Workplace-Based Vaccination Promotion: An Examination of Employers' Views and Practices and an Evaluation of a Pilot Intervention

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Abstract

Use of Vaccination Promotion Practices in the Workplace: Employers' Views and Practices and a Pilot Study in Restaurants

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Influenza is common among adults and has consequences for productivity and healthcare costs. Pertussis rates in adults are on the rise and adults with pertussis can miss work and may expose high-risk populations to infection. Influenza and Tdap (tetanus-diphtheria-pertussis) vaccination rates are low among working-age adults, but workplace-based vaccination programs can help to address this problem. Specifically, employers can use evidence-based practices to increase vaccination rates among their employees. In Chapter 2, I describe a qualitative analysis of large employers' views on workplace-based vaccination programs. Large employers offered influenza vaccinations as a benefit to employees and to keep them healthy, but were not aware of the potential benefits of promoting Tdap vaccination to their workers. Overall, they had not considered how to

maximize vaccination rates among their employee population. In Chapter 3, I describe a quantitative analysis of large employers' practices related to workplace vaccination programs. I estimate the prevalence of employers' use of evidence-based practices to increase vaccination rates among their employees. I show that while some promotion practices are well-used by employers, there is room for improvement in others. Employers could maximize the impact of their vaccination programs by increasing the use of some practices, particularly those related to increasing physical access to vaccination. In Chapter 4, I shift the focus to the use of evidence-based practices in a particular small to mid-sized workplace setting, restaurants. I describe a pilot study to evaluate a workplace-based intervention to increase vaccination rates among restaurant employees. The intervention increased influenza vaccination rates among restaurant employees, although the size of the increase differed among restaurants. Restaurants can successfully implement workplace-based influenza vaccination programs, although increasing physical and financial access does not guarantee an improvement in vaccination rates. I conclude that while employers are generally open to offering vaccinations at the worksite, they could do more to increase the impact of their vaccination programs. The full potential benefits of vaccination, both for their businesses and for the population, will only be realized if they commit to maximizing physical and financial access for employees. The investment required is modest and higher employee influenza vaccination rates are within reach for employers.

TABLE OF CONTENTS

Chapter 1: Introduction

BACKGROUND AND SIGNIFICANCE

Vaccination is an effective, simple, and cost-effective method of improving public health. In working-age adults, recommended vaccinations can reduce the impact of particular infectious diseases on mortality and morbidity, which in turn can decrease healthcare costs and productivity losses. Influenza vaccination and Tdap (tetanus-diphtheria-pertussis) vaccination are recommended for all adults [1-3]. Annual influenza incidence ranges from 2% to 10% in adults between 18 and 64 years of age [1]. Influenza vaccination can help to reduce health and productivity impacts of influenza for working-age adults [4]. In addition to protecting working-age adults from these infections, increasing vaccination rates in working-age adults can help to protect those who are most vulnerable to the effects of infection, such as infants and the elderly.

Influenza and Tdap vaccination require only modest resource investment relative to the benefits, making them a cost-effective approach. Vaccination is not time consuming. With annual influenza vaccination, individuals are protected from the influenza strains anticipated to be the most common in that year [1]. A Tdap vaccination is required only once for adults for protection from pertussis [2,5]. Influenza vaccination is relatively inexpensive, costing about $30. Tdap is more costly, ranging from about $60 to $100, but does not have to be repeated. The cost of vaccination is almost always covered by health insurance plans.

Despite the potential benefits of influenza and Tdap vaccination in working-age adults, vaccination levels are low. For influenza vaccination, only 29% of adults between 18 and 49 years of age and 43% of those 49-64 received the vaccination in 2011-2012 [6]. Tdap vaccination levels are even lower, rates for working age adults ranging between 3 and 6 per 100,000, depending on age 100,000 [7].

One approach to increasing vaccination rates is through workplace-based programs. Workplaces are an established site for influenza among working-age adults, second behind doctor's office as the most common site for vaccination [8]. Workplace-based programs also have the potential for extensive reach because of the high proportion of the population that is employed. They can help to address disparities in vaccination rates because they provide a way to target a range of population subgroups, especially those that may not seek regular medical care. Finally, employers have an interest in developing and maintaining workplace vaccination programs because of the chance to increase vaccination rates and decrease rates of illness, missed work, and doctor visits among their employees. For employers, influenza vaccination programs are cost-effective and often cost-saving [9-11].

Employers can use workplace-based practices to increase vaccination rates among their employees [12-20]. Evidence-based practices to increase vaccination rates among employees generally fall under one of five domains: physical access, financial access, communication, norms, and mandates [13-20]. Improving physical access means making vaccination more convenient for employees, including making vaccination available in

the workplace and making it available at days and times that make it easy for all employees to get vaccinated. Financial access practices include making vaccination free or reduced cost and offering incentives for vaccination. Communication practices include using various communication methods such as posters and e-mails as well as messaging to target influenza knowledge and attitudes. Norms practices consist of improving employees' perceptions of their employers' support for vaccination and their coworkers likelihood of vaccination. Mandates are policies that require vaccination among employees.

Despite the evidence for the effectiveness of workplace-based promotion practices to increase employee vaccination rates, employers' views of these practices and their level of use of the practices are not known. Given the low vaccination rates in the population and the potential impact of employers' use of evidence-based practices, it is important to know whether there may be potential to raise population rates by increasing employers' use of these practices. However, employers' views on workplace vaccination practices are not well-understood and their current levels of using vaccination promotion practices are unknown.

While large employers have the potential to make a major contribution to increasing vaccination rates, small and mid-sized employers, those with fewer than 500 employees, also have the potential to have an impact. Small and mid-sized companies employ approximately 52% of Americans [21]. Use of evidence-based practices among employers of this size could extend the reach of workplace promotion practices by

increasing the proportion of the population that can be targeted. It could also help to address disparities in that a broader range of types of workers could be reached.

Restaurants, often small to mid-sized, have the potential to have a major impact on vaccination rates. Restaurant workers are an important population but are difficult to reach. About 10% of the American workforce is made up of restaurant employees [22]. Similarly to healthcare workers, they are exposed to the public as part of their work. Restaurant workers often lose wages if they are ill and must miss work because paid sick leave is not common in the industry. Rates of health insurance are low; many restaurant employees would face medical bills if they had to seek medical treatment due to an influenza infection. Absenteeism is problematic for restaurant owners, who may not be able to replace employees who are out sick and who may lose business as a result. However, implementing evidence-based practices in restaurants may present unique challenges. The ability of evidence-based practices to succeed in the restaurant setting and the challenges associated with implementation in that setting are not known.

AIMS OF THE DISSERTATION

In Chapter 2, I explore employers' views on workplace vaccination programs. My objectives are to understand why employers offer the vaccinations that they provide and to learn about how they conduct workplace vaccination programs. I describe which adult vaccinations employers currently offer their employees, why they offer them, and how they go about providing them to employees. Understanding employers' views on

workplace vaccination programs is important because it lays a foundation for quantitative research into the levels of use of practices and provides insight into factors that may facilitate helping employers develop effective workplace vaccination programs.

In Chapter 3, I determine the proportion of employers currently using different evidence-based practices to increase influenza vaccination rates. I estimate the prevalence of employers' use of workplace-based vaccination promotion practices. Knowledge of the current level of use will help to determine whether employers could benefit from efforts to disseminate evidence-based promotion practices to increase vaccination rates among their employees. It will also help to identify particular evidence-based practices and subgroups of employers with low levels of using the practices.

In Chapter 4, I narrow the focus to a single vaccination and shift from large employers to a particular type of small to mid-sized employer: restaurants. We conducted a pilot study of an intervention to increase vaccination rates among restaurant workers using selected evidence-based workplace promotion practices. First, we aimed to evaluate the implementation of the intervention. Second, we determined the effect of the intervention on vaccination rates among restaurant workers. Finally, we assessed the quantity of resources that restaurants invested to implement the evidence-based practices. This study provides an opportunity to examine the use of evidence-based practices in a setting where there may be unique challenges to implementation but also particular benefits.

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Chapter 2: Influenza and Tetanus-Diphtheria-Pertussis Vaccination in the Workplace: A Qualitative Analysis of Employers' Views

INTRODUCTION

Despite the Centers for Disease Control and Prevention's (CDC) recommendation of influenza vaccination for all individuals over 6-months of age, adult (>=18 years of age) influenza vaccination rates were only 38.8% in 2011-2012 [1]. Likewise, while the CDC recommends tetanus, diphtheria, and pertussis (Tdap) vaccination for all adults, only 8.2% of adults between 19 and 64 years of age had ever received it in 2010 [2-5]. The result is a missed opportunity to prevent disease in the population, with important consequences.

Influenza results in substantial morbidity and mortality. It results in an average of about 226,000 hospitalizations each year [6]. From about 3,000 to 49,000 deaths annually are caused by influenza, depending on the severity of the influenza season [7].
Among working age adults, influenza has consequences for health care costs and productivity, and influenza vaccination can help to reduce the impact. While influenza-related mortality in working age adults is low relative to that in older adults [8], working age adults may experience illness resulting in lost workdays and physician visits [9]. Annual influenza-related health care costs for adults 18 to 64 years of age were estimated at $4.6 billion, based on the 2003 population [10]. An estimated 16.8 million days of productivity are lost annually in those 18 to 64 years of age [10]. Vaccinations that are well matched with the dominant influenza strains in a given year help to reduce influenza-related missed workdays and physician visits [11]. A review of randomized

trials of influenza vaccination in healthy adults found a savings of between .04 and .74 workdays per adult vaccinated when vaccinations were well matched [11-15]. Seasonal influenza vaccines provide protection from the three influenza viruses anticipated to be most common in a given season. During the 2009 H1N1 pandemic, a supplemental 2009 H1N1 monovalent vaccine was manufactured and administered. After the pandemic, the 2009 H1N1 vaccine strain was considered endemic among human populations and included as a component of the seasonal influenza vaccines. Pertussis (whooping cough) incidence is on the rise. Incidence In the population reached 8.97 cases per 100,000 in 2010, exceeding earlier peaks in 2004 and 2005 [16]. Pertussis rates vary by age group; in 2010, rates for working age adults were between 3.10 (40-64 years of age) and 5.97 (15-24 years of age) per 100,000 [16]. Without vaccination of adults and adolescents, pertussis rates in adults were predicted to double in twenty years, by 2029 [17].

Pertussis in working age adults has health and cost consequences. Pertussis rarely causes death in adults but may lead to complications requiring hospitalization [4]. Healthcare costs associated with pertussis are estimated at $326 per adult with pertussis-related illness [18]. The cost of missed work is responsible for the majority of the estimated $447 per case in non-medical costs [18]. Between 65% and 78% of adults with pertussis miss work [4], missing 9.8 days on average [18]. While pertussis rates among adults are relatively low, productivity impacts for individuals with pertussis can be large and workplace outbreaks could have substantial costs for employers. Another major concern

of rising adult pertussis rates is the increased risk of exposure for the infant population, in which the disease is more frequently fatal.

