Egg-a-day and breastfeeding promotion microsimulations: A framework and cost-effectiveness comparison between two MNCH interventions

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Abstract

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Microsimulation used with cost-effectiveness health research offers a powerful tool for NGOs, policy makers, and governments to make informed decisions on health programs prior to spending. These simulations offer comparisons of health scenarios using parameterization of key variables such as intervention coverage and efficacy of an intervention to produce incremental cost-effectiveness ratios (ICERs). In our analysis, we use Vivarium Public Health, a microsimulation platform, to compare cost-effectiveness of two child health interventions, breastfeeding promotion and complementary feeding with eggs. We run health scenarios of 80% coverage for breastfeeding promotion only, egg complementary feeding only, and a packaged intervention using BFP and eggs in Malawi between 2017 and 2020. In scale-up scenarios, we found 1.4% (95% CI 0.7% – 1.8%) and 7.9% (95% CI 3.4 – 11.3%) reduction in discontinued breastfeeding and non-exclusive breastfeeding risk exposures respectively. Similarly, child wasting, underweight and stunting exposure for children under five were 1.0% (95% CI 0.5% – 1.4%), 4.1% (95% CI 3.3%– 5.1%), and 8.9% (95% CI 5.2% – 14.1%) lower. Lastly, we found that breastfeeding promotion was almost ten times more cost effective than the egg intervention and packaged intervention at $58 (95% CI $31 – $341) per averted DALY.

Introduction

Global development assistance for health in 2015 was estimated to be $51.8 billion dollars[1]. Substantial amounts of developmental assistance dollars flow from high to low income countries, and are allocated to align with the Sustainable Development Goals (SDGs) towards reducing health burden from causes such as HIV, maternal mortality and child nutrition[2,3]. This health spending is invested in a range of global and local activities ranging from national vaccine coverage campaigns with GAVI (The Vaccine Alliance) to small scale randomized control trials testing new intervention technologies[4,5]. And, as health spending continues to grow, cost-effectiveness research is an important tool for governments, NGOs and policy makers to decide how to best allocate limited resources to vulnerable populations. Cost-effectiveness research on health aid helps prioritize policies and programs with maximum health benefit through usage of ICERs, or incremental cost-effectiveness ratios[2]. These ratios serve as standardized metrics in cost-effectiveness research to help evaluate the dollar cost per outcome of interest, such as dollars per averted death from scale-up of a health program.

Cost-effectiveness paired with microsimulation can be a powerful tool for researchers to assess population level impacts of various health scenarios before spending any funds on program implementation[6]. These health scenario microsimulations can vary from health emergencies, new program implementations, and program scale-ups; they offer a flexible method to adjust input parameters (e.g. disease rates, population targets, or intervention coverage), in order to determine cost-effectiveness of an intervention. Vivarium Public Health (previously known as Cost-Effectiveness Analysis and Microsimulation or CEAM) is an open-source generalized microsimulation framework created at the Institute for Health Metrics and Evaluation (IHME) at the University of Washington. Research and development of Vivarium, a discrete-time Markov model is extensively described elsewhere[7]. In short, Vivarium allows users to integrate population level risk, disease and mortality data to simulate and observe health burden in populations over time.

In our analysis, we use the Vivarium microsimulation framework to operationalize two maternal and child health (MNCH) interventions in Malawi: breastfeeding promotion (BFP) and complementary feeding of young children with eggs (egg-a-day). We chose Malawi as the location of our microsimulations, as an RCT of the egg-a-day intervention is currently underway in this country[5]. Breastfeeding promotion is a long-existing intervention used in MNCH while egg-a-day is a novel intervention technology with presumed 'uncracked potential' in reducing child malnutrition and growth failure[3,8]. We extensively describe the setup of these intervention within Vivarium, outlining high-level mechanisms of scale-up of these interventions with their downstream impacts on risk, disease and mortality rates. We also use a simple costing approach to demonstrate the pairing of cost-effectiveness and the power of microsimulation. Finally, as funders of health interventions lean towards creative packaged interventions, we simulate an additional health scenario where both of our interventions happen within the same population.

Methods

Summary
The Vivarium framework allows modelers to build custom intervention components – designed to alter baseline risk, disease and mortality rates, that are used to simulate hypothetical and proposed health scenarios. Adding an intervention component requires additional research and input data best characterized into three categories, including 1) baseline coverage data, 2) efficacy data, and 3) cost data. In order to create a valid and interpretable simulation model, these inputs require consistent intervention definitions.

Existing intervention coverage is a critical input required to prevent *double dosing* of a simulant (simulated person) with an intervention. For example, a country with 100% baseline intervention coverage would have a 0% population attributable fraction due to lacking the intervention. Intervention efficacy data is required to alter baseline rates in the microsimulation. Common efficacy measures in literature include odds ratios, relative risks and mean differences. Lastly, costing data inputs are required to generate output ICERs. Vivarium output metrics such as sample size of treatment groups, counts for hospital and home visits, or intervention durations are used by modelers in costing analysis. A summarizing table of coverage, efficacy and costing data for BFP and egg-a-day interventions can be found in Table 2.

