Strengthening Vaccination Programmes and Health Systems in the European Union: A Framework for Action

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Abstract

Vaccination is one of the most cost-effective public health interventions. However, the EU is facing increasing outbreaks of vaccine preventable diseases, with some fatal cases of measles. This paper reviews the main factors influencing vaccination uptake, and assesses measures expected to improve vaccination coverage. Obstacles to vaccination include concerns about vaccine safety and side effects, lack of trust, social norms, exposure to rumours and myths, and access barriers. Responses fall into three broad categories. Regulation, including the introduction of mandatory vaccination, can be justified but it is important to be sure that it is an appropriate solution to the existing problem and does not risk unintended consequences. Facilitation involves ensuring that there is an effective vaccination programme, comprehensive in nature, and reducing the many barriers, in terms of cost, distance, and time, to achieving high levels of uptake, especially for marginalised or vulnerable populations. Information is crucial, but whether in the form of public information campaigns or interactions between health workers and target populations, must be designed very carefully to avoid the risk of backfire. There is no universal solution to achieving high levels of vaccine uptake but rather a range or combinations of options. The choice of which to adopt in each country will depend on a detailed understanding of the problem, including which groups are most affected.

Keywords: Vaccination coverage, Immunisation, Enablers, Obstacles, Hesitancy, Policies.

Introduction

Vaccination is among the most cost-effective public health interventions available to prevent common communicable diseases. Yet, despite the availability of safe and effective vaccines against a growing range of infections and the existence of programmes to administer them, European countries continue to experience entirely preventable outbreaks, in some cases leading to fatalities.[1] These outbreaks often occur where there is a breakdown in herd immunity, whereby sufficient individuals remain susceptible to infection to allow it to spread within the population. It is therefore important to understand why existing programmes sometimes fail to achieve herd immunity. There are a number of reasons, relating to both supply (such as the effective organisation of the vaccination programme) and demand (such as vaccine hesitancy, where individuals distrust the vaccine). Consequently, the response must be tailored to the nature of the problem.

Based on a report written for the European Commission,[2] we review the main factors, both enablers and barriers, that influence vaccination uptake and suggest measures that can be expected to improve vaccination coverage.

Factors influencing vaccination coverage

At an individual level, the decision to be vaccinated can be viewed as the outcome of the individual's assessment of the benefits and costs involved. [3] Individuals will be vaccinated if their perceived benefits outweigh the perceived costs. Similarly, parents will vaccinate their children if their assessment of the benefits exceed the perceived costs of vaccination.

Individual or child vaccination provides private benefits. By being vaccinated, an individual protects herself/himself (or the parent protects her/his child) against contracting disease. The assessment of private benefit depends on i) the health loss that is anticipated from having the disease and ii) the perceived risk of contracting the disease. [4]

Individual or child immunization also generates private costs. These include monetary and non-monetary costs to the individual. Non-monetary costs include perceived adverse effects, safety concerns, discomfort, fear of injection, worries that the vaccine itself could cause the disease, and difficulties in accessing the vaccine provider due to distance or inconvenient or delayed appointments. Monetary costs include any payment for the vaccine or its administration, as well as costs of travel. There are also private opportunity costs related to taking time off from work or other activities.

However, vaccination also has social (or societal) benefits since it reduces the risk of directly infecting others and, as noted above, if the proportion of the population protected is above the herd immunity threshold, the infection is unable to spread through the population (social benefit).[5] This is a form of positive externality.

Low perceived benefits and/or high costs lead to what is known as vaccine hesitancy, defined by a WHO working group as "the delay or refusal of vaccination despite the availability of vaccine services". Key drivers of vaccine hesitancy, the so-called 3 Cs, are:[6]

- Complacency, relating to perceived low risk from vaccine preventable diseases. This leads to a low value being placed on perceived benefits.
- Low Confidence, reflecting concerns about the safety of vaccines and those who administer them, or lack of trust in them. Low confidence increases the private cost of vaccination.
- Lack of Convenience, arising when access to services is difficult, which increases the private cost of vaccination.

Importantly, benefits are delayed as protection is against possible future infection, so that differences in time preference come into play, and are uncertain, as not everyone who will be exposed to the infectious agent will become infected. Benefits for an individual are also difficult to define precisely, as the severity of any infection may range from mild to severe.[7]

There are a series of issues related to social benefits. Some individuals may fail to either recognise or accept the social benefits that vaccination has for the rest of the community (i.e., the positive externality they exert on others). Some individuals may also act strategically and "free ride", believing that if everyone else in the community is vaccinated, then the probability of an outbreak approaches to zero. [8] Such an individual will obtain the benefits from herd immunity but does not incur any costs or inconvenience associated with vaccination.