One approach to addressing the problem of low adult vaccination rates is to increase workplace-based vaccination [19]. Workplaces are an established vaccination site for working age adults. Among adults 18-64 years of age receiving the influenza vaccination, workplaces are second to doctors' offices as the most common site for vaccination [20]. Workplace programs that offer and promote vaccination have extensive reach to a broad range of socioeconomic and racial/ethnic groups. Additionally, employers have an incentive to minimize absenteeism and if they pay a portion of medical expenses, to reduce physician visits. Both decreased absenteeism and reduced physician visits are benefits of increased vaccination rates. However, despite the potential for workplace vaccination programs to increase influenza vaccination rates, rates remain low; only 22.4% of low-income workers were vaccinated in 2008 [21].

Free worksite influenza vaccination interventions that include active promotion are known to increase vaccination rates among workers [19]. These interventions are intended to reduce physical and financial access barriers to vaccination. Interventions include announcing vaccine availability using various communication methods and may also include strategies to provide information and address attitudes [19]. However, the extent of employers' implementation of these practices is not known. To begin an investigation into employers' use of worksite vaccination promotion practices, we aimed to learn more about perspectives on workplace vaccination and how to improve it.

We conducted two sets of qualitative interviews, one set with community vaccinators and one set with employers. The results of the community vaccinator interviews, in which we analyzed interviews with community-based providers of vaccination services, have been published previously [22]. Most community vaccinators already offered vaccinations other than the influenza vaccination, such as the Tdap vaccination. The community vaccinators identified barriers to increasing the number of employees taking advantage of workplace vaccination, including the employees' reluctance, costs associated with vaccination that were not covered by employers, and employers' lack of vaccination promotion efforts [22].

Here, we present the results of the employer interviews. We interviewed key informants representing large employers (>500 employees) headquartered in the United States and conducted a qualitative analysis of the interview data.

METHODS

We obtained a random sample of 60 employer contacts from a survey research company (Survey Sampling International, Encino, CA). We anticipated that 60 interviews would be the maximum number required to reach data saturation, defined as the point when additional interviews yielded only repetition of information already obtained in previous interviews. Saturation was reached when 25 interviews were complete, yielding our final sample. This sample size was adequate to capture most of the diversity of employers' views but was not intended to generate prevalence estimates of views or practices. We used quota sampling to ensure that the final sample was comparable to the random

sample with respect to region, industry and size. Ten employers we contacted were ineligible and three refused. The remaining 22 employers were not interviewed because saturation had been reached and region, industry, and size quotas had been satisfied. Key informants were human resources directors or staff, occupational health nurses, or other employees that handled vaccinations or benefits administration.

We developed an interview guide comprised of short-answer and open-ended questions about seasonal influenza, 2009 H1N1, and Tdap vaccination practices. Topics included the vaccinations offered, the reasons for offering them, and the process of providing them (cost, employee eligibility, challenges and planned changes). We focused on influenza and Tdap vaccinations because they are recommended for all adults, making workplace-based promotion more feasible than it would be for vaccinations recommended for only select adult populations. Seasonal influenza and 2009 H1N1 vaccinations were addressed separately because the interviews referenced practices in the 2009-2010 vaccination season when both of these vaccines were used. Development of the interview guide was informed by previous findings and recommendations from the Community Guide [19,22]. The interviews were completed during the fall of 2010 and early winter of 2011. Interview duration was approximately 10-15 minutes. A research scientist with past interview experience and without prior relationships with the informants, PL, conducted the interviews. The interviews were recorded with respondents' permission and were professionally transcribed (Proof Positive Transcriptions, Plano, TX). The interviewer took notes when permission to record the interview was not granted, which occurred nine times.

Atlas.ti software was used for coding (Atlas.ti Software Development, Berlin, Germany). We used a content analysis approach. Two team members coded the data. Inter-coder reliability was assessed qualitatively through discussion and review. The coders jointly coded interviews initially until a high degree of reliability was established. The University of Washington Institutional Review Board granted the study exempt status. We used the COREQ guidelines to report our findings [23].

RESULTS

Seasonal Influenza Vaccination

We identified four themes related to seasonal influenza vaccination (Table 1). First, employers offered influenza vaccination either to keep employees healthy or to provide employees with a benefit. It was common for employers to provide multiple reasons for offering the vaccination, but the majority of reasons fit into one of these categories. Employers often stated directly that they offered influenza vaccination to keep employees healthy. Additionally, many cited the related reasons of avoiding absenteeism and maintaining a productive workforce. Employers that described offering vaccination to provide a benefit to employees, often referred to providing vaccination as part of a wellness program, to please employees, and to aid in retention. Consistent with their intent to provide vaccination as a benefit to employees, most employers did not feel that the availability of community vaccination options, such as pharmacies and grocery stores, influenced their decision to offer onsite vaccination. Referring employees to community options rather than offering vaccination in the workplace would not provide employees with an equivalent benefit.

All of the employers interviewed made influenza vaccination available to employees at the workplace. The majority of employers that offered influenza vaccination onsite made it available to employees for free. Among those not offering it for free, there were a variety of payment arrangements. These included offering vaccinations for free only to employees with certain insurance plans or charging a co-payment.

Employers frequently described providing influenza vaccination as a routine process and rarely described approaches to increasing vaccination rates beyond making vaccinations free. Their primary interest was in making vaccination available to employees, rather than in maximizing vaccination levels among their employees. While the annual repetition of influenza vaccination could lead to opportunities for innovation, employers seemed satisfied with their current vaccination programs. Only a few employers identified problems with their vaccination programs, such as poor turnout. When describing their vaccination programs, few employers mentioned use of the active promotion strategies recommended by the Community Guide. While it was beyond our scope to obtain prevalence estimates of employers' use of specific promotion practices, we found that maximizing vaccination rates was not a major focus for employers. Accordingly, few employers planned on making any changes to their vaccination programs in the future, such as incorporating strategies to increase vaccination levels among their employees.

2009 H1N1 Influenza Vaccination

We found two themes related to employers' 2009 H1N1 vaccination experience (Table 2). Many employers offered H1N1 vaccination to employees at the worksite. However, the delay in availability was problematic for many employers.

Many employers offered onsite H1N1 vaccination to their employees. Of these employers, some described making a special effort to target priority groups. For some others, the delay led to postponement of their vaccination events until vaccine availability increased and vaccination was no longer limited to priority groups. Some employers also conducted H1N1 outreach efforts, including addressing employees' fears about the virus, keeping employees updated on when vaccination would be available, and referring employees in priority groups to alternative locations when vaccination was not yet available at the workplace.

Most employers that offered the H1N1 vaccination experienced difficulty scheduling the vaccination event. The delay was due to vaccination vendors initially being unable to obtain sufficient vaccine to meet demand. Employers were unable to schedule their events for their desired dates and had to wait until their vendors were able to obtain enough vaccine. For most employers, this was the only problem encountered during the usually routine vaccination season.

Tdap Vaccination

We identified one theme related to Tdap vaccination (Table 3). Namely, employers did not recognize the importance of offering Tdap vaccination to protect their workforce from pertussis. Three findings support this theme. First, Tdap vaccination was rarely

offered to employees and was almost never offered for free. Only four employers offered it and only one of those offered it for free. Second, employers that offered Tdap were motivated by the need to address occupational tetanus risk, rather than pertussis risk. Accordingly, they usually offered the vaccination only to those employees whose jobs placed them at risk of tetanus, rather than to their entire employee population. For example, one employer offered Tdap vaccination to its assembly line workers, but not to the remainder of its workers. To provide tetanus protection, some employers offered Td (tetanus-diphtheria) vaccination, which does not contain the pertussis vaccine, rather than Tdap. Finally, none of the employers that did not offer Tdap were planning to do so in the future to address pertussis risk. Several of these employers had considered offering it, but felt employee demand would be inadequate.

DISCUSSION

It is clear that employers are motivated to offer influenza vaccination at the workplace, but that they did not recognize this as an opportunity to increase vaccination rates. Availability of influenza vaccination in the workplace, frequently for free, indicates that employers are attempting to decrease physical and financial access barriers to vaccination for their employees. Making vaccinations free is a benefit for employees and is also a basic strategy for increasing vaccination rates. However, despite this investment, employers had not considered how best to increase influenza vaccination rates among their employees. While the prevalence of the use of promotion strategies was beyond our scope, the fact that few employers called attention to using such strategies suggests that implementing them was not a priority. This can be explained by their focus on influenza

vaccination availability rather than on vaccination rates and maximizing the health and productivity impact of their vaccination programs. In the context of the Community Guide recommendations, employers were providing free worksite influenza vaccination, but there was room for improvement in their understanding of the importance of active promotion.

While a separate H1N1 vaccination is no longer necessary, employers' involvement in offering H1N1 vaccination during the 2009-2010 influenza season is encouraging. Employers adapted to provide a new vaccination. Many also engaged in educating employees about the vaccination and demonstrated concern about employee access to vaccination that went beyond a typical influenza vaccination season.

Employers seemed unaware of pertussis as a threat to the health and productivity of their employees or that of the larger population. This is not surprising, given that the recommendation for adult Tdap vaccination is relatively new. However, given the recent rise in pertussis incidence, low Tdap vaccination rates are a significant threat to employee health and productivity. Given the low population vaccination rate for Tdap, it seems possible that there is not yet sufficient employee demand for Tdap vaccination as a workplace benefit. Since we conducted our interviews in the fall of 2010, pertussis incidence has continued to rise, along with media attention and public awareness. However, employee demand may not be a sufficient driver, and interventions may need to be developed to encourage employers to offer and promote Tdap vaccination in the workplace.

Our findings have implications for intervention development and future research. Employers are positioned very differently with regard to influenza and Tdap vaccinations. As workplace influenza vaccination programs are well established and influenza vaccination is frequently available for free, interventions intended to raise workplace vaccination rates should help employers to understand the increased health and productivity benefits of high vaccination rates. Interventions should also help employers to identify barriers to increasing rates and to implement promotion practices that will help to increase rates by addressing these barriers. More research is needed to determine the extent of employers' use of influenza vaccination promotion practices and to identify and evaluate innovative workplace-based strategies to raise influenza vaccination rates. For Tdap, interventions should focus on making the business case for offering free workplace Tdap vaccination and integrating free Tdap vaccination into existing workplace vaccination programs. Future research should identify barriers to expanding workplace availability of Tdap vaccination and evaluate programs that introduce it to the workplace.

