

Vaccine hesitancy

An overview

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Despite being recognized as one of the most successful public health measures, vaccination is perceived as unsafe and unnecessary by a growing number of individuals. Lack of confidence in vaccines is now considered a threat to the success of vaccination programs. Vaccine hesitancy is believed to be responsible for decreasing vaccine coverage and an increasing risk of vaccine-preventable disease outbreaks and epidemics. This review provides an overview of the phenomenon of vaccine hesitancy. First, we will characterize vaccine hesitancy and suggest the possible causes of the apparent increase in vaccine hesitancy in the developed world. Then we will look at determinants of individual decision-making about vaccination.

Introduction

Vaccination is considered to be one of the greatest achievements of public health. Vaccination programs have contributed to the decline in mortality and morbidity of various infectious diseases, and are credited with the elimination of poliomyelitis in the Americas and the worldwide eradication of smallpox.¹ To be successful in reducing the prevalence and incidence of vaccine-preventable diseases (VPD), vaccination programs rely on a high uptake level. In addition to direct protection for vaccinated individuals, high vaccination coverage rates induce indirect protection for the overall community, or herd immunity, by slowing transmission of VPD, thereby decreasing the risk of infection among those who remain susceptible in the community.²

The high rate of childhood vaccination coverage in most developed countries indicates that vaccination remains a widely accepted public health measure.³ However, these national estimates may hide clusters of under-vaccinated individuals.⁴ Indeed, recent outbreaks of VPD, including measles,^{5,6} poliomyelitis,⁷ and pertussis⁸ in several parts of the developed world have been linked mainly to under-vaccinated or non-vaccinated communities.⁹ In addition, results of many studies have shown that even vaccinated individuals can have important doubts and concerns

regarding vaccination.^{10–13} For instance, in a recent pan-Canadian survey, half of the parents were concerned that new vaccines are not as safe as older vaccines and one-third felt that children today receive too many vaccines, even if nine out of ten of these parents indicated their child's vaccination was up to date.¹⁴ Indeed, many experts consider that vaccination programs are threatened by growing concerns among the population regarding the safety and usefulness of vaccines.^{15–18} It is estimated that less than 5–10% of individuals have strong anti-vaccination convictions.¹⁹ However, a more significant proportion could be categorized as being hesitant regarding vaccination.²⁰ In this review, we will define vaccine hesitancy and look at the potential causes and determinants of the apparent increase in vaccine hesitancy in the developed world.^{15,16,19} Then, we will look at determinants of individual decision-making regarding vaccination and try to synthesize the wealth of data already published on factors influencing vaccine acceptance.

Figure 1 presents a conceptual model that has framed this review. This model consists of 3 domains of factors that interact and could lead to vaccine hesitancy at the individual level. This model was adapted from a schema summary of discussions held during a workshop on the cultural and religious roots of vaccine hesitancy in Canada in which some 40 experts from various fields (social sciences, humanities, public health, biomedical sciences) met to share their views on vaccine hesitancy in the Canadian context.²¹ As we will discuss in this review, this model illustrates that vaccine hesitancy is an individual behavior influenced by a range of factors, such as knowledge or past experiences. Vaccine hesitancy is also the result of broader influences and should always be looked at in the historical, political and socio-cultural context in which vaccination occurs. Trust placed in the system that delivers vaccines, in the health professionals who recommend and administer the vaccines, in the policy-makers who decide about vaccination programs and in the different types of information about vaccines conveyed in the media also mediates the impact of these factors on vaccine hesitancy.²²

Vaccine Hesitancy: A Definition

Studies examining determinants of vaccination decision-making have resulted in several proposed models of acceptance and