Determinants of vaccine hesitancy can be grouped in three domains: (i) Contextual influences include historic, socio-cultural, environmental and political factors, and factors that relate to the health system, the institutions involved, and the economy; (ii) Individual and group influences include factors arising from personal perceptions of the vaccine or influences from the individual's social or peer environment, especially in the online world; (iii) Vaccine and vaccination-specific issues, relating specifically to characteristics of the vaccine or the vaccination process.[9]

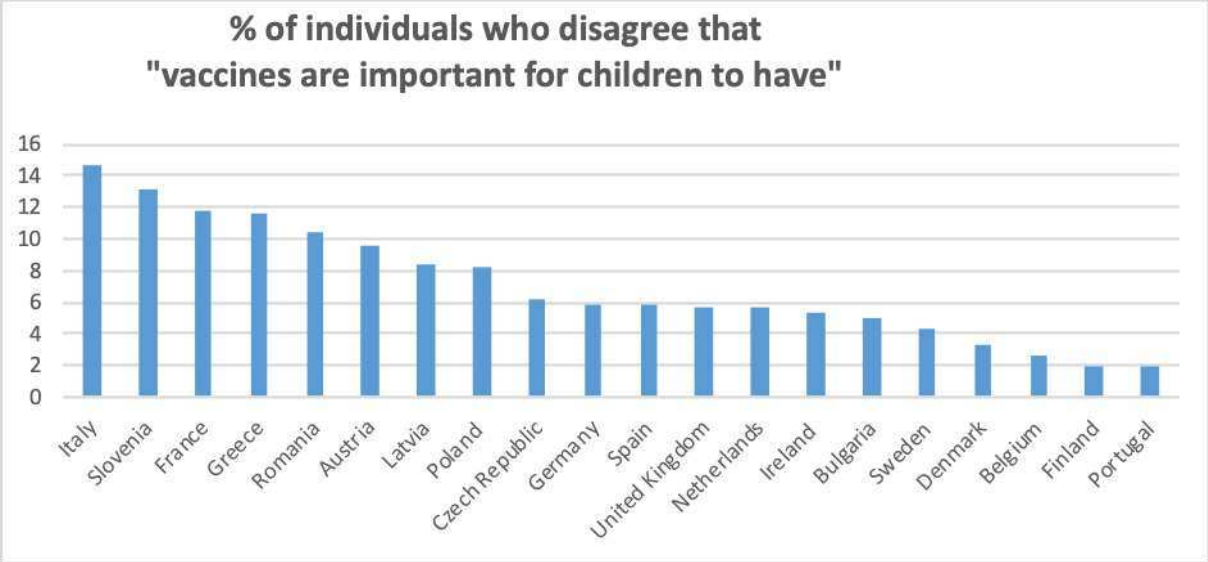
Vaccines often generate concerns that are distinct from those associated with other healthcare interventions. Individuals regularly take medicines and other treatments when they fall ill (sometimes with non-negligible side effects), but they do so for a purpose, to prevent, control, or alleviate symptoms from a condition that they know they have. Healthy individuals, in contrast, may be more reluctant to avoid what is an uncertain future health loss by being vaccinated or to otherwise act in ways that provide protective (private and social) health benefits.[3]

Vaccine hesitancy in the European Union

Rates of vaccine hesitancy vary internationally. In 2015 Larson et al reviewed data on vaccine confidence and hesitancy from surveys in 67 countries, including 65,819 individuals in total.[10] We use the same data from The State of Vaccine Confidence project but limit them to the 20 EU countries for which data are available in the public domain (thus, excluding Croatia, Estonia, Cyprus, Lithuania, Luxemburg, Hungary, Malta, and Slovakia).[10] Figures 1 and 2 show the proportion of respondents who disagree with the following statements: "Vaccines are important for children to have"; "Overall I think vaccines are safe". The category "disagree" combines those who "tend to disagree" and "strongly disagree".

