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Who Takes Advantage of Free Flu Shots?
Examining the Effects Of An Expansion in Coverage

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Abstract

Because of the high risk of costly complications (including death) and the externalities of contagious diseases, many countries provide free flu shots to certain populations free of charge. This paper examines the expansion of the free flu shot program in the Netherlands. This program expanded in 2008 to cover all individuals over the age of 60, instead of 65. We investigate the effectiveness of the expansion of the flu shot program and examine those factors that are likely to influence people to change their behavior. We find that the main barrier to take up of free flu shots in the Netherlands is labor force participation. Expansion of the program did little to change the behavior of those at increased risk due to co-morbidities, primarily because these individuals were already getting flu shots.

Keywords: Preventive Health Care, Flu Shot, Dutch Policy, Coverage Expansion

JEL Classification: I10, I18

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1. Introduction

Influenza can affect 10 to 30 percent of the population each year resulting in lost work days and higher health costs, not to mention pain and suffering for those who are ill and possible death, especially among high risk populations. In the last two years, infection rates in the Netherlands have approached epidemic levels (RIVM, 2009; Volkskrant, 2009 and 2011). To combat the risks of influenza, the Dutch government provides free influenza vaccinations (flu shots) to certain high risk groups, including the elderly, diabetics, and those with heart disease. Other countries recommend that more individuals get flu shot; this year for example, the United States Centers for Disease Control and Prevention (CDC) started to recommend that everyone get a flu shot, in order to promote so-called herd immunity.

While it may not be necessary for everyone to have a flu shot, the preventive benefits are clear, especially for high risk populations who are more likely to suffer complications from influenza, including death. These preventive benefits are the primary motivation for providing free flu shots in the Netherlands. But flu shots can also provide a positive externality. As with all vaccinations, flu shots reduce the prevalence of disease and therefore the likelihood that individuals will come into contact with and possibly contract influenza.

Economic theory shows that without government intervention individuals would underinvest in prevention. This means that some population-based prevention and promotion programs must be necessarily financed by the state.

This paper examines the flu shot program in the Netherlands. By using a random representative sample of Dutch individuals (LISS panel data) we aim to understand who responds to the availability of free flu shots. In 2008, the Netherlands expanded their free flu shot program to include all individuals over the age of 60, instead of all individuals over the age of 65. In both regimes, flu shots are provided free of charge by the National Institute of Public Health and the Environment (RIVM). Prior to the expansion 32% of our sample between the ages of 60 and 64 got flu shots. After the expansion, this grows to 61%. This paper investigates the effectiveness

of the expanded flu shot program by focusing on who responds to the new expanded program. We examine a number of factors that may influence people to change their behavior.

The paper proceeds as follows. Section 2 discusses literature on preventive health care and on flu shots in particular. Section 3 describes the institutional setting of the Dutch flu shot program. Section 4 focuses on the data description. Empirical results are presented in sections 5 and 6. Section 7 concludes.

2. Literature on preventive health care and flu shots

There is an extensive literature on the decision to take up a preventive care program if the expected present value of the reduction of getting sick and the probability of death is greater than the opportunity costs of intervention. See Grossman, 1992; Selden, 1993; Chang, 1996 for a further description of this notion.

Several empirical works examine the factors that make people decide to invest in preventive care. Trivedi et al. (2008) study the effect of an increase in patient's share of health care costs on the use of important preventive programs such as mammography. An increase in the cost sharing is significantly associated with lower mammography rates. Particularly women with low income and educational level are worse off when co-pays are in place. Kenkel (1994) finds that the probability of women will have pap smears and mammograms increases with schooling and insurance coverage and decreases with age. Belkar et al. (2006) state that women's awareness of the presence of Pap tests clearly increases their propensity to ever screen for cervical cancer. The role of awareness is pivotal in determining who uses preventive care programs and failing to account for it can bias the measurement of other effects.

Another strain of the literature focuses on the determinants of those individuals getting a flu shot. Mullahy (1999) examines the microeconomic determinants of being immunized against influenza. He finds that the propensity to receive a vaccine depends on a number of both individual characteristics, such as schooling and age, and environmental factors, such as insurance coverage. Chi and Neuzil (2004) investigate how patient attitudes, beliefs, knowledge, and sociodemographic factors relate to influenza vaccine acceptance in an older population.

Receipt of vaccination is associated with a discussion about the influenza shot with the health care provider and a positive attitude towards the flu shot. History of side effects and negative attitude toward influenza vaccine are associated to failures to receive the shot. Shahrabani and Benzion (2006) look at the socioeconomic factors affecting the decision to take a flu shot in Israel, where vaccination rates remain relatively low compared to other countries. Chronic illness, previous hospitalizations, and age increase the chance to take the flu shot. McCaul, Johnson, and Rothman (2002) test the effect of *cues to action*, i.e. messages intended to increase flu immunization. In North Dakota counties use remind letters, action letters, or no letters at all within the flu shot program. The authors show that the reminder type used does not significantly affect the immunization rate. However, the action messages worked better (28.2%) than no message (19.6%).

Denton (1997) examines the importance of communication in prevention programs. Research shows that high-risk patients who should take the vaccine are more likely to do so if they understand its efficacy and absence of side effects.