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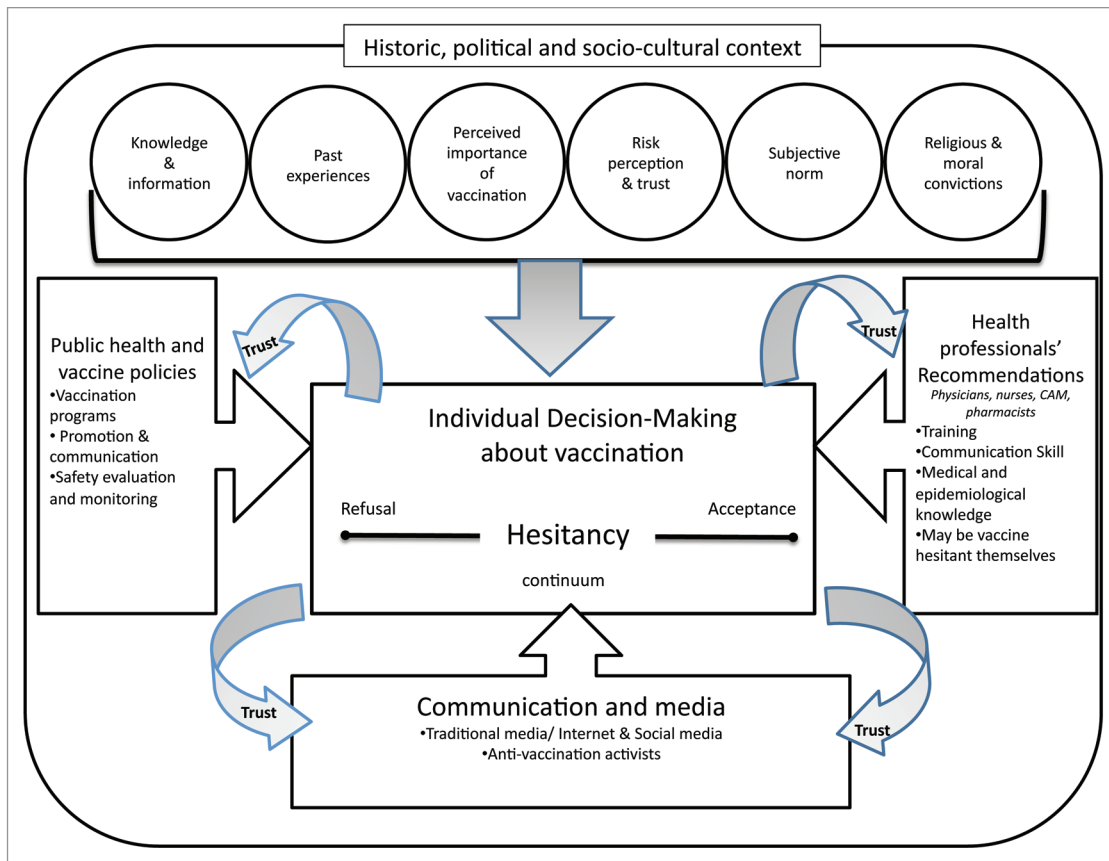


Figure 1. Conceptual model of Vaccine Hesitancy. Adapted from the Schema summary of discussions held during the Workshop on the cultural and religious roots of vaccine hesitancy: Explanations and implications for the Canadian healthcare. Accessible online: <http://www.usherbrooke.ca/dep-sciences-sante-communautaire/fileadmin/sites/dep-sciences-sante-communautaire/documents/HesitationVaccination/AfficheMG-anglais.pdf>

resistance, most focusing on parental decision-making.^{11,23-29} For instance, Nichter has differentiated *active demand* for vaccinations—adherence by an informed public—from *passive acceptance* of vaccinations—compliance by a public which yields to recommendations and social pressure.²⁴ Looking at responses to 44 questions (related to, for example, belief in vaccination and vaccine safety, interest and involvement in health issues, influence of family and friends on vaccination decisions, etc.), Gust and collaborators have identified five types of parental attitudes regarding vaccination, in decreasingly positive order: the “immunization advocates,” the “go alongs to get alongs,” the “health advocates,” the “fence-sitters” and the “worrieds.”²⁷ Keane and collaborators have distinguished four parent profiles: the “vaccine believer” parents who were convinced of the benefits of vaccination, the “cautious” parents emotionally involved with their child and who have an hard time watching them being vaccinated, the “relaxed” parents who were characterized by some skepticism about vaccines and the “unconvinced” parents who distrusted vaccinations and vaccination policy.³⁰ Finally, based on a combination of mothers’ actions and attitudes, Benin and collaborators have categorized the participants of their study into four categories: the “accepters” who agreed with or did not question vaccination, the “vaccine-hesitant” who accepted vaccination but had significant concerns about vaccinating their infants,

the “late vaccinators” who purposely delayed vaccinating or chose only some vaccines and the “rejecters” who completely rejected vaccination.²⁶

Challenges in Defining Vaccine-Hesitancy

The differences between these different models illustrate the difficulty of categorizing attitudes about vaccination. Because these models are often rooted in individual studies and because of the complex interaction of different social, cultural, political and personal factors in vaccine decision, it is hard to have a clear picture of the range of possible attitudes about vaccination. However, the common ground among these models is the fact that attitudes toward vaccination should be seen on a continuum ranging from active demand for vaccines to complete refusal of all vaccines. Generally speaking, vaccine-hesitant individuals are a heterogeneous group in the middle of this continuum. Vaccine-hesitant individuals may refuse some vaccines, but agree to others; they may delay vaccines or accept vaccines according to the recommended schedule, but be unsure in doing so.^{26,31} Despite the growing number of articles referring to vaccine hesitancy published in recent years,³²⁻³⁷ there are some discrepancies among publications about what exactly falls under the umbrella of “vaccine hesitancy.” The expression can be used to refer to a “gap

