Journal of Health Economics 28 (2009) 704–717

Contents lists available at ScienceDirect

Journal of Health Economics

journal homepage: www.elsevier.com/locate/econbase

Who has a clue to preventing the flu? Unravelling supply and demand effects on the take-up of influenza vaccinations

Jürgen Maurer[a,b,*]

[a] Health, Econometrics and Data Group (HEDG), University of York, UK
[b] Mannheim Research Institute for the Economics of Aging (MEA), University of Mannheim, Germany

ARTICLE INFO

Article history:
Received 30 January 2008
Received in revised form
17 September 2008
Accepted 24 January 2009
Available online 6 February 2009

Keywords:
Influenza vaccinations
Preventive health care
Physician agency supply and demand
Semiparametric methods

ABSTRACT

Influenza is a serious disease, especially for older people, and incomplete vaccination take-up poses a major public health challenge. On both the side of physicians and patients, there could be promising channels for increasing immunization rates, but no attempt has yet been made to empirically unravel their respective influences. Using exclusion restrictions implied by an economic model of physician–patient interactions, our study quantifies the particular effects of supply and demand on influenza immunization. On the supply side, our estimates highlight the importance of physician agency and physician quality, while a patient's education and health behaviors are key demand side factors.

1. Introduction

Influenza is an infectious disease that can have severe consequences for those affected. Older people and individuals with specific health conditions, such as heart or respiratory diseases, run a particularly high risk of suffering complications from an infection with one of the influenza viruses. Every year, influenza leads to a large number of excess hospitalizations and deaths worldwide (WHO, 2003).

Even though vaccination can considerably reduce the incidence and severity of influenza, its take-up is often far from complete. Even specifically targeted high-risk groups, such as the older population, often feature substantial gaps in vaccine take-up, with take-up rates below 50% at times (Mattke et al., 2006; Pohl, 2006). As a consequence, increasing influenza vaccination is one of the top public health priorities in many countries (WHO, 2005).

Asymmetric information is one of the key features characterizing the market for health care, and patients' perceptions of their own care need are often inaccurate (Arrow, 1963; Kenkel, 1990). Influenza is no exception in this regard, and even individuals at high risk of severe complications tend to have considerable misconceptions with respect to the seriousness of influenza and their own resistance (Kroneman et al., 2006). For this reason, physicians often need to act as agents for their less-informed patients, which leads to an important role for supply-side factors in determining actual patterns of health care use. In this way, physician agency may also offer an important supply-side channel for increasing the take-up rate of influenza vaccinations.

The main objective of this paper is to unravel supply and demand factors in the determination of vaccination take-up and assess their relative importance quantitatively. Disentangling the separate influences of supply and demand is particularly informative for the design of health policies targeting either market side. One important issue in this regard is the role of physician agency for vaccination take-up among high-risk individuals. Do high-risk patients exhibit sufficient health literacy to independently demand influenza vaccination or do they critically rely on their family physicians to obtain indicated immunizations?

We propose a simple economic model for vaccination take-up that highlights the role of physicians, patients and their interactions in the administration of influenza vaccines to illustrate key subject matters and inform our subsequent empirical analysis. Particularly, our model points out important simultaneity issues implied by physician agency in the physician–patient relationship. At the same time, it offers some guidance on potential exclusion restrictions that we can use to separate the respective influences of supply and demand on vaccination take-up.

To this end, we estimate a semiparametric double index model for influenza vaccine take-up using novel survey data on older

* Correspondence address: RAND Corporation, 1200 South Hayes Street, Arlington, VA 22202-5050, USA. Tel.: +1 703 413 1100x5946; fax: +1 703 413 8111.
E-mail address: jmaurer@rand.org.

0167-6296/$ – see front matter © 2009 Elsevier B.V. All rights reserved.
doi:10.1016/j.jhealeco.2009.01.005

individuals in Germany. Specifically, our econometric model features two distinct indices, one for supply and one for demand. Using exclusion restrictions implied by an illustrative theoretical model, we are able to separate structural supply and demand effects as well as quantify the impact of various micro-level factors on vaccination take-up. Importantly, our model also allows us to identify the exact pathway through which key health-related risk characteristics of the patients, such as age or background health, affect the conditional probability of getting vaccinated. We can therefore gauge the extent of physician agency in vaccination decisions based on our estimation results.

The remainder of the paper is organized as follows: Section 2 briefly reviews some non-technical background material on influenza, influenza vaccination and potential barriers to comprehensive immunization coverage. Section 3 presents our illustrative model of patient–physician interactions, which guides our empirical investigation. The corresponding econometric framework is detailed in Section 4. This section describes the most important aspects of our semiparametric estimation procedure and gives a detailed discussion of how we define structural effects of supply and demand. Section 5 describes the data underlying our analysis as well as the exact specification of our empirical model. Section 6 presents our estimation results, with Section 7 concluding the paper.