We built custom intervention components for BFP and egg-a-day interventions as inputs to our Vivarium microsimulations that change baseline GBD risk exposures. GBD risks are causally paired to disease outcomes, and exposure to a risk increases the relative risk for disease incidence (e.g. non-exclusive breastfeeding causally linked to child diarrhea incidence)[9]. When a transition into a diseased state, they experience the disability burden and excess mortality rates modeled in the disease-specific GBD study[11]. In summary, at each microsimulation time step, a simulant may experience mortality or transition between risk and disease states based on probabilities derived from baseline input data and any altering intervention effects. Figure 1 shows our full model diagram of the effects from intervention coverage to child mortality.

We constructed three sets of simulations using the following intervention specifications: 1) 80% coverage of breastfeeding promotion only, 2) 80% coverage of egg-a-day intervention only, and 3) 80% coverage a breastfeeding promotion and egg-a-day packaged intervention. In the breastfeeding promotion only scenario, 80% of eligible newborns born into the simulation using crude fertility rates are enrolled in the intervention. Enrollment continues for newborns throughout the entirety of the simulation. In the egg-a-day only simulation, 80% of children aged 6 to 9 months are enrolled in the intervention. Recruitment continues for children reaching 6 months of age throughout the entirety of the simulation. In the packaged intervention scenario, 80% of newborns are recruited at birth, and 100% of the surviving enrollees also receive the egg intervention starting at 6 months of age. Output metrics are calculated for each scenario using paired counterfactual simulations where there are no interventions. Full specifications and demographic setup for each scenario can be found in Table 1.

Input data
We use risk, disease and mortality estimates from the Global Burden of Disease (GBD) 2017 study as Vivarium inputs in our models. The GBD study is an international and collaborative scientific

endeavor that produces yearly estimates for 84 risk factors, 282 causes of death, and 354 diseases in 195 countries worldwide. Extensive methodologies for each area of the study (risk, morbidity and mortality), are published elsewhere, and GBD data used in this analysis are publicly available[9,10,11,12]. For this analysis, we use age, sex, year and location specific estimates as baseline inputs for health outcome rates in our simulations. Simulations occurring in the future years where GBD data is not yet available use filled values from the last available year published.

Intervention-specific data for breastfeeding promotion and egg-a-day coverage, efficacy and costing come from literature reviews for published scientific literature, market and survey reports, and the Lives Saved Tool (LiST), an intervention scale-up modeling tool created at Johns Hopkins University[13]. Modeling and data analysis were performed using R and Python. Definitions described below were made after careful consideration of available data.

Intervention component: Breastfeeding promotion

(a) Intervention definition

We define breastfeeding promotion as greater than four educational lessons on the importance of exclusive breastfeeding for children under 6 months by a nurse or community health worker during postnatal care visits. This definition does not limit an intervention to a specific curriculum or any other measure of intensity.

(b) Existing coverage

Our search found Demographic Health Survey (DHS) woman's health modules that included an indicator on whether a mother has ever received information on the importance of breastfeeding[14] (appendix figure 1). We also explored using national coverage estimates of four antenatal care (ANC4) visits from the GBD study as baseline coverage. However, we found that these coverage definitions did not adequately capture the intensity of a breastfeeding promotion intervention protocols published in literature[14]. For our final analysis, we assume zero baseline coverage for this intervention.

(c) Efficacy

Efficacy for breastfeeding promotion interventions on non-exclusive and discontinued breastfeeding risks (NEBF and DBF respectively) come from meta-analytic studies summarizing effect sizes in randomized control trials[15]. The meta-analyses published relative risks less than 1, representing the reduced risk effect from receiving the intervention on NEBF and DBF exposures. We re-constructed the meta-analysis to represent the relative risk as the increased risk of NEBF and DBF from lack of the intervention (RR > 1), and included a between-study heterogeneity term to increase uncertainty in our efficacy estimate. A forest plot of this reconstructed analysis is shown the appendix A. We found insufficient intervention literature data on discontinued breastfeeding risk, and use the effect size for non-exclusive breastfeeding risk as a placeholder.

To synchronize literature effect size data with GBD baseline risk input data, we re-categorized the GBD discontinued breastfeeding risk from four exposure bins (no breastfeeding, partial breastfeeding, predominantly breastfeeding and exclusive breastfeeding) into two bins to match dichotomous categories published in the intervention studies. We summed exposures for no, partial and predominately breastfeeding in Malawi for each relevant year, sex, and age and considered the sum as the exposure to non-exclusive breastfeeding.

Relative risks for breastfeeding promotion interventions are directly applied to an individual simulant's probability parameter of developing the target risk, and remain in effect across all relevant risk-effect ages. For example, a relative risk of 2 for the lack of breastfeeding promotion on discontinued breastfeeding exposure results in a simulant being twice as likely to be exposed the DBF risk. An equation for this adjustment is show below as **Equation 1**, where p(r) denotes the exposure parameter to a GBD risk:

Equation (1):

$$\boxed{\begin{array}{l}\text{If treated: } p(r) = p(r)_{\text{baseline}} * 1/RR \\ \text{If not treated: } p(r) = p(r)_{\text{baseline}}\end{array}}$$

(d) Costing

We use a simplified ingredients-based costing approach to estimate the cost of breastfeeding promotion scale-up. We multiply average time used for each breastfeeding promotion intervention by location specific nurse salaries and the number of simulants treated. We add a 15% indirect programming fee to cover overhead and operational costs.

