



State of Vaccine Confidence in the EU+UK

2020

A Report for the European Commission

written by

**A. de Figueiredo, PhD,
E. Karafillakis, MSc, and
Prof. H. J. Larson, PhD**



Further information on the Health and Food Safety Directorate-General is available on the internet at:
http://ec.europa.eu/dgs/health_food-safety/index_en.htm

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of the following information.

Luxembourg: Publications Office of the European Union, 2020

© European Union, 2020

Reuse is authorised provided the source is acknowledged.

The reuse policy of European Commission documents is regulated by Decision 2011/833/EU (OJ L 330, 14.12.2011, p. 39).

For any use or reproduction of photos or other material that is not under the EU copyright, permission must be sought directly from the copyright holders.

DISCLAIMER

This report was produced under the support expenditure of the Third Health Programme in the frame of a specific contract with the European Commission, Directorate General for Health and Food Safety acting under the mandate of the European Commission. The content of this report represents the views of the contractor and is its sole responsibility; it can in no way be taken to reflect the views of the European Commission and/or the Directorate General for Health and Food Safety or any other body of the European Union. The European Commission and/or the Directorate General for Health and Food Safety do not guarantee the accuracy of the data included in this report, nor do they accept responsibility for any use made by third parties thereof.

More information on the European Union is available on the Internet (<http://www.europa.eu>).

PDF ISBN 978-92-76-27022-5 doi:10.2875/06196 EW-03-20-831-EN-N

Acknowledgements

The Vaccine Confidence Project™ would like to thank ORB International (Gallup International) and acknowledge our long-term association (www.orb-international.com). The Vaccine Confidence Project would also like to thank the Standing Committee of European Doctors (CPME; www.cpme.com) for providing support and assistance in disseminating surveys with CPME members. Chapter stock images have been used from www.pexels.com under their license terms.

Contents

| | |
|--|-----------|
| Contents | 4 |
| Summary of Key Findings | 5 |
| Chapter 1: Introduction | 8 |
| The Vaccine Confidence Index survey tool.... | 8 |
| Who is surveyed? | 9 |
| Research questions | 10 |
| Methodologies | 10 |
| Outline..... | 12 |
| Chapter 2: Vaccine Confidence in the General Population | 14 |
| Introduction | 14 |
| Overall public confidence in vaccines..... | 15 |
| Changes in confidence, 2018 to 2020 | 15 |
| Public confidence by country..... | 18 |
| Confidence in the MMR and seasonal influenza vaccines..... | 19 |
| Confidence in the HPV vaccine | 20 |
| Mapping vaccine confidence..... | 23 |
| Vaccine confidence and socio-demographics | 28 |
| Chapter 3: Vaccine Confidence among Healthcare Professionals | 31 |
| Introduction | 31 |
| EU healthcare professional confidence | 32 |
| Associations between vaccine confidence and socio-demographics | 40 |
| Chapter 4: Comparison between healthcare professionals and the public | 42 |
| Introduction | 43 |
| Overall healthcare professional confidence versus public confidence | 43 |
| Vaccine-specific correlations..... | 44 |
| Chapter 5: Discussion | 49 |
| Main Findings | 49 |
| Confidence in the MMR, influenza and HPV vaccines..... | 50 |
| Healthcare professional confidence in vaccination | 51 |
| References | 54 |

Summary of Key Findings

The key findings from the State of Vaccine Confidence in the EU 2020 are outlined below. Throughout the 27 EU member states and the United Kingdom are referred to as “EU+UK”.

EU-wide public confidence in vaccines

- A large majority of the EU+UK public believe that vaccines are important, safe, effective, and that the MMR (measles, mumps, rubella), seasonal influenza (flu), and HPV (human papillomavirus) vaccines are important and safe
- Confidence in the safety and importance of vaccines generally, and in the MMR and seasonal influenza vaccine specifically, have increased since 2018 across the EU+UK (HPV confidence in 2018 was not measured in 2018 and no assessment in changes in HPV confidence could therefore be made)
- There are substantial improvements in perceptions of the importance and safety of the seasonal influenza vaccine

Country-specific confidence

- An overall vaccine confidence metric is made and defined as the percentage of respondents agreeing that vaccines are important, safe, effective, compatible with religious beliefs, and that MMR, HPV and influenza vaccines are important and safe
- Based on this metric, Portugal and Spain have the highest vaccine confidence across the EU, while Hungary and Malta have the lowest

Changes in confidence 2018 to 2020

- Since 2018, overall confidence has increased in all but four countries: Hungary, Romania, Greece, and the UK (though this drop was minor in these last two countries)
- The percentage of respondents agreeing that vaccines are safe has fallen in the Netherlands. The percentage agreeing that vaccines are important has fallen in Spain
- There have been increases in confidence towards the MMR vaccine, except in the Netherlands, where agreement in the safety (-8.1% compared to 2018) and importance (-8.8%) of MMR has decreased
- Almost every country has had considerable increases in their perceptions of the importance and safety of the seasonal influenza vaccine
- Despite increases in vaccine confidence since 2018, many Eastern European countries still rank particularly low

Determinants of vaccine confidence

- Females are found to be less likely than males to have high overall confidence in 11 countries, most notably in Czechia
- Over 65s have higher overall confidence than younger age groups in most EU+UK countries
- Respondents who do not provide a religious affiliation report lower confidence than atheists/agnostics: an effect found in 12 countries

Healthcare professional vaccine confidence

- Overall confidence among HCPs (GPs, other doctors, nurses, other health care workers) is higher than confidence among the general public
- HCP confidence is relatively low in Bulgaria and Croatia
- GPs surveyed in Czechia, Hungary, and Slovakia are the least likely to recommend

the MMR vaccine to patients and the majority of GPs surveyed in Czechia and Bulgaria would not recommend the seasonal influenza vaccine to pregnant women

- Only 68% of GPs surveyed in Czechia, 74% in Slovakia, and 75% in Bulgaria would recommend the HPV vaccine, the lowest among all 28 countries
- Countries with higher GP confidence in vaccines have higher public confidence, especially in the HPV vaccine

Introduction



Chapter 1: Introduction

Vaccination is considered one of the greatest public health achievements of the 20th century and is fundamental to the control and elimination of infectious diseases. In addition to having safe and effective vaccines, successful vaccination programmes rely on high vaccine coverage rates to minimise the spread of infection. While vaccine availability and supply are key to obtaining high vaccination levels, so is a population's willingness to receive a vaccine. High confidence in vaccines may prove to be vital for the uptake of a novel coronavirus (COVID-19) vaccine.

Although public concerns over vaccines are as old as vaccines themselves (Poland & Jacobson, 2011), the rapid spread of information facilitated by hyper-connected online and offline populations has contributed to the spread and amplification of public concerns surrounding vaccination (Casara et al., 2019). Low confidence in vaccination, among the general population as well as healthcare professionals, can lead to serious consequences. Measles outbreaks in recent years are a testament of the impact of decreasing vaccination rates (Coombes, 2017). Understanding trends and identifying regions of low and high vaccine confidence is therefore crucial, especially as the world prepares for a COVID-19 vaccine.

In 2018, The Vaccine Confidence Project™ (VCP) examined the state of vaccine confidence across the European Union (EU) using the Vaccine Confidence Index™ survey tool (Larson, H. J., de

Figueiredo, A., Karafillakis, E., Rawal, 2018). This report builds on the 2018 study to provide an overview of vaccine confidence across the European Union and the United Kingdom¹ in 2020 and examine trends since 2018.

The Vaccine Confidence Index survey tool

The Vaccine Confidence Index™ survey tool (VCI) is a battery of survey questions designed to measure populations' confidence in vaccines against a mix of sociodemographic variables. The tool has been included in many national and multi-national surveys to measure vaccine confidence across the world (de Figueiredo et al., 2020; Wellcome Trust, 2019).

The VCI survey tool measures individual confidence towards the importance, safety, and effectiveness of vaccines as well as the perceived compatibility of vaccines with religious beliefs.

The VCI survey tool evolved from a longer mix of survey questions specific to confidence (Larson et al., 2015) and demographic data, to inform the core four-item survey measuring vaccine confidence (Larson et al., 2016). The four core questions are,

“Overall, I think vaccines are important for children to have”

“Overall, I think vaccines are safe”

“Overall, I think vaccines are effective”

“Vaccines are compatible with my religious beliefs.”

¹ Throughout the report, the 27 EU+UK member states and the UK are referred to as “EU”.

In 2018, these questions were extended to measure confidence in specific vaccinations (Larson, H. J., de Figueiredo, A., Karafillakis, E., Rawal, 2018):

“I think the MMR vaccine is important for children to have”

“I think the MMR vaccine is safe for children to have”

“I think the seasonal influenza vaccine is important”

“I think the seasonal influenza vaccine is safe.”

In this report, the survey tool is further extended to measure confidence in the human papillomavirus (HPV) vaccine,

“I think the HPV vaccine is important”

“I think the HPV vaccine is safe.”

Each of these survey items are answered on a four-point scale (respondents can also reply that they ‘do not know’ or not provide a response),

- **Strongly agree**
- **Tend to agree**
- **Tend to disagree**
- **Strongly disagree.**

In addition to these questions, which are provided to both the general public and healthcare professionals (HCPs), a further four questions are asked to HCPs to understand their propensity to recommend vaccines to patients,

“I would recommend the measles, mumps, rubella vaccine to patients”

“I would recommend the seasonal influenza vaccine to patients.”

“I would recommend the seasonal influenza vaccine to pregnant women”

“I would recommend the human papillomavirus vaccine to patients.”

Each of these four items are also answered on a four-point scale (with respondents again able to state they ‘do not know’ or not provide a response),

- **Highly likely**
- **Somewhat likely**
- **Somewhat unlikely**
- **Highly unlikely.**

Throughout the report, the below abbreviations are often used with regards to these vaccines:

- MMR (measles, mumps, and rubella)
- Flu (seasonal influenza)
- HPV (human papillomavirus).

Who is surveyed?

A total of 27,158 members of the general public are surveyed across the EU’s 27 member states and the United Kingdom (EU). At least 1,000 respondents were surveyed in all countries except for Malta (500) and Luxembourg (587).

Survey samples are such that the percentage of each sex, age group, and sub-national region in each country matches national level distributions for these demographics within each country. When these percentages differ, survey weights are provided to provide a correction.

A total of 2,501 general practitioners (GPs) are surveyed across 24 member states and the UK. No GP data was collected for Cyprus, Luxembourg, or Malta due to smaller numbers of GPs and the unavailability of research panels which include GPs in these countries. In addition, a total of 10,552 HCPs are surveyed across the 28 countries in partnership with the Standing Committee of European Doctors² (CPME), their members and partners (see Chapter 3). Data collection summaries for the

² www.cpme.eu

public and HCPs can be found in Table 2.1 and Table 3.1, respectively.

Research questions

There are a number of key research questions in this study. In addition to mapping vaccine confidence across the EU+UK and investigating the barriers to vaccination, there is a strong study focus on changes in vaccine confidence across the EU+UK since 2018.

The key questions we seek to answer include:

Which EU+UK countries are the most vaccine confident in 2020?

Which countries have confidence concerns for specific vaccines?

How has the landscape of vaccine confidence changed across the EU+UK since 2018?

What socio-demographic groups are the most confident in vaccines?

Methodologies

Throughout this report, responses to the vaccine confidence survey items are given as percentages. These percentages have been weighted to adjust for differences between the sample and national-level sex, age, and regional populations demographic distributions. Percentages are rounded to the nearest integer or first decimal place.

Members of the public are surveyed on 10 items of vaccine confidence (see “What is the Vaccine Confidence Index survey tool?” on page 8). GPs and HCPs are surveyed on the same 10 items, but in addition are asked an additional four questions on their propensity to recommend vaccinations to patients (see page 8).

An overall confidence metric

A vaccine confidence metric summarises individuals’ overall level of vaccine confidence

across all the survey items that measure different domains of vaccine confidence. Such a metric allows a direct comparison between individuals while permitting an overall ranking of vaccine confidence between countries. In this report we use a definition that categorises all individuals into one of two groups:

High confidence. An individual has high confidence if they agree (“strongly agree” or “tend to agree” to all vaccine confidence survey items

Some/low confidence. An individual has some or low if they do not agree to all vaccine confidence survey items.

Individuals who agree to all questions are assigned the value “1” and those who do not agree to all questions are assigned the value “0”. This metric therefore distinguishes between individuals with very high confidence across all elements of vaccine confidence (safety, importance, effectiveness, and religious compatibility) as well as confidence in specific vaccines, and those who do not have this high confidence (some/low).

A country’s overall confidence metric is the (weighted) proportion of individuals who have high confidence. Although somewhat of a crude definition, it discriminates between individuals with full and partial confidence. This metric is used to compare overall public and healthcare professional confidence. (As confidence trends in the public are examined between 2018 and 2020, perceptions towards the HPV vaccine are excluded from this metric for the general public as HPV data were not collected in 2018.)

Respondents’ characteristics

A number of respondent characteristics are collected for the general public to investigate how individuals’ socio-demographic backgrounds impact on vaccination beliefs. Data are collected on respondents’ sex, age, highest level of education attained, religious affiliation,

and whether the respondent has children (see Table 1.1). Some variable recoding on these variables is performed. All Christian denominations are grouped as “Christian” and, due to the low counts of Jewish respondents across the EU, Jewish respondents are grouped into “Other”. Those reporting either an undergraduate or postgraduate education are recoded to “University” educated. The “Children under 18” variable is recoded to either “Yes” or “No”.

Table 1.1 Public socio-demographic characteristics

Variable recodes are shown in parentheses.

| Characteristic | Responses |
|--|---|
| Sex (SEX) | <ul style="list-style-type: none"> • Male • Female |
| Age (AGE) | <ul style="list-style-type: none"> • 18-24 • 25-34 • 35-44 • 45-54 • 55-64 • 65+ |
| Highest level of education attained (EDU) | <ul style="list-style-type: none"> • None • Primary • Secondary • Undergrad degree (University) • Postgraduate degree (University) • Other |
| Religion (REL) | <ul style="list-style-type: none"> • Roman Catholic (Christian) • Protestant (Christian) • Russian Orthodox (Christian) • Other Christian (Christian) • Jewish (Other) • Muslim • Atheist or Agnostic (Atheist) • Other • Religion refused |
| Children under 18 (CHI) | <ul style="list-style-type: none"> • No • Yes, 0-2 years • Yes, 3-6 years • Yes, 7-12 years • Yes, 13-17 years |

There is a smaller set of individual-level characteristics collected for HCPs than the public.

These HCP characteristics are shown in Table 1.2. A HCP’s sex, age, and profession are collected. Professions are grouped into general practitioners, other doctors, and other HCPs (midwives, nurses, and pharmacists).

In Chapters 2 (public) and 3 (HCPs) these individual-level variables are used to establish the characteristics that predict whether an individual has high confidence (see **An overall confidence metric**, page 10). These associations are determined through Bayesian logistic regression analyses (Gelman et al., 2013). The outcome variable is the individual-level confidence metric (either a “1” or a “0” depending on whether an individual agrees to all questions or not, respectively).

Associations between socio-demographics and confidence are given as **odds ratios**. The **odds ratio (OR)** is the odds that a given socio-demographic group will have high confidence divided by the odds that a baseline group will have high confidence. The odds is the probability of high confidence divided by the probability of some/low confidence for a given group (see page 10).

An odds ratio greater than one means that an individual in a given socio-demographic strata is more likely to have high confidence than an individual belonging to the baseline socio-demographic group while holding all other socio-demographic factors constant. Similarly, an odds ratio less than one means that an individual belonging to a given strata is less likely to have high confidence than the baseline group. Here is a specific example: if 30% of males in a country have high confidence (with the remaining 70% having some/low confidence), while 60% (40%) of females have high (some/low) confidence, then the odds ratio is $(0.3/0.7) / (0.6/0.4) = 0.28$. This odds ratio is

less than one, signifying that males tend to have a lower confidence metric than females.

For the public, the baseline group is taken to be male atheist/agnostic aged 65 or over with a secondary education and does not have children.

The baseline group for healthcare professionals is a male GP aged 65 or over.

performed to examine whether countries with high levels of public confidence in vaccines also have high levels of HCP confidence in vaccines. In the final chapter, chapter 5, the report concludes by discussing key findings and interpreting them in light of trends in vaccine confidence across the EU+UK and the COVID-19 pandemic.

Table 1.2 HCP characteristics

| Characteristic | Responses |
|---------------------------|---|
| Sex (SEX) | <ul style="list-style-type: none">• Male• Female |
| Age (AGE) | <ul style="list-style-type: none">• 18-24• 25-34• 35-44• 45-54• 55-64• 65+ |
| Profession (PRO) | <ul style="list-style-type: none">• GPs• Other doctors• Midwives (Other HCP)• Nurses (Other HCP)• Pharmacists (Other HCP) |

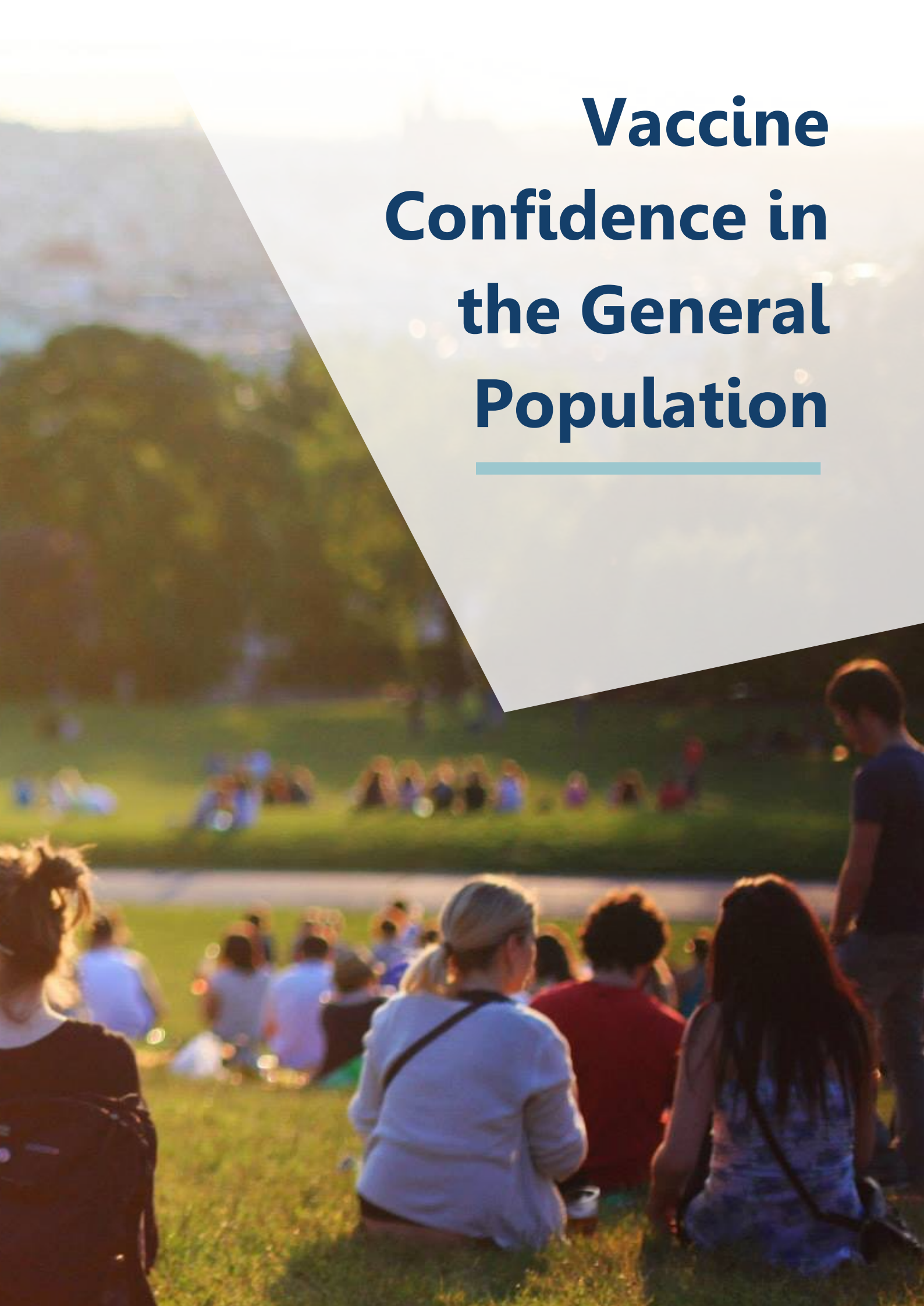
Outline

In chapter 2 public vaccine confidence is investigated across the EU. Vaccine confidence is mapped and compared to 2018 levels. The confidence metric (see **An overall confidence metric**, page 10) is used to rank countries across the EU+UK by their overall level of confidence. Socio-demographic determinants of this confidence metric are established to identify the groups with the highest confidence in vaccines.