in parental knowledge³⁶ or refer to “reflection and deliberation about the benefits of specific vaccines.”³⁸ It is hard to have a clear picture of vaccine hesitancy at the population level because hesitancy is not directly related to vaccine uptake (as vaccine-hesitant individuals may accept all recommended vaccines in a timely manner, but still have significant doubts in doing so). In addition, hesitancy can vary according to the vaccine involved (one can be hesitant regarding the flu vaccine but accept with confidence all other vaccines), with newer vaccines usually engendering more hesitancy.³⁹⁻⁴¹ Thus, caution is needed when trying to draw a general picture of vaccine-hesitant individuals’ characteristics. For example, in one study aimed at assessing attitudinal barriers to MMR vaccination among vaccine-hesitant parents, eligible parents were those who were “unsure” or “did not want” to get their child vaccinated against MMR.⁴² In contrast, in another study aimed at identifying the reasons why parents hesitate to have their children vaccinated, eligible parents needed to have been present in a clinic with a child requiring a minimum of one vaccination that was at least 6 mo overdue.³⁷ Both these studies were presenting characteristics of vaccine-hesitant parents, but their inclusion criteria were quite different which limits the comparability of results on attitudes and perceptions of vaccination.

Recent work in developing a survey instrument to directly measure the level of vaccine hesitancy among parents has shown promising results.^{31,43} The 15-item survey instrument, designed by Opel and collaborators for the US context, measures 4 domains linked to vaccine hesitancy: vaccination behavior, beliefs about vaccine safety and efficacy, attitudes about vaccine mandates and exemptions and trust. After having pre-tested their instrument among 230 parents, the authors found a statistically significant linear association between a parent’s total score on the 15-item survey and their child’s vaccination status (in terms of days of under-vaccination for 6 recommended vaccines from birth to 19 mo of age). In comparison, using data from a large population-based survey conducted among parents of children aged 24–35 mo, Smith and collaborators have concluded that the four psychosocial domains of the health belief model (perceived susceptibility to and seriousness of VPD, perceived efficacy of vaccines and concerns and influences that facilitate or discourage vaccination) allowed for measurement of beliefs linked with vaccine hesitancy and could be useful for predicting the parental decision to delay or refuse vaccines for their child.⁴⁴ In fact, the Health Belief Model was originally developed in the 1950s to look at barriers to polio vaccination among parents.⁴⁵

Potential Causes of Vaccine Hesitancy

The importance of the historical, political and socio-cultural context. Social science research has shown that vaccination decision-making should be understood in a broader socio-cultural context.^{25,46-48} In fact, vaccination is part of a “wider social world”⁴⁹ which means that different factors (past experiences with health services, family histories, feelings of control, conversations with friends, etc.) can influence the decision-making process regarding vaccination. As stressed by Hobson-West, “vaccination is just one decision of many that parents

are faced with. Other day-to-day concerns about child health and nutrition may take priority at certain times, or influence willingness to vaccinate.⁴⁷ Streefland and collaborators use the expression “local vaccination cultures” to characterize how “shared beliefs about disease aetiology, ideas about the potency and efficacy of modern medicine and views on the need for preventive measures” as well as “local health services experiences and vaccination settings” influence the individual decision about vaccination.²⁵ In the actual postmodern context that questions the legitimacy of science, expertise and medical authority,⁵⁰ it is not surprising that more and more individuals question the relevance of vaccination. Vaccine hesitancy may be a consequence of the focus of health promotion on lifestyle and individual action and the growth of “consumerism” in health-care, which means patients’ involvement in their own health decisions.⁵¹ The rise of the informed patient has shifted the traditional locus of power from doctors as sole directors of patient care to shared decision-making between health professionals and patients who want to be active participants in the decision-making process concerning their health.

In addition, since its introduction, vaccination has been the subject of many different controversies and vaccination scares.⁵² These controversies have affected vaccine acceptance to varying degrees and have often occurred within a particular context—such as the association between the hepatitis B vaccine and multiple sclerosis in France that resulted in the suspension of the universal vaccination program in the 1990s, despite the fact that many studies have found no evidence of such an association.⁵³ Some of these vaccination scares have transcended frontiers. The most recent and well-known is the fraudulent association between the MMR vaccination and autism that was first highly publicized in the United Kingdom, but then rapidly diffused worldwide. Fear of autism is still today a frequently reported vaccine safety concern among parents in different settings.^{54,55} Despite the fact that there are as many causes of hesitancy as there are contexts, we have hypothesized that some factors are playing a key role in the apparent increase of this phenomenon in the developed world. We will look specifically at the roles of media and communication, of public health and vaccine policies and of health professionals.