3. Dutch institutional setting

The Dutch government finances some preventive care programs through the National Institute of Public Health and the Environment (RIVM). Each year the Health Council of the Netherlands classifies the criteria of high-risk groups in the population who are then eligible to receive a free flu shot. General practitioners (GPs) provide most immunizations.[1] Through RIVM's program, GPs send letters in the fall to all of their patients who are eligible for these free flu shots inviting them to come in for their vaccination. There are two primary groups covered by the free flu shots: those over the age of 65 (or 60) and those at high risk due to other chronic illnesses, such as diabetes and heart disease. Outside of these groups, people can still receive a flu shot from their doctor. In this case the out-of-pocket price will depend on their specific health insurance package.

The main reason to offer a free flu shot is the significant public health benefits that can be reached. There are two types of benefits: direct benefits to the individuals receiving flu shots and

[1] The bulk of flu shots are indeed given at the GP practice. However, employers can offer such an immunization program as well.

indirect benefits to everyone due to decreased prevalence of an infectious disease. The reduction of morbidity among the elderly is estimated between 30 and 70%. Complications resulting from influenza are reduced by 20 to 50%. Evidence shows that influenza vaccines are effective in reducing the risk of contracting influenza. The ability of a flu vaccine to protect a person depends on the age and health status of the person getting the vaccine, and the similarity or "match" between the viruses or virus in the vaccine and those in circulation.

According to the Centers for Disease Control and Prevention (CDC)[2] the flu shot is 30 to 70% effective in preventing hospitalization for pneumonia (a lung infection) and influenza among elderly persons not living in chronic-care facilities (such as nursing homes) and those persons with long-term (chronic) medical conditions (such as asthma, diabetes, or heart disease). Dutch researchers find similar results. The flu shots offer protection to the elderly, especially if flu shots are taken every year (Simonsen et al., 2007).

In addition to these direct benefits, there are indirect benefits due to the fact that influenza is a contagious disease. If others receive flu shots, and therefore do not get influenza, the risk to the whole population can decline. Widespread use of flu shots can even lead to so-called herd immunity, where enough people can be vaccinated that the overall risk of contact with the disease is nearly eliminated. Along these lines, the US CDC now recommends that everyone (at all ages) get a flu shot.

In the Netherlands, there is a constant increase in the number of people eligible for the free flu vaccination program. This is due to the ageing population and to the better registration of patients with chronic conditions. The group entitled to get a flu shot also increased in 2008 due to a policy change in the immunization program. People over the age of 60 became eligible to receive a free flu shot. The previous age boundary was 65.

Take up of flu shots following this policy change was studied also by Tacken et al. (2009). The National GP Information Network (Landelijk Informatie Netwerk Huisartsenzorg) is a representative national network of GP practices that uses specific software (HIS) to record

[2] For further information see http://www.cdc.gov/flu/about/qa/vaccineeffect.htm

patients information. All 72 practices of this network have been approached in this study. The HIS software register the vaccine given to the patient, those who refused to get a flu shot, those who do not react to the invitation to get a flu shot, and those who do not belong to the high-risk population but are willing to pay out-of-pocket for their vaccination because they are excluded from the eligible group (e.g. younger than 60). Tacken et al. use data from 56 GP practices. The average GP practice has an average number of patients of 3,762 (minimum 1,533 and maximum 10,506). The patient group above the age of 60 has been split into one group with and one group without medical need for flu shot. Demographic characteristics such as gender, age, and living in poor boroughs are used as explanatory factors of the vaccination take up. Several patient categories (of 5 years each) have been created to account for the degree of vaccination per age category.

According to Tacken et al. (2009) the degree of vaccination in the "enlarged" group, those individuals aged between 60 and 65, was generally low (51,9%); just slightly more than the half of the high-risk patients aged between 60 and 65 decided to get a flu shot. There was no significant difference compared to previous years with the degree of vaccination of high-risk individuals. In other words, their study indicates that the policy change did not have any real influence on the vaccination program. In 2009 there was a slight increase in the percentage (54,7%) of people aged between 60 and 65 who got the flu vaccine. Also, the number of individuals eligible for the flu shot increased because of the vaccination against the influenza A H1N1. Generally women make more use of the free vaccination program than men (73,7% versus 69,0% in 2008) as the high-risks living in better boroughs do than high-risk individuals in poor boroughs (71,7% and 68,7% in 2008).

Tacken et al. also look at data at GP practice level to compute the average vaccination degree per GP practice. They investigate whether GP practice characteristics (e.g. urbanization level, solo vs. group practice, and GP care pharmacy, i.e. a GP authorized to practice as a pharmacist) play any significant role on the flu shot take up. Solo practices have lower vaccination degree, when the GP is qualified to practice as a pharmacist the flu shot take up is higher (72.4% vs. 71.5%), and rural areas show more vaccination take up than urban areas (72.7% vs. 71.3%).

There are two primary differences between Tacken et al. (2009) and our paper. First, they use administrative data while we use self reported survey data. Thus they may have more accurate measures of who receives a flu shot, but they are limited in their control variables. Survey data allows us to collect more detailed demographic information and investigate the reasons behind individuals' choices. Second, we consider in more detail the heterogeneity of flu shot take up. In particular we carefully consider to the role of past flu shot take up.

