

Adam Smith Meets Jonas Salk: Estimating the Social Cost of Third-Party Influenza Vaccination Restrictions

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Abstract

Influenza is the 7th leading killer in the United States. In order to attenuate the threat of an influenza outbreak, the Centers for Disease Control and Prevention (CDC) have established guidelines recommending that all parents of children between 0 and 60 months old should be vaccinated. Insurance companies, however, will not reimburse pediatricians who administer influenza vaccinations to adults. This seemingly innocuous insurance company restriction, however, is creating significant costs for society. Using a new observational dataset we estimate the cost of this insurance restriction to be between \$5.8 and \$188.4 million. While narrowly the paper advocates allowing pediatricians to vaccinate adults, more generally it warns of the costs inherent when third party entities inhibit the scope of physician-patient interaction.

Keywords: influenza vaccination, pediatrics, OCPE workflow instrument, insurance policy

INTRODUCTION

Specialization has always been an important determinant for economic growth and efficient production. Adam Smith wrote, “The greatest improvement in the productive powers of labour, and the greater part of the skill, dexterity, and judgment with which it is anywhere directed, or applied, seem to have been the effects of the division of labour” (Smith 1776). One of the most specialized industries in the world is the American medical system, yet specialization in this field does not completely display a Smithian concept of the division of labor.

Specifically, physicians often preclude others in the field from performing procedures deemed to be within their specialty's area of expertise. And as will be discussed in this paper, insurance companies often further this exclusionary practice by refusing to compensate physicians for treating patients outside their customary purview. We will also analyze the economic effects associated with pediatricians’ administration of adult influenza vaccinations, including the consequences of insurance company rules denying reimbursement to pediatricians who treat adults.

Why is this economic analysis so significant? Despite its reputation as a mild malady, influenza is a serious disease that should not be taken lightly. According to the National Vital Statistics Mortality Data compiled by the Centers for Disease Control and Prevention (CDC), influenza and pneumococcal diseases were the eighth leading cause of death in the United States in 2004, accounting for 59,664 deaths or 2.5% of the total number of deaths (Centers for Disease Control and Prevention 2007). As will be discussed later in this paper, research has shown that influenza vaccination is a cost-effective method of slowing the spread of this disease in adults of child-bearing age. Thus, the fact that adults rarely receive influenza vaccinations from pediatricians—

doctors whose offices are often visited by individuals of this age in their capacity as parents—represents a “missed opportunity” that can affect the spread of this disease.

Our research has found that pediatricians do not receive compensation for services—including vaccinations—provided to adults. (In such cases, adult patients would be required to pay for vaccinations out of their own pocket, as permitted by the individual provider.) Correspondence with San Diego-area pediatrician office managers revealed that despite the staff’s best efforts, insurance companies would not reimburse their offices for influenza vaccinations administered to adults.

At first glance, these pediatrician guidelines seem entirely sensible. Most adults do not want a pediatrician to treat them when other specialists might have greater expertise treating their more “mature” ailments; furthermore, insurance companies do not want to devote their limited resources to paying pediatric specialists for the treatment of adult patients. Yet even though the *de facto* rule that pediatricians only treat children seems innocuous on its face, this paper demonstrates that strictly limiting pediatricians to caring for children—specifically with regards to influenza vaccination—imposes substantial costs on society.

In the empirical section of the paper, we employ a new observational data set to estimate the cost that insurance companies impose due to not reimbursing pediatricians for vaccinating adults against influenza. Based on these calculations, the societal cost estimates range from \$5.8 million to \$188.4 million annually, dependent on such factors as parental adherence to CDC recommendations. The paper is also topical because the CDC is considering expanding the number of adults who should be vaccinated annually against influenza to include all parents of

children aged 0–18 years. Under these new guidelines, the societal cost of insurance company refusal to compensate pediatricians for vaccinating adults can increase considerably, up to \$560 million.

