

SHORT REPORT



Decreasing influenza vaccine coverage among adults with high-risk chronic diseases in Spain from 2014 to 2017

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ABSTRACT

The objectives of this study were to estimate coverage of influenza vaccination in Spain among adults suffering chronic conditions, to assess time trends from 2014 to 2017 and to identify vaccine uptake predictors. We used individualized data of persons ≥ 15 y interviewed in the 2017 Spanish National Health Survey. Vaccine uptake and the presence of the chronic conditions analyzed (diabetes; cancer; chronic respiratory disease; chronic heart disease and cerebrovascular disease) were self-reported. Independent variables included sex, age and nationality. In 2017 overall influenza vaccination uptake among subjects with high-risk chronic conditions remained low (40.3%) and decreased significantly from 2014 (41.7%, adjusted OR 0.98 95%CI 0.84–0.98). The highest coverage was found among those with cerebrovascular disease (52.2%), diabetes (51.5%) and heart disease (51.4%) and the lowest figures for those suffering cancer (34.9%) and respiratory disease (35.1%). Coverage for cancer patients declined a 25% from 2014 to 2017. Older persons had higher coverages whereas females and immigrant population had lower uptakes.

We conclude that influenza vaccination coverage among the high-risk population in Spain for suffering chronic conditions remains at a low level and has decreased significantly from 2014 to 2017, this affects more intensely to females and immigrants.

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Evidence of global influenza burden disease has led many countries to prioritize vaccination programs to prevent mortality and morbidities during influenza seasonal epidemics.¹

Vaccination is the most effective intervention to control dissemination, morbidity and mortality of seasonal influenza, as is accepted and recommended worldwide.^{1,2} Although the Advisory Committee on Immunization Practices recommendation targets all persons aged ≥ 6 months, most countries limit vaccination to persons at high risk for medical complications or age mainly due to economic costs.¹ However, recent studies have found that universal vaccination is cost-effective because it results in a reduction of the economic costs for hospitalization, the number of visits to the physician and the mortality caused by influenza.³ Without a doubt, it is cost-effective to increase vaccination rates in high-risk young adults.⁴

Despite strategies and interventions from governments to increase vaccination uptake of persons at higher risk, a great majority of European countries reported low coverage in vaccination, far below the 75% coverage recommended for older persons and for those with medical conditions by the European authorities by 2015.^{5–10}

There are several reports that analyze why vaccination is not accepted by the population, even in those high-risk groups. A systematic review found that elderly persons and

females and those visiting the physician have higher levels of vaccination uptake.¹¹ On the other side, fear of potential side-effects, previous bad experience with the vaccine may be negative factors for vaccination.⁶

In Spain and other European countries, several studies have found that vaccination uptake among high-risk groups is lower than the recommended rates and also showed a descending time-trend on vaccination uptake over the last years, especially after the 2009 H1N1 influenza pandemic.^{7,8,10} In Spain, the general practitioner is the main route for administering influenza vaccination, and patients are usually vaccinated at their primary-care health centers.^{7,10} Vaccination is free of charge for all recommended groups. It should also be remarked that advertisements in the media, including, television, radio and newspapers are used in order to increase vaccination uptake.^{7,10}

The objectives of this study were to estimate coverage of influenza vaccination in Spain among high-risk groups for suffering chronic medical conditions (diabetes; cancer; respiratory disease; heart disease and cerebrovascular disease), to assess time trends from 2014 to 2017 and to identify vaccine uptake predictors. To do so we used individualized data of persons ≥ 15 y interviewed in the 2017 Spanish National Health Survey.

We examined data from the Spanish National Health Survey 2017 (SNHS2017) conducted from October 2016 to October 2017. It included a representative sample of non-institutionalized adult population aged 15 y or over. Briefly, the type of sampling used is a three-stage stratified sampling and the collection method is a computer-assisted home-based personal interview. A total of 23,089 participant's interviews were included in the SNHS2017 and analyzed in our investigation. Details of the SNHS2017 methodology are described elsewhere.¹²

Vaccine uptake was assessed by asking the participants "Were you vaccinated against influenza during the last vaccination campaign?"

We analyzed socio-demographic variables such as age, sex and country of birth (Spain or another country). Those not born in Spain have been considered immigrants in our investigation.

