

Giving Vaccination a Shot:

Describing seasonal influenza vaccine hesitancy at Public Health - Seattle & King County

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A thesis

submitted in partial fulfillment of the
requirements for the degree of

Master of Public Health

University of Washington

2014

Committee:

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Program Authorized to Offer Degree:

School of Public Health

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Abstract

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Unlike healthcare workers, little research has been pursued to understand the reasons for declination of the seasonal influenza vaccine among clinical and non-clinical public health professionals. This research project aimed to describe the reasons for declination of the seasonal influenza vaccine as well as any motivating factors that might promote vaccination among a sample of 10 public health workers at Public Health – Seattle & King County. The results would inform possible areas for Public Health – Seattle & King County to target in order to increase their organizational rates of seasonal influenza vaccination.

Qualitative, semi-structured interviews were conducted with each of the participants. The subsequent transcripts were analyzed using directed content analysis [Hsieh & Shannon, 2005]; codes were developed from the research questions, interview guides, and the Health Belief Model.

Participants declined for many reasons, including: lack of perceived susceptibility, lack of perceived benefits of vaccination, and concerns about the safety of the vaccine. Additionally, five categories of motivational factors emerged from the analysis: 1) evidence about influenza or seasonal influenza vaccine, 2) incentives to promote vaccination, 3) mandatory vaccination policies, 4) generalized risks of acquiring/transmitting seasonal influenza, and 5) personalized risks of acquiring/transmitting seasonal influenza.

Therefore, three areas were chosen for Public Health – Seattle & King County to target based on these results: 1) shifting perceptions away from influenza vaccination as a form of over-medication, 2) promoting vaccination as a way to benefit the common good, and 3) personalizing the risks of seasonal influenza. Pursuit of any or all of these recommendations by Public Health – Seattle & King County hopefully will yield cost-effective interventions that will increase their organizational seasonal influenza vaccination rate.

ACKNOWLEDGEMENTS

First, I want to say thank you to the 10 employees at Public Health – Seattle & King County who made this thesis a reality. They shared their lives and their beliefs with me in the interest of informing research about seasonal influenza vaccine hesitancy. Furthermore, their honesty, enthusiasm, and friendliness made the interviews a true joy to conduct.

I would also like to thank Mr. Don Moritz and Ms. Rebecca Schirle at Public Health – Seattle & King County. They approved and coordinated participant recruitment and were incredibly helpful in guiding me through the study approval process at King County. It should be noted that they were willing to create extra work for themselves because they believed that this research project was worth pursuing. Without their dedication and knowledge, I would have been forced to abandon this thesis many months ago.

I am also indebted to all of my friends and family members who encouraged me whenever they noticed me struggling to complete this project. Their encouragement – whether it was a motivational phone call, a homemade dinner, or a simple hug – was vital to my success. As I move on to other adventures, I am happy to know that they will remain by my side in whatever endeavors I choose to pursue and through whatever challenges I may face in the future.

Lastly, I would like to thank my committee members, Kelly Edwards and Doug Opel. Their tireless assistance, insightful advice, and motivating support brought this thesis to fruition. They were willing to set aside time in their schedules to provide me with the tools to build this project. They then continued to invest in my education by spending much of their time and energy in helping me refine the study and hone the results into the thesis before you. Many of the skills I cultivated and much of the knowledge I gained as a graduate of the Public Health Genetics program are reflective of their incredible mentoring. So it bears repeating: Thank you, Kelly and Doug.

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INTRODUCTION & BACKGROUND

Introduction

In the last two hundred years in the United States (U.S.), there has been a huge shift in disease burden, specifically from communicable diseases like smallpox to non-communicable diseases such as diabetes. A major reason for this shift has been the development of vaccines. The ability of vaccines to protect people from infectious diseases is unparalleled – so much so that vaccines are hailed as one of the top 10 greatest public health achievements [Achievements in Public Health, 2001]. The development of a smallpox vaccine in 1798 by Edward Jenner allowed for the eventual eradication of smallpox in 1980, and the creation of the first polio vaccine by Jonas Salk in 1952 paved the way for the polio eradication effort today [Smallpox, 2014; Disease Eradication, 2014; Polio: Unprotected Story, 2012; Poliomyelitis, 2014].

One of the most prevalent vaccine-preventable diseases still around today is influenza. The seasonal influenza vaccine is a yearly vaccine recommended to all individuals 6 months and older [Key Facts About Seasonal Flu Vaccine, 2014]. Vaccine efficacy is variable from year to year, but recent evidence indicates that the influenza vaccine can reduce the risk of seasonal influenza by about 60% [Vaccine Effectiveness, 2014]. Despite this, seasonal influenza vaccination coverage among adults in the general population remains below 50% [Key Facts About Seasonal Flu Vaccine, 2014; Flu Vaccination Coverage, 2014], and even healthcare personnel hesitate to receive the vaccine. Only 75.2% of healthcare workers reported receiving their seasonal influenza vaccine for the 2013-2014 influenza season despite the risk of influenza-related morbidity and mortality for themselves and the patients with whom they interact [Black, 2014]. Their reasons for declination of the seasonal influenza vaccine are well documented, but reasons for declination among public health professionals, who often work in similar environments as healthcare personnel, have not been described. This thesis aims to describe these professionals' reasons for declination and to identify

potential factors that may motivate them to receive their seasonal influenza vaccine in future influenza seasons.

Seasonal Influenza

Seasonal influenza illness is a serious and highly contagious respiratory disease that affects roughly 5%-10% of adults and 20%-30% of children each year, globally. Put into perspective, these annual attack rates translate to roughly 3-5 million cases of severe illness and approximately 250,000-500,000 deaths worldwide due to influenza infection [Influenza (Seasonal), 2014].

Influenza is responsible for such significant morbidity and mortality because of the acute symptoms that develop after infection and the onset of potentially serious influenza-related complications among particularly susceptible individuals. Influenza may cause an infected person to develop any of the following symptoms: high fever/feeling feverish, a cough, headaches, muscle or body aches, a sore throat, a runny nose, and/or fatigue [Influenza (Seasonal), 2014; Flu Symptoms & Severity, 2014; Symptoms of the Flu, n.d.]. Furthermore, some infected adults may experience vomiting and diarrhea; however, this is more common among infected children [Flu Symptoms & Severity, 2014; Symptoms of the Flu, n.d.].

If the clinical case of influenza is severe enough, or if the infected individual has certain chronic health conditions, influenza-related complications may occur. These complications are often secondary infections that affect diverse systems of the body, including the pulmonary, cardiovascular, and neurologic systems. Since influenza is a respiratory disease, the most common complications that develop are in the pulmonary system, and these complications typically fall into one of four categories: 1) primary influenza pneumonia, 2) secondary bacterial pneumonia, 3) pneumonia due to unusual pathogens or in immunocompromised hosts, and 4) exacerbations of chronic pulmonary diseases. In the cardiovascular system, influenza may worsen congestive heart failure, ischemic heart disease, pericarditis, and myocarditis [Flu Symptoms & Severity, 2014;

Rothberg, 2008]. Seasonal influenza has also been related to neurologic conditions, such as encephalopathy (Reye's syndrome), encephalomyelitis, transverse myelitis, aseptic meningitis, focal neurologic disorders, and Guillain-Barré syndrome [Rothberg, 2008]. Taken together, seasonal influenza and its related complications can have a tremendous impact on the mortality of any population in any given year. Using U.S. death certificate and influenza surveillance data collected during the influenza seasons in the three decades prior to 2007, annual influenza-associated deaths in the U.S. ranged from a low of 3,000 people to a high of 49,000 people [Estimating Seasonal Influenza-Associated Deaths in the United States, 2013]. These minimum and maximum values demonstrate that influenza-related mortality is a significant public health problem, but it should be noted that the wide range of influenza-related deaths can be attributed to the unpredictability of influenza seasons, which often vary by length and severity [Estimating Seasonal Influenza-Associated Deaths in the United States, 2013].

The burden of complications from influenza infections is not arbitrary. Although all populations are at risk of developing these complications, some populations are at a much higher risk when compared to others. Children younger than 5 years (especially infants younger than 2 years), elderly adults aged 65 years or older, pregnant women, people with weakened immune systems due to medication or disease, and people of any age with certain medical conditions (such as asthma and chronic lung diseases; chronic heart, kidney, and liver diseases; and blood, endocrine, and metabolic disorders) are at the highest risk of experiencing influenza-related complications [Influenza (Seasonal), 2014; People at High Risk of Developing Flu-Related Complications, 2014; Who's at Risk, n.d.]. Additionally, people who are morbidly obese [defined as a Body Mass Index (BMI) of 40 or greater], American Indians and Alaskan Natives, and travelers/people living abroad may have a high risk for developing complications [People at High Risk of Developing Flu-Related Complications, 2014; Who's at Risk, n.d.].

Influenzaviruses A and B

The microbial agents responsible for causing seasonal influenza illness among humans belong to two genera of influenza viruses of the *Orthomyxoviridae* family: *Influenzavirus A* and *Influenzavirus B* [Influenza (Flu) Viruses, 2014]. These viruses consist of a helical nucleocapsid and a spherical or filamentous lipid envelope membrane, with hemagglutinin (HA) and neuraminidase (NA) surface proteins embedded in the envelope [Baron, 1996; Sander, 2007]. Hemagglutinin and neuraminidase are crucial to effective influenza virus infection and replication. HA binds specifically to sialic acid moieties on carbohydrate side chains of cell-surface glycoproteins and glycolipids in the respiratory tract, allowing the virus to selectively infect cells of the respiratory system [Gamblin, 2010; Varki, 2008]. NA, on the other hand, is activated after the influenza virus has replicated. Neuraminidase removes sialic acid from the surface of infected cells so that the released viral progeny do not try to infect already infected cells [Gamblin, 2010]. Hemagglutinin and neuraminidase also serve an important function in classifying influenza virus subtypes. These subtypes are derived from the 16 categories of HA protein and the 9 categories of NA protein, ultimately giving many influenza strains their name (such as H1N1) [Gamblin, 2010]. When a person is infected with influenza virus, their immune system creates antibodies against specific antigenic sites on the HA and NA surface proteins, putting a selective evolutionary pressure on the virus to mutate those antigenic sites and escape immune detection; a process that is aided by the highly unusual genome of these influenza viruses.

Unlike the double-stranded DNA genome of most organisms, *Influenzaviruses A* and *B* contain a single-stranded RNA genome. Single-stranded RNA genomes are typically subdivided into two categories: positive- and negative-sense. Positive-sense RNA genomes share the same polarity as mRNA and can be immediately translated into protein in the cytoplasm by the ribosomes of an infected cell [Rybicki, 2010]. Negative-sense RNA genomes are complementary to mRNA and must

be transcribed by an RNA-dependent RNA polymerase in order for the host's ribosomes to translate the transcripts [Rybicki, 2010]. Since host cells do not contain a suitable RNA polymerase, influenza viruses must package an RNA-dependent RNA polymerase within their nucleocapsids to be used for transcription and replication upon infection [Bouvier, 2008]. RNA polymerases inherently lack an exonuclease proofreading ability and are therefore highly error-prone, with a mutation frequency of 1 per 1,000-100,000 nucleotide bases polymerized [Rancaniello, May 10, 2009].

When the RNA-dependent RNA polymerase is transcribing the viral genome, the error(s) that occur in the transcript may have one of three effects on the protein's translation: 1) the mutation creates a premature stop codon that will halt protein synthesis; 2) the amino acid encoded for in the transcript will not be changed by the mutation; or 3) the amino acid encoded for in the transcript is substituted for another amino acid [Dernburg, n.d.]. Option 1, better known as a "nonsense mutation," is generally deleterious and will create viruses that are not viable for completing another cycle of infection. A "silent mutation" is what occurs in option 2, and these errors typically have no effect on the viral progeny. Option 3, a "missense mutation," is split into two categories - conservative and nonconservative. If the substituted amino acid has the same properties as the encoded amino acid, then the mutation is conservative and is unlikely to have an effect on protein function [Point mutation, n.d.]. Mutations that result in substituted amino acids that do not have the same qualities as the encoded amino acid are considered nonconservative, and may affect protein function depending on what the amino acid does [Point mutation, n.d.]. Together, viable conservative and nonconservative missense mutations in the genome allow for antigenic drift - small changes in the antigenic sites of the HA and NA surface proteins that occur continually over time [How the Flu Virus Can Change, 2014]. Those small changes allow the

influenza virus to avoid the targeted antibodies of the immune response and continue its infection unhindered.