Chapter 3 explores confidence among HCPs and the propensity of HCPs to recommend vaccines. Associations between HCPs individual characteristics and confidence are determined.

In Chapter 4, public confidence is compared to HCP confidence. A correlative study is

Vaccine Confidence in the General Population



Chapter 2: Vaccine Confidence in the General Population

Summary and Key Findings

In this chapter, the state of vaccine confidence across the EU's general population in 2020 is explored and compared to 2018. Socio-demographic drivers of vaccine confidence are determined.

- A large majority of the EU+UK public believe vaccines are important, safe, effective, and compatible with religious beliefs
- Public confidence in the safety and importance of the seasonal influenza vaccine has increased markedly in most EU+UK countries since 2018
- Males are more likely than females to have high confidence in 11 member states, most notably in Czechia and over 65s have higher overall confidence than younger age groups across most EU+UK countries.
- A refusal to provide a religious affiliation is associated with lower confidence (than atheists or agnostics) in 12 countries.

Introduction

On 30 January 2020, the World Health Organization confirmed that the COVID-19 outbreak was a pandemic. On 1 March 2020, there were about 1,000 recorded cases of the virus across Europe³. Fieldwork for this study began a week later on 6 March, when Spain, Italy, and France were reporting hundreds of new cases per day and the first COVID-19 deaths. The timing of this study therefore provides an unprecedented opportunity to measure changes in perceptions towards vaccinations across the EU+UK in light of an emerging pandemic. While this study does not ask respondents questions specific to the pandemic, we are able – through large-scale data collection in 2018 – to understand shifts

in confidence that may have been induced by the pandemic.

In this chapter, public perceptions to vaccines are investigated across the EU+UK and compared to 2018. A total of 27,158 individual across the EU+UK were surveyed in March 2020. Surveys were conducted online (21 countries), via computer assisted telephone interviews (CATI; 6 countries), and face-to-face (2, with CATI replacing face-to-face interviews with respondents in Switzerland during fieldwork during due to COVID-19 restrictions). At least 1,000 respondents were interviewed in all but two countries: Luxembourg (587) and Malta (500). The number of respondents sampled in each country, fieldwork dates, and survey methodology are shown in Table 2.1.

³ Although this figure is the number of cases across the EU/EEA, the majority of these cases were reported in the EU+UK (see

<https://www.ecdc.europa.eu/en/cases-2019-ncov-eueea>, accessed 4 October, 2020)

Overall public confidence in vaccines

EU-wide responses to the 10 survey items are shown in Figure 2.1. Responses have been weighted by each country's population so that more populous countries' respondents are assigned more weight compared to respondents from smaller populations.

Overall, 92% of respondents across the EU+UK agree (strongly or tend to) that vaccines are important, with 70% strongly agreeing. This figure is the highest rate of agreement for any of the ten confidence survey items.

87% of the EU+UK public believe that vaccines are safe; 90% agree that vaccines are effective; while 79% agree that vaccines are compatible with their religious views (although 11% of the public did not know whether vaccines were compatible with their religious beliefs). (See Figure 2.1.)

88% of respondents agree that the MMR vaccine is important and 86% agree that the MMR vaccine is safe. Fewer respondents believe the seasonal influenza (flu) vaccine is important (77%) and safe (80%). A total of 80% of respondents across the EU+UK agree that the HPV vaccine is important and 78% believe that it is safe (Figure 2.1).

Although the level of agreement that the seasonal influenza vaccine is safe and important is generally lower than other vaccines, agreement has increased significantly since 2018 in almost every EU+UK country.

Changes in confidence, 2018 to 2020

Changes in the level of confidence since 2018 are shown in Figure 2.2. Since 2018, there have been striking increases in the percentage of respondents strongly agreeing with the ten survey items. Although the majority of these increases in strongly agree result from a shift from "tend to agree", there are still overall increases in the percentage of respondents agreeing to each of the ten statements.

Most notable in Figure 2.2 are the substantial increases in the percentage of respondents strongly agreeing that the MMR and seasonal influenza vaccines are important and safe. Compared with 2018, the percentage of respondents agreeing that the seasonal influenza vaccine is important and safe has increased markedly, with a total increase of 9.5% and 10.4%, respectively. Unlike other statements, where the majority of this swing arises from those tending to agree, there are only small shifts in this category.

There have been substantial gains in the percentage of people strongly agreeing that the MMR vaccine is important and safe (10% and 10.1%, respectively). However, there are correspondingly large falls in the percentage of respondents tending to agree with these two statements (5.4% and 5.1%, respectively).

These large net changes in confidence towards the seasonal influenza (and to a lesser extent, the MMR vaccine) since 2018 are shown in Figure 2.3. (Net change = % agreeing change - % disagreeing change)

Table 2.1 Data collection summary

| Country | N | Fieldwork | Methodology |
|--------------|---------------|---------------------|----------------------------------|
| Austria | 1,000 | 13 March – 27 March | Online |
| Belgium | 1,000 | 13 March – 27 March | Online |
| Bulgaria | 1,000 | 13 March – 27 March | Online |
| Croatia | 1,001 | 13 March – 27 March | CATI |
| Cyprus | 1,009 | 6 March – 13 March | CATI |
| Czechia | 1,000 | 13 March – 27 March | Online |
| Denmark | 1,000 | 13 March – 27 March | Online |
| Estonia | 1,000 | 13 March – 27 March | Online |
| Finland | 1,049 | 6 March – 3 April | Face-to-face & CATI ⁴ |
| France | 1,000 | 13 March – 27 March | Online |
| Germany | 1,000 | 13 March – 27 March | Online |
| Greece | 1,000 | 13 March – 27 March | Online |
| Hungary | 1,000 | 13 March – 27 March | CATI |
| Ireland | 1,000 | 13 March – 27 March | Online |
| Italy | 1,000 | 13 March – 27 March | Online |
| Latvia | 1,006 | 13 March – 20 March | Face-to-face |
| Lithuania | 1,001 | 13 March – 20 March | Online |
| Luxembourg | 587 | 6 March – 13 March | Online |
| Malta | 500 | 13 March – 27 March | CATI |
| Netherlands | 1,000 | 13 March – 27 March | Online |
| Poland | 1,000 | 13 March – 27 March | Online |
| Portugal | 1,000 | 13 March – 27 March | Online |
| Romania | 1,005 | 13 March – 3 April | CATI |
| Slovakia | 1,000 | 13 March – 27 March | Online |
| Slovenia | 1,000 | 13 March – 27 March | Online |
| Spain | 1,000 | 13 March – 27 March | Online |
| Sweden | 1,000 | 13 March – 27 March | Online |
| UK | 1,000 | 13 March – 20 March | Online |
| Total | 27,158 | | |

⁴ Face-to-face fieldwork was suspended in Finland on 13 March (at n=700) due to restrictions relating to the COVID-19 pandemic. The remainder of the sample (n=349) was conducted via the CATI methodology.

Figure 2.1 Overall public vaccine confidence across the EU+UK in 2020

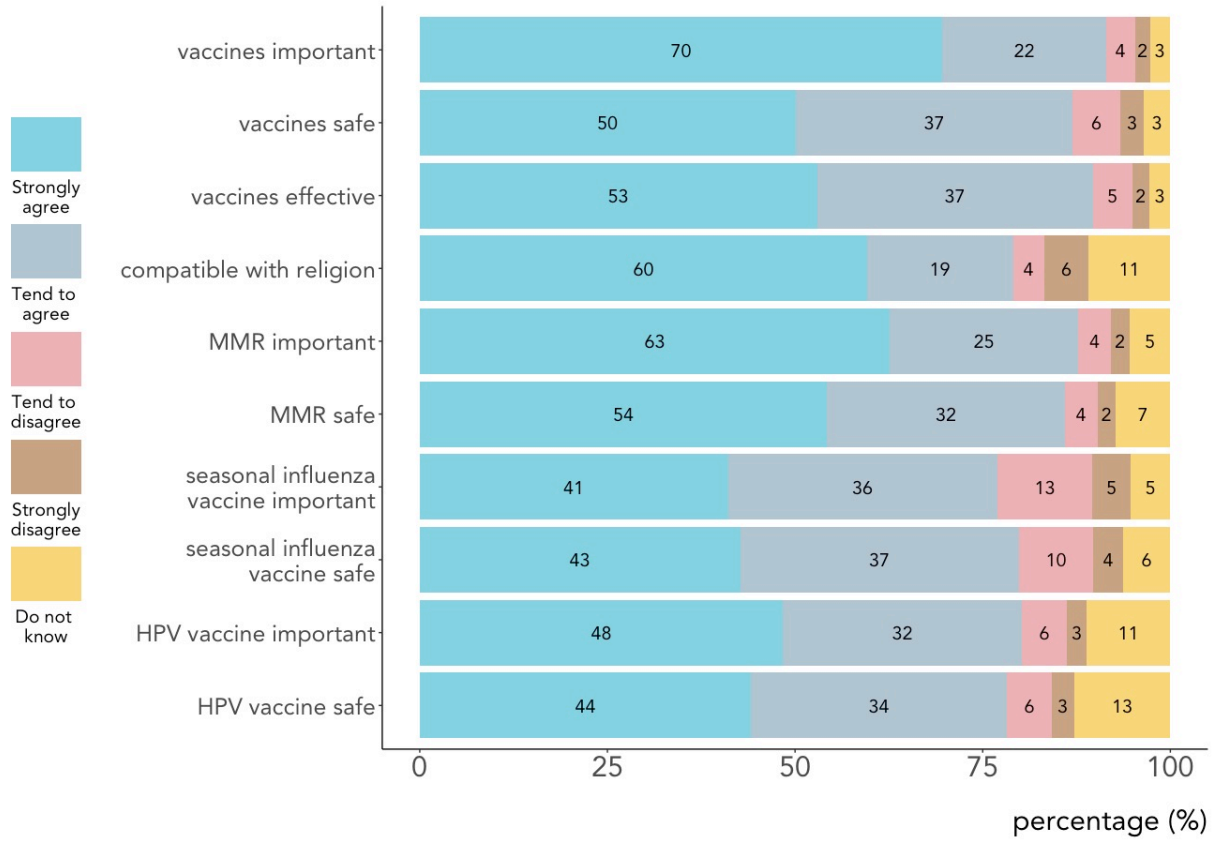


Figure 2.2 Change in vaccine confidence across the EU, 2018 to 2020

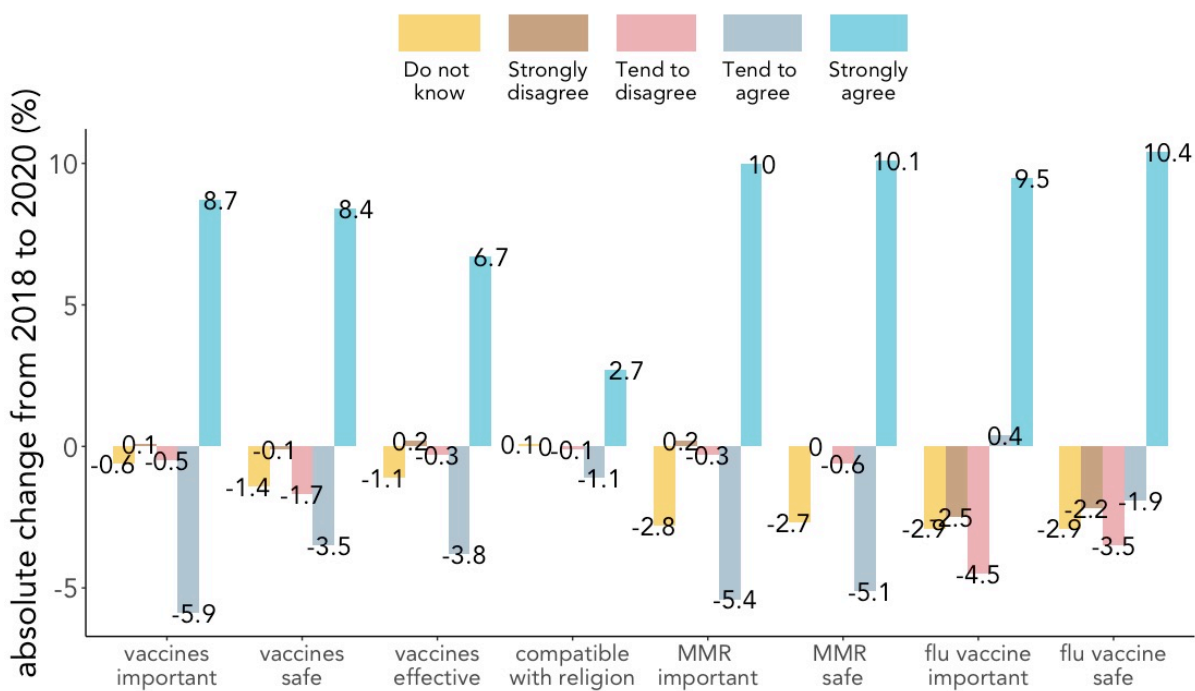
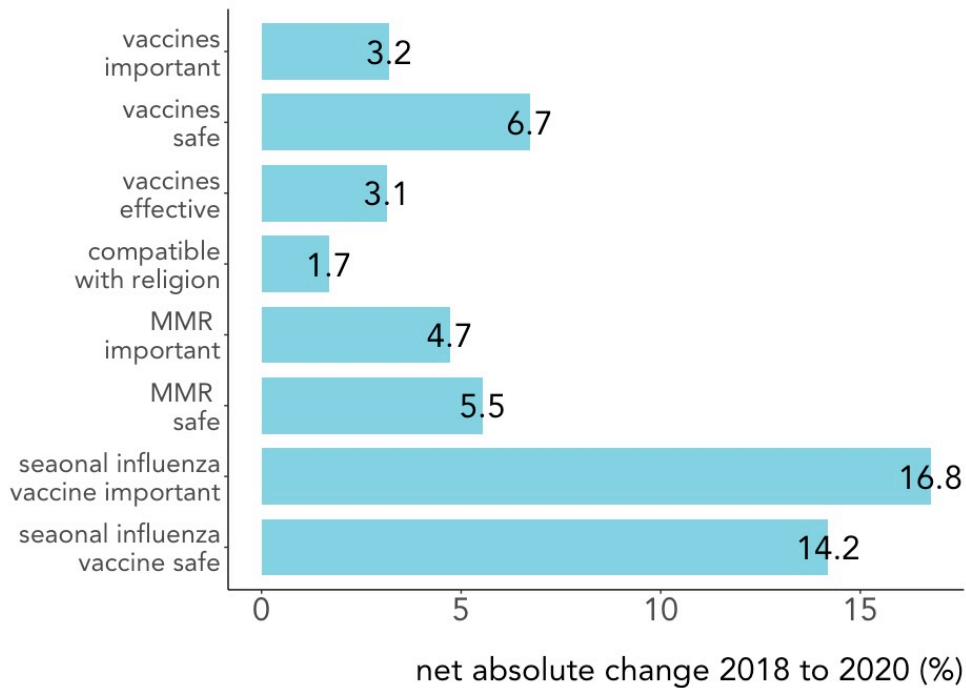


Figure 2.3 Net change in respondents agreeing to each survey item across the EU, 2018 to 2020



Public confidence by country

Countries are ranked by overall confidence (**An overall confidence metric**, page 10) in 2020 and compared to 2018 values in Figure 2.4 (though, as no HPV data were collected in 2018, HPV items are not included in the calculation of the metrics for this figure). This ranking gives an overall summary of the state of confidence in vaccines for each country across the EU.

Portugal and **Spain** have the highest percentage of respondents (70%) agreeing to all survey items followed by **Lithuania** (69%), **Finland** (68%), and the **UK** (62%). **Hungary** (36%), **Malta** (39%), **Cyprus** (41%), **Slovakia** (42%), and **Croatia** (42%) have the lowest percentages (see Figure 2.4).

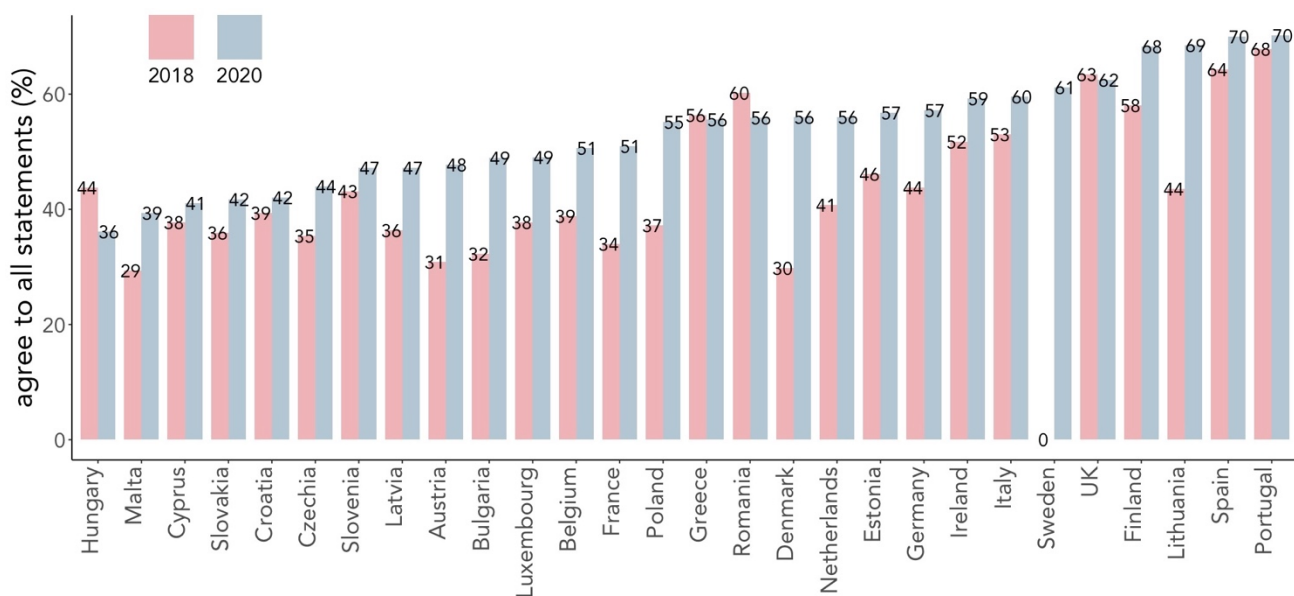
Every EU+UK state has a higher percentage of respondents surveyed agreeing to all items in

2020 than in 2018 except for **Hungary**, **Romania**, **Greece**, and the **UK** where overall vaccine confidence has fallen (though the overall decrease is small in Greece and UK).

The largest absolute increases in the percentage agreeing to all items between 2018 and 2020 are in **Austria** (31 to 48%), **Denmark** (30 to 56%), **France** (34 to 51%), and **Lithuania** (44 to 69%) (Figure 2.4).

The percentage of respondents agreeing to each of the eight vaccine confidence survey items (that vaccines are important, safe, effective, compatible with religious beliefs and that the MMR and seasonal influenza vaccine is important and safe) are shown in Table 2.2. This table, presented over two pages, also shows any significant changes in the level of agreement to a survey item between 2018 and 2020.

Figure 2.4 Overall vaccine confidence among the general public



Due to a re-field in Sweden for MMR in 2018 (Larson, H. J., de Figueiredo, A., Karafillakis, E., Rawal, 2018), this metric could not be computed for Sweden in 2018.

Across the EU, vaccine confidence in the importance, safety, and effectiveness of vaccine has increased in a large number of countries, while there is only evidence for a decrease in these elements of confidence in three countries: **Netherlands, Spain, and Portugal** (Table 2.2 A and B). In the **Netherlands** the percentage of respondents surveyed agreeing that vaccines are safe and effective has fallen by 5.7% and 5.4% (respectively), while agreement in the importance and safety of the MMR vaccine has fallen by 8.8% and 8.1%, respectively. In **Spain** there has been a 4.2% fall in the percentage of respondents agreeing that vaccines are important and the same percentage fall in agreement that vaccines are effective in **Portugal** (see Table 2.2 A and B). Despite these losses in Spain and Portugal, it should be noted that Portugal and Spain rank 1 and 2 (respectively) according to the confidence metric (Figure 2.4) due to their overall high agreement to all vaccine confidence survey items compared to other countries.