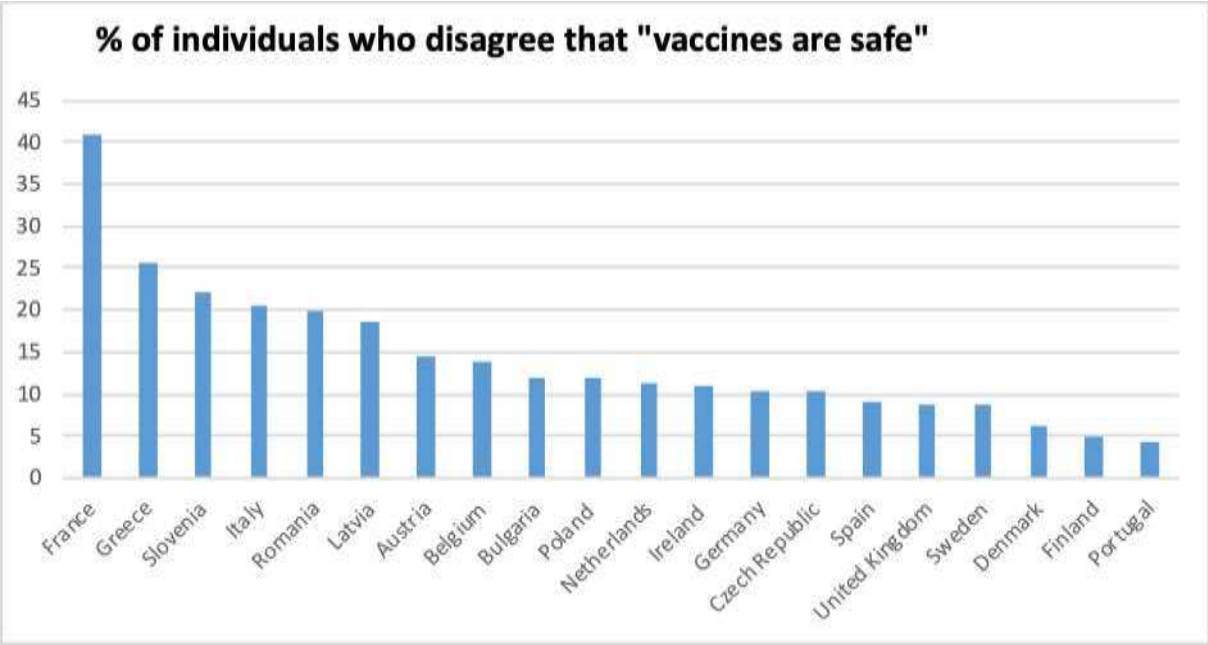
Figure 1 shows that, in 15 of the 20 countries, less than 10% of respondents disagreed with the statement that vaccines are important for children to have, five of which had less than 5% disagreeing. In another 5 countries the figure was over 10%, but always below 15%. Of more concern, however, Figure 2 reveals large differences in the proportion of respondents who disagree that vaccines are safe. Only in 6 countries is this less than 10%. In 10 countries it is between 10% and 20%, while it is over 20% in 4 countries. Thus, although at least 85% of respondents in each country think that vaccines are important, vaccine safety remains a significant concern, affecting as many as 40% of respondents in France. Given that herd immunity typically requires coverage rates in excess of 95%, these figures give cause for concern.

Figure 1 Vaccines are important for children (% response who disagree)



Source: The State of Vaccine Confidence (2016) project [10]

Figure 2 Overall, I think vaccines are safe (% response who disagree)