Although the exclusive use of RNA molecules is an interesting feature of these influenza viruses, what truly sets these viruses apart is the segmentation of their genomes. *Influenzavirus A* and *Influenzavirus B* have genomes that are split into 8 segments of varying sizes, each coding for different proteins necessary for viral replication and shedding [Bouvier, 2008]. Segmentation is important because it provides the basis for a phenomenon known as antigenic shift, which allows influenza viruses to change the antigenic sites of the HA and NA proteins without mutations [How the Flu Virus Can Change, 2014]. Unlike antigenic drift, antigenic shift occurs rarely and is an abrupt change of the surface proteins due to a “shuffling” of the segments of two or more influenza subtypes [How the Flu Virus Can Change, 2014]. For example, imagine that two strains of *Influenzavirus* have infected the same cell. As they replicate, they are copying each of their 8 segments and packaging them into subsequent viral generations. However, as they are doing this, by chance some of one strain’s segments will get packaged with some of the other strain’s. When segments 4 and 6 (that code for hemagglutinin and neuraminidase respectively) are reassorted, the resulting viral progeny have surface proteins that likely are novel to human immune systems [How the Flu Virus Can Change, 2014]. This lack of immunity then allows the viral strain to infect a large proportion of the human population and may spark a pandemic, as seen with the 2009 H1N1 strain [How the Flu Virus Can Change, 2014]. Antigenic shift often occurs in intermediate hosts (such as pigs) before “jumping” into humans, but there are documented cases of influenza viruses shifting directly from an animal reservoir (such as aquatic birds) directly into humans [How Flu Viruses Change, n.d.].

Seasonal Influenza Vaccine

After influenza viruses were discovered in 1933 by Smith, Andrewes, and Laidlaw in London, Dr. Thomas Francis Jr. of the United States (U.S.) began researching the viruses to better

understand how they cause disease and what could be done to prevent influenza illness [Paul, 1974]. Dr. Francis and Dr. Thomas Magill soon demonstrated the importance of antigenic diversity of influenza A viruses to the human immune response [Paul, 1974]. Dr. Francis' research, with assistance from Dr. Jonas Salk and others, then led to the development of a working influenza vaccine in the 1940s [Paul, 1974; Suddath, 2008]. In the 70 years since those discoveries, these scientists' contribution to the field of influenza virus research has served as the foundation for many of today's techniques in seasonal influenza vaccine development.

The antigenic variation described by Drs. Francis and Magill is responsible for the trivalent nature of the standard influenza vaccine that is used today. A trivalent vaccine is a vaccine that confers protection against three separate virus strains. The seasonal influenza vaccine specifically protects individuals against two influenza A strains and one influenza B strain [Key Facts About Seasonal Flu Vaccine, 2014]. Recently, a "quadrivalent" vaccine was developed to protect against the same three strains as the trivalent vaccine and one additional influenza B strain [Key Facts About Seasonal Flu Vaccine, 2014]. The specific subtypes that are chosen for inclusion in the trivalent (or quadrivalent) vaccine is based on surveillance of circulating influenza virus strains in the northern and southern hemispheres [Selecting the Viruses in the Seasonal Influenza (Flu) Vaccine, 2014; Influenza vaccine viruses and reagents, n.d.]. The World Health Organization's (WHO's) Global Influenza Surveillance and Response System (GISRS) [formerly known as the Global Influenza Surveillance Network (GISN)] tracks candidate vaccine viruses throughout the year, depending on which hemisphere is currently experiencing their peak influenza season [Selecting the Viruses in the Seasonal Influenza (Flu) Vaccine, 2014; Influenza vaccine viruses and reagents, n.d.]. For example, the GISRS predicts which strains are likely to circulate in the northern hemisphere based on current influenza strain data from countries in the southern hemisphere. Then, based on those predictions, the WHO recommends which three or four influenza virus subtypes should be included in the

vaccine though the final decision of which virus strains will be included in licensed vaccines is left to individual countries [Selecting the Viruses in the Seasonal Influenza (Flu) Vaccine, 2014; Influenza vaccine viruses and reagents, n.d.].

Aside from the timing of virus circulation, the other determining factor for influenza virus inclusion is whether the candidate vaccine virus strain can be cultured in eggs [Selecting the Viruses in the Seasonal Influenza (Flu) Vaccine, 2014; Influenza vaccine viruses and reagents, n.d.; Flu (Influenza) Vaccine Development, n.d.]. High yields of influenza virus strains are required for proper vaccine development, and since the highest yields of influenza virus come from being cultured in eggs (which are readily available), chicken eggs are used for large-scale manufacture of seasonal influenza vaccines [Flu (Influenza) Vaccine Development, n.d.; Rancaniello, December 10, 2009; Pandemic influenza vaccine manufacturing process and timeline, n.d.]. Once the strains have been propagated, the viruses are then “killed” using a variety of chemical methods and are ready for inclusion in the vaccine [Flu (Influenza) Vaccine Development, n.d.]. The vaccines that include the killed viruses are often called inactivated vaccines because the virus has been inactivated by chemical treatment [Flu (Influenza) Vaccine Development, n.d.]. In some cases, the viruses are attenuated, meaning that the viruses are active but have been “weakened” to prevent them from establishing infection [Flu (Influenza) Vaccine Development, n.d.]. When these viruses are included, the vaccine is known as a live, attenuated vaccine. Perhaps the most notable live, attenuated vaccine is the oral polio vaccine (OPV), which was developed by Dr. Albert Sabin in 1961 and has helped eliminate poliovirus infections in numerous countries [Oral polio vaccine (OPV), 2010]. Whether inactivated or attenuated, neither type of influenza vaccine can give a person influenza [Flu (Influenza) Vaccine Development, n.d.].

Seasonal Influenza Vaccine Hesitancy

The Centers for Disease Control and Prevention (CDC), the Advisory Committee on Immunization Practices (ACIP), and the Healthcare Infection Control Practices Advisory Committee (HICPAC) recommend that all U.S. healthcare personnel (HCP) receive their yearly seasonal influenza vaccine [Influenza Vaccination Information for Health Care Workers, 2014]. These organizations define HCP broadly; their list includes, but is not limited to: physicians, nurses, nursing assistants, therapists, technicians, emergency medical service personnel, dental personnel, pharmacists, laboratory personnel, autopsy personnel, students and trainees, contractual staff not employed by the healthcare facility, and persons (e.g., clerical, dietary, housekeeping, laundry, security, maintenance, administrative, billing, and volunteers) not directly involved in patient care but potentially exposed to infectious agents that can be transmitted to and from healthcare workers (HCWs) and patients [Influenza Vaccination Information for Health Care Workers, 2014]. Since seasonal influenza is such a serious illness for healthcare patients and workers (healthy or not) and since infected individuals can shed the virus before feeling ill, it is important for anyone who directly interfaces with patients or who is one-degree separated from patients to be vaccinated against influenza in order to prevent transmission and subsequent illness [Influenza Vaccination Information for Health Care Workers, 2014]. The WHO says that vaccination is the most effective way to prevent infection and severe outcomes caused by influenza viruses, even more so than general infection prevention measures such as covering a cough and performing proper hand hygiene alone [Vaccines, n.d.; Cover Your Cough, 2010].

Despite the described benefits of influenza vaccination and the call for universal immunization, many healthcare workers still decline to receive their yearly influenza shot. In the U.S., only 72% of healthcare personnel reported being vaccinated against influenza during the 2012-2013 flu season [Influenza Vaccination Information for Health Care Workers, 2014]. Although 72% is considered low for influenza vaccination, it deserves to be noted that it is an improvement over

the two previous influenza seasons. During the 2011-2012 season, 66.9% of HCWs reported receiving their seasonal influenza shot, and during the 2010-2011 season, only 63.5% said they were vaccinated against influenza [Influenza Vaccination Information for Health Care Workers, 2014]. These statistics were calculated from data that were collected via Internet panel surveys of healthcare personnel, conducted at the end of each influenza season by the CDC [Influenza Vaccination Coverage, 2014]. Because the data were self-reported, there are a few limitations that should be noted. The healthcare workers who chose to respond to these surveys may be systematically different (i.e., more likely to receive their seasonal influenza shot) from those workers who chose not to respond. Furthermore, the sampling method used to recruit healthcare personnel could bias the results by either recruiting workers who are more likely to get vaccinated or workers who are less likely. Potential biases notwithstanding, these statistics indicate that a large portion of the U.S.' healthcare workforce is unvaccinated against influenza. Yet these statistics do not explain why this is the case.

A small portion of those who are unvaccinated could be individuals who cannot receive an influenza vaccine due to underlying health conditions. Healthcare workers who have had a previous serious allergic reaction to the influenza vaccine, or who have a history of Guillain-Barré Syndrome (GBS) and who are not at risk for severe illness from influenza are not indicated to receive the influenza vaccine [Influenza Vaccination Information for Health Care Workers, 2014]. Cases of severe allergic reactions and GBS are exceedingly rare however. GBS occurs in about one person per 100,000, and severe allergic reactions to the influenza vaccine are estimated to occur less than once in a million doses [Guillain-Barré Syndrome Fact Sheet, 2014; Possible Side-effects from Vaccines, 2014]. Therefore, these conditions alone cannot explain the large proportion of unvaccinated healthcare workers reported by the CDC.

Literature Review

Reasons for Declination

Researchers who have investigated this phenomenon have found the reasons for declination of the seasonal influenza vaccine to be relatively consistent across workplaces, occupations, and geographic locations. Hakim and colleagues [2011] studied uptake of the seasonal influenza vaccine in an already high compliance healthcare setting - St. Jude's Children Research Hospital in Tennessee. They found that, among the unvaccinated HCWs, the workers were afraid that the influenza vaccine would make them feel sick and/or carry rare but serious side effects [Hakim, 2011]. The HCWs also expressed doubt as to the effectiveness of the vaccine [Hakim, 2011]. In a broader research study conducted in Texas, Oregon and Washington, Thompson et al [2013] focused on the barriers and motivators toward vaccination among HCP who provided direct patient care. Their barriers to vaccination included vaccine safety concerns, vaccine effectiveness concerns, low perceived risk of infection/disease, and lack of a PCP (primary care physician) recommendation [Thompson, 2013]. Similarly, a survey of nursing and physician staff at Yale-New Haven Hospital in Connecticut was used to assess potential reasons for seasonal influenza vaccine declination. Nurses tended to decline because they were concerned that the vaccine causes an influenza-like illness and were worried about the vaccine's efficacy [Martinello, 2003]. Furthermore, many nurses held a belief that they were not at risk for influenza [Martinello, 2003]. Physicians, on the other hand, tended to passively decline the vaccine, stating that there was a lack of convenience for getting vaccinated and that forgetfulness played a role [Martinello, 2003].

These reasons for declination of the seasonal influenza vaccine are also prominent globally. In 2014, Lehmann et al conducted semi-structured one-on-one interviews with 123 German, Belgian, and Dutch HCP about their reasons for and against vaccination and found that the reasons among non-immunizers to not get vaccinated fell into six categories. Specifically, these six categories were: 1) fear of potential side effects; 2) feeling of lack of risk since they never or almost never had

influenza before and reported feeling healthy; 3) disbelief in the effectiveness of the influenza vaccination in protecting themselves or patients; 4) organizational barriers such as appointment times; 5) lack of knowledge or misconception about who should get vaccinated, the belief that a person benefits from undergoing illness, and that there are protective measures that are more effective in preventing influenza; and 6) undefined negative emotions toward being vaccinated [Lehmann, 2014]. In two separate hospitals of Liverpool, England, 144 nurses and healthcare assistants completed a survey to identify the reasons for poor influenza vaccine uptake [Canning, 2005]. Workers responded, saying that they did not think the vaccine was needed and were also concerned about potential side effects [Canning, 2005]. Some workers admitted that they were not aware of the seasonal influenza vaccine [Canning, 2005].

