



Canada's source for
HIV and hepatitis C
information

La source canadienne
de renseignements sur
le VIH et l'hépatite C

Partial Efficacy and the Uptake of New Biomedical Prevention Technologies

Anthony P. Lombardo, PhD
January 2011

CATIE is Canada's source for up-to-date, unbiased information about HIV and hepatitis C. We connect people living with HIV or hepatitis C, at-risk communities, healthcare providers and community organizations with knowledge, resources and expertise to reduce transmission and improve quality of life.

Production of *Partial Efficacy and the Uptake of New Biomedical Prevention Technologies* has been made possible through financial contributions from the Public Health Agency of Canada.

Permission to Reproduce

This document is copyrighted. It may be reprinted and distributed in its entirety for non-commercial purposes without prior permission, but permission must be obtained to edit or otherwise alter its content. The following credit must appear on any reprint: *This information was provided by CATIE. For more information, contact CATIE at 1-800-263-1638 or www.catie.ca.*

Also available in French · aussi disponible en français

©2011, CATIE (Canadian AIDS Treatment Information Exchange).

All rights reserved.

Contact CATIE
1-800-263-1638 · www.catie.ca



TABLE OF CONTENTS

1 EXECUTIVE SUMMARY	3
1.1 PERCEIVED EFFECTIVENESS/EFFICACY IS A CENTRAL COMPONENT OF ACCEPTABILITY AND UPTAKE.....	3
1.2 UPTAKE OF TECHNOLOGIES GOES BEYOND INDIVIDUAL CHOICE.....	4
1.3 RISK COMPENSATION.....	4
1.4 EFFICACY ALSO A KEY ISSUE AT THE POLICY LEVEL.....	4
1.5 INSIGHTS FOR COMMUNICATING ABOUT NPTS.....	5
1.6 CONCLUDING NOTES.....	6
2 INTRODUCTION	7
3 METHODS	9
4 PARTIAL EFFICACY AND INDIVIDUAL UPTAKE	10
4.1 FACTORS THAT INFLUENCE UPTAKE.....	10
4.2 RISK COMPENSATION.....	18
5 PARTIAL EFFICACY AND POLICY-MAKING	19
6 INSIGHTS FOR COMMUNICATING “PARTIAL EFFICACY”	21
6.1 CONSIDERATIONS BEYOND “EDUCATION”.....	25
6.2 COMMUNICATION STRATEGIES.....	27
6.3 SOCIAL MARKETING.....	27
7 CONCLUDING NOTES	38
7.1 AREAS FOR FURTHER CONSIDERATION.....	38
7.2 AREAS FOR FUTURE INQUIRY.....	39
REFERENCES	40

1 Executive Summary

New prevention technologies (NPTs) for HIV prevention are on the horizon and their potential implementation will raise a number of issues. These technologies include vaccines, microbicides, male circumcision, and treatment as prevention (which includes treating HIV-positive people, pre-exposure prophylaxis [PrEP] and post-exposure prophylaxis [PEP]). One of the key issues related to NPTs is that these technologies will likely offer only partial protection from HIV. Nonetheless, NPTs are expected to have substantial impacts on HIV at a population level. The partial efficacy of these technologies raises two important questions: first, what is the best way to promote the use of a partially protective technology, to attain the population-health impacts?; and second, how to effectively communicate the idea that these prevention methods provide only “partial protection,” so that individuals do not think of them as “magic bullets” for HIV prevention and stop using other, more successful and established strategies?

The purpose of this review is to investigate how the issue of partial efficacy has been managed in the context of other HIV prevention technologies, as well as among other technologies—such as vaccines, measures to prevent malaria, and devices that protect people in case of accidents. It investigates whether the experiences with these other technologies hold any potential lessons for communicating about NPTs.

1.1 Perceived effectiveness/efficacy is a central component of acceptability and uptake

In the case of several technologies designed to protect people’s health and safety—such as vaccines, seatbelts, helmets, and bed nets for preventing malaria—the perceived effectiveness of a technology (how successful it is at doing what it is supposed to do) is key to whether people use it. For instance, if an individual does not think that seatbelts will protect them in an accident, then they are less likely to use one. Perceived threat is also a key issue—in other words, the level of risk an individual associates with not using the technology influences whether he or she will use it. For instance, if an individual does not think they are at risk for a traffic accident, then they may not use a seatbelt. However, many

of these other technologies have been proven to be more effective than NPTs are expected to be. Indeed, studies of the hypothetical use of NPTs have shown that proof the technology is efficacious is a prerequisite for a person's using it. Thus, the important challenge is to increase the uptake of NPTs in the face of partial protection, without giving people the false sense that they are fully protected.

1.2 Uptake of technologies goes beyond individual choice

A person's decision to use a prevention technology is affected by many social factors, including their friends, family, romantic partners, broader social networks and healthcare providers. In some areas, such as childhood vaccines, "vaccination cultures" have arisen, which shape how people come to understand the risks and benefits of vaccination; similar issues are expected with NPTs. Healthcare providers play an important role influencing people's reactions to and uptake of health technologies. A physician's view of a technology and its effectiveness can impact whether or not they recommend it, as can their abilities and comfort with discussing sensitive topics with their patients (and, indeed, their patients' comfort with discussing such topics with their physician). Research suggests that healthcare providers are not always clear on how to counsel their clients about partially effective technologies. This makes healthcare providers a key target audience for messages about NPTs.

1.3 Risk compensation

A key concern about NPTs is that some people may have a false sense of being 100% protected by an NPT and, because of this, engage in more risky behaviours—this is known as "risk compensation." Encouragingly, early findings from NPT studies show no evidence of risk compensation. However, these findings tend to come from trials where NPTs are used in controlled conditions and in tandem with risk reduction counselling. It is unclear at present whether NPTs will lead to risk compensation in the "real world."

1.4 Efficacy also a key issue at the policy level

Perhaps not surprisingly, the efficacy of a technology is also central to its acceptability among policy-makers. Even after NPTs are approved, it will need to be decided whether NPTs should be aimed at

certain populations or made universally available. Ethical considerations and the cost-effectiveness of the technologies will help inform such decisions.

1.5 Insights for communicating about NPTs

As mentioned, a key challenge in implementing NPTs will be the need to communicate that these technologies are only partially effective. Messaging about NPTs will have to be positive enough that individuals will want to use the technologies, but not so positive that they reduce their use or stop using other, more efficacious technologies. The literature on communicating about NPTs, such as vaccines and microbicides, consistently underlines the need for education on partial efficacy; however, the literature provides no clear direction on *how* to effectively communicate the concept. Messaging about other technologies tends to have a similar focus on “education” and providing the medical or scientific facts, so that individuals can make an informed choice. However, critiques of such an approach emphasize the need to understand not only the medical or scientific facts but also the myriad of contextual factors that mediate the scientific facts and affect whether or not people use the technologies (for example, the “vaccination cultures” discussed earlier). In communicating about NPTs, it will be important to address numerous target audiences—including friends, families, social networks and healthcare providers—and ensure that messaging is grounded in local realities and people’s experiences of NPTs. What is clear is that NPTs must be promoted as part of a combination prevention package, so that an NPT is not seen as a stand-alone, fully effective strategy to prevent HIV, but rather one tool to be used in tandem with other more efficacious strategies, like consistent condom use.