Our study has several limitations. While we interviewed until we reached data saturation and attempted to include respondents from across industries and geographical regions, the data are not necessarily representative of all large employers. The qualitative method of analysis allowed us to capture the range of employer opinions with a sample of 25 employers, but this sample size was not large enough to allow for inferences about the prevalence of views or practices. Given that this was a qualitative study, it was outside the scope to provide quantitative estimates of the prevalence of employers' views or

practices. Also, the interviews were conducted exclusively with large employers and do not necessarily generalize to small or midsize employers. Finally, there is the potential for response bias in our data. Employers that were willing to respond to our survey may also have been more likely to be interested in employee health in general and to offer onsite vaccination. We are conducting ongoing work to address these limitations, including a national quantitative survey of large employers that will provide prevalence estimates of promotion practices.

The strengths of our study are the novel focus and the approach. Little research has been conducted on employers' perspectives on the use of workplace vaccination practices. This work provides a first step in determining the extent of employers' use of worksite vaccination promotion practices. Additionally, the qualitative approach allowed us to explore employers' views in-depth and obtain a more complete understanding of the underlying views motivating practices.

CONCLUSION

Large workplaces, like those in our sample, are positioned to make a major contribution to addressing low adult vaccination rates for influenza and have the potential to help raise Tdap vaccination rates in the future. In turn, this could help to decrease the incidence of influenza and of pertussis in both working adults and the non-working population. Employers have an incentive to maintain a healthy and productive workforce, a goal vaccination programs can help achieve. However, this study provides evidence that there is room for development in vaccination programs if employers are to fulfill this potential.

Tables

Table 1: Seasonal Influenza Vaccination Themes and Supporting Quotations, Based on 2009-2010 Employers Interviews

Theme	Supporting Quotation
Influenza vaccination offered to keep employees healthy	"…from an employer's standpoint and from a prevention standpoint, we can't afford to have people missing work and being sick and being out. To spend, you know, between $20 and $25 to keep somebody healthy is a way better path than having them out of work for seven to ten days." "We do that so that our employees don't get the flu- bring it to work and spread it around."
Influenza vaccination offered to provide a benefit to employees	"It's a benefit we like to give employees. It keeps employees at work. It's convenient for them, it makes them happy." "We do it for employee relations." "Well, we have a wellness committee here, and they just feel that that's a nice benefit to offer our associates."
Vaccination was widely available and usually free for employees	"Free to employees who come to the clinic event, whether they're covered by health insurance or not. At the Health Fair, dependents and covered people won't have to pay. If they don't have a card or are not covered, it's $20." "Yes, we pick up the cost."
Offering was routine process that was not viewed as an opportunity to maximize vaccination rates	"It was routine- we don't have any plans to change what we've done before." "Some employees want it, some don't." "No [we didn't do anything different]. Just, you know, announced that it was going to be available and had them sign up…Again, non-eventful."

Table 2: 2009 H1N1 Vaccination Themes and Supporting Quotations, Based on 2009-2010 Employer Interviews

Theme	Supporting Quotation
Employers offered H1N1 vaccination	"Yes, we [offered H1N1]…I found [priority groups] a place to go. They went to the public health department actually and got it for free…When I started offering it to anyone, the health department…came out to the worksite here and administered H1N1 to anyone who wanted it."
Vaccine delay was problematic for employers	"The delay in H1N1 was out of the ordinary. Especially in the summer: we kept getting news but it wasn't ready! Not in September, not in October. Finally, December. The concern was built by the news: all kinds of bad news, "people are dying!" By the time it was available, it wasn't that big a deal and people didn't want it anymore." "We were contemplating giving H1N1, but it was delayed coming out so we did not."

Table 3: Tdap Vaccination Themes and Supporting Quotations, Based on 2009-2010 Employer Interviews

Theme	Supporting Quotation
Employers did not recognize the importance of offering Tdap vaccination to protect their workforce from pertussis	"If there's a job function that would put a person in need, we'd provide it. We're more focused on tetanus, not pertussis." "I have standing orders to give tetanus…due to a work-related injury- that's it…I just give tetanus diphtheria." "We haven't talked about any [non-flu] vaccines."

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Chapter 3: Workplace-Based Influenza Vaccination Promotion Practices among Large Employers in the United States

INTRODUCTION

The morbidity, mortality, and cost consequences of influenza in the United States are substantial. Annual incidence of influenza among adults 18 to 64 years of age ranges from 2% to 10% [1]. Influenza-related mortality is estimated to range between 3,000 and 49,000 deaths annually [2]. Annual direct medical costs associated with influenza are estimated at $10.4 billion [3].

For employers, influenza vaccination among employees can help to limit productivity losses, absenteeism, and healthcare costs associated with influenza. Vaccination is the most effective means of preventing influenza infection [4] and the Centers for Disease Control and Prevention (CDC) recommends influenza vaccination for all adults [1]. When the influenza vaccine is well-matched with the dominant influenza strains in a particular year, vaccination of employees is associated with decreases in influenza-like illness (34%), missed work days (32%), and physician visits (42%) [5]. Influenza vaccination is generally cost-effective for employers [6-8] and implementing onsite vaccination is generally inexpensive (less than $35 per employee) [9].

Despite the consequences of influenza and the benefits of vaccination, influenza vaccination levels among working-age adults are low. Only 29% of adults 18 to 49 years of age were vaccinated in 2011-2012, less than half of the vaccination level for adults 65

years of age or more (65%) [10]. Vaccination levels among those 50 to 64 years of age are intermediate, with about 43% vaccinated in 2011-2012 [10].

Employers can help address low influenza vaccination levels among their employees by engaging in evidence-based promotion practices. Based on a 2008 Community Guide review [11] and our review of the literature, we classified promotional practices into five domains--physical access, financial access, communication, mandates, and norms. There is particularly strong evidence to support use of two access-based practices. First, employers can increase physical access to vaccination by offering it to employees at the workplace. Second, they can increase financial access by making vaccination free for employees. While knowledge levels are associated with vaccination levels, free and convenient access to vaccination have been reported as the strongest motivators for vaccination [12]. Supporting the use of these access-based practices, the Community Guide concluded that there was sufficient evidence to recommend interventions that combine free, onsite access to vaccination with active promotional activities to announce vaccination availability [11]. The reviewers found these practices effective alone or in combination with additional strategies to enhance access, increase knowledge levels, and change norms and attitudes [11].

Additional evidence-based practices also address physical and financial access to vaccination. In addition to offering vaccinations at the workplace, effective interventions have improved physical access by offering vaccinations across an increased number of days [13]. To address financial access, in addition to making vaccinations free for

employees, some successful interventions have also incorporated vaccination "on the clock" and provided vaccination incentives such as deposits into health savings accounts or refreshments during the vaccination event [14-16].

Communication is also an effective promotion practice (13-18). Examples of communication methods are e-mails sent to employees and posters placed around the workplace. When used to announce availability of free, onsite vaccination, these communication practices form an essential element of evidence-based interventions, as determined by the Community Guide. The same communication methods can also be used to convey additional information about vaccination, such as describing the reasons that employees should get vaccinated and addressing common misconceptions about influenza vaccination [15, 13, 18]. Improving employees' attitudes about vaccination is an important strategy for increasing vaccination levels because attitudes are associated with decisions about whether to receive influenza vaccination [19].

Other effective promotion practices address vaccination norms, such as by establishing the fact that management supports employee vaccination. Supervisor encouragement has been associated with employees' decisions about influenza vaccination [19]. Receiving information about vaccination in the workplace can have a positive impact on vaccination levels even if knowledge levels remain constant [12], suggesting that workplace norms may play an important role in vaccination levels.

Finally, imposing vaccination mandates has been associated with increases in employee vaccination levels. Hospitals establishing such mandates experienced average improvements in employee vaccination levels between 11% and 20% [20, 21]. While more research is needed to determine the relative contribution of particular promotion practices, there is solid evidence that various combinations of practices can be very effective in increasing vaccination levels [11].

Despite the strong evidence base for practices to promote vaccination in the workplace, the extent of employers' use of these practices is unknown. Our objective in this study was to estimate the prevalence of employers' use of workplace-based vaccination promotion practices. This will help to determine the need for dissemination of evidence-based practices to employers offering influenza vaccination and will identify practices and employer groups with low levels of practice use.

METHODS

We conducted a national survey of large employers in the United States. The University of Washington IRB reviewed the study procedures and deemed the study exempt from review. Employers from all industries and regions were eligible. We included both employers that did and did not offer onsite vaccinations. Employers were not eligible if they had fewer than 500 employees, did not have a headquarters in the United States, did not have a working phone number available, or had no employee qualified to respond to the survey. A survey marketing company (Dunn and Bradstreet, Short Hills, NJ) provided a random sample of employers meeting inclusion criteria. A sample size of 376 was

required for analysis, to obtain an estimate of the proportion of employers offering onsite influenza vaccination that were providing it for free. An initial sample of 1268 was selected to ensure an adequate sample of employers that offered vaccination, after accounting for anticipated non-response. We assumed a 50% response rate and that 62% of employers offered workplace vaccinations (Martin and Garson, unpublished data). Data collection occurred in the winter of 2012 and addressed employers' practices during fall of 2011. Trained call center representatives from a market research firm (Research America, Philadelphia, PA) administered the survey by telephone. Survey duration was approximately 10-15 minutes. Respondents were representatives of each employer that were the most knowledgeable about benefits or vaccination programs, such as benefits managers and occupational health nurses. Respondents received a $25 gift card in appreciation of their participation.

We took three steps to maximize response rate. First, the sample was cleaned to ensure accurate, up-to-date contact information. This was accomplished by cross-referencing the name and telephone number of potential respondents with information listed on employers' websites or provided by employers' headquarters. Second, research staff conducted an in-person training session with call center management and interviewers. Finally, we established a protocol of attempting to contact employers 30 times before considering them a non-responder.

The data collection tool was a questionnaire consisting of short-answer items that included measures of employers' characteristics and vaccination promotion practices.

Employer characteristics were industry, number of employees, whether the employer was self-insured, percent of employees working full-time, average employee age, average employee salary, and wellness capacity. We assessed wellness capacity by determining whether employers had a paid wellness staff person. Measures of promotion practices addressed the five domains identified in our review of the literature: physical access, financial access, communication, norms, and mandates. All measures were binary, with the exception of communication practices, which were measured continuously. Measures of physical access were: having a multi-day vaccination event, making vaccination available within all employees' working hours, and offering vaccination at all worksites. Financial access measures were: making vaccinations free for employees, offering vaccinations "on the clock," and offering incentives for vaccination. Finally, we measured norms by assessing whether employers encouraged managers to get vaccinated as an example and mandates by determining whether employers had a policy mandating employee vaccination.