This research provides strong evidence that certain beliefs and knowledge about the influenza vaccine, such as perceived susceptibility to influenza illness and disease and vaccine effectiveness, are common to most HCWs' decision to decline receipt of the vaccine. In fact, Thompson and colleagues conducted a different study in 2012; this time asking both vaccinated and unvaccinated HCP in Texas, Oregon, and Washington to rank their opinions, on a Likert scale, about 12 flu vaccine-related statements that fell into four categories: 1) perceived susceptibility, 2) perceived effectiveness of the seasonal influenza vaccine, 3) concerns about the seasonal influenza vaccine (adverse events, side effects, etc.), and 4) emotional benefits of vaccination (feelings of regret or vulnerability if they do not receive the vaccine, etc.). Across all of these items, the difference between vaccinated and unvaccinated HCP was statistically significant ($P < 0.001$) [Thompson, 2012]. Furthermore, HCP who rated their susceptibility as "large" were 6.0 times more likely to be vaccinated than those who rated their susceptibility as "moderate" or lower [Thompson, 2012]. HCP who described the vaccine as "somewhat" or "very effective" were 10 times more likely to be vaccinated than those who rated the vaccine as "not too" or "not at all effective" [Thompson,

2012]. The study of nurses and physicians from Yale-New Haven Hospital mentioned previously found that there was a difference in vaccination habits between nurse and physician staff. Physician staff were significantly more likely to have been vaccinated when compared to nursing staff (82% vs. 62% respectively, $P=0.0009$) [Martinello, 2003]. Physicians or nurses who answered five basic knowledge questions about the influenza vaccine correctly were significantly more likely to have been vaccinated than those responding incorrectly to any question (84% vs. 64% respectively, $P=0.002$) [Martinello, 2003].

Motivating Reasons for Vaccination

Although much of the research has focused on why HCWs choose not to receive their seasonal influenza vaccination, some studies have begun asking both vaccinated and unvaccinated HCWs about factors that do, or would, motivate them to get vaccinated. The Hakim et al [2011] and Thompson et al [2013] studies took this approach. Among vaccinated HCWs at St. Jude's Children's Research Hospital, stated reasons for receiving the vaccine included: 1) "Influenza vaccine reduces my risk of getting sick," 2) "Influenza vaccine reduces my risk of transmitting influenza virus to my patients," and 3) "Influenza vaccine reduces the risk of transmitting influenza virus to my family and friends" [Hakim, 2011]. The nature of these responses highlight the importance of personal belief and knowledge in deciding to be vaccinated against influenza. Whereas regularly vaccinated HCWs believe in the effectiveness of the vaccine and its ability to protect, unvaccinated HCWs do not believe this and are therefore unwilling to be vaccinated for benefits that they do not think the vaccine can provide. In an attempt to understand what factors might encourage these HCWs to increase their faith and/or desire to get vaccinated, Thompson et al, in their 2013 study, asked unvaccinated HCWs to indicate which vaccination strategies would make them "much more" likely to vaccinated during the next season [Thompson, 2013]. The primary motivating reasons were: vaccination is required for all HCWs, the CDC says the upcoming influenza season will be

particularly severe, information on how the vaccine reduces the chance they will give influenza to patients, and information on their increased risk of getting influenza from patients [Thompson, 2013]. Although a vaccination requirement was mentioned as a motivating factor in this study, Hakim et al [2011] found in their sample that HCWs oppose mandatory vaccination on the basis that it violated their freedom of choice and/or autonomy. Whether the other two factors from the Thompson et al [2013] study - increased knowledge about the vaccine or increased knowledge about the threat of the disease - has an impact on vaccination behavior requires further research.

Perceptions of Seasonal Influenza Vaccine

A HCW's perception of the seasonal influenza vaccine also plays an important role in their decision to get vaccinated. As might be expected, HCWs who choose not to be vaccinated have significantly different perceptions of the influenza vaccine than their vaccinated peers. Among vaccinated and unvaccinated nonhospital-based HCWs working in St. Louis, Missouri, Rebmann et al [2012] found that vaccinated HCWs were more likely than unvaccinated HCWs to agree that influenza is a serious disease, that HCWs should be vaccinated every year, that employment should be dependent on vaccination, that nonimmunized HCWs play a role in influenza transmission, that vaccination is important to them, that they would receive the vaccine every year if it were offered for free and/or free and onsite, and that public health can be trusted to produce a safe vaccine. Additionally, vaccinated HCWs were less likely than unvaccinated ones to agree that influenza vaccine has a lot of adverse side effects, that they are afraid of influenza vaccine adverse effects, and that they are less susceptible to influenza because their immune system has become built up from years of working in healthcare [Rebmann, 2012].

Kraut et al [2011] conducted a study in Winnipeg, Canada among tertiary care hospital HCP to understand their attitudes and experiences with seasonal and pandemic H1N1 (pH1N1) influenza viruses and vaccines. Almost all respondents, regardless of vaccination history, considered pH1N1

to be a serious disease [Kraut, 2011]. Those who were not regularly vaccinated was less likely to consider seasonal influenza to be a serious illness than those who were regularly vaccinated [Kraut, 2011]. Fewer individuals in the not regularly vaccinated (NRV) group had confidence in either influenza vaccine when compared to those in the regularly vaccinated (RV) group [Kraut, 2011]. Indeed, only 25.1% of the NRV group (n=180) felt that the risk of getting influenza outweighed the risk of the seasonal influenza vaccine, compared to 79.6% of the RV group (n=504) [Kraut, 2011].

These perceptions help explain many of the reasons for declination and motivating factors listed above. However, perceptions about current strategies to increase vaccination need to be evaluated as well. In 2007, California enacted a law that requires all general acute care hospitals (GACHs) to annually offer employees free onsite influenza vaccination and educate them regarding risks of influenza and benefits of vaccination. It also required employees to be vaccinated or sign a written declination, and GACHs must report vaccination and declination rates to the California Department of Public Health. Khodyakov et al [2013] then interviewed hospital workers in GACHs about their perceptions of the law. Many HCWs did not believe that the vaccination requirements were strict enough to have an impact on vaccination rates, primarily because it does not have consequences for non-compliance aside from signing a declination form [Khodyakov, 2013]. Signing a declination form was not perceived to be an effective measure since it did not make people think about the importance of influenza vaccination [Khodyakov, 2013]. Therefore, the work of Hakim et al [2011] and Khodyakov et al [2013] indicate that interventions to increase seasonal influenza vaccination must fall between two extremes. On one hand, declination forms that cater to a person's autonomy and freedom of choice are perceived to be too weak while on the other, mandatory vaccine policies that seemingly violate those rights are perceived to be too coercive.

Summary of Current Knowledge

Several literature reviews and meta-analyses of the available data accurately and succinctly summarize the state of knowledge regarding seasonal influenza vaccine hesitancy among HCWs. In 2006, Hofmann and other researchers conducted a literature review of 25 peer-reviewed papers that addressed the attitudes of HCW toward influenza vaccination. In the review, the authors found four ideas that encouraged influenza vaccination and seven that hindered it. The four ideas that bolstered vaccination habits were: 1) to protect oneself from influenza, 2) to protect patients from influenza, 3) free and convenient vaccination, and 4) following the example set by peers [Hofmann, 2006]. Reasons for refusal across all studies included: 1) a fear of adverse effects, 2) misconception that “vaccination can cause influenza,” 3) perception of low risk, 4) the times/locations of vaccination were unsuitable, 5) doubt that influenza is a serious disease, 6) inefficacy of the vaccine, and 7) fear of injections [Hofmann, 2006].

Following the Hofmann review [2006] was the Hollmeyer et al literature review in 2008. This review focused on self-reported reasons against influenza vaccination among HCWs and predictive factors for vaccination in this population. 25 publications were available for review of the self-reported reasons against vaccination, and 13 studies were available for examination of predictive factors [Hollmeyer, 2008]. The self-reported reasons were divided into two categories - reasons for receipt of the vaccine and reasons for non-receipt of the vaccine. Reasons for receipt among HCWs, in ranked order, were: self-protection against infection and illness, protection of patients, protection of own family or colleagues, convenient access, compliance with recommendation, work ethics, free vaccine (no cost), trust in the vaccine, setting an example for patients, and claiming that they, “Always get influenza vaccination” [Hollmeyer, 2008]. Meanwhile, reasons for non-receipt among HCWs, in ranked order, were: fear of adverse reactions, lack of concern about infection and illness, inconvenient delivery, lack of perception of own risk, doubts about vaccine efficacy, avoidance of

medications, dislike of injections, self-perceived contraindications, and lack of availability [Hollmeyer, 2008]. Indeed, most of these reasons became apparent in the studies examined earlier.

The Hollmeyer et al review [2008] also determined potential factors that could predict vaccination status for future seasons. They found that factors related to: individual and occupational characteristics, knowledge and attitudes towards influenza or influenza vaccine, influenza vaccination practices, perceived beneficiaries of HCW vaccination, and reinforcing and enabling system factors were the best predictors of future influenza vaccination [Hollmeyer, 2008]. Similar to the reasons for or against vaccination, other studies have split the predictors into two categories - predictors of vaccination and predictors for refusing vaccination. Trivalle et al [2006] did just that. In their study, they distributed an anonymous and structured cross-sectional survey to the HCP at a tertiary geriatric hospital in Villejuif, France in order to assess the predictive factors for accepting or refusing influenza vaccination [Trivalle, 2006]. The authors found that occupation as a physician, previous receipt of influenza vaccination, and a desire to protect their own health predicted a HCW's acceptance of the influenza vaccine [Trivalle, 2006]. Meanwhile, factors that predicted refusal of the vaccine included occupation as a nurse or nursing assistant and a belief that homeopathic medication is more effective than the vaccine [Trivalle, 2006]. Finally, in a meta-analysis of 13 studies, Riphagen-Dalhuisen and colleagues [2012] were attempting to determine only the most important predictors of seasonal influenza vaccination acceptance among HCWs in hospitals. Knowing that the vaccine is effective, being willing to prevent influenza transmission, believing that influenza is highly contagious, believing that influenza prevention is important, and having a family that is usually vaccinated were all statistically significantly associated with a two-fold higher uptake of the seasonal influenza vaccine [Riphagen-Dalhuisen, 2012].

Taken together, the results of the literature indicate that HCWs choose not to be vaccinated against seasonal influenza for a variety of reasons - from a fear of needles to perceptions of low

vaccine efficacy. Furthermore, there are sharp divisions in the health beliefs regarding seasonal influenza vaccination between the HCWs who choose to get vaccinated and those who do not. Many of these beliefs hinge on the HCW's perception of influenza susceptibility, their perception of vaccine adverse effects, and a belief in stopping influenza transmission. Despite this wealth of knowledge, there has been minimal research into why public health professionals (those who work for state, county, and local health departments and who may not have regular patient contact) decline seasonal influenza vaccination and whether they decline for similar reasons as the HCWs described above.

METHODS

Study Purpose & Design

With the intent of better understanding the motives behind public health professionals' declination of the seasonal influenza vaccine, qualitative semi-structured interviews were conducted with ten employees from Public Health - Seattle & King County (PHSKC) who chose not to receive the seasonal influenza vaccine during the 2013-2014 season. The purpose of these interviews was two-fold: 1) to identify and describe the reasons and justifications for seasonal influenza vaccination declination among employees at PHSKC; and 2) to describe any motivating factors that would prompt these employees to receive the yearly influenza vaccine in the future. The information gathered from this research hopefully will be used by officials at PHSKC to understand their unvaccinated employees and to begin conversations with those employees about how to best improve seasonal influenza vaccination rates.

Ethical Considerations

This study was reviewed and approved by the Institutional Review Board at the University of Washington, as well as the Research Administrative Review Committee at PHSKC. The researchers have no financial conflicts to disclose.