The Role of Media and Communication

In a well-written book, the journalist Seth Mnookin explains how vaccination has become a source of fear and a target for misinformation.⁵⁶ Looking at the history of vaccination in the United States and the United Kingdom, he shows how media have played a role in keeping vaccination scares alive, even in face of strong evidence of the safety and effectiveness of vaccines. Indeed, many scientific studies have demonstrated the negative influence of media controversies on vaccine uptake.⁵⁷⁻⁵⁹ Research looking at pertussis incidence in many developed countries has shown that, in countries where vaccine uptake for pertussis vaccination programs decreased because of controversies regarding vaccine safety (actively circulated in news stories, television interviews, popular articles, etc.), the incidence of pertussis was 10 to

100 times higher than in countries where high vaccine coverage was maintained.⁵⁸

In addition to traditional media, the Internet has offered an opportunity for vocal anti-vaccination activists to diffuse their message.⁶⁰⁻⁶⁵ Many consider that the omnipresence of anti-vaccination content on the World Wide Web has contributed to a broader and faster dissemination of rumours, myths and “inaccurate” beliefs regarding vaccines that have had a negative impact on vaccine uptake.^{50,61,66} Indeed, even if health professionals are still frequently consulted by the majority of individuals with health concerns, the Internet has become an essential source of information.^{66,67} In addition, with Web 2.0 functions which allow users to create and share content using social networks (such as Facebook, Twitter, Youtube or Wikipedia), individuals can share their personal experiences of vaccination. These narratives add a new dimension to health information: a personal and embodied view of vaccine-preventable disease, vaccines and their potential (often negative) consequences.⁶⁶ Indeed, studies reviewing the content of websites or social networks concerning vaccination have shown that information is of variable quality and that inexact or negative content is predominant.^{61,62,64} For example, in a study simulating a patient’s search for advice on the potential link between MMR and autism using the Google search engine, Scullard and collaborators have reported that only 51% of the websites provided the correct information about the fact that no association has ever been demonstrated between MMR vaccination and autism.⁶⁵

Kata has shown that anti-vaccination websites shared common characteristics and used similar arguments and strategies to disseminate their message.^{50,68} For instance, most anti-vaccination websites argue against vaccination safety and usefulness, using arguments such as the existence of “hot lots” of vaccines or the presence of poisons in vaccines and use emotive appeals such as personal stories of vaccine damage.⁶⁸ Most of the arguments used by anti-vaccination activists can be seen as part of a larger phenomenon of “denialism.” Denialism can be defined as “the employment of rhetorical arguments to give the appearance of legitimate debate where there is none, an approach that has the ultimate goal of rejecting a proposition on which a scientific consensus exists.”⁶⁹ Whether it is to deny evolution, climate change or the fact that vaccines do not cause autism, Diethelm and McKee have shown that denialists employ similar tactics such as relying on “conspiracy theories,” using fake experts, purposively selecting only supportive evidence and discrediting all other, creating impossible expectations of what research can deliver or using logical fallacies.⁶⁹

Finally, despite concerns regarding the increasing influence of the Internet on vaccine acceptance, there is little data examining exposure to anti-vaccine websites on vaccine decision-making. Studies have shown that individuals who delayed or refused vaccines are significantly more likely to have looked for vaccine information on the Internet.^{44,70} The results of one large-scale experimental study done by Betsch and collaborators have shown that surfing on an anti-vaccination website for 5–10 min had a negative influence on risk perceptions regarding vaccinations and on the decision to vaccinate one’s child.⁷¹ However, more research is needed to assess whether individuals who already

have concerns regarding vaccination are more likely to search for information on the Internet from a range of sources or whether it is the Internet searches themselves that generate concerns regarding vaccination.

The Role of Public Health and Vaccine Policies

Before the 21st century, vaccination programs were commonly recognized as one of the most cost-effective public health intervention and the arrival of new vaccines was almost always welcomed by public health decision-makers and clinicians.^{72,73} However, in recent years we have seen an increase in the number of new vaccines licensed and commercialized on the market.⁷⁴ In the United States, the number of vaccines included in the publicly funded vaccination program for children from birth to 18 y of age has more than tripled between 1990 and 2012 (Fig. 67–3 in ref. 74). The increase in the number of vaccines has resulted in differences in regard to addition of new vaccines in regular programs or use of different vaccination schedules. Some have argued that differences between vaccination schedules and programs adopted in different countries, or even in different jurisdictions of the same country, could increase individuals’ negative perception of the relevance of particular vaccines or vaccine schedules.^{15,22}

In order to achieve high vaccine coverage, some countries have introduced laws to require children to be vaccinated before school entry. Policies that mandate vaccination have always been controversial.⁷⁵ However, there seems to be an increasing trend of opposition toward mandatory vaccination, as shown for instance by the increase in exemption rates in United States.⁴ Results of population-wide survey conducted in the United States have indicated that more than 10% of parents were opposed to compulsory vaccination. Not surprisingly, parents who disapproved of compulsory vaccination were significantly more likely to hold negative beliefs regarding the safety of vaccines and their utility to protect their child’s health.⁷⁶