To summarize use of promotion practices across the five domains among employers offering onsite vaccination, we developed a promotion practices scale. Nine promotion practices were included and employers could score a maximum of ten points on the scale. Vaccination mandates were excluded from the scale because they differed from the other practices in that they require rather than promote vaccination. Most practices were dichotomized for inclusion in the scale, with employers categorized as either using or not using a particular practice. Use of communication methods was incorporated in the scale as the proportion of all possible methods that were used by each employer.

Communication message use was included in a similar manner. Because of the relative strength of the evidence base for the impact of free vaccination, the scale was weighted to distribute two points for this practice and one point each for the remaining eight practices.

We conducted descriptive analyses to examine the characteristics of the sample and use of promotion practices. We described the characteristics of the full sample using summary statistics, but most of the remaining analyses were restricted to employers offering influenza vaccination in the workplace. We estimated proportions and 95% confidence intervals for use of each promotion practice. Practice use was dichotomized for the purposes of analysis. We conducted bivariate analyses to assess associations between employer characteristics and offering onsite vaccinations or making them free. The significance of differences was determined using chi-squared tests and tests of proportion. Mean promotion practices score was calculated and bivariate associations between employer characteristics and score were examined.

We used regression analyses to assess the relationship between employer characteristics and use of promotion practices. We performed the analyses using Stata version 12 (StataCorp LP, College Station, Texas). A logistic regression analysis was conducted to examine the association between employer characteristics and whether influenza vaccinations were offered. This analysis included all respondents that offered onsite vaccination and those that did not but excludes those that were unsure. We also conducted a logistic regression analysis to evaluate the association between employer

characteristics and whether vaccinations were free, among those employers offering vaccination. We conducted an ordinary least squares regression analysis to examine the association between employer characteristics and promotion practices score. This analysis was also restricted to those employers offering onsite vaccination. The initial models for all regression analyses included employer characteristics hypothesized to have an association with offering onsite vaccination or offering it for free: industry, region, workforce size, workforce distribution, mean employee age, percent full-time employees, mean salary, and whether employers were self-insured. Because of their hypothesized relationship with the outcome and predictive employer characteristics, employer characteristic variables that were not significantly associated with the outcome were retained in the final models.

RESULTS

Our final respondents consisted of 583 employers. Our response rate was 52%, excluding 140 employers deemed ineligible [22]. Ineligible employers had fewer than 500 employees (80), lacked an employee with knowledge about the company's health benefits (12), had a disconnected phone number (45), or blocked the call (3). The median number of employees among employers in the sample was 1,435.5 and the median number of worksites was 12.0 (Table 1). The sample included employers from all geographic regions of the United States. All major industries were represented, as categorized by North American Industry Classification System (NAICS) code. The most prevalent industries in our sample were healthcare and social assistance (23.8%) followed by manufacturing (16.8%). Of the 583 employers in the sample, 490 (84.0%) offered

employees onsite influenza vaccination in 2011, 90 (15.4%) respondents did not and 3 (0.5%) respondents were unsure.

Employers' level of use of promotion practices depended on the practice, with 4 practices used by 75% or more of employers offering onsite influenza vaccination and 4 practices used by 50% or less (Table 2). The more prevalent practices fell under the domains of physical and financial access. Prevalent physical access practices were holding a multi-day vaccination event and making vaccination available within all employees' working hours. Prevalent financial access practices were offering vaccinations for free and offering them "on the clock". The less prevalent practices fell under all four domains. Mandating vaccination was less common than any of the promotion practices, with 14% of employers requiring it; 58% of employers mandating vaccination were in the healthcare and social assistance industry. The other less prevalent practices were offering vaccination at all worksites, offering incentives for vaccination, and encouraging managers to get vaccinated as an example.

Six communication practices were used by approximately 50% or more of employers offering onsite influenza vaccination, while the remaining three practices were used by 15% percent or less. On average, employers used 5 out of 9 of the communication practices described and 14% said that they used some other communication practice. The most popular communication practices were sending e-mails (95%) and hanging posters (79%). The least popular communication practices were sending mail to employees' homes (7%) and sending postcards to employees (6%).

Score on the promotion practices scale, which summarized use of promotion practices among employers offering onsite influenza vaccination, ranged from 1.1 to 9.9 out of 10. Mean score was 6.5 (standard deviation 1.8). Score distribution was slightly left-skewed. Industry, wellness capacity, and mean employee age predicted whether or not employers offered onsite vaccination (Table 3). Membership in the professional, scientific and technical services industry was associated with lower odds of offering onsite vaccination than membership in the reference group, manufacturing, after adjusting for other employer characteristics (OR=0.22, 95% CI 0.09, 0.56). Employing a wellness staff person and having a higher mean employee age increased the odds that employers offered onsite vaccination, after adjusting for other employer characteristics.

We found that among employers offering workplace vaccination, two characteristics were associated with making influenza vaccination free for employees. Specifically, offering vaccination for free was associated with industry and number of employees (Table 3). The odds of employers in the health and social services industry making vaccination free were over five times those of the reference industry group, manufacturing, after adjustment (OR=5.44, 95% CI 1.86, 15.91). Employers with a higher number of employees were also more likely to make vaccination free, after adjusting for other employer characteristics.

Industry, number of employees, number of sites, and wellness capacity were associated with the promotion-practices score, after accounting for other employer characteristics (Table 4). The strongest predictor of promotion practices score was industry.

Membership in the healthcare and social services industry was associated with a score increase of 1.89 points. Having a paid wellness staff person was associated with a promotion practices scale score that was 0.72 points higher than not having a paid wellness person. Having a larger numbers of employees was associated with a score increase of 0.57 points, while having more worksites was associated with a decrease of 0.47 points.

DISCUSSION

Overall, we found that many evidence-based promotion practices were well used. Offering onsite influenza vaccination was a common practice that transcended most employer characteristics, including the size or worksite distribution of workforces and most industry groups. A large majority of employers offering onsite vaccination made it free for employees, helping to address physical and financial access barriers. Financial access promotion practices were especially popular among employers. In particular, offering employees the opportunity to get vaccinated while they were "on the clock" was universal.

However, room for improvement remains in the use of promotion practices. On average, based on the promotion practices score, employers offering onsite vaccination were only using 65% of potential evidence-based promotion practices. In particular, employers' use of the four evidence-based promotion practices in place at less than half of employers could benefit from increased dissemination efforts. First, fewer than half of the employers that offered vaccination made it available across all of their worksites. Availability at one worksite did not guarantee availability across all worksites. Given that employers

offering vaccination at one or more worksites already recognize the importance of offering vaccination, identifying and addressing the barriers to offering vaccinations at the remainder of their sites could produce a large payoff in vaccination levels with a relatively modest investment of resources.

Two other practices that were used relatively infrequently were offering incentives and encouraging managers to get vaccinated as an example, a norms practice. Both incentives and norms are aspects of workplace vaccination culture. Fostering a workplace culture that supports vaccination could help to increase employee demand for vaccination. Finally, few employers used mandates to require employee vaccination. It is not surprising that the healthcare and social services industry uses mandates the most frequently. Improving patient safety through reducing healthcare-associated influenza is aligned with the nature of their work [23]. Furthermore, influenza vaccination may be mandated by hospitals or health systems and healthcare employers in some states are required to have influenza vaccination programs [24]. Nationally, about 56% of acute care hospitals currently mandate influenza vaccination [25].

There were several limitations to this study. One concern is that our results were affected by non-response bias. Employers that offered vaccination might have been more likely to be willing to participate in the survey than those that did not. This effect may have inflated our estimates of the prevalence of onsite vaccination. However, a similar effect is less likely to have impacted our findings about the levels of promotion practices among those employers that do offer onsite vaccination. Another limitation was our limited

ability to assess the intensity of use of promotion practices. For instance, while we measured which methods employers used to communicate to employees about the availability of onsite vaccination, we were not able to obtain the level of detail of information needed to understand more about how intensely employers were using the practices. For instance, we captured whether or not employers used communication methods such as e-mails and posters, but not when or how often they used them or whether they were sent in all relevant languages. A final limitation is that we included only large employers. Our results generalize only to large employers and additional research is needed to assess vaccination-related practices among small and mid-sized employers.

CONCLUSION

We found that large employers' use of workplace-based vaccination promotion practices is generally high, though some promotion practices were more widely used than others. A large majority of employers were using the two practices with the greatest strength of evidence of effectiveness, offering vaccination at the workplace and making it free for employees. This study showed that employers are generally highly engaged in the fundamental practices involved in workplace vaccination promotion.

Further research is needed to help focus future dissemination efforts. An important component of this will be to evaluate the individual contribution of different promotion practices, many of which have only been evaluated in combination with other promotion practices. Research is also needed to determine barriers to implementation at different types of worksites. Finally, given the generally high use of evidence-based practices but

low vaccination levels among the working age population, novel vaccination promotion methods may need to be developed and evaluated.

Tables

Table 1: Characteristics of sample of large employers in the United States, 2011-2012 (n=583)

Variable		Summary Statistic
		Median
Number of employees (n=490)		1435.5
Number of worksites (n=548)		12
Average employee age (n=494)		40.0
Average employee annual base salary (n=300)		$42,000
Percent full-time employees (n=519)		80.0%
		Percent
Self-insured (n=583)		63.5
Paid wellness staff person (n=583)		45.8
Geographic region (n=583)		
	Northeast	20.9
	Midwest	25.7
	South	33.6
	West	19.7
Industry (583)		
	Healthcare and social assistance	23.8
	Manufacturing	16.6
	Education services	13.6
	Professional, scientific and technical services	8.6
	Public administration	6.5
	Finance and insurance	5.7
	Retail trade	4.8
	Accommodation and food service	3.6
	Other services	2.9
	Transportation and warehousing	2.6
	Wholesale trade	2.2
	Utilities	1.7
	Arts, entertainment and recreation	1.5
	Construction	1.5
	Information	1.4
	Real estate and rental and leasing	0.7
	Mining, quarrying, and oil and gas extraction	0.7
	Agriculture, forestry, fishing and hunting	0.7
	Administrative and support and waste management and remediation	0.7
	Management of companies and enterprises	0.2

Table 2: Use of promotion practices among large employers in the United States offering onsite influenza vaccination (n=490)

Promotion Practices	**Summary Statistic**
	Percent (95% CI)
Physical access	
Multi-day vaccination event	75.6 (72.1, 79.1)
Vaccination available within all employees' working hours *	76.5 (72.8, 80.3)
Offer at all worksites**	46.9 (42.3, 51.5)
Financial access	
Vaccinations offered "on the clock"	96.7 (95.1, 98.3)
Influenza vaccination free at workplace	83.1 (79.7, 86.4)
Incentives offered for vaccination	24.7 (20.9, 28.5)
Norms	
Encourage managers to get vaccinated as an example	39.8 (35.4, 44.1)
Mandates	
Require vaccination	14.0 (11.0, 17.1)
	Mean (SD)
Communication	
Number of communication methods used	4.7 (1.6)
Number of communication messages used	5.4 (2.1)

*Includes employees working only evenings or weekends, if applicable
**Denominator includes employers with only a single site.