Recruitment Strategy & Participants

Participants were recruited with the help of Ms. Rebecca Schirle and Mr. Don Moritz of the PHSKC Human Resources (HR) Department. We chose an opt-in method for recruitment. Employees were given a link to complete an optional survey in which they would indicate their interest in the study, and were given the primary researcher's contact information to then schedule their interview. The survey was created in SurveyMonkey by Ms. Schirle and Mr. Moritz and was released by email to 239 PHSKC employees first on May 19, 2014, then subsequently on June 13 and July 8, 2014 to encourage more employees to participate. A copy of the email that was released on those dates can be found in Appendix A. Four employees contacted the primary researcher after the original release; two more employees joined after the second release; and the final four participants contacted the primary researcher after the third release date. All 10 participants met the two eligibility criteria for the study – at the time of the survey, participants had to be employed by PHSKC and were unvaccinated against influenza for the 2013-2014 season as of April 1, 2014. Since influenza seasons tend to end in April or May [The Flu Season, 2014], this cut-off date was hypothesized to capture those employees who deliberately chose not to get vaccinated and not those who receive the vaccine late in the season.

Data Collection & Analysis

Qualitative semi-structured interviews were used to collect these data. A general interview guide was developed in order to probe seasonal influenza vaccination beliefs and vaccination habits of the participants. The first portion of the interview focused on the participant's reasons for declining the seasonal influenza vaccine. The remainder of the interview was devoted to the participant self-identifying any factors that might motivate them to get vaccinated against seasonal influenza in future years. The questions were primarily framed using the six components of the Health Belief Model, specifically: perceived susceptibility, perceived severity, perceived benefits, perceived barriers,

cues to action, and self-efficacy [The Health Belief Model, 2013]. A priori, the Health Belief Model was thought to best describe and explain the employees' decision to decline seasonal influenza vaccination based on current evidence discussed above. Additionally, the original interview guide was later revised to include questions about genetic susceptibilities to influenza and beliefs about other vaccines. The original guide was used in the first four interviews and is presented in Appendix B. The revised guide was used for the remaining six interviews and is available in Appendix C. Interview responses were recorded using a digital audio recorder and were transcribed for later data analysis. To maintain anonymity, the interviews were numerically coded and were deleted from the audio recorder after transcription was completed.

The collected data were analyzed using directed content analysis [Hsieh & Shannon, 2005]. Codes were developed from the research questions, interview guides, and the Health Belief Model. Two codes – “Rationale” and “Motivating/Persuading Factors” – were open coded, allowing the primary researcher to identify themes that were relevant to the research questions but did not fall into any of the preconceived categories. The “Rationale” code described any reasons outside of the Health Belief Model that influenced a participant's decision to not receive the seasonal influenza vaccine, and the “Motivating/Persuading Factors” code was used to categorize any self-identified factors that would motivate a participant to receive the seasonal influenza vaccine. The codebook used for analysis is provided in Appendix D.

Transcripts were coded once by the primary researcher, with a subset reviewed by the primary advisor. Once coding was complete, a coding report for each interview was created by taking all quotes from one interview and sorting them according to the codes listed in the codebook into one Microsoft Word document for review. This was done in order to construct case tables. The case tables served as a tool to review the summaries of all codes across all interviews, and is provided in Appendix E. All codes that were represented in the transcripts will be described, but the

codes that provide particular insight into the declination and motivations of seasonal influenza vaccine hesitancy among public health professionals will be focused on in the Discussion.

RESULTS

Demographic Variables

The 10 study participants represented a diverse group of public health professionals at PHSKC. Their ages ranged from 30 years old to 62 years old, with the mean and median ages being 44.4 years and 43.5 years respectively. Six of the 10 participants gender-identified as female, 3 as male, and 1 as genderqueer/gender non-conforming. These participants serve PHSKC in a variety of forms - from delivering education to managing administrative tasks to delivering healthcare services. A more detailed view of the participants' demographic data are presented in Table 1.

Participant	Age	Gender	General Job Title	Prior Flu Vaccine? (Y/N)
#1	59	Female	Nutrition Educator	Yes
#2	30	Female	Public Health Nurse	Yes
#3	43	Male	Program Manager & Medical Assistant	No
#4	54	Genderqueer/Gender non-conforming	Administrative Assistant	Yes
#5	44	Female	Administrative Specialist	Yes
#6	40	Male	Outreach Worker	No
#7	44	Female	Instructional Designer	No
#8	37	Female	Education Specialist	Yes
#9	31	Female	Registered Dietician	Yes
#10	62	Male	Health Investigator	Yes

Table 1. Demographic information (age, gender, and general job title) of the 10 participants in the study.

Descriptive Statistics

Because transcripts were examined using directed content analysis (meaning the codes were pre-determined before analysis), the number and percentage of participants who described a belief related to each code was calculated. Table 2 presents these calculations. For example, 10 (100%) of the interviewees stated in their interviews that perceived susceptibility was a reason for declining their seasonal influenza vaccine.

Code	Number (#) of participants	Percentage (%) of participants*
Perceived susceptibility	10	100%
Perceived severity	9	90%
Perceived threat**	10	100%
Perceived benefits	9	90%
Perceived lack of benefits	9	90%
Perceived harms	9	90%
Perceived barriers	7	70%
Cues	10	100%
Self-efficacy	0	0%
Rationale for declination	10	100%
Universal precautions	8	80%
Fear of needles	2	20%
Preference for natural immunity	2	20%
Natural methods as alternatives	3	30%
Workplace culture	1	10%
Persuading/motivating factors	10	100%
Evidence about virus/vaccine	7	70%
Incentives for vaccination	1	10%
Mandatory vaccination policies	10	100%
Generalized risks of influenza	10	100%
Personalized risks of influenza	7	70%
Vaccine history	10	100%

Table 2. Descriptive statistics of the study. Includes information regarding the number of participants who described a belief relevant to each code, as well as the percentage per code.

*Percentages were calculated by dividing the number of participants who described each code by 10 (total number of participants) and then multiplying the result by 100.

**In the Health Belief Model, perceived threat is a function of both perceived susceptibility and perceived severity. Due to substantial overlap with those codes, perceived threat will not be mentioned in the results.

Reasons for Declination

Perceived Susceptibility

The rationale for declining seasonal influenza vaccination among these public health professionals was largely consistent. In general, the participants did not feel as though they were particularly susceptible to influenza infection. Many reported that they had no clinical history of seasonal influenza disease and believed that, if they were infected, their immune system would be healthy enough to manage the infection on its own. Furthermore, influenza infection was much less of a perceived threat to them as several participants mentioned that their work did not involve regular contact with sick individuals, as one might expect if they worked in a clinic:

“Another thing about why I don’t get the flu shot is because it’s put out to public health workers who work in situations and with people who might carry the flu virus with them, and I don’t work in the clinics.” - Participant #1

Perceived Severity

Seasonal influenza was perceived to be a serious or severe disease only for specific vulnerable populations such as individuals who are chronically ill, the elderly, and pregnant women. Several participants described the relatedness of mortality of influenza and underlying medical conditions such as these to explain why the severity of influenza was less for them as healthy adults. However, pandemic influenza strains may be an exception to this rule and were perceived to be dangerous to most individuals. Finally, four of the respondents framed the mild severity of influenza by juxtaposing it with diseases they believed to be more serious such as measles or hepatitis B:

“Yeah, I’ll get vaccinated against hepatitis B. That could create long-term problems and death. That’s just not worth it. But the flu’s the flu.” - Participant #7

Perceived Benefits

With respect to the perceived benefits of the seasonal influenza vaccine, participants described the vaccine’s ability to prevent infection and disease in themselves and less so on the vaccine’s ability to decrease the likelihood of them transmitting the disease to others. Because of this, most respondents replied that the flu vaccine would be beneficial for the vulnerable

populations that are at high risk for influenza-related morbidity and mortality but not for themselves as healthy adults:

“And I do recommend...like, I tell my parents that they should go get it [the flu vaccine] because they’re older and my mom is not in the best of health. I’m the first one to tell them, ‘You guys have to get your flu shots. It’s really important.’” - Participant #5

“And I promote it to the patients. I don’t twist their arm to get it since obviously I haven’t gotten it, but I will promote it to them to get it. So I know it’s a good thing, but it’s just not my thing.” - Participant #6

Lack of Perceived Benefits

Most respondents felt that they did not need the vaccine as healthy adults and/or expressed a belief regarding the ineffectiveness of the vaccine as a useful tool in preventing seasonal influenza:

“[...] but considering my health and where I work and all that and the dangers of a flu shot and the ineffectiveness of the flu shot in some degrees, you can’t convince me yet.” – Participant #1

Perceived Harms

Many participants perceived that there were some harms associated with seasonal influenza vaccination that influenced their decision to decline the vaccine. However, the described harms were incredibly heterogeneous. One respondent declined seasonal influenza vaccination because of perceived vaccine-related side effects, both from FluMist as well as the intramuscular injection:

“I’ve had the experience in the past that when I get the shot, that I feel not well for a couple of weeks, and I’m not sick enough to not come to work but I just don’t feel well.” - Participant #4

Others were concerned about the ingredients included in the vaccine:

“And then I’ve just heard various different things about what’s in the vaccine. [...] Like formaldehyde, but things like that. [...] I don’t know if I want that in my body.” - Participant #9

“So I don’t like putting stuff in my body that wouldn’t naturally be going in there. So any time I eat a corn chip, a tortilla chip, I’m doing that, right? It’s not like I can pick a corn chip out of the...I eat stuff all the time that’s [not natural...] Even though I believe in the science of it [seasonal influenza vaccination], there’s a part of me that’s reticent because it’s unnatural.” - Participant #4

And one had questions about the long-term effects of seasonal influenza vaccination on the human immune system:

“I feel like I’d need some really good evidence that [...] putting this in my body year after year after year after year is not causing some sort of long-term issues with my immune system.”
- Participant #2

Perceived Barriers

This code represents beliefs or external factors that make it unlikely for these public health professionals to receive their seasonal influenza vaccination. Two participants expressed a belief of vaccination as a form of over-medication:

“I know that you can get the flu anyway [after vaccination] and then you’re getting extra drugs in your system, and I do think things add up. [...] I just prefer a society that doesn’t think drugs, either to prevent or heal, before thinking of other ways.” – Participant #1

“So the inherent job of a vaccine is to basically make your body make antibodies for its recovery [...] So it has to stimulate your immune system in some way. [...] A healthy immune system stimulating it, not a big deal, but it’s also not healthy to constantly stimulate it, right? So to me, if I [...] don’t have to stimulate it more often than I need to, I don’t want to.” - Participant #2

Related to this idea was a comment by a respondent who felt that the vaccine movement completely avoids the notion of holistic medicine and taking care of one’s entire body:

“I have some holistic care practitioners that I work with on other things. You know, osteopathic physicians and other people that help balance and make sure everything is moving and working. I could be ignorant, but [...] I honestly don’t see a strong case for having a vaccination just to keep from getting sick. You know, I’m not seeing a case for that.” - Participant #7

Another participant mentioned that her reluctance to get vaccinated was associated with a negative perception of the vaccine due to the relatively short period it has been marketed to the public:

“But yes, it hasn’t really been around for a long time, and the little negative things you hear about it [the vaccine]...” - Participant #8

Finally, one respondent acknowledged that, outside of his beliefs regarding seasonal influenza vaccine, time and energy barriers due to his work schedule may prevent him from getting vaccinated:

“There is some convenience factor. I’m always busy at work.” - Participant #10

Rationale

A common perception among interviewees was that other healthy behaviors like diet and exercise as well as universal precautions (covering a cough, washing one's hands, wearing a mask, etc.) protect them against infection and subsequent illness:

"You're out on the street with the general public and you are not immunized with the vaccine, but then still...I wash my hands constantly. I ride the bus all the time, so as soon as I walk in my door, I will wash my hands and stuff like that. So those precautions...you take them with you because it's the way - in my head - it's the way to do it." - Participant #3

"I mean, universal precautions - keep your hands clean, use your sanitizer, cover your cough, eat right. There's so many things you can do to contribute to your own health." - Participant #5

Two participants mentioned their dislike for needles as a contributing factor for declining the vaccine. Another two respondents expressed concerns regarding antibodies that were acquired "naturally" through wild-type influenza virus infection and those acquired "artificially" by the vaccine. In particular, one of the participants mentioned:

"I just don't want to put something there that I can naturally produce. So if I can build up immunities to it, maybe being exposed and I get sick...[I'll still be able to fight it off.]"
- Participant #6

However, when the same participant was probed as to whether he thought there was a difference between "natural" and "artificial" antibodies, he responded with:

"Difference? No, I don't think there's a lot of difference. I don't know the facts on it, but my perception is that it would be the same whether you build it up naturally or artificially."
- Participant #6

This potentially indicated that the participant holds a preference for "natural" immunity over vaccine-induced immunity for reasons other than those based on scientific evidence. The idea of natural methods as alternatives to vaccination made appearances in three more interviews.