Intervention component: Egg-a-day intervention

(a) Intervention definition

Definition of the egg-a-day intervention comes from a published RCT in Ecuador by Ianotti et. al[15]. In short, children between 6 to 9 months of age were recruited into experiment and control arms of the intervention. Households with enrolled children were visited weekly for egg delivery, reminders of adherence, and health status monitoring during the intervention period. In our scale-up scenario, we do not exclude children with comorbidities as in the RCT protocol.

(b) Existing coverage

Our search found pooled estimates from national surveys that included a 24-hour recall of egg consumption indicator[8]. This indicator did not match intervention protocol intensity; therefore, we assume zero baseline coverage of the egg-a-day intervention in our microsimulations.

(c) Efficacy

Outcomes reported in the Ianotti et al. RCT were used as effect sizes in our microsimulations. These outcomes included mean differences in weight-for-age (WAZ), height-for-age (HAZ), and weight-for-height (WHZ) z-score between the experiment and control arms. Exposure to child growth failure risks, consisting of child underweight, stunting and wasting are defined by more than 2 standard deviations below the reference mean WAZ, HAZ and WHZ scores respectively, and are defined by standard tables available from the World Health Organization[17].

GBD risk exposure data for child growth failure is reported in categorical bins: mild, moderate and severe. To synchronize categorical baseline exposure input data with mean z-score shifts in our efficacy data, we reconstructed the underlying ensemble distributions for each child growth failure risk to assign a simulant with a Z-score consistent with their GBD categorical exposure. More information about child growth failure models can be found in the GBD 2017 Risk Factors capstone appendix[8].

We assume that beneficial effects from egg-a-day are gradual between intervention start and outcome measurement (6 months after start as per published protocol). Therefore, z-score shifts within individual simulants increase linearly over time until reaching maximum benefit at the intervention end. Our model assumes that there is no waning effect in simulant z-scores after the intervention ends.

(d) Costing

Costing for the egg-a-day intervention follows a simple ingredients-based approach. We multiply location specific community health wages with the number of visits performed (based on sample size treated and weeks enrolled in trial) and combine this cost with egg unit costs (per dozen) and an additional 15% indirect programmatic fee. The Mazira RCT protocol increased the number of eggs delivered to each household to 14 to ensure that the child was individually receiving an egg per day (the remainder for household and other family members)[5]. For costing simplicity, we use the cost per dozen to calculate total egg costs.

Intervention component: Breastfeeding promotion and egg-a-day package

Our package intervention follows all individual component specifications described above. We recruit newborn simulants for BFP and these simulants later receive the egg-a-day intervention. Because breastfeeding risks are relevant starting at age 0 and enrollment for egg-a-day begins at age 6 months, sample sizes may deviate due to neonatal and infant mortality.

Results

In total, we ran three sets of interventions for a total of six micro-simulated scenarios (80% coverage of each intervention and a paired counterfactual with no intervention). We ran each of the six scenarios 100 times, using different input data “draws”, or a set of input data containing a sampled risk, disease and mortality rate from GBD population level distributions. Draw analysis is used to propagate uncertainty in our analysis. Our simulations ran for four years between 2017 and 2020 with an initial population of 20,000 simulants aged between 0 and 5 years. We exit the simulants from our simulation at age 5, and no longer track risk, disease or mortality. Using crude fertility rates from the GBD study, our average ending population size was 37,896 (95%CI 37,647 – 38,137) simulants.

The interventions treated comparable number of simulants. In the egg-a-day only and breastfeeding promotion only interventions, 14,646 (95% CI 14,459– 14,867) and 14,320 (95% CI 14,096 – 14,549) simulants were treated respectively. The mean number of simulants treated for eggs in the package intervention simulation (12,122 (11,926 – 12,301) simulants) was higher than in the egg-a-day only scenario, while the number of simulants receiving BFP in the package intervention was comparable with the BFP only scenario (14,322 (14,094 – 14,553)) simulants).

Risk exposures were observed in simulations at each year midpoint, and were lower in simulations covered by interventions than in simulations without interventions. Intervention effects on child growth failure are minimal in 2017 and decrease linearly through the end of the simulation (figure 2). By 2020, child wasting, underweight and stunting exposure for children under five are 1.0% (95% CI 0.5% – 1.4%), 4.1% (95% CI 3.3%– 5.1%), and 8.9% (95% CI 5.2% – 14.1%) lower in children receiving eggs than in children enrolled in the control arm of the experiment.

Trend-lines for breastfeeding risk exposures comparing the breastfeeding intervention and and counterfactual scenarios can be seen in figure 3. Baseline exposure to NEBF is higher than DBF in Malawi even with beneficial breastfeeding promotion effects. NEBF exposures decrease in the first year of intervention and stabilize to a constant effect as age structures in the simulation normalize. At simulation end difference in risk exposure between the control and experiment arm (delta in figure 3) are 1.4% (95% CI 0.7% – 1.8%) and 7.9% (95% CI 3.4 – 11.3%) for DBF and NEBF risk respectively. Intervention effects in the package intervention simulation for child growth failure and breastfeeding risks exhibit similar relationships with their counterfactual scenarios.