Public health has a role to play in communicating adequately with the population. High quality vaccine safety surveillance is in place in developed countries. However, the strength and reliability of these systems is not well-understood by the population or even by some healthcare providers. Inaccurate information regarding both vaccine safety and the process leading to vaccine licensure and inclusion in universal programs circulates widely, leading to significant problems for public health clinicians, policy makers and patients.^{77,78} A recent example of pitfalls in communicating vaccine safety to the public is the controversy surrounding the removal of thimerosal, a mercury-containing preservative, from vaccines for children in the US. Due to awareness of the theoretical potential for neurotoxicity of even low levels of organomercurials and because of the increased number of thimerosal-containing vaccines added to the childhood vaccination schedule in the US, concerns about the use of thimerosal in vaccines and other products have been raised.^{79,80} Because of these concerns, the Food and Drug Administration has worked with vaccine manufacturers to reduce or eliminate thimerosal from vaccines. As Jacobson and collaborators have illustrated, despite the fact that this information, including the fact that the

risk was only theoretical and that it was recommended to pursue vaccination during the transition period, was communicated to health professionals, “vaccine providers across the nation in fact withheld hepatitis B vaccination of newborn infants, premature or not, in a mistaken belief that they were preventing mercury poisoning of these infants.”⁸¹ The call for the production of thimerosal-free vaccines by health authorities was also seized upon by anti-vaccination movements as a proof that ‘there was something wrong’ with vaccines and that public health authorities were “hiding the truth about vaccines”.⁵⁶ This illustrates the importance for public health authorities to work in collaboration with communication experts so that their messages, while being scientifically rigorous, can be effectively communicated to the public and to health-care providers.²²

Finally, the increase in the number of vaccines and the consequent decline in vaccine-preventable illnesses have focused attention by both health professionals and parents on vaccine usefulness and safety.^{53,82-85} Because vaccination programs have been successful, VPD are becoming less visible and many individuals, as well as health professionals, have no first-hand knowledge of the risks of the diseases.⁸⁶ Indeed, attention is more often directed to the risk, or alleged risk, of the vaccines rather than to the risk of the diseases. That is why it can be argued that “vaccination is victim of its own success.”^{22,86} In addition, some new vaccines prevent diseases perceived as mild (e.g., chickenpox or gastroenteritis), which can compromise their acceptability.^{39-41,87} Many public health interventions to promote vaccination, especially those based on education and information, have not been successful in enhancing vaccine uptake.⁸⁸ This may be explained by the fact that many interventions are designed with the assumption that resistance to vaccination can be countered by supplying probabilistic information about vaccine risks and benefits. From this perspective, individuals who have concerns or doubts regarding vaccination are often assumed to be irrational, emotional, ill-informed, or to be manipulated by anti-vaccination groups. As we will discuss in the next section of this article, individual decision-making about vaccination is influenced by many different factors, including the fact that some of those who have doubts and concerns about vaccine safety use an entirely different decision-making model or subscribe to a different set of beliefs about health and illness. Supplying additional probabilistic information may not adequately address individual concerns. Dry statements on probabilities are not as powerful as anecdote and emotion often used in anti-vaccination claims. In addition, lay people may be more at ease with a binary “yes/no” approach to risk instead of probabilities used to define risks in science.⁸⁹ Suggestions have been made that public health communicators move beyond the “knowledge deficit model of communication” to develop messages tailored to the audience needs; to use new tools such as social media and to be proactive rather than reactive to vaccination scares.^{19,66}

The Role of Health Professionals

The interaction between patients and providers is the cornerstone of maintaining confidence in vaccination.^{20,90,91} Health

professionals’ knowledge and attitudes about vaccines have previously been shown to be an important determinant of their own vaccine uptake, their intention to recommend the vaccine to their patients and the vaccine uptake of their patients.⁹²⁻⁹⁷ Findings of a review on determinants of nurses’ practices regarding influenza vaccination indicate a relationship between knowledge, attitudes and vaccination practices. In the 12 research studies included in this review, higher knowledge and positive attitudes toward influenza vaccination were positively associated with vaccination coverage among nurses and there was also an association between nurses’ vaccination status and their reported promotion of vaccination to their patients.⁹⁸ Results of a study conducted among physicians in Switzerland have shown that almost 5% of (non-pediatrician) physicians have declined or delayed MMR or DTP-based vaccinations for their own children. The authors concluded that fear of “immune overload” among these health care providers means that they are unlikely to answer parental concerns adequately.⁹⁴

Health professionals are generally strong supporters of vaccination. However, some of them could be categorized as vaccine-hesitant.^{99,100} Results of a recent study conducted in Quebec, Canada, have shown that an important proportion of the 540 healthcare workers surveyed were having concerns about vaccination. Indeed, more than one third agreed that children are receiving too many vaccines (37% agreed) and that a good lifestyle can eliminate the need for vaccination (36% agreed).¹⁰¹ Vaccine hesitancy among health professionals is also well-illustrated by the reluctance of a significant proportion of healthcare workers to receive the flu vaccine despite strong recommendations to do so and free vaccines available at the workplace in many countries.^{93,102}