Specifically, this paper carries the policy implication that insurance companies should reimburse pediatricians for vaccinating adults against influenza, but its more general message is that patients and physicians often incur large costs due to restrictions imposed on them by third parties.

BACKGROUND

As noted previously, influenza and related diseases accounted for almost 3% of all deaths in 2004. While the annual toll influenza exacts on a population is worrisome, even more troubling is the possibility of an influenza pandemic. Meltzer, Cox, and Fukuda (1999) estimate that an influenza pandemic in the U.S. would cause 89,000–207,000 deaths; 314,000–734,000 hospitalizations; and 20–47 million additional illnesses at a cost of between \$71.3 and \$166.5 billion. These pandemics are not infrequent; there were three pandemic influenza outbreaks in the 20th century alone (in 1918, 1957, and 1968).

One manner to combat the threat of influenza is the flu vaccine, discovered through the research of Jonas Salk and Thomas Francis, Jr. The immunity provided by the vaccine, however, is not unlimited; according to the CDC, immunity against one type of influenza virus confers limited or no protection from any other type of influenza (Advisory Committee on Immunization Practices 2006). For this reason, the nationally circulated influenza vaccination is altered each year based on the predicted prevalent strains during the upcoming flu season. Research has found that

influenza vaccination is very cost-effective for children (Luce et al. 2001; Cohen and Nettleman 2000) as well as the elderly (Meltzer, Cox, and Fukuda 1999; Nichol and Goodman 1999; Davis et al. 2001).

But what about influenza vaccinations for healthy and high-risk adults of child-bearing age? The epidemiology literature generally holds that influenza vaccinations are cost-effective for these cohorts as well. While this subpopulation is less susceptible to fall seriously ill from influenza, the illness is often more costly to this group because (1) adults of child-bearing age are at the peak of their lifetime earnings curve and thus workplace absenteeism is more expensive for this demographic group; and (2) the illness can interfere with these adults' childrearing duties.

The seminal work in this field is that of Nichol et al. (1995), who found that each vaccination produces a cost savings of \$64 (in 2006 dollars). Subsequent studies (Nichol 2001; Lee et al. 2002) have also determined that influenza vaccination is cost-effective for healthy working adults, although one study (Bridges et al. 2000) challenged this assertion in the case where the influenza vaccine proved ineffectual. In general, the consensus from epidemiologists holds that influenza vaccination is cost-effective for healthy adults of child-bearing age.

Conditional on the empirical observation that many adults seek flu shots each year, it is consequential that vaccination occurs in as economically efficient a manner as possible. With over 100 million flu shot doses projected to be administered during the 2006–2007 flu season (Advisory Committee on Immunization Practices 2006), cost increases of as little as 2% can result in an additional burden to society in the hundreds of millions of dollars.

In the following sections of this paper we will estimate the direct unit cost to administer influenza vaccination in a variety of clinical settings. After these specific costs are determined, we will be able to impute the efficiency cost of the insurance companies' failure to reimburse pediatricians for administering adult influenza vaccinations.

DATA

Costs come in a variety of forms, including those related to direct material and labor, overhead and capital, and patient time. A large portion of the data used in this paper comes from a convenience sample around San Diego County named the 2006 Observational Checklist of Patient Encounters (OCPE). The OCPE, similar to the OCPE-S described by Fontanesi et al. (2006) is a standardized workflow data acquisition tool used in medical practice. The OCPE is used to record the presence or absence of key specific activities and functions, types of personnel involved, time required to complete specific tasks, and general operational conditions.

Observations were made in the fall of 2006, just prior to the start of the 2006–2007 flu season. The sample size of this dataset is 165 unique patient visits. All participants and/or their parent/guardian gave written consent to be observed for this study. Each study participant visited a provider at one of the following locations: (1) a well-child pediatric appointment; (2) a walk-in clinic; or (3) a mass immunization site. (For a more detailed description of mass immunization sites, see Fontanesi et al. 2006).