4. Data

The data for this study comes from a survey administered through the LISS panel. The LISS panel is a panel run by CentERdata that includes a random representative sample of Dutch households who answer monthly surveys accessed through the internet. In order to ensure representativeness, households without internet access are provided with a computer and internet access. While there are some problems attracting the oldest elderly to participate in the survey, this is primarily an issue among those over 80 and therefore not relevant for our study, which focuses on the ages of 60-64 for the main analysis and ages 55 to 69 for robustness. Our main analysis consists of 484 individuals; an additional 604 are between the ages of 55 and 59 and 391 between 65 and 69. There are a number of advantages of the LISS panel. First, the LISS panel regularly collects household demographic data, thus these questions need not be asked during our survey. Second, as it is a panel, it is easy to return to respondents at a later date to ask follow up questions.

Our study was conducted in the LISS panel in September 2008 and January 2009. In September respondents were asked about their past use of flu shots, whether they had a flu shot in 2007, whether they received an invitation for a flu shot in 2007, contact with health care providers, and their perceptions regarding flu shots. In January, respondents were asked whether they had received a flu shot during the fall of 2008. The timing of the initial survey was selected to occur prior to the mailing of invitations for flu shots for the Winter 2008/2009 season.

The primary interest is whether or not individuals choose to get a flu shot in 2008 after the expansion of eligibility. Panel A of Table 1 presents a cross tab of flu shot take up in 2007 and 2008. Several important factors can be gleaned from this table. First, participation in the flu

shot program for the affected age group increased dramatically from 2007 to 2008; nearly twice as many people get flu shots in 2008. Second, among those who got a flu shot in 2007, nearly all of them continue to do so in 2008. Only three individuals switch from getting a flu shot to not getting a flu shot. Panels B, C and D of Table 1 present the same information for those between 55 and 59, age 65, and ages 66 to 69. Like those between 60 and 64, people aged 65 were not eligible for flu shots in 2007 but are now eligible in 2008. What we learn from these comparison groups is that if nothing else changes (as in Panels B and D), most people continue to do what they did before. If flu shots become available for free (as in Panels A and C), roughly half of those who did not get a flu shot in 2007 get one in 2008. These results suggest that in the multivariate analysis it is important to consider past behavior.

Respondents are also asked about risk factors that may make them more prone to complications due to influenza. These include diabetes, high blood pressure, and heart disease. Individuals suffering from these chronic conditions should also have received an invitation for a flu shot, thus an invitation received by someone outside of the normal age range is likely to indicate that an individual has some additional risk factors.

When discussing influenza with a general population, one concern is that the word "flu" may be interpreted to mean something other than influenza. The same is true in the Dutch language. Thus respondents are instructed to consider actual influenza:

> *The first few questions are about the flu. By **flu**, we mean actual flu or influenza, not a cold or stomach flu. With influenza you become sick very fast, with aching muscles all over your body, a high temperature and usually have a pounding headache.*

The informal use of the word may influence how people respond to questions about influenza. For example, individuals are asked how many times in the last 5 years they had influenza; one person (outside of the age range for this paper) responded that they had influenza 30 times! In our sample, the average number of times one has had influenza in the last 5 years is 0.51.

We also ask individuals about whether or not they agree or disagree (on a 5 point scale) with a number of subjective statements that explain who might or might not get a flu shot.

> *I never thought about a flu shot.*
> *I think that a flu shot provides good protection against the flu.*

I think that flu shots can harm your immune system.
Flu shots have unpleasant side effects.
I do not like doctors.
I do not like needles.
I think I am at high risk to get the flu.
If you have had one or more flu shots, then it is no longer necessary.
I don't have time for a flu shot.
Flu shots are too expensive for me.
I do not know anything about flu shots.

These questions are designed to address the main reasons individuals may have for not getting a flu shot. In particular, this allows us to identify what factors are most related to take up or non-take up of flu shots.

Table 2 presents summary statistics for the main demographic variables and for the other control variables that will be considered in the multivariate analysis. Summary statistics are presented for all individuals between 60 and 64 and separately for those who did and did not get a flu shot in 2007. Recipients of flu shots are slightly older. Women are slightly more likely to have had a flu shot in 2007, but differences disappear in 2008. Married or partnered individuals are more likely to have a flu shot. Individuals who are still working are less likely to have flu shots. College educated individuals are less likely to have had flu shots. Those who visit the doctor more, or received invitations for flu shots in 2007 are more likely to have flu shots. Next we consider the subjective questions discussed above; all of these go in the expected directions. Note here that a higher number indicates more strong agreement. Respondents were also asked to report the monetary and time costs of a flu shot (either actual or perceived depending on whether they had a flu shot before). These costs are higher for those who did not get a flu shot. Perceived importance also is associated with higher take up.

Finally we asked about a number of risk factors, as discussed above. Risk factors such as diabetes, high blood pressure, and heart disease are more common among those who get a flu shot, in both years. This suggests first, that many individuals with risk factors were getting flu shots before the expansion of the program. Second, there is a slight decrease in diabetes and high blood pressure among those who do not get a flu shot, suggesting that a few people with risk

factors started getting flu shots after the expansion of the program. Other risk facts, such as perceived risk and self assessed health, also point in the expected directions.