From another point of view, vaccine hesitancy can induce strong emotional responses in health professionals, ranging from worries that trust in the relationship with patients can be endangered to medico-legal concerns.¹⁰³ Despite the fact that the American Academy of Pediatrics’ Committee on Bioethics discourages discontinuing care for families who refuse or delay immunization,¹⁰⁴ studies have illustrated that some providers are doing so.¹⁰⁵ This indicates that health professionals may need to be supported when addressing patients’ concerns regarding vaccination. Some professionals may feel overwhelmed by the concerns expressed by patients. The complexity of the vaccine schedule and the rapid development in vaccinology could be a barrier for health professionals who have to keep up to date and who may not feel comfortable discussing vaccination with patients.^{18,106-108}

Because health professionals are the most trusted source of information on vaccination for the majority of patients, many tools and tips have been presented to help providers in their discussions with vaccine-hesitant or vaccine-refusing patients.^{20,29,33,109,110} Although the approaches presented in these articles vary, they do share some common characteristics, such as the importance of maintaining a trustworthy patient-provider relationship and the importance of tailoring the communication to specific patients’ concerns and doubts.

Individual Decision-Making Process

Several literature reviews have been published recently looking at factors associated with vaccination acceptance or refusal in developed countries. These reviews have mostly focused on parental decision-making regarding different childhood vaccines,^{9,87,111-115} on decision-making regarding the HPV vaccine among different sub-populations¹¹⁶⁻¹¹⁹ or on decision-making regarding pneumococcal, seasonal flu or pandemic flu vaccination.^{98,120-123} The overwhelming majority of studies looking at determinants of vaccine acceptance have been conducted among parents, mainly because most vaccines are targeted at children and adolescents. These reviews had different objectives and scopes, making it difficult to draw definitive conclusions regarding the most influential factors in vaccine acceptance or refusal. Although individual vaccine decision-making varies according to socio-cultural context, social circumstances and personal experience, similarities in individual determinants of vaccination acceptance or refusal can be found. Of course, the direct and indirect costs of accessing healthcare services are important determinants of sub-optimal vaccine uptake,⁸⁸ but they will not be reviewed here; rather, our focus is on the psychosocial factors affecting vaccine acceptance at the individual level.

Knowledge/Information about Vaccination

Lack of awareness about “who, where and when” one should be vaccinated and self-estimated sufficiency of information about vaccination or satisfaction with information on vaccination are frequently associated with vaccination decisions. However, the association between level of knowledge about vaccination and vaccine acceptance is not straightforward. Many studies have shown that parents who choose to vaccinate their child generally have limited knowledge of vaccination and vaccine-preventable diseases compared with parents who refuse to vaccinate. These studies indicated that parents’ choice was often based on conformity—or following what is recommended—rather than based on specific knowledge about vaccine or vaccine-preventable disease.^{25,111,124-126} In addition, studies conducted in different settings have shown that non-compliant parents appear to have looked at a lot of information about vaccination and to have considerable interest in health-related issues.^{11,127,128}

Past Experiences with Vaccination Services

As discussed elsewhere,⁸⁸ accessibility to and convenience of vaccination services are important determinants of vaccine uptake. In addition, the quality of vaccination services could influence vaccine acceptance. Past experiences with vaccinations and vaccination services, such as negative encounters with vaccine providers, can influence future decision-making regarding vaccination. For example, results of a study conducted among parents attending a naturopathic clinic in Ontario have shown that feeling pressured by physicians to vaccinate one’s child was one of the main determinants of a child’s non-vaccination or incomplete vaccine status.¹²⁹ Fear of needles and of pain after vaccination

is also a documented barrier to vaccination. For example, results of a study conducted by Taddio and collaborators indicated that about two-thirds of children and one-quarter of parents reported needle fears.¹³⁰ In another study, the vaccine concern listed most often by parents was a child’s pain from the shots.¹³¹

Perceptions of the Importance of Vaccination in Maintaining Health

Perceived importance of vaccination is a well-known individual determinant of vaccine acceptance. For instance, in a study looking at the association between parents’ beliefs about vaccines, their decision to delay or refuse vaccines for their children and vaccination coverage of children at aged 24 mo, parents who were more likely to agree that vaccines are necessary to protect the health of children, to believe that their child might get a disease if they aren’t vaccinated, or to believe that vaccines are safe had significantly higher coverage for 10 childhood vaccines.⁴⁴ Studies have shown that individuals who refuse or are hesitant regarding vaccination often share a particular worldview regarding health (e.g., a preference for natural immunity, the belief that VPD are needed to build a strong immune system, the idea that it is possible to control exposure to disease or the belief that good hygiene and personal habits can make vaccination unnecessary).¹²⁸ Two studies, one ethnographic and one based on a questionnaire, have identified a “lay theory of immunity.” This theory is based on a view of the immune system as an individual characteristic needing individualized healthcare and on the idea that there is a possible risk of immune overload due to individual “weakness” of a child.^{49,127} As Casiday has shown in her qualitative study on parental measles, mumps and rubella (MMR) vaccination decision-making, this view often implies a “holistic notion of the immune system, (...) in which the immune system is viewed as central to the body’s overall health, but is itself intricate and delicately balanced; it must be maintained so that it can flexibly and effectively cope with a multitude of challenges from the environment.”⁷⁴⁸ From this point of view, vaccines are seen as something that would perturb rather than boost the immune system. Indeed, studies conducted among parents consistently show that concerns regarding the number of vaccines and doses as well as the age at first vaccination are associated with delayed vaccination or vaccine refusal. Results of a Dutch survey indicated that an important proportion of parents thought that children receive too many vaccines and that vaccines interfere with natural development.¹³²