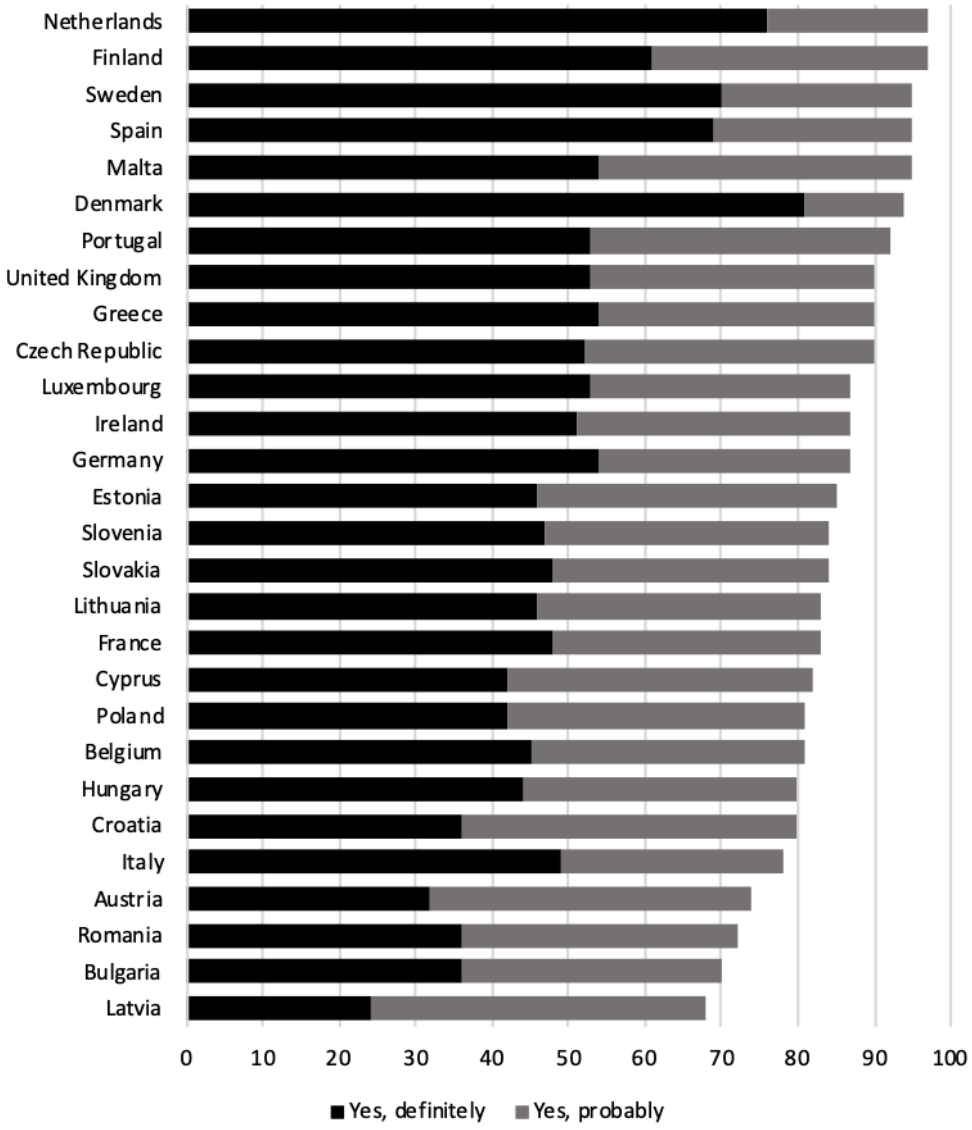
Source: The State of Vaccine Confidence (2016) project [10]

A report by Larson et al provides more up-to-date data on changes of confidence in vaccines over time (between 2015 and 2018).[11] Patterns vary markedly among countries. For example, confidence increased in all domains in Greece, Italy, Slovenia and the UK, but

decreased in all domains in Poland. Confidence in vaccine safety also increased in Demark, France, Netherlands, Spain and Romania, but decreased in Sweden, Finland, Germany and the Czech Republic. Older (55+) and better educated citizens are more likely to hold a positive view of vaccination than those who are younger and less educated.

A recent Eurobarometer report is based on fieldwork undertaken in March 2019.[12] Many of the questions differ from those in the earlier surveys, precluding precise comparisons but offering additional insights. As Figure 3 shows, while overall vaccines are seen as effective, over 1 person in 5 does not agree in several member states that they are effective.

Figure 3 Vaccines are (definitely or probably) effective



Source: Eurobarometer (2019) [8]

Specific factors affecting vaccination uptake

A series of specific psychological, social, and contextual factors affect the decision to be vaccinated or, in the case of a parent, to have their child vaccinated. The following section draws substantially on the systematic review by Smith et al [13] which identifies a series of psychological factors that influence vaccination uptake, based on 64 studies among parents of children. Many relate to the perception of individual and societal costs and benefits described above. We first review factors that relate to perceived costs, then those that relate to perceived benefits, and finally those that affect both perceived benefits and costs.

The systematic review found that there was strong evidence for an association between perceived adverse effects from vaccination, either viewing the vaccine as unsafe or having concerns about side effects, and refusal of vaccination.

Parental anxiety about the vaccination and fear of the illness was associated with refusal. Anticipating regret should the child become ill after refusing vaccination was associated with greater uptake.

The view that combined vaccines or a sequence of multiple vaccines given at the same time overwhelm the immune system is frequently invoked as a reason for not having a child vaccinated. However, this view was only associated with hesitancy in one of three studies. In contrast, a belief that combination vaccines are harmful or ineffective was associated with refusal in several studies.