To identify those chronic conditions for which annual influenza vaccination was recommended in Spain, regardless of the age group, we classified the participants as having the disease if they answered affirmatively to the question; "have you ever been diagnosed by a physician with the following disease?" showing the interviewed a list including: diabetes; cancer; respiratory disease (if the patient had asthma and/or chronic bronchitis and/or emphysema and/or chronic obstructive pulmonary disease); heart disease (if the patient had experienced myocardial infarction and/or angina pectoris and/or coronary heart disease); cerebrovascular disease (if the patient had experienced a stroke and/or brain embolism and/or cerebral infarction and/or brain hemorrhage).

The presence of one or more of these self-reported chronic diseases was used to create the dichotomous (yes/no) variable "any chronic condition".

The statistical analysis included; first, we described vaccination uptake for each medical condition according to sex, age group, nationality and number of other chronic conditions present. Second, we analyzed coverage against seasonal influenza according to each chronic diseases and age groups in the 2017 and 2014 National Health surveys. Percentage of vaccination and its 95% confidence interval (CI) were calculated for each condition.

In addition, the 2014 and 2017 SNHS databases were combined to estimate the time trends for uptake of influenza vaccination. For this, a multivariable logistic-regression model was constructed, using year (2014 vs. 2017) as the main independent variable, and adjusted by age, sex and presence of the chronic conditions analyzed.

Multivariable logistic regressions were conducted using the variables that, in the bivariate variable analysis, were statistically significant ($p < .10$) and those that, although not statistically significant, were of interest from a healthcare and epidemiological standpoint. Variables were eliminated, one at each step, according to their significance in the model used (Wald statistic) and considering the model's goodness of fit with the previous step (likelihood ratio test). The effects of interaction among the variables included in the final model were also examined.

Statistical significance was set at 0.05 (2-tailed). The analysis was performed using STATA 13[®] (StataCorp LP, Lakeway Drive College Station, Texas, USA).

In accordance with Spanish legislation, it is not necessary to submit the study protocol to an ethics committee or request informed consent, since the data come from anonymous and publicly available databases. These databases can be downloaded freely and without cost from the website of the Spanish Ministry of Health. (<https://www.msrebs.gob.es/estadisticas/microdatos.do>)

Women represented 51.3% of the sample and 28.9% were 60 y old or over. 6.3% were not Spanish born and 23.9% reported having at least one of the chronic condition analyzed. Overall, influenza vaccination uptake was 18.1% and reached 40.3% among those in the high-risk groups for suffering chronic conditions.

The influenza vaccination coverages for each medical condition are shown in Table 1.

According to the chronic condition, we found the highest uptake among those with cerebrovascular disease (52.2%) followed by diabetes (51.5%) and heart disease (51.4%). The lowest figures are shown in those with cancer (34.9%) and respiratory disease (35.1%). We observed that females had lower rates of vaccination than male in all groups except for diabetes (52.2% of female vs. 50.8% of male) and cerebrovascular disease (52.4% vs. 51.9%). In all groups, vaccination uptake increased with age. Those participants 75 y or over had the highest rates of vaccination. Immigrant subjects showed lower rates of vaccination uptake than Spanish born subjects in almost all groups, except cerebrovascular disease, where they had similar rates (52.4% vs 52.2% for Spanish participants). Those reporting a higher number of chronic conditions had higher influenza vaccination coverage, those with three or more had a 66.1% uptake compared with only 27.28% for those suffering a single condition.

Table 1. Influenza vaccination coverage against seasonal influenza among high risk subjects according to study variables. 2017 Spanish National Health Survey.

