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Influenza Vaccine Demand: The Chicken And The Egg

Issue Brief

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This issue brief is one of five produced for the Assistant Secretary for Planning and Evaluation (ASPE) by RTI International. The contents of these briefs is based upon research involving a review of literature including peer-reviewed journals, media reports, and other non-referenced sources including those identified using the World Wide Web search engine Google as well as confidential interviews with 30 key informants representing influenza vaccine manufacturers, wholesalers, community immunizers, state and local public health officials, and other experts. The other briefs in the series are

- *Influenza Vaccine Economics*
- *Influenza Vaccine: Who Buys It and Who Sells It*
- *Influenza Vaccine Manufacturing*
- *Influenza Vaccine Overview: Summary and Assessment.*

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INFLUENZA VACCINE DEMAND: THE CHICKEN AND THE EGG

ISSUE BRIEF

1. Introduction

1.1 Key Issues

The demand for influenza vaccine is a critical component in its availability. Unlike childhood vaccines whose demand is relatively simple for vaccine manufacturers to predict, influenza vaccine demand is more uncertain. As one expert explained,

> *… we don't have … signals in society that tell us what the size of the market is going to be [for influenza vaccine]. We have that for all of the pediatric vaccines simply because demographers can tell us what the birth cohort is going to be … Anybody who knows what that birth cohort is 5 years from now … knows the number of doses of vaccine you're going to have to give … We don't have that kind of signal for the demand of flu [vaccine].*

Meanwhile, because influenza vaccine is a seasonal product,[1] vaccine manufacturers are reluctant to produce more influenza vaccine than they believe they can sell in a given season.

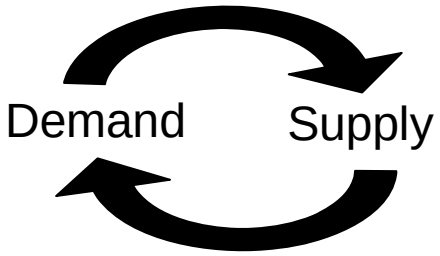
> *… flu vaccine … changes every year and you throw out stock that [is unused at the end of a season]. So that's why people try to manufacture just what they think they can sell every year. You can't sell it next year. If you [are] making measles vaccine you can stockpile. You can't do that for flu vaccine. So that's behind the idea of demand driving supply.*

Although influenza vaccine demand and supply are intricately linked (Figure 1), it appears that demand is the "tail that wags the dog." However, regardless of whether demand or supply is more important, the reality is that, to protect the public's health—especially those at increased risk for complications from influenza—demand for influenza vaccine is key to increasing the overall supply.

[1] As detailed in the companion brief, *Influenza Vaccine Manufacturing*, influenza vaccine is generally administered annually between October and December.

Annually, influenza causes an average of 36,000 deaths (Thompson et al., 2003) and 226,000 hospitalizations (Thompson et al., 2004). Despite such sobering statistics, immunization rates for those at high risk for complications and with health insurance for the immunization

Figure 1. Influenza Vaccine Supply and Demand Interrelationship



(e.g., Medicare recipients)—a group many would think the most likely to be immunized—are not immunized at levels that meet objectives such as *Healthy People 2010* (Centers for Disease Control and Prevention [CDC], 2000).[2]

Many different factors and stakeholders affect demand for influenza vaccine. One expert said, " … a potpourri of administrative [issues], financial incentives, accountability using the regulatory things such as contracts … " will affect demand. As we explain in detail later in this issue brief, factors that can affect influenza vaccine demand include

- price of vaccination
- convenience
- knowledge of influenza's impact
- severity and timing of influenza season
- demographics (race, ethnicity, socioeconomic status)
- severity of previous year's influenza season
- perception of need
- provider's recommendation

A variety of stakeholders are also involved. These stakeholders work independently and together to affect demand for influenza vaccine. The stakeholders that are involved in increasing influenza vaccine demand include

- federal government
- state and local governments
- academia
- health insurance companies
- vaccine industry (manufacturers, distributors)

[2] *Healthy People 2010* established the annual influenza vaccination goal of 90 percent coverage for noninstitutionalized adults ≥ 65 years of age. In 2003, 65 percent of adults ≥ 65 years of age reported receiving an influenza immunization in the previous year (CDC, 2005b).

- health care providers
- community immunizers
- advocacy organizations
- wholesalers
- professional societies
- consumers

1.2 The Purpose of This Issue Brief

This brief reviews the issues associated with influenza vaccine demand, including the relationship between influenza vaccine demand and supply and how demand may be seen as the linchpin in the influenza vaccination system. Factors that affect demand are reviewed, as are stakeholders' roles and responsibilities in increasing demand for influenza vaccine.

2. The Critical Nature of Demand in Influenza Vaccine Supply

Due to a myriad of factors detailed in the companion brief, *Influenza Vaccine Manufacturing*, influenza vaccine manufacturers produce what they predict they can sell in a given influenza season. Influenza vaccine is unlike other vaccines or pharmaceuticals because, among other reasons, its functional shelf-life is only a few months (typically, October through December in a given year). Because unused influenza vaccine generally cannot be returned to the manufacturer (a change that has taken place over the past few years), the health care providers or wholesalers that have vaccine at the end of the influenza season may suffer a financial loss. Given the negative impact of such a situation, wholesalers, purchasers, and health care providers are reluctant to order more than they think will be used in a given season. As a result, an unexpected increase in demand for influenza vaccine by the public can cause shortages (perceived or actual).

2.2 Factors that Affect Demand

Various determinants and conditions cultivate high or low levels of demand for influenza vaccine. The United States has seen volatile fluctuations in demand over the past decade; however, the market continues to expand and demand continues to increase. A primary driver of influenza vaccine demand is annual recommendations made by the Centers for Disease Control and Prevention (CDC) regarding who should receive the vaccine. The Advisory Committee on Immunization Practices (ACIP) is a 15-member panel of immunization experts in medicine, immunology, and public health that advises CDC and develops written recommendations for routine vaccine administration, including influenza vaccine. The CDC director has the discretion to adopt or reject the ACIP recommendations. ACIP recommendations regarding who ought to receive influenza vaccination have broadened over the past decade. For many years, the initial recommendation was for those 65 years of age or older and those with chronic health conditions, who were more likely to develop complications from influenza, to receive an annual influenza

immunization. As shown in Table 1, ACIP has broadened its recommendations in recent years to include other target groups.[3]

Table 1. Changes in ACIP Influenza Vaccination Target Groups: 1999–2000 through 2005–2006 Influenza Seasons

Target Group	1999–2000	2000–2001	2001–2002	2002–2003	2003–2004	2004–2005	2005–2006
≥ 65 years of age	X	X	X	X	X	X	X
Chronically ill	X	X	X	X	X	X	X
Pregnant[a]		X	X	X	X	X	X
≥ 50 years of age		X	X	X	X	X	X
Household contacts of high-priority persons	X	X	X	X	X	X	X
Health care workers		X	X	X	X	X	X
6 to 23 months of age						X	X

[a] Those who will be in the second or third trimester of pregnancy during influenza season. As of 2004, annual vaccination was recommended for all pregnant women, if they were pregnant during influenza season.