To this end, the “marketing mix” of social marketing may offer some direction for shaping messages about NPTs. Although social marketing is only one approach to health communication, its processes may hold insight for developing other means of communicating about NPTs. Literature on NPTs and other technologies have suggested a number of different approaches to messaging, including framing messages in terms of gain and loss; promoting NPTs in ways that resonate with key audiences and are grounded in their realities (e.g., circumcision as a hygienic practice, rather than a prevention strategy); or the use of tailored messages, to promote different prevention strategies based on the differing levels of efficacy of each technology. The use of behaviour change theory is also important to message design, to provide guidelines about how the desired behaviour changes may come about. Some

approaches have drawn extensively on the “perceived threat” and “perceived efficacy” of technologies in messaging about them (e.g., increasing perceived threat and offering effective solutions to promote uptake); but again, it is unclear how messages would specifically address the issue of a technology being only partially effective .

In the case of all the new prevention technologies, it is clear that extensive formative research with key audiences will be required, so that the messages resonate with and are relevant to those audiences; otherwise, the messages will likely be disregarded.

1.6 Concluding notes

There is little evidence available about the uptake of NPTs outside of controlled, clinical trials, which makes it difficult to understand how partial efficacy will be understood when NPTs are used in the “real world.” Hypothetical evidence of uptake is available, but there is a wide gap between hypothesized and actual behaviour. Although partial efficacy is talked about in the literature, there is little research on how the concept can be communicated most effectively. Again, formative research, which seeks to understand the behaviours, needs and interests of the target population, will be key to developing an initial understanding of how target populations will respond to the idea of partially effective technologies. It will also be necessary to consistently monitor and update these understandings once NPTs have been tested, approved and made available.

2 Introduction

New prevention technologies for HIV (NPTs) are considered to be the next stage in HIV prevention. These biomedical technologies include vaccines, microbicides, male circumcision, and treatment as prevention (i.e., treatment for people living with HIV, pre-exposure prophylaxis [PrEP] and post-exposure prophylaxis [PEP]). At present, the emphasis in HIV prevention is on strategies to reduce risk-taking behaviours, and the male condom is the main technology available to help prevent the transmission of HIV. NPTs are seen as heralding a new age of HIV prevention, one that uses biomedical approaches to prevent the transmission of HIV at a cellular/biological level. Nonetheless, it is widely recognized that NPTs will not replace established behavioural strategies for HIV prevention, and that biomedical and behavioural strategies will indeed need to work in tandem with one another.

These NPTs will introduce a host of new challenges, including how to promote awareness, acceptability, access and adherence to these technologies, as well as a number of socio-behavioural issues related to uptake, including gender and power relations, risk compensation, and structural barriers to access and adherence, as evidenced in a recent review (1).

One of the major concerns about NPTs is their predicted low, or partial, efficacy. Efficacy refers to how well a technology performs in controlled conditions, such as a clinical trial. This term should be contrasted with “effectiveness,” which is a measure of how well a given technology works under “real world” conditions. It is expected that NPTs will not provide full protection from HIV. Indeed, even condoms have not been shown to be 100% effective in practice because of condom failure, either due to how they are used or problems with the condom itself. A recent review suggested that condoms, when used consistently, reduced the rate of HIV being transmitted during vaginal intercourse by 80% (2).

Clinical trials of NPTs offer some insight into their potential efficacy:

- Recent findings from a microbicide trial in South Africa showed Tenofovir gel to be 39% effective in reducing the risk of HIV infection among the study’s 889 participants; it was also 51% effective in reducing genital herpes infections (3).

- In a trial of an HIV vaccine in Thailand, vaccine efficacy was in the range of 26.2%-31.2% across a number of analyses (4).
- Three trials of male circumcision for HIV prevention (in Kenya, South Africa and Uganda) have shown protective effects in the range of 60% (5-8).
- A systematic review of the use of non-occupational post-exposure prophylaxis (PEP) for HIV prevention was recently conducted; however, researchers were unable to draw conclusions on the effectiveness of PEP due to the lack of reliable evidence (9).

Thus, NPTs are considered “partially effective,” meaning that they are expected to protect some people, to varying degrees, but not all people in a population (10). With respect to an HIV vaccine, “partial efficacy” can also mean that the vaccine would not prevent infection, but rather, mitigate the severity of the disease (10). “Partial efficacy,” also known as “partial effectiveness” or “partial protection,” poses a particular challenge to the eventual introduction and implementation of NPTs at the individual level and population level (i.e., “herd immunity”), and could potentially influence people’s risk-taking behaviours. The challenge is to promote NPTs such that individuals will want to use them and, at the same time, discourage people from using partially efficacious NPTs *instead of* more efficacious strategies (such as condoms).

Despite their predicted low efficacy at the individual level, NPTs such as HIV vaccines may have a significant impact at the population level (11,12). However, these population-level gains will only be possible if the NPTs are taken up at an individual level, although they will not provide individuals with 100% protection. With respect to an HIV vaccine, for example, the issue of personal protection versus “herd immunity” is raised. “Herd immunity” generally refers to reduced transmission of a disease because of a high level of immunization against it (13). The impact of NPTs at the population level will depend on not only individual uptake of the technologies, but also the availability of the technologies as well as perspectives on NPTs in the media, and among social networks and health practitioners.

These issues are discussed in the following sections, which focus on the role of efficacy in the future implementation and uptake of NPTs, based on existing research on NPTs as well as in the uptake of a range of other technologies. The later sections focus on potential strategies for marketing NPTs and

communicating the idea of “partial efficacy,” again based on the research in this field, as well as lessons gleaned from the promotion of other technologies.

3 Methods

This review was driven by two central research questions:

1. What is known about how the efficacy of a new prevention technology affects its uptake by individuals, healthcare providers and policy-makers?
2. What is known about communicating the concept of “partial efficacy”?

A search for relevant research literature was conducted through Scopus, the largest abstract database, which includes 18,000 publications in the fields of medicine, health and social sciences. Search terms included variations on the terms “partial efficacy” and “partial effectiveness.” The searches were not limited to research in the field of HIV prevention, but also included the role of efficacy in the uptake and communication of a wide spectrum of technologies, such as other vaccines (including hepatitis A, hepatitis B, human papilloma virus [HPV] and influenza vaccines); malaria prevention; and various forms of contraception, such as intrauterine devices and emergency contraception. Given the widespread use of terms such as “efficacy” and “effectiveness” in academic research not related to the research questions, searches were further narrowed through a number of means. Terms related to the uptake and the communication/messaging of technologies were included where relevant. Search terms also included the relevant audiences, as well as particular technologies (e.g., vaccines). Where possible, recent reviews, systematic reviews and meta-analyses were sought in relevant areas.

Reviews and articles were selected based on readings of abstracts and their relevance to the review, namely, those that addressed issues of efficacy and/or effectiveness of the technologies and the impact of those issues on their uptake and acceptability. Additional sources were located through the reference lists of retrieved articles. Experts in the field of health communication and social marketing were also consulted. Some relevant grey literature was also consulted (that is, publications that are not published commercially or indexed by major databases), particularly in the review of research on partial efficacy and policy-making.

The purpose of this review was to investigate the nature of the research conducted in the area of partial efficacy and the uptake of NPTs by individuals, healthcare providers and policy-makers. It is not a formal literature review but rather a review aimed at gaining a sense of the research conducted in the area and identifying areas for future inquiry. As elaborated below, little substantive work has been completed that focuses specifically on the notion of the import of “partial efficacy” and how it may affect uptake, as well as strategies for communicating the concept successfully. Accordingly, the review suggests other areas of research that might be considered for offering guidance for the eventual implementation of NPTs.