VARIABLE	Category	Respiratory disease	Heart disease	Diabetes	Cancer	Cerebrovascular disease	Any chronic Condition
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Sex	Male	362 (37.5)	512 (51.8)	498 (50.8)	147 (38.7)	111 (51.9)	1126 (41.6)
	Female	359 (32.8)	423 (50.7)	465 (52.2)	188 (32.4)	88 (52.4)	1096 (39.0)
Age group	15–44 y	75 (9.6)	30 (18.2)	18 (16.1)	3 (3.9)	7 (31.8)	121 (11.0)
	45–59 y	109 (25.8)	74 (24.2)	122 (33.1)	36 (14.1)	20 (29.0)	269 (22.5)
	60–74 y	246 (56.9)	333 (53.1)	391 (50.6)	146 (37.8)	70 (52.6)	835 (48.2)
	≥75	286 (74.1)	498 (69.1)	432 (70.1)	150 (62.0)	102 (65.0)	992 (68.4)
Nationality	Spanish-born	696 (35.8)	915 (52.7)	940 (52.2)	329 (35.6)	188 (52.2)	2169 (41.3)
	Immigrant	25 (21.7)	20 (23.0)	23 (31.9)	6 (16.7)	11 (52.4)	53 (19.8)
Number of chronic conditions	One	378 (18.37)	434 (23.81)	506 (26.99)	161 (16.77)	87 (22.72)	1506 (27.28)
	two	235 (55.8)	364 (57.9)	332 (60.0)	114 (44.2)	74 (54.8)	560 (56.1)
	three or more	108 (66.3)	137 (69.8)	125 (65.4)	60 (63.8)	38 (58.5)	156 (66.1)
TOTAL		721 (35.1)	935 (51.4)	963 (51.5)	335 (34.9)	199 (52.2)	2222 (40.3)

Table 2 shows influenza vaccination coverage for seasonal influenza, according to chronic diseases and age groups in the 2014 and 2017 Spanish National Health Surveys.

Time trend analysis in influenza uptake coverage showed a significant decrease between 2014 and 2017 for Spanish adults with any high-risk medical condition from 41.66% (95% CI 40.13–43.20) to 40.26% (95% CI 38.82–41.71). After adjusting by sex, age and comorbidities these reductions remained significant (OR 0.92; 95%CI 0.84–0.98), this means a 8.7% lower coverage in year 2017 compared with 3 y before. According to specific conditions only participants with a cancer showed a significant decrease over time (OR 0.80; 95%CI 0.64–0.98). This means that the coverage for cancer patients declined a 25% from 2014 to 2017.

Results of multivariable analysis to identify predictors of influenza vaccination uptake among high-risk subjects are shown in Table 3.

In all chronic conditions studied, being older and suffering more than one chronic disease was associated to higher probability of vaccination uptake. Male gender was a positive predictor of influenza vaccination uptake in all groups, except among those in the cerebrovascular disease group.

Spanish birth status was also associated to higher rates of influenza vaccination than immigrant status, but this association was only statistically significant among heart disease sufferers and those with any chronic condition. None of the interactions analyzed showed a significant result.

The most relevant findings of this study are that influenza vaccination uptake in high-risk population groups due to suffering a chronic condition are unacceptably low and seem to be decreasing over time.

In our investigation, the overall uptake for those suffering one or more of the chronic conditions analyzed was 40.3% with coverage of only 16.9% in those aged 15–59 y. In England, for the 17/18 campaign, 49.4% of those aged between 16 and 65 y with one or more clinical at-risk group were vaccinated and this uptake was almost two points lower than in the 14/15 campaign (51.2%).¹³ In our investigation, this decrement was from 17.8% to 16.9% from 2014 to 2017.

In a study conducted by Jorgensen et al., among the 44 European countries with influenza vaccine recommendations for persons with specific chronic illnesses in 2014/2015, 14 (32%) provided information on coverage and most countries reported rates below 40%.⁵

Table 2. Influenza vaccination coverage against seasonal influenza in Spain according to chronic diseases and age groups. 2014 and 2017 Spanish National Health Surveys.