Table 3: Characteristics associated with offering onsite influenza vaccination at any cost among all employers and free of cost among employers offering onsite influenza vaccination in 2011-2012.

		Offering Onsite Influenza Vaccination (n=580*)	**Offering Free Onsite Influenza Vaccination (n=490**)**
Employer Characteristic	**Category**	**Adjusted Odds Ratio*** (95% CI)**	**Adjusted Odds Ratio*** (95% CI)**
Number of employees	Above median (1435.5)	1.07 (0.59, 1.94)	1.85 (1.00, 3.38)
Number of worksites	Above median (12.0)	0.70 (0.40, 1.23)	1.01 (0.57, 1.81)
Average employee age	Above median (40.0)	2.05 (1.16, 3.64)	1.28 (0.73, 2.26)
Average employee annual base salary	Above median ($42,000)	1.60 (0.81, 3.16)	1.37 (0.66, 2.86)
Percent full-time employees	Above median (80.0%)	0.89 (0.50, 1.59)	1.69 (0.92, 3.09)
Insurance	Self-insured	1.52 (0.90, 2.60)	1.54 (0.89, 2.65)
Wellness capacity	Paid wellness staff person	3.15 (1.76, 5.63)	1.53 (0.90, 2.60)
Geographic region	Northeast	1.09 (0.51, 2.35)	1.12 (0.47, 2.69)
	Midwest	1.21 (0.58, 2.54)	0.63 (0.29, 1.38)
	South	1.47 (0.73, 2.95)	0.61 (0.29, 1.29)
	West	Reference	Reference
Industry	Healthcare and social assistance	1.16 (0.40, 3.36)	5.44 (1.86, 15.91)
	Prof., scientific, and technical services	0.22 (0.9, 0.56)	1.28 (0.40, 4.11)
	Public administration	0.89 (0.25, 3.24)	1.24 (0.41, 3.76)
	Manufacturing	Reference	Reference
	Education services	0.93 (0.32, 2.67)	0.60 (0.25, 1.42)
	All other industries	0.48 (0.21, 1.09)	1.20 (0.55, 2.62)

*Total number of respondents included in analysis. Includes respondents that offered and did not offer onsite influenza vaccination. Excludes 3 respondents that were unsure about whether they offered onsite vaccination.

**Total number of respondents included in analysis. Includes respondents that offered onsite influenza vaccination for free or at some cost. Excludes respondents that did not offer onsite influenza vaccination or were unsure.

*** Adjusted for all employer characteristics

Table 4: Variation in Influenza Vaccination Promotion Practices Score by Selected Employer Characteristics (n=458*)

Employer Characteristic	**Category**	**Difference in Promotion Practices Score**) (95% CI)**
Number of employees	Above median (1435.5)	0.57 (0.24 0.91)
Number of worksites	Above median (12.0)	-0.47 (-0.78, -0.16)
Average employee age	Above median (40.0)	0.18 (-0.13, 0.50)
Average employee annual base salary	Above median ($42,000)	0.04 (-0.38, 0.45)
Percent full-time employees	Above median (80.0%)	0.28 (-0.07, 0.64)
Insurance	Self-insured	0.13 (-0.19, 0.44)
Wellness capacity	Paid wellness staff person	0.73 (0.43, 1.02)
Geographic region	Northeast	-0.11 (-0.56, 0.33)
	Midwest	0.16 (-0.28, 0.60)
	South	0.12 (-0.28, 0.53)
	West	Reference
Industry	Healthcare and social assistance	1.89 (1.36, 2.41)
	Prof., scientific, and technical services	-0.07 (-0.74 0.60)
	Public administration	-0.19 (-0.90, 0.46)
	Manufacturing	Reference
	Education services	-0.49 (-1.05, 0.08)
	All other industries	-0.20 (-0.66, 0.26)

* Includes only employers offering onsite vaccination and excludes 32 employers with incomplete data on promotion practices.
** Adjusted for all employer characteristics. Possible score ranged from 0.0 to 10.0. Employers' scores ranged from 1.1 to 9.9 with a mean of 6.5.

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Chapter 4: Workplace Promotion of Influenza Vaccination: A Pilot Study in Restaurants

INTRODUCTION

Influenza has consequences for morbidity, mortality, productivity and healthcare costs in adults in the United States. Annual influenza incidence is between 2% and 10% among adults 18 to 64 years of age [1]. Influenza leads to about 226,000 hospitalizations each year and accounts for between about 3,000 and 49,000 deaths annually, depending on the severity of the influenza season [2]. While influenza deaths are less common among adults between 18 and 64 years of age than among older adults, influenza in younger adults can result in missed work and doctor visits [3]. Annual healthcare costs associated with influenza are estimated at $4.6 billion for adults between 18 and 64 years of age [4].

Influenza vaccination can decrease the morbidity and mortality of influenza and is the most effective means of preventing influenza infection. Vaccinated adults experience lower levels of illness, fewer missed workdays, and fewer doctor visits [3].

Influenza vaccination is recommended for all adults, but vaccination levels among working age adults are low. Influenza vaccination is recommended for all adults by the Centers for Disease Control and Prevention (CDC) [1]. However, only about 29% of adults between 18 and 49 years of age received influenza vaccination in 2011-2012 [5]. Vaccination levels among adults between 49 and 64 years of age were slightly higher in 2011-2012, at 43% [5]. By comparison, vaccination rates for older adults were

considerably higher, 65% in 2011-2012 [5]. While there is room for improvement in vaccination levels for all adults, those of working-age adults are particularly low.

One approach to addressing the problem of low adult influenza vaccination rates is through workplace-based vaccination programs. Employers can use evidence-based promotion practices to increase vaccination rates among employees. Using particular practices, including offering vaccination to employees free of cost and the worksite, increases employee vaccination rates [6].

Four domains of promotion practices have been documented in the literature: physical access, financial access, communication, and norms [7-12]. Physical access practices make vaccination easy and convenient for employees, such as by offering vaccination at the worksite [7-12]. Improving financial access consists mainly of making vaccination free for employees or reducing its cost [7-12]. Communication practices can address employee awareness of the availability of onsite vaccination and can also target vaccination-related knowledge and attitudes. Communication methods might include hanging posters or sending e-mails to publicize vaccination. Finally, improving norms involves addressing employees' perceptions of management support for vaccination and the prevalence of vaccination among coworkers. Fundamental promotion practices, such as offering free onsite vaccination to employees, are generally well used by large employers, though some practices are used more frequently than others [13].

Among workplaces, implementing promotion practices in the restaurant setting offers particular benefits. Restaurant employees are an important population for influenza vaccination but are difficult to reach. Influenza vaccination for restaurant employees has important benefits. Restaurant employees make up about 10% of the national workforce [14]. Because paid sick leave is not often available to restaurant employees, they may lose wages if they miss work because of illness. Restaurants employees also have low rates of health insurance, so seeking medical care for an influenza infection can be costly for them. Finally, like healthcare workers, restaurant employees are exposed to the public in the course of their work. There are also benefits for restaurant owners/managers associated with increasing vaccination levels among employees. Absenteeism is particularly problematic in the restaurant industry because restaurants may lose business if they are not able to replace an employee that is out of work.

However, there are a number of potential challenges associated with implementing workplace-based vaccination promotion in the restaurant setting. The shift work schedule common to restaurants may make it difficult to arrange a vaccination event that will be convenient for all employees. The physical setting of the restaurant may not be as conducive to hosting a vaccination event as an office-based setting, as many restaurants lack a conference room or similar space to administer vaccination. Communication practices will need to account for the fact that employees at many restaurants do not meet as a group.

We conducted a pilot study of an intervention to increase vaccination rates among restaurant employees using evidence-based workplace promotion practices. Our first objective was to evaluate the implementation of the intervention. Second, we aimed to determine the effect of the intervention on vaccination rates among restaurant employees. Finally, we sought to determine the resource investment required by restaurants to implement the intervention.

METHODS

Focus Groups

To inform the intervention design, we conducted focus groups with restaurant owners/managers and employees. We held a total of seven focus groups, three with restaurant owners/managers, two with English-speaking restaurant employees, and two with Spanish-speaking restaurant employees. The primary purpose of the owner/manager focus groups was to determine whether various aspects of the proposed intervention would be acceptable to restaurant owners/mangers and what factors they anticipated would facilitate success of a workplace-based program to promote influenza vaccination in the restaurant setting. We found that owner/manager views on influenza vaccination varied, but that they were willing to consider offering vaccination to employees at their restaurants. It was important to them that employees understand that vaccination was not mandatory. They described the difficulty many employees have taking time off when they are sick because of the financial cost and the problem that absenteeism creates for restaurants. They believed that providing free, workplace vaccination would increase vaccination levels among their employees.

The aim of conducting the focus groups with employees was to determine what aspects of an intervention would motivate them to take advantage of a workplace-based vaccination program. Although misinformation about influenza and influenza vaccination was common, they felt that communication materials needed to be brief and to the point in the restaurant setting. Many would consider being vaccinated if vaccination was available at their restaurant, but others said that they preferred not to be vaccinated that that availability at the restaurant would not change their attitude towards vaccination. There was widespread agreement that making vaccination convenient and free would increase vaccination rates among their coworkers.

Design

We implemented an intervention and conducted a pre/post analysis to determine the effect on vaccination rates. Employees served as their own historical controls at the restaurant level. Restaurants implemented the intervention in the fall of 2012. In addition to outcome data, we also collected data about the implementation of the intervention to help explain its effect and data about owner/manager time investment and cost.

Sample

A sample size of about 250 employees was required for analysis in order to detect a difference of approximately 15% in vaccination rate at the 95% confidence level with a power of 0.80. For logistical reasons, and because very small restaurants would be less likely to have the capacity to sustain an onsite model of offering vaccination to

employees, we required that each participating restaurant had at least 25 employees that would potentially be eligible for vaccination. To ensure an adequate sample size even if one restaurant dropped out, we aimed to recruit 11 restaurants to participate.

Employers were selected using convenience sampling. We advertised the opportunity to participate by attending a meeting of a local restaurant trade organization. We contacted owners of well-known area restaurants that met our inclusion criteria to offer them the opportunity to participate. We asked restaurants that had agreed to participate to recommend other restaurants they thought might be interested. We enrolled the first 11 restaurants that met our inclusion criteria.

We included restaurants in the Seattle metropolitan area with at least 25 employees that spoke English or Spanish and were at least 18 years of age. Restaurants were excluded if they had offered influenza vaccination to employees in the past (this was uncommon).