4 Partial Efficacy and Individual Uptake

4.1 Factors that influence uptake

A review of the literature on the socio-behavioural issues related to NPTs for HIV prevention (1) showed that the key factors influencing the eventual uptake of these technologies included, but were not limited to (a) the efficacy of a technology; (b) cost; and (c) safety. Individuals’ perceptions of their risk for the disease in question also plays a role in their uptake of health technologies (1,15). A meta-analysis published after that review was conducted confirmed that efficacy was the primary factor that would affect the acceptability of an HIV vaccine (14).

One study of a potential HIV vaccine that explored the knowledge and beliefs of potential users revealed confusion about the meaning of the term partial efficacy. The participants, high-risk individuals in Los Angeles, noted that they understood efficacy in a number of different ways, including vaccine effectiveness for personal protection or for the protection of community. There was confusion about whether the vaccine would be effective at preventing HIV transmission or whether the vaccine might accidentally transmit the disease (16). These findings provide a sense of the challenges of communicating this notion with respect to NPTs.

A review of research findings on the uptake of other vaccines reveals the important role efficacy plays in the uptake and acceptability of an NPT:

- A systematic review of studies of HPV vaccination among diverse populations in the US (17) showed that the HPV vaccine was deemed more acceptable when people believed the vaccine was effective; the perceived effectiveness of the vaccine emerged as a “key predictor” of acceptability (p. 112).
- A national US survey of 306 men who have sex with men showed that the acceptability of the HPV vaccine among men who have sex with men was higher among those who perceived the vaccine to be more effective (18).
- In a Dutch study of the intentions of 53 men who have sex with men to get vaccinated against hepatitis B, the participants’ belief that the vaccine would reduce their risk for hepatitis B was the strongest predictor of their intention to get vaccinated (19).
- A review of the uptake of influenza vaccines (the “flu shot”) among older adults showed that their beliefs about the efficacy of the vaccine were associated with acceptance of the vaccine (20).
- Similarly, a survey of 2,042 people in Switzerland found the perceived usefulness of vaccines for a spectrum of diseases—including tetanus, influenza and pneumonia—was significantly associated with whether or not people got vaccinated (21).

The recent H1N1 influenza (“swine flu”) experience provides an interesting parallel to the case of NPTs, because in this situation, a new (although not altogether unfamiliar) vaccine was introduced. Studies of public reactions in different geographical areas to the vaccine for H1N1 showed concerns about (a) the safety of the vaccine and (b) its potential effectiveness (22-27). In particular, a study from Hong Kong asked the general public about the acceptability of an H1N1 vaccine in different conditions. It found that while 135 of the 301 participants (45%) would seek a vaccination if it was offered for free, only 14 (5%) would seek a vaccination if information about its efficacy and safety was not available (23). These studies also showed that people who did not see themselves as being at risk for H1N1 infection would not get vaccinated.

Studies of the attitudes of healthcare workers towards the H1N1 vaccine show similar results. The acceptance rate of the H1N1 vaccine among healthcare workers in Greece and in Istanbul, Turkey was low due to concerns about the safety, efficacy and potential side effects of the vaccine (28-30). However, a recent study of family physicians and pediatricians in Canada (n=921) showed that 72%-92% of participants felt the H1N1 vaccine was safe, effective and acceptable, and more than 75% would recommend that their patients become vaccinated and would seek the vaccination themselves (31).

However, such vaccines are very different from a potential HIV vaccine, or indeed any of the other NPTs for HIV prevention, in that these other vaccines tend to have high(er) efficacy rates and a person is not likely to engage in more risk-taking behaviours after getting vaccinated (see Risk Compensation, below). These studies do underline, though, the importance of efficacy across a wide variety of vaccines, even among those where the consequences of not getting vaccinated (e.g. the flu) are usually not as severe as HIV infection. The perceived efficacy of other technologies has likewise been linked to their use—for example, seatbelts (32-34); sunscreen (35,36); motorcycle helmets (37); personal hygiene practices to prevent severe acute respiratory syndrome (SARS) (38); and malaria prevention (39,40).

Interestingly, one study about condom use among adolescent Puerto Ricans found that some of the participants had concluded that condoms were not worth using because they had not been demonstrated to be 100% effective at preventing HIV (41). Such a perspective again illuminates the challenges of promoting partially effective technologies.

On the other hand, a study of the acceptability of male circumcision for reducing HIV transmission among adult men and women in Kenya showed that the majority of the participants understood that circumcision would not be 100% effective at preventing HIV transmission but saw it as a complementary prevention option (42). Another study of the acceptability of male circumcision, done in the Dominican Republic, found that the acceptability of circumcision increased after an information session about the benefits of the procedure, although the substance of these information sessions was not described in the findings (43). These studies are encouraging in that they demonstrate that a balanced view of at least one type of NPT is possible. However, both of these studies dealt with

hypothetical situations of male circumcision and cannot predict what an actual implementation process would look like or how individuals would react to it.

In sum, it is clear that the perceived threat and the perceived efficacy of a technology to address that threat are central to the uptake of new health technologies.

4.1.1 Personal protection and population-level impacts

Given that the perceived efficacy of a particular technology is central to its uptake, the eventual implementation of new NPTs, which are likely to have low to moderate efficacy rates, will pose significant challenges.

Low uptake at the individual level will hinder the population-level impacts of the NPTs. If individuals do not use the technologies because they do not see them as being effective (i.e., protecting them from HIV), then the expected population health gains cannot be realized (44,45). Vaccines are a good case in point: because childhood diseases are less prevalent—due to the impact of vaccines—parents feel there is less risk for their children of those diseases, and they focus instead on the potential risks of the vaccine, rather than the disease the vaccine is meant to prevent (44). In turn, some parents choose not to vaccinate their children, which can then result in the resurgence of these diseases. This fact underlines the importance and challenges of communicating the notion of “partial efficacy” to potential users (discussed further in Section 6).

4.1.2 Contextual factors

Uptake of NPTs will not only be influenced by individual choices but also by social contexts which will shape the way individuals understand and use the technologies.

4.1.2.1 Relevant audiences

Through a review of the socio-behavioural issues related to NPTs, a number of audiences that play an important role in promoting the uptake of NPTs were identified. While individual users need to be a central target audience for marketing, the eventual acceptance and uptake of NPTs will also be

impacted by the mass media and the social networks of individual users, including families, relationship partners and friends (1). Healthcare providers play a particularly important role in promoting NPTs.

4.1.2.2 Communication and vaccination cultures

While the efficacy of technologies has an important influence on uptake, there are other important contextual considerations that are likely to play a role in the eventual acceptance and uptake of NPTs. For instance, other vaccines have seen the rise of resistance movements which have implored individuals not to vaccinate against certain diseases. A good example of this is the controversy over MMR (measles, mumps and rubella) vaccinations in the United Kingdom. In this case, coalitions, conceptualized as “vaccine-critical” groups, arose against these vaccinations and reframed the risks of vaccination proposed by public health experts (46,47). For instance, the groups highlight the “unknowns” of vaccine safety; they argue that too much emphasis is placed on population-level impacts of vaccination and a lack of attention given to the social inequalities which cause or perpetuate ill health; they question the benefits of the MMR vaccine; or they argue that vaccination creates new risks (46). These groups arose after a significant controversy over the safety of the MMR vaccination, which had been linked to various diseases.

