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Influence of Media Information Sources on Vaccine Uptake: The Full and Inconsistent Mediating Role of Vaccine Hesitancy

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Abstract: Vaccine hesitancy is a significant public health concern, with numerous studies demonstrating its negative impact on immunization rates. One factor that can influence vaccine hesitancy is media coverage of vaccination. The media is a significant source of immunization information and can significantly shape people's attitudes and behaviors toward vaccine uptake. Media influences vaccination positively or negatively. Accurate coverage of the benefits and effectiveness of vaccination can encourage uptake, while coverage of safety concerns or misinformation may increase hesitancy. Our study investigated whether vaccine hesitancy acts as a mediator between information sources and vaccination uptake. We analyzed a cross-sectional online survey by the European Commission of 27,524 citizens from all EU member states between 15 and 29 March 2019. The study used structural equation modeling to conduct a mediation analysis, revealing that the influence of media on vaccine uptake is fully mediated by vaccine hesitancy, except for television, which depicted an inconsistent mediating role. In other words, the effect of different media on vaccine uptake is largely driven by the extent to which individuals are hesitant or resistant to vaccinating. Therefore, media outlets, governments, and public health organizations must work together to promote accurate and reliable information about vaccination and address vaccine hesitancy.

Keywords: media influence; inconsistent mediation; mediation; structural equation modeling; vaccine hesitancy; vaccine uptake; consumer behavior; social marketing

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1. Introduction

Vaccination is a crucial public health measure that has helped to eradicate deadly diseases and save millions of lives [1]. However, the success of vaccination programs relies heavily on high uptake rates among the population. In addition, various factors can influence an individual's decision to get vaccinated, including access to information about the vaccines and where people receive their information from [2–4].Vaccine hesitancy is a medical problem, but a social, behavioral, and cultural phenomenon at its core. Social and behavioral sciences can be used to study public health threats. This encompasses the examination of various factors, including demographic attributes within the population (such as social class, age, gender, culture, and race/ethnicity), personal beliefs, attitudes, and behaviors, as well as cultural and socio-political systems and policies that impact public health challenges and their possible remedies. This field integrates insights from psychology, sociology, anthropology, political science, and marketing, utilizing systems theory and models to address intricate public health issues.

Individuals receive information about vaccination from various sources such as healthcare providers, media, and social media. Healthcare providers can significantly influence a vaccination decision by providing personalized recommendations and answering questions [5]. Media, including television, radio, and online news outlets, can provide essential information, but it can also be a source of misinformation, contributing to vaccine hesitancy [6]. Social media is emerging as a significant source of information about vaccination, but it can

also be a breeding ground for misinformation and fear-mongering [7–10]. Overall, the sources of immunization information can positively and negatively influence vaccine uptake, and it is crucial to promote accurate and reliable information while countering misinformation.

The COVID-19 pandemic has significantly changed media sources and social networks, with substantial implications for the relationship between media and vaccine uptake. Traditional media outlets, such as television, radio, and newspapers, have played an essential role in disseminating crucial information about the pandemic, government regulations, and vaccination campaigns [11]. These sources have become central to informing and engaging the public [12]. Concurrently, online news platforms and social media have emerged as primary channels for the swift and extensive dissemination of information related to COVID-19, vaccines, and public health measures [13].

Social media platforms, such as Facebook, Twitter, and Reddit, have seen a surge in user activity related to COVID-19 and vaccinations, with people using these platforms to receive real-time updates and participate in discussions [14]. These platforms allow users to share information, experiences, and opinions, which can contribute to the broader discourse on vaccines and public health.

During the COVID-19 pandemic, online communities, particularly on platforms such as Reddit, have displayed heightened emotionality in their user-generated content [15]. Research has shown that significant global events, such as a pandemic, can substantially influence the emotional content of social postings [16]. Reddit communities, for example, have experienced a range of emotions, including joy, trust, fear, surprise, sadness, disgust, anger, and anticipation [17]. These emotions have been expressed and shared within these online spaces, reflecting the varying perspectives and concerns of the users [18].

The link between the information sources and vaccine uptake could be mediated by vaccine hesitancy [19]. Vaccine hesitancy refers to the reluctance or hesitation to get vaccinated despite the availability of vaccines [20]. It is a complex concept that public health and epidemiology researchers have been studying closely [21–23]. This complexity arises because vaccine hesitancy is not a one-size-fits-all phenomenon; instead, it encompasses a wide range of beliefs, attitudes, and behaviors related to vaccination. Experts recognize that understanding vaccine hesitancy requires a nuanced approach because it spans a spectrum of levels shaped by various factors such as individual beliefs, cultural norms, socioeconomic conditions, and healthcare access.

Our paper explores the complex relationship between information sources, vaccine hesitancy, and vaccine uptake. We argue that understanding the influence of information sources is essential for promoting vaccine uptake and creating a society where reliable information prevails over misinformation, safeguarding public health.

2. Related Work

Health behavior change theories offer valuable insights into understanding the array of factors that can drive health-promoting behavioral shifts, specifically increasing vaccine adoption. Various thoroughly tested approaches are at our disposal to comprehend the mechanisms underlying health behavior, including the Health Belief Model (HBM), Transtheoretical Model (TTM), Theory of Reasoned Action or Planned Behavior, and Media Dependence Theory, among others [24–27]. A common thread among these theories and models is that individuals engage in an internal decision-making process to weigh the advantages and disadvantages of taking a particular action—in this case, getting vaccinated. In particular, individuals cognitively assess the severity of the health threat and the perceived benefits or risks associated with the recommended action. This personal risk evaluation, akin to a balancing scale, is influenced by numerous factors, including one's perception of disease risk, the quality of available information regarding disease transmission and severity, the credibility of information sources, the individual's immediate environment, cultural beliefs, and the social milieu in which they reside and interact. In the contemporary landscape, regrettably, a segment of the population has employed a

decision-making framework to conclude that the personal and societal costs of forgoing vaccination might outweigh the health advantages it offers.

The World Health Organization's Strategic Advisory Group of Experts on Immunization (SAGE) has identified three key factors influencing vaccine uptake: contextual, individual, and group factors [20]. They also emphasize the significance of "complacency", "convenience", and "confidence", often referred to as the "3Cs", as the primary contributors to vaccine hesitancy.

Briefly, here are the definitions of these concepts:

- Complacency: Some people might be complacent about vaccination because they perceive the risk of vaccine-preventable diseases as low. They may also believe they are safe from these diseases due to good health or living in a developed country.
- Convenience: Inconvenience can be a barrier to vaccination. People may hesitate to get vaccinated if it is not easily accessible or convenient for them.
- Confidence: People may hesitate to get vaccinated because they do not trust vaccines or are concerned about their safety. They may have heard misinformation about vaccines or have had a negative experience with vaccination.