Sources: ACIP, 1999; ACIP, 2000; ACIP, 2001; Bridges, Fukuda, Uyeki, Cox, & Singleton, 2002; Bridges et al., 2003; CDC, 2005b; CDC, 2005c; Harper, Fukuda, Uyeki, Cox, & Bridges, 2004; Harper, Fukuda, Uyeki, Cox, & Bridges, 2005.

In 2000, ACIP broadened its recommendations to include pregnant women who would be in the second or third trimester during influenza season, health care workers, and those 50 years of age or older (Advisory Committee on Immunization Practices [ACIP], 2000). In 2004, ACIP further broadened its recommendation to include children 6 through 23 months of age (ACIP, 2004). CDC estimates that the total number of those currently included in all the target groups is 183.3 million (CDC, 2005b).

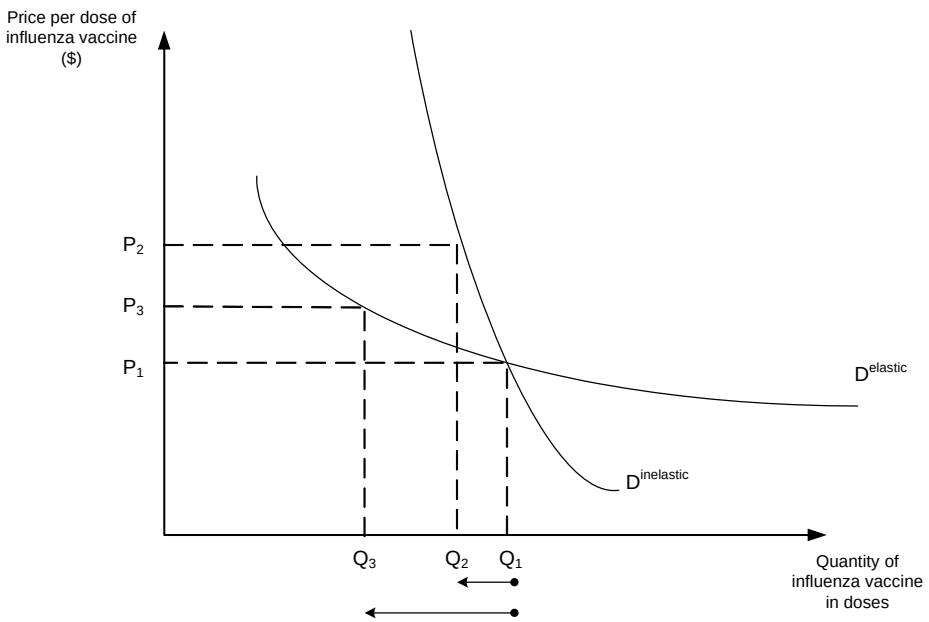
As is true for so many other phenomena, no one factor fully predicts demand. In addition to an expansion in the market and increase in demand, price elasticity, convenience, knowledge of influenza's impact, severity and timing of the influenza season, demographics, severity of the previous year's season, provider's recommendation, and perception of need are additional important factors that affect demand. The rest of this section addresses the issues that have influenced demand in previous seasons.

[3] Priority groups include persons 65 years of age or older, persons of any age with chronic diseases, pregnant women, children 6 to 23 months of age, health care personnel, and household contacts of previously listed groups. Target (or targeted) groups include priority groups plus healthy adults 50 to 64 years of age.

2.2.1 Price

The field of economics tells us that price is often a key to predicting quantity demanded. Understanding the impact of influenza vaccine prices on demand for the vaccine requires an understanding of other factors that affect demand for the vaccine (see Figure 2). First, the risk associated with influenza is not the same for all persons. For most people, influenza means a week in bed feeling miserable; for some it is life threatening. For those at high risk of complications, influenza vaccine is perceived as more necessary. Therefore, we would expect a willingness to pay a higher price. The second factor is that influenza vaccine is a covered benefit for most of those who are at highest risk, notably Medicare beneficiaries 65 years of age or older. An increase in cost would not affect these persons. Such a situation is described in economic terms as less elastic: if the price increases, manufacturers would see a relatively small decrease in the number of doses demanded, simply because the price increases would not be passed along to Medicare beneficiaries.

Figure 2. Price Elasticity of Demand for the Influenza Vaccine



With elastic demand ($D^{elastic}$), a small increase in price (P_1 to P_3) will cause a large reduction in quantity demanded (Q_1 to Q_3). With inelastic demand ($D^{inelastic}$), a large increase in price ($P_1$to P_2) will cause only a small decrease in quantity demanded (Q_1 to Q_2).

Alternatively, those at lesser risk have more elastic demand, meaning that if price were to increase, these consumers would demand significantly less influenza vaccine. A recent article in the journal *Health Affairs* suggests that the price in the influenza vaccine market is set by the "marginal consumer," which means that those with greater price elasticity of demand will

ultimately set the price. This marginal consumer is the healthy young person who does not perceive the influenza vaccine as a necessity (Pauly, 2005). However, in our research, we did not find any evidence to confirm this assertion. Our interviews with influenza vaccine manufacturers and other experts indicated that the way in which influenza vaccine prices are set is proprietary and may or may not reflect economic theories regarding pricing.

We know people do respond to pricing, but not how much. People who believe that getting an influenza vaccine is important may exhibit little response to changes in price. This may be true for Medicare beneficiaries or others in priority groups for influenza vaccination. Those who are not in the priority groups—notably healthy children and adults—may be more responsive to price; $10 vs. $50 could be an important price difference for those without health insurance coverage. For these price-sensitive subgroups, a small price increase would reduce their demand for vaccine.