These differences reported in table 2 are merely indicative. In the next section we will consider multivariate analysis that allows us to control for all factors at the same time.

5. Results

In this section we present the main results of our paper. In all cases we consider four models designed to identify which individuals are most likely to get a flu shot following the expansion of the program. All regressions are probit regressions reporting marginal effects. First, we regress a dummy for receiving a flu shot in 2008 on demographic characteristics and whether the individual received a flu shot in 2007. This model provides insight into whether or not individuals continue to make the same choice as in the past. Second, we regress a dummy for receiving a flu shot in 2008 on demographic characteristics and *do not* control for whether the individual received a flu shot in 2007. This model identifies who is most likely to get a flu shot, regardless of past behavior. Third, we rerun the second specification but limit our sample only to those who did not get a flu shot in the past. Because the descriptive statistics suggest that only a very small number of individuals stop getting a flu shot, this focuses attention on those who start to receive a flu shot in the year of the policy change. Fourth, we change the dependent variable to receiving a flu shot in 2007, to investigate what characteristics are most associated with past flu shot take up. In all cases we limit our sample to those between the ages of 60 and 64, the newly targeted age group.

Table 3 presents the base case specifications. In the first column, we see that if you received a flu shot in 2007, there is a nearly 60% increase in the probability that you will receive one again in 2008. Individuals who are currently working are 15.6% percent less likely to receive a flu shot. Individuals who visit the doctor more often are more likely to get a flu shot, with the probability increase by approximately 3% per visit.

Those who received an invitation in 2007 are actually 24.1% percent less likely to receive a flu shot. This somewhat counterintuitive result is easily understood by comparing the first column to

the second column. When we do not control for past behavior, invitations increase the likelihood of a flu shot in general. However, for those who chose not to get a flu shot in the past, even though they received an invitation, the expanded program does not change their behavior. This result can be interpreted to indicate that once you have declined an invitation for a flu shot, you are likely to continue to reject opportunities for a flu shot. The results in column 3, limited to those who declined a flu shot in 2007 are largely in line with those in column 1.

Finally the fourth column considers past take up of a flu shot. The main indicator of take up prior to the expansion of the program was receipt of an invitation for a flu shot. Doctor visits also increase take up. In this case, invitations and doctor visits can be interpreted as an indicator of the individuals underlying health and risk. Those who had health problems were likely to receive flu shots in the past (and to continue after the new expansion). Interesting, labor supply does not predict past take up. This suggests that labor supply may not be an impediment for receiving a flu shot for those at the highest risk. However comparing this result to the other columns, we see that working is an impediment to flu shot take up among those at lower risk. Interestingly, the pseudo R-squared is much higher (0.608 vs 0.048 to 0.283) for 2007 than for any of the 2008 specifications. Prior to the program expansion, invitations were very effective; when invitations were targeted to those with potential co-morbidities, invitation signaled more importance. After the expansion, many who received invitations probably did not see the reason to receive a flu shot. Prior to the expansion, it was easy to explain who would get a flu shot: anyone who got an invitation. However, after the expansion flu shot take up is more random.

Table 4 investigates the subjective reasons for and against flu shot take up described in the previous section. Demographic characteristics are excluded from the tables but are included in all regressions. These coefficients were not qualitatively affected by the addition of the subjective reasons. As in table 3, four models are included for each set of independent variables. In this table we consider two sets of independent variables. First we add all of the subjective reasons and second, we limit the subjective explanatory variables to those that are significant in more than one specification. Many of the possible explanations, such as fear of doctors or needles and lack of knowledge are consistently insignificant.

Perceptions of effectiveness of flu shots in protecting against the flu are a significant predictor of take up of flu shots. In 2008, moving up one point on the Likert scale, for example from agree to strongly agree that flu shots provide good protection against influenza, increases the likelihood of a flu shot by roughly 15 to 20% depending on the specification. For 2007 take up, the effect may be less strong, but is still significant; perceptions of effectiveness may be less important among the high risk groups who were likely to receive flu shots in 2007. Those who perceive more unpleasant side effects are less likely to receive flu shots. Moving up one point on the Likert scale decreases the likelihood of a flu shot by 7.4 to 12.8% depending on the specification. When we do not control for past behavior, we see that perceptions of risk affect take up. Those who strongly agree that they are at high risk to get the flu are 5.2 to 8.0% more likely to get a flu shot than those who only agree, in models 2, 4, 6, and 8. However in model 1, 3, 5, and 7 which explicitly or through sample limitations control for past behavior, the effect is (in most cases) not significant. Finally, people who feel that flu shots are too expensive were less likely to get a flu shot in 2007 but more likely to get a flu shot in 2008. This suggests that individuals who agreed with this statement would have liked to have a flu shot but found costs to be too high. When costs decline (to zero monetary cost) they are now able to have a flu shot. For those who disagree with this statement, other factors are likely to be more important determinants of behavior.