Smith et al also identify some studies pointing to the importance of logistical barriers, including inconvenient appointments times or locations and time pressures.[13] Having to pay for the vaccination was associated with refusal in two of three studies. This is line with the systematic review by Larson et al who identifies several types of costs (financial cost, time and distance to provider, administrative and general accessibility) as being associated with lower vaccination uptake.[14] A study comparing Italian regions found an association between lower vaccination rates and cuts to public health budgets.[15]

Smith et al [13] find that there was strong evidence linking uptake and perceived susceptibility of the child to illness. In contrast, there was only a tenuous association with the perceived severity of illness, with better-designed studies finding no association. Other reasons included a belief that the child had already contracted the illness, that complications following illness were rare, and parental experience of having the illness without sustaining complications.

Uptake was higher where parents believed that the information available was adequate and helpful and less likely where they felt it was inadequate. Refusal was higher among parents who had greater faith in the media, who were influenced by alternative/complementary medicine practitioners, and perceived research findings to be important.

Almost all studies reviewed in [13] found increased refusal among parents who had incorrect knowledge of the vaccination schedule and, in some, where the physician was also misinformed. Other factors included inadequate knowledge of the vaccine and where to get it, or a belief that one dose was enough. Two out of three studies found that uptake was reduced if parents believed that it was unimportant if a child missed a dose.

All studies found that refusal is higher among parents who believed that vaccination was neither necessary nor useful or disagree with it. On the other hand, uptake was higher among parents who perceived vaccination to be important.

Most studies found an association between being recommended to have their child immunised by a health professional, friend, or family member and an increased uptake of vaccination. Several studies reported parents not vaccinating their child because they had been advised against it, or they received no or a weak recommendation from a health professional, or because a health professional had a negative influence on them.

Parents who trusted healthcare professionals were more likely to have their child vaccinated, whereas those who believe that healthcare professionals administer vaccines without taking into account the individual circumstances of the child were less likely to do so.

The evidence that trust in government played a major role was weak. Perception that there was government pressure to vaccinate was not associated with uptake but belief in a conspiracy by government was associated with refusal.

Two out of three studies found an association between perceived social disapproval of vaccination and refusal. Uptake was greater where the children of family and friends had been vaccinated.

Larson et al suggest that, at least in the EU, those with less education are less likely to be confident in vaccines compared with those with university education.[11]

In summary, the perception that vaccination has adverse effects is a very common reason for not vaccinating. Parents were also influenced by their assessment of whether their child was susceptible to illness. Parents satisfied with the information provided by friends, family, and

health professionals were more likely to have their child vaccinated. Those who actively sought information from other sources, including the Internet and social media, were less likely to do so, presumably because those sources perpetuate vaccine-related myths.

Box 1 summarises the main obstacles and enablers of vaccination uptake.

Box 1. Key obstacles and enablers of vaccination uptake

Obstacles
Concerns or fears about vaccine safety (e.g. they can cause severe diseases and side effects)
Access issues (co-payment, availability, and distance to health facility)
Overload of children vaccination (and parents)
Lack of adequate information and perceived medical need
Lack of trust towards institutions
Social norms (family, friends, peers)
Negative exposure to rumours and myths about vaccines in general media
Lack of adequate encouragement (recommendation, advice) from healthcare providers
Enablers
Sources of reliable information for vaccination
Easy access, administration and availability of services
Building trust in institutions and providers, and confidence in vaccines
Active involvement by doctors and healthcare providers
Exposure to positive media messages

Source: authors' compilation

Measures and actions that can improve vaccination coverage

This study draws on a conceptual framework used in public health to influence the use of products that are harmful to health, such as tobacco or junk food.[16] To increase vaccination uptake, measures can be divided into those that involve regulation and legislation, for example mandating an action and imposing penalties for non-compliance, those that facilitate it, making the healthy choice the easy choice, and those that seek to change the motivation and intention of individuals to act through information (e.g., recommending vaccination). The policies that have been put in place across the European Union are presented in detail in a recent report [17].

Regulate

Several countries have already made childhood immunisation mandatory, with school entry contingent on the child being immunised (with penalties for non-compliance). Australia is adopting a "no jab, no play" law, which places responsibility for enforcement on nursery schools, fining those that admit an unvaccinated child.[18] In 2019, the German Bundestag voted to make measles vaccination mandatory for children, with penalties including a fine of up to €2,500 and exclusion from nursery or school.[19]

MacDonald and colleagues have provided a taxonomy of mandatory systems, reflecting differences in exemptions.[20] These range from a requirement to be immunised, but allowing anyone to opt out without penalty, with or without a requirement to state a personal or philosophical objection, the ability to opt out conditional on the vaccine hesitant individual (parent) having spoken with a trained healthcare worker who explains the risk of being unvaccinated and engages in dialogue about concerns, to the imposition of financial penalties or social restrictions for those refusing immunisation. The requirement for counselling partly addresses the concern among those who oppose mandatory vaccination on the ground that it violates individual rights. It ensures that the individual, or the parent of the child, makes an informed decision, in the latter case consistent with the duty of the state to uphold the rights of the child.