The development of “local vaccination cultures” has been documented (48). This refers to the rise of groups of people who share an understanding of the nature of vaccines (their safety, effectiveness and so on) as well as the vaccination process (e.g., the physical experience, treatment by healthcare providers and so on). Given the role of social networks in the acceptance and uptake of NPTs, such “sub-cultures” may be important to consider, as information becomes shared about NPTs before, during and after their implementation (see also (49)). Also, given the reality of “bandwagoning” (50,51)—the idea that people may be more likely to be vaccinated if they perceive that others are doing so—these local cultures may play a role in sharing information about who and how many people are receiving vaccinations, or, more broadly, using other types of NPTs. The mass media (including the Internet) will play an important role here as well, on both sides of the debate, as has been documented in the coverage of other vaccines (52,53). In sum, understandings of NPTs and their partially protective nature are likely to be shaped by both public and private discourse.

A recent study from Greece that considered the acceptability of an H1N1 vaccine among healthcare workers showed a link between where people received information from and their acceptance of the vaccination. People who received information about the safety of the H1N1 vaccine from the Greek Center for Disease Control and Prevention or from medical journals were more likely to accept vaccination, whereas people who received information about the safety of the vaccine from the mass media (especially television and radio) were more likely to refuse vaccination (29, see also 24). On the other hand, an analysis of print media reports (n=219) in sub-Saharan Africa of male circumcision for HIV prevention showed that a majority of the articles (~85%) reported that male circumcision provides only partial protection against HIV, and that circumcision should be seen as a complement to existing HIV prevention strategies, not a replacement for them (~54% of articles) (54). Continued monitoring of media coverage, before, during and after NPTs are implemented will be important to understanding reactions to the technologies.

The impact of the media and of social networks underline the need to understand and address the broader social and cultural factors involved in an individual's choice about whether or not to use an NPT.

These issues are raised here because it is likely that the partially protective nature of first-generation NPTs will stir much controversy. Coalitions both for and against the technologies will likely form, and the partial efficacy of the technologies will most likely be a central concern. It is equally likely that social networks will be abuzz with talk of these new technologies, again much of which will centre on the partial efficacy of the technologies and the level of personal protection they provide.

An editorial from the *New England Journal of Medicine* on the recent H1N1 outbreak offers an interesting take on “emotional epidemiology.” In this editorial, a New York physician reflects on how she witnessed her patients demand an H1N1 vaccine when the flu first came on the scene, and then became reticent about vaccination as the ‘epidemic’ seemed to become less threatening and her patients became “emotionally tolerant” of it (55). She concluded that “it is clear that there is a distinct emotional epidemiology and that it bears only a faint connection to the actual disease epidemiology of the virus” (p. 2595). In other words, the ways in which individuals perceive the threat of, and solutions to, health issues are not always related to the epidemiology of the health issue itself. Understandings of “partial efficacy” will have implications beyond the individual (for instance, for policymakers and

healthcare providers), as detailed in later sections. Again, this underlines the importance of communicating this notion successfully, such that population-level gains can be realized.

4.1.2.3 Healthcare providers

Healthcare providers exert a strong influence on the uptake of prevention technologies, especially vaccines. This was demonstrated in the review of socio-behavioural issues related to NPTs, and is evident in other areas. For instance, with respect to microbicides for HIV prevention, one study of practitioners and policy-makers noted:

The literature provides a strong indication that provider attitudes are likely to matter in clients' perceptions and use of microbicides, regardless of whether this new potential technology becomes available by prescription only or over the counter. (56, p. 190)

Indeed, studies have underlined the importance of physicians recommending vaccination for HPV (17,18), influenza (20,21,57,58) and other diseases (57) as well as vaccination for hepatitis A and B among men who have sex with men (59).

The literature on other technologies gives some indication of the issues involved in physician/healthcare provider recommendations and uptake, many of which are relevant to NPTs. For instance, with respect to vaccines, physicians' recommendations tend to be based on their own views of the vaccine and/or vaccination in general, and their beliefs about the safety and efficacy of the vaccine (60-63). Similar findings have been shown in female contraception, where physicians' misconceptions about certain forms of contraception (e.g., intrauterine devices and emergency contraception) prevent them from prescribing these otherwise safe and efficacious technologies (64,65).

Studies have shown variations in the way doctors prescribe post-exposure prophylaxis, based on the nature of the exposure, healthcare providers' beliefs about when post-exposure prophylaxis should and should not be prescribed, and the nature of the healthcare setting (66-69). Given the predicted partial efficacy of first-generation NPTs, physicians may be reluctant to recommend them, especially

when physicians question the use of existing vaccines and other technologies that are well-established and have higher rates of efficacy.

Another issue is physicians' attitudes towards discussing sensitive topics, such as sex and drug use, with their patients (63,70). For example, the concern of some physicians that discussing the HPV vaccine will result in increased sexual activity among young girls has been noted, although the impact of this concern is unclear (60,71).

The healthcare provider–patient relationship may also affect the uptake of vaccines and other technologies. For instance, the literature on hepatitis vaccination among men who have sex with men has shown a correlation between men's openness about their sexual identity and sexual behaviour with their healthcare provider and how likely they are to get vaccinated (72,73). A study of African-American men who have sex with men in Alabama showed that men who communicated more with their healthcare providers about their sex lives and sexual behaviour were more than nine times more likely to have a hepatitis A vaccination (74, see also 59). An environment that encourages trust and the open discussion of such issues is therefore important to encouraging vaccination (73). To this end, gay-friendly clinics with “open-door” policies have been established to reach those who might otherwise be alienated from other healthcare settings, and some of these clinics are already involved in prescribing post-exposure prophylaxis (e.g., 75).

These experiences of implementing other vaccines hold some insight for the eventual dissemination of information about NPTs. With NPTs, physicians will undoubtedly continue to play a key role in promoting their uptake. HIV prevention and the NPTs are often related to sensitive and sometimes “stigmatized” behaviours, such as sex and drug use, the open discussion of which has been shown to increase other kinds of vaccination. The expected partial efficacy of the first-generation NPTs will likely make these issues even more critical, underlining the importance of communicating the concept.

To this end, it has been recommended that healthcare providers gain a good grasp of the notion of partial efficacy, so that they can counsel their clients and patients accordingly (45). A study of healthcare providers' perspectives on microbicides (56) examined the partial efficacy of microbicides. The study found that healthcare providers from one site in New York and two sites in South Africa saw the issue of partial efficacy as “one of the most challenging topics to integrate into their generally

positive view” of microbicides (p. 196). Service providers across all three sites expressed uncertainty about how to counsel their clients on partially efficacious microbicides. While there was some sense that harm reduction counselling (counselling to educate people about the use of a less effective technology, in situations where a more effective technology is unlikely to be used) might be an acceptable proxy for counselling on partially protective technologies, there was greater support for promoting the use of microbicides in conjunction with the continued use of condoms. However, some saw this approach as an ethically untenable position, and preferred counselling on condom use only. There was also concern that healthcare providers would have difficulty underlining the importance of “herd immunity” when promoting individual behaviour change. Nonetheless, the authors noted that

Many providers and those in influential and policy positions believed that partial effectiveness was a necessary trade-off in order to have access to another prevention method besides condoms, pointing out that no method was 100% effective and that condoms were not being used adequately. (pp. 197-198)

Thus, educating healthcare providers about the partial efficacy of the NPTs will be paramount; but again, it will be very challenging, especially in the absence of literature about communicating the concept. However, it is encouraging that providers see microbicides, in this particular case, as a generally positive development and that they recognize the importance of promoting the use of microbicides as part of a prevention package.