The media can potentially play a role in each of these categories. For example, media is mentioned as a specific influence in contextual influences. The class of individual and group effects includes the factor of "immunization as a social norm", which can be influenced by media portrayals. Finally, the vaccine-specific factors listed in the paper include "introduction of a new vaccine", "the strength of recommendation", and "risk/benefit from scientific evidence", all of which can potentially be influenced by media coverage and portrayal. Therefore, vaccine hesitancy can mediate between the different sources of information about vaccination and vaccination uptake. To our knowledge, the potential mediating role of vaccine hesitancy in the association between information sources and vaccine uptake has not been investigated.

3. Hypotheses

In this article, we explore three hypotheses related to the influence of different sources of information on vaccine uptake. Our first hypothesis is that individuals who are not informed about the safety and effectiveness of vaccines or who do not remember receiving this information are less likely to get vaccinated [28–31]. This hypothesis is based on the idea that accurate information about vaccines is essential for individuals to make informed decisions about their health.

H1: *Not being informed or not remembering information about vaccination is associated with lower vaccine uptake.*

Our second hypothesis is that traditional media, such as television and radio, exert a higher positive influence on vaccine uptake than newer media, such as social media [32–34]. This hypothesis is based on the assumption that traditional media outlets can disseminate accurate information about vaccines to a broader audience than social media, which is more susceptible to misinformation.

H2: *Exposure to traditional media is associated with higher vaccine uptake than exposure to new media.*

Our third hypothesis is that vaccine hesitancy mediates the relationship between media information alternatives and vaccine uptake. This hypothesis is based on the idea that media information can influence an individual's level of vaccine hesitancy [35,36], affecting their decision to get vaccinated [37,38].

H3: *Vaccine hesitancy mediates the relationship between media exposure and vaccine uptake.*

The findings from this study have significant implications for public health efforts to promote vaccination. For instance, public health officials can use these insights to develop more effective strategies for encouraging vaccination and addressing vaccine hesitancy. Understanding the factors that influence vaccine acceptance is key. Additionally, this study can shed light on how various sources of information shape public opinion about vaccination. It can help us leverage these sources to promote accurate, science-based vaccine information.

4. Materials and Methods

4.1. Sample

The dataset used in this study originates from the EUROBAROMETER survey 91.2, which Kantar Public conducted on behalf of the European Commission between 15 March and 29 March 2019 [39]. We accessed this dataset through GESIS (Leibniz-Institute für Sozialwissenschaften) at the University of Cologne, Germany, via the following link: https://www.gesis.org/ (last accessed on 16 October 2021).

The EUROBAROMETER survey is part of wave 91.2 and encompasses individuals 15 years of age and older residing in European Union member states. This includes the national populations of these member states and EU citizens living in these countries who possess sufficient language proficiency in the respective national language(s) to participate in the survey.

The survey utilized a standard, multi-stage random sample design across all participating states, resulting in 27,524 respondents, as detailed in Table A1 in Appendix A.

The sampling procedure is based on a stratified approach that considers the distribution of the national resident population across metropolitan, urban, and rural areas. This ensures that the selection of sampling points is proportional to the population size for comprehensive countrywide coverage and the population density. These primary sampling units (PSUs) are chosen from each administrative region within every country.

In the second phase, clusters of addresses are chosen from the selected primary sampling units (PSUs). This selection of addresses follows a systematic approach using established random route methods, which starts with an initial address picked randomly. Within each household, a respondent is selected through a random procedure, such as the first birthday method. If necessary, up to two follow-up attempts are made to secure an interview with the chosen respondent. It is important to note that only one interview is conducted per household.

4.2. Measures

4.2.1. Model Measurement Constructs

The survey measured vaccine trust using six items (Cronbach's Alpha = 0.77)—the wording of the questions was: "... how much trust you have in certain media and institutions"... Item 1. "The media", Item 2. "Political parties", Item 3. "Regional of local public authorities", Item 4. "The national government", Item 5. "The national parliament", Item 6. "The European Union". Respondents expressed their agreements with these statements on a two-item scale from 1, "Totally agree" to 2, "Totally disagree". As the scale was reversed, we named the resulting latent variable DISTRUST. In SAGE's 3Cs model, Confidence in vaccines is vital for vaccine acceptance. The "DISTRUST" variable reflects respondents' lack of trust in media and institutions. This lack of trust can extend to information about vaccines provided by these sources. When people express distrust in media and institutions, they may also lack confidence in the vaccine-related information disseminated by these entities [40]. This lack of confidence can contribute to vaccine hesitancy, as individuals may question the credibility and safety of vaccines based on their distrust of the information sources.

The survey measured vaccine usefulness using four items (Cronbach's Alpha = 0.86). The wording of the questions was: "To what extent do you agree or disagree with the following statements" ... Item 1. "It is important for everybody to have routine vaccina-

tions", Item 2. "Not getting vaccinated can lead to serious health issues", Item 3. "Vaccines are important not only to protect yourself but also others", Item 4. "Vaccination of other people is important to protect those that cannot be vaccinated". Each item was measured on a four-point scale ranging from 1, "Totally agree", to 4, "Totally disagree". In SAGE's 3Cs model, the concept of Complacency aligns with the idea that individuals may not perceive the risk of vaccine-preventable diseases as very high. In this context, a higher score on the "USELESS" variable may suggest that respondents do not consider vaccines as essential or important, which could lead to Complacency. When people see vaccines as unnecessary, they might become complacent because they do not perceive a significant threat from these diseases.

4.2.2. Independent Variables

The survey asked the interviewees, "In the past six months, have you seen, read or heard any information on vaccination in the media?" as a multi-response question. The options were: 1. "No", 2. "Yes, on TV", 3. "Yes, on the radio", 4. "Yes, in newspapers or magazines", 5. "Yes, on online social networks", 6. "Yes, on other Internet sites", 7. "Other (SPONTANEOUS)", 8. "Do not know". They were coded as binary variables taking the value 0 if the option was not selected and 1 in the affirmative case.

4.2.3. Mediator Variable (Vaccine Hesitancy)

The model included a second-order latent variable that quantified vaccine hesitancy (HESITANCY) built on USELESS and DISTRUST. It was treated as a continuous variable.

4.2.4. Outcome Variable (Vaccine Uptake)

The primary outcome was the vaccine uptake reported by participants. It took the value 1 if respondents answered affirmatively to either of the following two survey questions: the first one was, "Have you had any vaccinations in the last five years?"; the second one was, "Why have you not had any vaccination in the last five years?", and the respondents chose "1. You are still covered by vaccines you received earlier". For the rest, it took the value 0.