Table 5 considers the effect of potential co-morbidities by adding controls for whether the individual had influenza in the past 5 years, whether they have diabetes, high blood pressure or heart disease. Tacken et al. (2009) find that the program expansion did not significantly change the behavior of high risk individuals. In our data, in all specifications (even the fourth column which considers past behavior) these risk factors have no effect on take up of the flu shot. Invitations to high risk individuals were very effective; most already got a flu shot in the past and did not change their behavior after the change in policy. Thus these coefficients are all insignificant. The only exception is that in 2007, individuals with heart disease were 17% more likely to get a flu shot, even controlling for invitations. However, this is only significant at the 10% level.

6. Comparing Targeted and Untargeted Age Groups

In section 5, we focused on individuals between the ages of 60 and 64 who were targeted by the new flu shot program. In this section we compare behavior of those in this age range to individuals age 55 to 59 and 65 to 69.

Table 6 compares the first specification from Table 3 for various age groups. The first column repeats the first column from Table 3. The second column adds individuals age 65 to 69 and adds a dummy to indicate individuals who are eligible for a free flu shot for the first time in 2008 (based on age). The third column includes individuals age 55 to 64 and adds a dummy to indicate individuals who are eligible for the first time in 2008. The fourth column includes all individuals age 55 to 69 and includes dummies for individuals eligible for the first time in 2008 and for individuals who were eligible in 2007.

In all age groups, previous behavior continues to be the most important indicator of flu shot take up, increasing the likelihood of take up by 59 to 72%. Most individuals are unlikely to change their behavior. If we were to consider the other specifications shown in Table 3, this would confirm this finding as well.[3] Working seems to only discourage participation in the flu shot program for individuals between ages 60 and 64. This is probably the case because it is very unlikely for individuals under 60 to have stopped working. Doctor visits also increase the likelihood of take up by 1.5-3.6%. The effect is smallest among the oldest group. This may reflect the fact that the average number of doctor visits per year is higher in this group. In Columns 1 and 2 (which focus on individuals who are eligible for free flu shots) an invitation in 2007 reduces the likelihood of a flu shot both for individuals aged 60-64 and aged 60-69. Again likely indicating that those who have rejected free flu shots in the past, are likely to continue to do so. For the most part these results are in line with those in Table 3.

The primary differences between Tables 3 and 6 are due to age variables. One difference is that when we add individuals aged 55 to 59, the coefficient on age becomes significant. This is likely due to the fact that among those who are not eligible for a free flu shot based on age (under age 60), the likelihood of eligibility based on other risk factors (diabetes, heart disease and high blood pressure) increases every year. Also we see that individuals who are newly eligible are

[3] These tables are available from the authors.

17.5-21.5% more likely to get a flu shot. This reflects the fact that most of these individuals were not getting a flu shot in 2007. Now with the new expanded program, they are more likely to get one. However, the coefficient on this dummy variable is not as large as the coefficient on past behavior. Newly eligible individuals do change their behavior, but they do not behave like the older groups in the first year that they are eligible.

Tables similar to 4 and 5, which add subjective reasons for a flu shot and risk factors, for the larger age groups could also be considered. However, we see no differences between the broader age groups and the group age 60-64. [4]

7. Conclusions

In sum, the primary determinant of flu shot take up after the expansion of the program was whether an individual had a flu shot in the previous year. Among those who did not have a flu shot in 2007, those who work were the least likely to take advantage of the new expanded program. Similarly those who expect unpleasant side effects or that flu shots are not effective are less likely to receive a flu shot. Changing the price of a flu shot (to free) did influence some individuals to take up the flu shot, particularly those who felt the price was too high. Finally, the expanded program had no impact on the highest risk groups in the 60 to 64 year old age group, primarily because they were already receiving flu shots.

One barrier to take up is perceptions of effectiveness and side effects. Individuals who think that flu shots cause influenza, a common albeit not totally accurate belief, are unlikely to get a flu shot. Better information about side effects and effectiveness would likely help to improve take up rates. Finally, it is important that education programs help people to understand what can and what can not be prevented by a flu shot. Individuals who get a flu shot and then get a bad cold may perceive that they have "the flu" and therefore that the flu shot was not effective. Better information about influenza and influenza vaccinations may help to improve take up.

The largest barriers to take up of free flu shots is participation in the labor force. Many individuals between the ages of 60 and 65 in the Netherlands stop working, so individuals who

[4] These tables are available from the authors.

are still working are likely very dedicated to working. They have jobs that make it more difficult for them to miss work or they may *feel* that they can not afford to miss work, even if they would be allowed to do so. Unlike many countries, in the Netherlands most individuals must go to the general practitioner if they want a flu shot. Flu shots are not available in grocery stores, drug stores, megamarts, etc. However, the costs of influenza among workers age 60 to 65 are likely to be great. These individuals are deemed to be at high risk based on their age and have similar social and monetary costs as non-workers. But there is also the cost of missed work; individuals who get true influenza are likely to miss 1 to 2 weeks of work. More widely available flu shots, especially after normal working hours would likely help to increase take up of this program. If there is concern about availability of flu shots in non-medical locations, flu shots at urgent care centers and hospitals could be introduced.