Total years lived with disabilities (YLDs) and years of life lost (YLLs) were observed for diseases directly related to the intervention downstream effects (figure 1). Disability and mortality due to other causes were not recorded. YLDs across all simulations were significantly lower than cumulative YLLs (Table 3), and ranged from 1.6 to 5.3 mean YLDs averted per 100,000 person years for breastfeeding promotion and egg-a-day simulations respectively. Averted YLL's per 100,000 person years ranged from 612 (109 – 1189) in breastfeeding promotion to 1682 (782 – 2979) in the packaged simulation. YLDs and YLLs were also used to calculate averted DALYs, or disability adjusted life years (shown in table 3).

Ingredients based costing analysis were used for each intervention using Vivarium output metrics. All costing analysis were translated to USD using a 0.0014 conversion rate of 1 MWK. Each simulant treated with breastfeeding promotion occurred identical costs, while simulants receiving eggs may have occurred different costs due to mortality during the six-month intervention. Breastfeeding promotion costs were significantly lower than egg intervention costs, accruing a total intervention cost of $31,072 (95% CI $30,585– $31,569) used to treat 14,320 simulants over four years. Egg-a-day for 14,647 simulant children over the same timespan accrued a total cost of $866,617 (CI $855,433 – $881,050). Combined total intervention costs for the packaged intervention were $738,833 (95% CI $727,092– $749,755). A breakdown of these total intervention costs is displayed in Appendix B.

Finally, we used output metrics for averted DALYs and total costs to generate incremental cost effectiveness ratios for each intervention. Median ICERs for breastfeeding promotion, egg-a-day, and the package intervention were $58 (95% CI $31 – $341), $651 (95% CI $386 – $1243) and $590 (95% CI $301 – $1143) respectively (table 3). We report the median ICER, as extreme draws with zero averted DALYs in the breastfeeding promotion only scenario lead to unstable means (figure 4).

Discussion

Our goal was to demonstrate the research process involved in operationalization of two MNCH interventions using the Vivarium Public Health microsimulation framework. We also show how independent intervention components might be packaged together to create unique health scenarios, and use simple costing analysis for cost-effectiveness comparisons. In an objective comparison of ICERs for each health scenario, breastfeeding promotion had a much lower dollar cost per averted DALY at $58 than egg-a-day intervention and the packaged intervention at $651 and $590 respectively.

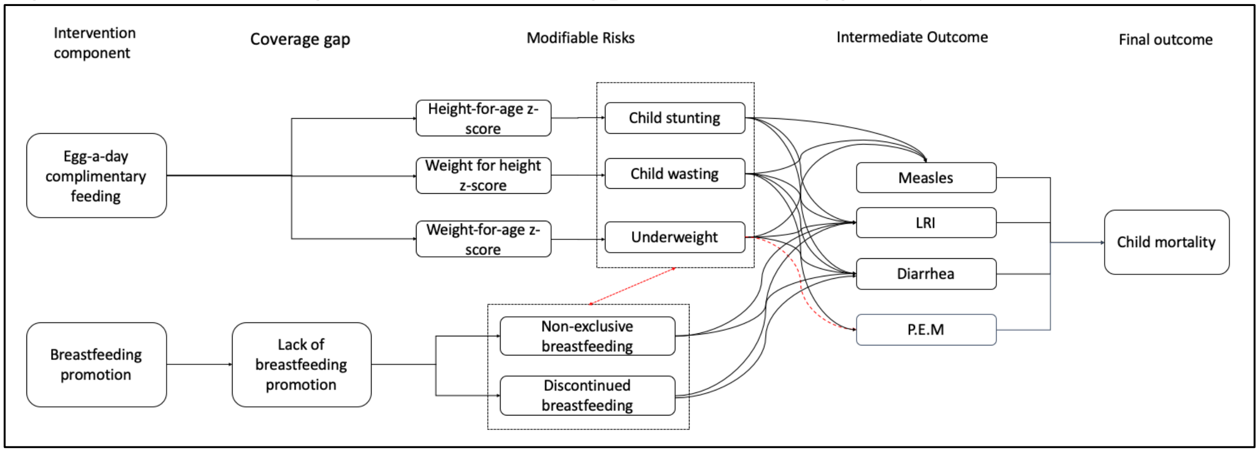
Our total intervention costs for the egg-a-day intervention are likely an overestimate, as our input data uses market prices for eggs. In addition, our simple costing approach does not account for egg-delivery mechanism. In a realistic intervention scale-up of egg-a-day, wholesale egg pricing and the removal of community health worker visits will likely drive the total intervention cost down. Therefore, we hypothesize that the egg-a-day intervention may be a comparable cost-effective intervention to breastfeeding promotion, although our ICERs for this analysis suggest otherwise. Lastly, our costing model does not take into account decreased healthcare utilization costs for scale-up scenarios (e.g. reduced outpatient visits costs due to averted LRI and diarrhea cases), which may drastically reduce ICERs in all scenarios

Risk exposures for child growth failure and breastfeeding risks change as expected over the simulation years. After 2020, we hypothesize that the experiment CGF exposure will level when all simulants who were ineligible to receive the intervention at initialization are aged out and intervention exposure normalizes across the population. This is observed in figure 3 with non-exclusive breastfeeding, which has the smallest relevant risk age range for exposure. The greatest absolute decreases in risk exposure are observed where baseline exposure starts highest (e.g. child stunting and NEBF). This example exemplifies the importance of considering baseline risk exposure when considering different interventions.