4.2.5. Control Variables

In this study, we have incorporated a set of control variables to enhance the robustness and validity of our analysis. As substantiated by the existing literature, these control variables are crucial in accounting for various factors influencing vaccine uptake and hesitancy. By controlling for these variables, we aim to isolate the specific effects of our primary variables of interest, shedding light on the intricate relationship between information sources, vaccine hesitancy, and vaccine uptake.

We incorporated the following covariates from the initial baseline survey into our analysis to investigate their impact on vaccine uptake:

- Age Groups: We divided respondents into the following age brackets: 15–24 years (8.2%), 25–39 years (19.8%), 40–54 years (24.5%), and 55 years and older (47.5%).
- Gender: Participants were categorized as either male (45.3%) or female (54.7%).
- Educational Background: We considered the age at which individuals completed their full-time education: no full-time education (0.7%), up to 15 years (14%), 16–19 years (43.3%), 20 years and older (34.7%), still studying (6%), and missing values (1.3%).
- Marital Status: Respondents were classified as unmarried (16%), (re-)married/single with a partner (64.8%), divorced or separated (8.2%), widowed (10.4%), or with missing values (0.6%).
- Occupation: Occupation categories included self-employed (6.9%), managers (10.8%), other white-collar workers (12.5%), manual workers (21%), housepersons (4.7%), unemployed (5.2%), retired (33%), and students (6%).
- Residential Setting: Participants were situated in either rural areas or villages (33.7%), small or medium-sized towns (37.5%), or large towns (28.7%).

- Financial Strain: We assessed the difficulty in paying bills with categories such as most of the time (8.3%), from time to time (23.4%), and almost never/never (66.8%).
- Social Class: Social class distinctions included the working class of society (26.4%), the lower middle class of society (15.3%), the middle class of society (47%), the upper middle class of society (7%), and the higher class of society (0.6%).
- Political Views/Left–Right Positioning: Respondents identified their political leanings as left (24.5%), center (34.5%), right (21.7%), or missing values (19.3%).
- Usage of Online Social Networks: Frequency of using online social networks was categorized as every day or almost every day (14.4%), two or three times a week (4.3%), about once a week (1.9%), less often (10.4%), never (44.7%), or missing values (19.9%).
- Number of Children at Home: Participants reported the number of children living at home, including none (76%), one (11.8%), two (9.1%), three (2.2%), and four or more (0.8%).

Age is a well-established determinant of vaccine uptake and hesitancy [41–43]. Generally, older adults have higher vaccination rates than younger adults, while children exhibit higher vaccination rates than adolescents and young adults. Several factors contribute to these age-based variations in vaccination behavior. Older adults may have greater awareness of the benefits of vaccination due to their accumulated life experiences and may have witnessed the consequences of vaccine-preventable diseases. They might also be more likely to encounter mandatory vaccination requirements through their jobs or healthcare providers. Conversely, younger adults may exhibit lower vaccine uptake due to lower awareness of vaccine benefits, increased exposure to vaccine misinformation, and decreased likelihood of facing mandatory vaccination requirements. It is essential to note that there is considerable variation in vaccine uptake and hesitancy within all age groups, highlighting the complexity of individual vaccination decisions. Principio del formulario Vaccination rates often vary between women and men, depending on the specific vaccine. For instance, women tend to have higher vaccination rates for HPV and influenza vaccines compared to men [43,44]. However, it is worth noting that the dynamics of gender and COVID-19 vaccine acceptance and hesitancy may differ from what we have observed with routine vaccinations. Recent research suggests that gender disparities in COVID-19 vaccine uptake are not as pronounced as with some other vaccines, and, in some instances, men are showing greater acceptance of the COVID-19 vaccine [45,46].

There are several possible reasons for the connection between gender and vaccine behavior. Women may have more accessible healthcare services, which makes it easier for them to get vaccinated. They might also generally hold more positive attitudes toward vaccination and have confidence in the safety and effectiveness of vaccines. Additionally, women might be more influenced by social norms, observing other women getting vaccinated encourages them to do the same. Conversely, men may exhibit a greater tendency to take risks and prioritize short-term considerations, possibly making them less likely to seek vaccination.

Regarding occupation, it is important to recognize that certain professions, such as healthcare workers and teachers, typically have higher vaccination rates than individuals in other fields [47,48]. Nevertheless, evidence suggests that those in specific occupations, such as self-employed or manual laborers, may be less inclined to get vaccinated [49]. Occupation-related disparities may be due to varying access to healthcare services and insurance, job-related vaccination requirements, or higher exposure to vaccine-preventable diseases in certain occupations. Some individuals in these fields may also harbor negative attitudes toward vaccines or fall victim to misinformation.

When considering education levels, it is worth mentioning that individuals with higher education tend to have greater vaccination rates than those with lower education levels [43,46,48,50–52]. Higher-educated individuals often have better access to vaccine information, trust scientific evidence, and may have positive experiences with healthcare providers. They are also likely to be influenced by social norms that promote vaccination.

Regarding marital status, it is noteworthy that married individuals generally exhibit higher vaccination rates than unmarried individuals [48,53–55]. Married people might enjoy easier access to healthcare services and health insurance, making vaccination more accessible. Furthermore, marital status can influence vaccine decisions, as spouses often influence each other's attitudes toward vaccination. If one spouse is vaccinated, it is more likely that the other will follow suit. On the flip side, unmarried individuals may tend to be younger, be less educated, and have lower socioeconomic status (SES), factors often associated with vaccine hesitancy.

In the case of households with children, it is essential to recognize that parents are generally more likely to be vaccinated than people without children living at home [48,56,57]. Parents may be more likely to be aware of the importance of vaccination because they are responsible for vaccinating their children. They may also be more likely to be exposed to vaccine-preventable diseases because of their children. In addition, parents may be more likely to trust healthcare providers and to be influenced by social norms that support vaccination.

Concerning financial challenges (problems paying bills), it is significant to acknowledge that people with economic issues are generally less likely to be vaccinated than people without economic problems [43,46,58]. People with financial difficulties may have less access to healthcare services and health insurance than people without economic problems. They may also be more likely to be uninsured or underinsured. Additionally, people with financial problems may be more likely to choose between paying for basic necessities such as food, housing, and healthcare services. This can make it difficult for them to afford to get vaccinated. In addition to financial barriers, people with economic problems may also be more likely to face other barriers to vaccination, such as lack of transportation to vaccination sites, difficulty taking time off from work to get vaccinated, language barriers, and cultural barriers.

