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Influenza vaccination landscape in Italy: A comprehensive study through the OBVIOUS project lens

Angelo Capodici[a], Marco Montalti[a], Giorgia Soldà[a], Aurelia Salussolia[a], Giusy La Fauci[a], Zeno Di Valerio[a], Francesca Scognamiglio[a], Maria Pia Fantini[a], Anna Odone[b], Claudio Costantino[c], Heidi J. Larson[d], Julie Leask[e,f], Jacopo Lenzi[a], Davide Gori[a], and the OBVIOUS Board*

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ABSTRACT

Influenza annually claims an estimated 8,000 lives in Italy. Despite no-cost vaccinations for high-risk groups, hesitancy persists. This study aims to pinpoint social and behavioral vaccination determinants, forming strategies to bolster vaccine uptake. From April 11 to May 29, 2022, we surveyed a demographic-stratified sample of 10,000 Italian adults, employing the WHO's Behavioral and Social Drivers of Vaccination (BesD) framework. Of those, 4,613 (46.1%) were eligible for the influenza vaccine and included in the analysis. Roughly a third remained unvaccinated and unwilling. Central Italy showed the highest resistance, with significant percentages of seniors and professionals like teachers, law enforcement, and healthcare workers expressing noncompliance. A lack of awareness of being in a target group correlated significantly with vaccine refusal or delayed acceptance. Other refusal factors included female gender, being aged 45–54, rural residency, absence of higher education, perceived vaccine unsafety, and having vaccine-opposed acquaintances. Thus, addressing these perceptions and enhancing awareness can potentially increase vaccination rates and lessen disease impact.

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KEYWORDS
Vaccine; uptake; influenza; health-policy; hesitancy; social and behavioral determinants

Introduction

Influenza, a pervasive public health concern, impacts approximately 8% of Italy's population each year and it claimed around 68,000 deaths between 2013 and 2017.[1,2] Certain individuals face higher risks, including those over 65, people with preexisting conditions such as diabetes or chronic respiratory and cardiovascular diseases, very young children, and pregnant women.[1] Alarmingly, across the European Union, influenza accounts for around 15,000–70,000 premature deaths each year.[3]

Vaccination stands out as the most effective approach to mitigating influenza transmission and reducing its burden on society.[4,5] The World Health Organization (WHO) and the Italian National Vaccine Prevention Plan have established ambitious coverage targets for influenza vaccination, aiming for a minimum of 75% and an optimal goal of 95% among individuals over 65 and those in at-risk groups.[6,7] To make vaccination more accessible, Italy offers it free of charge to those with an elevated risk of influenza-related complications; these groups encompass people aged 65 and older, and people living with pulmonary, kidney, hepatic, hematological or heart diseases, people living with diabetes, people living with neoplastic diseases, people living with chronic inflammatory diseases, immunosuppressed and splenectomized patients, people scheduled to undergo under major surgeries, patients with underlying neuromuscular disorders, and those who live in assisted-living structures at any age and pregnant women. Furthermore, the influenza vaccine is recommended and offered free of charge to specific working classes, such as healthcare workers (HCWs), teachers, law-enforcement members (LEM) and people working with animals.[7,8] Collaborative efforts between Public Health Departments of Local Health Authorities and family physicians ensure the efficient delivery of vaccinations to patients in risk categories, especially in the Italian context, in which each region can autonomously decide how to deliver the vaccine to the aforementioned risk groups. Even though regions can decide how to deliver the vaccine, and how to advertise it to their own population, most regions are currently working with general practitioners to deliver the vaccine, as well as with their local health authorities, which being located widely throughout the territory, ensure comprehensive coverage.

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Supplemental data for this article can be accessed on the publisher's website at https://doi.org/10.1080/21645515.2023.2252250.

Table 1. Sociodemographic characteristics of the study respondents who provided information about their own seasonal influenza vaccine uptake, overall and by NUTS statistical region.

Characteristic	Italy (*n* = 4613)	Northwestern Italy (*n* = 1278)	Northeastern Italy (*n* = 917)	Central Italy (*n* = 910)	Southern Italy (*n* = 1034)	Insular Italy (*n* = 474)
Gender						
Male	2362 (51.2%)	632 (49.5%)	492 (53.7%)	470 (51.6%)	543 (52.5%)	225 (47.5%)
Female	2243 (48.6%)	643 (50.3%)	424 (46.2%)	440 (48.4%)	488 (47.2%)	248 (52.3%)
Non-binary	7 (0.2%)	2 (0.2%)	1 (0.1%)	0 (0.0%)	3 (0.3%)	1 (0.2%)
Prefer not to say	1 (0.0%)	1 (0.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Age group, y						
18–24	157 (3.4%)	32 (2.5%)	32 (3.5%)	29 (3.2%)	51 (4.9%)	13 (2.7%)
25–34	555 (12.0%)	107 (8.4%)	134 (14.6%)	107 (11.8%)	150 (14.5%)	57 (12.0%)
35–44	753 (16.3%)	200 (15.6%)	168 (18.3%)	138 (15.2%)	168 (16.2%)	79 (16.7%)
45–54	671 (14.5%)	173 (13.5%)	134 (14.6%)	137 (15.1%)	150 (14.5%)	77 (16.2%)
55–64	1052 (22.8%)	319 (25.0%)	173 (18.9%)	241 (26.5%)	206 (19.9%)	113 (23.8%)
≥65	1425 (30.9%)	447 (35.0%)	276 (30.1%)	258 (28.4%)	309 (29.9%)	135 (28.5%)
Place of residence degree of urbanization*						
City (densely populated area)	1814 (39.3%)	566 (44.3%)	242 (26.4%)	366 (40.2%)	479 (46.3%)	161 (34.0%)
Town or suburb (intermediate density area)	2089 (45.3%)	571 (44.7%)	390 (42.5%)	422 (46.4%)	439 (42.5%)	267 (56.3%)
Rural area (thinly populated area)	710 (15.4%)	141 (11.0%)	285 (31.1%)	122 (13.4%)	116 (11.2%)	46 (9.7%)
Educational attainment						
Less than high school diploma	692 (15.0%)	217 (17.0%)	130 (14.2%)	129 (14.2%)	130 (12.6%)	86 (18.1%)
High school diploma	2468 (53.5%)	736 (57.6%)	433 (47.2%)	504 (55.4%)	540 (52.2%)	255 (53.8%)
Academic degree	919 (19.9%)	214 (16.7%)	175 (19.1%)	192 (21.1%)	245 (23.7%)	93 (19.6%)
Post-graduate/Doctorate degree	534 (11.6%)	111 (8.7%)	179 (19.5%)	85 (9.3%)	119 (11.5%)	40 (8.4%)
Occupation						
Teacher	515 (11.2%)	100 (7.8%)	161 (17.6%)	83 (9.1%)	123 (11.9%)	48 (10.1%)
Healthcare worker (excl. medical doctor)	286 (6.2%)	84 (6.6%)	57 (6.2%)	46 (5.1%)	78 (7.5%)	21 (4.4%)
Law enforcement member	160 (3.5%)	25 (2.0%)	44 (4.8%)	37 (4.1%)	36 (3.5%)	18 (3.8%)
Student	106 (2.3%)	24 (1.9%)	21 (2.3%)	20 (2.2%)	36 (3.5%)	5 (1.1%)
Medical doctor	82 (1.8%)	24 (1.9%)	9 (1.0%)	21 (2.3%)	16 (1.5%)	12 (2.5%)
Other occupation	1442 (31.3%)	424 (33.2%)	282 (30.8%)	299 (32.9%)	294 (28.4%)	143 (30.2%)
Unemployed	659 (14.3%)	141 (11.0%)	81 (8.8%)	151 (16.6%)	186 (18.0%)	100 (21.1%)
Retired	1363 (29.5%)	456 (35.7%)	262 (28.6%)	253 (27.8%)	265 (25.6%)	127 (26.8%)
Household composition						
Alone	689 (14.9%)	229 (17.9%)	153 (16.7%)	144 (15.8%)	109 (10.5%)	54 (11.4%)
Couple	3080 (66.8%)	846 (66.2%)	632 (68.9%)	598 (65.7%)	686 (66.3%)	318 (67.1%)
With parents/family	583 (12.6%)	120 (9.4%)	91 (9.9%)	113 (12.4%)	185 (17.9%)	74 (15.6%)
Other	261 (5.7%)	83 (6.5%)	41 (4.5%)	55 (6.0%)	54 (5.2%)	28 (5.9%)
Able to pay for things needed in life						
With great difficulty	701 (15.2%)	163 (12.8%)	97 (10.6%)	157 (17.3%)	188 (18.2%)	96 (20.3%)
With some difficulty	2083 (45.2%)	547 (42.8%)	371 (40.5%)	426 (46.8%)	498 (48.2%)	241 (50.8%)
Quite easily	1527 (33.1%)	485 (37.9%)	312 (34.0%)	294 (32.3%)	313 (30.3%)	123 (25.9%)
Easily	302 (6.5%)	83 (6.5%)	137 (14.9%)	33 (3.6%)	35 (3.4%)	14 (3.0%)

*According to the Eurostat Degree of Urbanization (DEGURBA) classification system based on 2011 population grids and 2018 administrative boundaries.
Eighty-one respondents who did not recall whether they had been vaccinated are excluded. Northwestern Italy includes the regions of Piedmont, Aosta Valley, Lombardy, and Liguria; Northeastern Italy includes the regions of Trentino-South Tyrol, Veneto, Friuli-Venezia Giulia, and Emilia-Romagna; Central Italy includes the regions of Tuscany, Umbria, Marche, and Lazio; Southern Italy includes the regions of Abruzzo, Molise, Campania, Apulia, Basilicata, and Calabria; Insular Italy includes the regions of Sicily and Sardinia.