There has been an increase in the percentage of respondents agreeing that vaccines are important, safe, and effective in five countries: **Bulgaria, Lithuania, Poland, Slovakia, and Sweden**.

Confidence in the MMR and seasonal influenza vaccines

Confidence in the safety and importance of the MMR vaccine and seasonal influenza vaccines have increased markedly across the EU. A total of 13 countries have a higher proportion of respondents surveyed agreeing that the MMR vaccine is safe or important (or both) in 2020 than in 2018. Only the **Netherlands** has seen falls in the percentage of respondents agreeing that the MMR vaccine is important and safe (8.8% and 8.1%, respectively, see Table 2.2B). **Bulgaria** and **Poland** have the largest increase in the percentage of respondents agreeing that the MMR vaccine is important (14.1 and 14.2%,

respectively). **Bulgaria, Poland, and Sweden** have the largest increase in the percentage of respondents surveyed agreeing that the MMR vaccine is safe (17.1, 14.5, and 14.8%, respectively; Table 2.2B).

Attitudes towards the safety and importance of the seasonal influenza vaccine have increased in 22 countries. There are only three countries which have not shown an increase in the level of agreement that either the flu vaccine is important or safe. These three countries are **Hungary, Romania, and the UK** (see Table 2.2B, “seasonal influenza vaccine important AGREE” and “seasonal influenza vaccine safe AGREE”). The largest increases in perceptions towards the importance of the seasonal influenza vaccine are found in **Denmark** (42.7% agreeing that the seasonal influenza vaccine is important in 2018 compared to 81.6% in 2020) and **Lithuania** (50.2% in 2018 to 81.6% in 2020). (Table 2.2B.)

The largest increases in perceptions towards the safety of the seasonal influenza vaccine are found in **Poland** (60.0% agreeing that the seasonal influenza vaccine is safe in 2018 compared to 82.4% in 2020) and **Lithuania** (60.8% in 2018 to 80.1% in 2020). (Table 2.2B.)

The lowest confidence in the safety and importance of the MMR vaccine in 2020 is in **Netherlands** (75.9% of the public surveyed

agreeing that the MMR vaccine is important for children and 75.8% agreeing that it is safe), **Belgium** (77.6% and 75.6%, respectively), and **Latvia** (81.9% and 77.4%, respectively).

Although it should be noted that confidence in both the safety and importance of the MMR vaccine has increased in Belgium since 2018 (Table 2.2B).

Confidence in the HPV vaccine

For the first time, confidence in the HPV vaccine is collected across all EU+UK countries. The percentages of respondents in each country agreeing that the HPV vaccine is important and safe is shown in Table 2.3.

Overall, **Portugal** has the highest level of agreement that the HPV vaccine is important (92.8% agreeing) and safe (91.1%). **Latvia** has the lowest level of agreement that the HPV vaccine is important (56.4%) and safe (53.7%).

Mapping vaccine confidence

The percentage of respondents agreeing with the VCI survey items are shown in Figures 2.5 to 2.8 (left-hand side). Countries with changes in agreement between 2018 and 2020 are also shown (right column). In Figure 2.9, perceptions towards the HPV vaccine are mapped.

Table 2.2 (A) Public agreement with vaccine confidence items in 2018 and 2020

Only statistically significant changes in vaccine confidence between 2018 and 2020 are shown. A change in agreement across two years is significant if the 99.95% confidence interval excludes zero. This interval corrects for the large number of multiple hypotheses using Bonferroni correction. The ranking shown here and in Table 2.2 (B) is the overall confidence metric ranking (page 10).

| Vaccines are... | important for children (AGREE) | | | safe (AGREE) | | | effective (AGREE) | | | compatible with religious beliefs (AGREE) | | | |
|-----------------------|--------------------------------|------|------|--------------|------|------|-------------------|------|------|---|------|------|-------------|
| | Rank/Country | 2018 | 2020 | Δ | 2018 | 2020 | Δ | 2018 | 2020 | Δ | 2018 | 2020 | Δ |
| 20 Austria | | 90.6 | 88.0 | - | 82.7 | 84.2 | - | 88.1 | 87.4 | - | 85.1 | 80.7 | - |
| 17 Belgium | | 87.3 | 87.4 | - | 79.0 | 83.3 | - | 84.0 | 86.2 | - | 78.0 | 76.9 | - |
| 19 Bulgaria | | 78.3 | 89.5 | 11.2 | 66.3 | 76.1 | 9.9 | 72.7 | 84.9 | 12.2 | 70.8 | 79.2 | 8.4 |
| 24 Croatia | | 88.9 | 92.1 | - | 78.5 | 84.6 | 6.2 | 85.9 | 89.1 | - | 71.3 | 61.6 | -9.7 |
| 26 Cyprus | | 93.3 | 93.8 | - | 79.9 | 83.1 | - | 86.1 | 86.2 | - | 79.4 | 71.8 | -7.5 |
| 23 Czechia | | 92.9 | 93.6 | - | 78.7 | 83.9 | - | 87.3 | 89.7 | - | 79.0 | 75.1 | - |
| 12 Denmark | | 95.6 | 96.8 | - | 94.0 | 94.4 | - | 94.6 | 95.5 | - | 77.8 | 77.3 | - |
| 10 Estonia | | 89.4 | 91.2 | - | 81.1 | 84.1 | - | 86.8 | 88.9 | - | 70.9 | 81.7 | 10.8 |
| 4 Finland | | 97.7 | 98.7 | - | 89.0 | 93.9 | 4.9 | 91.1 | 95.3 | 4.2 | 92.0 | 88.9 | - |
| 16 France | | 85.8 | 89.8 | - | 69.8 | 81.2 | 11.3 | 82.8 | 87.3 | - | 77.4 | 78.8 | - |
| 9 Germany | | 92.2 | 92.8 | - | 83.6 | 89.0 | 5.4 | 90.5 | 91.6 | - | 79.2 | 81.2 | - |
| 14 Greece | | 92.8 | 93.5 | - | 84.5 | 86.1 | - | 89.3 | 90.1 | - | 82.2 | 76.2 | - |
| 28 Hungary | | 95.3 | 96.3 | - | 91.4 | 87.7 | - | 90.6 | 88.8 | - | 76.7 | 69.9 | -6.8 |
| 8 Ireland | | 90.4 | 90.7 | - | 84.9 | 87.0 | - | 88.9 | 89.5 | - | 70.1 | 73.6 | - |
| 7 Italy | | 91.7 | 91.1 | - | 85.3 | 87.5 | - | 90.0 | 89.6 | - | 80.7 | 81.5 | - |
| 21 Latvia | | 85.8 | 89.3 | - | 68.2 | 75.1 | 6.8 | 70.9 | 76.7 | - | 81.8 | 85.2 | - |
| 3 Lithuania | | 87.2 | 91.6 | 4.4 | 81.3 | 89.1 | 7.8 | 81.5 | 90.4 | 8.9 | 92.4 | 91.6 | - |
| 18 Luxemb'g | | 93.2 | 94.8 | - | 87.2 | 86.7 | - | 90.2 | 91.7 | - | 80.8 | 79.1 | - |
| 27 Malta | | 88.9 | 93.6 | - | 75.0 | 82.8 | - | 83.2 | 86.2 | - | 70.1 | 64.6 | - |
| 11 Netherlands | | 90.3 | 85.6 | - | 87.9 | 82.2 | -5.7 | 89.2 | 83.8 | -5.4 | 67.3 | 84.6 | 17.3 |
| 15 Poland | | 75.9 | 90.8 | 14.8 | 72.4 | 88.5 | 16.1 | 74.9 | 89.7 | 14.8 | 59.2 | 69.8 | 10.6 |
| 1 Portugal | | 98.0 | 96.4 | - | 95.1 | 94.4 | - | 96.5 | 92.4 | -4.2 | 89.0 | 83.1 | - |
| 13 Romania | | 88.1 | 89.6 | - | 82.2 | 80.8 | - | 85.2 | 84.7 | - | 74.7 | 80.1 | 5.4 |
| 25 Slovakia | | 85.5 | 91.5 | 6.0 | 74.7 | 82.7 | 8.0 | 80.2 | 87.3 | 7.1 | 73.7 | 74.5 | - |
| 22 Slovenia | | 88.1 | 89.8 | - | 81.1 | 81.2 | - | 86.9 | 85.8 | - | 76.6 | 69.1 | -7.5 |
| 2 Spain | | 96.1 | 91.9 | -4.2 | 91.6 | 90.5 | - | 94.0 | 91.8 | - | 90.7 | 85.4 | -5.3 |
| 6 Sweden | | 88.3 | 94.5 | 6.2 | 83.7 | 90.4 | 6.7 | 87.4 | 92.2 | 4.8 | 72.8 | 75.7 | - |
| 5 UK | | 92.7 | 91.5 | - | 90 | 90.4 | - | 92 | 91.5 | - | 81.6 | 76.9 | - |

Table 2.2 (B) Public agreement with vaccine-specific confidence items in 2018 and 2020

| Rank / Country | MMR vaccine important for children (AGREE) | | | MMR vaccine safe (AGREE) | | | Seasonal influenza vaccine important (AGREE) | | | Seasonal influenza vaccine safe (AGREE) | | |
|----------------|--|------|------|--------------------------|------|------|--|------|------|---|------|------|
| | 2018 | 2020 | Δ | 2018 | 2020 | Δ | 2018 | 2020 | Δ | 2018 | 2020 | Δ |
| 20 Austria | 87.8 | 89.2 | - | 86.1 | 89.0 | - | 40.5 | 63.1 | 22.6 | 55.8 | 71.4 | 15.6 |
| 17 Belgium | 64.6 | 77.6 | 13.0 | 64.8 | 75.6 | 10.8 | 61.7 | 72.7 | 11.0 | 68.1 | 76.3 | 8.3 |
| 19 Bulgaria | 74.6 | 88.7 | 14.1 | 65.5 | 82.6 | 17.1 | 50.2 | 67.4 | 17.2 | 56.2 | 72.3 | 16.1 |
| 24 Croatia | 91.5 | 92.3 | - | 86.8 | 87.4 | - | 59.8 | 73.6 | 13.7 | 63.0 | 76.0 | 13.0 |
| 26 Cyprus | 86.3 | 90.6 | 4.3 | 80.2 | 84.5 | - | 60.6 | 74.0 | 13.4 | 62.2 | 73.0 | 10.8 |
| 23 Czechia | 80.9 | 84.7 | - | 76.1 | 81.6 | 5.6 | 49.4 | 63.3 | 13.8 | 62.0 | 73.0 | 11.0 |
| 12 Denmark | 86.6 | 83.8 | - | 84.1 | 81.8 | - | 42.7 | 81.6 | 38.9 | 72.7 | 85.0 | 12.3 |
| 10 Estonia | 86.0 | 85.6 | - | 77.4 | 82.3 | 4.8 | 65.7 | 71.8 | - | 74.8 | 80.4 | 5.7 |
| 4 Finland | 93.0 | 97.1 | 4.1 | 90.1 | 93.3 | - | 73.0 | 81.9 | 8.8 | 79.2 | 86.6 | 7.4 |
| 16 France | 79.7 | 83.0 | - | 77.4 | 81.7 | - | 52.3 | 71.5 | 19.1 | 51.9 | 71.0 | 19.2 |
| 9 Germany | 89.9 | 91.8 | - | 86.3 | 90.7 | - | 61.0 | 74.6 | 13.6 | 65.1 | 79.2 | 14.1 |
| 14 Greece | 85.2 | 87.5 | - | 81.5 | 82.6 | - | 76.3 | 82.1 | 5.8 | 78.8 | 83.3 | - |
| 28 Hungary | 92.8 | 97.5 | 4.7 | 90.4 | 94.0 | - | 62.0 | 59.8 | - | 66.3 | 64.7 | - |
| 8 Ireland | 86.1 | 87.7 | - | 82.2 | 85.4 | - | 74.7 | 82.9 | 8.2 | 77.6 | 83.1 | 5.6 |
| 7 Italy | 80.5 | 84.8 | - | 80.6 | 84.4 | - | 67.6 | 78.4 | 10.8 | 72.8 | 81.6 | 8.8 |
| 21 Latvia | 74.6 | 81.9 | 7.3 | 68.3 | 77.4 | 9.1 | 54.0 | 65.2 | 11.2 | 55.2 | 68.3 | 13.1 |
| 3 Lithuania | 86.3 | 91.7 | 5.4 | 78.2 | 89.1 | 10.9 | 50.2 | 81.6 | 31.4 | 60.8 | 80.1 | 19.4 |
| 18 Luxemb'g | 88.2 | 92.1 | - | 86.9 | 89.3 | - | 52.2 | 67.7 | 15.5 | 60.0 | 72.1 | 12.1 |
| 27 Malta | 85.0 | 92.4 | 7.4 | 75.7 | 84.6 | 8.9 | 64.5 | 75.6 | 11.1 | 60.5 | 71.6 | 11.1 |
| 11 Netherl's | 84.7 | 75.9 | -8.8 | 83.9 | 75.8 | -8.1 | 62.1 | 74.4 | 12.3 | 76.3 | 79.3 | - |
| 15 Poland | 76.0 | 90.2 | 14.2 | 73.0 | 87.5 | 14.5 | 59.7 | 78.1 | 18.4 | 60.0 | 82.4 | 22.4 |
| 1 Portugal | 97.2 | 95.6 | - | 95.8 | 94.7 | - | 77.9 | 86.7 | 8.8 | 79.3 | 87.2 | 8.0 |
| 13 Romania | 87.2 | 85.8 | - | 85.4 | 82.4 | - | 81.0 | 77.6 | - | 78.2 | 73.2 | - |
| 25 Slovakia | 76.0 | 84.0 | 8.0 | 70.5 | 82.2 | 11.7 | 50.5 | 62.6 | 12.1 | 61.0 | 71.5 | 10.6 |
| 22 Slovenia | 80.3 | 85.1 | - | 76.9 | 80.8 | - | 56.8 | 69.0 | 12.2 | 68.3 | 75.1 | 6.7 |
| 2 Spain | 88.8 | 90.9 | - | 88.1 | 89.7 | - | 77.5 | 86.4 | 9.0 | 79.6 | 87.4 | 7.8 |
| 6 Sweden | 87.0 | 93.7 | 6.6 | 78.9 | 93.7 | 14.8 | 64.6 | 82.1 | 17.5 | 66.4 | 84.9 | 18.5 |
| 5 UK | 86.6 | 87.9 | - | 85.4 | 85.7 | - | 80.8 | 83.2 | - | 85.4 | 86.1 | - |

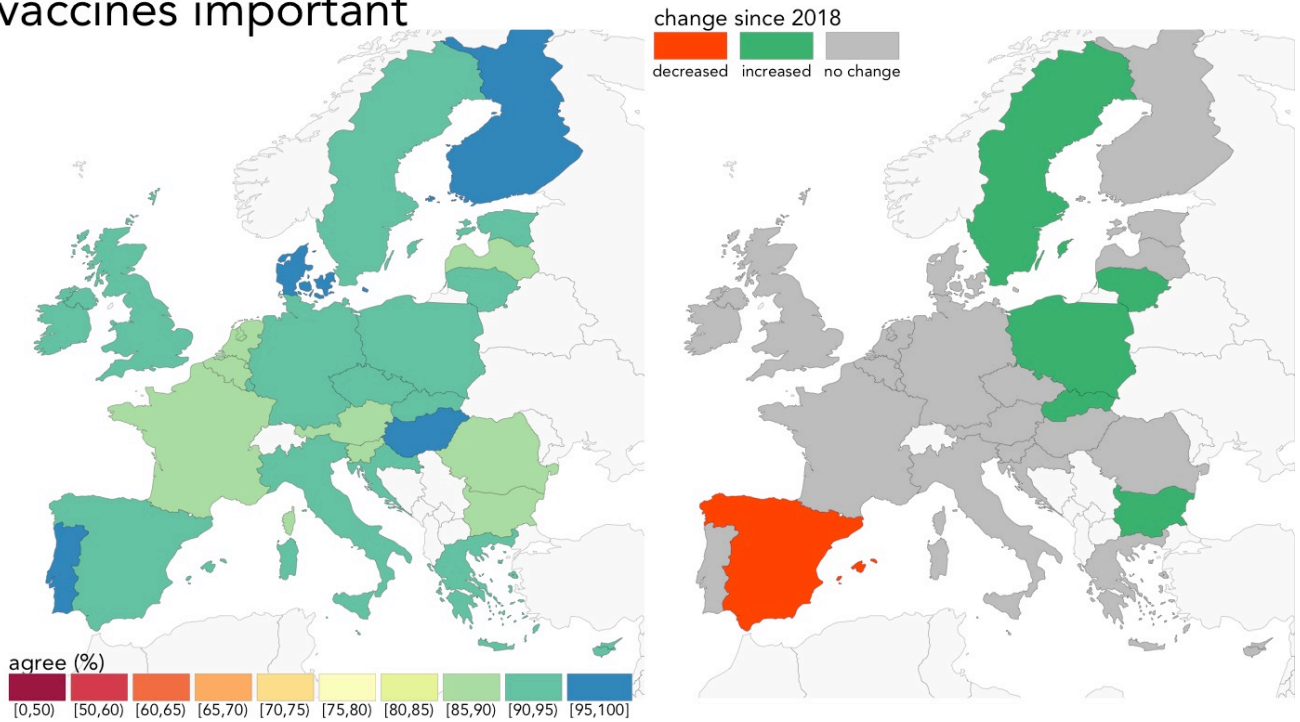
Only statistically significant changes in vaccine confidence between 2018 and 2020 are shown. A change in agreement across two years is significant if the 99.95% confidence interval excludes zero. This interval corrects for the large number of multiple hypotheses using Bonferroni correction. The ranking shown here and in Table 2.2 (B) is the overall confidence metric ranking (page 10).