Survey	Category	Respiratory disease	Heart disease	Diabetes	Cancer	Cerebrovascular disease	Any chronic Condition
		% (95% CI) (N)	% (95% CI) (N)	% (95% CI) (N)	% (95% CI) (N)	% (95% CI) (N)	% (95% CI) (N)
2014	15–60 y	17.2(14.67–20.06) 1051	17.43(13.55–22.12) 459	28.39(23.17–34.25) 456	11.92(8.22–16.99) 279	23.77(14.94–35.62) 87	17.82(15.87–19.94) 2084
	≥60 y	65.06(61.49–68.46) 1010	64.89(62.09–67.59) 1655	61.98(58.96–64.92) 1490	55.08(50.51–59.56) 639	66.42(60.63–71.75) 381	60.82(58.92–62.68) 3726
	Total	36.30(33.87–38.79) 2061	51.12(48.48–53.74) 2114	51.80(49.03–54.56) 1946	39.45(35.82–43.20) 918	56.39(50.90–61.73) 468	41.66(40.13–43.20) 5810
2017	15–60 years	15.23 (12.96–17.82) 1240	21.91 (17.53–27.01) 475	29.02 (24.23–34.33) 482	11.75 (8.42–16.18) 332	30.11 (19.29–43.73) 92	16.91 (15.11–18.87) 2336
	≥ 60 years	65.02 (61.48–68.40) 818	61.66 (58.93–64.31) 1348	59.25 (56.46–61.98) 1389	47.16 (43.10–51.26) 628	59.16 (53.20–64.86) 291	57.39 (55.56–59.19) 3184
	Total	35.03 (32.71–37.42) 2058	51.30 (48.78–53.81) 1823	51.47 (48.96–53.98) 1875	34.91 (31.78–38.18) 960	52.19 (46.74–57.59) 383	40.26 (38.82–41.71) 5520
Time trend ^a (OR 95%CI)		0.95(0.81–1.09)	1.00(0.87–1.16)	0.98(0.85–1.15)	0.80(0.64–0.98)	0.84(0.61–1.15)	0.92(0.84–0.98)

^a Adjusted by age, sex and other comorbidities.

Table 3. Predictors of influenza vaccination uptake among high risk subjects. 2017 Spanish National Health Survey.

VARIABLE	Category	Respiratory disease	Heart disease	Diabetes	Cancer	Cerebrovascular disease	Any chronic Condition
		OR (CI 95%)	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)	OR (CI 95%)
Age group	15–44 y	1	1	1	1	1	1
	45–59 y	2.58 (1.84–3.63)	1.52 (0.86–2.67)	1.67 (0.95–2.95)	3.32 (1.12–9.86)	1.07 (0.33–3.46)	1.86 (1.41–2.44)
	60–74 y	5.62 (3.85–8.21)	3.54 (2.05–6.10)	2.50 (1.41–4.41)	5.71 (1.97–16.56)	2.31 (0.76–7.04)	3.67 (2.77–4.87)
	≥75	10.09 (6.63–15.34)	6.11 (3.50–10.69)	4.56 (2.54–8.21)	10.89 (3.70–32.10)	4.00 (1.31–12.19)	6.65 (4.90–9.02)
Sex	Female	1	1	1	1	1	1
	Male	1.43 (1.17–1.75)	1.29 (1.08–1.55)	1.30 (1.09–1.56)	1.39 (1.06–1.81)	1.09 (0.75–1.60)	1.31 (1.15–1.48)
Nationality	Immigrant	1	1	1	1	1	1
	Spanish-born	1.58 (0.85–2.94)	2.17(1.19–3.94)	1.64 (0.86–3.12)	2.58 (0.89–7.44)	1.27(0.40–4.00)	2.02 (1.30–3.14)
Number of chronic conditions	One	1	1	1	1	1	1
	Two or more	2.41 (1.79–3.26)	2.50 (1.84–3.41)	2.20 (1.67–2.91)	4.40 (2.82–6.88)	2.25 (1.02–4.95)	2.72 (2.23–3.33)

In the Netherlands, the influenza vaccination rate among patients with cardiovascular diseases, lung diseases, diabetes and aged 60 y and older decreased significantly from 71.5% in the 2008 season to 59.6% in the 2013 vaccination season. The difference of 11.9% was gradual over the years, with a mean decrease of 2.4% per year.⁸

In Canada from 2006 to 2014 most of the clinical groups analyzed showed a slightly decreasing trend of vaccination rates with an overall decrease for those with any chronic condition from 51% to 47%.¹⁴

Unlike European countries survey data from the US for season 13/14 indicated coverage for people aged 18–64 y with a high-risk medical condition of 46.3% with similar figures for the 16/17 season 46.4%.^{15,16} This positive trend has also been found in Korea.¹⁷

When we compare the estimated uptake in patients with a chronic condition in previous Spanish surveys we find that coverage was 42.7% in the 2011/12 SNHS. Therefore, over a two-point drop has occurred over the last 5 y for the entire population suffering a high-risk condition in Spain.¹⁰

The respiratory disease group showed an overall vaccine uptake (35.1%) lower than other high-risk groups analyzed, which was an outstanding result, since respiratory disease is particularly related to influenza complications, such as pneumonia and vaccination is highly recommended.¹⁸ The inclusion of asthma among the respiratory diseases, that usually affect young people, may partially explain this finding.