A 2016 systematic review identified 21 studies of the effectiveness of mandates for vaccination, 18 of which were from the USA. It concluded that mandates generally led to increased short-term and long-term uptake in the group to whom the mandate applies.[21] This is consistent with evidence from Italy where a decree-law (73/2017) was issued in June

2017 stipulating that the number of mandatory vaccinations, for minors up to 16-years, would be increased from four to 10. Vaccination coverage increased between 2016 and 2017, ranging from 0.9% for vaccination against tetanus at 24 months to 4.4% for MMR vaccination at 24 months.[22]

The available evidence on mandatory vaccination has been assembled by MacDonald and colleagues. [20] Overall, they find this evidence to be limited but also contextually bounded. Ultimately, they conclude that a decision to mandate vaccination should involve a detailed consideration of the nature of the problem to which a mandate is seen as a solution, other reasons for low uptake, the prevailing cultural context, and the risk of unintended consequences.

Facilitate

A second set of measures involves facilitating action. Getting immunised should be as easy as possible, removing any obstacles that exist. Administering a vaccine is only one stage in a complex process that should address the many elements that are necessary to optimise population uptake.

A first step is to decide what vaccines to provide. Some 15–20 vaccines are listed in most National Vaccine Plans. Especially when faced with austerity measures, health authorities have to make choices about which vaccines to prioritise. Several tools have been developed to support prioritisation and decision-making. The US Institute of Medicine (IOM) on Ranking Vaccines introduced an analytical model that employed multi-criteria decision-analysis tools to prioritize vaccines in development, but was later tested to make “smart choices” in relation to different goals (e.g. eradication of disease or improvement of delivery etc.).[23]

Frameworks supporting comprehensive evaluation provide a structured approach [24] and lay the basis for consistent decisions on vaccination national programmes. At the core of these frameworks are criteria of public health relevance (burden of disease) and vaccine characteristics (effectiveness, immunity length, adverse events, doses required, costs per dose, cost-effectiveness and feasibility).[23-26] Decisions about prioritized vaccines have to be made public in a comprehensible manner, which in turn will facilitate public confidence and acceptability of vaccines by citizens and health professionals.[27]

Differences among EU countries in the vaccines that are on the national schedule can create confusion among the public as it gives the impression of lack of consensus. There may be a rationale for such differences (in particular in relation to sub-groups of the population and

different epidemiology) but these differences need to be articulated and explained, giving a rationale for improved coordination across countries.

The various elements of a comprehensive programme were set out in an umbrella review also written to inform the European Commission.[28] It brings together a series of subsystems necessary for the effective operation of a vaccination programme, including generating and applying evidence, funding, enacting appropriate legislation, developing appropriate professional roles, registering the population, monitoring public attitudes, governing the system, and evaluating outcomes. The review highlighted a scarcity of high-quality evidence from Europe and questioned the applicability of much of the evidence from the United States. It did, however, highlight the importance of a comprehensive approach, with a particular focus on groups at risk of exclusion. This includes having an accurate population register, and in particular one that is up-to-date and ensures inclusion of marginalised populations, a system for generating and applying evidence, appropriate funding, and a system of monitoring uptake and, where it is less than optimal, the reasons why this is so, including public attitudes. [28]

Vaccination programmes should be as accessible as possible. Accessibility can be considered in terms of distance, time, and cost. A vaccination facility should be near to where people live or work, or for children perhaps in schools. Facilities should be open at times that are convenient and may require operating outside normal working hours. Accessibility can also be improved by expanding the range of providers who administer vaccine. These do not have to be restricted to medically-qualified primary care providers, but can include pharmacists, nurses, community care providers and other qualified professionals, subject to adequate training. This diversity in provision is important to reach out to remote or underserviced areas and disadvantaged groups. Here, particular attention should be directed to groups such as migrants, especially those that are undocumented, and ethnic minority populations, who may face multiple barriers to obtaining care. The cost of being immunised should be reduced as low as possible or free of charge. Any positive price introduces a barrier, bringing vaccination coverage to even lower levels. Even if vaccination is free of charge, there may still be barriers related to accessing the health facility or loss of pay because of time off work. It may be argued there is even a case for setting negative prices, in the form of conditional cash transfers. However, a systematic review found no association between such financial incentives and vaccination uptake.[29] Moreover, offering money to people that involves a trade-off between a reward and their moral values can backfire (see below), causing a sense of

moral outrage.[30] There may be also scope for appropriately designed financial incentive schemes that encourage providers to achieve herd immunity. One example is within the Quality and Outcome Framework in England, which among others gave rewards for family practices to four separate influenza immunization rates for patients with coronary heart disease, chronic obstructive pulmonary disease, diabetes, and stroke, although with mixed success.[31]