Observational data were also used to calculate many of the indirect and fixed costs utilized in the paper. Employing the Intermediate Observation tool—also utilized in Fontanesi et al. (2006)—one is able to determine the time it takes to pull and file a chart, costs related to handling and

receiving influenza vaccination, and other associated vaccination costs. Thus, the majority of variable and fixed costs measures utilized in the paper are based on observational data.

The importance of having data obtained by structured observation should not be understated. Patient survey data are often unreliable (Litwin and McGuigan 1999; Cunningham, Denk, and Sinclair 2001; Westbrook et al.) In Table 1 we list the variables used to calculate the cost of vaccination. Although it is likely that this list does not exhaust every cost that providers face when administering a vaccination, we believe these cost categories encompass the majority of physicians' vaccination-related operating expenses. The final column of Table 1 describes the data source from which each variable originates. All duration variables come from the OCPE workflow data, and all wage data are based on the November 2004 and 2005 Bureau of Labor Statistics (BLS) Occupational Employment Statistics. The direct cost of purchasing one dose of an influenza vaccine is taken from the 2006 CDC "Pink Book" (Centers for Disease Control and Prevention 2006) and fixed cost data used in the Fontanesi et al. (2006) paper are labeled as "Intermed. Obs" in the table. Other data sources are described in the footnotes of Table 1. Data from years prior to 2006 are inflated to 2006 dollars using the appropriate component of the Consumer Price Index (CPI).

METHODS

The empirical section of the paper aims to estimate the following: (1) the cost of influenza vaccination in a variety of settings; and (2) the societal cost of the *de facto* regulation prohibiting pediatricians from administering influenza vaccinations to adults.

In order to fully exploit the precision of the OCPE observational data, different estimates are made within three provider environments. Specifically, influenza vaccination can occur at (1) routine scheduled physician visits; (2) walk-in clinics specifically set up for influenza vaccination; or (3) mass vaccination centers. Table 2 provides an activity-based duration analysis broken down by the three site types. The reader may observe that a traditional, scheduled physician visit has the lowest vaccination rate per hour, while mass immunization centers perform vaccinations most swiftly. The fact that scheduled physician visits are the least productive in terms of vaccinations per hour does not mean that medical care is supplied inefficiently in this setting; this option may require more of a time commitment from patients, but a physician's visit provides patients with a more comprehensive examination than they would receive at either a walk-in clinic or a mass vaccination site.

To evaluate the cost of the pediatric insurance reimbursement restriction on adult influenza vaccination, we must first calculate the cost of the influenza vaccination. Four types of cost will be analyzed: average variable cost (AVC), average total cost (ATC), average total societal cost (ATSC), and opportunity cost (OppCost). Each is described mathematically below.

$$AVC = DM + DL$$

$$ATC = AVC + AFC + OpMargin$$

$$ATSC = ATC + PtCosts$$

$$OppCost = VC + PtCosts$$

The *average variable cost* is the sum of the direct material (DM) unit cost of purchasing the vaccine plus the direct labor (DL) unit cost of administering the vaccine. *DM* is equal to the vaccine price, the cost of patient education materials and hazardous waste disposal fees.

Approximately 95% of the direct material cost comes from the vaccine purchase price. *DL* includes the staff labor costs during patient check-in, pre-examination procedures, shot administration, and patient discharge. Each cost is calculated by multiplying the average time the patient spends on each activity by the BLS Occupational Employment Statistics' San Diego mean wage for the appropriate worker (e.g., LPN, medical assistant). The second cost category, *average total cost*, is proportional to *AVC* but also includes a measure of average fixed costs (*AFC*) plus a standard operating margin (*OpMargin*). *Average total societal costs* (*ATSC*) is equal to the *ATC* plus a measure of patient's private time and travel costs (*PtCosts*). Finally, the *opportunity cost* is proportional to average variable cost but also takes into account *PtCosts*.