Data Collection

We used three main methods to collect data. First, we conducted surveys with employees. The overall purpose of the employee surveys was to obtain data about employee vaccination rates. There were two types of employee survey, one administered pre-intervention and post-intervention and the other administered on the day of the vaccination event. The pre/post intervention survey was open to all employees, regardless of their vaccination status. Pre-intervention and post-intervention surveys were not linked at the individual level and employees could complete the post-intervention survey

regardless of whether they had completed the pre-intervention survey. However, employees were excluded from analysis of the post-intervention survey data if they had not been hired before the start date of the intervention, because they may not have been exposed to all or part of the intervention.

The pre-intervention survey was administered in September and October of 2012 and referred to employees' vaccination status the year before the intervention, during the 2011-2012 influenza season. The post-intervention survey was administered in January and February of 2013 and referred to employees' vaccination status in the year of the intervention, during the 2012-2013 influenza season. Employees received $5 in cash in appreciation of their time completing the survey.

The vaccination day survey was offered only to those employees that were vaccinated at workplace vaccination events. It was administered during the vaccination event at each restaurant. The vaccination day survey captured demographics of employees that were vaccinated at the worksite event. It also provided count data about the number of employees vaccinated at the events.

Second, we conducted site-audits at each restaurant. Site-audits consisted of two researchers visiting each restaurant during its vaccination event to observe the implementation of the intervention.

Third, we surveyed owners/managers after the intervention was complete. The purpose of this survey was to collect data about employers' time investment and their experiences with implementing the intervention. Surveys with owners/managers were completed by telephone and lasted 10-15 minutes.

Measures

The pre-intervention and post-intervention surveys included measures of whether employees have received influenza vaccination in the past year (dichotomous) and the location of vaccination (categorical). They also included measures of demographic information including age (categorical), sex (dichotomous), race/ethnicity (categorical), and education (categorical). Age and education were dichotomized for the purposes of some analyses. The survey also included a measure of knowledge and attitudes, consisting of eight likert-style items that addressed five domains (relevance of vaccination, effectiveness of vaccination, vaccination side effects, ease of access, and norms). The items were weighted so that each domain carried an equal weight of five points. Twenty five total points were possible and the score was continuous. In addition to inclusion in the knowledge and attitudes measure, norms were also measured with an item on the survey that addressed employees' perception of their coworkers vaccination status. This measure was included in the analysis as a categorical variable.

Items included on the vaccination day survey were sex (dichotomous), age (categorical), education level (categorical), how employees heard about the vaccination event

(categorical), whether they had received influenza vaccination in the past (dichotomous), and location of previous vaccination (categorical).

Measures collected using the site audits included the use of posters (count and location) and the wait time for employees seeking vaccination (in minutes). Qualitative data were recorded regarding the presence of champions among members of the management and employees, the location of the event within the workplace, and signs of management support for the intervention.

The employer survey included measures of time investment (in hours and minutes) and the average income of employees in different positions. Qualitative data were collected regarding the challenges employees encountered when implementing the intervention. Employer attitude toward employee influenza vaccination was measured using four items addressing employers' perceptions of the effectiveness of vaccination and the effects of influenza on the health and productivity of their employees. Responses were likert-scale and employers could earn a maximum of five points on each item, for a maximum total score of 20 points. The scores were included in the analysis a continuous variable. Management attitude was also measured qualitatively by assessing managers' comments during the interview, regarding the intervention and implementation.

Intervention

The intervention addressed physical access, financial access, and communication practices. To improve physical access to vaccination, we made arrangements with a

community vaccination vendor to provide onsite vaccination at each restaurant location. The restaurants were provided with contact information for the vendor and asked to schedule the event for a time that worked well for their restaurant. We recommended that they choose a time when as many of their employees would be onsite as possible. To improve financial access, the vaccination was available to the employees free of cost. The cost of the vaccination event was covered by the study; employers were not asked to contribute to the cost of the vaccine or its administration.

The intervention included several components to address communication practices. First, employers were provided with English and Spanish language posters that had been developed based on focus group feedback. There were two posters designs and employers were provided with two copies of each design in each language. They were asked to hang the posters in prominent locations, such as on bulletin boards and near the schedule. Second, employers were provided with model e-mails and texts and asked to send those to employees if they normally communicated with employees using these methods. Employers were also given flyers to distribute to employees approximately a week before the intervention. The messaging on the communication materials focused on awareness of the date and time of the vaccination event but also addressed some common myths about vaccination. Employers were also encouraged to have one-on-one conversations with employees about influenza vaccination and to convey their support to employees. Employers were provided with a list of frequently asked questions about influenza vaccination to which they could refer if employees had questions. Norms were not an explicit component of the intervention, but were addressed indirectly through

communication practices. Managers were encouraged to convey their support for influenza vaccination to their employees.

Analysis

At the employee level, we conducted descriptive analysis to examine the characteristics of the employees responding to the pre-intervention, post-intervention, and vaccination day surveys using proportions. We described the proportion of employees that were vaccinated in the year before the intervention and the intervention year, overall and by demographic subcategory. We also examined the distribution of vaccination history among those vaccinated at the workplace vaccination event and the distribution of vaccination location among pre-intervention and post-intervention survey respondents, using proportions for both.

At the restaurant level, we described mean demographic characteristics, mean employee attitude score at baseline, employer attitudes, and implementation of the intervention. To examine employer attitudes, we described the variation in qualitative observations based on the employer interviews and site-audits and calculated the mean and variance of the employer attitude score. Implementation analysis was conducted qualitatively using measures from the site-audits and employer interviews. Specifically, we assessed variation in access practices, including how easy it was for all employees to get vaccinated and in communication practices, such as how posters were used. We examined bivariate relationships between the presence of the intervention and mean levels of employee demographic characteristics at each restaurant. We also conducted

bivariate analyses of the association of the intervention with mean pre-intervention employee attitude score and with employer attitude score.

The intervention was assessed using employee level data. We tested the significance of the association between the presence of the intervention and the likelihood that an employee was vaccinated. We used a mixed effects logistic regression model, in which a restaurant specific random effect was used to account for the within-restaurant correlation among employees surveyed at both time points. The outcome was the binary indicator whether an individual employee was vaccinated. The main predictor of interest is the indicator of presence of intervention, which is the same as a pre-post indicator given the design. Other fixed effect covariates included in the model were sex (dichotomous), race/ethnicity (dichotomous), age (dichotomous), and education (dichotomous). These covariates were included because they were hypothesized or suggested by previous literature to be associated with vaccination rates and were unbalanced in the pre-intervention and post-intervention samples.

To identify differences in the effect of the intervention among restaurants, we described the difference in vaccination rate comparing the baseline rate to the rate in the intervention year for each restaurant. We also descriptively compared restaurant level differences in vaccination rate to baseline vaccination rate, change in employee selected characteristics, management attitude score, employee attitude score at baseline, and selected implementation measures. These variables were selected because of their a priori hypothesized relationship with the size of the change in vaccination rates.

RESULTS

A total of 11 restaurants implemented the intervention. The participating restaurants included three chains with three to four restaurants each and one single-site restaurant. The restaurants ranged in size from 35 to 85 at the time of the pre-intervention survey and 20 to 125 at the time of the post-intervention survey.

Implementation

All restaurants provided free onsite vaccination, but access varied by restaurant. Scheduling the vaccination event required careful planning and some restaurants were more successful in finding a suitable time than others. It was challenging to find a time of day that would be convenient for all employees when their shifts did not necessarily overlap. It was also important to find a time when many employees were present but were not too busy to get vaccinated and several employers reported that this was difficult. Some restaurants found a time that seemed to be accessible to many employees, while others scheduled events for times that fell between shifts. Scheduling the vaccination event on a day of the week when many employees were scheduled to work was also important. Most restaurants held their vaccination events on Fridays or Saturdays, but one held their event mid-week. Eighty-nine percent of employees vaccinated at workplace vaccination events were scheduled to work on the day of the vaccination event, suggesting that employees were not likely to attend on a day off. Another implementation

challenge related to access was finding an appropriate location within the restaurant for the vaccination vendor to set up the vaccination materials and administer the vaccinations. Most restaurants did not have a conference room or similar space, but some were able to find well-suited locations where the event was noticeable to employees but did not interfere with restaurant business. However, others had trouble finding such a place or did not seem to have given much though to the location.

Implementation of communication and norms practices also varied across restaurants. For communication, all of the restaurants used the posters, but intensity of use varied. The number of posters used ranged from two to eight. Posters at some locations were clearly visible in prominent locations, such as near the schedule, while at other locations they were harder to find, and in one case, had been covered with other postings. At the same restaurant where posters had been covered the manager had written incorrect information about the date of the event on the posters and corrected this information on only a portion of the posters. Employers used between three and five of the six communication methods suggested to them (posters, flyers, group announcements, one-on-ones, e-mails, and texts) and two used additional methods (an employee newsletter and an online HR portal). Posters were used most frequently (11/11 employers) and texts were used least frequently (1/11 employers). One employer created her own posters to supplement those supplied. The was no clear association between use of communication practices and outcome, though the employer with posters that were covered and had incorrect information experienced the smallest increase in vaccination rates, comparing the intervention year to the previous year. Based on the vaccination day survey, about equal

numbers of employees reported hearing about the vaccination event from the posters, from e-mails from their employer, and from in-person announcements (Table 4).

Management Attitude

We also observed differences in management attitude among the restaurants. Scores on the management attitude measure ranged from 10 to 20, with 20 indicating the most positive view. Mean score was 16.7 (s.d. 3.4). Based on the employer interviews, managers generally had positive attitudes regarding employee influenza vaccination and the intervention. However, two managers expressed views that stood out as potentially being detrimental to the effect of the intervention. One noted that he had not been vaccinated himself because he was generally healthy. He mentioned a problem with oft-shift employees not having access to the clinic (which was the only event not held on a Friday or Saturday), but later said that everyone who wanted a shot got one. He implied that those that did not get vaccinated failed to appreciate the opportunity to get vaccinated, but then expressed the view that because vaccination is a personal choice, it was not his role to promote vaccination beyond letting employees know about the date and time of the vaccination event. The other manager, from a different restaurant, also reported that he did not get the flu shot, stating that he had gotten it in the past but that he got sick. He said they he had joked with the employees that the vaccine contained HIV rather than the influenza vaccine. He reported that when employees asked why the restaurant was participating in the influenza vaccination program, he responded that it was because they were involved in a study.