Exploring different residential settings, it is clear that people living in rural areas or villages are generally less likely to be vaccinated than people living in small or middle-sized towns or large towns [59,60]. People in rural areas or villages may have less access to healthcare services and health insurance than those in small or middle-sized towns or large towns. They may also be more likely to face transportation barriers and other barriers to vaccination. Furthermore, people living in rural areas or villages may be more likely to be influenced by vaccine hesitancy among their peers and community members.

When we talk about differences in social classes, it is evident that folks from lower social classes tend to get vaccinated less often than those from higher social classes [48,61–63]. This is usually because they might have less access to healthcare services and health insurance. Financial barriers can also make vaccination less accessible for them. On top of that, people from lower social classes might be influenced by the vaccine hesitancy they see among their peers and in their communities.

Now, let us dive into political views. It is important to note that individuals with conservative political leanings are generally less inclined to get vaccinated than those with more liberal views [64,65]. This may be due to conservatives' distrust in government and public health institutions. They might also be more likely to buy into vaccine-related conspiracy theories. Additionally, conservative individuals may encounter more misinformation and disinformation about vaccines on social media and in right-wing media outlets.

Speaking of online networks, we cannot ignore the impact they have. People who spend more time on these networks are more likely to come across vaccine-related misinformation and disinformation, which can fuel vaccine hesitancy [66,67]. Online platforms can sometimes become hotbeds for spreading false information to a broad audience. Moreover, those who use these networks extensively might find themselves in echo chambers, where they are only exposed to information that aligns with their existing beliefs. This can make it challenging for them to consider different perspectives on vaccines.

4.3. Model and Analytic Strategy

Figure 1 represents our study's structural equation model (SEM) to analyze the complex relationships between information sources, vaccine hesitancy, and vaccine uptake. In this model, we have several latent variables, which are not directly observable but are constructed from observed indicators. Let us break down the elements of the model:

- Information Sources: These are the sources from which individuals obtain information about vaccination. They are located on the left side of Figure 1.
- Vaccine Hesitancy (VH): This is a second-order latent variable represented in the middle of the model. It is constructed from two first-order latent variables: "Distrust" and "Useless". Distrust measures individuals' trust in various media and institutions, while Useless reflects the importance of routine vaccinations and the perceived consequences of not getting vaccinated. A set of observed variables indicates these first-order latent variables. The two first-order variables directly influence Vaccine Hesitancy. Distrust and Useless are located above VH in Figure 1.
- Vaccine Uptake: This is the outcome variable that represents the decision to get vaccinated. It is located on the right side of Figure 1. It is influenced by both Vaccine Hesitancy and the control variables defined in the previous section (not shown in the diagram).

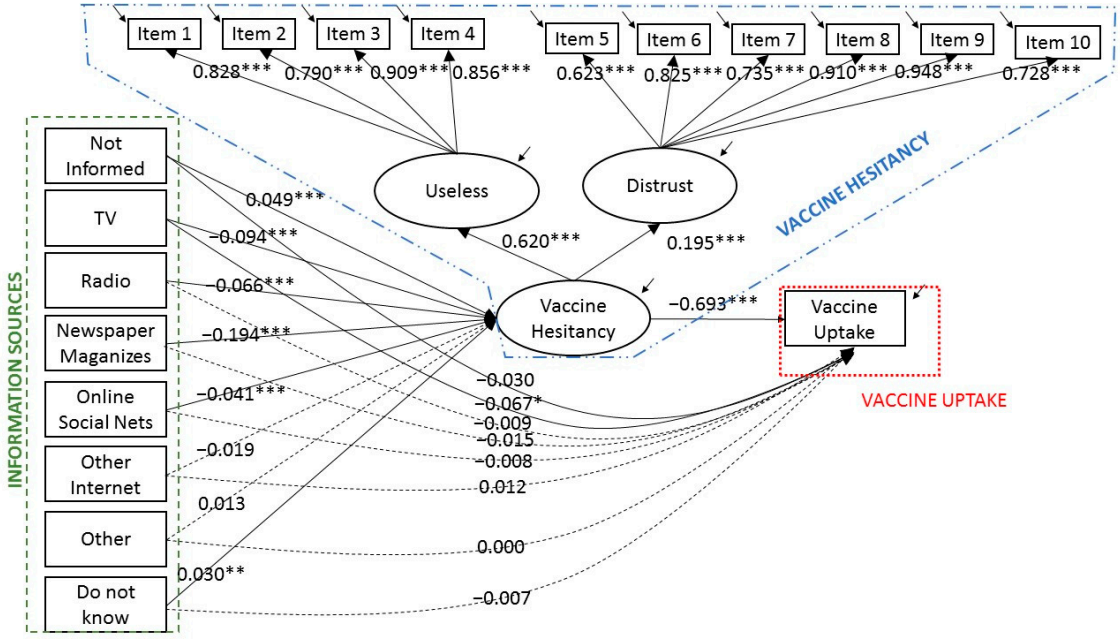

Figure 1. Structural equation model. Vaccine hesitancy mediation between media information sources and vaccine uptake. Estimates presented are standardized path estimates. Ellipses represent latent variables and rectangles the observed ones. Solid lines denote statistically significant paths and dashed lines indicate non-significant paths. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Control variables were included but are not shown.

Mediation analysis is a statistical tool that can help researchers understand the complex relationship between variables. It does this by looking at an intermediary variable, called the mediator, which is affected by the predictor variable and also affects the outcome variable. In this study, we will use mediation analysis to see how much of the effect of information sources on vaccine uptake is due to their influence on vaccine hesitancy. This will help us to better understand the complex relationships between these variables and to develop more effective strategies for promoting vaccine uptake.

Before Baron and Kenny (1986) [68] proposed a causal steps approach, no established methodology existed for analyzing mediation. This approach is based on inferring mediation from separate regression models. Another approach for analyzing mediation that was

becoming increasingly popular at the time is structural equation modeling (SEM). SEM is superior to the causal steps method because it can simultaneously estimate all model paths [69].

When ignored, measurement error in the mediator can give a strong distortion of indirect and direct effects [70,71]. Using a factor analysis model for multiple indicators of the latent variable mediator is a useful way to avoid such distortions [72]. In our study, the mediator variable, vaccine hesitancy, is an intricate second-order latent variable derived from two first-order latent variables: Useless and Distrust. The construction of vaccine hesitancy in this manner acknowledges the multifaceted nature of hesitancy, encompassing a wide range of interconnected beliefs, attitudes, and behaviors related to vaccination. To better understand this concept, we recognize that both Useless and Distrust are themselves first-order latent variables, each with a unique set of indicators.

Useless is constructed based on four specific indicators, which gauge respondents' views on the importance of routine vaccinations, their beliefs about the consequences of not getting vaccinated, and the significance of vaccination for both individual and collective protection. Distrust, another first-order latent variable, is derived from six different indicators measuring trust in various media and institutions. Respondents express their agreement or disagreement with these statements to gauge their level of trust.