Including patient time costs in the price of medical services is common throughout the health economics literature (Janssen 1992; Phelps and Newhouse 1974). There is some debate as to whether using a mean wage rate or some other measure of a patient's willingness to pay (*WTP*) or willingness to accept (*WTA*) is a more accurate estimate of patient time costs. Two papers by Borisova and Goodman (2004; 2003) study methadone maintenance clients and claim that *WTP* may be a more accurate measure of patient time cost than their wage rate, especially as sick individuals may have a lower time cost than their wage would indicate. In this paper, however, we have decided to use the median San Diego County wage from U.S. Census data in order to estimate the patients' time cost. As influenza vaccination can be given to sick or healthy patients, using the median wage should be more representative of the patient base than in the Borisova and Goodman studies. Further, we use the median rather than the mean wage, which will make our cost estimates more conservative and more representative of the cost to a "typical" patient.

Policymakers or insurance administrators who need an appropriate physician reimbursement rate should use ATC, while epidemiologists and economists performing cost-benefit analyses should utilize the ATSC figure. The OppCost measure may be useful in determining whether a patient chooses to receive a vaccination if he or she would be charged the shot's true variable cost.

RESULTS

Cost per Vaccination

Table 3 lists each of the four costs described previously in the scheduled appointment, walk-in clinic, and mass vaccination settings. The average total cost ranges from \$15.41 to \$19.56 in the preferred specification. In order to test the robustness of these figures, we vary the number of vaccines administered in each site as well as the operating margin. The number of vaccines will affect how the fixed cost are allocated on a per-vaccine basis, as more intensive use of fixed cost components will reduce AFC. In order to account for the owner's profit level, our sensitivity analysis allows the operating margin to vary from 0% to 5%.

While the operating margin may seem low, this is due to the fact that physicians generally do not administer the vaccines themselves, and thus one should not include the physicians' implicit labor cost in the operating margin calculations. We conclude that an appropriate profit level is approximated by the 0%–5% operating margins of the owners of health service systems.

Although we do not know of any studies specifically examining pediatric operating margins for services in which pediatrician labor is not used, we believe that the health plan operating margin studies (Bellandi 1999; Cunningham and Sherlock 2002; McCue et al. 1999) should provide a reasonable approximation of pediatricians' operating margins for flu shot administration.

After varying the number of vaccines provided between 100 and 5,000 per office per year and varying the operating margin between 0% and 5%, our estimates show that ATC in the scheduled appointment setting ranges between \$18.70 and \$26.76. In the walk-in clinic and mass vaccination settings, the costs range from \$16.42 to \$24.37 and from \$14.64 to \$22.50, respectively.

The influenza cost estimates obtained here are similar to the ones found in Fontanesi et al. (2006). Coleman et al. (2005) also used OCPE data to estimate average total cost for adult influenza immunizations. The cost estimates from the Coleman et al. study are on the high end of the range found here, but not unreasonably so; average total vaccination cost in 2006 dollars for a large practice was \$30.12 in a scheduled visit setting and \$23.04 at walk-in clinics.

There are a few facets of this analysis that may concern a careful reader. Fontanesi et al. (2004) argue that vaccination is a complex process—not simply an incremental activity—and thus extracting the cost of vaccination from all the other services provided in a clinical setting may be difficult. Due to the quality of the observational data used in this study, however, we believe that we have adequately accounted for many of these issues. Also, the estimates provided here are not nationally representative, as the data come exclusively from San Diego County. Finally, there always exists the possibility of omitted cost variables not taken into account in this analysis but which would bias our estimates downward.

Incremental Cost

To find the economic impact of pediatricians not administering flu vaccines to adults, one must calculate the incremental cost of an adult vaccination conditional on the adult(s) already being at

the pediatrician's office for a scheduled child visit. Adults are not likely to visit pediatricians specifically for an influenza vaccination; however, if they visit a pediatrician's office for treatment of their child, there may be benefits from having the adult immunized during the child's visit. As the fixed costs (e.g., rent, staff training) will not change as a result of adding an adult vaccination to a pediatric visit, additional fixed costs are assumed to be zero in the base case. Further, time spent on check-in and discharge is not included in the calculation, as the incremental cost from adding the adult vaccination to a child's pediatric appointment are zero.