Vivarium Public Health microsimulations offers a powerful tool to simulate RCTs and health programs prior to program investment. After the construction of an adequate intervention component, any parameters of baseline input data, intervention coverages, effects and costs can be modified and modeled – giving researchers and policy makers fast and comprehensive predictions from scenarios to choose from. Microsimulations also offer detailed output metrics; While this analysis focuses on ICERs and risk exposures, other metrics such as disease cases, incidence, remission and mortality rates are also available for analysis. Lastly, our goal is to use Vivarium to model complex packaged interventions that include risk mediation effects. In our search, we found no evidence for breastfeeding promotion effects on child growth failure risks and do not include this linkage in our model[20]. These complex packaged interventions demonstrate the potential of microsimulations to model estimates not easily available in traditional population health metrics.

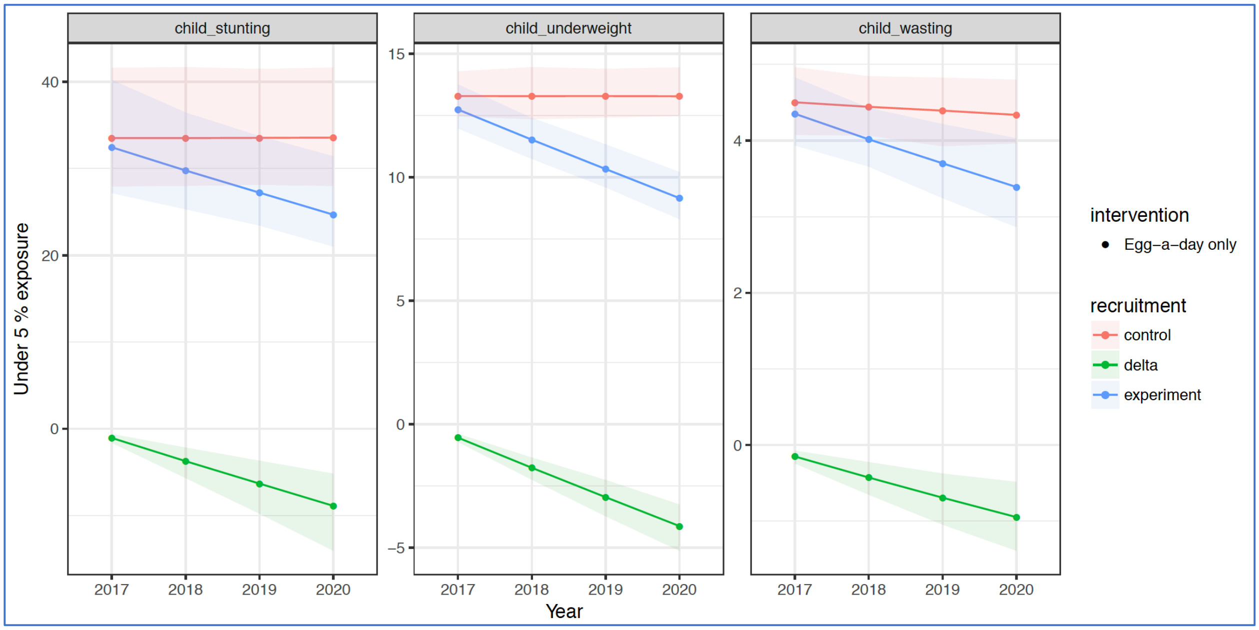
Tables and Figures

Figure 1. Full model diagram for breastfeeding promotion and egg-a-day interventions



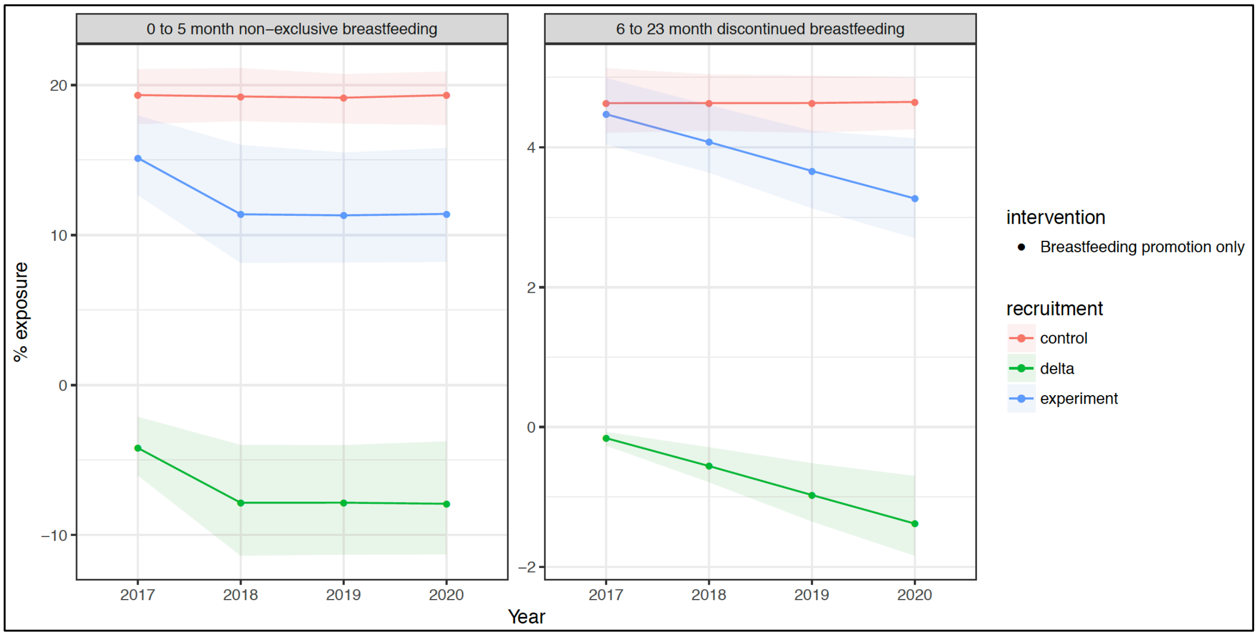
High-level flow diagram showing the interactions between breastfeeding promotion and egg-a-day interventions downstream modifiable risks, intermediate disease outcomes and mortality. Top half of the diagram represents an egg-only intervention where the bottom half represents BFP only. Red lines indicate special relationships between components. We assume no relationship between breastfeeding and child growth failure risks [add citation]. Our model does not currently observe protein energy malnutrition (P.E.M). Burden from this disease is considered in "other cause mortality" for the time being.