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Table 1 Flu Shots in 2007 and 2008

Panel A Ages 60-64

	No flu shot in 2008	Flu Shot in 2008	Total
No flu shot in 2007	184	150	334
	38%	31%	69%
Flu shot in 2007	3	148	151
	1%	31%	31%
Total	187	298	485
	39%	61%	100%

Panel B Ages 55-59

	No flu shot in 2008	Flu Shot in 2008	Total
No flu shot in 2007	391	44	435
	72%	8%	80%
Flu shot in 2007	14	96	110
	3%	18%	20%
Total	405	140	545
	74%	26%	100%

Panel C Age 65

	No flu shot in 2008	Flu Shot in 2008	Total
No flu shot in 2007	24	22	46
	24%	22%	47%
Flu shot in 2007	0	52	52
	0%	53%	53%
Total	24	74	98
	24%	76%	100%

Panel D Age 66-69

	No flu shot in 2008	Flu Shot in 2008	Total
No flu shot in 2007	44	17	61
	22%	8%	30%
Flu shot in 2007	6	136	142
	3%	67%	70%
Total	50	153	203
	25%	75%	100%

Notes: Tables present number of individuals in each cell and percent of total in each cell.

Table 2 Summary Statistics

Variable	Whole Sample	Did not Have a flu Shot in 2007	Had a flu Shot in 2007	Did not Have a flu Shot in 2008	Had a flu Shot in 2008
Age	61.9546	61.9341	62	61.861	62.0134
	[1.3415]	[1.3407]	[1.3466]	[1.3448]	[1.3383]
Dummy if male	0.5361	0.515	0.5828	0.5401	0.5336
	[.4992]	[.5005]	[.4947]	[.4997]	[.4997]
Dummy if partnered	0.7893	0.7838	0.8013	0.7688	0.802
	[.4083]	[.4123]	[.4003]	[.4227]	[.3992]
Dummy if working	0.25	0.2763	0.1921	0.3441	0.1913
	[.4335]	[.4478]	[.3952]	[.4764]	[.394]
Dummy if some college education	0.132	0.1257	0.1457	0.1337	0.1309
	[.3388]	[.3321]	[.354]	[.3412]	[.3378]
Dummy if College educated	0.2577	0.2874	0.1921	0.2995	0.2315
	[.4378]	[.4532]	[.3952]	[.4593]	[.4225]
Number of Doctor Visits in Last Year	2.5361	1.9281	3.8808	1.7701	3.0168
	[2.9649]	[2.0167]	[4.0856]	[2.0883]	[3.3156]
Dummy if Received an Invitation for Flu Shot	0.367	0.1048	0.947	0.1604	0.4966
	[.4825]	[.3067]	[.2247]	[.368]	[.5008]
I never thought about a flu shot.†	2.7485	3.2036	1.7417	3.1711	2.4832
	[1.4268]	[1.3199]	[1.1043]	[1.361]	[1.4052]
I think that a flu shot provides good protection against the flu. †	3.5918	3.2784	4.2848	3.0749	3.9161
	[.9036]	[.8185]	[.6671]	[.8455]	[.7804]
I think that flu shots can harm your immune system. †	2.5711	2.8353	1.9868	2.9198	2.3523
	[.9302]	[.8629]	[.7999]	[.8607]	[.9064]
Flu shots have unpleasant side effects. †	2.5856	2.8892	1.9139	3.0214	2.3121
	[.9553]	[.847]	[.8322]	[.8548]	[.9137]
I do not like doctors. †	1.9031	1.997	1.6954	2.0107	1.8356
	[.9669]	[1.0149]	[.8164]	[1.0212]	[.9265]
I do not like needles. †	2.1649	2.2485	1.9801	2.2299	2.1242
	[1.1179]	[1.1342]	[1.0613]	[1.1147]	[1.1198]
I think I am at high risk to get the flu. †	2.5361	2.2186	3.2384	2.1765	2.7617
	[1.0569]	[.8257]	[1.1702]	[.8005]	[1.1342]
If you have had one or more flu shots, then it is no longer necessary. †	1.8804	1.985	1.649	2.0214	1.7919
	[.7939]	[.7921]	[.7501]	[.7546]	[.8063]
I don't have time for a flu shot. †	1.6021	1.7305	1.3179	1.754	1.5067
	[.719]	[.7509]	[.5461]	[.743]	[.6878]

Table 2 Summary Statistics (Continued)

