribution to the gamma distributions. Log-normal priors with mean of 0 and precision of 1 were used. This prior was chosen to resemble the gamma(1,1) prior in shape, but reflect an alternative assumption about the family of the distribution.

Figure 26 displays the results from this sensitivity analysis for PCV1 in Uganda. These figures show the comparison between the "accepted model" (the model from which results are displayed in the main text) each alternative specification. Points in these graphs represent individual parameter estimates, and are colored by whether they are coefficients, intercepts, variances or covariances. Points that fall along the diagonal line indicate that this model parameter changed very little when different priors were used. The graphs show that the majority of parameter estimates were unaffected by prior specification; they remained the same under all five models.

The interpretation of this sensitivity analysis is that the model results are truly a reflection of patterns in the data, and not the result of unjustifiably-influential prior distributions. Identical tests were conducted for all other outcomes and showed similar results.

6.4.2 *Sensitivity to Model Specification*

Another robustness check relates to model specification. With as many as 36 observed variables in the model, a concern may be "high-leverage variables", akin to high-leverage data points. Such variables, if they exist, might shed doubt on the robustness of the model since they would explain much of the findings. We tested for sensitivity to variable inclusion using leave-one-out analysis. Separate models were run, each model excluding a different variable. The results were collated and compared using the six performance metrics (mentioned in section 3.2.2.3). All performance metrics compare the predicted vaccine status of each child to their actual status. These performance metrics were:

- **Sensitivity** The proportion of vaccinated children who were correctly classified.
- **Specificity** The proportion of unvaccinated children who were correctly classified.
- **Positive Predictive Value (PPV)** The proportion of predicted-to-be-vaccinated children who actually were vaccinated.
- **Negative Predictive Value (NPV)** The proportion of predicted-to-be-unvaccinated children who actually were unvaccinated.
- **Concordance** The proportion of all children who were correctly classified.
- **Distance** The geometric distance (square root of the sum of squared differences) between perfect sensitivity and specificity and observed sensitivity and specificity.

Using these metrics, all leave-one-out model variants were evaluated in addition to the accepted model. The bars in figure 27 show model performance, sorted in descending order for Pentavalent-3 in Uganda. The green bars highlight where the accepted model falls among all variants. Models further to the left (except in the distance plot) indicate better model performance. In general, the accepted model was found to be average among all model variants. The accepted model fell in the middle of the distribution for sensitivity and NPV, and towards the upper end of the distribution for specificity and PPV. Concordance was moderate relative to other models, and distance was low. The graphs show that the accepted model was not exceptional among alternative models, and that no clear high-leverage variables exist.

The interpretation of this sensitivity analysis is that the exact configuration of observed variables in the model did not have undue influence over the results. There is no single variable that, if excluded, would lead to drastically different performance. The accepted model was chosen on the basis of theory, so is preferred.