2. Background

Influenza is a common seasonal infection with one of the influenza viruses. In the Northern hemisphere, the influenza season typically ranges from November to around May, as virus circulation normally peaks during the winter period. Although influenza may affect people of all ages, it tends to be particularly serious in older individuals for whom it often leads to severe complications such as pneumonia, markedly increased chances of hospitalization or even death. In Germany, influenza-associated excess mortality amounted to an average of around 13,600 deaths per influenza season during 1990–2001 (Zucs et al., 2005). Reflecting this relatively high death toll, the combined category of "influenza and pneumonia" commonly ranks among the top 10 causes of death, and most of these deaths occur in the older population (Statistisches Bundesamt, 2006).[1]

Influenza vaccination constitutes the primary policy tool for reducing influenza virus circulation as well as preventing infections and their associated complications (CDC, 2007). The influenza vaccine is mostly administered via so-called flu shots, which are typically injected in the patient's arm. The vaccine thereby consists of three season-specific inactivated influenza viruses. The exact composition of the vaccine changes each year based on projections about which types and strains of viruses are most likely to circulate in the upcoming flu season. As influenza viruses undergo antigenic drift, revaccinations are required each year a new. October is the preferred month for vaccination take-up, since it takes about 2 weeks for the body to develop sufficient antibodies for effective influenza protection.

Influenza vaccinations are generally deemed efficacious and cost-effective, especially when targeted at persons who are at high risk of complications.[2] Although the exact degree of protection depends on the age and immunocompetence of the vaccine recipient as well as on the match between vaccine and actual virus circulation, flu shots lead to considerably lower incidence rates of influenza as well as to a substantial mitigation of its adverse consequences in case of infection. Specifically, while vaccination prevents influenza among 70–90% of healthy adults age < 65, its efficacy tends to be somewhat lower (around 50%) for older people. Yet, beyond this (still substantial) reduction in the probability of getting the flu, it has been shown that the vaccine may prevent up to 70% of hospitalizations due to pneumonia and influenza, in addition to preventing other secondary complications and death among older adults. In fact, influenza vaccination is often regarded as especially cost-effective for the older population, as its reduced efficacy is more than compensated by the large reductions in hospitalizations and mortality for this population group.

Although there appear to be no universally accepted recommendations for influenza vaccination use, most official agencies base their advice on criteria related to age and the prevalence of other major risk factors for disease complications, such as chronic cardiovascular or respiratory diseases or diabetes (CDC, 2007; RKI, 2007; WHO, 2005).[3] In Germany, the "permanent commission on vaccination" (Ständige Impfkommission, STIKO), which gives advice to the German states on issues related to infectious diseases and vaccination, recommends influenza vaccinations for all individuals aged 60+ and other persons suffering from any high-risk condition. However, not all 16 German states follow the STIKO in their official vaccination recommendations. For example, the relatively large state of Baden-Württemberg recommends influenza vaccinations for all inhabitants regardless of age and background health.

While some health insurance companies tie vaccination coverage to the STIKO recommendations, most insurers reimburse all expenditures on influenza vaccinations as "voluntary benefits" (freiwillige Satzungsleistungen). As health insurance is nearly universal in Germany, this essentially means that in the vast majority of cases, none of the financial costs of influenza vaccinations are to be borne by the patients. Moreover, patients are also exempt from any practice user fees, as these do not apply to purely preventive doctor visits. In most cases, influenza vaccinations are therefore free of any charge to the patient (Szecsenyi, 2005).[4]

The main providers of influenza vaccinations in Germany are family physicians, who get reimbursed for administering influenza vaccinations. More than 80% of the German people report to have a regular family physician (Szecsenyi, 2005), with an even larger fraction among the older population.[5] Patients usually have more or less regular contacts with their respective physicians, who also play an important role in chronic disease monitoring and management as well as initial contact points for entering the health care system (even if generally not acting as formal gatekeepers).[6]

Despite the broad indication of influenza immunizations and their general availability at no (financial) cost to the patient, vac-

[1] By and large, influenza epidemiology and associated mortality patterns seem comparable across most industrialized countries. The United States, for example, featured approximately 36,000 deaths per influenza season during 1990–1999, with more than 90% of these deaths concentrated among persons aged 65 and older (CDC, 2007).

[2] See for example CDC (2007) or WHO (2005) for an overview and further references regarding the efficacy and cost-effectiveness of influenza vaccinations.

[3] In addition to pure medical criteria, recommendations often also indicate vaccination take-up for persons dealing with high-risk individuals, such as care-givers or healthcare workers. Yet, our study will exclusively focus on medical considerations, as these appear most relevant for individual (utility maximizing) take-up decisions of older people.

[4] For the small minority of patients that do not have any influenza vaccination coverage, associated financial costs of vaccination would be around EUR 20–30.

[5] For example, among German respondents aged 50+ of the first wave of the Survey of Health, Ageing and Retirement in Europe (SHARE), 95% of individuals state that they have a regular family physician.

[6] In the German SHARE sample, more than 85% of all respondents report at least one visit to a family physician within the last 12 months.