The direct cost of an offsite influenza vaccination for an adult is the same as in the analysis shown in the prior section of this paper. One finds that patient travel costs are relatively large, as the adult must make a second trip to receive the shot if an insurance company will not permit him to receive an influenza vaccination at pediatric offices.

For onsite walk-in influenza clinics, the calculations are preformed differently. The pediatrician must utilize an extra room and check-in area for the adult-only walk-in clinic; this adds an additional expense to a pediatric practice's bottom line. Thus, a measure of the incremental average fixed costs is included in the onsite walk-in clinic cost estimates.

The top portion of Table 4 gives the results of the incremental cost calculations. The table shows the incremental cost per patient of influenza vaccination conditional on having to take a child to the pediatrician's office. We see that the additional cost from this regulation ranges from \$9.89 to \$21.54 per person affected by the regulation. In all the clinical settings, the majority of the cost burden stems from patients spending more time at each site and more time traveling between the different treatment sites.

Patients visiting a pediatric office may have the option of making an out-of-pocket payment for a flu shot and thus bypassing the insurance regulation altogether. We estimate that patients would be willing to pay approximately \$16–\$17 to receive a flu shot during a pediatric office visit with their child. The parent willingness to pay figure is calculated as the incremental benefit from not having to leave pediatrician's office in order to receive the vaccine. This is equal to the patient costs (*PtCost*) in the mass vaccination setting less the additional time cost the patient would incur receiving a shot at the pediatrician's office. If the willingness-to-pay figure is below the ATC price, \$19.56, the pediatrician would likely charge the parent in order for vaccinations to be profitable. Thus, going forward we will ignore the possibility of out-of-pocket payments to pediatricians in future calculations. Further, many physicians will not allow individuals to pay out-of-pocket if they have insurance, or do not inform patients of this self-payment option.

Societal Cost of Insurance Restriction

The above costs are estimated on a per-person basis, but it is important to understand the overall annual cost to society brought on by this insurance restriction. We calculate the overall societal costs as the incremental cost multiplied by the number of people affected by the restriction. The people affected include parents who meet the following three criteria: (1) those whose children receive a flu shot; (2) those who wish to have a flu shot themselves, and (3) those who otherwise would not visit their own primary care physician just prior to or during the flu season.

To calculate the number of people affected by the restriction, we first assume that one parent takes one child to the pediatrician. According to the National Vaccination Advisory Committee, it is a standard of care that all children aged 0–5 years receive an annual influenza vaccination;

thus, the number of adults affected by the regulation is proportional to the number of children in the U.S. aged 0–5 years, Pop_{age} , as given by data from U.S. census projections (U.S. Census Bureau 2007). We use figures from a study by Nichol (2006) and the Advisory Committee on Immunization Practices (2006) to estimate the proportion of children and adults of child-bearing age who receive an influenza vaccination each year; we denote these two quantities as $P(child_{age})$ and $P(parent)$, respectively. Using the 1996 Community Tracking Study Household Survey, we calculate the percentage of adults aged 20–49 who do not visit a physician just prior to or during the flu season, denoted as $P(no\ visit)$. The cost of the insurance restriction is zero for adults who would visit their own doctor for a flu shot regardless of whether or not they had the option to receive an influenza vaccination at a pediatrician’s office.