Health Professionals’ Recommendations and Use of Complementary and Alternative Medicine (CAM)

One of the main predictors of acceptance of a vaccine is a recommendation for vaccination by a health care professional.^{55,91,133} For example, results of a large US study indicated that the largest proportion of parents who changed their minds about delaying or not getting a vaccination for their child listed “information or assurances from health care provider” as the main reason.³⁹ In contrast, the association between use of CAM, such as

homeopathy, and non-vaccination among parents on behalf of their children and among adults themselves has frequently been observed.^{32,44,127,134-137} Downey and collaborators found that, among non-Medicaid pediatric enrollees in two Washington State insurance companies, those who received care from naturopathic physicians or chiropractors at ages < 2 y were significantly less likely to have received the four vaccinations (measles/mumps/rubella, chickenpox, diphtheria/tetanus/pertussis and *H. influenzae* type B).¹³⁴ In another study, consultation with a homeopath was strongly associated with parental non-compliance with MMR vaccination.¹²⁷ Authors of this study noted that their study quantifies a striking influence of homeopathy on the belief that vaccinations could harm the immune system. Indeed, despite the fact that the founder of homeopathy was strongly in favor of vaccination,¹³⁸ many studies performed in different countries have illustrated that homeopaths have advised their patients not to be vaccinated (see Erns¹³⁷ for a review).

Risk Perceptions

In a meta-analysis, Brewer and collaborators found strong evidence that risk perceptions are predictors of adult vaccination behavior.¹³⁹ In health, two dimensions are usually used to assess risk perceptions: perceived vulnerability or likelihood of harm if no action is taken and perceived severity or seriousness of the consequences if harm was to occur.¹⁴⁰ These risks are viewed as being balanced against the perceived costs and benefits of an action to prevent this harm. Perceptions of risk can influence vaccine decision-making in two ways: perceived risks of VPD can foster vaccine acceptance and perceived risks of vaccines can contribute to vaccine refusal. This is further complicated by the fact that vaccines are administered as prophylactics to healthy individuals and the risks of vaccines (real or alleged) are visible while their benefits are impossible to evaluate from an individual perspective. In addition, the decision not to vaccinate is reversible, while the opposite is not true. Indeed, many studies have shown that individuals are more averse to the risks associated with an action—getting an “unsafe” vaccine—than to the risks associated with inaction—taking a chance of contracting a VPD. This is known as the “omission bias.”¹⁰⁹

When looking at individual risk perception regarding vaccination, it is important to note that risk is perceived differently by lay people than by experts.¹⁴¹ An epidemiological perspective of risk is based on a rational approach (or a probabilistic view) where risk is objective and measurable. A rational approach to risk implies that decision-making in face of a risk can be improved by ensuring that emotional, cognitive and social distortions or bias affecting judgement are corrected and that external influences, such as those triggered by media, are counteracted.^{46,47,108} However, many studies have shown that popular interpretation of risk is not always based on a rational approach, but rather on an “uncertainties and ambiguities” approach where doubts remain even in the face of empirical evidence.^{47,142,143} Risk perceptions among lay people, contrary to experts, are grounded in past experiences (such as those with other vaccines or health services) rather than on scientific data.^{47,48} Finally, research conducted among parents

has shown that in the decision-making process regarding vaccination, most parents consider the risk of a VPD or of side effects of vaccines not from a population-based perspective as in epidemiology, but rather based on their perceptions of their own child’s health and vulnerabilities.^{46,49} For a review of the implications of risk perception in the decision to vaccinate at the individual level, please see Serpell and Green.¹⁴⁴

Trust

In studies of vaccination decision-making, risk perception is often closely linked with ideas of trust in health professionals, in government or in public health institutions and the interplay between these actors.^{25,128,145} For example, in a qualitative longitudinal study, Benin and collaborators found that trust or lack of trust was pivotal for new mothers making decisions about vaccinating their infants.²⁶ The authors concluded that the “reliance on trust was especially impressive, because mothers perceived that ‘diseases are not around’ or ‘not so bad’ and they had little experience with VPD.”²⁶ However, Leach and Fairhead warned researchers of using too narrow a concept of trust when studying vaccination acceptance and refusal. After extensive field work in Brighton, UK and several countries in West Africa, they conclude that the concept of trust was rarely evoked by parents when describing their relationships with health professionals. More significant was whether parents felt supported and confident to ask questions and to express their views when discussing about vaccines with doctors or other health professionals. In contrast, parents were using the concept of trust to refer to “socially remote institution” such as pharmaceutical companies or government.⁴⁶