Variable	Whole Sample	Did not Have a flu Shot in 2007	Had a flu Shot in 2007	Did not Have a flu Shot in 2008	Had a flu Shot in 2008
Flu shots are too expensive for me. †	1.7546	1.8922	1.4503	1.8182	1.7148
	[.828]	[.8421]	[.7089]	[.7614]	[.866]
I do not know anything about flu shots. †	2.2103	2.5419	1.4768	2.4652	2.0503
	[1.17]	[1.179]	[.7379]	[1.2325]	[1.1013]
Actual or expected time for a flu shot	25.8784	29.3832	18.1258	29.2727	23.7483
	[16.9653]	[17.964]	[11.1554]	[17.5167]	[16.2812]
Actual or expected cost for a flu shot	16.4568	23.2771	1.3709	20.9679	13.626
	[23.4383]	[25.1912]	[5.5765]	[22.4512]	[23.6372]
How important to do you think it to have a flu shot (5 point scale, 5=Very important, 1=Not at all important)	2.6845	1.8713	4.4834	1.6364	3.3423
	[1.4804]	[.9062]	[.7198]	[.8141]	[1.425]
Number of times had flu in last 5 years	0.5093	0.4371	0.6689	0.4064	0.5738
	[1.0902]	[.9651]	[1.3152]	[.9647]	[1.1589]
Ever had flu in last 5 years	0.2536	0.2425	0.2781	0.2193	0.2752
	[.4355]	[.4292]	[.4496]	[.4148]	[.4474]
Dummy if ever diagnosed with Diabetes	0.1278	0.0479	0.3046	0.0428	0.1812
	[.3343]	[.2139]	[.4618]	[.2029]	[.3858]
Dummy if ever diagnosed with High Blood Pressure	0.3876	0.3144	0.5497	0.2888	0.4497
	[.4877]	[.465]	[.4992]	[.4544]	[.4983]
Dummy if ever diagnosed with Cardiovascular disease	0.1773	0.0928	0.3642	0.1016	0.2248
	[.3823]	[.2906]	[.4828]	[.3029]	[.4182]
What do you think is the chance that you will get a flu shot this winter? (5 point scale, 1=very unlikely, 5=very likely)	2.4495	1.4132	4.7417	1.3048	3.1678
	[1.7333]	[.822]	[.7161]	[.7464]	[1.79]
Dummy if Smoker	0.2255	0.2287	0.2185	0.2582	0.2054
	[.4183]	[.4206]	[.4146]	[.4389]	[.4047]
Self Assessed Health on 5 point scale	3.0146	3.125	2.7748	3.1538	2.9293
	[.7331]	[.7417]	[.655]	[.7421]	[.7155]
Dummy if Self Assessed Health Good or Excellent	0.1837	0.2317	0.0795	0.2418	0.1481
	[.3877]	[.4226]	[.2714]	[.4293]	[.3558]
Observations	485	334	151	187	298

Note: Standard deviations in brackets. †Answered with 5 point likert scale from 5=strongly agree to 1=strongly disagree.

Table 3 Base Case Probit Regressions Predicting Who Gets a Flu Shot

	Model 1	***Model 2***	***Model 3***	***Model 4***
Dependent Variable	Flu shot in 2008	Flu shot in 2008	Flu shot in 2008	Flu shot in 2007
Flu shot in 2007	0.594***			
	(0.041)			
Age	0.006	0.010	0.008	0.015
	(0.017)	(0.018)	(0.021)	(0.019)
Dummy if male	-0.014	0.005	0.004	0.050
	(0.047)	(0.048)	(0.058)	(0.051)
Dummy if partnered	0.045	0.047	0.018	0.040
	(0.057)	(0.057)	(0.067)	(0.055)
Dummy if working	-0.156***	-0.145**	-0.156**	-0.016
	(0.060)	(0.058)	(0.064)	(0.057)
Dummy if some college education	-0.051	-0.040	-0.079	0.037
	(0.075)	(0.074)	(0.084)	(0.080)
Dummy if College educated	0.011	-0.032	0.012	-0.075
	(0.053)	(0.055)	(0.065)	(0.051)
Number of Doctor Visits in Last Year	0.029**	0.043***	0.035**	0.031***
	(0.013)	(0.012)	(0.016)	(0.012)
Dummy if Received an Invitation for Flu Shot	-0.241***	0.297***	-0.251***	0.762***
	(0.087)	(0.043)	(0.077)	(0.034)
Sample	Whole sample	Whole sample	Individuals who did not receive a flu shot in 2007	Whole sample
Observations	484	484	333	484
Pseudo R-squared	0.283	0.134	0.0480	0.608

Note: Table presents marginal effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4 Probit Regressions Predicting Who Gets a Flu Shot: Subjective Explanations