Assuming one parent takes each child to the pediatrician, the number of parents who are affected by this regulation annually is 583,450. This is calculated as follows:

$$\begin{aligned}
 \text{Number Affected} &= [Pop_{0-1} * P(child_{0-1}) + Pop_{2-5} * P(child_{2-5})] * P(parent) * P(no\ visit) \\
 &= [8.4\ m * 48.4\% + 16.5\ m * 31.6\%] * (17.9\%) * (35.1\%) \\
 &= 0.583\ m
 \end{aligned}$$

To calculate the total cost to society of the insurance restriction, one simply multiplies the incremental cost of vaccination by the number of people affected. The “Present Regime” row of Table 4 shows that the result of this calculation is that the regulation’s cost to U.S. society is between \$5.8 and \$12.6 million per year.

It is important to note, however, that there is some ambiguity in the “population affected” calculation. Parents may make appointments for multiple children during a single pediatrician visit, or both parents may take one child to the doctor’s office. Also, this calculation assumes that each probability is independent from the others, which is unlikely. It is more reasonable to believe that a positive correlation exists between the probability a child is vaccinated, $P(\text{child}_{age})$, and the probability a parent is vaccinated, $P(\text{parent})$; however, the probability that either is vaccinated is likely negatively correlated with the probability that the parent would not otherwise have seen a primary care physician for an influenza vaccination, $P(\text{no visit})$. To conclude, if any bias exists in these estimates, the direction of the bias is unknown.

Figure 1 gives a more complete description of the societal cost of the insurance restrictions from pediatrician reimbursement for adult immunization. The x and y axes represent the percentage of the “population affected” who, after visiting a pediatrician with their child, receive an immunization from an offsite clinic or offsite mass immunization center, respectively. The percentage of people who receive a flu shot from an onsite clinic can be calculated as $1-x-y$. Thus, when $x=y=0$, everyone who does not receive the flu shot at their pediatrician’s office receives their influenza vaccination at an onsite clinic. The plane in Figure 1 is sloping upward, indicating that as more and more people receive offsite influenza immunizations—relative to onsite vaccinations—the societal cost of the insurance restriction increases.

While the “Present Regime” row of Table 4 uses empirically estimated probabilities, we can also look at the cost where parents strictly adhere to the CDC guidelines for vaccinating healthy children. If every person that the CDC recommends to receive a flu shot would actually receive the vaccination (i.e., full compliance), the population affected by the regulation jumps to 8.7

million. The “Full Compliance” row of Table 4 shows that the societal cost under this scenario is between \$86.5 and \$188.4 million annually due to the pediatrician vaccination restriction.

The CDC is also considering extending its influenza vaccination recommendations to all parents of children aged 0–18. If this policy were established, 26 million parents would be affected, and costs could range up to \$559.8 million annually. While these costs may be somewhat inflated due to the fact that compliance rates are never 100%, the societal costs for this seemingly innocuous pediatrician reimbursement restriction are considerable.

DISCUSSION

The economics literature offers considerable experience modeling how third-party restrictions affect overall welfare. Writing about eighteenth century British rulers, Adam Smith declares, “It is the highest impertinence and presumption . . . to pretend to watch over the economy of private people, and to restrain their expense” (Smith 1776). Various seminal economic studies (Kessel 1958; Peltzman 1976; Stigler 1971) further illuminate the deleterious effects of dictates on efficiency. These results are also extended to the area of physician licensure by subsequent authors (Anderson et al. 2000; Leffler 1978; Leland 1979), and now to this piece.

Here we have analyzed how another third party—insurance companies—can create large inefficiencies through reimbursement restrictions. The restrictions center around one of the great products from Jonas Salk’s early research: the influenza vaccine. Using new observational workflow data, we see that the majority of the efficiency losses from insurance company reimbursement restrictions are due to the convenience or time costs that patients incur. For instance, the inconvenience of parents not being able to receive a flu shot at a pediatrician’s

office creates extra time costs for adult patients, including needing to set up a new appointment or visit a walk-in clinic or mass vaccination center in order to be vaccinated against influenza. Patient costs include the time spent at these appointments; the time spent traveling to the appointment; and the direct cost of transportation to the provider.