Participant #1 mentioned that her family's beliefs in "...alternative medications and alternatives to medications and alternative means of eating and caring for [them]selves" played a "big role" in her decision to not get vaccinated against influenza. Furthermore, participant #2 regularly sees a naturopath. After noticing participant #2 struggle with allergies and specific sensitivities, the

naturopath and participant #2 decided that she should not do something that “...wasn’t absolutely necessary for [her] health...,” and from participant #2’s perspective, the seasonal influenza vaccine was not absolutely necessary this year. Participant #5 espoused a belief that “...germs are good for you to some point.” The necessity of using sanitizer to prevent influenza infection among unvaccinated individuals was also worrisome to her in that sanitizers were “killing off good germs.” Her advice to unvaccinated individuals was to, “Be as clean as you can; be as careful as you can, but don’t freak yourself out about it...” since other universal precautions (washing hands and covering coughs) would maintain a balance between stopping “bad germs” and maintaining “good germs.”

Finally, a culture of vaccination in the work environment may cause unvaccinated individuals to reassert their position even more firmly. Many of participants #6’s co-workers would exert peer pressure to encourage him to get vaccinated against seasonal influenza during the past influenza season. Unfortunately:

“And it became more of a... Well no, I’m not going to do it because you guys want me to. So no, I’m not going to do it. I don’t care what you say.” - Participant #6

Perceptions of Motivational Factors

Five categories of motivational factors emerged from the analysis: 1) evidence about influenza or seasonal influenza vaccine, 2) incentives to promote vaccination, 3) mandatory vaccination policies, 4) generalized risks of acquiring/transmitting seasonal influenza, and 5) personalized risks of acquiring/transmitting seasonal influenza.

Evidence-based knowledge

The lack of knowledge regarding certain aspects (e.g., ingredients, long-term effects) of the seasonal influenza vaccine prompted six interviewees to mention that, if they were presented with evidence that addressed their concerns about the vaccine, they would be more likely to receive the flu vaccine next year or at least be more open to considering getting it after further research:

“That I’m going to be protected long-term for several strains; that my not getting the flu [vaccine] could have serious consequences to multiple people - like people, species, populations. [...] Then I would probably have to do some serious reconsideration and research. It wouldn’t be something I would just take at face value. I would have to do some additional research.” - Participant #7

Although this held true for five other participants, participant #8 felt that she had already seen most of the scientific evidence regarding the effectiveness of the vaccine and would not want to see any more.

Incentivizing vaccination

When asked about the use of incentives (e.g., gift or cash incentives), most respondents felt that there was little PHSKC could offer that would make them change their mind about getting vaccinated:

“No. It’s my body. Sorry. There’s no incentive that going to motivate me to do something differently.” - Participant #7

“...I have seen other organizations where they offer either a discount or whatever at Walgreens or something like that or gift card...In my case, to me, it doesn’t matter because to me, it’s a personal decision.” - Participant #3

However, two participants were willing to concede that a personalized incentive might motivate them to get vaccinated in future seasons despite their current hesitations:

“Well, paid leave would be an incentive because if I end up using a sick day because I don’t feel well after I get vaccinated. [...] There’s some acknowledgement that there are side effects, but there’s really nothing to incentivize me to want to have those.” - Participant #4

“[Discussing a healthy incentives program at PHSKC...] They incentivize the behavior, so this is not a big jump at all. [...] For example, the amount I pay for healthcare is based on the healthy incentives program. [...] If they chose to pursue that as a way to incentivize, I would be fine for that. It would increase my chances of doing that [getting vaccinated]. [...] I would add that in to the other factors I am using to make my decision.” - Participant #10

Mandatory policies

All 10 interviewees were against instituting a mandatory vaccination policy at PHSKC, but most agreed that if were a choice between losing their job and getting vaccinated, they would get vaccinated against seasonal influenza. Comments regarding such a policy hit on three themes - 1)

vaccination as a personal choice, 2) mandatory vaccination as a logistical impossibility, and 3) proper justification for a mandatory policy. These themes may be interconnected since a participant was likely to talk about at least two of these themes, if not all three, when asked about a mandatory vaccination policy at PHSKC.

Vaccination as a personal choice was a primary concern for participants #1 and #6 since a mandate from PHSKC would be a perceived threat toward their autonomy:

“Well, I hope they never would. I mean, if it was like get vaccinated or lose your job, I might. But I hope that wouldn’t happen. [...] It’s a personal decision; King County and Public Health isn’t going to convince me of anything.” - Participant #1

*“The flu vaccine...I just don’t think that should be a requirement for any individual. You should have a choice, and if you want it, fine. It’s there. If you don’t fine. You don’t need it.”
- Participant #6*

A couple of the participants focused on the legal aspects that would make mandatory vaccination a legal conundrum for PHSKC, which was perhaps best summarized by participant #8:

“I feel like anybody else would. I would first like to know first my rights with the company, and more from there. [...] Why are they making it mandatory? What are the reasons behind it? And if there’s any way to get out of it. Legally, not make it a big deal, but do it legally.” - Participant #8

Finally, there were interviewees who were unsure about a mandatory vaccination policy but were willing to adopt the strategy so long as PHSKC could justify it:

“There are things that I could see being told [...] that would mitigate a decision where King County was saying, ‘We’re gonna require flu vaccine.’ For example, if you drive a bus, drug testing is mandatory. So there’s a health related procedure that’s pretty invasive - you’ve gotta pee in a cup - but they’re saying, ‘If you want to do this job, we’re gonna tell you to do it. We’re not going to ask you. We’re gonna tell you.’ [...] That makes sense. Justification.” - Participant #10

Generalized risks of seasonal influenza

All participants commented that becoming more vulnerable to influenza or having a prior history of influenza would encourage them to get vaccinated. Their current perception of healthiness is part of their hesitancy to receive the vaccine since they do not believe that they are particularly

susceptible to influenza, as described earlier. Interestingly, half of interviewees mentioned that their risk of transmitting seasonal influenza to a vulnerable person would be a reason to get vaccinated:

“My mother lived in a nursing home for four years, and they just routinely gave everybody [a] flu shot. I wasn’t going to argue with that. You know, she was dependent upon people to take care of herself. If she was sick with the flu on top of everything else, that would have been unfortunate...”
- Participant #1

“A different question is, when it’s not just me laying on the couch for a week, but I might transmit it to an elderly or other [...] immune compromised person, that adds that ethical element. And I don’t want...I want to be conscious about that and mindful of that. I’m not going to risk somebody else’s serious disease for my inconvenience [meaning: convenience].” - Participant #10

However, it is important to note that most of the participants who mentioned preventing transmission of influenza framed their point in the context of preventing a vulnerable loved one from becoming ill.

Personalized risks of seasonal influenza

Seven out of 10 participants were asked whether personalized influenza risk information, based on a hypothetical genetic test, would influence their decision to get vaccinated in the future. All participants expressed interest in what the test could tell them about their risk of acquiring and transmitting influenza, but the group was divided about whether the information would actually make a difference in their decision-making. Two of the individuals believed that the risk information would not be useful to them unless their personal history of influenza substantiated the claim that they were at higher risk:

“I think I would just take it case-by-case basis. Like, if I got it [the flu] two years in a row and was really sick, I may be more inclined. [...] Even if...I might have something that makes me more susceptible to it [the flu], but until I actually get it and I can see this pattern forming, that I’m going to be like, “Well...” - Participant #5

The other two participants simply did not see the utility of the genetic test due to other factors that influence risk of influenza illness and transmission:

“I think for other people [...] finding out what their genetic susceptibility is to influenza could be a powerful motivator if they don’t know about epigenetics and they sort of have this belief that genes are destiny. ‘Biology is destiny,’ I think is the saying. [...] And now, that’s not the common belief.

It's not the paradigm for the relationship between genetics and expression. I don't think it would impact me that much." - Participant #4

"I think I would be more interested in how do I prevent it, not whether I'm susceptible to it or not. Because again, it's just the flu. Heart attacks? Maybe. Atherosclerosis? Maybe. Those are a little bit more life-threatening and I'd be interested to get that genetic information. But for influenza? Probably not." - Participant #7

Three of the interviewees felt like risk information based on their genetics would not only be interesting but could positively influence their decision to get vaccinated against seasonal influenza in the future. Since this information would be personalized, inherently it would be more meaningful in prompting them to receive their seasonal influenza shot:

"Yes it would. Because now that you're making it more personal. Since you're talking about genetics, it gets more in depth. Not just a regular study with a bunch of people or animals that you can study; it's more of a human make-up, so that would change my decision." - Participant #8

However, this motivator comes with a caveat - specifically that participants who were willing to reconsider their decision were only willing to do so **if** the information told them that they were at **higher** risk of influenza illness or transmission. When participant #6 was asked about his decision to vaccinate in light of a minimal hypothetical genetic susceptibility to influenza, he responded by saying, "Then I probably wouldn't get the flu shot."

Perception of Declination Process at PHSKC

Participants were also asked to discuss what they thought of the current declination process at PHSKC. Overwhelmingly, participants thought that the declination process was simple and user-friendly:

"But I feel like it's really easy, and I don't feel like I've ever been infringed upon or pried into or just questioned." - Participant #5

Although two participants were annoyed with certain aspects of the process, they did understand why those aspects were necessary:

"I just think that sometimes they over-communicate...Like, you only need one reminder because we're all adults. I know that we procrastinate many times, but [...] I don't need 20 emails about getting my flu shot." - Participant #3

“I get it because I work in public health that I need to explain why I didn’t get the vaccine, but I’m actually offended that I actually have to tell them why...that I didn’t get the vaccine. But I also understand I’m in a county public health organization, and they’ve got people who are working with...in direct contact with people and in direct contact with people who could be at high-risk, so I understand that.” - Participant #7

Two interviewees also pointed out potential issues with the current declination process. One acknowledged that the process may be too easy for employees to choose declination. The other demonstrated why the rate of declination may be under-reported at PHSKC:

“...It’s easy to do in terms of the process. There’s really nothing to it. [...] But it’s hard because it’s like I have to fess up to that I’m not walking-the-talk. [...] So you can see how if there was someone who was in a situation where it was highly expected for them to get it [the flu shot] and they had some of the same feelings that I have or maybe others that are even stronger against vaccination in general, that they might just click yes and put a date. [...] So I do wonder about that. What I’m saying is, I wonder if the declination is under-reported.” - Participant #4

Finally, one participant suggested an educational modification to the declination process in order to encourage more employees to receive their seasonal influenza vaccine:

“Like a lot of surveys, they could set-up to provide you with a little education. You know, for example, you might have to read a bullet-pointed list and you get a little knowledge too. [...] But they could make that more educational or they could look at drivers and figure out...They could give me information that would make me more likely to get that vaccine.” - Participant #10

DISCUSSION

Comparison to Healthcare Workers

The reasons for declination of the seasonal influenza vaccine among this sample of public health professionals almost entirely aligned with previously documented reasons for declination among healthcare workers (HCWs) [Hakim, 2011; Thompson, 2013; Martinello, 2003; Lehmann, 2014; Canning, 2005; Thompson, 2012]. Perceived notions of low susceptibility, low severity of disease, lack of efficacy, and lack of personal need constituted most of the reasoning behind declining the vaccine in both groups. However, during open coding, one notable difference emerged – the perception of vaccination as a form of over-medication. This particular reason will be

discussed in greater detail below as a potential target for improving vaccination compliance at PHSKC.