Figure 2. Child growth failure risk exposures over time in egg-a-day and package interventions scenarios



Delta recruitment denotes the difference between the control and experiment groups

Figure 3. Breastfeeding risk exposures over time in breastfeeding promotion only and package intervention scenarios



Delta recruitment denotes the difference between the control and experiment groups

Figure 4. Simulation draws for ICERs calculated for all health intervention scenarios (100 draws)

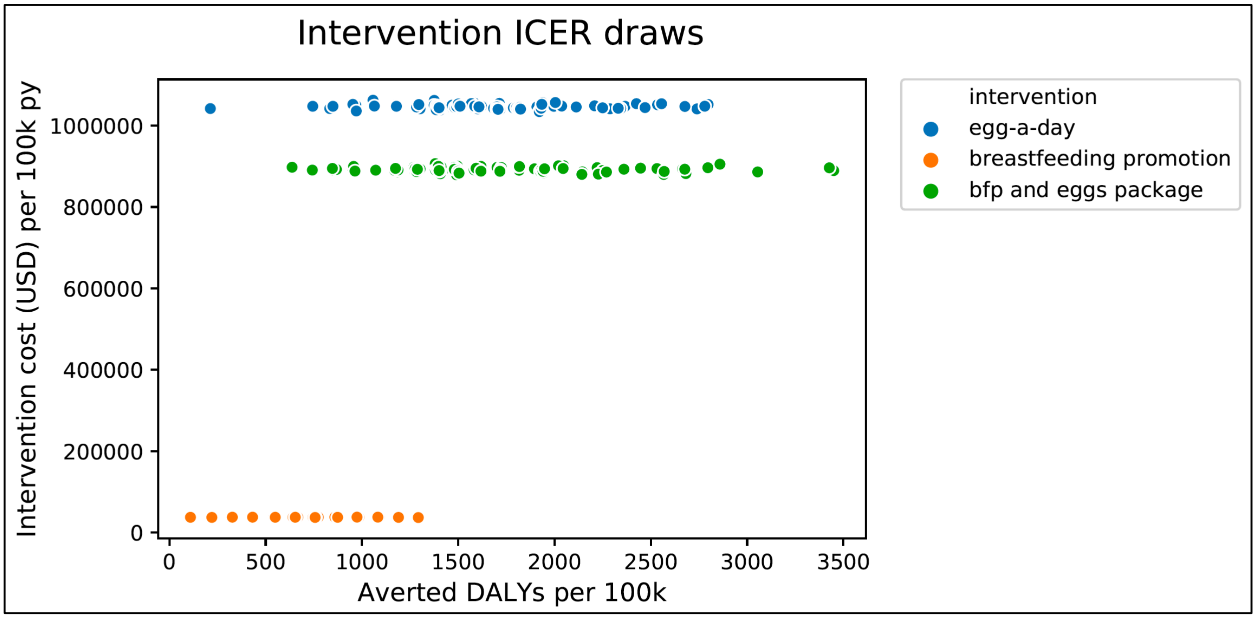


Table 1. Model specifications for BFP only, Egg-a-day only, and BFP and Egg package scenarios

	BFP only	**Egg-a-day only**	**BFP and Eggs package**
Location	Malawi	Malawi	Malawi
Initialized population age start/age-end	0-5 years	0-5 years	0-5 years
Initial population size	20,000	20,000	20,000
Simulation years	2017 – 2020	2017 – 2020	2017 – 2020
Intervention coverage	80%	80%	80%

Each intervention is paired with a counterfactual simulation with 0% intervention coverage.