Vaccine uptake, however, is influenced by a complex array of factors, such as beliefs, emotions, social influences, and practical or logistical issues.[9–11] Vaccine hesitancy, as redefined by the WHO,[12] presents a considerable obstacle in Italy. In a study conducted by Rossi[13], the authors highlighted the consistently low coverage of the influenza vaccine from 1999 to 2019, specifically falling below the minimum threshold of 75% for individuals aged 65 and older. Similar findings were presented by Stefanati[14], who reported sub-optimal vaccination rates in people with chronic heart diseases, consistently failing to reach the 75% threshold. Examining HCWs, Montagna[15] revealed that influenza vaccine coverage also failed to meet the desired minimum of 75%, even among Italian public health physicians, with only 66.5% of the 2,030 surveyed participants reporting vaccination. Alas, limited research has been conducted on influenza vaccine hesitancy and uptake in the Italian population, leaving little data available on the factors driving and hindering vaccine uptake in Italy.

Addressing hesitancy and uptake is critical, and understanding the full spectrum of drivers and barriers to influenza vaccination is essential for crafting evidence-informed policy and programmatic solutions. With this study, we aim to present the key social and behavioral drivers of influenza vaccination among those recommended to receive the vaccine in Italy, therefore empowering decision-makers with evidence-based results.

Methods

Study design and data collection

This study was conducted as a cross-sectional computer-assisted web interviewing (CAWI) questionnaire. From April 11 to May 29, 2022, the professional online provider *Dynata* (https://www.dynata.com/) surveyed 10,000 Italian citizens aged ≥18 years using a stratified sampling based on proportionate allocation by first-level NUTS (Nomenclature

Table 2. Clinical characteristics of the study respondents who provided information about their own seasonal influenza vaccine uptake, overall and by NUTS statistical region.

Characteristic	Italy (n = 4613)	Northwestern Italy (n = 1278)	Northeastern Italy (n = 917)	Central Italy (n = 910)	Southern Italy (n = 1034)	Insular Italy (n = 474)
Pregnant in October/November 2021						
Yes	230 (5.0%)	57 (4.5%)	45 (4.9%)	46 (5.1%)	57 (5.5%)	25 (5.3%)
No	2021 (43.8%)	589 (46.1%)	380 (41.4%)	394 (43.3%)	434 (42.0%)	224 (47.3%)
Not applicable	2362 (51.2%)	632 (49.5%)	492 (53.7%)	470 (51.6%)	543 (52.5%)	225 (47.5%)
Problems with daily living tasks due to physical or mental impairment						
Yes	652 (14.1%)	139 (10.9%)	204 (22.2%)	91 (10.0%)	162 (15.7%)	56 (11.8%)
No	3961 (85.9%)	1139 (89.1%)	713 (77.8%)	819 (90.0%)	872 (84.3%)	418 (88.2%)
BMI ≥30 kg/m^2						
Yes	1200 (26.0%)	286 (22.4%)	232 (25.3%)	260 (28.6%)	284 (27.5%)	138 (29.1%)
No	3413 (74.0%)	992 (77.6%)	685 (74.7%)	650 (71.4%)	750 (72.5%)	336 (70.9%)
Respiratory diseases						
Yes	592 (12.8%)	152 (11.9%)	114 (12.4%)	109 (12.0%)	144 (13.9%)	73 (15.4%)
No	4021 (87.2%)	1126 (88.1%)	803 (87.6%)	801 (88.0%)	890 (86.1%)	401 (84.6%)
Cardiovascular diseases						
Yes	649 (14.1%)	179 (14.0%)	135 (14.7%)	109 (12.0%)	168 (16.2%)	58 (12.2%)
No	3964 (85.9%)	1099 (86.0%)	782 (85.3%)	801 (88.0%)	866 (83.8%)	416 (87.8%)
Diabetes						
Yes	828 (17.9%)	193 (15.1%)	240 (26.2%)	121 (13.3%)	191 (18.5%)	83 (17.5%)
No	3785 (82.1%)	1085 (84.9%)	677 (73.8%)	789 (86.7%)	843 (81.5%)	391 (82.5%)

Eighty-one respondents who did not recall whether they had been vaccinated are excluded. Northwestern Italy includes the regions of Piedmont, Aosta Valley, Lombardy, and Liguria; Northeastern Italy includes the regions of Trentino-South Tyrol, Veneto, Friuli-Venezia Giulia, and Emilia-Romagna; Central Italy includes the regions of Tuscany, Umbria, Marche, and Lazio; Southern Italy includes the regions of Abruzzo, Molise, Campania, Apulia, Basilicata, and Calabria; Insular Italy includes the regions of Sicily and Sardinia.
BMI, body mass index.

of Territorial Units for Statistics) statistical region of residence (Northwest, Northeast, Center, South, and Islands), gender, and age group.

The survey was designed to be completed in ~10 minutes and included seven sections investigating (section 1) demographics and living conditions, (sections 2–6) data on vaccination against influenza (the focus of this work), pneumococcus, varicella-zoster virus, rotavirus, and human papillomavirus, and (section 7) political orientation, attitudes toward SARS-CoV-2 vaccination, science and alternative medicine. All respondents accessed sections 1 and 7, while only respondents with specific characteristics (age groups, gender, clinical conditions, body mass index, professions, or combinations thereof) had access to sections 2–6 on specific vaccines in accordance with the population-target definitions provided by the 2017–2019 Italian National Vaccination Plan.[7]

Target populations of the influenza section were: people aged ≥60 years; people with underlying diseases (chronic respiratory diseases, chronic cardiovascular diseases, diabetes, obesity); pregnant women; people at occupational risk; parents or guardians of last-born children between 6 months and 6 years of age. Questions were tailored according to a set of priority keys: if the respondents met at least one of the adult-population criteria, they were asked to answer on their own behalf; if not, they were asked to answer about their youngest child's vaccination status.

Data management of *Dynata* was performed in accordance with the General Data Protection Regulation of the European Union. The survey followed all requirements under Italian regulations.

Variables

Cognitive testing was conducted prior to full implementation, and feedback was used to revise the questionnaire. A total of 27 questions were included: gender (four categories: male, female, non-binary, prefer not to say); date of birth; region of residence; municipality of residence; educational attainment (four categories; less than high school diploma, high school diploma, academic degree, post-graduate or doctorate degree); occupation (eight categories: student, medical doctor, other healthcare worker, law enforcement member, teacher, other occupation, unemployed, retired); living arrangement (four categories: alone, in couple, with parents or family of origin, other); ability to pay for things needed in life (four categories: with great difficulty, with some difficulty, quite easily, easily); being pregnant during the 2021–2022 seasonal influenza vaccination campaign (yes or no); problems with daily living tasks due to physical or mental impairment (yes or no); weight in kg; height in cm; suffering from chronic respiratory diseases, cardiovascular diseases and/or diabetes (yes or no); the place where most vaccinations were given (six categories: hospital, pharmacy, family doctor, vaccine hub, home, workplace); preferred place to be vaccinated (same categories listed before); friends and family's views on vaccination (six categories from very unfavorable to very favorable); having children (yes or no); youngest child's gender (male or female); youngest child's date of birth; decision-making agreement between partners on youngest child's vaccinations (three categories: mostly myself, mostly my partner, equally myself and my partner); if they had gotten the influenza vaccine during the 2021–2022 campaign (three categories: yes, no, not sure) and, if not, would they get it now (yes or no); perceived worry about getting influenza (four categories from not worried to very worried); perceived