The complexity and interconnectedness of these latent variables highlight the need for a robust analytical method. Structural equation modeling (SEM) emerges as the optimal choice in this context. While other statistical methods may provide insights into isolated relationships, SEM is uniquely equipped to handle the intricate relationships within our research framework. It enables us to assess how information sources influence the first-order variables of Useless and Distrust, which, in turn, shape vaccine hesitancy. SEM uncovers the nuanced pathways through which these variables interact, providing a comprehensive view of the multifaceted associations within our study. Therefore, SEM is advantageous and indispensable for unraveling the complex dynamics and indirect effects between information sources, vaccine hesitancy, and vaccine uptake.

Bootstrapping is a method that does not require assumptions about the distribution of the data, and it can be used to accurately test the indirect effect [73]. To bootstrap our mediation model, we first draw a large number of new samples from the original data, with replacement. The model parameters would then be estimated for each new sample. This would result in a large number of estimates for each parameter. Because the distribution of the bootstrap estimates is not guaranteed to be normal, we cannot use *t*-tests or *p*-values to determine whether the indirect effect is statistically significant. Instead, we use the confidence interval of the bootstrap distribution. If the confidence interval does not include zero, then we can be confident that the indirect effect is different from zero. We use bias-corrected bootstrap because our sample is large. This procedure adjusts the confidence interval for bias in the bootstrap sample distribution, resulting in slightly wider confidence intervals [74].

Utilizing Mplus software version 8.7, we employed structural equation modeling (SEM) to investigate the hypothesized mediating effects. To evaluate the model's goodness of fit, we computed various indices, including the comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean residual (SRMR) [75]. Acceptable model fit parameters were defined as CFI > 0.90, TLI > 0.90, RMSEA < 0.08, and SRMR < 0.08 [76].

Moreover, to assess the statistical significance of the mediating effects, we conducted bias-corrected bootstrap tests, generating 10,000 bootstrap draws with 20 different initial stage starts. We established a significance threshold of 0.05 for this study. Additionally, the model incorporated all previously outlined potential confounding variables.

5. Results

Figure 1 shows the final SEM model. Fit statistics indicated that the SEM fitted the data well (χ^2 = 4145.226, df = 494, CFI = 0.983, TLI = 0.981 SRMR = 0.052, RMSEA

[90% CI] = 0.017 [0.016, 0.017]), and all standardized path coefficients were significant except for the direct effects of "Radio", "Newspaper/Magazines", "Online Social Networks", "Other Internet", "Other", and "Do not Know" on Vaccine Uptake. It indicated full mediation of Vaccine Hesitancy on Vaccine Uptake for these options, which we will comment on later when describing the mediation analysis. The model explained 53.7% of the variance of the vaccine uptake.

Mediation analysis was conducted to examine the mediation role of Vaccine Hesitancy on the relationship between each of the alternatives of the Info Media and Vaccine Uptake (see Table 1).

Table 1. Direct, indirect, and total effects [1].

Paths	Probit Standardized Path Coefficient, β Estimate (95% CI)	Logit Standardized Path Coefficient, β Estimate	Odds Ratio	*p*
Direct Effect				
NI→V	−0.030 (−0.062 0.004)	−0.054	0.947	0.077
TV→V	−0.067 (−0.099 −0.037)	−0.121	0.886	<0.001
RD→V	−0.009 (−0.032 0.013)	−0.016	0.984	0.438
NW→V	−0.015 (−0.053 0.016)	−0.027	0.973	0.398
OSN→V	−0.008 (−0.030 0.013)	−0.014	0.986	0.462
OI→V	−0.008 (−0.030 0.013)	−0.014	0.986	0.237
O→V	0.000 (−0.019 0.018)	0.000	1.000	0.965
DK→V	−0.007 (−0.026 0.014)	−0.013	0.987	0.508
Indirect Effect				
NI→H→V	−0.034 (−0.063 −0.006)	−0.062	0.940	<0.05
TV→H→V	0.065 (0.039 0.093)	0.118	1.125	<0.001
RD→H→V	0.046 (0.027 0.067)	0.083	1.087	<0.001
NW→H→V	0.135 (0.105 0.172)	0.244	1.277	<0.001
OSN→H→V	0.029 (0.010 0.048)	0.052	1.054	<0.05
OI→H→V	0.013 (−0.005 0.032)	0.024	1.024	0.165
O→H→V	−0.009 (−0.026 0.008)	−0.016	0.984	0.308
DK→H→V	−0.021 (−0.039 −0.003)	−0.038	0.963	<0.05
Total Effect				
NI→V	−0.063 (−0.090 −0.037)	−0.114	0.892	<0.001
TV→V	−0.003 (−0.027 0.022)	−0.005	0.995	0.84
RD→V	0.037 (0.021 0.053)	0.067	1.069	<0.001
NW→V	0.120 (0.102 0.137)	0.217	1.243	<0.001
OSN→V	0.021 (0.003 0.038)	0.038	1.039	<0.05
OI→V	0.026 (0.009 0.043)	0.047	1.048	<0.05
O→V	−0.009 (−0.024 0.006)	−0.016	0.984	0.233
DK→V	−0.027 (−0.043 −0.011)	−0.049	0.952	<0.001

[1] Cell entries are standardized coefficients. CI, Confidence Interval; V, Vaccine Uptake; NI, Not Informed; TV, Television; RD, Radio; NW, Newspapers and Magazines; OSN, Online Social Networks; OI, Other Internet; O, Other; DK, Do not Know. Logit coefficients were calculated from probit coefficients applying the formula $logit\hat{\beta} = probit\hat{\beta} * \sqrt{\pi^2/3}$ [77,78].

