



# Adoption of preventive measures during and after the 2009 influenza A (H1N1) virus pandemic peak in Spain<sup>☆</sup>

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## ABSTRACT

**Objective:** This study describes the preventive measures adopted by the Spanish population towards 2009 influenza A (H1N1) virus and their associated factors.

**Method:** An anonymous computer-assisted telephone interview survey was conducted in Spain in December 2009 and February 2010. Respondents were asked about their perceptions of influenza A (H1N1) virus and the preventive measures adopted. Factors associated with the adoption of preventive measures were assessed by logistic regression analyses.

**Results:** Out of 4892 households approached, 1627 valid responses were obtained (response rate of 33.3%). The most commonly adopted preventive measures were respiratory hygiene and hand washing. Factors independently associated with the adoption of the preventive measures recommended by the Spanish Ministry of Health were female gender, higher educational level, size of municipality of residence >50,000 inhabitants, high perceived susceptibility to infection, high perceived effectiveness of the measures and high perceived usefulness of the information provided by the government. The presence of school-aged children in household was associated with purchasing masks and hand sanitizer.

**Conclusion:** In addition to demographic factors, modifiable factors such as personal beliefs and expectations play a role in the adoption of preventive measures.

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## Introduction

Novel influenza A (H1N1) emerged from Mexico in April 2009 (CDC, 2009). On June 11, 2009, the World Health Organization raised the pandemic alert level to phase 6 (WHO, 2009). The number of deaths at the beginning led to early predictions of massive spread and unknown clinical course (Watson, 2009). A worldwide debate was sparked on the advisability of epidemiological control measures. Most western countries decided to vaccinate at-risk groups while the general population was advised to adopt preventive measures to avoid or mitigate transmission.

In Spain, the first suspected cases of 2009 influenza A (H1N1) were notified on 26 April 2009 (Spanish Ministry of Health, 2009a). In fact,

one of them was the first laboratory-confirmed case in Europe. On July 2009, the Spanish Ministry of Health (MoH) began a campaign recommending two preventive measures: covering the mouth and nose with a tissue when sneezing or coughing (respiratory hygiene) and washing hands regularly using soap and water (Spanish Ministry of Health, 2009b). Furthermore, a vaccination campaign to some specific groups began on November 16, 2009 in Spain.

Since substantial changes in risk perceptions occurred throughout the course of pandemics (Lau et al., 2003; Sypsa et al., 2009), this study explores behaviors and perceptions related to the 2009 influenza A (H1N1) during the peak and the declining phase of the pandemic in Spain.

## Methods

Two waves of anonymous cross-sectional surveys using computer-assisted telephone interview (CATI) method were conducted. The first wave (December 2010) covered the pandemic peak (weeks 43–46/2010) and the second wave (February 2010) included the declining phase (weeks 47/2009–4/2010).

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The sample size was estimated as 800 interviewed people per wave, providing an error of  $\pm 3.5\%$  with a confidence level of 95% for  $p=q=0.5$ . Methods were previously described in “Attitudes and Preventive Behaviours Adopted during the (H1N1) 2009 Influenza Virus epidemic in Spain” (Agüero et al., 2011). To describe and analyze the primary outcomes, three variables were created summarizing preventive measures: MoH recommended measures (respiratory hygiene and/or hand washing more frequently); avoidance measures (avoiding people with influenza and/or any of the followings: avoiding crowds, avoiding health facilities, avoiding public transport) and purchase measures (buying masks and/or hand sanitizer).

## Data analysis

The association between personal characteristics (including medical conditions considered as risk factors which deserve vaccination) and attitudes with the primary outcomes were analyzed using multivariate logistic regression adjusting for wave. Data entry and statistical analysis were performed with the SPSS software program (v13.0).

## Results

A total of 4892 eligible participants were contacted. 2823 refused to participate, 223 were unable to respond and 219 did not finish the interview. 1.627 completed the interview (response rate of 33.3%). The distribution of sex, age groups and educational level were similar in both waves (data not shown).