Figure 22: Districts sampled

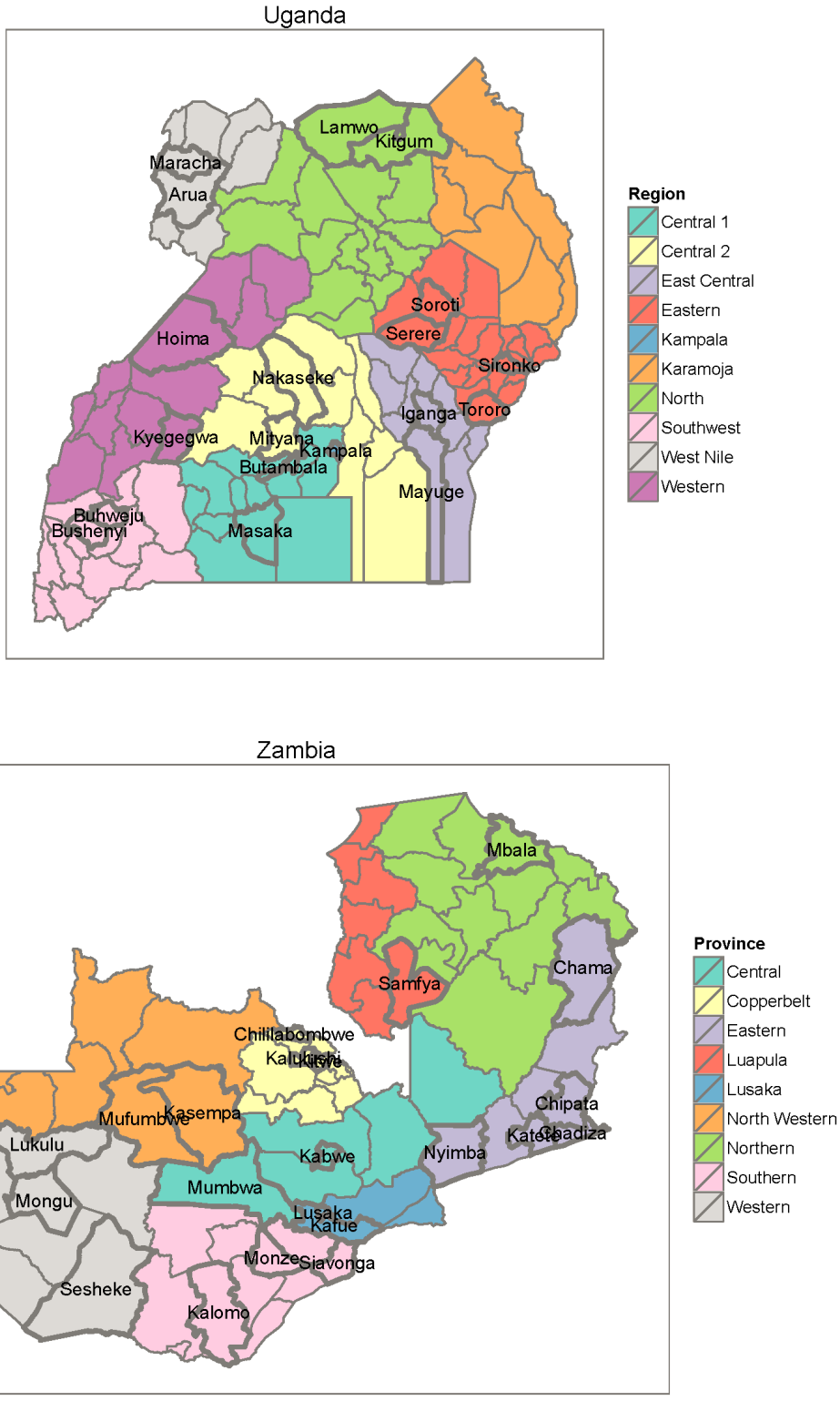


Figure 23: Sensitivity to study design: Comparison of model parameters before and after adjustment