Before exploring vaccination as overmedication, it is worth considering why the reasons for declination are so congruent between HCWs and public health workers. It is perhaps not surprising that there is overlap in reasons for declination between these two populations given the substantial overlap between HCWs and public health professionals regarding their career paths and job experiences. It is relatively common for HCWs to be familiar with; and learn from public health professionals about certain public health strategies. It is equally common for public health professionals to be in regular contact with HCWs for data, education, or administrative purposes. The similarities between their career fields may mean that people in healthcare- and public health-related jobs are already similar to each other in many respects and are therefore more likely to respond in similar ways to questions about vaccination regardless of vaccination status (i.e., unvaccinated public health professionals already are likely to respond in similar ways as unvaccinated HCWs).

Another possible idea is that the commonality between these two groups is completely unrelated to their careers. Based on current evidence, the general public declines both seasonal and pandemic influenza vaccines for similar reasons already described by HCWs and public health professionals [Maurer, 2010; Seale, 2010]. These reasons include: low perceived susceptibility, low perceived severity, and vaccine safety and efficacy concerns [Maurer, 2010; Seale, 2010]. The overlap among these three populations indicates that reasons for declination of the seasonal influenza vaccine share a commonality that is independent of a person's career experience or knowledge. More research comparing reasons for declination between HCWs, public health professionals, and the general public needs to be conducted in order to elucidate that commonality, if one exists.

Although the reasons for declination were similar between this study sample of public health professionals and those previously reported of HCWs, factors for motivating seasonal influenza vaccination were less so. The primary motivators for HCWs were: mandatory vaccination and increased knowledge about the acquisition and transmission of influenza to and from patients [Hakim, 2011; Thompson, 2013]. In this sample of public health workers, these factors constituted only three of the motivating factor categories; the other two were generalized risks and personalized risks of seasonal influenza. Whether this difference in motivation is related to differences in career experience or knowledge is currently unknown. However, these differences offer particular insight into areas that PHSKC could use to potentially increase vaccination rates among their unvaccinated employee population. For this reason, these areas will be explored in more depth - vaccination as over-medication, generalized risks of transmitting seasonal influenza to others, and personalized risks of acquiring seasonal influenza.

Vaccination as Over-Medication

Several participants mentioned that one of their major barriers to vaccination was the perception that the seasonal influenza vaccine is more of a drug that should be avoided in favor of typical healthy behaviors like washing one's hands, covering one's cough, and avoiding work when sick. For most of the professionals in this sample, the decision came down to weighing the risks and benefits of the vaccine. The perception that the seasonal influenza vaccine could reach toxic levels like a pharmaceutical contributed heavily to the risks side of the equation for some participants. But this belief of vaccination as over-medication has roots in other perceptions as well, specifically unhealthy vaccine components (addition of risk) and a lack of vaccine efficacy (subtraction of benefit). Taken together, these perceptions of the vaccine make it all the more unlikely that public health professionals who have this belief will seek the seasonal influenza vaccine in future years.

Therefore, it is necessary to shift these individuals' thought of vaccination as over-medication toward a belief of seasonal influenza vaccination as an effective and healthy tool in preventing influenza-related morbidity and mortality. In their interviews, several of the public health workers dichotomized prevention of influenza into two mutually exclusive areas: vaccination and universal precautions. Yet this is not an accurate portrayal of influenza prevention in any setting; vaccination and universal precautions work hand-in-hand to prevent influenza [CDC Says "Take 3" Actions To Fight The Flu, 2014]. Vaccination and universal precautions should be viewed by public health professionals as tools to be used simultaneously in order to more completely protect themselves and the people with whom they interact from illness. However, shifting this paradigm will not be a simple task. It requires significant education of the unvaccinated population regarding new evidence of what is and is not included in the seasonal influenza vaccine, what any long-term effects may be, whether there is any harm incurred due to multiple injections over time, and what the efficacy of the vaccine truly is. Tackling these concerns may serve as a significant step toward "debunking" the over-medication belief and prompt individuals to reconsider their unvaccinated status.

Vaccination for the Common Good

In general, the participants of this study cared little about receiving a seasonal influenza vaccine to protect strangers but were willing to consider getting vaccinated if it meant protecting someone they knew from illness. In fact, all participants said that a strong incentive to receive the vaccine or reconsider their decision would be having a friend, colleague, or family member who was particularly vulnerable influenza, regardless of whether they currently had a loved one who was vulnerable. This information has significant implications for organizations such as PHSKC that desire to increase their seasonal influenza vaccination rates. Based on these interviews of public health professionals who declined the vaccine, some themes that represent areas to target to

improve compliance include education about one's susceptibility to serious influenza infection and obligations to protecting others – the general public as well as family members. It might be important to highlight the importance of the seasonal influenza vaccine to decrease transmission, as public health workers would be willing to reconsider getting the vaccine if they knew that not getting vaccinated made it more likely for them to transmit the virus to someone they care about. A seasonal influenza vaccine campaign could then be utilized to point out the discrepancy in their logic - a stranger is inherently someone else's colleague or loved one. This strategy could be easily employed and may be particularly effective as it speaks to many people's desire to protect those they care about. Therefore, such a campaign could shift the perceived benefits of vaccination in such a way that they outweigh the risks for some unvaccinated individuals and increase the employee seasonal influenza vaccination rate.

Personalized Vaccination Profiles

As we continue into the era of personalized medicine, more and more research is being directed toward investigating the role of human genetic susceptibilities to infectious diseases [Chapman, 2012; Hill, 2001]. Influenza is one such infectious disease, and although the evidence regarding the human genetic susceptibilities to influenza is currently sparse [Pitzer, 2007; Horby, 2010], it is highly likely that this area of research will continue to grow. The participants of this study were interested in understanding more about their personalized risk for influenza through a hypothetical genetic test but were divided when it came to determining whether results from such a test would be useful to their decision-making. For those who did not believe that the results would influence their decision to receive their seasonal influenza vaccine, they often pointed to other factors that influence their personal risk of acquiring influenza - working in a high-risk environment, a clinical history of influenza, etc. Genetic information was only one component and therefore could not sway their perception of susceptibility or severity in a way that would incline them to reconsider

vaccination. For those who believed that the genetic test results could influence their decision-making, much of their reasoning was centered on their own form of genetic exceptionalism - a belief that their genetic information was a better indicator of personalized risk than any other factor. If the test were to say that they were at a high risk for developing influenza, the benefits of vaccination and protecting themselves from the illness would be worth any risks that they perceive the seasonal influenza vaccine has.

Any genetic test for markers associated with increased risk for acquiring influenza is a long-time off, if developed at all. Yet the perceptions of these public health professionals provide insight into methods that could be used to improve vaccination rates. Personalized susceptibility to infection and personalized severity of disease have been described as major contributors to reasons for declination as well as a motivating factor. In essence, these components are two sides of the same coin. On one side, personalized susceptibility and severity are perceived to be too low, making the employee unlikely to reconsider getting vaccinated against influenza. On the other, susceptibility and severity are perceived to be high enough, indicating that the employee will be more likely to get vaccinated or at least reconsider their decision to remain unvaccinated. The task moving forward then is to determine what kinds of factors influence public health professionals' perception of susceptibility and severity of influenza so that they can be used to improve seasonal influenza vaccination rates at PHSKC.

Limitations

This study has a few limitations. First, the results of these interviews may have been shaped by the primary researcher's personal biases in favor of vaccination. The primary researcher worked to guard against this through self-awareness and also by reviewing every stage of the research process, including data coding and interpretation, with a primary advisor. Second, 10 interviews cannot be taken as representative of the beliefs regarding seasonal influenza vaccination among all

unvaccinated employees at PHSKC. Qualitative research is not designed to determine representativeness, but rather to elicit themes and threads that are worth pursuing in a broader population context. Therefore, the findings presented here can only be considered within the context from which they were gathered (PHSKC).

RECOMMENDATIONS

Many of the reasons for declination of seasonal influenza vaccination among this sample of public health professionals coincided with the reasons espoused by HCWs. Factors that may encourage vaccination somewhat differed between these two populations, but those few differences offered insight into methods that PHSKC could adopt to increase their rates of seasonal influenza vaccination. Specifically, PHSKC could focus their efforts on educating their employees about the vaccine and shift the paradigm away from vaccination as over-medication and more toward vaccination as a preventive measure to be used in tandem with universal precautions. Additionally, pursuing campaigns that put a personal face to the risks of non-vaccination and/or personalizing the risks of non-vaccination and making them relevant to the employee's lived experience could be of particular benefit. PHSKC should also be aware that any interventions that appear coercive may unintentionally cause employees to reassert their anti-vaccination stance more firmly. Overall, the pursuit of any or all of these recommendations hopefully will yield cost-effective interventions that can be utilized by PHSKC to increase their organizational seasonal influenza vaccination rate.

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APPENDICES

Appendix A - Participant Recruitment Email

We are conducting a survey, and your response would be appreciated.

Matt Seymour, a graduate student at the University of Washington, is conducting a research study to learn more about what motivates public health professionals to get vaccinated against influenza. He hopes to conduct interviews (~45 minutes) with workers at Public Health – Seattle & King County (PHSKC) who are currently unvaccinated against influenza as of April 1, 2014. The questions focus on the decision to get vaccinated and whether incentives provided by PHSKC would impact that decision. All responses will be anonymous and confidential.

If you are interested in sharing your views about vaccination, please leave your name and contact information for Matt to contact you. Thank you for your time.

Matt can be reached by phone or by email. His phone number is (817) 360-9526, and his email is mas5790@uw.edu.

Here is a link to the survey:

https://www.surveymonkey.com/s.aspx?sm= 2fL7qbl_2fb81lo7fc5VUHCrw_3d_3d

This link is uniquely tied to this survey and your email address. Please do not forward this message.

Thanks for your participation!

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.

https://www.surveymonkey.com/optout.aspx?sm= 2fL7qbl_2fb81lo7fc5VUHCrw_3d_3d

Appendix B - Original Interview Guide

I am very interested in understanding more about what motivates people to receive influenza vaccines, and what might get in the way. I am a UW student, meaning I am independent of the Department of Public Health. I hope that some of what I learn in this study may be shared with the DPH in a general way that is not identifiable to you that might help them as they think through ways to help improve vaccination rates among their employees. That said, there are no “right answers” here and I am really interested in your honest perception about influenza vaccinations. I would like your permission to audio record this interview, but this recording is just for me to make sure I get the notes right from our conversation. I will erase the tape once I have my notes. Your supervisor will never hear it or see it. We can also pause the tape at any time if there is something you would prefer to not go on the recording. Do you have any questions for me before we start?

Open-Ended Questions:

1. Tell me about your decision not to be vaccinated against influenza this year.
 - a. First probe after initial response: was there anything impacting your decision?
 - b. Have you received the vaccine in prior years?
 - i. (If yes) What was different about this year?
 - ii. (If no) Tell me about your decision not to be vaccinated during those years.
2. I would like to understand more about how you are thinking about influenza vaccination. In general, what are your thoughts about the risks or benefits of this vaccine?
 - a. First probe, depending on their response: (Normalizing beliefs) There are a variety of beliefs that healthcare workers have regarding influenza vaccination. These include beliefs: that the vaccine protects the healthcare worker, their family, and their patients from infection; that getting vaccinated is a professional responsibility; that the vaccine is ineffective; that they're immune system is healthy enough to prevent infection; or that other preventive measures can minimize or eliminate influenza risk.
 - b. (If any) Tell me if and how these beliefs influenced your decision not to be vaccinated this year.
3. Now I would be interested in talking about your intentions to receive or decline influenza vaccination. Is there anything that would make a difference to your thinking about being vaccinated against influenza?
 - a. First probe: Is there anything you can imagine the DPH offering (or perhaps threatening) that would motivate you to get the vaccine?
 - b. How would your intent to get vaccinated change if you received a \$10 gift or cash incentive for getting vaccinated?
 - c. How would your intent to get vaccinated change if you had to sign a statement when declining to get vaccinated?
 - d. How would your intent to get vaccinated change if it were mandatory for you to be vaccinated in order to continue working at PHSKC?