The two most frequently adopted preventive measures were those recommended by the Spanish MoH. Overall, 79.5% of the participants reported adopting at least one preventive measure in the first wave. The proportion was lower in the second wave (74.6%,  $p=0.02$ ) (Table 1).

As shown in Table 2, the factors associated with the adoption of the MoH recommended measures were female gender, secondary or higher educational level, living in towns with more than 50,000 inhabitants, high concern about becoming infected by 2009 influenza A (H1N1), perceiving the preventive measures to be highly effective and high perception of the usefulness of the information provided by the government. For purchase measures, similar associated factors were identified except that the respondents belonging to the younger age groups (<55) and those living with school-aged children were more likely to follow these measures. In addition, no association was observed regarding the perceived usefulness of the information provided by the government. Avoidance measures were independently associated with

the group aged 18–35 years, living in towns with more than 50,000 inhabitants, high concern about becoming infected by 2009 influenza A (H1N1) and perceiving the preventive measures to be highly effective.

## Discussion

To our knowledge this is the first study reporting information on self-reported behaviors and perceptions towards the 2009 influenza A (H1N1) pandemic during the peak and the declining phase. As expected, there was a decrease of the adoption of preventive measures. In addition, we have found that respiratory hygiene and hand washing were the most frequently preventive measures adopted. These two measures are considered as effective non-pharmaceutical public health interventions against influenza (Aledort et al., 2007). The high prevalence of both measures is consistent with the government campaign (Spanish Ministry of Health, 2009b). Clearly, 2009 influenza A (H1N1) impacted on health-related perceptions and behaviors in terms of self-protection, as approximately 80% of respondents adopted at least one preventive measure. Some of these behaviors persisted among a large proportion of the population after the pandemic peak, although a significant decrease was observed during the declining phase.

The hand washing rate in this study was in the range reported by previous studies (28%–80%) (Cowling et al., 2010; Lau et al., 2009; Rubin et al., 2009). In our study, the proportion of respondents who purchased face masks (3.9% and 1.9% in the first and second waves, respectively) was lower than the proportion reported by other European countries during the pre-pandemic peak phase (7%) (Goodwin et al., 2009), the USA (5%) (Steel Fisher et al., 2010) and Malaysia (8%) (Goodwin et al., 2009). There were also wide regional differences in the prevalence of wearing a face mask, ranking between 22% and 89% in previous Asian studies (Lau et al., 2010a), again much higher than the proportion we found in Spain (7%). The same pattern was observed for avoidance measures. The proportion of Spanish general population reporting keeping away from crowded places was 4% while in Asian countries it was around 55% (Lau et al., 2010b). This might be explained by a higher public concern in those countries regarding the threat of the severe acute respiratory syndrome (SARS) or the human avian H5N1 virus a few years ago (Tang and Wong, 2003).

This study highlights the importance of perceptions and beliefs, such as perceived susceptibility to the infection by 2009 influenza A (H1N1), perceived effectiveness of preventive measures and perceived usefulness of government information, to explain preventive health behaviors. A recent review (Bish and Michie, 2010) reported similar findings

**Table 1**

Adoption of preventive measures during and after the 2009 influenza (H1N1) virus pandemic peak in Spain (December 2009–February 2010).