Table 2.3 HPV confidence

| HPV vaccine is... Country and Ranking (overall) | Important (AGREE) | Safe (AGREE) |
|---|----------------------|-----------------|
| | 2020 | 2020 |
| 20 Austria | 74.2 | 74.1 |
| 17 Belgium | 76.9 | 75.8 |
| 19 Bulgaria | 72.9 | 67.3 |
| 24 Croatia | 81.8 | 76.0 |
| 26 Cyprus | 77.5 | 67.7 |
| 23 Czechia | 77.6 | 76.4 |
| 12 Denmark | 86.8 | 84.0 |
| 10 Estonia | 76.6 | 72.6 |
| 4 Finland | 87.4 | 81.5 |
| 16 France | 74.6 | 71.0 |
| 9 Germany | 76.7 | 77.1 |
| 14 Greece | 77.3 | 75.0 |
| 28 Hungary | 85.8 | 77.3 |
| 8 Ireland | 83.8 | 82.3 |
| 7 Italy | 85.0 | 83.7 |
| 21 Latvia | 56.4 | 53.7 |
| 3 Lithuania | 78.0 | 69.8 |
| 18 Luxembourg | 81.1 | 74.5 |
| 27 Malta | 86.6 | 74.4 |
| 11 Netherlands | 73.5 | 74.7 |
| 15 Poland | 85.2 | 82.3 |
| 1 Portugal | 92.8 | 91.1 |
| 13 Romania | 80.4 | 75.9 |
| 25 Slovakia | 77.5 | 75.4 |
| 22 Slovenia | 79.6 | 76.7 |
| 2 Spain | 88.0 | 86.8 |
| 6 Sweden | 73.4 | 73.0 |
| 5 UK | 80.4 | 77.8 |

Figure 2.5
Country-level public vaccine confidence in the importance and safety of vaccines in 2020 and change since 2018

vaccines important



vaccines safe

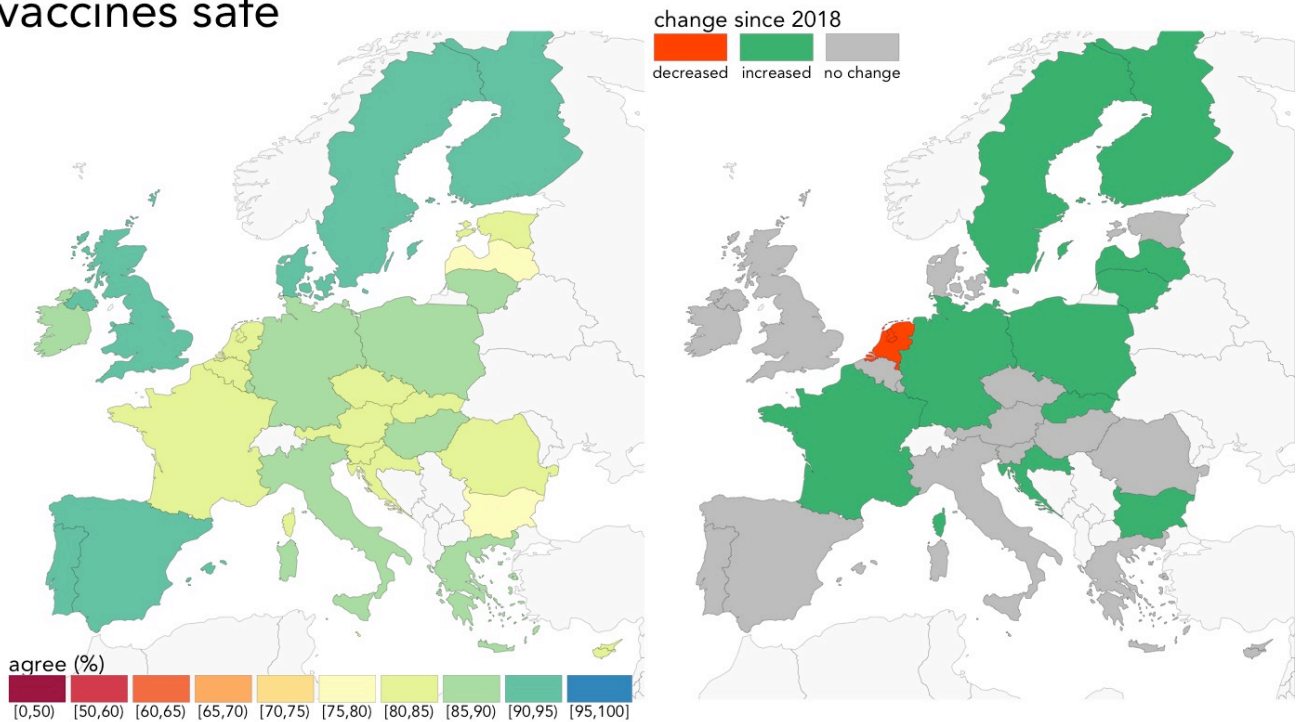
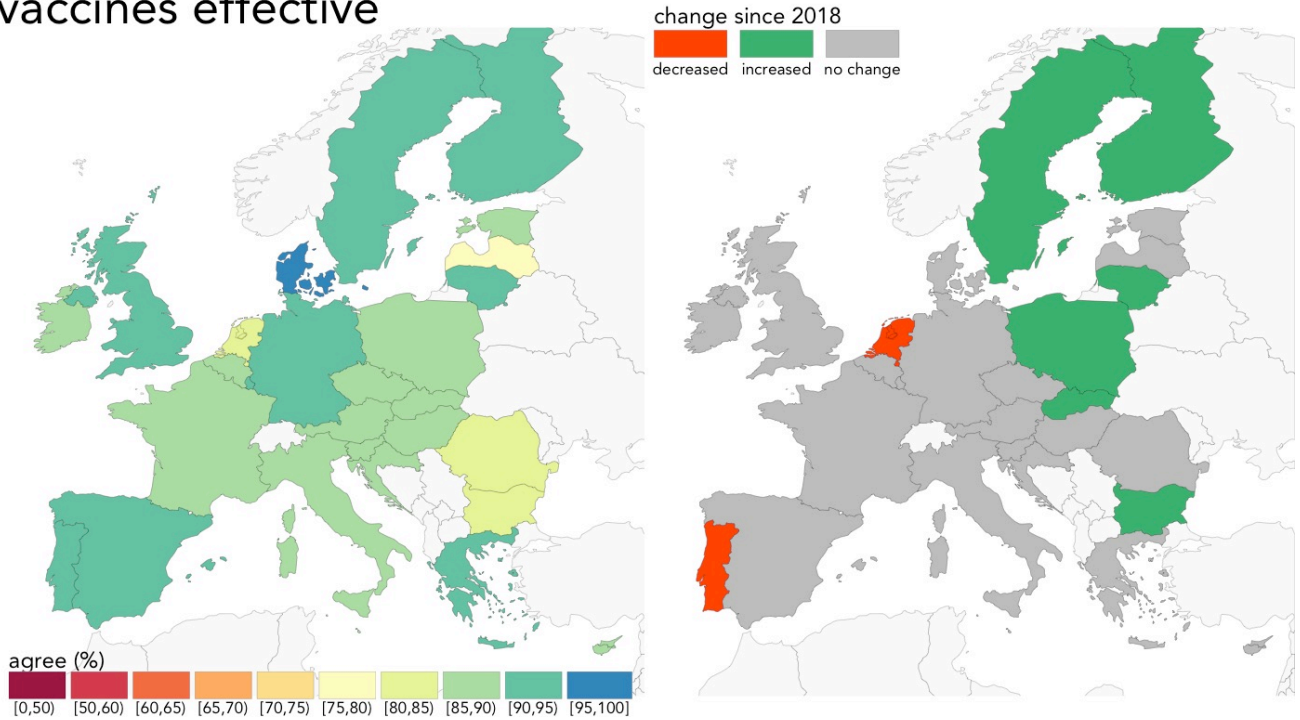


Figure 2.6

Country-level public vaccine confidence in the effectiveness and religious compatibility of vaccines in 2020 and change since 2018

vaccines effective



compatible with religion

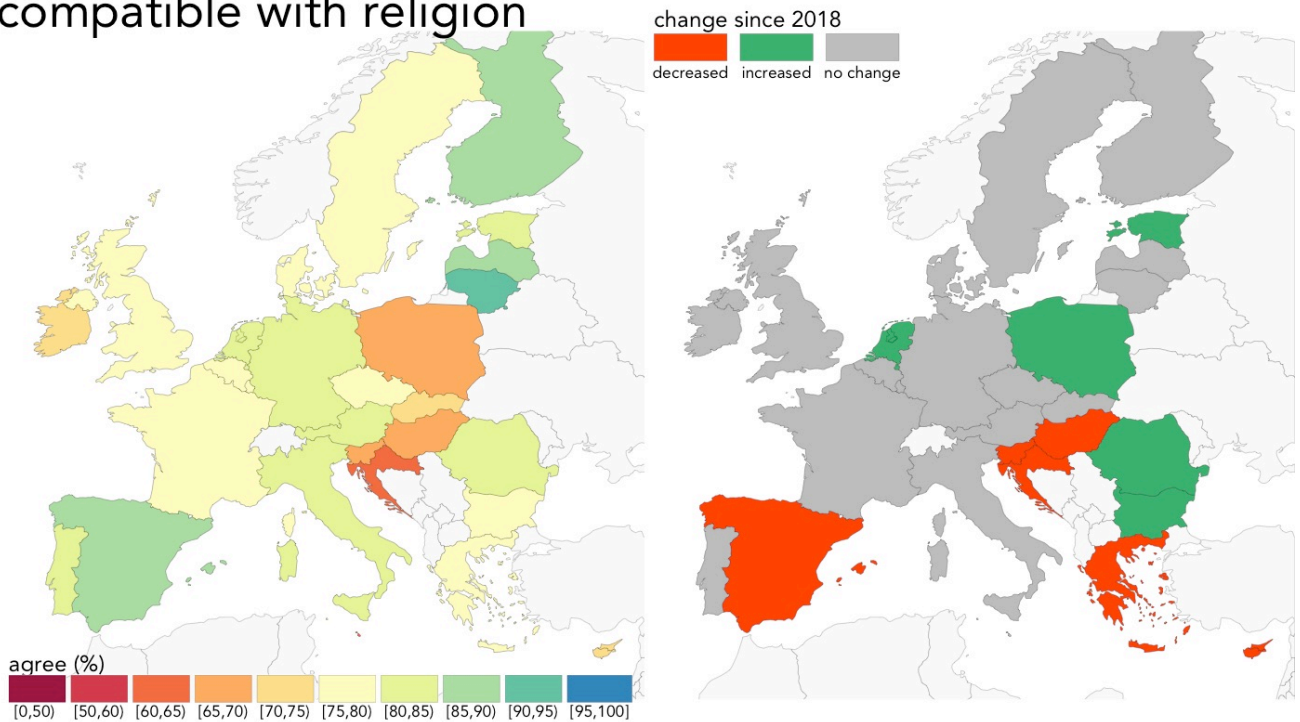
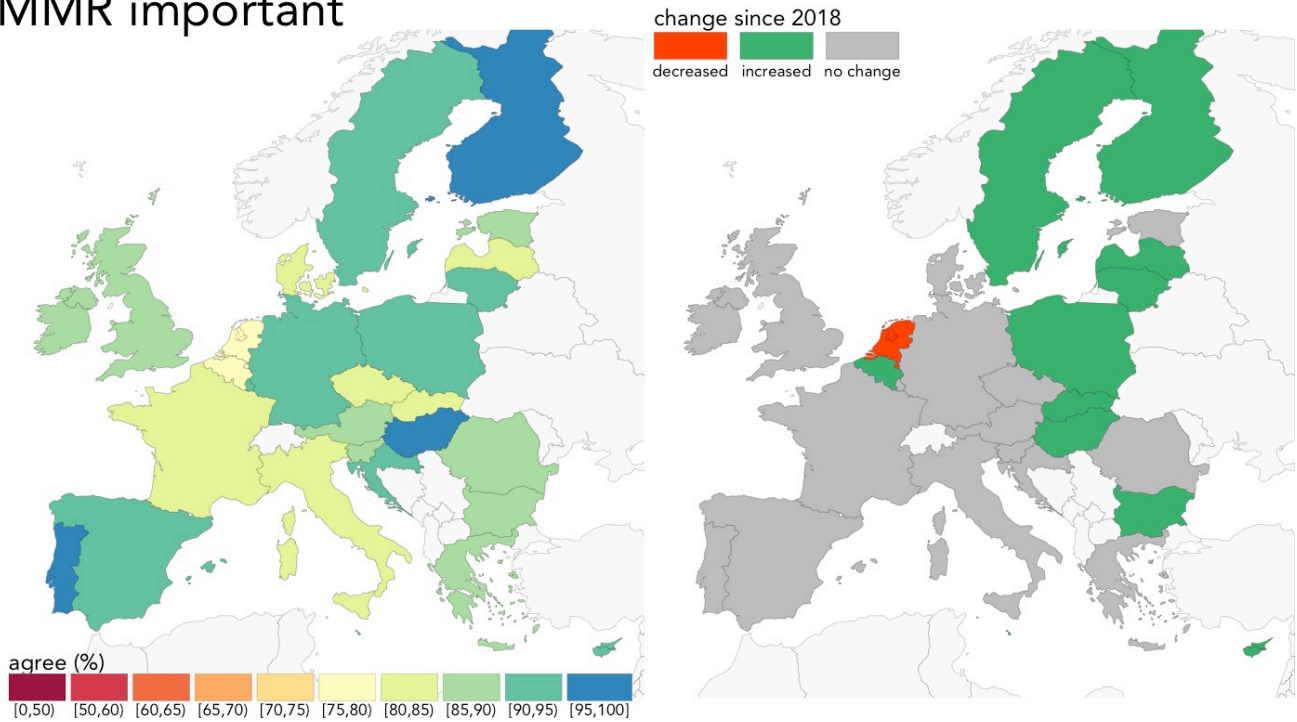


Figure 2.7
Country-level public vaccine confidence in the importance and safety of the MMR vaccine in 2020 and change since 2018

MMR important



MMR safe

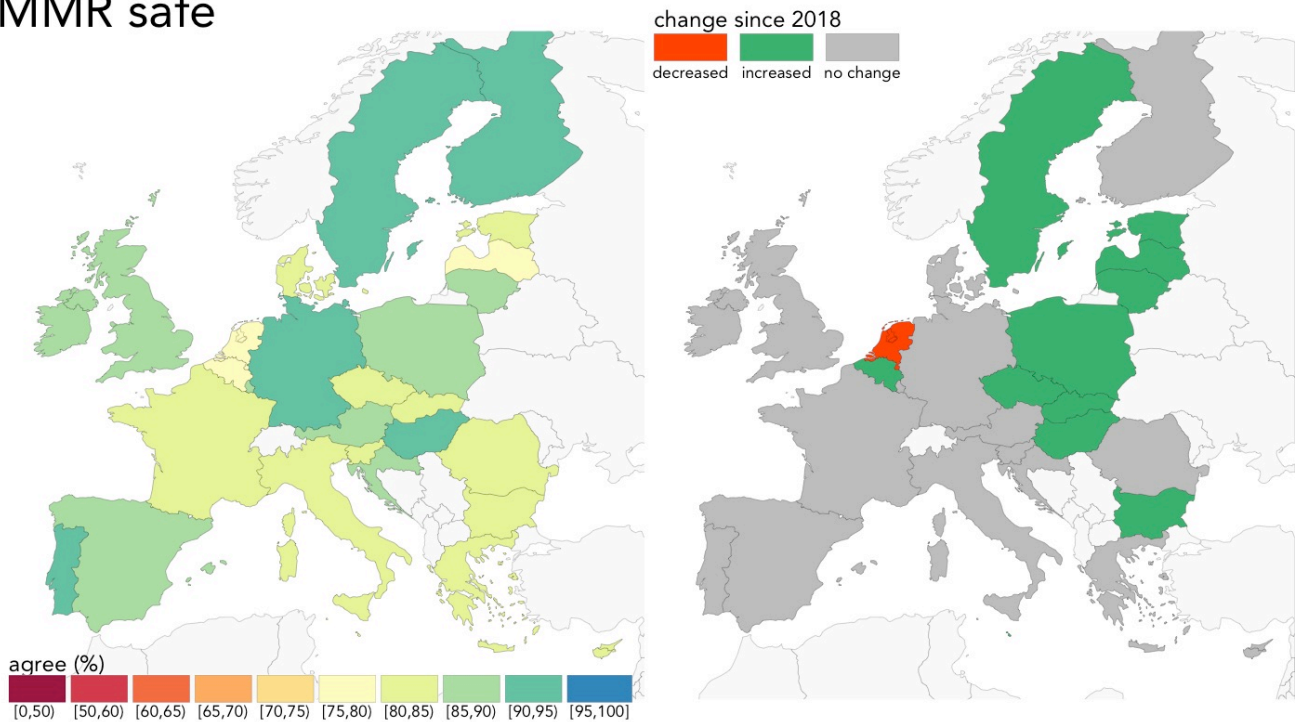
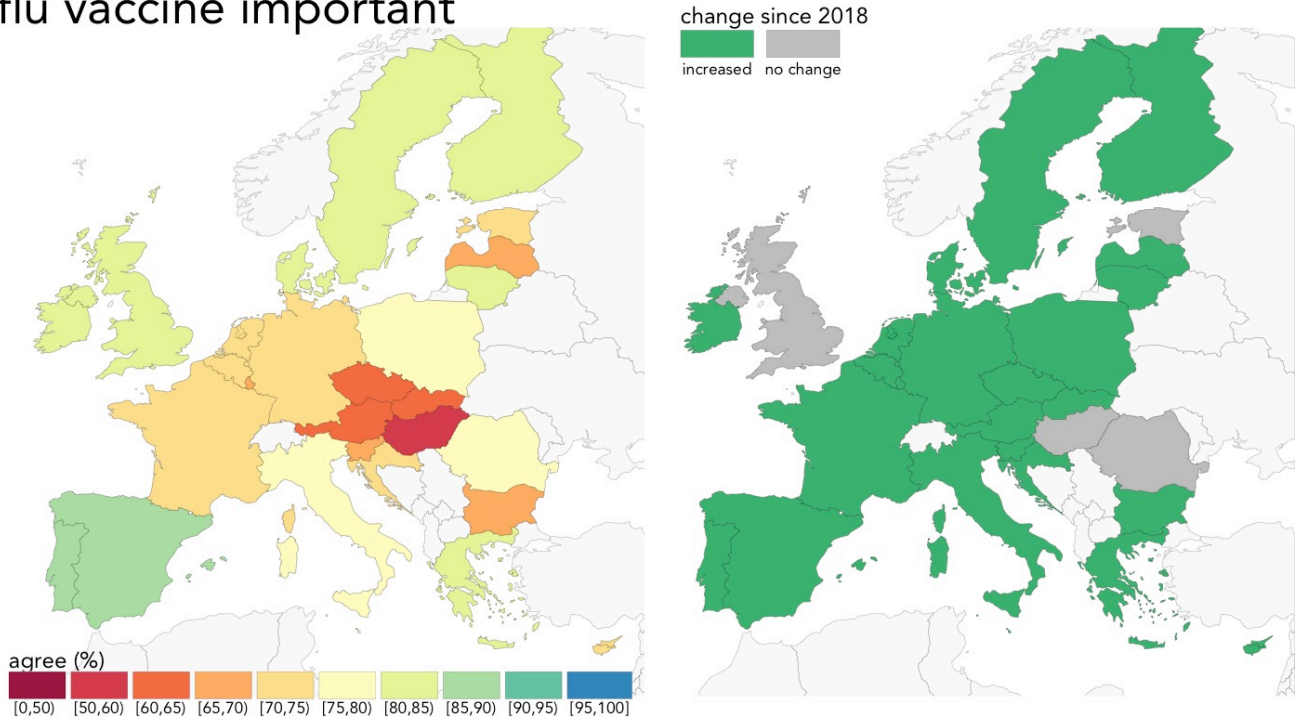