Responsiveness to vaccine prices may also vary across different income groups. Among poor and uninsured people, price is a significant barrier. Prices for the influenza vaccine may already be set high enough to discourage them from purchasing the vaccine. A recent review article reported that when vaccines are provided for free, coverage will increase by 10 percent to 30 percent among certain groups (Helms et al., 2005). However, it should be noted that for those 65 years of age or older with Medicare, influenza vaccination rates remain below goals established by *Healthy People 2010* (CDC, 2000).

In addition to the price of influenza vaccine itself is the cost of administration. Although the cost of one dose of influenza vaccine may be as little as $10, this is not generally the price paid by the person receiving the vaccine.

For-profit community immunizers with whom we spoke explained that they did not know the price at which consumers would opt not to be vaccinated. One community immunizer explained that it would set the retail price for influenza immunization at $25 for the 2005–2006 season. “I think people will still see a value in it. I’m hoping. But I don’t know where that point [where people would not get immunized because the cost is too high] is. It could be $24, and we’ll be in trouble.”

2.2.2 Convenience

Convenience is a necessary determinant of vaccination decisions, and the level of effort a consumer must put forth to get vaccinated is a key determinant in demand for influenza vaccine. Evidence suggests that the more convenient the vaccination process is, the more likely an

individual will be to get vaccinated. Less evidence suggests that people perceive influenza vaccine as hard to find—except during seasons in which there is a vaccine shortage. However, a person's *perception* of a shortage will also affect demand. If a patient perceives a large shortage, usually due to delays in delivery, the patient may make an early decision in October or November—the height of seasonal demand. If the vaccine is not available at that time, the patient will likely not be vaccinated (Nowalk, 2005). Timing will be discussed in following sections.

One's perception of convenience appears to depend on where influenza immunizations are provided. In a study conducted by researchers at the University of Pittsburgh in 2005, interviewers surveyed parents with children 6 to 23 months of age about their perceptions of the influenza vaccine. In this study, 83 percent of parents whose children received influenza vaccine said that it was easy to go to the child's doctor to get the vaccine; 79 percent of parents of unvaccinated children also said it was easy (Nowalk, 2005). Notice that these perceptions are among parents of young children who have frequent well-child visits.[4] Preventive health visits are much less frequent among adults. In fact, most adults do not have annual exams, but rather visit their physician only if they have acute or chronic illness. Although women do tend to comply with yearly visits to the gynecologist, vaccination in the gynecologist's office is not common (Helms et al., 2005).

Various attempts and interventions have been explored to increase vaccination levels. Organizational change, free vaccination, and gift incentives have been identified as effective measures to increase vaccination among adults (Briss et al., 2000). Some successful examples range from vaccination in nontraditional settings to provider-based approaches. Places such as work sites, grocery stores, pharmacies, shopping malls, and detention centers can effectively increase vaccination among groups that do not usually receive annual vaccination (Helms et al., 2005). Figure 3 illustrates how immunization in nontraditional sites is becoming more common.

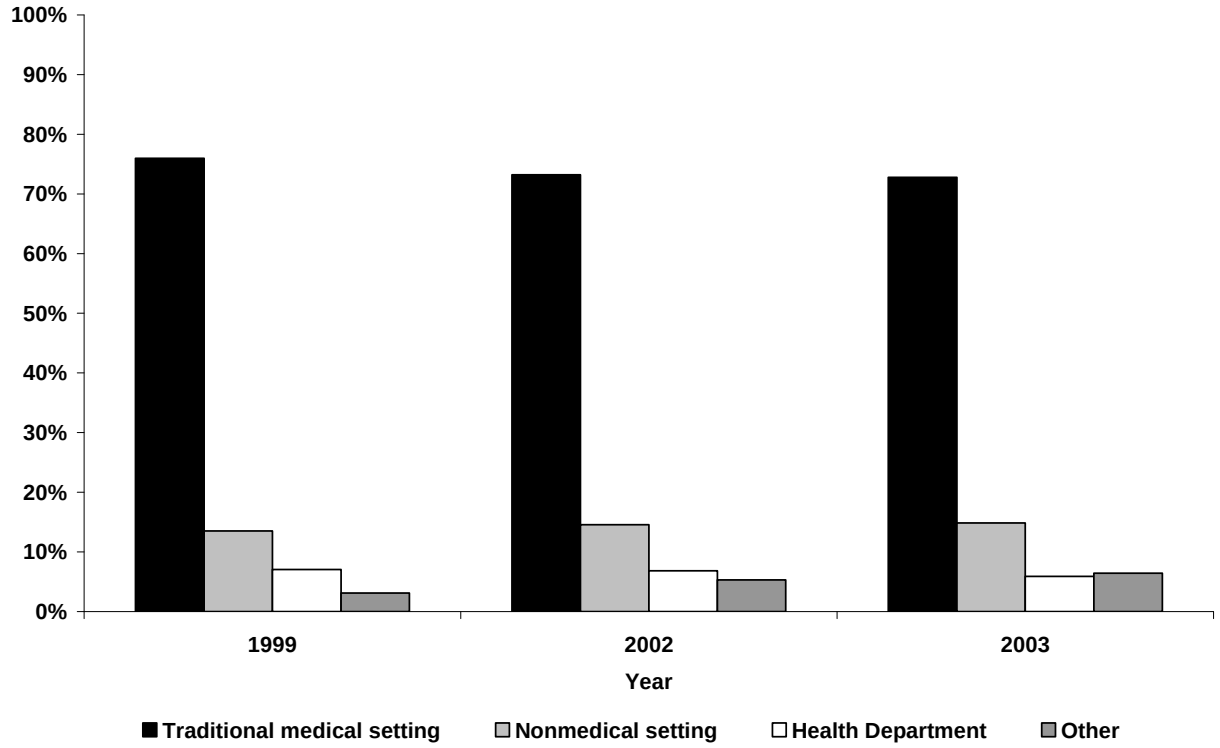
2.2.3 Knowledge of Influenza's Risk to Health

The public lacks an accurate understanding of how serious influenza can be. Although for most people infected, the illness results in feeling miserable for a few days; for some it can be life threatening. In a study by researchers at Harvard University, survey respondents were offered a multiple choice question about the number of deaths associated with influenza annually

[4] The survey was conducted following the 2002–2003 influenza season during which ACIP "encouraged" children 6 to 23 months of age to receive influenza immunization "whenever feasible."