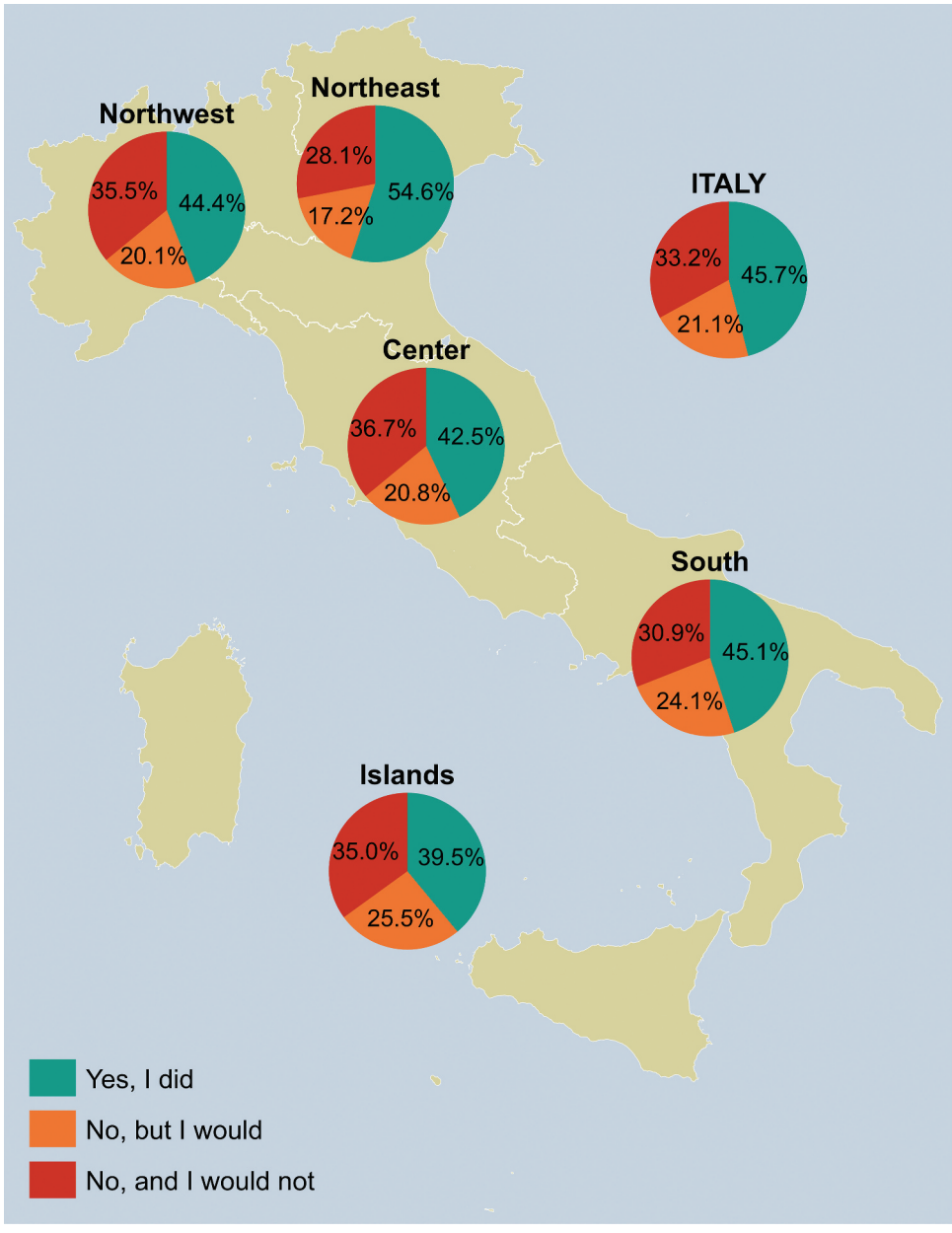

Figure 1. Seasonal influenza vaccine uptake between October and December 2021 among respondents who answered on their own behalf (n = 4613), overall and by NUTS statistical region; if the answer is no, the respondents are asked whether or not they would get the vaccine. Notes: Northwestern Italy includes the regions of Piedmont, Aosta Valley, Lombardy, and Liguria; Northeastern Italy includes the regions of Trentino-South Tyrol, Veneto, Friuli-Venezia Giulia, and Emilia-Romagna; Central Italy includes the regions of Tuscany, Umbria, Marche, and Lazio; Southern Italy includes the regions of Abruzzo, Molise, Campania, Apulia, Basilicata, and Calabria; Insular Italy includes the regions of Sicily and Sardinia.

vaccine safety (four categories from very safe to very unsafe); knowledge of higher priority (three categories: yes, no, don't know); perceived ease of getting the vaccine (four categories from very easy to very difficult). Adults' age was categorized into six groups (18–24, 25–34, 35–44, 45–54, 55–64, ≥65 years), and children's age into two (6 months to 3 years, 4–5 years). Regions of residence were collapsed into Italy's five NUTS groups to reduce data sparsity, while municipality degree of urbanization (three categories: city, town or suburb, rural area) was derived according to the Eurostat Degree of Urbanization (DEGURBA) classification system based on 2011 population grids and 2018 administrative boundaries.

Vaccine-specific sections were developed following the domains of the WHO BesD framework:[10] *thinking and feeling*; *social processes*; *motivation*; *practical issues*; *vaccination*. The questionnaire can be found in the Appendix.

Statistical analysis

Post-stratification by gender, age group, and area of residence confirmed that non-response to the survey in some strata of Italy's population was negligible (Supplemental Table S1) and had no substantial effect on the study estimates of the overall sample of 10,000 (results not shown). Adjustment of sampling weights was thus deemed unnecessary to be performed on the targeted subsample of respondents for influenza vaccination (n = 5282).

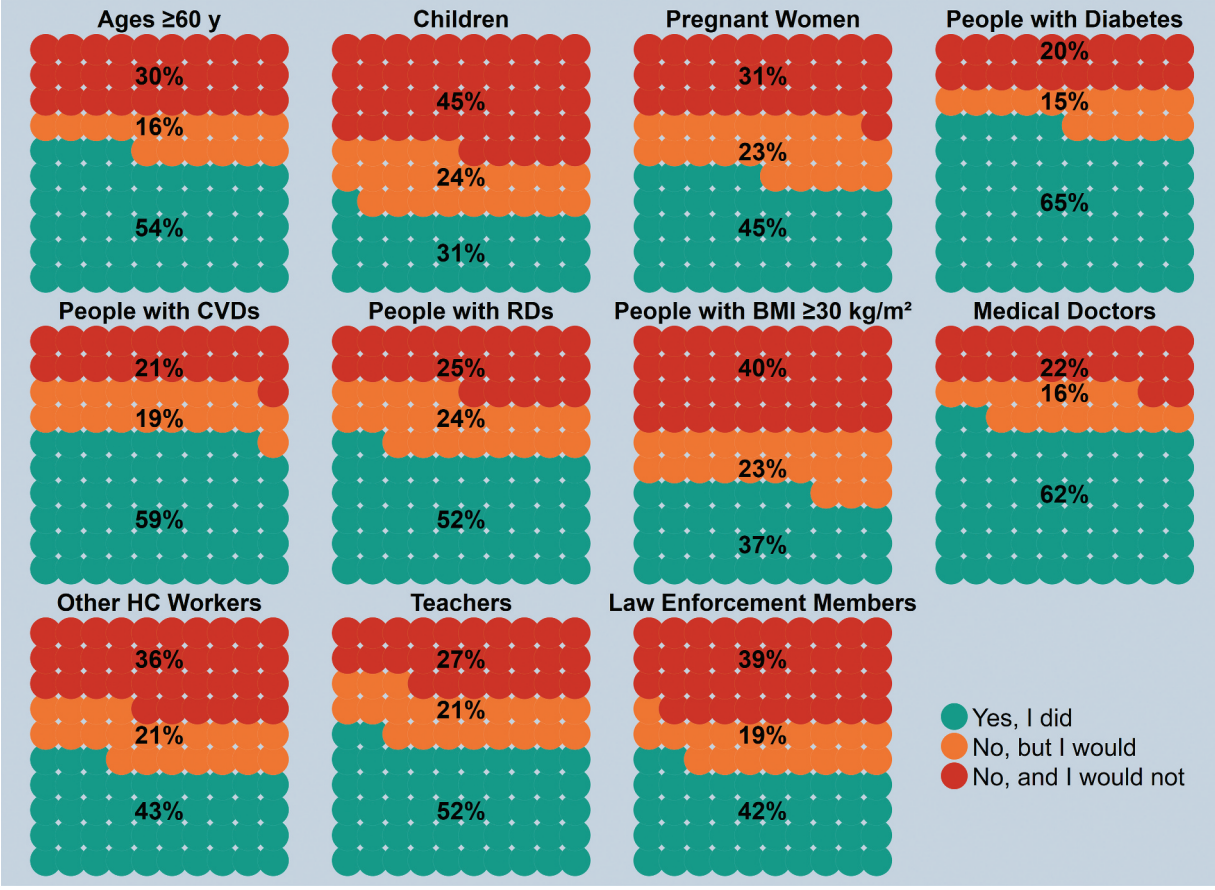

Figure 2. Seasonal influenza vaccine uptake between October and December 2021, by high-risk target group based on age, clinical status or profession; if the answer is no, the respondents are asked whether or not they would get the vaccine. Notes: Information about children was provided by their parents. *CVD*, cardiovascular disease; *RD*, respiratory disease; *BMI*, body mass index; *HC*, healthcare.