4.2 Risk compensation

An ongoing and salient concern about NPTs for HIV prevention is that people may falsely believe that the new technologies provide full protection against HIV (76,77) and, as a result, engage in more risk-taking behaviours. This tendency to take more risks as a result of perceiving a reduced risk is known as risk compensation. If people perceive that an NPT offers them full protection from HIV, they may take more risks (e.g., be less likely to use condoms consistently; increase their number of sexual partners; or, if they are injection drug users, engage in unsafe injection drug practices) (77). There is concern that risk compensation could negate or otherwise offset the potential of NPTs to prevent HIV.

The review of socio-behavioural issues in NPTs specifically considered the evidence about risk compensation (1). Encouragingly, there is not yet definitive evidence that any of the NPTs encourage increased risk behaviour. Furthermore, evidence suggests that individuals would not change their safer sex behaviours unless the technologies were shown to be highly effective (e.g., 78-81). However, the available data are very early, preliminary and generally come from trials, which may not accurately reflect actual uptake in the “real world.” It is therefore too early to state definitely the impact that NPTs may have on individuals’ risk-taking behaviours.

When implementing partially protective NPTs, it will be important to communicate the concept of partial protection its implications clearly and accurately, without encouraging risk compensating behaviour.

5 Partial Efficacy and Policy-Making

Not surprisingly, the efficacy of a particular technology plays an important role in its acceptability at the policy-making level. A recent review compared policy decision-making aids, used in the context of introducing vaccines, in a number of countries (Canada, Netherlands, USA, countries in the Western Pacific region), as well as international guidelines from the World Health Organization (82). Based on this comparison, the review proposed an analytic model for understanding the development and implementation of vaccine policies. The second “step” of this model included consideration of the characteristics of the vaccine, including its efficacy and effectiveness at a population level, in addition to issues such as safety, dosaging and so on. The acceptability of the vaccine to the general public, as well as the feasibility of implementing the vaccine among the public, were also considerations.

A Canadian-specific analytic framework for understanding immunization policy and program development was developed through key informant interviews with scientific and public health experts involved in vaccination programming in Canada (83). Again, vaccine characteristics—especially vaccine efficacy and safety—emerged as key elements, as did the acceptability and feasibility of the vaccine and vaccination program. The International AIDS Vaccine Initiative likewise highlights the acceptability of an HIV vaccine to be a key challenge in its dissemination; they include efficacy and risk compensation as dimensions of acceptability (84).

Clearly, and not surprisingly, the efficacy of the technology is important to policy-makers. It will be important to communicate to policy-makers the importance of the NPTs despite their projected low efficacy. Encouragingly, there is some sense that the conditions are favourable for the implementation of NPTs for HIV prevention. The burden of illness of a particular disease, as well as the cost-effectiveness of the proposed vaccine, also have a strong impact on vaccine policy-making (82). The argument of the burden of disease of HIV/AIDS is an easy one to make, and arguments may also be made about the cost-effectiveness of first-generation AIDS vaccines, despite their predicted limited efficacy. Furthermore, to the extent that vaccines can carry political currency (83), the introduction of an HIV vaccine—or similar NPT with broad population health benefits—may bring positive political benefit (although many pitfalls would also be predictable).

The fast uptake of the HPV vaccine in Europe may also hold hope for the uptake of NPTs when they become available. A recent article published in the *Journal of Public Health* noted that two of the reasons behind this quick uptake of the vaccine in Europe were (a) the rapid licensure of the vaccines because of the availability of rigorous data and (b) a supportive environment (85). The data that influenced the quick licensing of the HPV vaccine included the epidemiological data on the need for vaccination and evidence of the vaccine's safety and efficacy. The supportive environment encompassed an awareness of the impact of cervical cancer at a population health level; the existence of secondary prevention programs; and the mobilization of diverse stakeholders to promote the vaccination programs. The projected efficacy of the first-generation NPTs notwithstanding, the context of HIV/AIDS (in the developed world at the very least) meets these criteria.

It has also been suggested that the initial roll-out of a partially effective HIV vaccine would have the greatest impact if restricted to higher-risk groups, such as men who have sex with men, injection drug users and others at high risk for acquiring HIV (11,86). However, others have countered that targeted immunizations protect the immunized individuals, but may dampen the effects of immunizations at a population level (e.g., 87,88). Furthermore, there are ethical issues involved in deciding whether NPTs should be universally available or available only to specific populations. For example, such a decision could potentially stigmatize certain groups or could potentially expose lower-risk groups to vaccines or other technologies they may not need (89).

6 Insights for Communicating “Partial Efficacy”

The implementation of NPTs will require extensive communication efforts with different target audiences. Social marketing, a health communication technique that applies commercial marketing principles to encourage behaviour change (90,91), has a long history in HIV/AIDS behaviour change (90) and is commonly recommended for disseminating information about NPTs. While social marketing is not the only method of promoting health-related behaviour change, the lessons it holds are applicable to other approaches to promoting the technologies.

It is well recognized that the “social marketing of a low efficacy vaccine will be a tremendous challenge” (48, p. 1307, see also 92). Newman and colleagues (93) have pointed out that “effective communication with vaccine consumers may be an integral component of successful HIV vaccine dissemination” (p. 322). They continue,

A partial-efficacy vaccine must be presented in a positive enough light to facilitate acceptability and uptake; however, it must also be introduced cautiously to avoid promulgating a belief in a “magic bullet” and, in turn, carte blanche for risk behaviors, which would eradicate the benefits of a partial-efficacy vaccine on an epidemic level.
(p. 330)

The International AIDS Vaccine Initiative (84) has also noted that “it is critically important that stakeholders at all levels understand the benefits of a partially effective vaccine when making decisions” (p. 135). The previous sections have likewise noted the importance of communicating this concept to individuals, healthcare providers and policy-makers.

However, little literature was found that described best practices or strategies for communicating the concept of “partial efficacy.” Instead, the notion has been couched in more general recommendations for the promotion of vaccines and the need to educate target audiences.

The emphasis in these recommendations has been education—to provide facts about the efficacy and safety of the vaccine. A report from a consultation of the World Health Organization, UNAIDS and the Centers for Disease Control (USA), for instance, noted that the marketing of a first-generation

vaccine should highlight all the facts related to the vaccine, the risks and benefits of vaccination, and the vaccine's level of efficacy (94). They note, in particular, that “material will need to be backed-up scientifically and partial efficacy outlined clearly” (p. W4). It also suggested drawing parallels between other methods, such as condoms and contraceptives, to explain partial effectiveness.