(DesRoches, Blendon, & Benson, 2005). Given five possible options, only four percent selected the correct answer. More than half (63 percent) underestimated the number, and only 8 percent

Figure 3. Site of Vaccination of Persons 65 Years of Age or Older



Source: Compiled from Behavioral Risk Factor Surveillance System survey data (CDC, 1999, 2002, 2003).

overestimated the number. This may lead one to believe that if the public had a better sense of the risks associated with influenza—not only to themselves but to the public as a whole, demand for influenza vaccine would increase. However, the same study asked respondents to identify the means that are "very effective at preventing you from getting sick with the flu." Fewer than half (44 percent) noted influenza vaccination. Respondents reported the belief that hand washing, avoiding those with influenza, and avoiding touching one's eyes, nose, or mouth were more effective at preventing influenza (72, 64, and 52 percent respectively). Key informants echoed this concern about the public's understanding of influenza and immunization:

> *There has to be a better understanding, just in terms of the vaccine and what it can do. Last year a lot of people didn't get vaccinated and we didn't have a bad flu year so people are saying, 'So why should I get vaccinated?'*

Many interviewees mentioned the idea of public education to promote awareness of influenza's risk to the public health and the efficacy of influenza vaccine. As one influenza vaccine manufacturer said,

> *[We need] some sort of mass education, which would include CDC-based or state health department-based advertising—"go get your flu vaccine," "protect yourself from a serious infectious disease that could kill you." Not too polite words. People need to be hit over the head.*

2.2.4 Severity and Timing of the Influenza Season

The severity and timing of the influenza season can also affect the demand for influenza vaccine. Years in which influenza is perceived to be particularly severe or occurs early (around November or December) are more likely to see increases in vaccine demand. One recent example occurred during the 2003–2004 influenza season—most notably in Colorado. The worries started in Colorado when the influenza season began early and deaths were reported among children, suggesting an unusually virulent illness. In early November, the first reports of high absenteeism in schools were made available. By the end of the month, Colorado's vaccine locator Web site had 2.3 million hits. In December, the Web site received 2.9 million hits. In January, the demand began to diminish rapidly (Gershman, Smith, & Trefren, 2004). A health official explained,

> *… 2003–2004 … was the first year we used all of the [influenza] vaccine. We never [had] used all of the influenza vaccine supply until that year, and people think we had a shortage of vaccine. But no, we actually used the vaccine. If you have a severe flu season, you're going to increase demand for sure.*

CDC ultimately described the 2003–2004 season as "moderately severe" (Mitka, 2004). By May 31, 2004, a total of 152 influenza-associated deaths occurred among those 18 years of age or younger (CDC, 2005a). Whether this number represents a substantially higher rate than in previous influenza seasons is difficult to ascertain because no similar data were collected previously.[5] However, one model estimated that between 1990 and 1999, approximately 92 influenza-related pediatric deaths occurred among children younger than 5 years of age (Thompson et al., 2003). Given these data, it does not appear that the 2003–2004 influenza season had more influenza-associated pediatric deaths than usual.

[5] The Council of State and Territorial Epidemiologists (CSTE) and CDC are working to implement a national notification system for influenza-associated pediatric mortality.

In seasons when influenza infections occur late, demand for vaccine tends to be low. Once potential vaccinees have made it far enough through the season, they are unlikely to get vaccinated, often assuming that if they have made it past January, the risk of infection is too low to warrant the effort to be immunized. However, the public is not entirely to blame for these late-season decisions. Health care providers also make similar assumptions. A recent article described why people do not receive influenza vaccines in December and January (Fishbein et al., 2005). Evidence suggests that providers cease recommendations and attempts to get their patients vaccinated at this point. With health care providers as key demand inducers, this could potentially lead to even lower vaccination levels. After December and January, the number of missed opportunities to vaccinate patients who are already in the office is high (Fishbein et al., 2005).

2.2.5 Demographics

An additional factor affecting demand for influenza vaccine is demographics—most notably race. Among all persons 65 years of age or older, and those living below the poverty level, whites are more likely than blacks or Hispanics to have received an influenza vaccination (CDC, 2003). (See Table 2.) Hebert, Frick, Kane, & McBean (2005) report that the explanation for these disparities is that whites are more likely to initiate visits for influenza immunization. Such data indicate the need to address these racial disparities. Data from Veterans Administration clinics suggest that disparities can be eliminated by health care providers recommending influenza immunizations to their patients more directly (Zimmerman et al., 2003).

Table 2. Influenza Vaccination Rates by Race

	White	Black	Hispanic
65 years of age or older	66%	48%	54%
Below poverty level	57%	49%	48%

Source: National Health Interview Survey 2000 and 2001 combined (as cited in CDC, 2003)

2.2.6 Severity of Previous Years' Influenza Season

Manufacturers and consumers alike assess the risks and benefits of production or consumption, which is usually decided before the influenza season begins. Just as manufacturers are making production decisions before the upcoming influenza season, potential vacinees are making similar consumption decisions based on their perception of the previous season. For example, if an individual perceived the previous influenza season as severe either because they

or someone they knew got sick, or due to media attention, this individual is more likely to get vaccinated than in the absence of these events. The individual will interpret these events as risk and weigh the cost and benefit of the vaccine. Especially if perceived risks are high, the benefits will far outweigh the costs involved in getting the vaccine. However, unlike manufactures, potential vacinees may reevaluate their perception of risk during a given influenza season and conclude that the risk is higher than they initially thought. Unfortunately, when such persons change their mind, they may do so too late in the season to obtain influenza vaccination.

From the manufacturer's perspective, once a season has finished, the company will begin to predict demand for the following season. Demand for the previous season's vaccine is very important in determining production levels for the upcoming season. For example, ignoring Chiron's unanticipated absence from the 2004–2005 influenza vaccine makers, the United States anticipated approximately 100 million doses due to the apparent increase in demand in the 2003–2004 season. On the contrary, Charatan (2004, p. 8) said that, "The [2003–2004] vaccine shortage was the result of poor demand in previous years, leading to overproduction and subsequent loss to the manufacturers. Only 83 million doses of the vaccine were available, whereas an estimated 185 million doses were needed."