Table 3. General information about vaccines among respondents who provided information about their own seasonal influenza vaccine uptake, overall and by NUTS statistical region.

Characteristic	Italy (n = 4613)	Northwestern Italy (n = 1278)	Northeastern Italy (n = 917)	Central Italy (n = 910)	Southern Italy (n = 1034)	Insular Italy (n = 474)
Place where you prevalently got vaccines						
Vaccine Hub	2906 (63.0%)	883 (69.1%)	522 (56.9%)	544 (59.8%)	667 (64.5%)	290 (61.2%)
Hospital	772 (16.7%)	195 (15.3%)	140 (15.3%)	185 (20.3%)	161 (15.6%)	91 (19.2%)
Family doctor	613 (13.3%)	119 (9.3%)	165 (18.0%)	123 (13.5%)	139 (13.4%)	67 (14.1%)
Workplace	137 (3.0%)	33 (2.6%)	51 (5.6%)	21 (2.3%)	22 (2.1%)	10 (2.1%)
Pharmacy	115 (2.5%)	33 (2.6%)	22 (2.4%)	25 (2.7%)	26 (2.5%)	9 (1.9%)
Home	70 (1.5%)	15 (1.2%)	17 (1.9%)	12 (1.3%)	19 (1.8%)	7 (1.5%)
Favorite place to get vaccines						
Vaccine Hub	1608 (34.9%)	483 (37.8%)	287 (31.3%)	316 (34.7%)	380 (36.8%)	142 (30.0%)
Family doctor	1377 (29.9%)	330 (25.8%)	299 (32.6%)	271 (29.8%)	310 (30.0%)	167 (35.2%)
Hospital	810 (17.6%)	230 (18.0%)	151 (16.5%)	182 (20.0%)	162 (15.7%)	85 (17.9%)
Pharmacy	334 (7.2%)	117 (9.2%)	61 (6.7%)	53 (5.8%)	74 (7.2%)	29 (6.1%)
Home	300 (6.5%)	65 (5.1%)	61 (6.7%)	56 (6.2%)	80 (7.7%)	38 (8.0%)
Workplace	184 (4.0%)	53 (4.1%)	58 (6.3%)	32 (3.5%)	28 (2.7%)	13 (2.7%)
Friends and family's views on vaccination						
Very unfavorable	212 (4.6%)	57 (4.5%)	46 (5.0%)	40 (4.4%)	52 (5.0%)	17 (3.6%)
Unfavorable	144 (3.1%)	33 (2.6%)	22 (2.4%)	34 (3.7%)	35 (3.4%)	20 (4.2%)
Quite unfavorable	356 (7.7%)	92 (7.2%)	74 (8.1%)	75 (8.2%)	82 (7.9%)	33 (7.0%)
Quite favorable	1307 (28.3%)	331 (25.9%)	213 (23.2%)	256 (28.1%)	345 (33.4%)	162 (34.2%)
Favorable	1311 (28.4%)	391 (30.6%)	265 (28.9%)	257 (28.2%)	265 (25.6%)	133 (28.1%)
Very favorable	1283 (27.8%)	374 (29.3%)	297 (32.4%)	248 (27.3%)	255 (24.7%)	109 (23.0%)

Eighty-one respondents who did not recall whether they had been vaccinated are excluded. Northwestern Italy includes the regions of Piedmont, Aosta Valley, Lombardy, and Liguria; Northeastern Italy includes the regions of Trentino-South Tyrol, Veneto, Friuli-Venezia Giulia, and Emilia-Romagna; Central Italy includes the regions of Tuscany, Umbria, Marche, and Lazio; Southern Italy includes the regions of Abruzzo, Molise, Campania, Apulia, Basilicata, and Calabria; Insular Italy includes the regions of Sicily and Sardinia.

Table 4. General information about vaccines among respondents who provided information about their youngest children's seasonal influenza vaccine uptake, overall and by NUTS statistical region.

Characteristic	Italy (*n* = 562)	Northwestern Italy (*n* = 162)	Northeastern Italy (*n* = 76)	Central Italy (*n* = 117)	Southern Italy (*n* = 142)	Insular Italy (*n* = 65)
Place where you prevalently got vaccines						
Vaccine Hub	367 (65.3%)	107 (66.0%)	39 (51.3%)	75 (64.1%)	107 (75.4%)	39 (60.0%)
Hospital	116 (20.6%)	34 (21.0%)	27 (35.5%)	20 (17.1%)	19 (13.4%)	16 (24.6%)
Family doctor	65 (11.6%)	18 (11.1%)	7 (9.2%)	20 (17.1%)	11 (7.7%)	9 (13.8%)
Pharmacy	11 (2.0%)	2 (1.2%)	2 (2.6%)	2 (1.7%)	4 (2.8%)	1 (1.5%)
Home	2 (0.4%)	1 (0.6%)	1 (1.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Workplace	1 (0.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.7%)	0 (0.0%)
Favorite place to get vaccines						
Vaccine Hub	214 (38.1%)	71 (43.8%)	26 (34.2%)	36 (30.8%)	60 (42.3%)	21 (32.3%)
Family doctor	133 (23.7%)	32 (19.8%)	14 (18.4%)	40 (34.2%)	25 (17.6%)	22 (33.8%)
Hospital	132 (23.5%)	36 (22.2%)	28 (36.8%)	27 (23.1%)	23 (16.2%)	18 (27.7%)
Home	38 (6.8%)	9 (5.6%)	4 (5.3%)	8 (6.8%)	16 (11.3%)	1 (1.5%)
Pharmacy	27 (4.8%)	10 (6.2%)	0 (0.0%)	3 (2.6%)	11 (7.7%)	3 (4.6%)
Workplace	18 (3.2%)	4 (2.5%)	4 (5.3%)	3 (2.6%)	7 (4.9%)	0 (0.0%)
Friends and family's views on vaccination						
Very unfavorable	13 (2.3%)	2 (1.2%)	4 (5.3%)	2 (1.7%)	3 (2.1%)	2 (3.1%)
Unfavorable	15 (2.7%)	7 (4.3%)	2 (2.6%)	2 (1.7%)	3 (2.1%)	1 (1.5%)
Quite unfavorable	40 (7.1%)	13 (8.0%)	2 (2.6%)	10 (8.5%)	8 (5.6%)	7 (10.8%)
Quite favorable	201 (35.8%)	54 (33.3%)	27 (35.5%)	42 (35.9%)	47 (33.1%)	31 (47.7%)
Favorable	163 (29.0%)	43 (26.5%)	24 (31.6%)	30 (25.6%)	49 (34.5%)	17 (26.2%)
Very favorable	130 (23.1%)	43 (26.5%)	17 (22.4%)	31 (26.5%)	32 (22.5%)	7 (10.8%)

Northwestern Italy includes the regions of Piedmont, Aosta Valley, Lombardy, and Liguria; Northeastern Italy includes the regions of Trentino-South Tyrol, Veneto, Friuli-Venezia Giulia, and Emilia-Romagna; Central Italy includes the regions of Tuscany, Umbria, Marche, and Lazio; Southern Italy includes the regions of Abruzzo, Molise, Campania, Apulia, Basilicata, and Calabria; Insular Italy includes the regions of Sicily and Sardinia.

All variables were summarized as counts and percentages and were stratified by first-level NUTS statistical region of residence and by target group based on age, gender, clinical status, and profession (male vs. female adults, ages ≥60 years, children, pregnant women, individuals with certain chronic conditions [respiratory diseases, cardiovascular, diabetes, BMI ≥30 kg/m^2], Medical Doctors (MDs), other Healthcare Workers (HCWs) [nurses, pharmacists, optometrists, etc.], teachers, and law enforcement members (LEM)).

Multivariable multinomial logistic regression analysis was performed to examine the drivers of a three-category nominal outcome consisting of three mutually-exclusive response options: "*I did get the vaccine*;" "*I did not get the vaccine, but I would*;" "*I do not want to get vaccinated*." In keeping with the increasing vaccination model proposed by the BeSD Expert Working Group,[10] the covariates included in the regression model as potential drivers of vaccine uptake,[8] delay, and refusal were the following: attitudes and beliefs about seasonal influenza infection and vaccination (perceived worry and safety concerns); social processes (friends and family's views on vaccination, gender); practical issues (awareness of having higher priority for vaccination, perceived ease of access to healthcare to get the vaccine). Other relevant sociodemographic determinants considered were: age group, statistical region of residence, level of urbanization, educational level, and clinical/professional factors that lead to a higher priority for vaccination.

All analyses were conducted using Stata 17,[16] and were performed separately on individuals answering on their own behalf vs. individuals answering on their children's behalf.