Table 2. Intervention inputs: coverage, efficacy and costing data for BFP and egg-a-day

	Existing coverage (%)	**Efficacy**	**Costs**
Breastfeeding promotion intervention	0%	RR, Lack of BFP on NEBF and DBF risks: 2.15 (1.84 – 2.51)[1]	- Intervention duration per person: 70 minutes[1] - Malawi nurse annual salary: 1,117,086 MWK[1] - Average hours per week worked: 39.7[2] - Average weeks per year worked: 48[2] - Indirect costs: 15% add on to total unit cost[1]
Egg-a-day intervention	0%	Mean Z-score shifts:[3] HAZ: 0.63 (0.38 – 0.88) WAZ: 0.61 (0.45 – 0.77) WHZ: 0.33 (0.14 – 0.51)	- Unit cost per dozen eggs: $1.51 USD - Duration of weekly visit: 30 minutes[4] - Malawi CHW annual salary: 683,753 MWK[4] - Average hours per week worked: 39.7[2] - Average weeks per year worked: 48[2] - Indirect costs: 15% add on to total unit cost[1]

1 – Meta-analystic study [Reference 14]
2 – International Labor Organization Surveys – Malawi 2013 [Reference 18]
3 – LiST Tool [Reference 12]
4 – Ianotti et. al protocol [Reference 15]
5 – Numbeo – crowd sourced market price data [Reference 19]
All values are denoted as mean (95% CI) unless otherwise stated

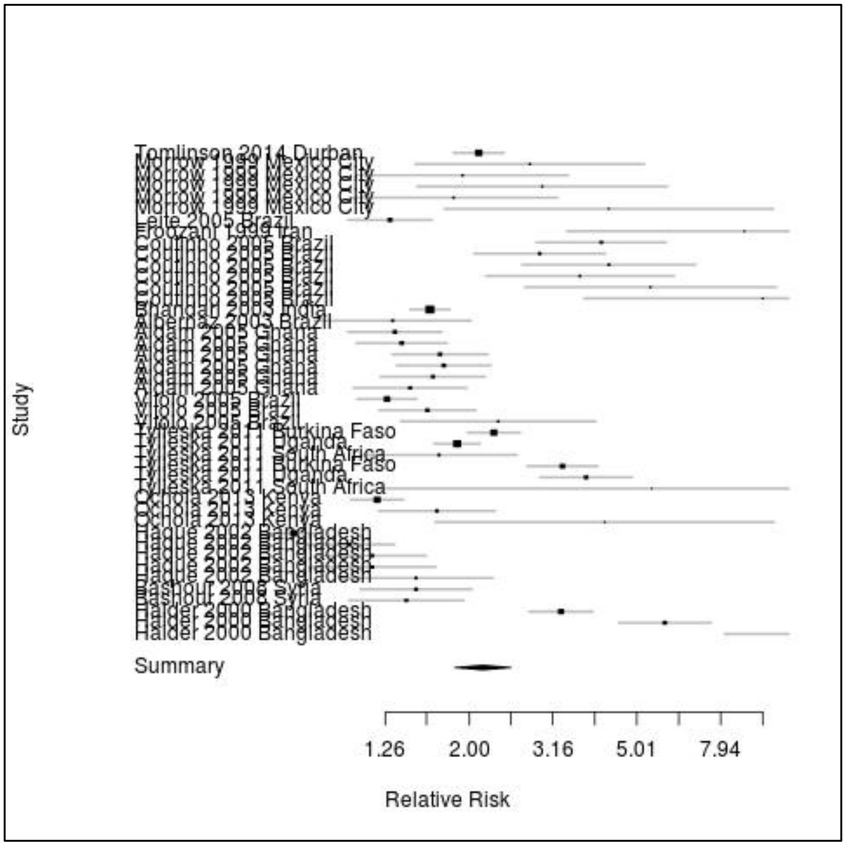
Table 3: Averted YLDs, YLLs and DALYs for each intervention scenario compared with a counterfactual scenario

	Egg-a-day simulation	BFP simulation	BFP and Eggs simulation
Averted YLDs per 100k person years	3.1 (1.5 – 5.3)	0.9 (0.3 – 1.6)	2.7 (1.5– 4.4)
Averted YLLs per 100k person years	1662(841 – 2711)	612 (109 – 1189)	1682 (782 – 2979)
Averted DALYs per 100k person years	1669 (839 – 2706)	613 (109 – 1190)	1685 (784 – 2981)
Total intervention cost	$866,617 ($855,433 - $881,050)	$31,072 ($30,585 - $31,568)	$738,833 ($727,092 - $749,755)
Median ICERs ($/averted DALY)	$651 ($386 – $1243)	$58 ($31 – $341)	$590 ($301 – $1143)