On the matter of total effects, for respondents who answered that they did not see, hear, or read any information about vaccination in the media—8052 individuals, 29.3% of the total sample—the total effect on vaccine uptake was the highest negative one of all the alternatives analyzed, depicting 10.8 lower odds to be vaccinated than the rest of the participants in the survey (probit standardized path coefficient, $\beta = -0.063$; $p < 0.001$; 95% CI, −0.090–0.037). The high rate of people who declared not to remember any information about vaccination in the media could be explained because data were collected in a pre-pandemic situation (fieldwork was carried out between the 15th and the 29th of March 2019). People that answered "Do not know" to the Info Media question—490 individuals, 1.8% of the total sample—were closely related to the previous alternative because they showed a statistically significant negative total effect on vaccine uptake, presenting 4.8 lower odds

(probit standardized path coefficient, β = −0.027; $p < 0.001$; 95% CI, −0.043–0.011). Therefore, not being informed or not remembering it meant that vaccination uptake fell (H1 holds). Total effects for all the Info Media considered on vaccination uptake were statistically significant and positive, with the exception of Television (probit standardized path coefficient, β = −0.003; $p = 0.84$; 95% CI, −0.027–0.022) and Other (probit standardized path coefficient, β = −0.009; $p = 0.233$; 95% CI, −0.024–0.006). The most positive one was the Newspapers and Magazines alternative—5771 individuals, 21% of the total sample—reporting 24.3 higher odds to be vaccinated (probit standardized path coefficient, β = 0.120; $p < 0.001$; 95% CI, 0.102–0.137), followed at a distance by Radio—4775 individuals, 17.3% of the total sample— exhibiting 6.9 higher odds to be vaccinated (probit standardized path coefficient, β = 0.037; $p < 0.001$; 95% CI, 0.021–0.053). Online Social Networks—3571 individuals, 13% of the total sample—showed the lowest positive influence with only 3.9 higher odds to be vaccinated (probit standardized path coefficient, β = 0.021; $p < 0.05$; 95% CI, 0.003–0.038), and Other Internet Sites—2835 individuals, 10.3% of the total sample—portrayed 4.8 higher odds to be vaccinated (probit standardized path coefficient, β = 0.026; $p < 0.05$; 95% CI, 0.009–0.043). Hence, traditional media positively influenced vaccine uptake more positively than new ones (H2 holds).

When analyzing Vaccine Hesitancy's mediation role, we looked at the indirect and direct effects results (see Table 1). All indirect effects were statistically significant except for "Other Internet" (probit standardized path coefficient, β = −0.013; $p = 0.165$; 95% CI, −0.005–0.032) and "Other" (probit standardized path coefficient, β = −0.009; $p = 0.308$; 95% CI, −0.026–0.008). On the other hand, all direct effects were statistically non-significant except for "Television" (probit standardized path coefficient, β = −0.067; $p < 0.001$; 95% CI, −0.099–−0.037). It meant that Vaccine Hesitancy fully mediated the relationship between the Media Info alternatives presented and Vaccine Uptake (H3 holds). In the Television case, we found inconsistent mediation [79]. When we checked the indirect (probit standardized path coefficient, β = −0.065; $p < 0.001$; 95% CI, 0.039–0.093) and the direct effect (probit standardized path coefficient, β = −0.067; $p < 0.001$; 95% CI, −0.099–−0.037), we noticed that both were statistically significant, with approximately the same effect but with reversed signs. Hence, the mediation also existed but was hidden behind the non-significant total effect. Furthermore, it was the second most influential media to reduce Vaccine Hesitancy but with the most negative significant impact on Vaccine Uptake. Several hypotheses that could explain this relationship were out of the scope of the present investigation. It could be due to the content that this information media usually uses about infectious diseases/vaccines and how it affects the final Vaccination Uptake decision [80]. If, for instance, trust in the information provided by Television is eroded, Vaccine Uptake would decrease, and the positive effect Television could exert on Vaccine Hesitancy would disappear.

A closer look at the two components that composed the indirect effect also gave valuable information about the relationship between Vaccine Uptake and media through Vaccine Hesitancy (see Figure 1). Therefore, not being informed (probit standardized path coefficient, β = 0.049; $p < 0.001$; 95% CI, 0.008–0.089) or not remembering to have seen any information (probit standardized path coefficient, β = 0.030; $p < 0.05$; 95% CI, 0.005–0.055) increased Vaccine Hesitancy. Traditional media reduced Vaccine Hesitancy the most (Television, probit standardized path coefficient, β = −0.094; $p < 0.001$; 95% CI, −0.132–−0.056; Radio, probit standardized path coefficient, β = −0.066; $p < 0.001$; 95% CI, −0.092–−0.041; Newspapers/Magazines, probit standardized path coefficient, β = −0.194; $p < 0.001$; 95% CI, −0.229–−0.162) whereas online media the least (Online Social Networks, probit standardized path coefficient, β = −0.041; $p < 0.001$; 95% CI, −0.068–−0.014; Other Internet was not statistically significant). Furthermore, the second component of the indirect effect revealed Vaccine Hesitancy's high impact on Vaccine Uptake (probit standardized path coefficient, β = −0.693; $p < 0.001$; 95% CI, −0.767–−0.629). In sum, any variation that the media had on Vaccine Hesitancy greatly impacted Vaccine Uptake. The full mediation was held for all media except for Television, which presented an inconsistent mediation.

Table 2 shows how the different socio-demographic variables considered in our study affected Vaccine Uptake. Because these variables were categorical, we needed to transform them into dummy variables to perform the probit analysis. We converted the probit coefficients into logit ones following Muthén & Muthén [29] to facilitate the interpretation of the coefficients. It was done by applying the formula $logit\hat{\beta} = probit\hat{\beta} * \sqrt{\pi^2/3}$ [78]. Finally, we obtained the odds ratio by exponentiating the logit coefficients (e^{logit}).

Table 2. Vaccine uptake control variables.