	December 2009 No. (%)	February 2010 No. (%)	<i>p</i>
MoH recommended measures			
Covering mouth and nose with a tissue when sneezing or coughing (respiratory hygiene)	489 (61.1)	462 (55.9)	0.03
Hand washing more frequently	328 (41.0)	296 (35.8)	0.03
Any of the above	582 (72.8)	549 (66.4)	<0.01
Purchase measures			
Buying hand sanitizer solutions	188 (23.5)	190 (23.0)	0.80
Buying face masks	31 (3.9)	16 (1.9)	0.02
Any of the above	203 (25.4)	200 (24.2)	0.58
Avoidance measures			
Avoiding contact with people with influenza symptoms	164 (20.5)	162 (19.6)	0.65
Avoiding visiting hospitals and health centres	36 (4.5)	44 (5.3)	0.44
Avoiding crowded public places	25 (3.1)	36 (4.4)	0.19
Avoiding public transport	20 (2.5)	27 (3.3)	0.36
Cancelling or delaying aeroplane, train or bus use	8 (1.0)	10 (1.2)	0.69
Any of the above	193 (24.1)	196 (23.7)	0.84
Other preventive measures			
Ventilating house more frequently	195 (24.4)	182 (22.0)	0.21
Wearing face mask at least once	67 (8.4)	52 (6.3)	0.11
Vaccination against a 2009 influenza (H1N1) virus	38 (4.8)	61 (7.4)	0.03
Non-specified preventive measures	27 (3.4)	27 (3.3)	0.90
At least 1 preventive measure adopted	636 (79.5)	617 (74.6)	0.02

**Table 2**

Association between sociodemographic variables, attitudes and risk factors with preventive measures adopted against influenza A (H1N1) in Spain (December 2009–February 2010).

	MoH recommended measures <sup>a</sup>			Purchase measures <sup>b</sup>			Avoidance measures <sup>c</sup>		
	n (%)	OR (95% CI)	OR <sup>d</sup> (95% CI)	n (%)	OR (95% CI)	OR <sup>d</sup> (95% CI)	n (%)	OR (CI 95%)	OR <sup>d</sup> (95% CI)
Sex									
Men	804	521 (64.8)	1	170 (21.1)	1	1	178 (22.1)	1	1
Women	823	610 (74.1)	1.6 (1.3–1.9)	233 (28.3)	1.5 (1.2–1.9)	1.5 (1.1–1.9)	211 (25.6)	1.2 (0.9–1.5)	1.1 (0.9–1.4)
Age group (years)									
>55	545	365 (67.0)	1	94 (17.2)	1	1	125 (22.9)	1	1
36–55	580	394 (67.9)	1.1 (0.8–1.3)	157 (27.1)	1.8 (1.3–2.4)	1.6 (1.2–2.3)	127 (21.9)	0.9 (0.7–1.3)	0.9 (0.7–1.2)
18–35	502	372 (74.1)	1.4 (1.1–1.9)	152 (30.3)	2.1 (1.6–2.8)	1.6 (1.1–2.3)	137 (27.3)	1.3 (0.9–1.7)	1.3 (1.0–1.8)
Social Class									
Manual	729	501 (68.7)	1	179 (24.6)	1	1	189 (25.9)	1	1
Non manual	755	533 (70.6)	1.1 (0.9–1.4)	184 (24.4)	1.0 (0.8–1.3)	0.9 (0.7–1.2)	170 (22.5)	0.8 (0.7–1.1)	0.9 (0.7–1.1)
Educational level									
Primary or below	603	395 (65.5)	1	121 (20.1)	1	1	142 (23.5)	1	1
Secondary/tertiary or above	1019	733 (71.9)	1.4 (1.1–1.7)	280 (27.5)	1.5 (1.2–1.9)	1.3 (1.0–1.7)	246 (24.1)	1.0 (0.8–1.3)	1.0 (0.8–1.4)
Size of municipality of residence (inhabitants)									
1–50,000	770	516 (67.0)	1	167 (21.7)	1	1	168 (21.8)	1	1
>50,000	857	615 (71.8)	1.3 (1.0–1.6)	236 (27.5)	1.4 (1.1–1.7)	1.5 (1.2–1.9)	221 (25.8)	1.3 (1.0–1.6)	1.2 (1.0–1.6)
School-aged children in household									
No	1138	794 (69.8)	1	235 (20.7)	1	1	269 (23.6)	1	1
Yes	489	337 (68.9)	1.0 (0.8–1.2)	168 (34.4)	2.0 (1.6–2.5)	1.9 (1.5–2.5)	183 (37.4)	1.1 (0.8–1.4)	1.1 (0.8–1.5)
Concern about becoming infected									
Low/very low	766	492 (64.2)	1	156 (20.4)	1	1	157 (20.5)	1	1
High/very high	856	635 (74.2)	1.6 (1.3–2.0)	244 (28.5)	1.6 (1.2–2.0)	1.5 (1.2–1.9)	231 (27.0)	1.4 (1.1–1.8)	1.3 (1.0–1.7)
High perception of effectiveness of preventive measures									
No	301	181 (60.1)	1	50 (16.6)	1	1	39 (13.0)	1	1
Yes	1188	886 (74.6)	2.0 (1.5–2.5)	331 (27.9)	1.9 (1.4–2.7)	1.7 (1.2–2.4)	332 (27.9)	2.6 (1.8–3.7)	2.5 (1.8–3.7)
Perceived usefulness of government information									
Low/very low	760	508 (66.8)	1	172 (22.6)	1	1	172 (22.6)	1	1
High/very high	754	555 (73.6)	1.4 (1.1–1.7)	214 (28.4)	1.4 (1.1–1.7)	1.2 (0.9–1.5)		1.2 (0.9–1.5)	1.0 (0.8–1.3)
Presence of risk factor for vaccination against influenza A (H1N1) <sup>e</sup>									
No	1351	934 (69.1)	1	343 (25.4)	1	1	322 (23.8)	1	1
Yes	276	197 (71.4)	1.1 (0.8–1.5)	60 (21.7)	1.0 (0.6–1.6)	0.8 (0.4–1.5)	67 (24.3)	1.0 (0.8–1.4)	1.1 (0.8–1.5)