Results

Sociodemographics

The sociodemographic characteristics of the respondents who answered on their own behalf are summarized in Table 1. Out of the 10,000 respondents to the full questionnaire, 4,694 (46.9%) were eligible for the influenza vaccine. Since 81 of these respondents (1.7%) did not recall their vaccination status, further analyses were conducted solely on the remaining 4,613 (46.1%). The sample comprised slightly more males (51.2%) than females (48.6%), with a majority of individuals aged 65 years or older (30.9%). Most respondents resided in towns or suburbs (45.3%), and a large proportion (60.4%) faced moderate or great difficulties in providing necessities with their economic means. The clinical characteristics of the 4,613 study respondents, overall and by NUTS region, are presented in Table 2.

The sociodemographics of the 562 respondents who provided information about their youngest child's seasonal influenza vaccination status are presented in Supplemental Table S2, while children's demographics are provided in Supplemental Table S3. Of note, nearly half of the respondents (45.7%) reported that decision-making about child vaccination was equally shared between partners.

Seasonal influenza vaccination status

In order to explore geographical differences in seasonal influenza vaccination status, data about uptake, delay, and refusal were disaggregated by NUTS statistical region. As depicted in Figure 1, 45.7% of the respondents who answered on their own behalf were vaccinated, 21.1% were not vaccinated but would, and 33.2% were not vaccinated and would not. Northeastern Italy had the highest vaccine uptake (54.6%), while Insular Italy had the lowest (39.5%). Central Italy exhibited the highest reluctance to the influenza vaccine (36.7%), while Northeastern had the lowest (28.1%).Data stratified by high-risk target group based on age, clinical status, or profession are illustrated in Figure 2. Among individuals aged 60 years or older, 16.2% did not receive the

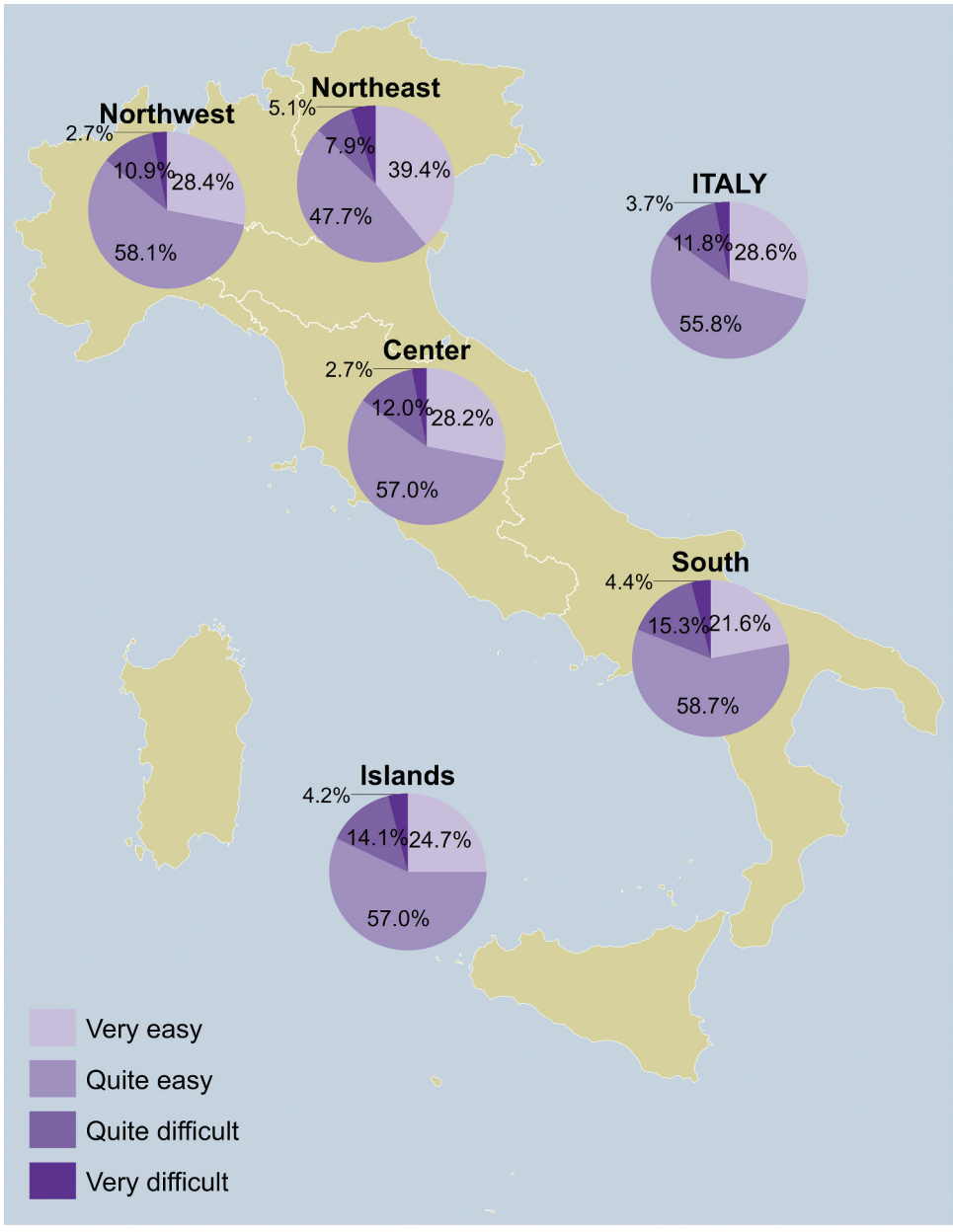

Figure 3. Perception of how easy it is to access healthcare facilities to get a seasonal influenza vaccine among respondents who answered on their own behalf (n = 4613), overall and by NUTS statistical region. Notes: Northwestern Italy includes the regions of Piedmont, Aosta Valley, Lombardy, and Liguria; Northeastern Italy includes the regions of Trentino-South Tyrol, Veneto, Friuli-Venezia Giulia, and Emilia-Romagna; Central Italy includes the regions of Tuscany, Umbria, Marche, and Lazio; Southern Italy includes the regions of Abruzzo, Molise, Campania, Apulia, Basilicata, and Calabria; Insular Italy includes the regions of Sicily and Sardinia.

vaccine but would have if informed, and 29.8% reported not getting the vaccine and having no intention to. Among all the target groups, children had the lowest vaccine uptake (31.5%). Among occupation categories, vaccine uptake ranged from 41.9% for law enforcement members to 62.2% for medical doctors, while among clinical categories, vaccine uptake ranged from 36.6% for people with BMI ≥30 kg/m^2 to 65.1% for people with diabetes. Further stratification of each target group by gender is provided in Supplemental Table S4.

Information about vaccination-priority awareness, worry about getting sick with influenza, and perceived safety of influenza vaccines are shown in Supplemental Figures S1–S6. More specifically, data stratified by statistical region are presented in Supplemental Figures S1–S3, while data stratified by high-risk target group are presented in Supplemental Figures S4–S6. Further stratification of each target group by gender is provided in Supplemental Tables S5–S7.

Experience with vaccines in general

As shown in Table 3, 63.0% of the study participants who answered on their own behalf received their influenza vaccine in dedicated hubs, 16.7% in hospitals, and 13.3% from their primary care physician. When asked about their preferred vaccination locations, respondents chose dedicated vaccine hubs in 34.9% of cases, primary care physicians in 29.9%, and hospitals in 17.6%.