Ultimately, it is the previous year's demand that helps predict the next year's demand. One health official put it bluntly,

> *I think if we have a severe flu season every year, that's a great way to increase demand because it's tangible. People can see the effects of influenza and actually take action on that, whereas if there's a mild flu season like the past year the demand isn't so high so it's not such a problem.*

As this description does not reflect the nature of the situation, what actually occurs are fluctuations in demand that are frustrating for advocates of influenza vaccination and disruptive for vaccine production. One interviewee summarized the true situation:

> *The concern I have for this [influenza vaccination] industry is what I see happening. We have a lesson from just a couple years ago [2000–2001]—the last time we had a shortage, actually they called it a delay—the following year was the problem. The problem was that the next year 20M doses went unused … People are fighting a 50M-dose battle for 2005 already. People have to see that each year is different. It's very reactionary. And we're talking about state government, county officials, even the CDC. I think the CDC is getting smarter about this all the time. They say, "You see one flu*

season; you've seen one flu season." My biggest concern in the short term is that people are playing last year's game or fighting last year's battle when we really need to see what this year's battle is …

2.2.7 Perception of Need

As explained earlier, the public has a poor understanding of the risks associated with influenza and the potential benefits associated with vaccination. Clearly, if the public perceived that they need influenza vaccine, demand would rise. Although the public may understand that those at increased risk for influenza should be vaccinated, exactly who falls into what risk groups is poorly understood.

As part of the Medicare Current Beneficiary Survey (MCBS),[6] Medicare beneficiaries 65 years of age or older were asked to state their reason for not getting an influenza shot for the influenza seasons between the years 1997–2002. Overall, the most common reason for not being vaccinated in the survey years was because respondents did not know the vaccine was needed. The second most common reason was that respondents believed that the vaccine itself could cause influenza (CDC, 2004).

This situation is exacerbated by what many have described as inconsistent messaging from ACIP and CDC. As one public health expert explained,

> *We definitely need to have consistent messages year to year. I realize that with the influenza vaccine supply situation, … this is not always doable but in the past years we've lost a lot of healthy people who would normally get their flu shots because we've asked them to step aside so much that our coalition actually is concerned that we've lost those people and there goes our demand for the flu vaccine because there're less people demanding it because they've been told, "It's not really that important. We've got to get it to the high-risk people first." That's how the message comes across to the public.*

In addition to inconsistent messages regarding who should be targeted—particularly when there is a shortage of vaccine—is the public's misconceptions concerning the influenza vaccine itself. "We don't get a good message out with influenza because people think that if they get sick it's the vaccine. They don't realize it's a killed vaccine." Many other people who become ill despite receiving an influenza immunization believe that the vaccine was ineffective. Such people do not understand that they may have an "influenza-like illness" (i.e., an illness with symptoms similar to those associated with influenza but not actually caused by the influenza

[6] The MCBS is a nationally representative survey conducted by the Centers for Medicare & Medicaid Services.

virus) or that the vaccine requires approximately 2 weeks to produce immunity (it is possible to become infected with influenza between the time the vaccine is administered and an adequate immune response is achieved). It is likely that such misconceptions could be corrected and demand increased by increasing and improving the information presented to the public.

> *When's the last time you saw an immunization message on Superbowl Sunday. If we had a public campaign we could forget ACIP recommendations. We create demand for $200 tennis shoes, why not a vaccine that could save your life? It's nuts. We don't go prime time. You could circumvent the problem [of public misunderstanding] with a clear message to the public. You create demand that way. That's what we do with everything else. Look at Viagra! We don't do that with influenza vaccine.*

2.3 Approaches to Increase Demand

Increased demand for the influenza vaccine may help to limit or eliminate shortages of the vaccine. If manufacturers expect the U.S. demand for influenza vaccine to grow, particularly growth coupled with less volatility in demand, they may feel less vulnerable to the risk of profit losses associated with having to throw out excess vaccines. Manufacturers may have less incentive to produce only the number of doses they believe can be sold. Growing demand may also encourage existing producers to expand production and may provide incentive for new producers to enter the influenza vaccine market. Increasing the number of influenza vaccine producers will limit the possibility of shortages because the loss or delay of any one manufacturer's doses due to production problems will have less impact on the overall supply of the vaccine. In this section, we describe a number of approaches that may work to increase the demand for influenza vaccine, and ultimately, reduce shortages.

2.3.1 National Adult Immunization Program

The creation of a national adult immunization program, which would provide vaccines free of charge to specified populations through their current provider, could serve to increase demand for the influenza vaccine. Most proponents of a national adult immunization program have suggested that it could operate much the way the Vaccines for Children (VFC) program works. VFC was intended to provide vaccines to low-income, underinsured children by giving enrolled providers free vaccines for these eligible populations. A national adult immunization program working in a similar way could help increase the demand for influenza and other adult vaccines among low-income adults in target groups who are not eligible for Medicare or other health insurance that includes vaccine coverage. For example, low-income individuals between 50 and 64 years of age and adults of any age with chronic conditions such as asthma, diabetes,

heart disease, or chronic lung disease could benefit from such a program. Because we are discussing a number of similar strategies for increasing demand for the influenza vaccine, it is important to note that a national adult immunization program could help raise demand for the influenza vaccine primarily by creating incentives for health care providers to offer and administer vaccines to their adult patients. The primary incentive of such an approach (at least for influenza immunization) would be to remove the financial risk associated with purchasing influenza vaccine.

2.3.2 Universal Recommendations

A universal recommendation would recommend that all persons, regardless of age or presence of underlying health conditions, receive an annual influenza vaccination. Such a recommendation could help increase demand for the influenza vaccine both through its impact on demand in the general population and through its impact on providers' perceptions of the importance of influenza vaccination for even healthy adults and children. For example, a universal recommendation could cause a healthy person to consider getting the vaccine when he or she otherwise would not have. Additionally, because the perceptions and actions of health care providers may also be influenced by a universal recommendation for influenza vaccination, health care providers could be more likely to purchase vaccine for their patients and to encourage vaccination of all patients during the October through March period. Finally, the policies of health insurers are also often influenced directly and indirectly by ACIP recommendations. Employers who sponsor insurance (either through contracting with insurance companies or self-insuring) may find universal ACIP recommendations sufficient motivation to include immunizations as a covered benefit. Health insurers may decide on their own to cover vaccine and administration costs for anyone covered by their policies as well. Such policy changes could increase demand for the vaccine among those who did not previously seek the vaccine because it was not covered under their health insurance.