Recommendations in a similar vein have been made for promoting other vaccines. One review of studies on the acceptability of the HPV vaccine (95) noted that “educational initiatives targeted towards patients, parents and healthcare providers will play key roles in fostering positive attitudes towards vaccination” (p. 3). A consultation conducted by the US Centers for Disease Control that asked 314 Americans, stratified by gender, race and urban/rural settings, about their knowledge, attitudes and beliefs regarding HPV vaccination concluded that there is a need to “empower the public” through complete information, to enable them to distinguish the “truth” from other information about vaccines (96). They recommended the following:

- Educate people about HPV.
- Portray the potential risks accurately, without creating anxiety.
- Distinguish HPV from other sexually transmitted infections.
- Disclose the uncertainties and unknowns about HPV.

A systematic review of HPV acceptability studies published between 1995 and January 2007 (17) likewise concluded that “campaigns may need to take care to communicate that HPV vaccines provide less than total protection against cervical cancer” (p. 113). However, the review offered no direction on how to do so effectively.

A study of the perspectives of 48 African-American seniors (97) on influenza vaccination, recommended the following communication strategies:

- Reinforce the protective effects of the vaccine.
- Explain the potential side effects.
- Provide accurate information about how the vaccine works.
- Explain why some individuals may still develop influenza after vaccination.

- Explain why the vaccine will not transmit the influenza virus.

In a similar way, a study of the intentions of men who have sex with men to vaccinate against hepatitis B (19) suggested that campaigns should target “both risk perception and outcome expectancies” about the hepatitis B vaccine (p. 731; see also (18) on HPV vaccination among men who have sex with men). Studies on the uptake of H1N1 vaccines likewise suggest emphasizing the efficacy of behaviours one can take to protect against H1N1 as a strategy to increase those behaviours (e.g., 98,99).

Messages about “herd immunity” have also been suggested as a strategy for promoting vaccines. The idea behind this messaging is to inform individuals that vaccination will protect not only themselves (or their children) but also the population or community at large; in other words, such messaging constructs an argument of civic duty. However, it is unclear how much of an impact such a strategy would have (50,100).

Many of these recommendations may be able to guide the marketing of NPTs for the prevention of HIV. It will be important to provide information about the technologies, including information about how the vaccine works, its efficacy, side effects and safety. Introducing a low efficacy vaccine in a “staggered” manner—targeting perhaps higher-risk groups first—will require specific messaging strategies. As suggested in one article on the introduction of an HIV vaccine, these strategies will need to (48):

- explain why some groups are receiving the vaccine, while others are not, without stigmatizing those groups who are receiving the vaccine.
- explain that acquiring HIV is still possible after vaccination.
- explain the delay in vaccine coverage.
- reinforce the need for continued safer sex practices.

In a similar way, a Centers for Disease Control (USA) consultation on male circumcision for HIV prevention in the United States offered guidelines for communicating with men about male circumcision:

- Frame circumcision as one of several partially effective risk-reduction alternatives, to be used in combination with other strategies.
- Frame adolescent/adult circumcision as an intervention for promoting genital health and hygiene.
- “Develop clear messaging about partial protection” for men engaging in penile-vaginal sex.
- Develop tailored messages for different groups of men (for example, men who are already circumcised, those electing to become circumcised, men of different ethno-racial backgrounds).
- Conduct formative research.
- Provide fact sheets on what is known and what is not known about circumcision and HIV prevention for men who have sex with men.
- Hold “formative studies” of circumcision among men who have sex with men (89, p. 78).

To this end, the male circumcision trials in Kenya, South Africa and Uganda (5-7) also warned against the potential for risk compensation in the face of circumcision, and that care must be taken when informing people that male circumcision provides only partial protection. The researchers involved in the Kenyan trial observed,

A challenge to prevention specialists and clinicians will be to develop circumcision interventions that communicate the benefits of the procedure, while also explaining that circumcision does not offer full protection from HIV acquisition...Circumcision will be most effective if it is not perceived as a stand-alone clinical procedure, but as one component of a full suite of HIV prevention and reproductive health services, including HIV testing and counselling, diagnosis and treatment of sexually transmitted infections, condom promotion, behavioural change counselling and promotion, and other methods as they are proven effective. (6, p. 655)

In these trials, men were offered information about the benefits and risks of circumcision, as well as information about the partially protective nature of the procedure. However, the published articles do not detail how this information was delivered. Further, men were also offered ongoing risk reduction counselling, so it is difficult again to gauge the reaction an NPT such as circumcision would receive

outside of the controlled setting of a clinical trial. Also, the efficacy of circumcision has been shown to be higher than that predicted for other NPTs.

Thus, while these strategies provide some potentially useful guides, they are rather silent on best practices for communicating “partial efficacy,” despite the repeated recommendations for doing so clearly and accurately.

6.1 Considerations beyond “education”

As discussed, many of the recommendations for implementing vaccines and other technologies have focused on “educating” the public. However, there are a number of critical perspectives on the role and effectiveness of “education” in promoting vaccination that provide further insight into how to improve marketing efforts for NPTs. In particular, the assumption that individuals are passive receptors of “expert authority” has been brought into question. For instance, a study that considered parents’ decision-making around the MMR vaccine concluded:

Simply providing more leaflets, television campaigns and didactic verbal statements, in which medical evidence on the effectiveness and safety of the vaccine is meant to flow from the producers to the consumers, is to fail to recognise the need to contextualise information [for parent’s own understandings]. (101, p. 524, see also 102)

Similarly, a study on why older people obtain influenza vaccinations (103) found that the older adults saw traditional health promotion initiatives as “dictatorial and irrelevant” and suggested instead that “older peoples’ own subjective assessments, understandings and experience need to be taken into consideration” (p. 752). This issue has been made particularly relevant with the rise of anti-vaccination groups, who can promote their own constructions of “authority” and influence the uptake of vaccines and other technologies (46,104,105). In a context where “controversy sells” and the Internet provides a platform for the exchange of all sorts of information, it has been noted that emotional appeals may play an increasingly important role in promoting the uptake of a vaccine. For instance, one editorial (104) noted:

In situations where parental concern is high, medical expertise is trumped by empathy, openness, and perceived honesty. A behavior change model that embraces this is needed.... A message that can arouse the audience emotionally will be more likely to get their attention and motivate them to change their behavior... *The use of rational argument and data alone will not be sufficient* [italics added]. (p. 433-434)

A related perspective questions the extent to which the perceived “risk” of vaccination influences an individual’s decision of whether or not to get vaccinated (105):

From the assumption that risk is key it is only a step to the conclusion that refusal to vaccinate or concern about vaccination is due to a misperception of the relative balance of risk.... *This view is part of the much discredited model of the public understanding of science* [italics added]. (p. 281)

Taken together, such perspectives underline the importance of recognizing and engaging “local vaccination cultures,” as discussed earlier (48). A case study of the role of rumours in the uptake of health interventions in Africa is particularly telling, as it illustrates that scientific “truths” may have less influence than rumours from sources considered credible (49). This issue has been identified with male circumcision as an HIV prevention strategy as well (89). Similarly, misconceptions about NPTs may also affect whether or not people decide to use them (e.g., 36,106,107) .

It is likely that the partial efficacy of NPTs will emerge as a crystallizing issue for and against the new technologies. In the age of mass communication, the notion of a “local” culture may not be relevant, but shared understandings of NPTs will arise and should be integrated into communication efforts. It will therefore be important that relevant communities be engaged in the development of materials about NPTs (108,109). Such community engagement has been long emphasized in the roll-out of malaria interventions in developing countries (e.g., 110,111,39,112). Even after the launch of communication campaigns, it will be important to continue to assess how audiences understand and react to messages, to be able to manage any misconceptions or unintended consequences (106). As noted (48), “the scientific facts about the safety and efficacy of a vaccine are not the main determining factor for people’s reactions to it, but their interpretations of these facts in so far as they have

information about them” (p. 1306). The discourses about NPTs that arise will influence how audiences react to the technologies.