Indeed, Brownlie and Howson provide a reliable definition of trust as “a complex relational practice happening within particular socio-political context.”¹⁴⁶ After in-depth analysis of focus group data on trust and MMR vaccination, they conclude that trust is not only based on knowledge, but also on a “leap of faith” that could only be possible because parents have a relationship with health professionals based on familiarity.¹⁴⁶

Subjective Norm, Social Pressure and Social Responsibility

Seeing vaccination as a social norm is a potentially powerful driver of vaccine acceptance. The importance of subjective norm, or the fact that those around you, whom you respect, are being vaccinated themselves or having their children vaccinated, is a factor related to vaccine acceptance in many studies.¹¹³ Based on ethnographic studies conducted in six countries, Streefland and collaborators have shown that “people have their children vaccinated because everybody does so and it seems the normal thing to do.”²⁵ Similarly, Brown and collaborators have shown that perceiving peers and family members as pro-MMR was associated with vaccine uptake.²⁸ Social norm can also result in social pressure to accept vaccination. Indeed, in a review of psychological factors associated with uptake of vaccination during the 2009 A(H1N1) influenza pandemic, Bish and collaborators concluded that there was “evidence of social pressure on uptake, with those

believing that others wanted them to be vaccinated being more likely to do so.¹²³ From another point of view, social responsibility, or seeing vaccination as a duty of individuals in order to maintain herd immunity, could also be linked with vaccine acceptance. Quadri-Sheriff and collaborators have systematically searched the literature to determine if the concept of “benefit to others” was a motivator of parents’ willingness to vaccinate their child.¹¹⁴ They concluded that even if some parents see the role of childhood immunization in building herd immunity in a positive light, their decision to vaccinate was largely based on the perceived benefit to their own child.¹¹⁴

Moral or Religious Convictions

Finally, as discussed earlier in this section, vaccination refusal is sometimes linked with philosophical beliefs or moral convictions regarding health and immunity, such as a preference for “natural” over “artificial” medicines. Refusal of vaccines has also been linked with strong religious convictions. Orthodox Protestants in The Netherlands and the Amish in the United States are religious communities well-known for rejecting vaccination for religious motives.^{147,148} Opposition to vaccination based on religious motives dates back to the introduction of vaccination and can be explained, at least partially, by the idea that vaccination is not congruent with religious considerations regarding the “origin of illness, the need for preventive action and the search for a cure.”¹⁴⁷

In summary, the individual decision-making process regarding vaccination is complex and multidimensional. Numerous barriers to vaccination have been identified: fear of side effects, lack of a provider recommendation to be vaccinated, beliefs regarding the efficacy and usefulness of vaccines, distrust of the motives behind, lack of awareness of the need to be vaccinated, etc. Often, these barriers are presented as discrete and measurable variables, without regard to the “processes and pathways” leading to vaccination refusal as well as to the broader socio-cultural context within which these barriers are rooted.²⁴

Conclusion

Despite the fact that it seems impossible to quantify precisely the proportion of the population that could be categorized as vaccine-hesitant, experts worldwide acknowledge that there is an increasing trend toward vaccine hesitancy. As shown in this

review, individual decision-making regarding vaccination is complex and involves emotional, cultural, social, spiritual and political factors as much as cognitive factors. Of course, individuals have been hesitant or unsure about vaccination since the first vaccines were made available.⁵² However, as we have tried to illustrate in this review, vaccine hesitancy can be heightened by the current “changing scientific, cultural, medico-legal and media environments.”⁵¹

As illustrated in the model, in addition to the factors affecting vaccine acceptance at the individual level, a thoughtful understanding of vaccine hesitancy needs to be grounded in the particular historical, political and socio-cultural context in which vaccination occurs. Consideration should also be given to broader influences on vaccine hesitancy such as the role of public health and vaccine policies, communication and media and health professionals.

The growing interest in vaccine hesitancy has resulted in the development of different tools and strategies to enhance vaccination acceptance. Many experts have proposed ways to counter vaccine hesitancy at the population level, including transparency in policy-making decisions regarding vaccination programs, providing education and information to the public and health providers about the rigorous process that leads to approval of new vaccines and diversified post-marketing surveillance of vaccine-related events. In addition, as stressed by Larsson and collaborators, “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.”²² Finally, as their role is crucial in sustaining the success of vaccination programs, more research is needed to understand why some health professionals, trained in medical sciences, still have doubts regarding the safety and effectiveness of vaccination.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

Endnote

¹Generally speaking, a leap of faith could be defined as the act of believing in something intangible or improvable. In their study, Brownlie and Hobson describe how parents, who were having important knowledge gaps about MMR, were making a leap of faith by consciously or unconsciously dismissing some uncertainties in order to decide about MMR vaccination.

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