Dependent Variable	***Model 1*** Flu shot in 2008	***Model 2*** Flu shot in 2008	***Model 3*** Flu shot in 2008	***Model 4*** Flu shot in 2007	***Model 5*** Flu shot in 2008	***Model 6*** Flu shot in 2008	***Model 7*** Flu shot in 2008	***Model 8*** Flu shot in 2007
Flu shot in 2007	0.512***				0.509***			
	(0.052)				(0.051)			
I never thought about a flu shot.	0.007	0.000	0.006	-0.007				
	(0.020)	(0.021)	(0.026)	(0.015)				
I think that a flu shot provides good protection against the flu.	0.147***	0.195***	0.189***	0.088***	0.140***	0.198***	0.181***	0.140***
	(0.035)	(0.036)	(0.043)	(0.033)	(0.032)	(0.033)	(0.041)	(0.035)
I think that flu shots can harm your immune system.	0.022	-0.002	0.017	-0.021				
	(0.032)	(0.034)	(0.041)	(0.023)				
Flu shots have unpleasant side effects.	-0.085***	-0.120***	-0.085**	-0.074***	-0.084***	-0.128***	-0.088**	-0.097***
	(0.031)	(0.032)	(0.039)	(0.026)	(0.029)	(0.030)	(0.037)	(0.028)
I do not like doctors.	-0.028	-0.019	-0.025	-0.005				
	(0.029)	(0.030)	(0.037)	(0.023)				
I do not like needles.	0.000	-0.006	-0.011	0.018				
	(0.025)	(0.026)	(0.032)	(0.018)				
I think I am at high risk to get the flu.	0.041	0.080***	0.069*	0.052**	0.028	0.071**	0.050	0.079***
	(0.030)	(0.030)	(0.040)	(0.023)	(0.029)	(0.029)	(0.037)	(0.026)
If you have had one or more flu shots, then it is no longer necessary.	-0.035	-0.023	-0.047	0.066**				
	(0.034)	(0.036)	(0.044)	(0.026)				
I don't have time for a flu shot.	-0.032	-0.075*	-0.022	-0.053				
	(0.041)	(0.043)	(0.051)	(0.037)				
Flu shots are too expensive for me.	0.086**	0.093**	0.113**	-0.019	0.068**	0.045	0.092**	-0.075***
	(0.037)	(0.039)	(0.046)	(0.029)	(0.030)	(0.032)	(0.037)	(0.028)
I do not know anything about flu shots.	0.026	0.009	0.024	-0.061**				
	(0.025)	(0.027)	(0.031)	(0.026)				
Sample	Whole	Whole	Limited	Whole	Whole	Whole	Limited	Whole
Observations	484	484	333	484	484	484	333	484
Pseudo R-squared	0.357	0.286	0.148	0.811	0.350	0.277	0.141	0.781

Note: Table presents marginal effects. Regressions also control for age, gender, partnered status, working, education, doctor visits in previous year, and invitation in previous year. Coefficients for excluded variables are similar to those in Table 3. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5 Probit Regressions Predicting Who Gets a Flu Shot: Risk Factors

Dependent Variable	***Model 1*** Flu shot in 2008	***Model 2*** Flu shot in 2008	***Model 3*** Flu shot in 2008	***Model 4*** Flu shot in 2007
Flu shot in 2007	0.511***			
	(0.053)			
Dummy if ever had flu in last 5 years	0.036	0.034	0.071	0.026
	(0.053)	(0.055)	(0.070)	(0.048)
Dummy if has Diabetes	-0.010	0.076	0.009	0.104
	(0.107)	(0.089)	(0.152)	(0.093)
Dummy if has High Blood Pressure	0.026	0.021	0.053	-0.013
	(0.052)	(0.054)	(0.067)	(0.039)
Dummy if has Heart Disease	-0.004	0.064	-0.093	0.170*
	(0.082)	(0.072)	(0.106)	(0.095)
Observations	484	484	333	484
Pseudo R-squared	0.351	0.281	0.146	0.794

Note: Table presents marginal effects. Regressions also control for age, gender, partnered status, working, education, doctor visits in previous year, invitation in previous year, and four subjective explanation questions perceptions of effectiveness, side effects, risk and costs. Coefficients for excluded variables are similar to those in Tables 3 and 4. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6 Probit Regressions Predicting Who Gets a Flu Shot: Comparing Age Groups

Dependent Variable	Model A Flu shot in 2008	Model B Flu shot in 2008	Model C Flu shot in 2008	Model D Flu shot in 2008
Flu shot in 2007	0.594***	0.593***	0.721***	0.689***
	(0.041)	(0.034)	(0.030)	(0.025)
Age	0.006	0.011	0.057***	0.044***
	(0.017)	(0.011)	(0.015)	(0.012)
Dummy if newly eligible for free flu shot (based on age)		0.175**	0.185**	0.215***
		(0.077)	(0.077)	(0.068)
Dummy if previously eligible for free flu shot (based on age)				-0.193
				(0.132)
Dummy if male	-0.014	-0.018	-0.044	-0.037
	(0.047)	(0.033)	(0.042)	(0.037)
Dummy if partnered	0.045	0.088**	-0.010	0.046
	(0.057)	(0.042)	(0.049)	(0.043)
Dummy if working	-0.156***	-0.132***	-0.046	-0.052
	(0.060)	(0.051)	(0.045)	(0.043)
Dummy if some college education	-0.051	-0.055	0.014	-0.012
	(0.075)	(0.055)	(0.059)	(0.053)
Dummy if College educated	0.011	0.016	-0.006	0.002
	(0.053)	(0.036)	(0.047)	(0.041)
Number of Doctor Visits in Last Year	0.029**	0.015*	0.036***	0.030***
	(0.013)	(0.008)	(0.008)	(0.007)
Dummy if Received an Invitation for Flu Shot	-0.241***	-0.076*	-0.025	-0.004
	(0.087)	(0.044)	(0.063)	(0.049)
Sample	Whole Sample Age 60-64	Whole Sample Age 60-69	Whole Sample Age 55-64	Whole Sample Age 55-69
Observations	484	837	1,026	1,379
Pseudo R-squared	0.283	0.354	0.421	0.462

NZa

The Dutch Healthcare Authority (NZa) is the regulator of health care markets in the Netherlands. The NZa promotes, monitors and safeguards the working of health care markets. The protection of consumer interests is an important mission for the NZa. The NZa aims at short term and long term efficiency, market transparency, freedom of choice for consumers, access and the quality of care. Ultimately, the NZa aims to secure the best value for money for consumers.

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