One clear recommendation in the literature is the need to provide continued risk reduction counselling as NPTs are implemented. This call is virtually universal in all discussions of the implementation of NPTs. Thus, it will be important for messaging and marketing efforts to emphasize the need for other HIV prevention strategies, including condom use. It is clear that NPTs will need to be promoted as an adjunct prevention method, to be used with other strategies as part of an HIV prevention package (1). It has been observed that the introduction of NPTs may be a unique opportunity to start to seriously promote combination prevention and move beyond “dichotomous” thinking in HIV prevention to consider how a variety of prevention options can work together (113, p. 709)

6.2 Communication strategies

Social marketing has been recommended as a useful tool for promoting the uptake of vaccines, as well as for promoting changes in health-related behaviours more generally. Although there has been little written specifically about communicating the concept of partial efficacy, social marketing may provide insight into the communication strategies for the eventual implementation of NPTs.

6.3 Social marketing

The social marketing process is different from other health communication efforts in its focus on exchange; an orientation to the consumer; and a reliance on the “marketing mix” used in commercial marketing (90). Like other forms of health communication, though, formative research plays a central role. Potential social marketing approaches to the uptake of NPTs are explored below. Although this discussion is particular to the approach of social marketing, the discussion is relevant to other approaches to health communication as well.

6.3.1 Marketing mix

The “marketing mix” is a defining feature of social marketing (90). It refers to commercial marketing techniques applied to behaviour change. The components of the mix are: (1) product, (2) price, (3) place and (4) promotion.

Product refers to the benefits that adopting the intended behaviour change brings. Social marketing is based on the notion of exchange, where people are theorized to change behaviour when the product offers benefits that are truly valued and the benefits of changing behaviour outweigh the costs (90). Thus, the product being marketed—the behaviour change—must solve a particular problem that the target audience considers important and/or offer a highly valued benefit. Since an NPT may not offer 100% protection and the concept of “herd immunity” is a difficult one to communicate, it will be challenging to devise messages that highlight the benefits of adopting a partially effective technology.

Price refers to the “costs” of the behaviour change, from the point of view of the target audience. Unlike commercial marketing, “price” in social marketing refers to psycho-social costs and other barriers to accessing the behaviour change. With NPTs, the costs might include the stigma of accessing a technology, the concerns about side effects in the face of partial efficacy, the fear of infection after use (e.g., with an HIV vaccine), and/or the fear of not being completely protected against HIV.

Place refers to those locations where an individual will act on the intended behaviour change. It also includes organizations and other people who can facilitate the change. In the case of NPTs, public health clinics, doctor’s offices, and other health and social service settings may be the place where decisions about NPT use are made, through discussions about NPT use and/or the prescription of an NPT. It also has been suggested, with respect to men who have sex with men at least, that offering immunization services in non-traditional locations (such as bars, bathhouses or gyms) may help increase uptake (114) as well as provide “gay-friendly” clinics (75). Such an approach could most likely be used with other groups as well, such as intravenous drug users, women and Aboriginals. For NPTs that do not need to be prescribed, broader dissemination would be possible, as the case of condom distribution shows. “Place” would also include those places where individuals can be provided with

information about what partial efficacy means in terms of protecting oneself and one's community, and implications for sexual practice.

Promotion refers to the design and delivery of the messages that promote the behaviour change. This encompasses the channels through which the marketing will occur. This component will be one of the most important in the marketing of the NPTs, as it will be these messages that convey the benefits of the NPTs, communicate the concept of idea of “partial efficacy,” and help reduce the costs of uptake.

6.3.1.1 Message design

Other areas of health promotion may provide some direction for the design of messages about NPTs. One approach to message design is “framing.” Framing refers to how particular information about a health behaviour (e.g., getting immunized) is presented (115). Messages may be framed in terms of “gain” or “loss”: gain-framed messages emphasize the benefits of a certain behaviour whereas loss-framed messages emphasize the negative consequences of not adopting a certain behaviour (115). It is generally, although not universally, accepted that *gain-framed messages* are more effective for promoting behaviours that are perceived to have a low risk of an unpleasant outcome (e.g., preventive behaviours), while *loss-frame messages* are more effective for behaviours that are perceived to have a higher risk of an unpleasant outcome (e.g., behaviours to detect health problems, such as cancer screening (115, see also 116).

It is not clear what kind of framing works best to promote the uptake of vaccines (117), but messages that draw awareness to potential losses may be most useful for promoting the uptake of vaccines. This may be because vaccination is a one-time activity, as opposed to one that people do on a more ongoing basis, such as exercise or safe driving (117). The way a message is framed is mediated by the characteristics of the individual and/or the characteristics of the vaccination itself (117-119), although there are conflicting views on this (120-122).

Framing can also refer to commonly held expectations and attitudes towards certain phenomena that come to influence how individuals and societies respond to new information (123,124). The key to framing messages in this way is to present the new phenomenon (or behaviour) in a light that

resonates with the relevant audiences, such as individuals, policy-makers and so on. Five key “lessons” of framing have been delineated:

- “Fast and frugal” communication recognizes that people use shortcuts to understand new information and once they have done so, it is difficult to change that impression; thus, initial communications are vital.
- People assign responsibility based on how the issue is framed—whether the issue is framed as the responsibility of individuals or a social responsibility.
- Uninterpreted numbers are not effective: it is better to use similes and analogies to explain numbers and relate them to things that people already understand (“social math”) than to present the raw numbers.
- People stop trying to understand information once they believe they have come to the appropriate understanding; thus, “bait and switch” approaches—the practice of luring people with one message in order to sell them the “real goods” later—are ineffective and may be counter-productive.
- People are more motivated to act when a message resonates with them personally and they see a particular role for themselves (123,124).

Thus, it is important to carefully consider how to construct frames through which individuals, policy-makers and societies will come to understand NPTs. For instance, it has been noted that the practice of circumcision is understood very differently in African, Caribbean and Latin-American countries; thus, different frames—grounded in local realities—are required to promote its uptake for HIV prevention (123). It has been suggested, for example, that in certain situations, it may be better to frame circumcision as a procedure to maintain good hygiene and prevent sexually transmitted infections, rather than as a strategy for HIV prevention.

The “framing” of responsibility is also important, as it can encourage or discourage public policy and debate. For example, a frame that promotes an issue as one of individual responsibility will result in different policy discussions from a frame that promotes an issue as one of social and/or environmental responsibility; for example, framing obesity as an individual issue of uncontrolled

eating or bad diet will result in different policy approaches than a frame that places responsibility with corporations for providing foods with low nutritional value, or for the prices of fruits and vegetables compared to convenience foods (123-126). Each frame suggests a different type of solution—be it individual or structural (123,124). To promote circumcision, it has been suggested that the benefits of circumcision to the community be highlighted—in other words, that the focus be on the societal benefits rather than individual benefits (123).