I would like to ask you a few demographic questions just to help me make sure I am talking to a diverse range of people. With your permission, may I record:

1. Your age?
2. Your gender?
3. Your (generic) job/professional title?
 - a. Examples: nurse, administrative assistant, etc.

Thank you very much for your time.

Appendix C - Revised Interview Guide

I am very interested in understanding more about what motivates people to receive influenza vaccines, and what might get in the way. I am a UW student, meaning I am independent of the Department of Public Health. I hope that some of what I learn in this study may be shared with the DPH in a general way that is not identifiable to you that might help them as they think through ways to help improve vaccination rates among their employees. That said, there are no “right answers” here and I am really interested in your honest perception about influenza vaccinations.

I would like your permission to audio record this interview, but this recording is just for me to make sure I get the notes right from our conversation. I will erase the tape once I have my notes. Your supervisor will never hear it or see it. We can also pause the tape at any time if there is something you would prefer to not go on the recording. Do you have any questions for me before we start?

Open-Ended Questions:

1. Tell me about your decision not to be vaccinated against influenza this year.
 - a. First probe after initial response: was there anything impacting your decision?
 - b. Have you received the vaccine in prior years?
 - i. (If yes) What was different about this year?
 - ii. (If no) Tell me about your decision not to be vaccinated during those years.
 - c. Have you received other vaccines in previous years?
 - d. If you have kids, do they receive any vaccines? If so, which?
2. I would like to understand more about how you are thinking about influenza vaccination. In general, what are your thoughts about the risks or benefits of this vaccine?
 - a. First probe, depending on their response: (Normalizing beliefs) There are a variety of beliefs that healthcare workers have regarding influenza vaccination. These include beliefs: that the vaccine protects the healthcare worker, their family, and their patients from infection; that getting vaccinated is a professional responsibility; that the vaccine is ineffective; that they're immune system is healthy enough to prevent infection; or that other preventive measures can minimize or eliminate influenza risk.
 - b. (If any) Tell me if and how these beliefs influenced your decision not to be vaccinated this year.
 - c. How does risk of transmitting influenza illness among others influence your decision, if at all?
3. Now I would be interested in talking about your intentions to receive or decline influenza vaccination. Is there anything that would make a difference to your thinking about being vaccinated against influenza?
 - a. First probe: Is there anything you can imagine the DPH offering (or perhaps threatening) that would motivate you to get the vaccine?
 - b. How would your intent to get vaccinated change if you received a \$10 gift or cash incentive for getting vaccinated?
 - c. How would your intent to get vaccinated change if you had to sign a statement when declining to get vaccinated?
 - d. How would your intent to get vaccinated change if it were mandatory for you to be vaccinated in order to continue working at PHSKC?
 - e. If you were provided with information about your genetic susceptibility to influenza illness, would it influence your thinking or decision about influenza vaccination?

I would like to ask you a few demographic questions just to help me make sure I am talking to a diverse range of people. With your permission, may I record:

1. Your age?
2. Your gender?
3. Your (generic) job/professional title?
 - a. Examples: nurse, administrative assistant, etc.

Thank you very much for your time.

Appendix D - Analysis Codebook

Unique identifier	Title	Description
P. SUSC.	Perceived susceptibility	when an interviewee describes their susceptibility to influenza infection/illness
INC. SUSC.	Increased susceptibility	perception of increased likelihood of developing influenza infection/illness of self
(FROM)	from others	perception of increased likelihood of developing influenza infection/illness from others
(TO)	to others	perception of increased likelihood of causing influenza infection/illness in others
DEC. SUSC.	Decreased susceptibility	perception of decreased likelihood of developing influenza infection/illness of self
(FROM)	from others	perception of decreased likelihood of developing influenza infection/illness from others
(TO)	to others	perception of decreased likelihood of causing influenza infection/illness in others
P. SEV.	Perceived severity	when an interviewee describes their severity of illness upon influenza infection
SIG. ILL.	Significant illness	perception of significant symptoms and illness upon influenza infection
INSIG. ILL.	Insignificant illness	perception of insignificant symptoms and illness upon influenza infection
P. BEN.	Perceived benefits	when an interviewee describes any perceived benefits of seasonal influenza vaccination
B. HEALTH	Health	perception of benefits of the influenza vaccine to health of self
Others	to others	perception of health benefits of flu vaccine to the health of others
B. FINANCE	Financially	perception of monetary/financial benefits of the influenza vaccine (i.e., not missing work)
LACK OF BEN.	Lack of perceived benefits	when an interviewee describes perceptions related to a lack of benefits from seasonal influenza vaccination
P. HARMS	Perceived harms	when an interviewee describes any perceived harms of seasonal influenza vaccination
P. BARR.	Perceived barriers	when an interviewee describes any barriers to influenza vaccination
COSTS	Financial costs	perception of financial barriers to influenza vaccination
AVAIL.	Availability	perception of barriers related to the availability of the influenza vaccine
OVER-MED.	Over-Medication	perception of vaccination as a form of over-medication
P. THREAT	Perceived threat	when an interviewee discusses dangers of influenza infection and illness (combo of perceived severity and perceived susceptibility)
INC. THREAT	Increased threat	perception of increased threat to influenza infection and/or illness to self
(FROM)	from others	perception of increased threat of developing influenza infection/illness from others
(TO)	to others	perception of increased threat of causing influenza infection/illness in others
DEC. THREAT	Decreased threat	perception of decreased threat to influenza infection and/or illness to self
(FROM)	from others	perception of decreased threat of developing influenza infection/illness from others
(TO)	to others	perception of decreased threat of causing influenza infection/illness in others
NEG. THREAT	Negligible threat	perception of influenza infection and/or illness as a negligible threat to self
(FROM)	from others	perception of negligible threat of developing influenza infection/illness from others
(TO)	to others	perception of negligible threat of causing influenza infection/illness in others
UNDER. ILL.	Underlying illness	perception that an underlying illness and/or allergies affect the threat of influenza illness or need for influenza vaccination
ILL. INC. THREAT	Increased threat/need	perception that the underlying illness and/or allergies increase the threat of influenza illness or need for influenza vaccination
ILL. DEC. THREAT	Decreased threat/need	perception that the underlying illness and/or allergies decrease the threat of influenza illness or need for influenza vaccination
CUES	Cues to action	when an interviewee describes resources used to remind them to get vaccinated
SELF-EFF.	Self-efficacy	when an interviewee describes their ability to vaccinated against influenza
RATIONALE	Rationale for declination	when an interviewee describes their reason for declining the flu vaccine
EX. FACT.	External factors	external factors (e.g., cost, availability) are identified as the reason(s) for not being vaccinated
BEL. VACC.	Beliefs about vaccines	beliefs about vaccinations that may have influenced the interviewee to decline (knowledge that is shared may or may not be true)
R. HEALTH	Health issues	health issues that don't indicate the interviewee to get vaccinated
HEALTH BEL.	Health beliefs	beliefs that other healthy behaviors should be prioritized before vaccination
HEALTH HIS.	Health history	prior experiences with the flu or other illnesses that are reasons for not getting vaccinated
PERS. FACT.	Persuading factor(s)	self-identified factor(s) that may persuade the interviewee to receive the flu vaccine in the future
(POS)	Positive factors	the interviewee feels positively about a particular factor that should motivate a person toward vaccination
(NEG)	Negative factors	the interviewee feels negatively about a particular factor that should motivate a person toward vaccination
(NONE)	No factors	the interviewee feels that there, should be no/are no/are ineffective, factors that motivate them to get vaccinated
VACC. HIS.	Vaccine history	when an interviewee describes their vaccine history (with the flu or any other vaccine)

Appendix E - Case Tables

	Case #1	Case #2	Case #3	Case #4
PERCEIVED SUSCEPTIBILITY	Little susceptibility despite asthma. Desire to protect others though. Little history of flu and not in risky environment.	No history of the flu. Vacc. recommended b/c of asthma. Feels at higher risk b/c of starting in new job at PHSKC.	No history of the flu and perception of good immune system. Little exposure to sick clients. Take other precautions.	No history of flu. Never got sick even during a year that hir* close contacts did. Per. susc. to side effects of shot.
PERCEIVED SEVERITY	Views flu as a serious disease for others. Not H1N1.	Aware of flu's morbidity and mortality, but not worried compared to other diseases (measles).	Perception that flu doesn't kill many people anymore.	Flu is serious disease for vulnerable pops, not all. Pandemic influenzas are more serious.
PERCEIVED BENEFITS	Only benefit is for others, such as her mother.	Believes it can work to reduce number of cases of flu and the severity of cases.	Flu vaccine can prevent the flu.	Can be used to protect others, such as hir elderly mother, by not transmitting the flu.
LACK OF BENEFITS	History of no flu, where she works, dangers of the shot, and ineffectiveness mean no need for the shot.	Not a very effective vaccine. Where are data on the shot's impact on pop. health?	Not effective for his age range, just chronically ill.	Vaccine not very effective in guaranteeing protection from the flu.
PERCEIVED HARMS	Danger to people with egg and other allergies.	Worried about other things in the vacc. Worried about long-term effect of vacc. on immune system – inflammation. Related to uptick in cases of allergies?	Possible improper injection technique. Improper antisepsis. Possibly getting the flu from the vaccine.	Prior experience of always feeling ill (perceived side effects) after getting the shot (even with FluMist – tho milder case of it). Perception of vaccine virus as unnatural.
PERCEIVED BARRIERS	Vacc as over-med. Don't want to put more in than needed. Question the motives of drug companies	Vacc. as over-med and lack holistic view of health. Believes in own immune system for protection/getting sick for protection.	N/A	Fear of side effects of the vaccine. Attenuated virus is unnatural.

	Case #1 (cont.)	Case #2 (cont.)	Case #3 (cont.)	Case #4 (cont.)
PERCEIVED THREAT	Told that she's at risk due to asthma. Recently got sick with the flu, may get it again. Feels like she could be a threat to others. But not a threat in her job.	Flu is serious; may be at high risk in new job at PHSKC; at high risk due to asthma & allergies. But confident in immune system for prevention if needed. No history of flu.	Flu isn't serious/doesn't kill many people anymore. No history of flu; good immune system; and takes precautions if he comes in contact with an ill person.	Never got sick from the flu even when other people did. Less threat from flu than from side effects of vacc.
CUES	Doesn't like the push from doctors/nurses, signs, and PHSKC to get people to get vaccinated.	Okay with PR around the clinic. And people asking if she had gotten it yet.	Likes the at-work clinic at PHSKC. Doesn't need constant reminder from PHSKC. Enjoys ease of declination; worried it may be too easy.	Ease of declination at PHSKC. Wonders if the pressure at PHSKC results in a shame factor that may cause declination to be under-reported.
SELF-EFFICACY	N/A	N/A	N/A	N/A
RATIONALE	Societal pressure isn't appreciated. Vaccines are essentially more drugs. Can get sick with the flu even after vaccination. Ineffective shot. Little medication as possible. Use of alternative meds. Other healthy behaviors more important. Feels healthy.	Naturopath doesn't recommend this vacc. Less enthusiasm for vacc. after focusing on holistic health. Possible allergy to something in flu shot; avoid the shot to see if allergy decreases. Worries about long-term effects and stuff in the vacc. Diet & hygiene to prevent disease and spread of flu.	Feels like he doesn't need it yet. After immigration to US, he had 4 shots, didn't want one more (flu) and never got sick, so continues to not get it. Should go to vulnerable pops. Should probably get it in clinical setting – but he's not in that setting. Out in public? Probably should get it but can rely on general precautions. Feels healthy.	Hard time declining b/c of culture in hir division at PHSKC but believes in personal choice. Not worth the side effects. No history of the flu. Doesn't like needles. Clinicians should get it due to their environment, but that's not hir. Worried about unnatural things in the vaccine.
PERSUADING FACTORS	Would need to work in a high risk environment. At high risk of transmitting. Would read information.	Having to wear a mask. Evidence of no long-term effects on immune system. Feeling guilty for	When it's recommended due to declining health. Incentives won't work (personal decision). Not	Would if ze would be fired. Would if ze knew ze was transmitting it to vulnerable pops. Would if