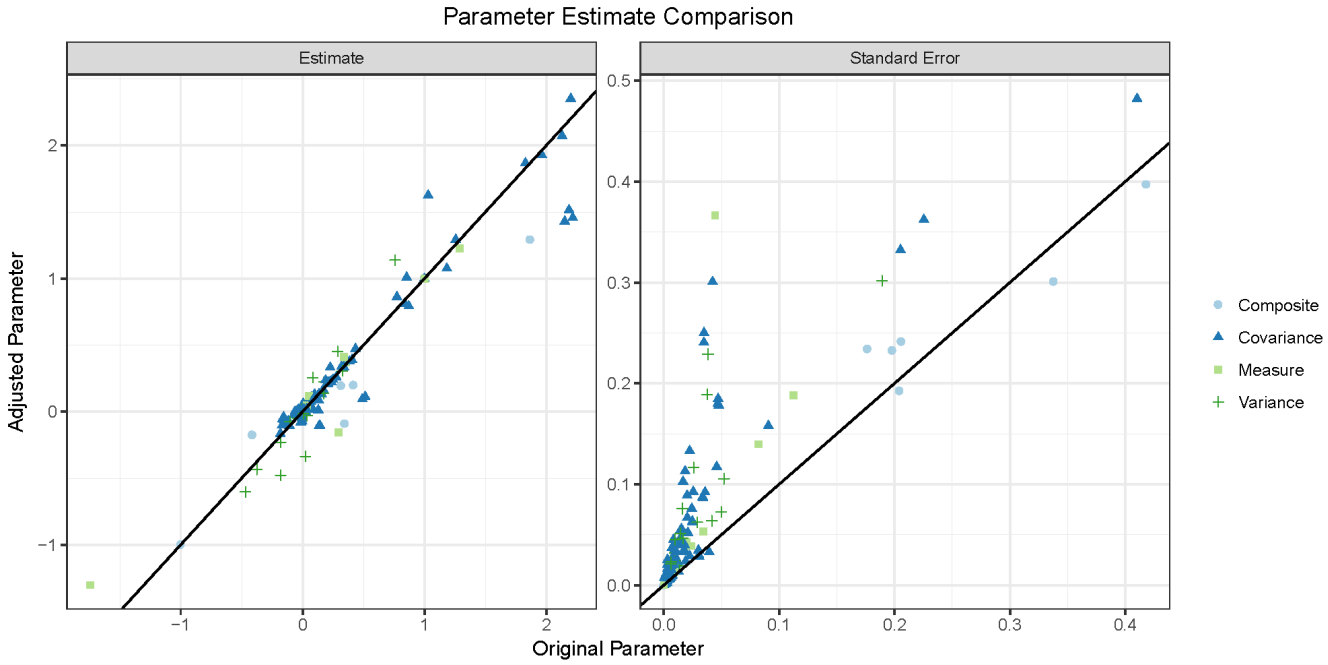


Figure 24: Sensitivity to study design: Comparison of rank order of model parameters before and after adjustment

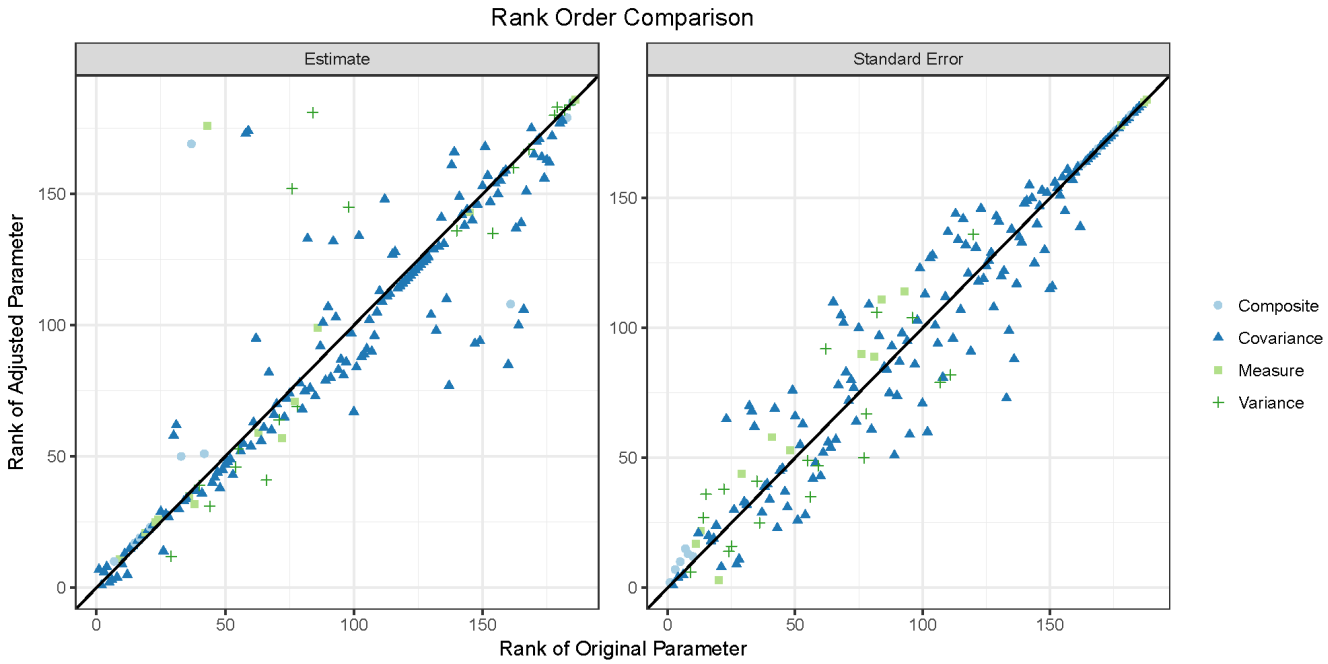


Figure 25: Sensitivity to data processing: different offset for log transformation