Figure 2.8
Country-level public vaccine confidence in the importance and safety of the seasonal influenza vaccine in 2020 and change since 2018

flu vaccine important



flu vaccine safe

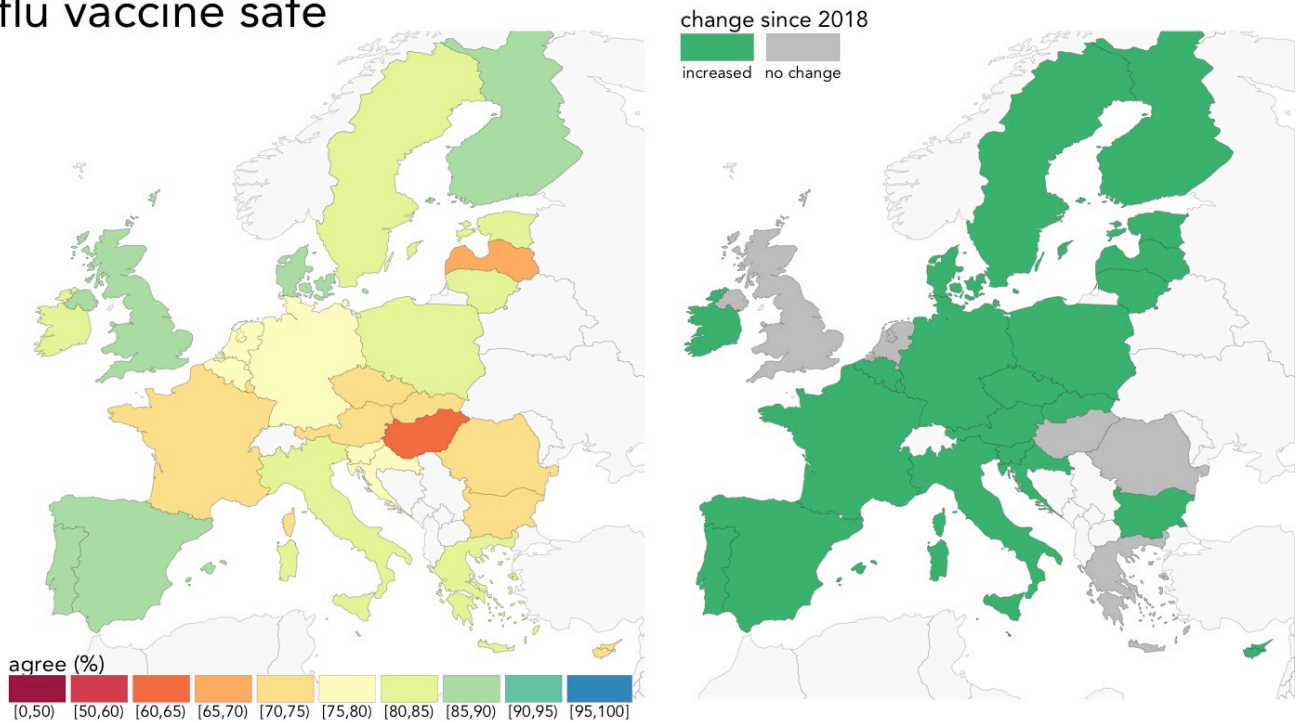
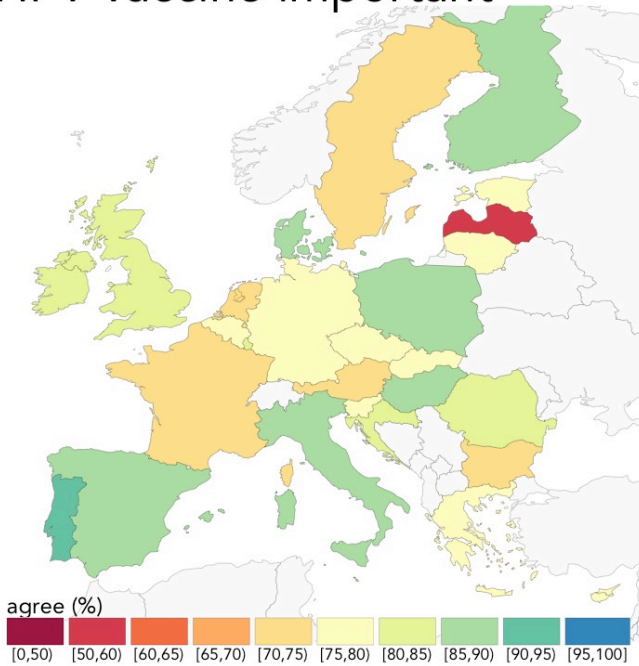
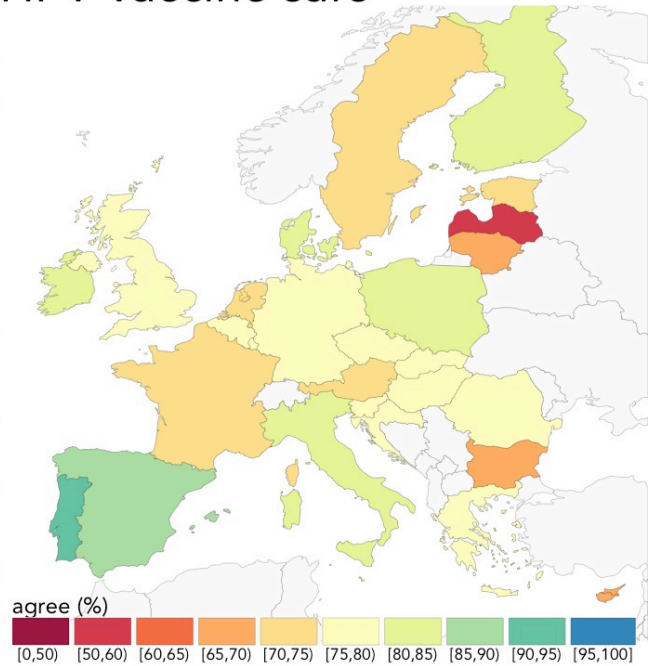


Figure 2.9 Country-level public vaccine confidence in the importance and safety of the HPV vaccine (2020 only)

HPV vaccine important



HPV vaccine safe



Vaccine confidence and socio-demographics

Associations between individuals' socio-demographic characteristics and their overall vaccine confidence are shown in Table 2.4. Odds ratios are displayed if the 95% credible interval excludes one: these effects are considered 'significant'.

Across the EU, males are found to be more likely than females to have high confidence in 11 countries (**Austria, Croatia, Czechia, Estonia, France, Greece, Italy, Lithuania, Luxembourg, Romania, and Slovakia**, see Table 2.4, SEX).

Over 65s have higher confidence than younger groups in 20 countries with **Latvia** the only exception (see Table 2.4, AGE).

In 12 countries, individuals with a university education are more likely to have high vaccine

confidence than those with secondary education. Primary education is associated with lower vaccine confidence in four countries: **Finland, Poland, Romania, and the UK**. (See Table 2.4, EDU.)

With regards to religious affiliation, Christians have higher confidence than atheists or agnostics in **Croatia, Czechia, France, Germany, Italy, Poland, and the UK**, but Christians are less confident than atheists or agnostics in **Latvia**. Interestingly, individuals who refuse to provide their religious affiliation or who report an "other" religion tend to have lower confidence than atheists or agnostic (13 and seven countries, respectively). (See Table 2.4, REL).

Individuals with children have higher confidence than those without children in Ireland and Slovenia, while those without children have higher confidence in **Denmark, Romania, and Sweden** (Table 2.4, CHI).

Table 2.4 Vaccine confidence and socio-demographic factors

Only significant (95% credible interval excludes 1) odds ratios are shown.

| | SEX | AGE | | | | | EDUCATION | | | RELIGION | | | | CHI |
|--------------------|---------------|-------------|-------------|-------------|-------------|-------------|---------------------|------------------------|--------------------------|---------------------|------------------|-------------------|---------------------|------------------------|
| | Female v Male | 18-24 v 65+ | 25-34 v 65+ | 35-44 v 65+ | 45-54 v 65+ | 55-64 v 65+ | Primary v Secondary | University v Secondary | Other/No EDU v Secondary | Christian v Atheist | Muslim v Atheist | Refused v Atheist | Other REL v Atheist | Has children v has not |
| Austria | 0.77 | 0.34 | 0.26 | 0.49 | 0.63 | - | - | 1.59 | - | - | - | - | - | - |
| Belgium | - | 0.58 | 0.56 | 0.57 | - | - | - | - | - | - | 0.67 | - | - | - |
| Bulgaria | - | 0.54 | 0.43 | 0.41 | 0.66 | - | - | - | - | - | 0.46 | 0.33 | - | - |
| Croatia | 0.79 | - | 0.58 | 0.66 | - | - | - | 1.42 | - | 1.80 | - | - | - | - |
| Cyprus | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Czechia | 0.53 | - | - | - | - | - | - | 1.48 | - | 1.47 | - | - | - | - |
| Denmark | - | 0.53 | 0.58 | - | - | - | - | - | - | - | 0.57 | - | - | 0.62 |
| Estonia | 0.7 | - | - | - | - | - | - | - | - | - | 0.68 | 0.55 | - | - |
| Finland | - | - | - | - | - | - | 0.62 | 1.49 | - | - | - | - | - | - |
| France | 0.75 | 0.34 | 0.65 | - | - | - | - | - | - | 1.70 | - | 0.46 | - | - |
| Germany | - | 0.57 | 0.58 | - | - | - | - | - | - | 1.81 | - | - | - | - |
| Greece | 0.79 | - | - | - | - | - | - | - | - | - | 0.55 | 0.51 | - | - |
| Hungary | - | - | - | - | - | - | - | 2.08 | - | - | - | - | - | - |
| Ireland | - | 0.4 | - | - | - | - | - | 1.48 | - | - | 0.44 | 0.42 | - | 1.42 |
| Italy | 0.66 | 0.39 | 0.68 | 0.52 | 0.67 | - | - | 1.73 | - | 1.48 | - | 0.50 | - | - |
| Latvia | - | - | 1.84 | - | - | - | - | - | - | 0.63 | - | - | 0.51 | - |
| Lithuania | 0.73 | 0.42 | - | 0.6 | - | 0.5 | - | - | - | - | - | 0.50 | 0.33 | - |
| Luxembourg | 0.59 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Malta | - | - | 0.49 | 0.41 | - | - | - | 1.98 | - | - | - | - | - | - |
| Netherlands | - | 0.24 | 0.33 | 0.5 | - | 0.58 | - | 1.55 | - | - | 0.42 | 0.62 | - | - |
| Poland | - | - | 0.48 | 0.67 | - | - | 0.22 | - | - | 1.56 | - | 0.61 | - | - |
| Portugal | - | 0.54 | - | - | - | - | - | 1.98 | - | - | - | 0.56 | 0.49 | - |
| Romania | 0.79 | - | 0.5 | - | - | - | 0.45 | - | - | - | - | - | - | 0.58 |
| Slovakia | 0.61 | 0.53 | - | - | - | - | - | - | - | - | - | - | - | - |
| Slovenia | - | - | 0.49 | - | 0.65 | - | - | - | - | - | - | 0.50 | - | 1.42 |
| Spain | - | 0.25 | 0.42 | 0.57 | - | - | - | 1.74 | - | - | - | - | 0.54 | - |
| Sweden | - | 0.44 | 0.3 | 0.48 | 0.46 | - | - | 1.88 | - | - | - | - | - | 0.70 |
| UK | - | 0.64 | 0.53 | 0.61 | - | - | 0.48 | - | - | 1.46 | - | - | - | - |

A blue stethoscope is positioned diagonally across the frame, with its chest piece in the bottom right corner and its earbuds at the top left. A white diagonal shape, resembling a folded piece of paper, is placed over the upper part of the stethoscope. The text is printed on this white shape.

**Vaccine
Confidence
among
Healthcare
Professionals**

Chapter 3: Vaccine Confidence among Healthcare Professionals

Summary and Key Findings

In this chapter, vaccine confidence is investigated for healthcare professionals in the EU+UK using a survey conducted among general practitioners (GPs) and another distributed among members of the Standing Committee of European Doctors (CPME) to investigate views among a broader set of healthcare professionals.

- Overall vaccine confidence among healthcare professionals is higher than confidence among the general public
- Healthcare professional confidence is comparatively low in Bulgaria and Croatia compared to other EU+UK countries
- GPs surveyed in Czechia, Hungary, and Slovakia were the least likely to recommend the MMR vaccine to patients
- The majority of GPs surveyed in Czechia and Bulgaria would be unlikely to recommend the seasonal influenza vaccine to pregnant women.

Introduction

Doctors are often considered the most trusted source of health information by the general population (Bouder et al., 2015). Recent studies have shown that some healthcare professionals may be losing confidence in vaccination, impacting their recommendations and conversations with patients (Paterson et al., 2016). Quantifying HCP vaccine confidence levels and their willingness to recommend certain vaccines is therefore essential.

In this chapter, confidence in vaccines among healthcare professionals is examined using data from two separate EU-wide surveys.

In 25 EU+UK countries, 100 GPs were surveyed via online questionnaires. In total, 2,501 GPs were surveyed (101 GPs were surveyed in Portugal). This set of surveys is referred to as the

“GP survey”. Data were not collected for Cyprus, Luxembourg, and Malta to the smaller number and availability of GPs in these three countries.

Additional data on vaccine confidence among healthcare professionals (including GPs, other doctors, nurses, midwives, and pharmacists) were collected across all 28 countries through a collaboration with the Standing Committee of European Doctors (CPME) and their members and partners. The survey was distributed by CPME to national medical associations. These associations then shared the survey directly with healthcare professionals in each country. As with the GP surveys, the CPME sample was managed and monitored by Gallup International (ORB International).

Summaries of both the GP survey and the CPME survey are shown in Table 3.1. A different proportion of each type of healthcare professional completed the CPME

survey in each country (Figure 3.1). Survey weights were therefore generated to re-weight national-level summaries from the CPME dataset so that the overall fraction of each type of healthcare professionals is fixed across countries. This reweighting therefore allows like-for-like healthcare professionals comparisons across countries. The overall reweighted fractions of healthcare professionals across all countries are as follows: GPs (26.6%), doctor (other specialty) (69.7%), nurse (2.4%), pharmacist (1.1%), midwife (0.3%). For the purposes of comparison these latter three groups are recoded to “other healthcare professionals”.

EU healthcare professional confidence

The percentage of respondents in each country agreeing to all ten confidence items (see [An overall confidence metric](#), page 10) is shown in Figure 3.2 (GP sample) and Figure 3.3 (CPME sample). The number of respondents sampled within each country is shown at the base of the bars.

For the GP sample, agreement to all survey items is highest in **Italy** (97 of 100 GPs agree to all ten survey items), followed by **Poland** (94), and **Lithuania** (94). Agreement is lowest in **Bulgaria** and **Romania** (both 71), followed by **Croatia** (72), see Figure 3.2. Within the CPME sample, agreement to all survey items is highest in **Ireland** (92), **Italy** (90), and **Finland** (90), while it is lowest in **Poland** (60), **Latvia** (61), and **Bulgaria** (70), see Figure 3.3. (Czechia, Denmark, France, Lithuania, Spain, Sweden, and the UK have fewer than 10 responses and are excluded from this and future analyses).

The percentage of respondents reporting that they would likely (either “highly likely” or “somewhat likely”) recommend the MMR, seasonal influenza (including recommending to pregnant women), and HPV vaccine to patients, is shown in Figure 3.4 (GP sample) and Figure 3.5 (CPME sample).

Denmark (96 GPs out of 100), the **UK** (95) and **Lithuania** (93) have the highest proportion of GPs reporting that they would be likely to recommend all these vaccines to patients (Figure 3.4). **Bulgaria** (17), **Czechia** (32), and **Slovakia** (46) have the lowest percentage of GPs reporting that they would likely recommend the MMR, seasonal influenza, and HPV vaccines to patients.

For the CPME sample, **Bulgaria** again has the lowest percentage reporting that they would likely recommend all vaccines to patients (31%), while **Estonia** (88%), **Ireland** (87%), and **Italy** (83%) have the highest (Figure 3.5).

While Figures 3.2 to 3.5 present overall response summaries for vaccine confidence and likelihood to recommend vaccines, an item-specific breakdown is useful to highlight specific confidence issues. Responses to all ten vaccine confidence questions for all countries are provided in Table 3.2 A and B. Responses to the four vaccine recommendation questions are shown in Table 3.3.

Table 3.2A shows the percentage of respondents (both GP and CPME surveys) agreeing that vaccines are important, safe, effective, and compatible with their religious beliefs. Table 3.3B shows agreement towards the vaccine-specific confidence items. (Data is again only stated if there are more than 10 responses.)

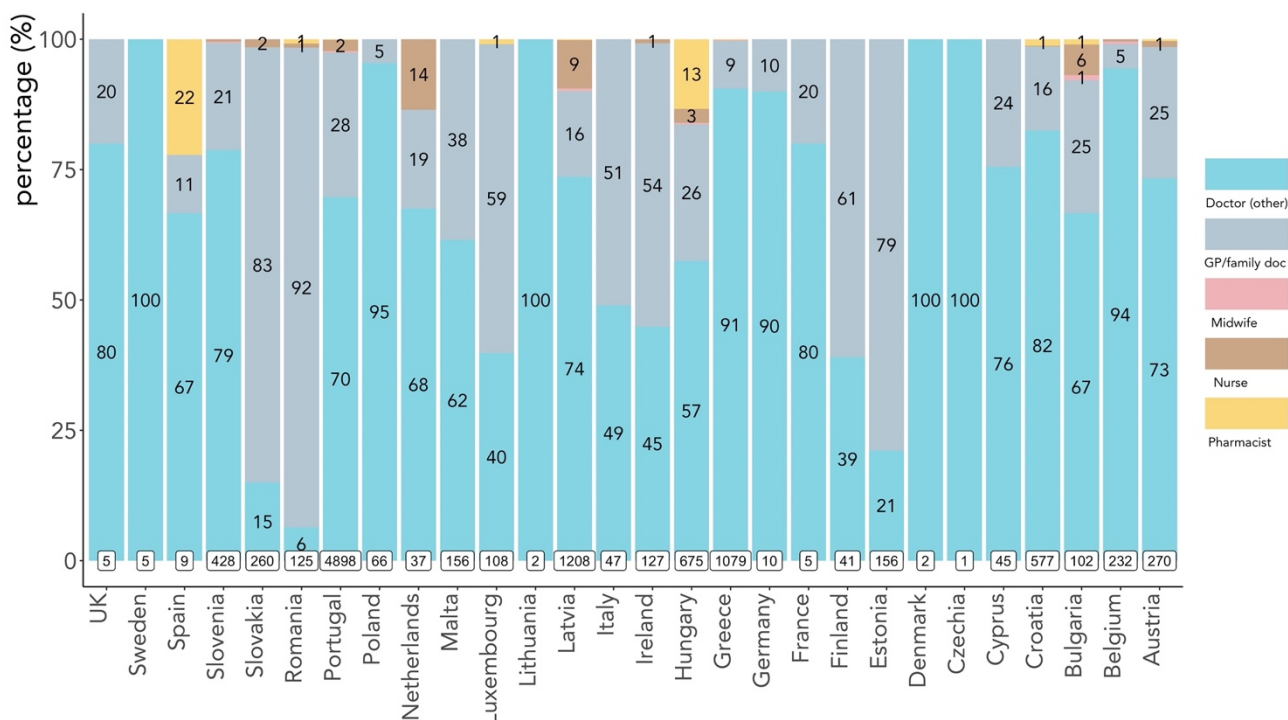
Table 3.1 Healthcare professional data collection summary

The number (N) of respondents for the GP survey and CPME survey is shown. In addition, the number of GPs in the CPME survey is shown with the fieldwork dates for both surveys.

| Country | GPs: (N) | CPME: All specialisms (N) | CPME: GPs only (N) | GP Survey Fieldwork | CPME Survey Fieldwork |
|--------------|--------------|---------------------------|--------------------|---------------------|-----------------------|
| Austria | 100 | 269 | 68 | 25 Mar – 9 Apr | 27 Apr – 27 May |
| Belgium | 100 | 232 | 11 | 3 Apr– 4 May | 23 Apr – 18 May |
| Bulgaria | 100 | 102 | 26 | 3 Apr – 28 Apr | 24 Apr – 8 May |
| Croatia | 100 | 576 | 93 | 8 Apr – 27 Apr | 24 Apr – 28 May |
| Cyprus | 0 | 44 | 11 | N/A | 4 May – 25 May |
| Czechia | 100 | 1 | 0 | 30 Mar – 6 May | 3 May – 4 May |
| Denmark | 100 | 2 | 0 | 1 Apr – 30 Apr | 27 Apr – 30 Apr |
| Estonia | 100 | 156 | 123 | 20 Apr – 4 May | 23 Apr – 18 May |
| Finland | 100 | 41 | 25 | 3 Apr– 76May | 24 Apr – 20 May |
| France | 100 | 5 | 1 | 20 Mar – 7 Apr | 23 Apr – 15 May |
| Germany | 100 | 9 | 0 | 20 Mar – 4 Apr | 24 Apr – 26 May |
| Greece | 100 | 1,072 | 99 | 6 Apr – 14 Apr | 24 Apr – 27 May |
| Hungary | 100 | 675 | 177 | 1 Apr – 9 Apr | 26 Apr – 22 May |
| Ireland | 100 | 127 | 69 | 16 Mar – 6 Apr | 23 Apr – 20 May |
| Italy | 100 | 47 | 24 | 23 Mar – 26 Mar | 24 Apr – 8 May |
| Latvia | 100 | 1,206 | 198 | 14 Apr – 15 Apr | 25 Apr – 28 May |
| Lithuania | 100 | 2 | 0 | 16 Apr – 23 Apr | 2 May – 20 May |
| Luxembourg | 0 | 57 | 23 | N/A | 24 Apr – 28 May |
| Malta | 0 | 117 | 42 | N/A | 2 May – 2 Jun |
| Netherlands | 100 | 36 | 6 | 30 Mar – 1 Apr | 26 Apr – 26 May |
| Poland | 100 | 65 | 3 | 26 Mar – 6 Apr | 25 Apr – 26 May |
| Portugal | 101 | 4,879 | 1,351 | 30 Mar – 2 Apr | 24 Apr – 27 May |
| Romania | 100 | 125 | 115 | 3 Apr – 16 Apr | 23 Apr – 25 May |
| Slovakia | 100 | 260 | 217 | 8 Apr – 21 Apr | 23 Apr – 13 May |
| Slovenia | 100 | 428 | 88 | 3 Apr – 23 Apr | 24 Apr – 20 May |
| Spain | 100 | 9 | 1 | 20 Mar – 26 Mar | 25 Apr – 6 May |
| Sweden | 100 | 5 | 0 | 30 Mar – 14 Apr | 25 Apr – 27 Apr |
| UK | 100 | 5 | 1 | 16 Mar – 19 Mar | 24 Apr – 11 May |
| Total | 2,501 | 10,552 | 2,772 | | |

Figure 3.1 Occupation summary in CPME survey

The number occupation summary of respondents in CPME. The number at the base of the bars denotes the total number of respondents in that country



In the entire GP sample (2,501 GPs), only 10 GPs do not agree that vaccines are important, but 32 GPs do not agree that they are safe (with five of these 32 GPs in **Croatia**). **Latvia** (88.8%) has the lowest agreement that vaccines are safe within the CPME survey (Table 3.2B).