A vaccine programme must also leave no-one behind. Protection against vaccine preventable diseases will only be achieved if sufficient people are vaccinated to provide herd immunity. Unfortunately, in some European countries, certain vulnerable and marginalised groups are at risk of exclusion from vaccination programmes. For example, in many countries, Roma have high levels of unmet need for care in general,[32] and in particular for vaccination.[33] The characteristics of those who are excluded, and the reasons why they are, will vary greatly. However, it is essential that the scale and nature of this exclusion are understood and that appropriate policies to address it are implemented.

Inform

Communication strategies are widely seen as key to improving coverage but it will be important to ensure that they are carefully designed and tailored for groups who are more hesitant. General messaging campaigns might instead have unintended consequences.[34] There are at least three types of communication interventions:[7, 14]

- Mass communication campaigns
- Personalized communication campaigns
- Training and educational interventions

We examine each of these in turn. Larson et al conclude that "Traditional principles and practices of vaccine communication remain valid, …. However, additional emphasis should be placed on listening to the concerns and understanding the perceptions of the public to inform risk communication, and to incorporate public perspectives in planning vaccine policies and programmes."[14] Cairns et al concluded that there was a lack of explicitly stated theoretical underpinnings in most studies evaluating these interventions, although many were based on the information deficit model.[7] They argued that this should be addressed by formulating communication interventions that are based on stated theoretical frameworks, prioritising interventions that support population-scale behaviours, developing macro and micro theories of behaviour change, integrated with social marketing principles.

These concerns have led to a shift from the idea that people are uninformed, and thus simply require information, to being misinformed or disinformed, where it is not that they lack information, but rather the information that they have is incorrect. Messages may be conveyed for purposes that have nothing to do with health, but rather as a manifestation of, or a means to promote, distrust in authority. A failure to appreciate the power of misinformation may lead traditional messages on the benefits of immunisation to backfire.[35] Table 1 summarises the mechanisms by which backfiring might occur.

Table 1. Backfire effects in communicating public health messages

Backfire effect	Description
Familiarity	Repeated exposure to misinformation increases familiarity, leading to assumption that it is true
Overkill	Multiple counterarguments to misinformation is cognitively taxing and may lead individuals to favour simpler explanations based on misinformation
Attitude polarisation	When given information that is contrary to their beliefs, individuals selectively recall evidence and arguments that oppose it, thereby reinforcing the pre-existing beliefs
Sacred values	If ideas are viewed as sacred, or part of deeply held beliefs, monetary incentives may create moral outrage
Social norms	Highlighting an undesirable behaviour as being frequent may suggest that it is socially approved
Group directed threat	Messages that criticise a particular group can strengthen group identity and reject arguments perceived as criticising them
Fear appeals	Messages that induce fear may trigger defensive responses

Source: Rossen et al (2016).[35]

Drawing on the review by Rossen et al we can illustrate the role of backfire with some examples. Skurnik et al examine that correcting a myth can, paradoxically, reinforce it among those whose pre-existing views are challenged.[36] Thus, parents presented with text from the US Centers for Disease Control correcting the myth that MMR causes autism reduced the level of belief in the false claims, but also reduced the intention to vaccinate their child among those holding an unfavourable view.[37] Research has confirmed the role of motivated

reasoning, whereby people search for information that supports their preconceived view and disregards anything that conflicts with it.[38] People's self-esteem derives from the groups that they identify with. If they feel that that group has been portrayed negatively, those who are more highly committed will seek to demonstrate a strong affiliation. This is becoming an issue because of the growth of networks, including on social media, adopting attitudes that are critical of authority. Thus, messages promoting vaccination may be seen as threatening the identity of the group, causing them to become more cohesive. An Australian study found that parents identify vaccination as a marker of parental conformity to the 'toxic practices of mass industrial society'.[39]