Leland's economic model (1979) shows that under the assumption of perfect information, third-party restrictions will simply reduce a patients' choice set and may compel them to choose a suboptimal allocation of medical services compared to other goods and a suboptimal allocation of their time endowment. In this paper, we see that insurance restrictions can lead to an inefficient production of medical services by eliminating influenza vaccination options with corresponding low "treatment time" amounts (i.e., adult vaccination at pediatric offices).

This is not to say that insurance company restrictions are never justifiable, especially in the case of asymmetric information. For instance, an insurance company's prohibition against reimbursing non-licensed physicians would be sensible if non-licensed physicians harm patients. In his seminal work, Thomas Moore (1961) claims that problems of asymmetric information may justify third-party regulation. Leland (1979) argues that informational asymmetry can be solved without regulation either through repeated interaction, certification, labeling, or a *caveat venditor* device, but these solutions may often be too expensive to implement in the case of the healthcare industry.

One issue not touched upon here is the cost society bears from a lower influenza immunization coverage rate due to the fact that parents are not able to receive an influenza vaccination during a pediatric visit. When more adults are vaccinated, the negative externality associated with the

person-to-person transmission of influenza diminishes. While we believe that permitting adults to receive flu shots via pediatric visits is likely to increase the nation's overall influenza coverage rate, the data used in this study make it difficult to quantify the monetary impact of Americans' taking full advantage of this "missed opportunity." Nevertheless, if vaccination rates were to rise significantly after a revocation of insurance industry restrictions against reimbursing pediatricians for adult influenza vaccinations, then the cost figures derived above would underestimate the true cost of the current regulation.

CONCLUSION

Our empirical analysis uses a new observational dataset to examine the societal cost associated with insurance companies' failure to reimburse pediatricians for vaccinating adults against influenza. This restriction imposes an annual cost on society of \$6–\$188 million, or up to \$560 million if new CDC guidelines were implemented.

The finding of these significant costs has direct policy implications, including our suggestion that insurance companies should begin reimbursing pediatricians for providing flu shots to adults.

This recommendation would become even more essential should the CDC expand its influenza vaccination guidelines to include the parents of all children aged 0–18. More generally, however, we believe that this paper should compel third-party payers to more carefully weigh the costs *as well as the benefits* whenever they create medical care or reimbursement guidelines.

What comes next? This paper does not consider the fact that pharmacies in some communities offer influenza vaccinations; analyzing the cost structure and welfare implications of using pharmacies to distribute flu shots would enrich the analysis. Also, the data used in this study

come exclusively from San Diego County and may not be nationally representative. Finally, our analysis was conducted using a partial equilibrium framework. These features of our work could each provide a starting point for future research endeavors.

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TABLE 1

Table 1: Influenza Vaccination Cost Categories and Data Sources				
Category	Units	Cost/Unit	Total Cost	Data Source
Check-in Time	varies	\$13.52/hr	varies	OCPE, BLS
Pre-exam Time	varies	\$19.99/hr	varies	OCPE, BLS
Shot Administration	varies	\$19.99/hr	varies	OCPE, BLS
Discharge	varies	\$13.52/hr	varies	OCPE, BLS
Vaccine Price	1 vaccine	\$12.50/vaccine	\$12.50	CDC Pink Book
Pt. Educ. Materials	1 vaccine	\$0.02	\$0.02	Office Supply Data
Receiving	8 min/box	\$19.99/hr	\$0.03/vacc.	Intermed. Obs., BLS
HazMat Disposal	1 bin	\$50	\$0.25/vacc.	HazMat website
Chart Pull/Return	3 min/chart	\$13.52/hr	\$0.67/chart	Intermed. Obs., BLS
Anticipating	2.4 hours	\$54.84/h.	\$131.69/yr	Intermed. Obs., BLS
Handling	1 min/day	\$19.99/hr	\$23.32/yr	Intermed. Obs., BLS
Storage	1 refrigerator	\$350	\$350	Assumption
Training (Initial)	9 hrs	\$33.12/hr	\$298.12	Intermed. Obs., BLS
Training (Ongoing)	3 hrs/yr	\$16.65/hr	\$27.42/yr	Intermed. Obs., BLS
Rent	125 ft ² /room	1.25/ft ² /yr	\$156.25/yr	VA, Intermed. Obs.
Patient Time	11:07–40:38 min	\$16.12	\$2.99–\$10.92	OCPE, BLS
Patient Travel	40 min/visit	\$16.12	\$10.75/visit	OCPE, BLS
Direct Travel Cost	1 round trip	\$3/trip	\$3/trip	Assumption