			95% C.I.			
Variable	**Categories**	**Probit**	**Lower 2.5%**	**Upper 2.5%**	**Logit**	**Odds Ratio**
Age	15–24 years	Ref.	Ref.	Ref.	Ref.	Ref.
	25–39 years	−0.094	−0.128	−0.061	−0.17	0.844
	40–54 years	−0.114	−0.152	−0.077	−0.206	0.814
	55 years and older	−0.104	−0.149	−0.059	−0.188	0.828
Gender	Man	Ref.	Ref.	Ref.	Ref.	Ref.
	Woman	−0.006	−0.021	0.01	−0.011	0.989
Occupation	Self-employed	Ref.	Ref.	Ref.	Ref.	Ref.
	Managers	0.031	0.008	0.054	0.056	1.058
	Other white collars	0.008	−0.015	0.031	0.014	1.015
	Manual workers	0.007	−0.02	0.033	0.013	1.013
	House persons	−0.002	−0.022	0.017	−0.004	0.996
	Unemployed	−0.03	−0.05	−0.011	−0.054	0.947
	Retired	0.048	0.015	0.081	0.087	1.091
	Students	0.069	0.044	0.095	0.125	1.133
Education	None	−0.008	−0.024	0.007	−0.014	0.986
	Up to 15 years	0.048	0.032	0.064	0.087	1.091
	16–19	−0.084	−0.101	−0.067	−0.152	0.859
	20 years and older	0.075	0.058	0.092	0.136	1.145
	Still studying	Ref.	Ref.	Ref.	Ref.	Ref.
Marital Status	Unmarried	Ref.	Ref.	Ref.	Ref.	Ref.
	(Re-)married/single with partner	−0.01	−0.033	0.013	−0.018	0.982
	Divorced or separated	0.004	−0.014	0.023	0.007	1.007
	Widowed	−0.029	−0.05	−0.008	−0.052	0.949
	Other	−0.012	−0.027	0.003	−0.022	0.979
Childs Living at Home	None	Ref.	Ref.	Ref.	Ref.	Ref.
	One	0.019	0.002	0.035	0.034	1.035
	Two	0.013	−0.004	0.029	0.024	1.024
	Three	0.008	−0.008	0.023	0.014	1.015
	Four or more	−0.004	−0.019	0.011	−0.007	0.993
Problems Paying Bills	Most of the time	Ref.	Ref.	Ref.	Ref.	Ref.
	From time to time	0.000	−0.025	0.025	0.000	1
	Almost never/never	0.106	0.08	0.132	0.192	1.212
Residential Setting	Rural area or village	0.006	−0.012	0.024	0.011	1.011
	Small or middle size town	0.018	−0.001	0.035	0.033	1.033
	Large town	Ref.	Ref.	Ref.	Ref.	Ref.
Social Class	The working class	Ref.	Ref.	Ref.	Ref.	Ref.
	The lower middle class	0.021	0.003	0.038	0.038	1.039
	The middle class	0.016	−0.003	0.034	0.029	1.029
	The upper middle class	0.06	0.041	0.078	0.109	1.115
	The higher class	0.013	−0.003	0.029	0.024	1.024
Political Left–Right	Left	0.046	0.03	0.061	0.083	1.087
	Center	Ref.	Ref.	Ref.	Ref.	Ref.
	Right	0.01	−0.006	0.025	0.018	1.018
Use Online Social Network	Every day or almost every day	Ref.	Ref.	Ref.	Ref.	Ref.
	Two or three times a week	0.021	0.006	0.038	0.038	1.039
	About once a week	−0.008	−0.023	0.007	−0.014	0.986
	Two or three times a month	−0.019	−0.036	−0.003	−0.034	0.966
	Less often	0.001	−0.015	0.018	0.002	1.002
	Never	0.048	0.028	0.068	0.087	1.091

Note: Cell entries are standardized coefficients. Dummy variables were created to perform the analysis. Ref. means the selected reference group. Logit coefficients were calculated from probit coefficients applying the formula $logit\hat{\beta} = probit\hat{\beta} * \sqrt{\pi^2/3}$ [77,78].

Analyzing the outcomes presented in Table 2, it becomes evident that when adjusting for age, the odds ratios for Vaccine Uptake were consistently lower across all age groups

compared to the youngest cohort. Taking the youngest as the reference group, older age brackets had between 15.6% and 18.6% lower odds of getting vaccinated.

When adjusting for Occupation, we did not obtain significant differences to be vaccinated for the different categories considered. When compared with the Self-employed people, only Managers (5.8% higher odds), Retired (9.1% higher odds), and Students (13.3% higher odds) had significant results.

Education was measured by answering when the participant stopped full-time education. It was statistically significant for all the alternatives except those declaring not having any study. The relationship between Education and Vaccine Uptake was positive: higher education meant higher vaccination odds. Hence, with the reference group being those Still studying, participants who received education Up to 15 years had 9.1% higher odds of being vaccinated [OR = 1.091, $p < 0.05$], and participants with higher education background had 14.5% lower odds of being vaccinated [OR = 1.145, $p < 0.001$]. The group that stopped their full education between 16 and 19 years old did not meet the expected relationship, depicting 14.1% lower odds than the reference group.

Having children living at home represented higher odds of being vaccinated for families with one child than those with none (One [OR = 1.035, $p < 0.05$]). For the rest of the families, the results were not statistically significant.

Vaccine Uptake was also influenced by the interviewee's economic circumstances. For example, those who Almost never/never had problems had 21.2% higher odds of being vaccinated [OR = 1.212, $p < 0.001$].

Social class was associated with Vaccine Uptake. Higher social class and The middle class did not present statistically significant results. The other two categories considered showed higher odds of getting vaccinated than The working class (The lower middle class [OR = 0.039, $p < 0.05$] and The upper middle class [OR = 1.115, $p < 0.001$]).

Political orientation was also related to vaccine uptake. The left-oriented participants were most likely to be vaccinated, with 8.7% higher odds than the center-oriented ones [OR = 1.087, $p < 0.001$]. Results for right-oriented people were not statistically significant.

Online Social Networks did not shed any clear conclusion about their relationship with Vaccine Uptake. When compared to those who said they used Online Social Networks every day or almost every day, two out of the five options available were not statistically significant (About once a week [OR = 0.986, $p = 0.323$] and Less often [OR = 1.002, $p = 0.909$]). The most significant finding we uncovered was when we compared individuals who claimed to never use online social networks with those who use them daily. We observed that the former group had a 9.1% higher likelihood of being vaccinated than the latter group. Hence, it illustrated a noticeable distinction between individuals who utilize Online Social Networks and those who do not. People who used Online Social Networks two or three times a week had 3.9% higher odds of getting vaccinated [OR = 1.039, $p < 0.05$], and people who used them two or three times a month had 3.4% lower odds of getting vaccinated [OR = 0.966, $p < 0.05$].

We did not find statistically significant results for the rest of the control variables under study.

6. Discussion

Our study found that traditional media, such as newspapers, magazines, and radio, strongly affected vaccine uptake rates, while online social networks had a limited positive impact. The little effect of social media on vaccine uptake rates may be attributed to the presence of anti-vaccination groups, the preference of vaccine-hesitant individuals for social media, and the perceived lack of credibility and trustworthiness of social media [81]. Addressing these limitations will require novel interventions and collaboration between public health officials, social media companies, and trusted influencers to ensure that accurate and trustworthy vaccine information reaches those who most need it [34,82].

One of the main findings of our study is that vaccine hesitancy fully mediated the relationship between media exposure and vaccine uptake, indicating that media exposure

alone is insufficient to increase vaccine uptake rates. Therefore, when it comes to boosting vaccine uptake, our primary focus should be tackling vaccine hesitancy head-on. This means giving people accurate vaccine information, addressing common misunderstandings, and reaching the root causes of hesitancy. These underlying reasons can range from worries about vaccine safety to doubts about healthcare providers' trustworthiness [83,84].

We also need to pay close attention to the role of anti-vaccination groups and social media influencers. They can significantly amplify and spread false information about vaccines, which fuels vaccine hesitancy [85].

In our study, we found that not recalling exposure to information in the media about vaccines had a negative impact on vaccine uptake rates. This result is consistent with previous research showing how lack of information can affect vaccine uptake rates [28–31].