Outcomes

A total of 428 employees responded to the pre-intervention survey and 305 employees responded to the post-intervention survey (Table 1). Response rates to the pre-intervention and post-intervention survey were 73% and 55%, respectively. The demographic distribution of respondents to the pre-intervention and post-intervention surveys was similar. Approximately two-thirds of respondents were male. About 30% were Hispanic and the majority of the remainder were non-Hispanic whites. The population was relatively young, with about 60% under the age of 35 and no employees 65 years of age or older. The most prevalent level of education was "some college or tech school" and few employees reported that their education was "less than high school."

Vaccination were about 20 percentage points higher in the year of the intervention than the previous year, rising from about 26% to about 46% (Table 2). Differences in baseline rate by demographic characteristics have previously been described [Parrish]. Vaccination rates for both sexes were comparable at baseline and rose by approximately the same amount for men and women. Hispanics had a higher vaccination rate at baseline than non-Hispanic whites, but the intervention was equally successful in raising vaccination rates in both groups and the size of the difference between the groups remained relatively constant. Before the intervention, those with less than a high school education had a vaccination rate that was lower than that of those with higher levels of education, but after the intervention, they had among the highest vaccination rates.

The regression analysis, conducted with employee level data, showed that the intervention was associated with a significant increase in the likelihood that an employee was vaccinated. The odds ratio for vaccination comparing the intervention year to the previous year was 1.84 (95% CI 1.29, 2.64), adjusting for age, education, sex, ethnicity, management attitude, and employee baseline attitude. Employee attitude at baseline was also associated with the likelihood that an employee was vaccinated. A one-point increase in employee attitude score at baseline was associated with an odds ratio for vaccination of 1.50 (95% CI 1.38, 1.64) adjusting for the presence of the intervention, age, education, sex, ethnicity, and management attitude.

Approximately one-third of employees that were vaccinated at the workplace vaccination event received the influenza vaccination for the first time (Table 3). A total of 210 employees were vaccinated at workplace vaccination events. Using the management estimates of the total number of employees (582 in fall 2012 and 638 in winter 2013) as a denominator indicates that approximately 33% to 36% of employees were vaccinated at workplace events. The range allows for the fact that the total number of employees at the time of the intervention likely fell between the fall and winter estimates.

Offering free influenza vaccination onsite resulted in a modest shift away from vaccinations occurring in doctors' offices (Table 4). Before the intervention, 16% of employees were vaccinated in doctors' offices. In the intervention year, this decreased to 6%. The percent of employees vaccinated at drugstores or grocery store pharmacies and

at other locations remained relatively constant before the intervention and in the intervention year.

We observed an improvement in norms associated with the intervention, but little or no change in knowledge and attitudes. There was a large increase positive responses to the norms measure, agreement that "most of my coworkers got the flu shot." Knowledge levels about the flu shot, including whether it is effective and whether it causes the flu, did not change before and after the intervention. Attitudes towards the flu shot also remained constant.

At the restaurant level, there was wide variation in the size of the difference in vaccination rates among employees before and after the intervention (Table 5). Five restaurants had large vaccination rate increases, ranging from 26 to 46 percentage points, while six had small vaccination rate increases, ranging from 2 to 14 percentage points. The pre-intervention vaccination rate, mean employee attitude score at baseline, employer attitude score, change in percent of employees that were male, and percent of employees with vaccination available during their work hours did not seem to fully explain these differences. However, some of these variables may partially explain the variation. Employers with the two lowest employer attitude scores were in the lower half of the distribution of change in vaccination rates. Though the other three employers in the lower half had high scores, two of these were found to have negative attitudes based on comments made during their interviews, as described above. The remaining employer in the lower half of the distribution in change in vaccination rates had a positive attitude

based on both measures, but had the highest pre-intervention vaccination rate. This employers' pre-intervention rate was about five points above the next highest employers' pre-intervention rate and there may have been less room for improvement in vaccination rate at this site. However, not all employers that experienced relatively small improvements in vaccination had low pre-intervention vaccination rates.

Resource Investment

Employers' time investment on the intervention was modest. Managers/owners spent an average of two hours and forty minutes on intervention activities, including promoting vaccination and planning and hosting the vaccination event. Based on the salary range of $45,000 to $90,000 reported by owners/managers, this time investment equates to a cost of between $60.00 and $120.00, depending on the manager's salary. The total cost of providing onsite vaccination, including the vaccine and administration, was approximately $500 to $600, with vaccination for an individual costing about $25. The large majority of employers felt that they amount of time they invested was reasonable or very reasonable.

DISCUSSION AND CONCLUSION

We found that evidence-based practices for increasing vaccination rates among employees can be successfully implemented in the restaurant setting. The combination of providing free influenza vaccination at the workplace and promotion by management

increased vaccination rates among restaurant employees. Implementation of the intervention required relatively modest resource investment for restaurants.

The intervention is noteworthy not only because it succeeded in increasing vaccination rates, but because it was equally successful in changing a health behavior across demographic subcategories and eliminated disparities in vaccination rate by education level. In the year before the intervention, Hispanics had a vaccination rate that was slightly higher than non-Hispanic whites and the size and direction of this difference remained relatively constant after the intervention, with vaccination rates for both groups rising by approximately the same amount. This is a particular achievement in the restaurant setting because many of the Hispanic employees were Spanish-speaking, increasing the challenge of reaching them with the intervention. Regarding disparities by education level, before the intervention, employees with lower educational attainment were less likely to have been vaccinated than those with higher educational attainment. However, after the intervention, this relationship was reversed, with employees with lower educational attainment having a larger increase in their vaccination rate and ultimately the higher vaccination rate. One possible explanation is that those with less education were more impacted by access barriers to vaccination, and therefore more greatly affected when these barriers were removed. Those with less education may also have been more motivated to obtain the protective benefits of vaccination because they were less able to afford illness and missed work than their more educated colleagues if those with more education had greater financial resources.

Increased access was an important factor in increasing vaccination rates, though it was not sufficient to produce consistent increases in vaccination rates across restaurants. Increased physical and financial access were the core components of the intervention and many restaurants experienced a large increase in vaccination rates associated with the intervention. However, while improved access was a vital component of the intervention, it does not seem to be sufficient to increase vaccination rates. While there were small differences in implementation of the improvements in access, all restaurants made free influenza vaccination available onsite. They also all conducted some communication to employees about the vaccination event. However, despite the relatively consistent improvement in access across restaurants, we observed large differences in the success of the intervention across restaurants. This suggests that the success of an access-based workplace intervention can be thwarted at the local, or restaurant level.

We observed variation in the success of the intervention in increasing vaccination rates by restaurant that we were only partially able to explain. We found no single factor that fully explained the bi-modal distribution of the change in vaccination rates. There may have been a factor or factors that differed among restaurants that we did not identify. However, for four of the five employers in the lower half of the distribution of change in vaccination rates, management attitude may have played a role in limiting the effectiveness of the intervention. If managers have a poor attitude towards influenza vaccination in general or employee influenza vaccination, they may consciously or unconsciously pass their views on to employee, lower the probability that employees will

be vaccinated. The low attitude scores of two employers that experienced small changes in vaccination rates suggests that this effect may have been at play at their restaurants.

For the two employers with the smallest change in vaccination rates, while employer attitude scores were not low, negative attitudes were expressed during interviews. The employer with the smallest change in vaccination rates was also the only employer that held the vaccination event on a day other than Friday or Saturday and the one that included incorrect date information on their promotional posters. Their overall attitude towards vaccination may have impacted their implementation of the intervention, thereby impacting the effectiveness of the intervention in two ways. None of the employers in the upper half of the vaccination change distribution expressed the same views and the lowest attitude score in the upper half of the distribution was 15.

There was one exception to the generally negative attitudes of managers in the lower half of the distribution, an employer with a high attitude score and no negative attitudes observed during the site-audits or interview nonetheless had a small change in vaccination rate. This employer had the highest pre-intervention vaccination rate, which may have minimized the opportunity for improvement. Alternatively, an unobserved factor may have impact vaccination rate change at this restaurant. Unobserved factors such as employee opinion leaders may have influenced the effectiveness of the intervention at this restaurant as well as at others.

The resource investment required to implement the intervention was modest, particularly in the context of the large potential benefits for employers and employees. Employers overall impression was that implementing the intervention was not overly burdensome. Managers felt that the anticipated benefits were worth their investment. The cost of managers' time spent undertaking promotion activities, planning, and hosting the vaccination event, was a relatively small portion of the total intervention costs. However, vaccination is relatively inexpensive and the total cost of implementing the program is anticipated to be manageable for most restaurants, given the anticipated cost-savings associated with decreased absenteeism and presenteeism. One manager estimated that the cost to his restaurant when an employee misses a night of work is approximately $100. Given that the total cost of providing the onsite vaccination event was approximately $500 to $600, and that promotion added a cost of $90 on average, vaccination programs would need to prevent six or seven days of employee absenteeism for employers to break even. As employees with influenza can miss multiple days of work and the prevalence of influenza in the adult population, employers could easily reach this point, even in the absence of a workplace outbreak. However, one challenge to sustaining the intervention is that it requires an upfront investment and that the payoff can vary by year, depending on the severity of the influenza season.

Our study has several limitations. One concern is the difference in response rate between the pre-intervention and post-intervention employee surveys. Two restaurants had particularly low post-intervention survey response rates, lowering the overall post-intervention survey response rate. However, the demographic similarity of the

respondents to the two surveys reduces the chance that this was a large source of bias. Additionally, removing survey responses from these two restaurants from the analysis resulted in no change to the overall estimate of the post-intervention vaccination rate, which also reduces concern about bias. Another limitation is the study's generalizability. Specifically, our results may not apply to all restaurants, as the participating restaurants were all located in a particular geographical area, and were generally of the same style and in a similar price range. Out finding may not apply to small restaurants, where the intervention would be more difficult to sustain because vaccination vendors often require clients to purchase a minimum number of vaccinations, often between 15 and 25. Additionally, the investment for restaurants participating in the intervention was limited to time spent on implementation, as the cost of providing onsite vaccination was covered as part of their participation in the study. If restaurants were to adopt intervention practices in the future, the investment required would be greater, as it would include the cost of the vaccination event. The cost of vaccination event is not prohibitive, but it would require restaurants to make an upfront investment in anticipation of future cost savings.

Restaurants should consider implementing evidence-based practices to increase influenza vaccination rates among their employees. We found that these practices could be successfully implemented in restaurants, though the increase in vaccination rates varied by restaurant. Improved access was associated with a large increase in vaccination rates at some restaurants, but was not sufficient to produce a large change across all restaurants. Managers' time investment on the intervention was small and the total cost of

the intervention was not large, especially given the likelihood of decreased risk of illness and missed work. With careful consideration of how to overcome the logistical challenges associated with promoting and holding a worksite vaccination event in the restaurant setting, restaurants can increase vaccination rates among their employees with a very modest time investment.