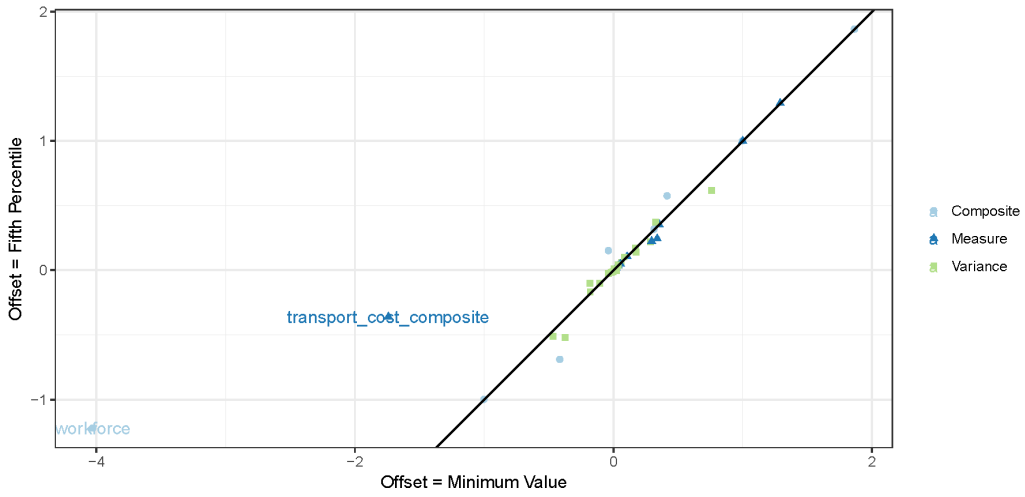


Figure 26: Sensitivity to prior specification

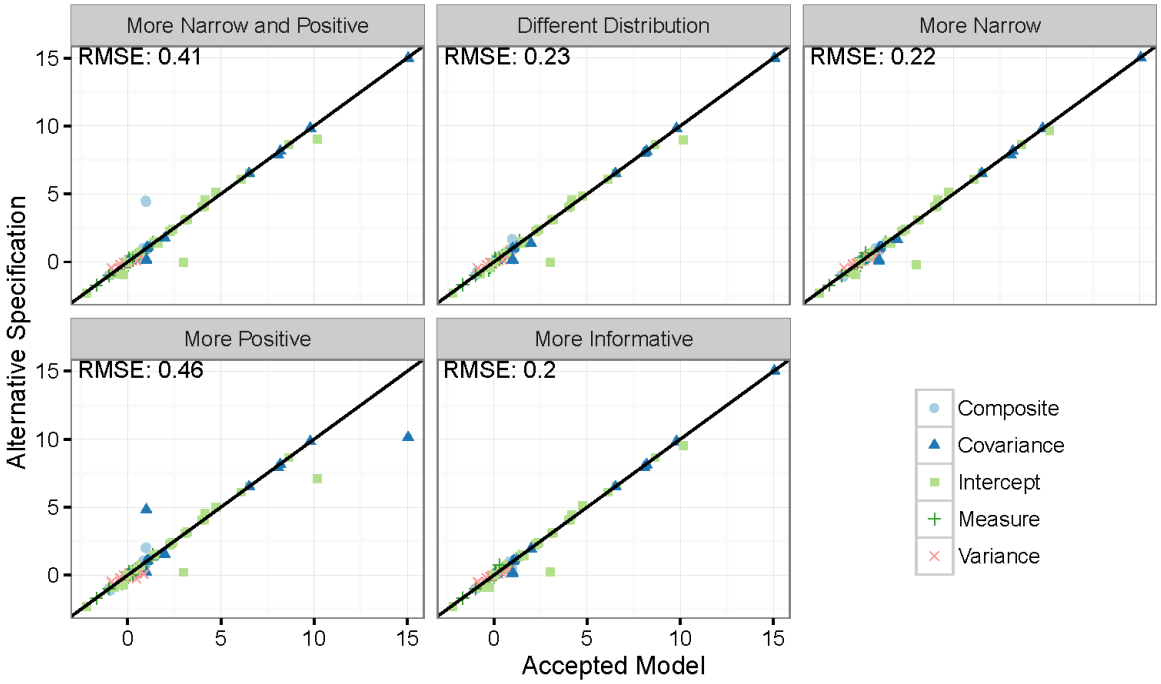
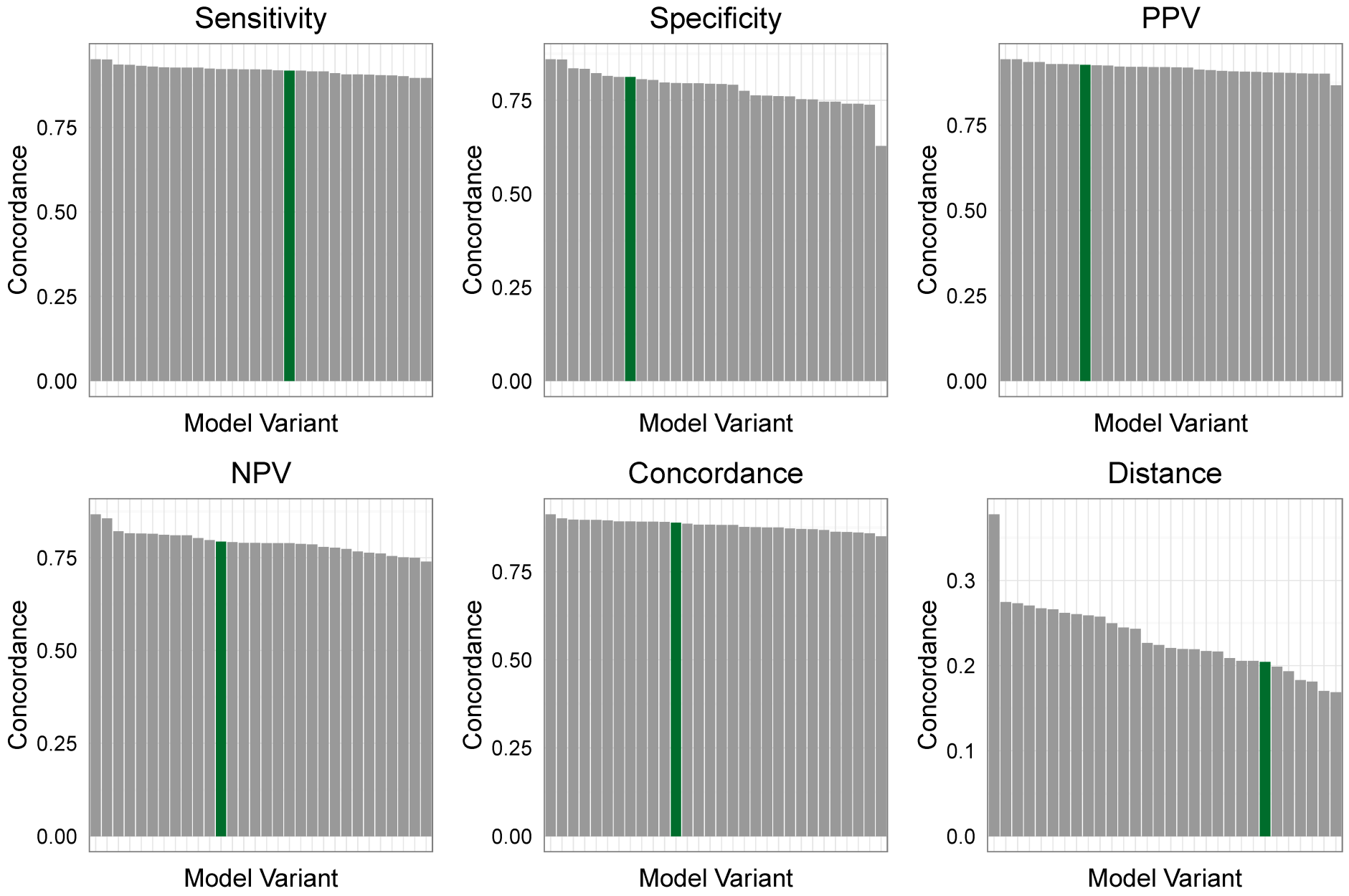


Figure 27: Sensitivity to model specification

The BSEM was re-run 36, times, leaving one variable out at a time. Model performance was evaluated for each model. The green bar represents the accepted model, with no variables excluded.



David E Phillips: *Childhood Vaccines in Uganda and Zambia,* Determinants and Barriers to Effective Coverage, March 15, 2017