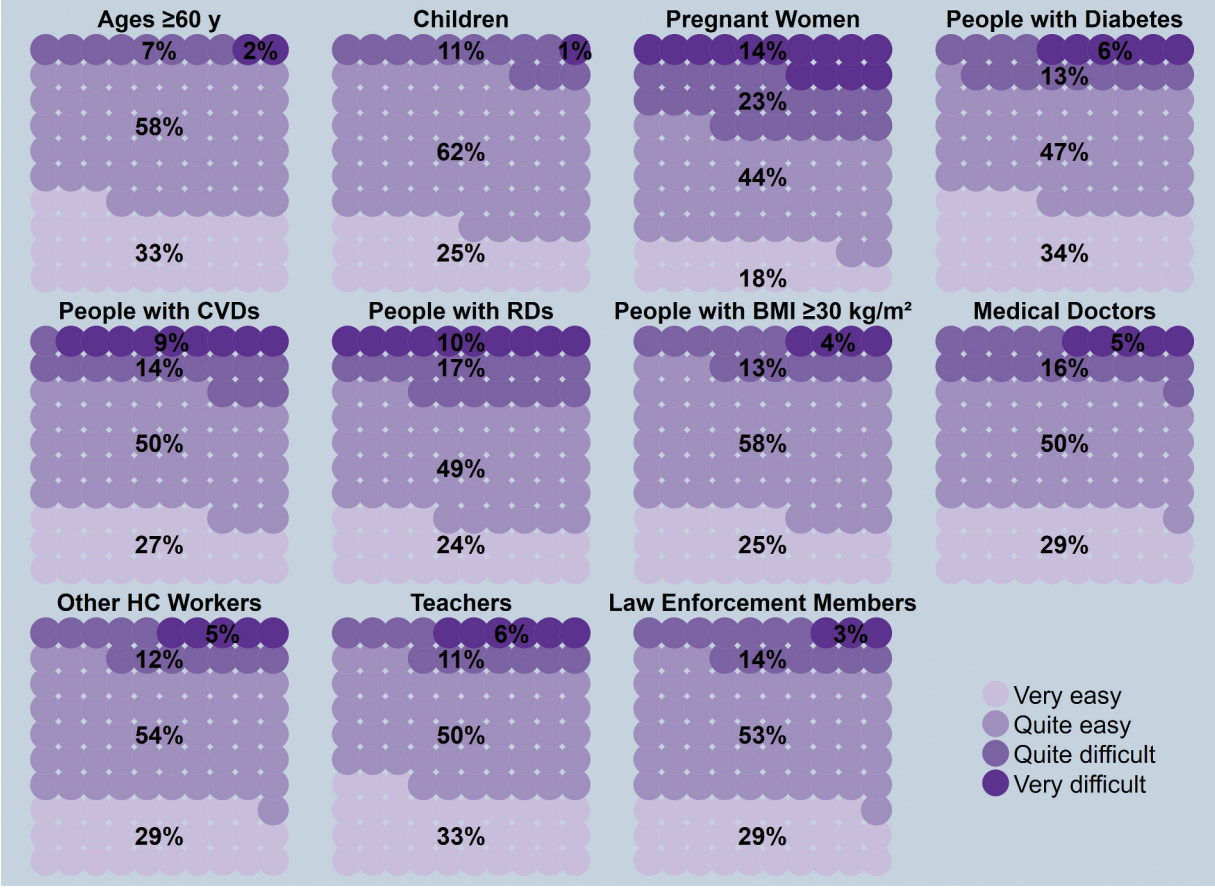

Figure 4. Perception of how easy it is to access healthcare facilities to get a seasonal influenza vaccine, by high-risk target group based on age, clinical status or profession. Notes: Information about children was provided by their parents. *CVD*, cardiovascular disease; *RD*, respiratory disease; *BMI*, body mass index; *HC*, healthcare.

As shown in Table 4, among the 562 participants who answered on their children's vaccination status, vaccine hubs emerged as the preferred vaccination location for children (38.1%), closely followed by family doctors (23.7%).

Figures 3 and 4 summarize respondents' perceptions of ease of access to vaccination services, with Northeastern Italy (5.1%) and pregnant women (14.3%) reporting the most difficult access to vaccination services. Further stratification of each target group by gender is provided in Supplemental Table S8.

Multivariable regression analysis

The lack of awareness of being in the target groups for seasonal influenza vaccination was significantly associated with an increased probability of both refusal and delay in acceptance (Table 5). Moreover, being female, being between 45 and 54 years of age, living in rural areas, not having an academic education, being unworried about catching the flu, perceiving seasonal influenza vaccination as unsafe, and having friends or relatives against vaccination were significantly associated with a higher probability of refusing vaccination, while significant predictors of delay in acceptance were self-reported difficulty in access to healthcare and living in Southern or Insular Italy. Furthermore, being ≥65 years old, living in Northeastern Italy, being a teacher or HCW, and suffering from cardiac disease or diabetes significantly increased the probability of vaccine uptake. All these significant associations between a predictor and the study outcome were obtained controlled for all the other covariates included in the regressions model, which means that, for instance, the higher probability of vaccine uptake in the Northeast was confirmed even after adjusting for differences in the percentage distribution of other significant covariates such as educational attainment, rural area, gender, teacher, and diabetes.

The analysis of possible interactions effects across covariates revealed that the impact of safety concerns on vaccine refusal was much stronger among the eldest (*very safe*: 16.7%; *quite/very unsafe*: 72.2%; Δ = +55.5; 95% CI = 47.2 to 63.8) than among the young (*very safe*: 23.6%; *quite/very unsafe*: 37.4%; Δ = +13.7; 95% CI = 4.5 to 23.0) (LR test = 101.0, *p*-value <.0001). There was also evidence of a significant interaction (LR test = 74.2, *p*-value <.0001) between age and relatives and friends' opinions, suggesting that the impact of having friends or relatives against vaccination on refusal was null in individuals aged <45 years (*very favorable*: 29.4%; *unfavorable/very unfavorable*: 25.4%; Δ = −4.0; 95% CI = −11.8 to 3.8), strong among those aged ≥65 years (*very favorable*: 25.6%; *unfavorable/very unfavorable*: 43.7%; Δ = +18.1; 95% CI = 10.5 to 25.7), and even stronger in those aged 45–64 years (*very favorable*: 27.9%; *unfavorable/very unfavorable*: 54.4%; Δ = +26.5; 95% CI = 11.7 to 41.2).

Table 5. Results of multivariable multinomial logistic regression analysis: determinants of seasonal influenza vaccine uptake, delay, and refusal among respondents who answered on their own behalf ($n = 4613$).

	Did get the vaccine			Would get the vaccine			Would not get the vaccine		
	Predicted	Discrete difference (Δ)		Predicted	Discrete difference (Δ)		Predicted	Discrete difference (Δ)	
Characteristic	probability	Estimate	95% CI	probability	Estimate	95% CI	probability	Estimate	95% CI
Gender									
Male	47.0%	Ref.		22.7%	Ref.		30.3%	Ref.	
Female[†]	44.4%	−2.5*	−5.0, −0.1	19.7%	−3.1*	−5.3, −0.8	35.9%	5.6*	3.3, 7.9
Age group, y									
18–34	43.6%	Ref.		27.6%	Ref.		28.8%	Ref.	
35–44	41.7%	−1.9	−6.5, 2.6	24.4%	−3.2	−7.5, 1.2	33.9%	5.1*	1.2, 8.9
45–54	38.3%	−5.4*	−10.0, −0.7	23.4%	−4.2	−8.7, 0.3	38.3%	9.5*	5.5, 13.6
55–64	41.1%	−2.5	−6.9, 1.9	25.4%	−2.2	−6.4, 2.0	33.5%	4.7*	1.0, 8.3
≥65	54.0%	10.4*	6.0, 14.7	12.4%	−15.2*	−19.1, −11.2	33.6%	4.8*	1.0, 8.5
NUTS statistical region									
Northwestern Italy	44.9%	Ref.		19.8%	Ref.		35.4%	Ref.	
Northeastern Italy	49.2%	4.3*	0.7, 8.0	19.6%	−0.2	−3.5, 3.2	31.2%	−4.2*	−7.5, −0.8
Central Italy	46.4%	1.5	−2.0, 5.0	20.6%	0.8	−2.4, 4.0	33.1%	−2.3	−5.5, 0.9
Southern Italy	45.3%	0.4	−3.0, 3.7	22.9%	3.2*	0.0, 6.3	31.8%	−3.5*	−6.7, −0.4
Insular Italy	41.5%	−3.4	−7.7, 0.9	24.5%	4.8*	0.6, 8.9	34.0%	−1.4	−5.4, 2.7
Degree of urbanization[‡]									
City	47.5%	Ref.		20.5%	Ref.		32.0%	Ref.	
Town or suburb	44.5%	−3.1*	−5.6, −0.5	22.4%	1.9	−0.5, 4.3	33.2%	1.2	−1.2, 3.6
Rural area	44.2%	−3.4	−7.1, 0.4	18.9%	−1.6	−5.0, 1.9	36.9%	4.9*	1.4, 8.5
Educational attainment									
Post-graduate/Doctorate degree	52.2%	Ref.		19.7%	Ref.		28.1%	Ref.	
Academic degree	48.6%	−3.6	−8.1, 1.0	19.1%	−0.6	−4.7, 3.4	32.3%	4.2	−0.1, 8.6
High school diploma	44.0%	−8.2*	−12.5, −3.9	22.0%	2.2	−1.7, 6.2	34.1%	6.0*	1.9, 10.0
Less than high school diploma	43.0%	−9.2*	−14.4, −4.0	23.1%	3.3	−1.5, 8.2	33.9%	5.8*	1.0, 10.7
Occupation									
Teacher	48.8%	4.3*	0.1, 8.6	19.3%	−2.8	−6.5, 0.9	31.9%	−1.5	−5.5, 2.4
Healthcare worker (incl. MD)	52.7%	8.2*	3.6, 12.7	17.8%	−4.3*	−8.2, −0.4	29.6%	−3.9	−7.9, 0.1
Law enforcement member	46.3%	1.8	−5.0, 8.5	16.0%	−6.1*	−11.4, −0.8	37.8%	4.3	−2.0, 10.6
Other	44.5%	Ref.		22.1%	Ref.		33.5%	Ref.	
Respiratory diseases									
No	45.3%	Ref.		20.8%	Ref.		33.8%	Ref.	
Yes	48.4%	3.1	−0.6, 6.8	23.3%	2.4	−1.1, 6.0	28.3%	−5.5*	−8.9, −2.1
Cardiovascular diseases									
No	44.6%	Ref.		21.3%	Ref.		34.0%	Ref.	
Yes	52.2%	7.6*	4.1, 11.1	20.5%	−0.8	−4.1, 2.4	27.3%	−6.8*	−10.1, −3.4
Diabetes									
No	44.2%	Ref.		21.9%	Ref.		33.8%	Ref.	
Yes	52.5%	8.3*	5.0, 11.6	17.8%	−4.1*	−7.2, −1.1	29.7%	−4.1*	−7.4, −0.9
Worry about catching the flu									
Very/Quite worried	56.4%	Ref.		26.2%	Ref.		17.4%	Ref.	
A little worried	45.5%	−10.9*	−14.1, −7.8	22.7%	−3.5*	−6.5, −0.5	31.8%	14.4*	11.7, 17.2
Not worried	36.9%	−19.5*	−23.2, −15.9	15.0%	−11.2*	−14.5, −7.9	48.1%	30.7*	27.3, 34.2
Perception of vaccine safety									
Very safe	54.7%	Ref.		26.8%	Ref.		18.5%	Ref.	
Quite safe	44.8%	−9.9*	−13.2, −6.5	23.5%	−3.4*	−6.7, 0.0	31.7%	13.2*	10.2, 16.3
Quite/Very unsafe	35.2%	−19.5*	−24.4, −14.7	7.9%	−18.9*	−22.7, −15.2	56.9%	38.5*	33.7, 43.2
Dear ones' views on vaccination in general									
Very favorable	49.2%	Ref.		24.2%	Ref.		26.6%	Ref.	
Favorable	47.3%	−1.8	−5.2, 1.5	22.9%	−1.3	−4.5, 1.9	29.8%	3.1	0.0, 6.3
Quite favorable	43.5%	−5.7*	−9.2, −2.1	19.1%	−5.1*	−8.4, −1.9	37.5%	10.8*	7.5, 14.2
Quite unfavorable	39.6%	−9.6*	−14.9, −4.2	17.0%	−7.2*	−12.1, −2.3	43.4%	16.7*	11.6, 21.9
Unfavorable/Very unfavorable	44.4%	−4.8	−10.6, 1.1	17.1%	−7.1*	−12.7, −1.6	38.5%	11.9*	6.4, 17.3
Awareness of having priority for vaccination									
Yes	58.2%	Ref.		17.6%	Ref.		24.2%	Ref.	
No	21.8%	−36.4*	−39.9, −32.8	30.3%	12.7*	9.2, 16.2	47.9%	23.7*	20.2, 27.2
Don't know	24.5%	−33.6*	−37.4, −29.9	27.8%	10.1*	6.6, 13.7	47.7%	23.5*	19.9, 27.0
Perceived ease of access to get the vaccine									
Very easy	48.7%	Ref.		15.9%	Ref.		35.5%	Ref.	
Quite easy	43.0%	−5.6*	−8.6, −2.7	22.3%	6.5*	3.8, 9.1	34.7%	−0.8	−3.7, 2.1
Quite/Very difficult	48.8%	0.1	−4.1, 4.4	25.5%	9.7*	5.7, 13.7	25.7%	−9.8*	−13.4, −6.2