2.3.3 Health Care Provider-Based Approaches

Many informants expressed the belief that the key to increasing demand for the influenza vaccine is to change provider perceptions of the importance of annual influenza vaccination for both vulnerable and healthy populations. For many people, a health care provider's recommendation can be the key to changing behaviors. Many strategies have been recommended to encourage health care providers to offer the influenza vaccine to their patients or to educate patients about the value of annual influenza vaccination. Some of the most effective strategies may be those that increase reimbursement levels for vaccination. Prior to the 2005–2006 season, many providers complained that Medicare's reimbursement for the influenza vaccine barely

covered the cost of the vaccine, much less the cost to administer the vaccine. In response to studies that analyzed the costs of administering the influenza and other vaccines (Coleman, Sangrujee, Zhou, & Chu, 2005), Medicare raised vaccine administration reimbursement rates beginning in the 2005–2006 season. Other provider-based approaches for increasing vaccine demand that have been shown to be effective include standing orders for vaccination and physician reminders (Briss et al., 2000). Some contend that, before health care providers can successfully encourage their patients to receive influenza vaccinations, health care providers themselves need to improve their adherence with ACIP recommendations. One study reports that only 38 percent of health care workers comply (Harper et al., 2004).

2.3.4 Pricing Changes

As described in Section 2.2, demand for the influenza vaccine may not be very responsive to changes in price, especially for individuals whose health insurance covers influenza vaccination (e.g., people on Medicare). Data show that those with lower incomes who lack health insurance have lower rates of vaccination (CDC, 2003). Such data suggest that price may serve as a barrier to vaccination for some. For these people, especially those in groups already targeted for vaccination, lowering the price of the influenza vaccine could encourage them to obtain an annual vaccination. A challenge of implementing this strategy is to identify what price is low enough to encourage those who need and want an annual influenza vaccination to get it. Prices charged for the influenza vaccine in 2004–2005 ranged from about $6.80 to $8.50 per dose. If targeted consumers would seek the vaccine only when prices are $5 or lower, government intervention may be necessary to subsidize production costs to offer the vaccine at a low-cost to those of low income—especially those who are in priority groups .

3. Roles for Stakeholders in Increasing Demand

Given the complexity in increasing demand for influenza vaccine, a number of stakeholders are involved. Based on our interviews with key informants and a review of other relevant sources of information, we describe the following roles for stakeholders in increasing demand for influenza vaccine. We have adapted a list of stakeholders in the U.S. influenza vaccination system created by the former director of CDC's National Immunization Program, Walter Orenstein, and colleagues (Orenstein, Douglas, Rodewald, & Hinman, 2005).

3.1 Federal Government

Although the vast majority of influenza immunizations are provided in the private sector, the federal government is a significant stakeholder in the means to increase demand for influenza vaccine. As one public health expert explained,

The government can play a much larger role in educating the public of the importance of influenza immunization and the importance of the disease and, secondly, to also ensure that the physicians and health care providers, etc. that they're being appropriately reimbursed.

This same expert further explained that funding policies for public programs such as Medicare can indirectly affect private health insurance,

The government sets the tone for private payers as well. Reimbursement done by Medicare, Medicaid, etc. kind of sets the tone for private payers, so adequate reimbursement to the physicians so that they don't feel that it's some sort of loss leader for them would be very encouraging.

The federal government is also a source of information regarding influenza immunization target groups. " … [ACIP] recommendations drive demand and demand drives supply." Through their recommendations and health communications information, ACIP and CDC are key stakeholders in efforts to inform the public.

… you need more targeted information. So to say, "it should go to people between 50 and 65 who are high-risk" … People don't identify themselves as being high risk. They identify themselves as being diabetic, or having asthma. You can go to people and say, "you're in a high-risk category," and they will say "no I am not, I am diabetic."

3.2 Vaccine Manufactures

Unlike the producers of some other pharmaceutical products, influenza vaccine manufacturers have, by and large, not engaged in direct-to-consumer marketing. In part this is due to the fact that although there is more than one influenza vaccine manufacturer, influenza vaccine is—in essence—a generic product. As such, an influenza vaccine manufacture does not have a sufficient financial interest in promoting its particular influenza vaccine product. Nevertheless, casual observation would suggest that influenza vaccine manufactures could provide a considerable amount of support to others who are working to improve vaccine demand—especially given the benefit that this would offer the influenza vaccine manufacturer.

Health care providers receive much of their information regarding what should be prescribed and to whom from pharmaceutical sales representatives (Avorn, Chen, & Hartley, 1983). Aside from influenza vaccine, Sanofi Aventis (Sanofi Pasteur's parent pharmaceutical

company[7]), Chiron, and MedImmune do not have other pharmaceutical products that are designed for a broad portion of the public. As such, one may speculate that sales representatives from these companies are not likely to have the opportunity to provide information to health care providers promoting influenza vaccine. As GlaxoSmithKline (GSK)—a company with a broader array of pharmaceutical products that target more diseases—enters the U.S. market, it will be interesting to see how its pharmaceutical sales representatives may play a role in providing health care providers with information promoting influenza vaccination.

3.3 State and Local Governments

Like the federal government, state and local governments have key roles in health promotion and disease prevention. In addition to a modest role in vaccine delivery through public clinics, state and local governments are in a position to establish public information campaigns to improve the public's understanding of influenza and the benefits of immunization. Likewise, states are in a position to educate business leaders and health insurers about the benefits of including vaccine coverage in their policies and practices.

3.4 Wholesalers

Although wholesalers and other distributors may not be primary stakeholders in improving demand for influenza vaccine, as they are the ones who are most often in a health care provider's office or clinic, they can work to provide information to health care providers and other office or clinic staff. As described more thoroughly in the companion brief, *Influenza Vaccine: Who Buys it and Who Sells It*, wholesalers often have a long-standing relationship with health care providers and offer a variety of products ranging from the paper that covers examination tables to cotton balls and alcohol swabs.