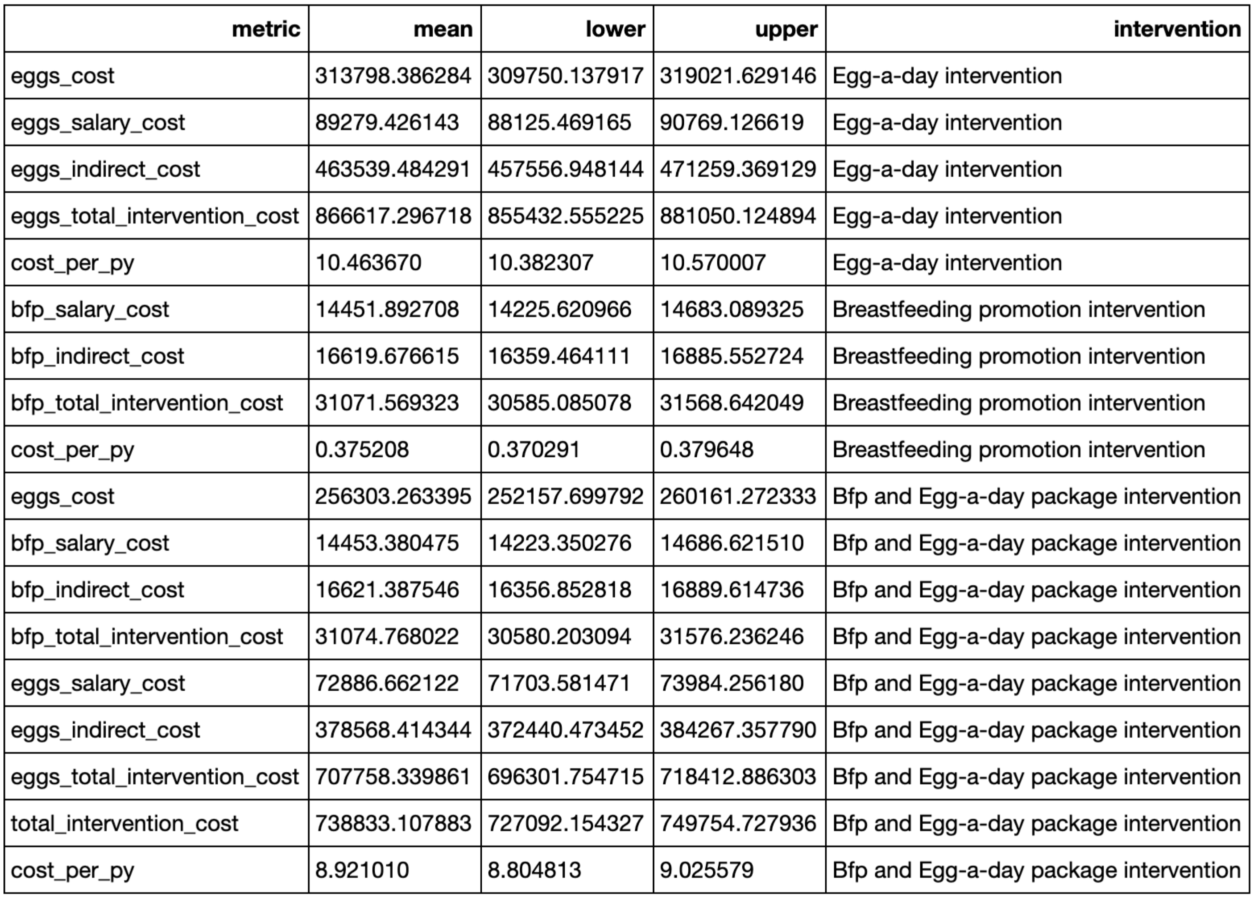
All values are denoted as mean (95% CI) unless otherwise stated

Appendix

Appendix A. Meta-analysis used to calculate intervention RR for breastfeeding promotion intervention component



Appendix B. Costing breakdown for Egg-a-day, Breastfeeding promotion and Breastfeeding and Egg packaged intervention



metric	mean	lower	upper	intervention
eggs_cost	313798.386284	309750.137917	319021.629146	Egg-a-day intervention
eggs_salary_cost	89279.426143	88125.469165	90769.126619	Egg-a-day intervention
eggs_indirect_cost	463539.484291	457556.948144	471259.369129	Egg-a-day intervention
eggs_total_intervention_cost	866617.296718	855432.555225	881050.124894	Egg-a-day intervention
cost_per_py	10.463670	10.382307	10.570007	Egg-a-day intervention
bfp_salary_cost	14451.892708	14225.620966	14683.089325	Breastfeeding promotion intervention
bfp_indirect_cost	16619.676615	16359.464111	16885.552724	Breastfeeding promotion intervention
bfp_total_intervention_cost	31071.569323	30585.085078	31568.642049	Breastfeeding promotion intervention
cost_per_py	0.375208	0.370291	0.379648	Breastfeeding promotion intervention
eggs_cost	256303.263395	252157.699792	260161.272333	Bfp and Egg-a-day package intervention
bfp_salary_cost	14453.380475	14223.350276	14686.621510	Bfp and Egg-a-day package intervention
bfp_indirect_cost	16621.387546	16356.852818	16889.614736	Bfp and Egg-a-day package intervention
bfp_total_intervention_cost	31074.768022	30580.203094	31576.236246	Bfp and Egg-a-day package intervention
eggs_salary_cost	72886.662122	71703.581471	73984.256180	Bfp and Egg-a-day package intervention
eggs_indirect_cost	378568.414344	372440.473452	384267.357790	Bfp and Egg-a-day package intervention
eggs_total_intervention_cost	707758.339861	696301.754715	718412.886303	Bfp and Egg-a-day package intervention
total_intervention_cost	738833.107883	727092.154327	749754.727936	Bfp and Egg-a-day package intervention
cost_per_py	8.921010	8.804813	9.025579	Bfp and Egg-a-day package intervention

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