Remarkable that in the year 11/12 SNHS uptake was two points higher 37.4% suggesting that the downward trend is also affecting this risk group.¹⁰

Reports from other countries found results ranging from 37.4% to 49.1% uptake among patients with respiratory disease, which are considered low vaccination rates and agree with us finding higher vaccination uptake among elder persons.^{13,19} This could be explained because most patients and physicians are more self-aware of pneumonia as the most severe complication of influenza disease among older patients and vaccination is known to be effective to prevent hospitalizations.^{14,20}

Regarding vaccination coverage among the cancer group patients, we observed the lowest rate, with 34.9% and this remains low for young or old patients. Despite a systematic review reporting the benefits of vaccination for this risk group, vaccination rates found in other studies were also very low (18% and 9%) in line with our results.^{21–23} Another relevant finding regarding persons with cancer was that vaccination uptake decreased from 2014 to 2017, which states the need to conduct studies to estimate barriers or patient behaviors to explain this result.¹⁰

For the other three chronic conditions analyzed; cerebrovascular disease, diabetes and heart disease we described similar figures compared with 5 y before but lower than those obtained in other European countries.^{10,13}

When analyzing predictors of vaccination uptake, older ages were associated to higher rates of vaccination, confirming others reports.^{17,24,25} We found, unlike other studies, that females were less likely to uptake the vaccine than males.^{6,17,19} However other studies, some performed in Spain, showed similar results to ours.^{7,10,26} In our opinion, this could be explained by a lack of recommendation for females, as they are considered to be more aware of self health care and prevention compliance habits.

Another explanation could be because of their uncertainties on the usefulness and safety of the vaccine.²⁷

Finally, we found that non Spanish born persons were less likely to uptake the vaccine than Spanish persons. Some prior studies have reported similar results regarding social and racial disparities on vaccination.^{10,24,28} In Spain, non-Spanish persons might have less regular access to primary medical care and subsequently are less likely to be regularly vaccinated, which has been pointed out as one of the principal determinants for influenza vaccine uptake.^{6,26}

Some possible strategies to improve vaccination coverage among high-risk groups that could be implemented in our country include among others; surveillance of vaccine uptake, giving financial incentive to nurses and physicians, lowering the age at which the vaccine recommendation becomes universal, distributing and translating information of the benefits of the vaccine in the natal languages of immigrants and providing the vaccine in nontraditional settings.^{1,4,6,7,10,11,26–28} Our present study has several limitations. First, self-reported measures of influenza vaccination coverage and chronic conditions were used in our analysis and are therefore subject to recall bias. Nevertheless, some studies suggest that, despite the fact that overestimation of influenza vaccination coverage may occur, self-reporting may be the only effective and feasible way to gather data on preventive services uptake.²⁹ Furthermore, other studies have reported high sensitivity, specificity and concordance between self-reported chronic conditions and medical records used as a reference.³⁰

In cross-sectional designs, as we do not have a follow-up period, and the risk factors and the event are measured at the same time, we cannot be certain if the exposure-disease process is reversed. In other words, the event causes the exposure.

Lastly, the initial response rate to the SNHS –2017 was around 72% so a nonresponse bias should be considered.¹²

We conclude that influenza vaccination coverage among the high-risk population in Spain for suffering chronic conditions remains at a low level and has decreased significantly from 2014 to 2017. Females and non Spanish persons are less likely to uptake the vaccine. We encourage primary care physicians to increase awareness in recommending the vaccine, giving detailed information to high-risk persons. Implementation of new vaccination campaign strategies to increase coverage must be a primary objective.

Disclosure of potential conflicts of interest

No potential conflicts of interest were disclosed.

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