Tables

Table 1: Demographics of Restaurant Employees Participating in Pre-Intervention and Post-Intervention Surveys

		Pre-Intervention (2011-2012)	**Post-Intervention (2012-2013)**
Variable	**Category**	**Percent of sample* (N)**	**Percent of sample* (N)**
Sex	Male	65.9 (282)	70.8 (216)
	Female	33.2 (142)	29.2 (89)
Race/Ethnicity**	Non-Hispanic White	60.5 (259)	52.8 (161)
	Hispanic	27.6 (118)	28.9 (88)
Age	18-24	22.9 (98)	17.7 (54)
	25-34	40.7 (174)	40.3 (123)
	35-44	22.7 (97)	26.2 (80)
	45-54	11.4 (49)	11.1 (34)
	55-64	2.1 (9)	4.6 (14)
Education	Less than high school	6.5 (28)	5.9 (18)
	High school or GED	22.2 (95)	21.6 (66)
	Some college or tech school	44.4 (190)	41.6 (127)
	College graduate	26.4 (113)	30.5 (93)
Health Insurance Status	Insured	--	62.2
TOTAL		**100 (428)**	**100 (305)**

Table 2: Percent of Restaurant Employees Vaccinated Pre-Intervention and Post Intervention, by Demographic Group

		Percent vaccinated	
Variable	**Category**	**Pre-Intervention (2011-2012)**	**Post-Intervention (2012-2013)**
Sex	Male	26.6	45.4
	Female	25.4	46.1
Race/Ethnicity**	Non-Hispanic White	23.9	44.1
	Hispanic	31.4	53.4
Age	18-24	30.6	38.9
	25-34	27.6	37.4
	35-44	18.6	57.5
	45-54	28.6	50.0
	55-64	22.2	64.3
Education	Less than high school	17.9	50.0
	High school or GED	28.4	53.0
	Some college or tech school	27.4	43.3
	College graduate	24.8	41.9
TOTAL		**26.2**	**45.6**

Table 3: Comparison of Pre-Intervention and Post-Intervention Vaccination Location Among Restaurant Employees

		Pre-Intervention	Post-Intervention
		Percent	Percent
Unvaccinated		73.8	54.4
Vaccinated	Worksite	0.7	34.1
	Drugstore or grocery store pharmacy	7.8	5.0
	Doctor's office or medical clinic	16.2	6.3
	Don't know	0.0	0.3
	Other	0.5	0.0
Total		100.0	100.0

Table 4: Vaccination History and Promotion Methods Reported by Employees Vaccinated at Workplace Vaccination Events

Prior Vaccination Status (n=210)	Percent
First time receiving flu shot	35.2
Received flu shot in past, but not last year	32.4
Received flu shot last year	25.7
Don't know	6.7
TOTAL	100.0
Promotion Method	
Poster	34.1
E-mail announcement	27.5
In-person announcement	31.3
Paycheck insert	2.0
Just walked by (unplanned)	8.5
Other*	8.5
TOTAL	100.0
Scheduled for work	
Day of clinic	89.0

Table 5: Difference in Vaccination Rates Before and After Promotion Intervention and Selected Outcomes, by Restaurant

Restaurant	Difference in Vaccination Rate (percentage points)	Pre-Intervention Vaccination Rate	Baseline Employee Attitude Score	Management Attitude Score	Percent with Vaccinations Available During Work Hours
A	46.0	27.3	15.1	18	100.0
B	45.9	29.1	15.8	15	83.3
C	32.1	26.2	16.0	18	89.8
D	32.1	25.0	16.0	19	57.1
E	26.3	25.0	15.8	20	89.5
F	13.6	30.0	16.2	19	77.4
G	13.1	23.3	16.5	10	81.8
H	9.2	20.8	15.5	11	90.0
I	6.3	38.7	16.0	19	61.1
J	2.6	32.2	15.0	19	82.6
K	1.5	16.7	15.0	16	87.5

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Chapter 5: Conclusion

In Chapter 2, I showed that large employers are positioned to contribute to increasing low adult influenza rates. Employers were motivated to offer influenza vaccination in the workplace. However, they had not considered the potential of their vaccination programs to increase vaccination rates among their employees. Their focus was on offering vaccination, not on increasing the likelihood that their employees were vaccinated. They have the potential to help raise Tdap rates in the future, although they are not currently aware of the threat of pertussis to the health and productivity of their employees. Overall, I found that there is room for employers to continue to develop their vaccination programs in order to maximize the impact of their programs on vaccination rates.

Chapter 3 described the prevalence of employers' use of vaccination promotion practices. Employers' use of promotion practices was generally high, but there was room for improvement in the use of a number of practices. A large majority of employers offered onsite influenza vaccination and it was generally free of cost for employees. On average, employers offering onsite vaccination used about 65% of the evidence-based practices that they might have used. There was particular room for improvement in making vaccination available at all worksites, offering incentives, and encouraging managers to get vaccinated as an example for employees. The practices with the strongest evidence base for effectiveness in increasing vaccination rates, offering vaccinations onsite and making them free for employees, were well-used. Given the generally high use of evidence-based vaccination promotion practices in the workplace but the low influenza

vaccination rates among working-age adults, novel approaches to promoting vaccination in the workplace may need to be developed.

In Chapter 4, I demonstrated that evidence-based practices for increasing vaccination rates among employees can be successfully implemented in the restaurant setting. Increased access, together with management promotion of vaccination, increased average employee vaccination rates. The intervention was equally successful across race/ethnicity categories and decreased vaccination level disparities related to education level. However, we observed variation in the success of the intervention in increasing vaccination rates among the restaurants that we were not fully able to explain. Approximately half of the participating restaurants were very successful in increasing vaccination rates, while the change in rates among other restaurants was relatively small. Only a modest resource investment was required by restaurants to implement the intervention.

Considered collectively, these papers provide several lessons regarding workplace-based vaccination programs. First, improving physical access to vaccination is an important practice for increasing vaccination rates, but is underutilized by employers. There is a strong evidence-base for the impact of making vaccination easy and convenient on vaccination rates. A large majority of large employers offered onsite vaccination and all restaurants in the pilot study did so as well. However, making vaccination easy and convenient for employees cannot consist merely of arranging an onsite vaccination event without thought to whether it will be truly accessible for all employees. One of the least

frequently used strategies among large employers was making vaccination available to employees at all of their workplaces. This means that for many employees, vaccination was not available at the workplace, although their employer recognized the importance of offering it to at least a portion of employees. In the case of the pilot intervention, making vaccination accessible to all employees meant carefully considering shift schedules and nightly variations in staffing volume. Making vaccination easy for all employees to access requires thought and planning and may require a larger investment, but employers can expect to experience healthier employees and reduced productivity losses.

Second, improving physical access and financial access is not sufficient for increasing vaccination rates. All restaurant employees had access to free vaccination at their worksites. Onsite availability and free vaccination are the two promotion practices with the greatest evidence of effectiveness, and their success has been well-documented in workplace-based intervention studies. Yet, while the intervention was extremely successful at some restaurants, vaccination rates scarcely changed at others.

Improvements to physical and financial access are important to increasing vaccination rates, but they are not necessarily sufficient. Factors at the level of individual employers or specific workplaces can negate their impact, as demonstrated by the relative lack of change in vaccination rates among some restaurants. The specific factors that may influence success in a particular workplace merit further study. Employer attitudes appeared to be important. Other factors that were not measured, such as the presence of

employee opinion leaders with negative attitudes about vaccination, could also have influenced outcomes.

The mixed success of these strategies may relate to the fact that low vaccination rates among working-age adults persist in spite of employers' high use of many promotion strategies. While employers may be implementing free onsite access to vaccination rates, factors at the workplace level may be interfering with the effect of these practices on vaccination rates. As described in the qualitative study, employers had generally not given thought to how to increase their vaccination rates, so it is likely that they had not identified the factors limiting the effectiveness of their programs.

Workplace vaccination is an approach to improving public health that is well worth the investment, for both employers and for the general public. Certain types of employers could experience particular benefits associated with increasing vaccination rates among their employees. For instance, employers whose employees that work closely together, those with employees in demographic groups with low vaccination rates, and those that can not easily replace an employee that is out sick could experience especially large benefits from increasing vaccination rates among workers. The restaurant industry fulfills all of these criteria, as do other service industries and the retail industry, among others.

Society also stands to benefit from workplace vaccination programs. Vaccination of employees that are highly exposed to the public in the course of their work, such as healthcare workers, can help to protect not only the employees but also the members of

the public to whom they are exposed. Vaccination programs are already well established in the healthcare setting, though room for improvement remains in vaccination rates among healthcare employees. The next step to increasing the societal benefits of workplace vaccination programs is to direct dissemination efforts towards other occupations with high levels of exposure to the public, such as restaurant and retail employees.

Current evidence-based strategies have the potential to increase vaccination rates, even in a resource-limited environment. Though vaccination rates remain low despite large employers high use of some evidence-based practices, we may not need to completely re-think our approach to workplace-based vaccination promotion. The post-intervention vaccination rate of nearly 75% at several restaurants participating in the pilot hints at what it is possible to achieve with workplace-based vaccination programs when all of the pieces fall into place.

However, more research is needed to identify exactly what these pieces are and the strength of the effect that they exert on vaccination rates. Convenience and cost are certainly important, and local-level management attitudes are likely important as well. Other local level factors may also influence success. Until strategies are developed that can transcend the effect of these local level factors, we can expect to see variation in the outcomes of vaccination programs. This is a shame, because it dilutes their overall impact and the return on investment in workplace vaccination programs. Research into

developing programs that are more resistant to this effect could help to ensure more consistent results across programs.

While it is not realistic to imagine that adult influenza vaccination rates will ever reach 100%, workplace vaccination programs can provide an opportunity for vaccination for those that might not seek it out on their own. Some prefer not to get vaccinated, and increasing access or attempting to change knowledge, attitudes, or norms are unlikely to change their behavior. In the pilot, 25% of employees remained unvaccinated even in the most successful restaurants. However, for nearly 50% of the employees at those restaurants, the program was sufficient to change their vaccination behavior. Based on their past behavior, these employees were not willing to invest in a trip to the doctor's office or a community vaccination location to obtain influenza vaccination. However, when influenza vaccination was available to them at their workplace for free and promoted by their employer, they chose to get vaccinated.

Workplace-based vaccination programs have the potential to make a major contribution to increasing population influenza vaccination rates. Tdap vaccination may not be as well suited to the workplace setting, but some employers may wish to consider making it an option for employees. Workplace vaccination programs succeed because they decrease the barriers to vaccination and make it easier to choose to get vaccinated. Employers should consider how to maximize the impact of their programs by making vaccination as accessible as possible for their employees. The potential impact of widespread, well

implemented workplace-based influenza programs are substantial and have not yet been fully realized.