3.5 Professional Organizations

One of the ironies regarding influenza immunization rates is the observation that so few health care workers (HCW's) receive annual influenza immunization. Influenza vaccination is associated with reduced mortality among HCW's patients (Wilde et al., 1999). Nevertheless, according to the 2002 National Health Interview Survey, only 38 percent of HCW's reported receiving an influenza immunization (Harper, Fukuda, Uyeki, Cox & Bridges, 2004). A persuasive article outlines "seven truths we must accept" to increase health care workers' influenza vaccination rates (Poland, Tosh, & Jacobson, 2005). Professional organizations are in a position to promote and otherwise facilitate members' receipt of annual influenza

[7] In 2004, Sanofi merged with Aventis Pasteur to create the Sanofi Aventis Group. The vaccine division of the Sanofi Aventis Group changed its name to Sanofi Pasteur.

immunizations. As one key informant explained, "I think that you need to get doctors to get their own clinical staff to get vaccinated so they can essentially carry the message to patient."

3.6 Health Insurance Companies

Health insurance companies are in a position not only to provide coverage for influenza immunization but to use immunization rates as a benchmark against which health care provider performance can be measured. The National Committee for Quality Assurance (NCQA) already includes influenza immunizations among those 50 years of age or older among Health plan Employer Data and Information Set (HEDIS) indicators, which are used to determine health plans' adherence with various health promotion efforts. HEDIS measures can also be used by employers that are choosing which insurance to offer to its employees and by individuals who are selecting health plans. As such, HEDIS measures of influenza vaccination coverage can potentially influence health insurance purchasers or potential enrollees.

In addition, health insurance companies could potentially offer incentives for participating health care providers as an additional effort to improve immunization rates among their patients. One key informant described an array of approaches to improve immunization rates:

> *You could be building incentives for immunization levels into the HMO contracts. We don't do that. Medicare could be doing the same thing—and this is just the reimbursement end of things … If you don't have accountability to tie you down to some contractual agreement, where they did what they did like in Great Britain where they paid for performance using individual office assessments, we're not going to see it happen. … I don't mean in a punitive way … if you go into offices and if they know you're coming in to look at immunization rates and compliance, it actually goes up. … It's a whole series of things from the administrative side. The regulatory side—… states could [be] doing more to require performance from plans—that they have to meet certain goals in the area of immunization practice. And have it graded, or at least benchmarked against yourself.*

3.7 Private Health Care Providers

Private health care providers are the traditional source of immunization. They have direct contact with persons who could potentially be immunized. As such, they are in a prime position to ensure that their patients receive recommended immunizations. Nevertheless, the literature

shows that so-called "missed opportunities"[8] are common (Nowalk, Zimmerman, & Feghali, 2004).

> *… at some point the person who supplies the vaccine, theoretically the physician, convinces the person they need to get vaccinated. So it's hard to talk about increasing demand if you don't find ways to encourage physicians to offer it more broadly.*

Assuring that health care providers offer vaccine is important, especially in light of recent events that have led some health care providers to no longer offer influenza vaccinations. As one wholesaler explained, "physicians—some of them—are saying, "We're not even going to try to plan for vaccinating." Physicians offering influenza vaccine in their practices can increase demand (by being able to offer immunization on site and reduce missed opportunities). This, in turn, can help to increase supply.

4. Summary and Conclusion

Although influenza vaccine supply and demand are integrally linked, increasing demand has the potential to not only spur influenza supply but promote the public's health as well. In our key informant interviews, the significance of demand and ways to promote influenza vaccine demand arose frequently. One key informant observed,

> *… there're two elements of demand. Demand of provider and demand of consumer. One doesn't always equate to the other. I say that because many providers have backed out of the flu immunization business because of the craziness of it—the unpredictability of it. And I think there's an impact of that on consumer demand. If physicians aren't really aggressive about making sure they have flu vaccine in their offices, then they're more likely—I think—not to be as aggressive in encouraging their patients to pursue it.*

In summary, demand for influenza vaccine is a critical component in the complex means to reduce the public's risk from a leading cause of morality and morbidity. The means to improve demand are complicated and include roles for a variety of stakeholders.

References

Advisory Committee on Immunization Practices (1999, April 30). Prevention and control of influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morbidity and Mortality Weekly Reports, 48*(RR-04), 1–28. Retrieved October 5, 2005, from http://www.cdc.gov/mmwr/preview/mmwrhtml/00057028.htm

[8] Missed opportunities are situations in which an individual who should receive an immunization and is in a location where immunizations are provided (most notably a physicians' office, clinic, or hospital) does not receive one.

Advisory Committee on Immunization Practices (2000, April 14). Prevention and control of influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morbidity and Mortality Weekly Reports, 49*(RR03), 1–38. Retrieved October 4, 2005, from http://www.cdc.gov/mmwr/preview/mmwrhtml/rr4903a1.htm

Advisory Committee on Immunization Practices (2001, April 20). Prevention and control of influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morbidity and Mortality Weekly Reports, 50*(RR04), 1–46. Retrieved October 5, 2005, from http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5004a1.htm

Avorn, J., Chen, M., & Hartley, R. (1983). Scientific versus commercial sources of influence on the prescribing behavior of physicians. *American Journal of Medicine; 73*:4-8.

Bridges, C.B., Fukuda, K., Uyeki, T.M., Cox, N.J., & Singleton, J.A. (2002, April 12). Prevention and control of influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morbidity and Mortality Weekly Reports, 51*(RR03), 1–31. Retrieved October 5, 2005, from http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5103a1.htm

Bridges, C.B., Harper, S.A., Fukuda, K., Uyeki, T.M., Cox, N.J., & Singleton, J.A. (2003, April 25). Prevention and control of influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morbidity and Mortality Weekly Reports, 52*(RR08), 1–36. Retrieved October 5, 2005, from http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5208a1.htm

Briss, P.A., Rodewald, L.E., Hinman, A.R., Shefer, A.M., Strikas, R.A., Bernier, R.R., Carande-Kulis, V.G., Yusuf, H.R., Ndiaye, S.M., & Williams, S.M. (2000). Reviews of evidence regarding interventions to improve vaccination coverage in children, adolescents, and adults. The Task Force on Community Preventative Services. *American Journal of Preventive Medicine*, *18*(Suppl 1), 97–140.