*P-value ≤.05, that is, Δ significantly ≠ 0.
[†]Including non-binary people and respondents who did not declare their gender identity.
[‡]According to the Eurostat Degree of Urbanization (DEGURBA) classification system based on 2011 population grids and 2018 administrative boundaries.
MD, medical doctor.

When the analysis was performed on vaccine uptake among children (Table 6), we found that a significant predictor of both refusal and delay in acceptance was not being aware that children had higher priority for seasonal influenza vaccination. Moreover, mothers, ages ≥35 years, living in Northeastern Italy, living in towns, suburbs, or rural areas, not being worried about catching the flu, having safety concerns, and having friends or relatives against vaccination were significantly

Table 6. Results of multivariable multinomial logistic regression analysis: determinants of seasonal influenza vaccine uptake, delay, and refusal among respondents who answered on their children's behalf ($n = 562$).

	Did get the vaccine			Would get the vaccine			Would not get the vaccine		
	Predicted	Discrete difference (Δ)		Predicted	Discrete difference (Δ)		Predicted	Discrete difference (Δ)	
Characteristic	probability	Estimate	95% CI	probability	Estimate	95% CI	probability	Estimate	95% CI
Parent's gender									
Male	38.3%	Ref.		24.7%	Ref.		37.0%	Ref.	
Female	26.9%	−11.4*	−18.0, −4.7	22.9%	−1.7	−8.5, 5.0	50.1%	13.1*	7.2, 19.1
Parent's age group, y									
18–34	37.8%	Ref.		25.7%	Ref.		36.5%	Ref.	
35–44	27.8%	−10.0*	−17.4, −2.6	24.8%	−1.0	−8.5, 6.6	47.4%	11.0*	4.4, 17.6
45–59	32.2%	−5.6	−16.2, 4.9	15.9%	−9.9*	−19.6, −0.1	51.9%	15.5*	5.5, 25.4
NUTS statistical region									
Northwestern Italy	35.6%	Ref.		23.9%	Ref.		40.6%	Ref.	
Northeastern Italy	27.5%	−8.0	−18.8, 2.7	19.7%	−4.2	−14.9, 6.4	52.8%	12.2*	2.8, 21.7
Central Italy	22.1%	−13.4*	−22.2, −4.7	29.8%	5.9	−3.6, 15.4	48.1%	7.5	−0.9, 15.9
Southern Italy	36.8%	1.2	−7.5, 10.0	20.9%	−3.0	−11.6, 5.5	42.3%	1.8	−6.2, 9.8
Insular Italy	31.6%	−4.0	−15.1, 7.2	23.7%	−0.2	−11.5, 11.1	44.8%	4.2	−5.5, 14.0
Degree of urbanization†									
City	36.5%	Ref.		25.0%	Ref.		38.5%	Ref.	
Town or suburb	29.4%	−7.1*	−14.0, −0.1	23.1%	−1.9	−9.0, 5.2	47.5%	9.0*	2.6, 15.4
Rural area	24.8%	−11.7*	−22.3, −1.2	23.8%	−1.2	−12.0, 9.5	51.5%	13.0*	3.7, 22.2
Parent's educational attainment									
Academic/Post-graduate degree	32.1%	Ref.		19.0%	Ref.		48.8%	Ref.	
Up to high school diploma	31.2%	−0.9	−7.7, 5.9	25.9%	6.8	−0.1, 13.8	42.9%	−5.9	−12.2, 0.4
Child's gender									
Male	30.8%	Ref.		23.6%	Ref.		45.5%	Ref.	
Female	32.2%	1.4	−5.0, 7.8	23.7%	0.0	−6.4, 6.5	44.1%	−1.4	−7.2, 4.4
Child's age group									
6 months to 3 years	30.1%	Ref.		24.7%	Ref.		45.2%	Ref.	
4 to 5 years	34.1%	4.0	−2.7, 10.7	21.7%	−3.0	−9.7, 3.7	44.2%	−1.0	−7.1, 5.0
Worry about catching the flu									
Very/Quite worried	34.3%	Ref.		35.5%	Ref.		30.2%	Ref.	
A little worried	29.3%	−5.0	−12.2, 2.2	21.4%	−14.1*	−22.0, −6.1	49.3%	19.1*	12.1, 26.1
Not worried	34.8%	0.5	−9.9, 10.8	7.7%	−27.7*	−36.6, −18.9	57.5%	27.3*	17.2, 37.3
Perception of vaccine safety for the child									
Very safe	54.5%	Ref.		32.2%	Ref.		13.2%	Ref.	
Quite safe	30.0%	−24.5*	−36.1, −12.9	29.9%	−2.3	−14.3, 9.7	40.1%	26.8*	17.7, 35.9
Quite/Very unsafe	17.7%	−36.8*	−50.0, −23.6	5.0%	−27.2*	−38.9, −15.5	77.2%	64.0*	52.6, 75.4
Dear ones' views on vaccination in general									
Very favorable	33.0%	Ref.		30.2%	Ref.		36.8%	Ref.	
Favorable	29.9%	−3.1	−12.1, 5.9	25.0%	−5.2	−14.8, 4.3	45.1%	8.4*	0.0, 16.7
Quite favorable	35.1%	2.1	−7.1, 11.4	19.3%	−10.9*	−20.3, −1.6	45.6%	8.8*	0.2, 17.4
Quite to very unfavorable	23.2%	−9.8	−22.2, 2.5	18.0%	−12.2	−26.2, 1.8	58.8%	22.0*	9.1, 34.9
Awareness that the child has priority for vaccination									
Yes	49.2%	Ref.		20.3%	Ref.		30.5%	Ref.	
No	10.5%	−38.7*	−47.0, −30.5	30.1%	9.8*	0.5, 19.2	59.4%	28.9*	20.1, 37.7
Don't know	14.1%	−35.1*	−42.8, −27.3	30.9%	10.6*	2.7, 18.5	55.0%	24.4*	16.9, 31.9
Perceived ease of access for the child to get the vaccine									
Very easy	27.4%	Ref.		21.7%	Ref.		50.9%	Ref.	
Quite easy	31.4%	4.0	−3.6, 11.6	23.6%	1.9	−6.3, 10.0	45.0%	−5.9	−13.4, 1.7
Quite/Very difficult	41.3%	14.0*	1.3, 26.6	25.1%	3.4	−9.8, 16.6	33.5%	−17.4*	−27.9, −6.9

*P-value ≤.05, that is, Δ significantly ≠ 0.
†According to the Eurostat Degree of Urbanization (DEGURBA) classification system based on 2011 population grids and 2018 administrative boundaries.

associated with a higher probability of refusing vaccination while reporting difficulties in access to healthcare was significantly associated with a higher probability of vaccination.