HazMat: BioMedical Waste Solutions, Inc. web site. Accessed April 2, 2007.

(www.biomedicalwastesolutions.com)

VA: Veterans Affairs standards for ambulatory care room size.

Office Supply Data: Cost estimated from prices listed on the Web sites of large office supply stores.

Direct Travel Cost: Mean of a round trip bus/subway fare, or 8–10 min. one-way drive

Bus fare calculation: Cities of Austin, Charlotte, Denver, Milwaukee, NY, Philadelphia, San Diego & Seattle included

TABLE 2

Table 2: Average Influenza Vaccination Duration by Activity and Visit Type			
Duration Type	Scheduled Visit	Walk-in Clinic	Mass Imm. Center
Non-Treatment (waiting room)	21:04 (18:21)	9:07 (16:46)	5:27 (4:06)
Check-in Time	5:08 (6:56)	3:15 (2:28)	3:15 (0:00)
Pre-Exam Time	8:34 (7:24)	2:58 (1:48)	0:00 (0:00)
Shot Administration	2:18 (2:53)	2:18 (2:53)	2:18 (2:53)
Discharge	3:34 (6:44)	3:37 (6:11)	0:07 (0:29)
Total	40:38 (46:22)	21:15 (22:12)	11:07 (6:13)

Quantities in (min:sec) format. Standard deviations in parentheses.

TABLE 3

Table 3: Variable Cost, ATC, ATSC, and OppCost by Visit Type			
Cost	Scheduled Visit	Walk-in Clinic	Mass Imm. Center
<i>Direct Materials</i>	\$12.50	12.50	12.50
<i>Direct Labor</i>	5.88	3.60	1.82
AVC	18.38	16.10	14.32
AFC	0.71	0.71	0.71
Op. Margin	<u>0.48</u>	<u>0.42</u>	<u>0.38</u>
ATC	19.56	17.23	15.41
<u>Patient Costs</u>	<u>24.66</u>	<u>19.45</u>	<u>16.73</u>
ATSC	44.22	36.68	32.14
Opp Cost	43.04	35.55	31.05

AVC: Average Variable Cost, AFC: Avg. Fixed Cost, ATC: Avg. Total Cost

Op. Margin: Operating Margin (2.5%), ATSC: Avg. Total Social Cost

TABLE 4

Table 4: Incremental and Societal Cost of Insurance Restriction				
<u>Incremental Cost (Dollars)</u>				
Cost Category	During Visit	Onsite Clinic	Offsite Clinic	Offsite Mass. Imm.
ATC	13.64	17.4	16.5	14.68
Total Patient Costs	0.76	6.9	19.45	16.73
Total Cost	<u>14.41</u>	<u>24.3</u>	<u>35.95</u>	<u>31.41</u>
Cost Differential		9.89	21.54	17.00
<u>Societal Cost (in millions USD)</u>				
Cost Category	Pop. Affected (k)	Onsite Clinic	Offsite Clinic	Offsite Mass. Imm.
Present Regime	583	5.8	12.6	9.9
Full Compliance	8,744	86.5	188.4	148.7
New CDC Guidelines	25,986	257	559.8	441.8

Sources: U.S. Census Projections, Nichol (2006), 1996 Community Tracking Study, MMWR (7/28/06)