Public health campaigns can appeal to fear, highlighting the risks of not being vaccinated. Fear of not being vaccinated may have declined because of the reduced incidence of vaccine preventable illness. Meta-analysis suggests that fear appeals are generally effective, but can also induce negative effects among those who are less likely to engage.[40]

Rossen et al make several proposals to avoid messages backfiring.[35] In addressing myths, it is better to start by stating the facts, then introduce the myth, debunk it, and replace it with scientific facts. The myth should never be repeated.[41] Overkill should be avoided, as multiple counterarguments require more cognitive efforts. They suggest messages should appeal to an individual's desire to be consistent with social norms. Finally, it may be possible to use fear appeals selectively, but only when designed to promote positive emotions, including a powerful message.[40]

It has been suggested that promotion of understanding of the concept of community, or herd, immunity might improve vaccine uptake. A recent systematic review found some evidence that this is the case but little on the effectiveness of interventions to achieve it.[42]

Building public confidence is likely to be crucial for achieving public trust in communities. Trust is built through dialogue and exchange of information and opinion.[14]

We now consider personal communication, while noting that the issues related to messaging, and particularly backfire, apply equally here.

Reminder systems targeting parents and healthcare providers have been shown to be effective strategies.[43, 44] Parental reminders for pre-school children can increase immunization rates up to 34%. Positive effects on uptake have been obtained with both generic and specific reminders.[43] Personalised and tailored reminders have also been shown to be effective to increase influenza vaccination rates of those older than 60.[45]

Parental trust in the provider is crucial for establishing vaccine uptake.[46-48] To increase the willingness of parents to consider vaccination, they need to believe their provider is motivated by the welfare of their child rather than an abstract public health goal. Interactions between health professionals and parents should recognise their concerns that may range from side effects to the belief that vaccines weaken the immune systems or cause autism. A non-confrontational, participatory discussion that is personalized seems the best approach to improve compliance.[49] Even when parents remain hesitant, the patient-provider relationship needs to stay intact to convey respect, build trust, and allow for other opportunities to discuss immunization.[50] Face-to-face interventions are particularly effective in populations who lack of awareness of new or recommended vaccinations.[51]

Finally, we turn to training and education interventions, aimed primarily at vaccine providers. These can be effective in increasing vaccination rates in children,[43] but this has not been shown for increasing influenza vaccination rates among older people.[45] This can be part of continuing medical education or one-off sessions, using peer support and educational resources.[43]

Based on a 2011 review of the literature, Cairns et al include the following recommendations in relation to communication strategies [7]:

- Vaccination advocacy: credible and trusted champions for immunisation to build support and trust in vaccine efficacy and safety, and raise awareness of benefits.
- Personalised information: face-to-face exchange aimed in particular for hesitant groups.
- Education and training of health care workers: pre-service and in-service training for health care staff to improve competencies with regard to advocacy and delivery of effective vaccination programmes, including expertise in communication design.

Overall, however, several reviews have concluded that the evidence for different types of information campaign is very limited and what exists is largely of low quality.[52, 53]

Policy recommendations

Based on the framework provided in the previous section, a comprehensive approach to strengthening vaccine programmes should consider measures in three broad categories.

Regulation, in the form of mandatory vaccination, can be justified, with evidence that it can improve vaccine uptake in the short and long term. However, it can also give rise to

unintended and potentially counter-productive consequences. Where it is being considered, there should be a detailed assessment to ensure that it is an appropriate response to the problems being faced by the vaccination programme, that the risk of unintended consequences is low, and other reasons for low uptake have been addressed. It should also take account of the prevailing cultural context, and its characteristics should be adapted to the existing circumstances.

Facilitating uptake is essential. Getting vaccinated should be made as easy as possible. This requires a comprehensive program to be in place, beginning with an open and transparent process for deciding what vaccines should be offered, ensuring that there are enough vaccines available in a timely manner, and continuing with a system that combines the many different elements required to identify the population at risk, and to facilitate their access to facilities that are convenient and affordable,

Information is important. However, it is essential that this is handled in a way that is not counterproductive, given the considerable risk of "backfire". Messaging should draw on the growing body of psychological research on framing, ensuring that health professionals have appropriate training. It is particularly important that those who make decisions about being vaccinated, in respect either of themselves or their children, see themselves as being adequately involved in those decisions.[54]

Conclusion

Vaccination rates are decreasing in many European countries, with potentially fatal consequences. Many factors contribute to this situation, among them misinformation and, in some cases, disinformation. There is no single solution to this problem but rather a range of measures that can be adopted and are not mutually exclusive. However, the choice must be based on a detailed understanding of the nature of the problem.

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