Discussion

This cross-sectional study sheds light on the vaccination uptake among various target groups recommended for the influenza vaccine in Italy, supplementing what is already mapped by the Italian Ministry of Health,[17] which focuses solely on the general public and the ≥ 65 age group. The findings from the OBVIOUS project offer valuable insights into the possible reasons for low vaccination uptake among these groups.

One key finding is that HCW, teachers, and LEMs often lacked awareness of the recommendation for influenza vaccination or even doubted its safety. As a result, HCWs, other than medical doctors, and LEMs, were the ones with the highest percentages of influenza vaccine refusal. Alas, both professional groups also had non-negligible percentages of people who would have gotten the vaccine should had they known they could. This knowledge gap presents an opportunity for Italian decision-makers and public health professionals to develop tailored information campaigns.[18] Since vaccine uptake can be

influenced by practical factors, such as the convenience of health services, this study also explored people's preferences for vaccination locations. Although the data was collected shortly after the massive COVID-19 vaccine campaign, the preference for dedicated hubs suggests that an annual opening of flu-dedicated hubs could help increase vaccine uptake. Additionally, the primary care physician's clinic was the second preferred location, emphasizing their crucial role in promoting vaccination uptake.[19,20]

To effectively enhance uptake, strategies should address people's perceptions of vaccine safety.[21] Our findings reveal that one in five respondents with respiratory diseases, LEM, or HCWs (excluding MDs) did not consider the vaccine safe. Targeting these demographics with campaigns that stress the vaccine's safety profile could be beneficial. Furthermore, multivariable analyses showed that individuals aged 65 years or older often did not receive the vaccine due to safety concerns and were strongly influenced by close friends' and relatives' opinions. Policymakers could prioritize efforts to improve coverage among these demographics by launching targeted awareness campaigns that provide accurate information about vaccine safety and address people's concerns.[22,23] Such campaigns might lead to social and economic gains for the national health service, as the elderly are most susceptible to life-threatening consequences related to influenza.[24,25]

Interestingly, our data also revealed that mothers aged 35 or older with difficulty accessing healthcare facilities, and living in northeastern Italy, were more likely to get vaccinated. This phenomenon warrants further investigation, as identifying the specific causes of increased uptake could inform strategies to enhance vaccine coverage. Finally, the Northeast regions of Italy showed the highest vaccine uptake rates, as confirmed by our regression analysis. Consequently, regions with comparatively lower vaccine coverage could consider emulating the vaccination policies implemented in Northeast Italy to enhance their own vaccine coverage rates.

Limitations and strengths

This study has several limitations. First, the cross-sectional design precludes causal inferences. Second, the online survey relies on self-reported data, which may be subject to reporting biases. Third, the over-representation of lower socioeconomic classes in the sample (60.4% reporting economic struggles) could limit generalizability. Fourth, economic status was assessed through perceived income adequacy rather than actual family income, as the latter is a sensitive topic that may compromise survey completion. Fifth, the survey did not consider the gestational age of pregnant women or all immunocompromised individuals, despite their prioritization by the Italian Ministry of Health. Lastly, the decision to prioritize brevity in the survey design may have introduced selection bias, particularly when interpreting children's data, and removing questions investigating transportation, which may be a barrier to getting the vaccine for some.

Despite these limitations, this is the first study to provide comprehensive data from a large national sample of individuals recommended and offered seasonal influenza vaccination in Italy.

Conclusions

As low influenza vaccine uptake contributes to population morbidity and mortality, this study offers valuable insights to inform program planning and guide policymakers' decisions. The nationwide disaggregated analysis of influenza vaccine uptake by sex, age, geographic area, and risk category (health or occupational), as well as the focus on behavioral and social determinants of uptake, highlights key areas for intervention to improve influenza vaccination coverage in Italy.

Disclosure statement

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Appendix

Questionnaire

1. Sex*
Male
Female
2. Year of birth*
Free text:YYYY
(i) over 60 (since 1961) [Influenza target]
(ii) over 64 (since 1957) [Influenza target]
(iii) 18-27 (2003 to 1990)
3. Education level*
A. Elementary/middle school
B. High school
C. University
D. Postgraduate education
4. What is the postcode of the area you live in*?
Free field: postcode (e.g. 40126)
5. Occupation*
A. Student
B. Doctor [Influenza target]
C. Other health worker [Influenza target]
D. Law enforcement [Influenza target]
E. Teacher [Influenza target]
F. Employed (other category than above)
G. Unemployed
H. Retired
6. Who do you live with*?
A. I live alone
B. I live as a couple
C. I live with my family of origin
D. Other
7. With the financial resources available to you (from your own or your family's income) can you meet the needs of your current living situation?
A. grade 1 (with many difficulties)
B. grade 2
C. grade 3
D. grade 4
E. grade 5 (with no difficulties)
8. Do you have any children*?
A. Yes [Children]
B. No
9. [Children] **What is the sex of your youngest child?**
A. M
B. F
10. [Children] **Date of birth of the youngest child:**
Free field: DD/MM/YYYY
(i) 2 - 2.5 months
(ii) 2.5 - 6 months
(iii) 6 months - 4 years [Influenza target]
(v) 4 years - 6 years [Influenza target]
(vi) 6 years to 9 years
(vii) 9 to 32 years (born from 1990,onwards)
11. [Children] **Who makes decisions about vaccination of your children?**
A. Mainly me
B. Mainly my partner
C. Evenly divided
12. [Pregnancy] **Were you pregnant at the beginning of the influenza epidemic season(October/November 2021)?**
A. Yes [Influenza target]
B. No
13. Due to a physical/psychological/sensory disability, do you have difficulties completing daily tasks such as going to the doctor or buying groceries?
A. Yes
B. No
14. Weight
Free range: kg (e.g. 77)
15. Height
Free range: cm (e.g. 130) - BMI[kg/(m^m)]>30 [Influenza target]
16. Do you have chronic respiratory diseases (i.e.: severe asthma, bronchopulmonary dysplasia, cystic fibrosis and chronic obstructive pulmonary disease-BPCO)?
A. Yes [Influenza target]
B. No
17. Do you have any cardiovascular chronic diseases (i.e.: congenital and acquired heart disease)?
A. Yes [Influenza target]
B. No
18. Are you diabetic?
A. Yes [Influenza target]
B. No
19. In which of the following facilities did you have most of your vaccinations*?
A. in a hospital
B. in a pharmacy
C. at your family doctor's
D. in a vaccination hub
E. at home
F. at work
20. If you could choose, in which facility/place would you prefer to receive a vaccination*?
A. in a hospital
B. in a pharmacy
C. at your family doctor's
D. in a vaccination hub
E. at home
F. at work
21. How do your family and friends feel about vaccinations?**
A. grade 1 (strongly disagree)
B. grade 2
C. grade 3
D. grade 4
E. grade 5 (strongly agree)
[Influenza]

Note: if more than one answer involves filling in the [Influenza] section then the [over 60] > [Pregnancy]> [Pneumopathies] > [Heart Disease] > [Diabetes] > [Occupation]> [BMI > 30] > [Child/ren aged 6 m-6a (In this case it is necessary to make a heading specifying that the answers refer to the youngest child/ren)]

22. Have you had a flu vaccine during the vaccination season 2021?
A. Yes
B. No [NoFlu]
I don't know what it is → close section
23. [NoFlu] **Would you get a flu shot?**
A. Yes
B. No
24. How worried are you about getting the flu?**
A. grade 1 (very little)
B. grade 2
C. grade 3
D. grade 4
E. grade 5 (very much)
25. How safe do you think the flu vaccine is?**
A. grade 1 (not very safe)
B. grade 2
C. grade 3
D. grade 4
E. grade 5 (very safe)
26. Do you think you are entitled to receive a free flu shot?**
A. Yes
B. No
27. How easy do you think it is for you to access facilities to get the flu shot?**
A. grade 1 (with many difficulties)
B. grade 2
C. grade 3
D. grade 4
E. grade 5 (with no difficulties)