Across most countries, fewer GPs agree that the seasonal influenza vaccine is important than agree that the MMR vaccine is important (Table 3.2B). While the level of agreement that the MMR vaccine is safe is high across the EU, noteworthy numbers of GPs in **Czechia** (20), **Hungary** (31), and **Slovakia** (21) would not be likely to recommend the MMR vaccine to patients (Table 3.3).

Confidence in the HPV vaccine has the most variability across countries (Table 3.2B). **Bulgaria** and **Romania** have the lowest percentages of GPs agreeing that the HPV

vaccine is important and safe. Only 78 GPs in Bulgaria think the HPV vaccine is important and 86 believe it to be safe. 77 GPs in Romania agree that the HPV vaccine is important, and 89 believe that it is safe.

The likelihood of GPs recommending the HPV vaccine also shows large variability, ranging from 74 GPs likely to recommend in **Slovakia** to 99 in the **UK** (Table 3.3).

The proportion of GPs likely to recommend the seasonal influenza vaccine to patients is very high across all countries. **Austria** has the most GPs (6) reporting that they would not be likely to recommend this vaccine (Table 3.3). Recommendation of the seasonal influenza vaccine to pregnant women, however, shows considerable variation across the EU, with the likelihood of recommending ranging from 18 GPs in **Bulgaria** to 97 in **Denmark**.

Figure 3.2 Overall vaccine confidence (GP sample)

The total number of GPs surveyed in each country is denoted at the bottom of each bar.

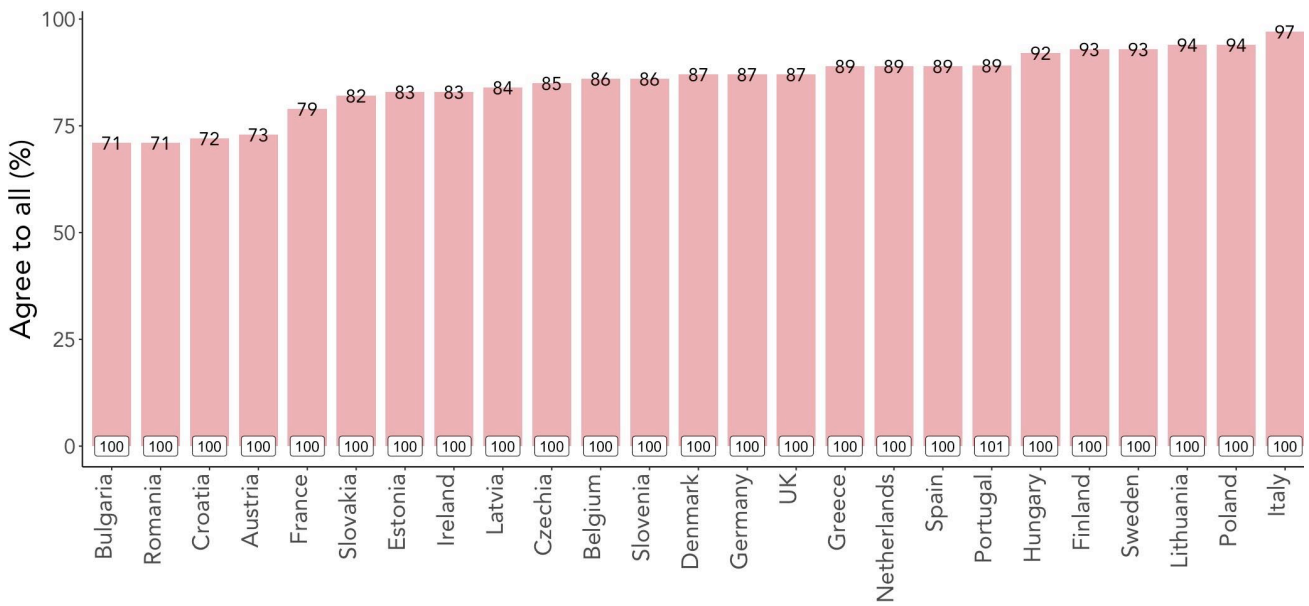


Figure 3.3 Vaccine confidence among healthcare professionals (CPME)

The total number of healthcare professionals surveyed in each country is denoted at the bottom of each bar.

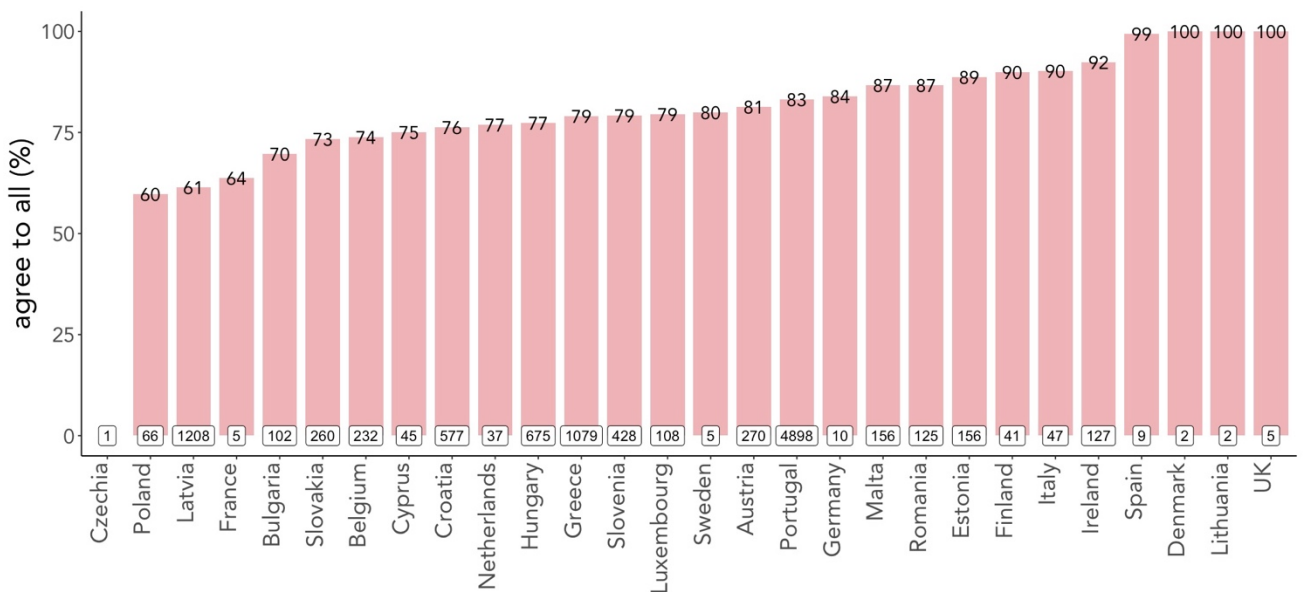


Figure 3.4 Percentage of GPs likely to recommend the MMR, seasonal influenza, and HPV vaccines (GP sample)

The total number of GPs surveyed in each country is denoted at the bottom of each bar.

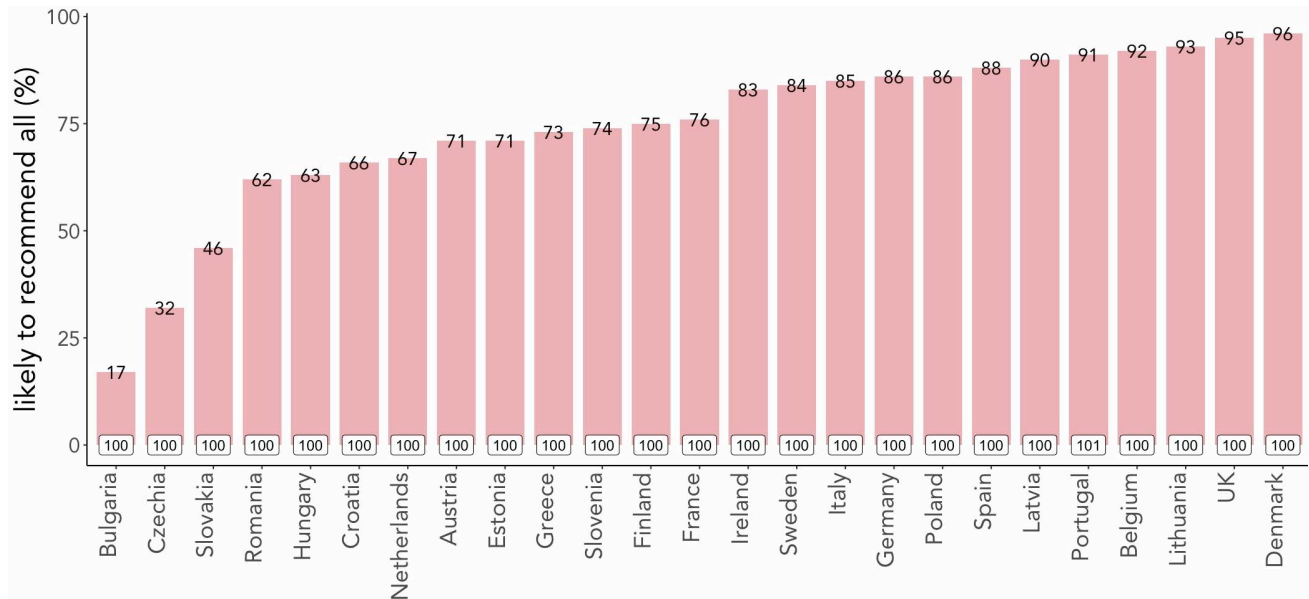


Figure 3.5 Percentage of HCPs likely to recommend MMR, seasonal influenza, and HPV vaccines (CPME sample)

The total number of healthcare professionals surveyed in each country is denoted at the bottom of each bar.

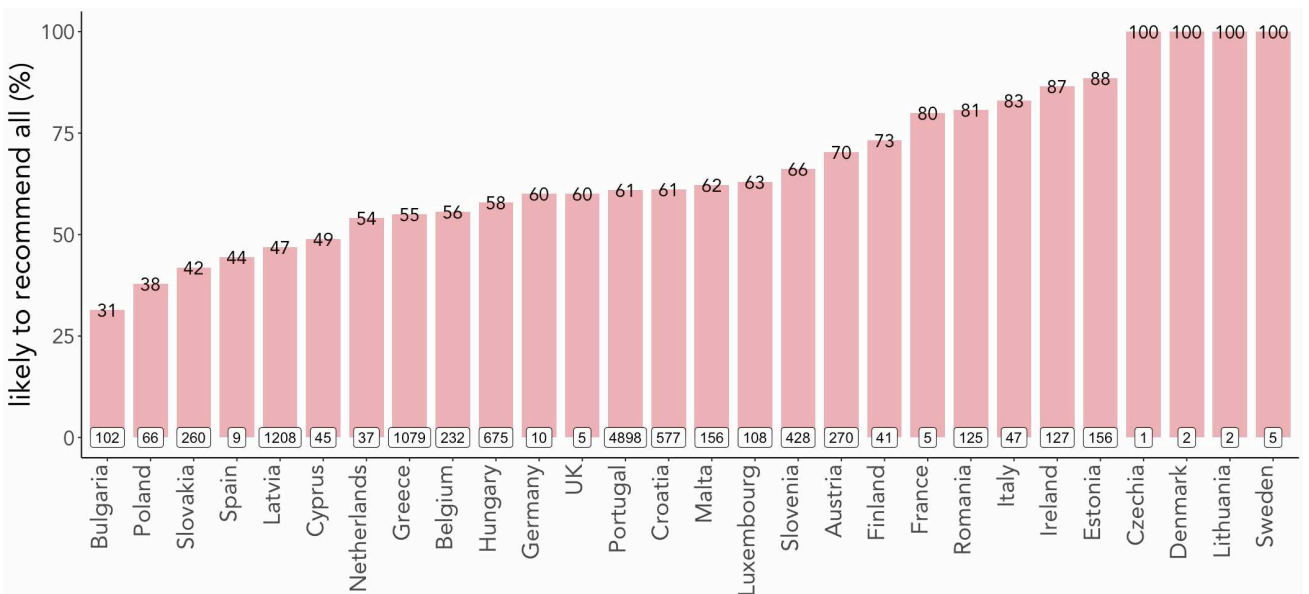


Table 3.2 (A) Percentage of healthcare professionals (GP and CPME surveys) agreeing that vaccines are important, safe, effective, and compatible with religious beliefs

A country is removed from CPME data if there are fewer than 10 respondents surveyed (see Figure 3.1).

| Rank / Country | Important for children (AGREE) | | safe (AGREE) | | effective (AGREE) | | compatible with religious beliefs (AGREE) | |
|--------------------|--------------------------------|------|--------------|------|-------------------|------|---|------|
| | GP | CPME | GP | CPME | GP | CPME | GP | CPME |
| Austria | 100 | 97.4 | 98.0 | 97.0 | 100 | 98.2 | 86.0 | 89.6 |
| Belgium | 100 | 99.1 | 100 | 98.7 | 99.0 | 99.6 | 92.0 | 90.5 |
| Bulgaria | 100 | 97.1 | 99.0 | 93.1 | 100 | 96.1 | 95.0 | 96.1 |
| Croatia | 100 | 99.0 | 95.0 | 96.2 | 100 | 98.1 | 89.0 | 91.2 |
| Cyprus | - | 95.6 | - | 95.6 | - | 95.6 | - | 88.9 |
| Czechia | 99.0 | - | 98.0 | - | 100 | - | 99.0 | - |
| Denmark | 99.0 | - | 99.0 | - | 99.0 | - | 94.0 | - |
| Estonia | 99.0 | 99.4 | 99.0 | 99.4 | 99.0 | 99.4 | 91.0 | 94.9 |
| Finland | 100 | 100 | 100 | 100 | 99.0 | 100 | 99.0 | 92.7 |
| France | 100 | - | 98.0 | - | 99.0 | - | 92.0 | - |
| Germany | 100 | 100 | 100 | 100 | 100 | 100 | 91.0 | 90.0 |
| Greece | 99.0 | 98.3 | 98.0 | 95.8 | 100 | 97.6 | 96.0 | 89.0 |
| Hungary | 100 | 98.5 | 100 | 97.5 | 100 | 98.4 | 96.0 | 93.9 |
| Ireland | 99.0 | 99.2 | 99.0 | 99.2 | 99.0 | 99.2 | 89.0 | 90.6 |
| Italy | 100 | 100 | 99.0 | 100 | 100 | 100 | 98.0 | 93.6 |
| Latvia | 100 | 94.1 | 100 | 88.8 | 98.0 | 93.0 | 99.0 | 95.1 |
| Lithuania | 100 | - | 100 | - | 100 | - | 99.0 | - |
| Luxembourg | - | 100 | - | 99.1 | - | 100 | - | 87.0 |
| Malta | - | 100 | - | 98.1 | - | 99.4 | - | 96.2 |
| Netherlands | 98.0 | 97.3 | 98.0 | 97.3 | 99.0 | 97.3 | 98.0 | 83.8 |
| Poland | 100 | 100 | 99.0 | 95.5 | 100 | 98.5 | 97.0 | 89.4 |
| Portugal | 100 | 99.7 | 100 | 99.0 | 100 | 99.3 | 92.1 | 91.1 |
| Romania | 100 | 98.4 | 99.0 | 100 | 100 | 99.2 | 99.0 | 97.6 |
| Slovakia | 100 | 98.9 | 97.0 | 98.1 | 100 | 97.7 | 98.0 | 95.0 |
| Slovenia | 100 | 97.9 | 99.0 | 96.3 | 99.0 | 98.1 | 89.0 | 92.1 |
| Spain | 100 | - | 97.0 | - | 98.0 | - | 97.0 | - |
| Sweden | 99.0 | - | 100 | - | 99.0 | - | 97.0 | - |
| UK | 98.0 | - | 97.0 | - | 98.0 | - | 93.0 | - |

Table 3.2 (B) Percentage of healthcare professionals (GP and CPME surveys) agreeing that the MMR, seasonal influenza, and HPV vaccines are important and safe

A country is removed from CPME data if there are fewer than 10 respondents surveyed (see Figure 3.1).

| Rank / Country | MMR vaccine is important (AGREE) | | MMR vaccine is safe (AGREE) | | seasonal influenza vaccine important (AGREE) | | seasonal influenza vaccine safe (AGREE) | | HPV vaccine important (AGREE) | | HPV vaccine safe (AGREE) | |
|-----------------|----------------------------------|------|-----------------------------|------|--|------|---|------|-------------------------------|------|--------------------------|------|
| | GP | CPME | GP | CPME | GP | CPME | GP | CPME | GP | CPME | GP | CPME |
| Austria | 99.0 | 97.0 | 98.0 | 97.8 | 91.0 | 91.9 | 97.0 | 94.5 | 94.0 | 92.6 | 93.0 | 94.1 |
| Belgium | 100 | 99.1 | 98.0 | 98.7 | 99.0 | 89.2 | 100 | 96.1 | 98.0 | 94.0 | 98.0 | 94.4 |
| Bulgaria | 98.0 | 98.0 | 99.0 | 97.1 | 95.0 | 78.4 | 97.0 | 82.4 | 78.0 | 78.4 | 86.0 | 84.3 |
| Croatia | 100 | 98.4 | 92.0 | 98.4 | 95.0 | 93.1 | 94.0 | 95.3 | 86.0 | 89.8 | 98.0 | 91.0 |
| Cyprus | - | 95.6 | - | 95.6 | - | 88.9 | - | 93.3 | - | 86.7 | - | 91.1 |
| Czechia | 97.0 | - | 97.0 | - | 100 | - | 99.0 | - | 93.0 | - | 94.0 | - |
| Denmark | 100 | - | 100 | - | 97.0 | - | 98.0 | - | 100 | - | 99.0 | - |
| Estonia | 99.0 | 99.4 | 100 | 99.4 | 97.0 | 98.7 | 97.0 | 100 | 91.0 | 96.8 | 91.0 | 97.4 |
| Finland | 100 | 100 | 100 | 100 | 97.0 | 100 | 99.0 | 100 | 99.0 | 100 | 99.0 | 100 |
| France | 99.0 | - | 97.0 | - | 97.0 | - | 98.0 | - | 90.0 | - | 91.0 | - |
| Germany | 100 | 100 | 100 | 100 | 99.0 | 100 | 99.0 | 100 | 96.0 | 90.0 | 95.0 | 90.0 |
| Greece | 98.0 | 98.5 | 99.0 | 98.2 | 97.0 | 94.6 | 95.0 | 95.3 | 94.0 | 91.8 | 95.0 | 93.8 |
| Hungary | 100 | 98.5 | 99.0 | 97.8 | 100 | 83.4 | 100 | 89.8 | 97.0 | 91.4 | 99.0 | 91.9 |
| Ireland | 98.0 | 100 | 96.0 | 100 | 96.0 | 99.2 | 97.0 | 100 | 98.0 | 100 | 98.0 | 100 |
| Italy | 99.0 | 100 | 100 | 100 | 100 | 97.9 | 100 | 97.9 | 100 | 97.9 | 100 | 100 |
| Latvia | 99.0 | 92.1 | 100 | 90.2 | 95.0 | 75.1 | 97.0 | 81.1 | 93.0 | 72.4 | 92.0 | 76.1 |
| LT | 99.0 | - | 99.0 | - | 99.0 | - | 97.0 | - | 99.0 | - | 98.0 | - |
| LU | - | 100 | - | 100 | - | 96.3 | - | 97.2 | - | 92.6 | - | 94.4 |
| Malta | - | 100 | - | 99.4 | - | 93.0 | - | 94.9 | - | 96.2 | - | 98.1 |
| NL | 100 | 97.3 | 100 | 94.6 | 95.0 | 91.9 | 99.0 | 91.9 | 98.0 | 94.6 | 99.0 | 97.3 |
| Poland | 99.0 | 93.9 | 100 | 93.9 | 98.0 | 81.8 | 99.0 | 84.8 | 99.0 | 83.3 | 99.0 | 89.4 |
| Portugal | 100 | 99.7 | 99.0 | 99.4 | 99.0 | 94.0 | 100 | 96.0 | 99.0 | 96.6 | 98.0 | 97.6 |
| Romania | 99.0 | 99.2 | 97.0 | 97.6 | 99.0 | 96.0 | 100 | 96.0 | 77.0 | 94.4 | 89.0 | 96.0 |
| Slovakia | 97.0 | 95.8 | 97.0 | 96.2 | 98.0 | 90.4 | 98.0 | 92.7 | 92.0 | 89.6 | 93.0 | 89.6 |
| Slovenia | 99.0 | 96.7 | 99.0 | 95.8 | 98.0 | 94.2 | 98.0 | 94.6 | 98.0 | 90.7 | 99.0 | 91.1 |
| Spain | 99.0 | - | 99.0 | - | 98.0 | - | 98.0 | - | 95.0 | - | 96.0 | - |
| Sweden | 100 | - | 100 | - | 99.0 | - | 100 | - | 98.0 | - | 99.0 | - |
| UK | 100 | - | 99.0 | - | 98.0 | - | 99.0 | - | 99.0 | - | 98.0 | - |