There is a paradoxical finding in our study. While television ranked as the second most effective medium for reducing vaccine hesitancy, it had the most detrimental impact on vaccine uptake. One possible explanation for this paradox is that the vaccine information on television might have been insufficient or unclear, failing to convince individuals to get vaccinated. Even though television was good at reducing hesitancy, it might not have provided enough detailed or compelling information to motivate people to take action and get vaccinated [86,87]. This underlines the importance of developing more precise and persuasive communication strategies tailored to different groups, intending to curb the spread of vaccine misinformation [88].

An intriguing observation emerged in our comprehensive analysis of vaccine uptake determinants that merits further discussion. While our data reaffirm the well-established association between higher education levels and increased vaccine uptake, we also identified a unique deviation from this pattern. Specifically, individuals who left their studies between 16 and 19 exhibited the lowest odds of vaccination (see Table 2). This unexpected finding introduces complexity into the relationship between education and vaccine behavior. While our study provides valuable insights, further research is needed to uncover the underlying factors contributing to this deviation. Understanding the dynamics influencing the vaccination decisions of individuals in this specific age group could hold critical insights for tailored public health interventions in the future.

Public health officials and media professionals should use effective communication strategies to increase vaccination rates that promote accurate and trustworthy vaccine information [89]. Specifically, we can do a few things to address this. First, working closely with journalists and media outlets is crucial to ensure responsible vaccine reporting [90]. Secondly, we should use social media and other digital channels to share accurate vaccine information with a wider audience [91]. Lastly, we need to develop targeted campaigns that reach people who might not regularly receive vaccine information in the media. This includes folks who do not follow the news regularly or have limited access to information [92]. Public health officials should also consider alternative channels such as community outreach programs, social media, mobile messaging apps, or even virtual reality to reach these groups.

Furthermore, healthcare providers are vital in dealing with vaccine hesitancy and encouraging vaccine uptake. They can engage in patient education and counseling to address concerns about vaccine safety and effectiveness while providing accurate information about the benefits of vaccination. They can also collaborate with public health authorities to spread reliable information and debunk vaccine myths and misconceptions.

Our study has given us valuable insights into how information sources, vaccine hesitancy, and vaccine uptake are connected. However, it is essential to remember that the countries we studied have diverse sociodemographic and economic backgrounds. As a result, the applicability of our findings to individual countries within our sample may vary due to their unique characteristics.

One critical factor that affects the relevance of our findings is the level of socioeconomic development. Countries at different economic levels may show distinct patterns of vaccine

hesitancy and uptake. For instance, wealthier countries often have better healthcare systems and more vaccine access, which could lead to lower hesitancy and higher vaccination rates.

Cultural and social factors also play a significant role in shaping people's attitudes towards vaccines. Beliefs, norms, and attitudes about vaccination can differ greatly across countries and regions. Some countries may have a strong tradition of vaccine acceptance, while others may have historical or cultural factors contributing to vaccine hesitancy. These variations highlight the need for country-specific analyses to better understand the nuances of vaccine-related behaviors.

Moreover, differences in healthcare policies and vaccination programs can impact our findings. Countries may have varying vaccination schedules, requirements, and public health campaigns that influence individuals' decisions regarding vaccination. These variations can introduce heterogeneity into the relationships we have examined.

To address the issue of generalizability, future research should consider conducting country-specific analyses to explore how our identified relationships hold in different socio-demographic and economic contexts. Such investigations would involve examining the associations between information sources, vaccine hesitancy, and vaccine uptake within individual countries, considering their unique characteristics.

Future studies should continue to investigate the effectiveness of communication strategies and interventions to promote vaccine uptake, address vaccine hesitancy, and evaluate the impact of different media formats and channels on vaccine uptake, building upon the rich body of existing literature.

It is essential to acknowledge the study's constraints. Firstly, our reliance on pre-established items from the Eurobarometer survey should be noted. Nonetheless, Eurobarometer surveys are well-suited for research of this nature due to their expansive nature. These surveys encompass a substantial and demographically representative cross-section of the population, enhancing the likelihood of obtaining results that are both representative and statistically robust. Secondly, the study used self-reported data, which may be subject to bias or misreporting. Thirdly, the study was conducted in a specific geographic location, Europe, and the results may not be generalizable to other populations. Fourthly, the study did not explore the content of the media information participants were exposed to, which may be a significant factor shaping their perceptions of vaccines. Lastly, we used cross-sectional data in a pre-pandemic scenario.

Future research could address some of these limitations by utilizing more objective measures of vaccine uptake and exposure to media information, such as medical records or social media analytics. Additionally, researchers could delve into the content and framing of media messages about vaccines and their influence on vaccine hesitancy and uptake. For instance, examining how various media messages, whether emphasizing vaccine safety and effectiveness or highlighting potential risks and side effects, impact vaccine hesitancy and uptake warrants further investigation. Another area for future research is the role of social networks and interpersonal communication in shaping vaccine attitudes and behavior. While our study found that exposure to traditional media had a greater impact on vaccine uptake than social media, other studies have shown that social networks and interpersonal communication play a significant role in shaping vaccine attitudes and behavior [93]. Investigating how social networks and interpersonal communication can be leveraged to promote vaccine uptake and address vaccine hesitancy would be useful.

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Ethical Review Statement: The data utilized in this study were obtained from Eurobarometer surveys conducted by the European Commission. These surveys are subject to ethical review and compliance with data protection regulations by the European Commission or relevant authorities overseeing data collection activities at the EU level.

Appendix A

Table A1. Sample size by country, total population older than 15 years (15+).

COUNTRY	Number of Interviews	Population 15+
Austria	1006	7,554,711
Belgium	1041	9,693,779
Bulgaria	1026	6,537,535
Croatia	1010	3,796,476
Czech Republic	1068	9,238,431
Denmark	1017	4,838,729
Estonia	1005	1,160,064
Finland	1000	4,747,810
France	1013	54,097,255
Germany	1507	70,160,634
Greece	1014	9,937,810
Hungary	1030	8,781,161
Ireland	1078	3,592,162
Italy	1021	52,334,536
Latvia	1012	1,707,082
Lithuania	1004	2,513,384
Luxemburg	512	457,127
Malta	497	364,171
Netherlands	1017	13,979,215
Poland	1011	33,444,171
Portugal	1013	8,480,126
Republic of Cyprus	505	741,308
Romania	1025	16,852,701
Slovakia	1020	4,586,024
Slovenia	1016	1,760,032
Spain	1014	39,445,245
Sweden	1021	7,998,763
United Kingdom	1021	52,651,777
TOTAL	27,524	431,452,219

Source: Eurobarometer 91.2. European Commission [39].

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