<sup>a</sup> MoH recommended measures (respiratory hygiene and/or hand washing more frequently).<sup>b</sup> Purchase measures (buying masks and/or hand sanitizer).<sup>c</sup> Avoidance measures (avoiding people with influenza and/or any of the followings: avoiding crowds, avoiding health facilities, avoiding public transport).<sup>d</sup> Adjusted for wave.<sup>e</sup> Defined by the MoH (chronic diseases [pulmonary, cardiovascular—except isolated hypertension, renal, hepatic, neurological, haematological or metabolic disorders], persons with immunosuppression (caused by medications or by HIV) and children and adolescents who were receiving long-term aspirin therapy and who might be at risk for Reye's syndrome after influenza virus infection)

whereas Cava et al. have observed that the credibility of the information received from public health authorities could impact on the adoption of some measures (Cava et al., 2005). On the other hand, some associated factors observed in the present study (i.e., female sex, higher educational level) are consistent with previous reports (Lau et al., 2010a; Tang and Wong, 2003).

One of the limitations of this study was the use of telephone surveys, which excluded those households without telephone line. While this is a potential selection bias that cannot be ruled out completely, the magnitude is limited since more than 80% of households have a landline in Spain (Spanish National Institute of Statistics, 2010). More important is that we obtained a response rate of 33% which is nevertheless in the range of other published studies (Lau et al., 2010a; Rubin et al., 2009). Finally, since cultural factors could result in differences in behavioral responses, caution should be exercised when generalizing our results to other contexts.

The Spanish MoH campaign was effective in making the general population to follow its recommendations. The results provided can be useful in case of similar future events.

## Contributors

FA analyzed the data, contributed to the data interpretation and drafted the report. MN was involved in the study design, discussion of the data, and helped write the report. MJL, AP and XGC participated in

the study design, data discussion and drafting the paper. All authors have read and approved the final version.

## Conflict of interest statement

The authors declare that there are no conflicts of interest.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at doi:10.1016/j.ypmed.2011.06.018.

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