Table 3.3 Percentage of healthcare professionals (GP and CPME samples) reporting that they would be likely to recommend the MMR, seasonal influenza, and HPV vaccines to patients

A country is removed from CPME data if there are fewer than 10 respondents surveyed (see Figure 3.1).

| Rank / Country | MMR vaccine to patients (LIKELY) | | seasonal influenza vaccine to patients (LIKELY) | | seasonal influenza vaccine to pregnant women (LIKELY) | | HPV vaccine to patients (LIKELY) | |
|--------------------|----------------------------------|------|---|------|---|------|----------------------------------|------|
| | GP | CPME | GP | CPME | GP | CPME | GP | CPME |
| Austria | 99.0 | 97.4 | 94.0 | 93.7 | 73.0 | 71.9 | 90.0 | 93.3 |
| Belgium | 98.0 | 94.8 | 97.0 | 81.9 | 92.0 | 66.8 | 97.0 | 90.1 |
| Bulgaria | 96.0 | 96.1 | 95.0 | 81.4 | 18.0 | 33.3 | 75.0 | 78.4 |
| Croatia | 100 | 94.3 | 99.0 | 93.1 | 68.0 | 66.6 | 97.0 | 81.8 |
| Cyprus | - | 82.2 | - | 86.7 | - | 55.6 | - | 80.0 |
| Czechia | 80.0 | - | 99.0 | - | 47.0 | - | 68.0 | - |
| Denmark | 100 | - | 100 | - | 97.0 | - | 98.0 | - |
| Estonia | 98.0 | 98.7 | 96.0 | 99.4 | 75.0 | 91.0 | 89.0 | 95.5 |
| Finland | 91.0 | 87.8 | 98.0 | 97.6 | 82.0 | 85.4 | 90.0 | 87.8 |
| France | 97.0 | - | 97.0 | - | 84.0 | - | 89.0 | - |
| Germany | 100 | 100 | 100 | 100 | 87.0 | 70.0 | 96.0 | 90.0 |
| Greece | 91.0 | 88.6 | 97.0 | 93.2 | 85.0 | 62.9 | 91.0 | 78.1 |
| Hungary | 69.0 | 89.8 | 100 | 84.9 | 93.0 | 63.7 | 97.0 | 84.0 |
| Ireland | 98.0 | 98.4 | 96.0 | 99.2 | 88.0 | 89.8 | 98.0 | 95.3 |
| Italy | 98.0 | 100 | 100 | 100 | 86.0 | 85.1 | 100 | 91.5 |
| Latvia | 98.0 | 80.3 | 98.0 | 72.3 | 94.0 | 58.6 | 94.0 | 64.7 |
| Lithuania | 98.0 | - | 100 | - | 95.0 | - | 98.0 | - |
| Luxembourg | - | 92.6 | - | 95.4 | - | 72.2 | - | 85.2 |
| Malta | - | 99.4 | - | 93.6 | - | 66.0 | - | 89.1 |
| Netherlands | 99.0 | 91.9 | 100 | 91.9 | 68.0 | 56.8 | 98.0 | 78.4 |
| Poland | 100 | 78.8 | 100 | 77.3 | 90.0 | 45.5 | 94.0 | 57.6 |
| Portugal | 100 | 93.4 | 100 | 92.5 | 92.1 | 64.5 | 98.0 | 86.0 |
| Romania | 92.0 | 100 | 99.0 | 99.2 | 74.0 | 83.2 | 87.0 | 95.2 |
| Slovakia | 79.0 | 91.9 | 97.0 | 92.3 | 62.0 | 45.4 | 74.0 | 83.5 |
| Slovenia | 95.0 | 93.0 | 97.0 | 91.8 | 83.0 | 73.1 | 94.0 | 81.8 |
| Spain | 98.0 | - | 98.0 | - | 94.0 | - | 92.0 | - |
| Sweden | 100 | - | 100 | - | 85.0 | - | 98.0 | - |
| UK | 100 | - | 99.0 | - | 96.0 | - | 99.0 | - |

Associations between vaccine confidence and socio-demographics

Associations between healthcare professional demographic characteristics (sex, age, and healthcare professional profession) and overall vaccine confidence (**An overall confidence metric**, page 10) in are shown in Table 3.5 (blue). Associations between healthcare professional demographic characteristics and whether GPs would recommend all vaccines are also shown in Table 3.5 (orange).

For this analysis, data from the GP and CPME surveys are pooled together as the same demographic characteristics were collected for all respondents across both datasets. Associations between demographics and confidence are again given as odds ratios. Only odds ratios whose 95% credible interval excludes one are stated.

Across all countries, there is no observed difference between overall vaccine confidence between males and females among healthcare workers surveyed.

An association between age and vaccine confidence is only found in seven countries. When an effect is found between age and vaccine confidence, the results are more mixed than with the general public. 65s and over are more confident in vaccines than 55-64-year-olds in **Hungary, Latvia, and Poland**; are more confident than 18-24-year-olds in **Greece and Hungary**; and more confident than 25-44-year olds in **Bulgaria** (Table 3.5, blue).

Unlike in the general public, where no younger age group was found to be more confident than over 65s, 18-24-year-old healthcare professionals are more confident in vaccines than over 65s in **Portugal**. Further, 55-64-year

old healthcare professionals are more confident than those over 65s in **Austria** (Table 3.5, blue).

With regard to profession, other doctors are less likely than GPs to agree to all vaccine confidence statements in **Hungary, Latvia, and Portugal** (Table 3.5, blue).

With regards to being likely to recommend MMR, HPV, and the seasonal influenza vaccines to patients (and pregnant women, in the case of seasonal influenza), females are less likely to recommend all vaccines than males in **Bulgaria and Italy**. Interestingly, 55-64-year olds are substantially less likely to recommend all vaccines than over 65s in ten countries. In **Portugal**, younger age groups (18-34-year olds) are more likely than over 65-year olds to recommend all stated vaccines.

Other doctors in **Hungary, Latvia, and Portugal** are less likely to recommend all vaccines than GPs.

Table 3.5 Associations between socio-demographic factors and vaccine confidence and likelihood to recommend vaccines

| | Determinants of vaccine confidence metric | | | | | | | Determinants of likelihood to recommend the MMR, seasonal influenza ⁵ , and HPV vaccines | | | | | | |
|----------|---|-------------|-------------|-------------|-------------|-------------|--|---|-------------|-------------|-------------|-------------|-------------|--|
| | Female v Male | 18-24 v 65+ | 25-34 v 65+ | 35-44 v 65+ | 45-54 v 65+ | 55-64 v 65+ | Doctor (other) v GPs Other HCP v GP | Female v Male | 18-24 v 65+ | 25-34 v 65+ | 35-44 v 65+ | 45-54 v 65+ | 55-64 v 65+ | Doctor (other) v GPs Other HCP v GP |
| Austria | - | - | - | - | - | 2.39 | - | - | - | - | - | - | - | - |
| Belgium | - | - | - | - | - | - | - | - | - | - | 2.45 | - | 0.14 | - |
| Bulgaria | - | - | - | 0.41 | - | - | - | - | 0.45 | - | - | - | - | 0.45 |
| Croatia | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cyprus | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Czechia | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Denmark | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Estonia | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Finland | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| France | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Germany | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Greece | - | 0.53 | - | - | - | - | - | - | - | - | - | - | 0.36 | - |
| Hungary | - | 0.56 | - | - | - | 0.49 | 0.31 | - | - | 0.37 | - | - | 0.70 | 0.51 |
| Ireland | - | - | - | - | - | - | - | - | - | - | - | - | 0.27 | - |
| Italy | - | - | - | - | - | - | - | - | 0.38 | - | - | - | - | 0.38 |
| Latvia | - | - | - | - | - | 0.25 | 0.25 | - | - | 3.02 | - | - | 0.08 | 0.12 |
| LT | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| LU | - | - | - | - | - | - | - | - | - | - | - | - | 0.54 | - |
| Malta | - | - | - | - | - | - | - | - | - | - | - | - | 0.51 | - |
| NL | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Poland | - | - | - | - | - | 0.34 | - | - | - | - | - | - | 0.11 | - |
| Portugal | - | 1.32 | - | - | - | - | 0.43 | - | - | 1.72 | 1.56 | - | 0.26 | 0.48 |
| Romania | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Slovakia | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Slovenia | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Spain | - | - | - | - | - | - | - | - | - | - | - | - | 0.34 | - |
| Sweden | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| UK | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

⁵ Includes whether a healthcare professional is also likely to recommend the flu vaccine to pregnant women

Comparison between healthcare professionals and the public



Chapter 4: Comparison between healthcare professionals and the public

Summary and Key Findings

In this chapter, the relationship between confidence among healthcare professionals and the general public is examined.

- A strong association is found between the percentage of the public with high confidence in the safety and effectiveness of vaccines and the percentage of healthcare professional (CPME sample), such that countries with higher healthcare professional confidence in the safety and effectiveness of vaccines tend to have a general public with high confidence in the safety of vaccines
- This relationship is also evident for public and healthcare professional (CPME) perceptions towards the safety and importance of the HPV vaccine

Introduction

While the effect of HCPs recommendations on patients' acceptance of vaccination is evident (Habersaat & Jackson, 2020), less is known about the influence of HCPs' own levels of confidence in vaccination on their patients' perceptions. Evaluating how HCPs' confidence in and recommendations of vaccination may impact public confidence in vaccination is crucial, especially for understanding possible consequences on vaccine uptake.

In this chapter, correlative studies are performed to assess whether countries with higher vaccine confidence among the public also have healthcare professionals with higher confidence. Although we do not test for a causal relationship, further work could examine the full extent of this relationship.

Overall healthcare professional confidence versus public confidence

Correlative studies are performed to assess whether countries with higher confidence among the general population also have higher vaccine confidence among the healthcare professionals of that country.

In the first part of this study, overall confidence (**An overall confidence metric**, page 10) among the general public is plotted against overall healthcare professionals confidence and, separately, against the percentage of healthcare professionals who would be likely to recommend all vaccines. In total there are four correlations performed:

- 1) Between overall GP confidence and overall public confidence (Figure 4.1A);

- 2) Between overall HCP confidence (CPME survey) and overall public confidence (Figure 4.1C);
- 3) Between GP likelihood to recommend all vaccines and public confidence (Figure 4.1B);
- 4) Between HCP likelihood to recommend all vaccines and public confidence (CPME survey) (Figure 4.1D).

Correlation is measured via a Bayesian coefficient of determination (or R^2) which like the classic R^2 , is a number between -1 and +1, and gives the strength of association between two variables, ranging from a perfect anti-correlation (-1) to a perfect correlation (+1) (Gelman et al., 2019).

There is weak evidence to suggest that countries with higher public confidence in vaccines have more confident healthcare professionals (CPME survey: $R^2 = 0.20$ [10^{-9} , 0.45]; GP survey: $R^2 = 0.22$ [10^{-9} , 0.46]). (see Figure 4.1A and C.)

There is also weak evidence to suggest that countries with higher public confidence have a higher proportion of healthcare professionals likely to recommend all vaccines (CPME survey; $R^2 = 0.19$, [10^{-11} , 0.43]) (Figure 4.1D).

However, there is some evidence to suggest that countries with higher overall vaccine confidence within the public also have GPs who are more confident in vaccines (GP sample: $R^2 = 0.30$, [0.02, 0.57]; see Figure 4.1B).

Vaccine-specific correlations

To examine the extent to which vaccine-specific views correlate between healthcare professionals and the public, the coefficient of determination is also calculated between:

- 1) GPs and the public for agreement to each of the ten vaccine survey items (Table 4.1, GP column);
- 2) Healthcare professionals in the CPME sample and the public for agreement to the ten vaccine confidence survey items (Table 4.1, CPME column);
- 3) GPs and HCPs likelihood to recommend each vaccine and public agreement that each vaccine was important or safe.

Strong evidence was found to suggest that countries with a high proportion of healthcare professionals agreeing that the HPV vaccine is safe also had very HPV-confident populations. (This effect was found for both the CPME and GP survey independently – see Table 4.1).

There was also strong evidence to suggest that countries with higher proportions of healthcare professionals (CPME survey only) agreeing that vaccines are safe and effective also have populations who believe that vaccines are safe and effective.

A likely limitation in finding strong associations between GP agreement to each of the 10 statements and public agreement is due to the very high percentage of GPs agreeing with all statements across all countries

Table 4.1 Correlation between vaccine confidence among healthcare professionals and the general public across all confidence survey items

An example: the coefficient of determination of 0.46 (0.13, 0.73) between confidence in the safety of vaccines among the general public and healthcare providers. This suggests that countries with higher HCP confidence in the safety of vaccines have a public with higher confidence in the safety of vaccines.

| | GPs | HCP (CPME sample) |
|---|---------------------------------|---------------------------------|
| | R ² and 95% HPD | R ² and 95% HPD |
| vaccines are important | 0.07 (10 ⁻¹⁰ , 0.26) | 0.20 (10 ⁻⁰⁹ , 0.46) |
| vaccines are safe | 0.11 (10 ⁻⁰⁹ , 0.32) | <u>0.46 (0.13, 0.73)</u> |
| vaccines are effective | 0.20 (10 ⁻¹⁰ , 0.49) | <u>0.68 (0.41, 0.87)</u> |
| vaccines compatible with religion | 0.18 (10 ⁻¹¹ , 0.46) | 0.06 (10 ⁻¹² , 0.20) |
| MMR vaccine is important | 0.09 (10 ⁻¹⁰ , 0.28) | 0.13 (10 ⁻¹⁰ , 0.36) |
| MMR vaccine is safe | 0.04 (10 ⁻¹⁰ , 0.16) | 0.23 (10 ⁻⁰⁹ , 0.47) |
| seasonal influenza vaccine important | 0.07 (10 ⁻⁰⁹ , 0.24) | 0.26 (10 ⁻⁰⁸ , 0.51) |
| seasonal influenza vaccine safe | 0.05 (10 ⁻¹⁰ , 0.17) | 0.23 (10 ⁻⁰⁷ , 0.49) |
| HPV vaccine is important | 0.20 (10 ⁻⁰⁸ , 0.50) | <u>0.59 (0.28, 0.83)</u> |
| HPV vaccine is safe | <u>0.47 (0.09, 0.77)</u> | <u>0.67 (0.41, 0.87)</u> |

Figure 4.1 Association between healthcare professional and public vaccine confidence

Relationship between public and healthcare professional vaccine confidence is shown for the GP survey (A) and the CPME survey (C). The relationship between overall public confidence and the proportion of healthcare professionals who would be likely to recommend all vaccines is also shown for the GP survey (B) and CPME survey (D).

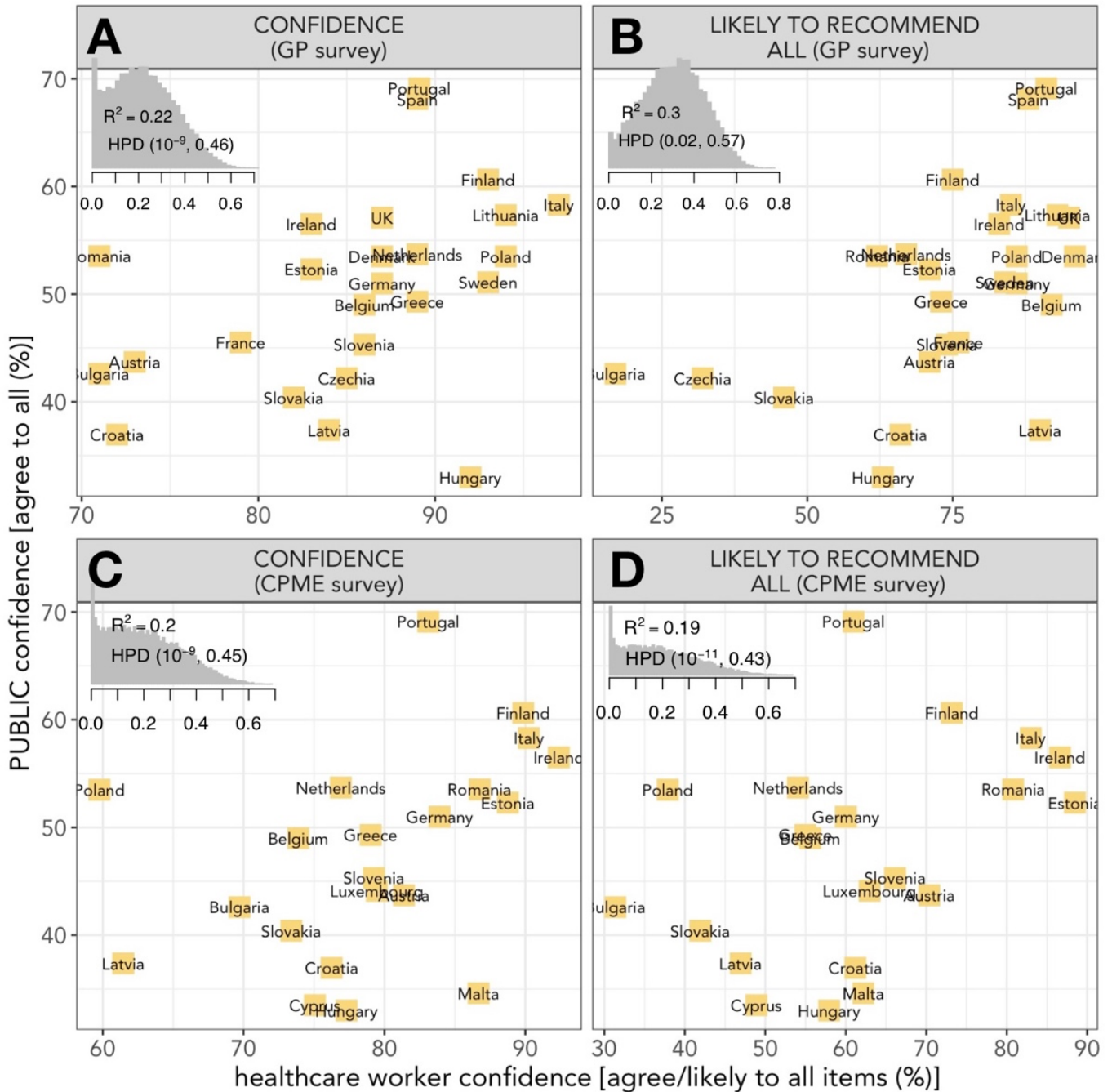
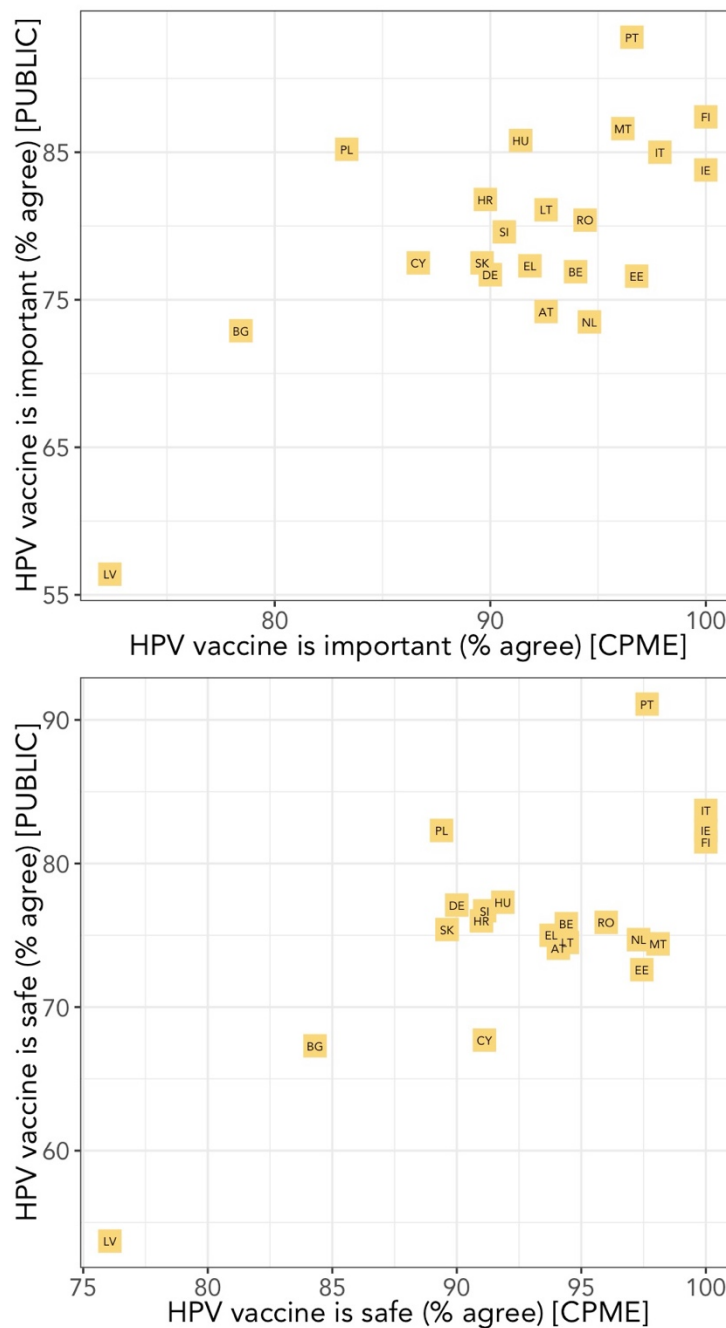


Figure 4.2 Correlation between level of agreement that the HPV vaccine is important and safe between healthcare professionals (CPME) and the public

Countries whose healthcare professionals have a higher level of agreement that the HPV is important (top) and safe (below) also have a more confident public. (Data from CPME survey.) EU+UK country codes are used for figure clarity: Austria (AT), Belgium (BE), Bulgaria (BG), Croatia (HR), Cyprus (CY), Czechia (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (EL), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Luxembourg (LU), Malta (MT), Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE), and the United Kingdom (UK).