Centers for Disease Control and Prevention (CDC). (1999, 2002, 2003). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention (CDC) (2000). Immunization and infectious diseases, Vaccine coverage and strategies (objective 14). In: *Healthy People 2010*. Retrieved October 4, 2005, from http://www.healthypeople.gov/Document/tableofcontents.htm

Centers for Disease Control and Prevention (CDC) (2003, October 10). Racial/ethnic disparities in influenza and pneumococcal vaccination levels among persons aged ≥ 65 years—United States 1989–2001. *Morbidity and Mortality Weekly Reports, 52*(40), 958–962. Retrieved October 4, 2005, from http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5240a3.htm

Centers for Disease Control and Prevention (CDC) (2004, November 5). Influenza vaccination and self-reported reasons for not receiving influenza vaccination among Medicare beneficiaries aged ≥ 65 years—United States, 1991–2002, *Morbidity and Mortality Weekly Reports, 53*(43), 1012–1015. Retrieved October 4, 2005 from http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5343a3.htm

Centers for Disease Control and Prevention (CDC) (2005a, July 2). Update: Influenza activity—United States and worldwide, 2003–04 season, and composition of the 2004–05 influenza vaccine. *Morbidity and Mortality Weekly Reports 53*(25), 547–552. Retrieved October 24, 2005, from http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5325a1.htm

Centers for Disease Control and Prevention (CDC) (2005b, July 28). *Interim estimates of populations targeted for influenza vaccination from 2003 National Health Interview Survey data and estimates for 2004 based on influenza vaccine shortage priority groups*. Retrieved September 23, 2005, from http://www.cdc.gov/flu/professionals/vaccination/pdf/targetpopchart.pdf

Centers for Disease Control and Prevention (CDC) (2005c, September 2). Update: Influenza vaccine supply and recommendations for prioritization during the 2005–06 influenza season. *Morbidity and Mortality Weekly Reports*, *54*(34), 850. Retrieved September 23, 2005, from http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5434a4.htm

Charatan, F. (2004). Widespread flu in United States exposes shortage of vaccine. *BMJ*, *328*(7430), 8. Retrieved January 3, 2004, http://bmj.bmjjournals.com/cgi/content/full/328/7430/8-a

Coleman, M.S., Snagrujee, N. Zhou, F. & Chu, S. (2005). Factors affecting U.S. manufacturers' decisions to produce vaccines. *Health Affairs (Millwood) 24*(3), 635–642.

DesRoches, C.M., Blendon, R.J., & Benson, J.M. (2005). Americans' responses to the 2004 influenza vaccine shortage. *Health Affairs (Millwood), 24*(3), 822–831.

Fishbein, D.B., Fontanesi, J., Kopald, D., Stevenson, J., Bennett, N.M., Stryker, D.W., Long, C., Coleman, M.S., & Schefer, A. (2005, in press). Why patients do not receive influenza vaccine in December and January. *Vaccine.*

Gershman, K., Smith, R., & Trefren, L. (2004). Lessons learned: Colorado's 2004 flu experience. *NACCHO Exchange*, *2*(4), 13–15. Retrieved October 4, 2005, from http://archive.naccho.org/Documents/naccho-exchange-spring-04.pdf

Harper, S.A., Fukuda, K., Uyeki, T.M., Cox, N.J., & Bridges, C.B. (2004, May 28). Prevention and control of influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morbidity and Mortality Weekly Reports, 53*(RR06), 1–40. Retrieved October 4, 2005, from http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5306a1.htm

Harper, S.A., Fukuda, K., Uyeki, T.M., Cox, N.J., & Bridges, C.B. (2005, July 29). Prevention and control of influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP). *Morbidity and Mortality Weekly Reports, 54*(RR08), 1–40. Retrieved October 5, 2005, from http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5408a1.htm

Hebert, P.L., Frick, K.D., Kane, R.L., & McBean, A.M. (2005). The Causes of racial and ethnic differences in influenza vaccination rates among elderly medicare beneficiaries. *HSR: Health Services Research 40*(2), 517-537

Helms, C.M., Guerra, F.A., Klein, J.O., Schaffner, W., Arvin, A.M., & Peter, G. (2005). Strengthening the nation's influenza vaccination system: A National Vaccine Advisory Committee assessment. *American Journal of Preventive Medicine, 29*(3), 221–226.

Mitka M. (2004). Health officials brace for flu season. *Journal of the American Medical Association, 292*(14), 1670–1671.

Nowalk, M.P., Zimmerman, R.K. & Feghali, J. (2004). Missed opportunities for adult immunization in diverse primary care office settings. *Vaccine 22*, 3457-3463.

Nowalk, P. (2005). Parental perspectives on influenza immunization of children aged 6 to 23 months. *American Journal of Preventive Medicine*, *29*(3), 210–214.

Orenstein, W.A., Douglas, R.G., Rodewald, L.E., & Hinman, A.R. (2005). Immunizations in the United States: Success, Structure, and Stress. *Health Affairs*, *24*(3), 599–610.

Pauly, M.V. (2005). Improving vaccine supply and development: Who needs what? *Health Affairs (Millwood), 24*(3), 680–689.

Poland, G.A., Tosh, P., & Jacobson, R.M. (2005). Requiring influenza vaccination for health care workers: Seven truths we must accept. *Vaccine 23*, 2251–2255.

Thompson, W.W., Shay, D.K., Weintraub, E., Brammer, L., Bridges, C.B., Cox, N.J, & Fukuda, K. (2004). Influenza-associated hospitalizations in the United States. *Journal of the American Medical Association, 292*(11), 1333–1340.

Thompson, W.W., Shay, D.K., Weintraub, E., Brammer, L., Cox, N., Anderson, L.J., & Fukuda, K. (2003). Mortality associated with influenza and respiratory syncytial virus in the United States. *Journal of the American Medical Association, 289*(2), 179–186.

Wilde J.A., McMillan J.A., Serwint, J., Butta, J., O'Riordan, M.A. & Steinhoff, M.C. (1999). Effectiveness of influenza vaccine in health care professionals: a randomized-trial. *Journal of the American Medical Association, 281*, 908-13.

Zimmerman, R.K., Santibanez, T.A., Janosky, J.E., Fine, M.J., Raymund, M., Wilson, S.A., Bardella, I.J., Medsger, A.R., Nowalk, M.P. (2003). What affects influenza vaccination rates among older patients? An analysis from inner-city, suburban, rural, and Veterans Affairs practices. *American Journal of Medicine*, *114*(1), 31–38.