	History of flu. Make it mandatory (feel bad). Overall, feels like that they should leave the people alone to make the decision	spreading the flu (evidence that you can spread it asymptotically). Motivational phone calls. Mandate (not happy about it tho)	ready to change his beliefs on vacc. Mandatory? Would get the shot but knows PHSKC can't make it mandatory.	ze got a sick day to manage side effects. Would if genetic marker said ze was at high risk for mortality due to a specific strain. Hard to incentivize having side effects. Genetic info not too important since biology isn't destiny.
VACCINATION HISTORY	Feels more important to get vaccine against pneumonia.	Got since age 8. Stopped to see if allergic to something in vaccine and due to decrease in faith in flu shot.	No vaccination against the flu ever – either in El Salvador or U.S.	Vaccinated against the flu multiple times up until 2012. (Both shot and mist.) Always followed by side effects.
DEMOGRAPHICS	59; Female; Education Specialist/Nutrition Educator	30; Female; Public Health Nurse	43; Male; Program Manager, MD (in El Salvador), med. ass't., & med. interp.	54; Genderqueer/gender-nonconforming; Administrative Ass't

	Case #5	Case #6	Case #7	Case #8
PERCEIVED SUSCEPTIBILITY	Feels very healthy. One child only got vacc. b/c he was hospitalized for another infection. Stopped vacc. kids once she felt they were healthy. Can fight flu if infected.	Young enough, healthy enough to not get sick. Can fight flu if infected. Takes care of self; not in a vulnerable pop. that needs the vaccine.	Pretty healthy immune system. Can fight the flu and/or be treated for it and be fine. Rarely sick and no history of the flu.	Is a healthy person. Would rather get sick to get immune system working. Family is healthy - why they don't get vacc. Got sick for 2 mos. after getting vacc. years ago.
PERCEIVED SEVERITY	Flu isn't serious; not scared of it. People who die of the flu already have underlying illness.	Influenza isn't that important in comparison to other risks for him. Flu doesn't kill many people unless in high risk group.	Flu only lasts 2-3 days; resolves itself. Some flu epidemics kill millions. Not as serious as things like Hep B.	N/A

PERCEIVED BENEFITS	Benefit of protection only if you're in a vulnerable pop. like her parents.	Potential benefit to his clients.	Vaccine prevents discomfort of illness. Benefit of non-vacc.: population control through infection.	Vacc. can protect people, esp. in vulnerable groups. When other people get vacc., they protect her as well.
LACK OF BENEFITS	No extra benefit b/c her family is already healthy.	No benefits of vaccine for him as healthy adult.	N/A	Ineffective vaccine – not 100% .
PERCEIVED HARMS	No risks involved; more a problem of lack of benefit.	Minimal risk – the pinch of the needle.	Harms of non-vacc.: viruses that cause death and destruction.	Could be dangerous to people w/egg allergies or those w/underlying illness
PERCEIVED BARRIERS	N/A	N/A	Limited case for vacc. to prevent getting sick if seen from a holistic medicine standpoint. Getting sick with the flu could be good – message saying to “slow down” and take of the body more holistically.	Doesn't want to get sick again based on personal experience. Feels uncomfortable w/the relatively short period flu vaccine has been on the market. Has heard negative things about the vacc.
	Case #5 (cont.)	Case #6 (cont.)	Case #7 (cont.)	Case #8 (cont.)
PERCEIVED THREAT	Flu doesn't kill healthy people. Her and her family are healthy. Only get it if already sick (and everyone else in family to prevent transmission). Has faith in own immune system.	The threat of flu is minimal, especially in comparison to other health risks for him (substantial family history of cancer).	Not in high risk pop., not concerned about getting sick. Knows people can die of flu but only if immunocompromised.	Doesn't get sick, so no need for the vacc. Same for family members – also healthy.
CUES	Ease of declination process at PHSKC. Hasn't felt infringed upon or pried into.	No problem with opt-out process at PHSKC. Would be bothered if the vacc. was required	Offended that she has to explain why she declines. But understands why that's the case.	Likes the in-house vacc. clinic at PHSKC. Fine with declination process; likes its confidentiality.
SELF-EFFICACY	N/A	N/A	N/A	N/A

RATIONALE	Vacc. are for “really bad” diseases, not flu. Infection good for building up own immunity. Only needed if vulnerable – currently healthy. Belief in universal precautions as primary protection. “Germs are good for you at some point.”	Doesn’t get vacc. partly in retribution for peer pressure to get vacc. Personal choice. Feels healthy. Preference for “natural immunities” despite belief of no difference between “natural” & “artificial” antibodies. Potential side effects & ineffective vaccine. Can prevent flu with diet, exercise, masks, and other precautions.	Not at high risk/in high risk environment/risk of spreading it. Doesn’t like needles. Precautions to prevent spread and infection (wash hands, stay home, etc.). Not concerned about severity of flu. Ineffective vaccine. Can take care of self for prevention (diet, exercise, sleep).	Worried about negative effects; possible illness after vacc. (tho aware it might not have been the vacc. that caused it). Ineffective vacc. Belief that “natural” immunity is better than vacc. Worried about long-term effects (not on market long time). Use universal precautions for protection.
PERSUADING FACTORS	Would if her or her family were in a vulnerable pop. Would to keep job (concerned about why PHSKC would mandate it tho). Would if there were a trend of healthy people dying of flu. No incentives will work (PHSKC has no funding for it). Would get it if she had personal history of flu. Genetic info not useful unless personal history substantiates it.	Would consider if in vulnerable pop. Would if knew he would take flu home to his daughter (hasn’t happened yet tho). Would consider if genetic info said he was at higher risk. BUT he wouldn’t if genetic info said he was at lower risk. No incentives would work – already healthy. Wouldn’t just to prevent transmission to others.	Would if she was in a vulnerable pop. Maybe if around vulnerable people (depends on quality of life ahead). Would if working with vulnerable pop. & were in frequent contact with them. Would if personal history of getting the flu. Would if saw evidence about likelihood of infection/illness after exposure. Would if saw evidence that unvaccinated are causing others to get sick w/flu. Would if saw evidence of protection against multiple strains or high likelihood of death due to	Would if she was in a vulnerable pop. Would if the vaccine has been on the market for a long time (no defined time period). Genetic info would make a difference because it makes the risk of infection and transmission more personal. However, only would get vaccinated if the results showed that the vacc. would be beneficial for her. Evidence about the effectiveness of the vacc. or why it’s marketed to the public won’t make a difference. No incentives will influence her

			a specific strain. Would if mandatory to save job (not happy about it). Genetic info not useful – not worried about flu. No incentives will change her mind about what goes in her body.	decision. Mandate of vacc. would make her seek out her legal rights w/in PHSKC but did not say if it would make her likely to get vacc.
VACCINATION HISTORY	Last vacc. against H1N1 (2009) and believes she still got sick with H1N1. Her and her kids are all up-to-date with vacc. for “bad diseases” like tetanus.	No prior vacc. of himself of kids against flu. He and his kids all received their childhood vaccinations.	No prior vacc. against flu. Up-to-date w/childhood vacc. and adult boosters. Children aren’t vaccinated against the flu.	Hasn’t received the flu shot in several years (17-18) after she got sick days later. Kids are up-to-date on vacc. but none have gotten a flu shot.
DEMOGRAPHICS	44; Female; Administrative Specialist	40; Male; Outreach Worker	44; Female; Instructional Designer	37; Female; Education Specialist

	Case #9	Case #10
PERCEIVED SUSCEPTIBILITY	No history of flu. Would get kids vacc. due to belief that they are more susc. Doesn’t get sick; healthy 30 year old. Family rarely sick.	No history of flu. Not at high risk of getting sick; feels he has a good immune system. Only feels like he interacts with healthy adults.
PERCEIVED SEVERITY	Flu is a serious disease that leaves you “down and out.”	Flu is a debilitating disease, but it’s not as serious as things like measles, mumps, or hepatitis.
PERCEIVED BENEFITS	Getting the shot will, hopefully prevent a person from getting sick from the flu strains included in the vaccine.	N/A
LACK OF BENEFITS	Doesn’t think there would be an effect of getting vaccinated for her.	Doesn’t see the benefit for himself; comparing risks vs. benefits, the benefits haven’t outweighed the risks.
PERCEIVED HARMS	Possibility of still getting sick after vacc. Then spreading the illness to others. Worried	N/A

	about other things in the vaccine, like formaldehyde. Working around kids and not getting vaccinated might be a harm.	
PERCEIVED BARRIERS	Harmful chemicals in the vaccine that are not beneficial to a person's health.	Problem of convenience factors. Won't get vaccinated also b/c he's always busy at work. Doesn't jump at a new drug or injection to improve people's health.
PERCEIVED THREAT	Flu is serious but minimal threat because of already healthy status.	Flu is a serious disease but little threat due to health and no history of disease. Healthy immune system.
CUES	Has nurse comes to clinics to vaccinate employees. Fine with declination process; doesn't feel scolded when marks "No" on form and send it in.	Does think the reminder email from PHSKC. Okay with the declination process but feels that it could be more educational to increase vaccination rates.
SELF-EFFICACY	N/A	N/A
RATIONALE	Ineffective vaccine that doesn't completely prevent infection – can still get sick, multiple times too. Fear of unwanted things in vacc. – formaldehyde, etc. Cares about what's in the vaccine. Not in a vulnerable pop. No history of the flu.	Lack of convenience. Got sick once after getting the vaccine; doesn't feel like it's worth the risk (knows he's acting on an anecdote and that the vaccine may not be the cause). Still feels healthy/good immune system and doesn't have much contact with vulnerable pops. Not in a risky environment. The argument for vacc. isn't compelling enough – the benefits don't outweigh the risk. Take other measures to stay healthy – lifestyle factors.
PERSUADING FACTORS	Would if she becomes a part of a vulnerable pop. (such as pregnancy). Would in order to prevent guilt of affecting health of fetus. Would if she or her family had a personal history of getting flu. Would if she had evidence about ingredients of the vaccine, which strains are included, & what possible effects/risks are. Rumor that PHSKC shames	Would if he knew was transmitting flu to friends or colleagues. Open to knowledge from trusted sources about flu. Mandate? Would get vaccinated; doesn't mind as long as PHSKC can justify it. Genetic info would be a useful component in his decision and evaluate it to possible get vacc. (If at low genetic risk, he wouldn't get vacc. but might

	<p>employees if they get sick (possibly with the flu) but weren't vacc. (feels coerced but can understand why PHSKC would do it). Mandate? Feels uncomfortable about getting something she is unsure about. Genetic info means less unless personal experience with the flu substantiates the info.</p>	<p>use it broadly to find target pops.) Would if he had history of flu. Would if: feels at greater risk (deadly strain/declining immune system) or comes in contact w/more susc. people. Would if the benefits of vacc. were greater. Might get it as he joins vulnerable pop. (older). Might get it with incentives (but might feel coerced). Less reinforcing if public health wastes money on a particularly ineffective vaccine that year.</p>
VACCINATION HISTORY	<p>Hasn't been vaccinated against the flu since leaving school and joining WIC. Up-to-date with all childhood vaccines, probably vaccinated against flu as a kid too.</p>	<p>Have not gotten vaccinated in several years despite reminders. Daughter was up-to-date on all childhood vaccines. Family willing to get other vacc. when traveling overseas.</p>
DEMOGRAPHICS	<p>31; Female; Registered Dietician</p>	<p>62; Male; Health Investigator</p>