A photograph of a group of people in a meeting. In the foreground, a man with dark skin and short hair is seen from the back, wearing a teal shirt. To his left, a man with light skin is seen in profile, looking towards the right. In the background, another person is visible, holding a smartphone. A white semi-transparent overlay covers the upper portion of the image, featuring the word "Discussion" in a bold, dark blue font, underlined with a teal line.

Discussion

Chapter 5: Discussion and interpretation of Results

Main Findings

The State of Vaccine Confidence in the EU+UK 2020 report shows that large majority of the EU+UK public surveyed have high confidence in vaccines. Compared to 2018, a growing majority of the EU+UK public agrees that vaccines are important (92%, an increase of 3% since 2018), effective (90%, an increase of 3%), safe (87%, an increase of 5%) and compatible with their religion (79%, an increase of 2%).

National differences and changes in vaccine confidence since 2018

Portugal and Spain have the highest overall confidence in 2020 according to the confidence metric (see [An overall confidence metric](#), page 10), despite some losses in the overall agreement that vaccines are effective in Portugal (-4.2% since 2018) and important in Spain (-4.2% since 2018) (see Table 2.2A and Figures 2.5 and 2.6). Other countries with high confidence in vaccination include the UK, Finland and Lithuania (see Figure 2.4, Table 2.2 A and B, and Figures 2.5 to 2.8). Further research is needed to explain what factors contribute to the resilience of vaccination programmes, particularly in countries such as Lithuania that are bordered by countries with lower confidence in vaccination.

Findings from this 2020 study show that Hungary, Malta and Cyprus have the lowest confidence in vaccines across the EU+UK according to the confidence metric. While other countries were found to have lower confidence for specific items or vaccines, the confidence metric highlights countries with more generalised low confidence in vaccines. Understanding the factors that influence

confidence in vaccination across all questions compared to specific items or vaccines is important and the reasons behind the low confidence levels identified in these countries should be investigated further.

Despite increases in vaccine confidence since 2018 (see Figure 2.4), many Eastern European countries still rank particularly low in terms of confidence in the safety, importance and effectiveness of vaccines, including Romania Slovakia, and Slovenia. It is important to continue monitoring confidence in Eastern Europe to understand future trends in confidence. Further research should also be conducted to understand what is driving the observable increase.

Confidence was found – in many cases – to have large increases and falls in the two years since the 2018 report. This variability highlights the need for constant monitoring of confidence levels to allow rapid responses and mitigate negative outcomes. The Netherlands has seen a considerable decrease in confidence in the safety and effectiveness of vaccines in general since 2018. In-depth research should be conducted to understand the factors behind this decrease to avoid possible impacts on vaccine coverage rates. Furthermore, in the 2018 State of Vaccine Confidence report, Poland was identified with decreases in confidence across all questions and particularly low confidence in vaccine safety and effectiveness (Larson, H. J., de Figueiredo, A., Karafillakis, E., Rawal, 2018). However, since 2018, confidence has increased significantly across all eight confidence survey items (Table 2.2 A and B) and is one of the most confident countries in the HPV vaccination (Table 2.2B, Figure 2.9), despite the vaccine not being included as part of the national immunisation programme (Ganczak et al., 2018).

France also observed an increase in confidence in the safety of vaccination, a consistent trend over the past five years (de Figueiredo 2020). However, France remains one of the countries with the lowest confidence in the safety of vaccines, showing that rebuilding trust requires a long time and continuous efforts.

Socio-demographics and vaccine confidence

While the impact of socio-demographics on vaccine confidence vary by country, females and younger age groups were found to be less confident in vaccination in many countries. These trends reflect findings from the 2018 study. As young women and are often key decision-makers for childhood vaccination, these results should be investigated further to find specific confidence barriers to vaccinating among this socio-demographic group.

Confidence in the MMR, influenza and HPV vaccines

This study shows a substantial rise in the percentage of the EU+UK public surveyed agreeing that the seasonal influenza vaccine is important (77%, an increase of 10% since 2018) and safe (80%, an increase of 9% since 2018). Confidence in HPV vaccination is generally lower than confidence in MMR and seasonal influenza vaccination.

Differences between general vaccine confidence and confidence in the MMR, influenza and HPV vaccines

There are striking differences in the confidence towards the four core VCI questions and confidence in the MMR, influenza or HPV vaccines. For example, confidence in the influenza vaccination is particularly low in

Slovakia and Czechia. In Slovakia, 62.6% of respondents agreeing that the seasonal influenza vaccine is important, with only 71.5% agreeing that is safe. In Czechia, these values are 63.3% and 73.0%, respectively. These numbers are among the lowest across the EU+UK (see Table 2.2B), while their agreement that vaccines are important and safe are 93.6% and 83.9% in Czechia and 91.5% and 82.7% in Slovakia (respectively). These differences between general perceptions towards vaccines and to the HPV vaccine specifically point to the important role of context in vaccine confidence, with specific events or information impacting confidence in certain vaccines differently in certain countries.

Increasing confidence in influenza vaccine: the possible impact of COVID-19

Since 2018, confidence in both the safety and importance of influenza vaccination has increased greatly in almost all countries. As the 2020 data was collected in the midst of the COVID-19 pandemic, the increase in confidence in influenza vaccination may have been influenced by the early descriptions of the symptoms of COVID-19 as flu-like (Shahsavari, S, Pavan, H, Tangherlini, T, Roychowdhury, 2020). As new vaccines for COVID-19 are being researched, there have been many comparisons between a COVID-19 vaccine and the seasonal influenza jab (Krittanawong et al., 2020). It is possible that a heightened level of awareness and perceived severity of COVID-19 has had an impact on perceptions around influenza and influenza vaccination. More research is needed to fully understand this association. Additional research could also be used to understand why confidence towards the seasonal influenza vaccine did not increase in Romania and Hungary and whether this may have any consequences for the introduction of a novel COVID-19 vaccine.

HPV vaccination: lower confidence than for other vaccines across Europe

Confidence in HPV vaccination was found to be lower than in MMR or influenza vaccination, even in countries with higher confidence in the core VCI questions such as Scandinavian countries. Despite drops in HPV vaccine coverage in 2014 following the spread of rumours around the vaccine's safety (Hansen et al., 2020), Denmark is now one of the most confident country in the EU+UK for HPV importance and safety (see Table 2.3). Ireland, which suffered from similar challenges (Corcoran et al., 2018) is also among the countries with the highest confidence in the safety and importance of HPV vaccination. These findings could be evidence of the strong response that both health authorities took, together with successful communication and engagement campaigns (Corcoran et al., 2018). Furthermore, a notable proportion of participants responded that they "do not know" whether the HPV vaccine was important or safe, which could confirm what has been shown in other studies, that HPV is still perceived as a vaccine for which evidence around its safety and effectiveness remains sparse (Karafillakis et al., 2019). Alternatively, these "do not know" responses could also reflect lower awareness about the vaccine, given it is administered to a specific at-risk group, and could be discussed less commonly than other vaccines.

The state of MMR vaccine confidence in Europe

The MMR vaccination was generally perceived as more important and safer than the influenza and HPV vaccinations, with participant confidence levels more closely resembling those to vaccines in general. This could indicate that participants tend to answer the core VCI questions with childhood vaccination in mind. Despite increases in confidence in the MMR vaccine (Table 2.2B, Figure 2.7), Belgium is still among

the countries with the lowest levels of MMR confidence. Belgium is also among the countries with the lowest levels of confidence in importance of vaccines in general, which should be investigated while vaccine uptake remains high in order to understand if interventions are needed to avert possible future drops in vaccine uptake.

Healthcare professional confidence in vaccination

Although confidence is high among healthcare professionals, there is some hesitancy towards recommending MMR, HPV and seasonal influenza vaccines, particularly in Eastern Europe.

National differences in HCP vaccine confidence

Confidence in vaccines among HCPs was found to be particularly high in Italy (Table 3.2A and B), which could be an effect of the COVID-19 pandemic as well as of measures taken nationally to improve confidence in vaccination such as the introduction of mandatory vaccination policies (Paolo D'Ancona et al., 2019). Other countries with particularly high confidence in vaccination among GPs include Poland and Lithuania (Table 3.2A and B). In the CPME survey, the highest levels of confidence were found in Ireland and Finland (Table 3.2 A and B).

While GP confidence in the importance, safety and effectiveness of vaccines was above 95% in all countries, it was lower among HCPs surveyed in the CPME survey, most notably in Latvia and Bulgaria (Table 3.2 A and B). HCPs in the CPME survey in both countries reported lower confidence levels for other vaccines as well, with GPs in Bulgaria also found to have low confidence in the HPV vaccine. Bulgaria was also the country with the lowest percentage of GPs

and HCPs (CPME survey) that would recommend all vaccines and particularly the influenza vaccination to pregnant women. These results reflect findings from the general population, which could indicate that factors that have influenced confidence in vaccination among the general population have also affected healthcare professionals' views about vaccination. Understanding what these factors are would be essential to mitigate long-term effects on trust and vaccine uptake. Further research should also be conducted to explore whether HCPs have influenced patients' confidence in vaccination.

Differences between GPs and HCPs

While differences between GPs and other HCPs in recommending vaccines (Table 3.3) might be explained by differing professional responsibilities among healthcare professionals' (i.e. that some HCPs are not responsible for recommending some vaccines, if any), the differences in confidence observed between HCPs across countries warrant further investigation. The differences in confidence between HCPs could indicate a lack of communication around certain vaccines or the effect of common misperceptions or misinformation, for example around the importance of influenza vaccination.

HCP confidence in the MMR, influenza and HPV vaccines

Healthcare professionals' confidence in specific vaccines was lower than their confidence in vaccines in general, particularly in Eastern Europe, which mirrors findings from the general population. Many factors could explain these regional differences, from cultural and political contexts to the spread of misinformation online in Eastern European languages. A stronger understanding of these factors and their role in influencing vaccine confidence among the general population and medical professionals is

essential to help rebuild trust. Confidence in MMR vaccination among healthcare providers was generally higher than for seasonal influenza and HPV: in all but six countries (Hungary, Slovakia and Czechia, Poland, Latvia and Greece), more than 90% of GPs or HCPs responded they would recommend MMR vaccination (see Table 3.3).

HCPs in Eastern European countries were also found to have low confidence in the importance and safety of influenza vaccination (Table 3.2). Furthermore, comparable to findings from the general populations, GPs in Austria were found to have lower confidence in the importance of seasonal influenza than other European countries and to be less likely to recommend seasonal influenza vaccines to patients. While GP data was not collected in 2018, the general population in Austria was already found to have low confidence in influenza vaccination in 2018 (Larson, H. J., de Figueiredo, A., Karafillakis, E., Rawal, 2018) and studies have shown coverage rates to remain relatively low, possibly pointing to insufficient awareness and communication campaigns (Kunze, U, Böhm, G, Prager, B, Groman, 2019).

Similar to findings from the 2018 survey, the lowest levels of confidence and recommendation of vaccines among GPs were for seasonal influenza for pregnant women. Only nine countries had more than 90% of GPs recommending the vaccine (Poland, Belgium, Portugal, Hungary, Latvia, Spain, Lithuania, UK, Denmark) with particularly low results found for Bulgaria and Czechia (Table 3.3). Estonia was the only country where more than 90% of HCPs would recommend seasonal influenza vaccination to pregnant women, with particularly low recommendation rates for Bulgaria, Slovakia and Poland. Seasonal influenza vaccination policies vary widely among countries, and while these findings could reflect national policies, they should constitute a warning, particularly as countries prepare for

influenza vaccination during the COVID-19 pandemic.

Confidence in HPV vaccination among GPs and HCPs was lower than for other vaccines, echoing results from the general population. While Eastern European countries such as Romania and Bulgaria showed particularly low levels of confidence and recommendation rates, France was the only non-Eastern European country where GPs recommendations for (and confidence in) HPV vaccine safety and importance was particularly low. This is a worrying trend, especially as HPV vaccine confidence was found to be low among the general public as well and HPV vaccination coverage rates remain low compared to other European countries. Many studies have identified the reasons for low confidence in HPV vaccination in Europe, yet efforts to restore trust and improve uptake remain challenging (Karafillakis et al., 2019).

While confidence in vaccination remains high among healthcare professionals, vaccine-specific confidence and recommendations were found to be lower in certain countries. As doctors are one of the most trusted sources of information around vaccination in Europe, the impact of HCPs low confidence in vaccination on their patients and the general population could be

large. Correlations between confidence in vaccination in the public and HCPs were inconclusive, with some evidence found to suggest that countries whose HCPs had higher confidence in the HPV vaccine also had a more confident population.

Continuous monitoring of HCPs confidence levels in vaccination and recommendation practices are required, together with in-depth investigations of the reasons behind their hesitancy and mistrust.

Conclusion

Confidence in vaccination in the EU+UK remains high in 2020, both among the public and HCPs. However, this report shows that countries can experience significant changes in vaccine confidence, stressing the importance of continuous monitoring to allow rapid responses and mitigate possible effects on vaccine uptake. Preparedness is particularly important in the context of the COVID-19 pandemic, and countries facing low or decreasing vaccine confidence should take the necessary steps to rebuild confidence before a COVID-19 vaccine becomes available.

References

- Bouder, F., Way, D., Löfstedt, R., & Evensen, D. (2015). Transparency in Europe: A Quantitative Study. *Risk Analysis*. <https://doi.org/10.1111/risa.12386>
- Casara, B. G. S., Suitner, C., & Bettinsoli, M. L. (2019). Viral suspicions: Vaccine hesitancy in the web 2.0. *Journal of Experimental Psychology: Applied*. <https://doi.org/10.1037/xap0000211>
- Coombes, R. (2017). Europe steps up action against vaccine hesitancy as measles outbreaks continue. In *BMJ (Clinical research ed.)*. <https://doi.org/10.1136/bmj.j4803>
- Corcoran, B., Clarke, A., & Barrett, T. (2018). Rapid response to HPV vaccination crisis in Ireland. In *The Lancet*. [https://doi.org/10.1016/S0140-6736\(18\)30854-7](https://doi.org/10.1016/S0140-6736(18)30854-7)
- de Figueiredo, A., Simas, C., Karafillakis, E., Paterson, P., & Larson, H. J. (2020). Mapping global trends in vaccine confidence and investigating barriers to vaccine uptake: a large-scale retrospective temporal modelling study. *The Lancet*. [https://doi.org/10.1016/s0140-6736\(20\)31558-0](https://doi.org/10.1016/s0140-6736(20)31558-0)
- Ganczak, M., Owsianka, B., & Korzeń, M. (2018). Factors that predict parental willingness to have their children vaccinated against HPV in a country with low HPV vaccination coverage. *International Journal of Environmental Research and Public Health*. <https://doi.org/10.3390/ijerph15040645>
- Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). Bayesian data analysis, third edition. In *Bayesian Data Analysis, Third Edition*.
- Gelman, A., Goodrich, B., Gabry, J., & Vehtari, A. (2019). R-squared for Bayesian Regression Models. In *American Statistician*. <https://doi.org/10.1080/00031305.2018.1549100>
- Habersaat, K. B., & Jackson, C. (2020). Understanding vaccine acceptance and demand—and ways to increase them. In *Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz*. <https://doi.org/10.1007/s00103-019-03063-0>
- Hansen, P. R., Schmidtlaicher, M., & Brewer, N. T. (2020). Resilience of HPV vaccine uptake in Denmark: Decline and recovery. *Vaccine*. <https://doi.org/10.1016/j.vaccine.2019.12.019>
- Karafillakis, E., Simas, C., Jarrett, C., Verger, P., Peretti-Watel, P., Dib, F., De Angelis, S., Takacs, J., Ali, K. A., Pastore Celentano, L., & Larson, H. (2019). HPV vaccination in a context of public mistrust and uncertainty: a systematic literature review of determinants of HPV vaccine hesitancy in Europe. *Human Vaccines and Immunotherapeutics*. <https://doi.org/10.1080/21645515.2018.156443>
- 6
- Krittanawong, C., Narasimhan, B., Virk, H. U. H., Narasimhan, H., Hahn, J., Wang, Z., & Tang, W. H. W. (2020). Misinformation Dissemination in Twitter in the COVID-19 Era. In *American Journal of Medicine*. <https://doi.org/10.1016/j.amjmed.2020.07.012>
- Kunze, U, Böhm, G, Prager, B, Groman, B. (2019). Influenza vaccination in Austria: persistent resistance and ignorance to influenza prevention and control. *Central European Journal of Public Health*.
- Larson, H. J., de Figueiredo, A., Karafillakis, E., Rawal, M. (2018). *State of vaccine confidence in the EU+UK 2018*. <https://doi.org/10.2875/241099>
- Larson, H. J., de Figueiredo, A., Xiahong, Z., Schulz, W. S., Verger, P., Johnston, I. G., Cook, A. R., & Jones, N. S. (2016). The State of Vaccine Confidence 2016: Global Insights Through a 67-Country Survey. *EBioMedicine*. <https://doi.org/10.1016/j.ebiom.2016.08.042>
- Larson, H. J., Schulz, W. S., Tucker, J. D., & Smith, D. M. D. (2015). Measuring vaccine confidence: Introducing a global Vaccine Confidence Index. *PLoS Currents*. <https://doi.org/10.1371/currents.outbreaks.ce0f6177bc97332602a8e3fe7d7f7cc4>
- Paolo D'Ancona, F., D'amario, C., Maraglino, F., Rezza, G., & Iannazzo, S. (2019). The law on compulsory vaccination in Italy: An update 2 years after the introduction. *Eurosurveillance*. <https://doi.org/10.2807/1560-7917.ES.2019.24.26.1900371>
- Paterson, P., Meurice, F., Stanberry, L. R., Glismann, S., Rosenthal, S. L., & Larson, H. J. (2016). Vaccine hesitancy and healthcare providers. *Vaccine*. <https://doi.org/10.1016/j.vaccine.2016.10.042>
- Poland, G. A., & Jacobson, R. M. (2011). The age-old struggle against the antivaccinationists. In *New England Journal of Medicine*. <https://doi.org/10.1056/NEJMp1010594>
- Shahsavari, S, Pavan, H, Tangherlini, T, Roychowdhury, V. (2020). Conspiracy in the time of corona: detection of COVID-19 conspiracy theories in social media and the news. *Arxiv (Preprint)*.
- Wellcome Trust. (2019). *Wellcome Global Monitor 2018*. <https://wellcome.org/reports/wellcome-global-monitor/2018>