A recent study discussed a particularly interesting case of the acceptability of spraying insecticides indoors to prevent malaria. The study is relevant to the issues of both framing and partial efficacy (127). This study, based in Mozambique, showed that although the participants felt that the spraying of insecticides was relatively ineffective at killing mosquitoes and protecting them from malaria, they nonetheless found it a very acceptable practice. The authors argue that this was related to the socio-political context in which acceptance of government initiatives was framed as a function of group citizenship, and the acceptance of the spraying was framed as a civic responsibility or act of patriotism. While such tactics may not be feasible or even ethically sound in situations related to NPTs, the example does show how socio-political context and the way an issue is framed can impact the uptake of a technology, despite its perceived lack of effectiveness.

The way other health-related issues have been framed has been critical to the way people respond to them as well: for example, framing the HPV vaccine as preventing cervical cancer rather than preventing a sexually transmitted disease (128), or framing the influenza vaccine in a way that emphasizes the safety of the vaccine (129) influenced their uptake. Framing vaccines as popular among influential others or having a high uptake more generally has also been suggested as a means to promote uptake (50,130). When framing messages about NPTs, it will be important to also consider the potential unintended consequences of messaging (1).

Other work has considered different ways of presenting information about risks and benefits. It has been suggested, for instance, that the promotion of vaccines should use “two-sided messages,” to simultaneously present the benefits of a vaccine while acknowledging its shortcomings (104). The use of narrative stories has also been suggested as a way of engaging people emotionally (104,131,132). There are debates about how best to represent potential risks, including relative risk versus absolute risk (116,133). Recent reviews have concluded there is little evidence of best practices for

communicating health risks (e.g., numerically, verbally or visually) (134) or communicating uncertainties around medical technologies (135).

Another approach to the design of health-related messages has been the use of hierarchical messages. This approach gives people a number of different behavioural options, with varying levels of efficacy. The concern with hierarchical messages is that individuals may forego the most effective option for other less effective options. This is acceptable when an individual may not be able to use the most effective method (e.g., a form of risk reduction), but not acceptable when the message encourages an individual to use a less-effective method even when the more effective method is a possibility. For instance, one study considered messages aimed at women that promoted first, the use of male condoms; second, the use of female condoms; and third, the use of microbicides (136). It found that women who already used condoms with their male partners did not show interest in the other methods; however, among women who were not already using male condoms, there was interest in less efficacious prevention methods.

However, other studies of counselling that used hierarchical messages for women attending STD clinics showed an increase in the women's use of protection methods; no decrease in their use of condoms; and the rare use of less-efficacious methods of protection (e.g., spermicides, diaphragms and cervical caps) without condoms (137,138). A more recent randomized controlled trial of a sexual health intervention for adolescent females showed that hierarchical messages on abstinence and condom-use were effective in decreasing sexual risk, and did not increase how frequently the adolescents in the study had sex (139). Such hierarchical messages may have a role to play in the communication of combination prevention and NPTs.

Finally, it is particularly important that social marketing campaigns—and indeed health communication campaigns more generally—be based on an established behaviour change theory. Examples of such theories include:

- The Health Belief Model—A model that tries to explain people's health-related behaviours based on their attitudes and beliefs. Individuals are theorized to change behaviour based on their perceptions of how susceptible they are to a certain illness; their perceptions of the severity of the illness; and the perceived costs and benefits of changing their behaviour.

- The Transtheoretical Model of Change—According to this model, individuals are at different stages of readiness to change their behaviour (precontemplation, contemplation, preparation, action and maintenance) and messages are targeted to the groups at each stage.
- Social Cognitive Theory—This theory provides a framework for designing, implementing and evaluating a program based on three factors: environment (social and physical), personal factors and behaviours. Individuals are encouraged to change their behaviour through role modelling, skill development, and building their confidence to use those skills.

Theory can help ground the communication efforts aimed at bringing about the desired changes, as well as influence how the messages are designed and implemented to increase the potential uptake of the behaviour being promoted (140). For instance, a campaign that draws upon the transtheoretical model of change might tailor messages to individuals' differing levels of readiness to change, whereas a campaign based on social cognitive principles might emphasize building individuals' skills—and their ability to use those skills—to carry out the suggested behaviour.

6.3.1.1.1 Theoretical considerations of efficacy

The section on Factors that influence uptake showed how the perceived threat or risk of a particular health issue and the efficacy of the suggested response impact the uptake of a technology. These issues have been a mainstay of theories on the uptake of health technologies. In the field of health, the perceived efficacy of a potential response to an issue is more commonly referred to as “response efficacy” (141). A number of theoretical models include dimensions of response efficacy, including Protection Motivation Theory and the Extended Parallel Processing Model (EPPM).

The common link between these theories is that they both focus on potential threats and appealing to people's fears. The general argument is that the likelihood of adopting a behaviour (or accepting a health message) is a function of how severe the consequences of not adopting the behaviour are perceived to be, how effective the recommended action is perceived to be, as well as one's ability to carry out that action.

According to Protection Motivation Theory, four factors influence people's attitudes, intentions and behaviours: (1) perceived severity, (2) perceived susceptibility, (3) the perceived efficacy of a response and (4) how confident a person feels that they can carry out the suggested action (141).

The Extended Parallel Processing Model was designed to account for how people's fears influence their acceptance or rejection of a message. According to this model (141), an appeal to fear instigates one of two appraisals of the message, with differing outcomes. First, individuals decide how much of a threat the content of the message carries for them. If the message convinces an individual that he or she is at risk of the issue at hand, then the individual is more likely to judge how well the suggested action would ameliorate the threat (i.e., response efficacy). If the message is not successful at raising fear in the individual, he or she may not progress to this second appraisal; if, however, the message does prompt fear, then the individual will try to mitigate the fear. If an individual believes the suggested action will be effective and believes that he or she can successfully do what is being prescribed, he or she is likely to adopt or carry out that action. However, if there is uncertainty about how effectively the suggested action will mitigate the threat, or in one's ability to carry out that action, then the individual may instead attempt to eliminate the fear by denying or avoiding the threat, rather than attempting to eliminate the actual threat.

Across these theories, there are debates about how reactions are formed and acted upon, which are beyond the scope of this inquiry. The important point for this discussion is that all of these theories share the understanding that people are more likely to respond to messages and adopt certain behaviours when they believe the actions they take will work (141,142). A meta-analysis of public health campaigns that appeal to people's fears showed that communicating the efficacy of the response was key to a positive outcome (141). This meta-analysis suggested that to be effective, campaigns that appeal to people's fears should emphasize the severity of a threat and the efficacy of what is being encouraged. It noted that "to increase perceptions of response efficacy, practitioners should clearly outline how, why, and when a recommended response eliminates or decreases the chances of experiencing the health threat" (141, p. 606).

However, these theoretical ideas have been applied in situations where the suggested actions are reasonably effective at reducing the threat (e.g., wearing a seatbelt, not speeding, wearing sunscreen). It is unclear how well these will work in the context of technologies of partial efficacy. In the case of

NPTs, the response efficacy argument is only partly true—while NPTs may reduce the threat of HIV infection on a broader level, at an individual level the effect may not be great. This issue again highlights the difficulties in communicating about NPTs. Interestingly, one study of breast self-examinations suggested that materials should promote the efficacy of self-examinations as a strategy to screen for and prevent breast cancer; however, researchers did note that the scientific community is divided on the efficacy of self-examinations (143). However, even this case is not parallel to NPTs, where there is likely to be little debate about strong/weak efficacy of the new technologies.

6.3.1.2 Message channels and audiences

It will be important to target these messages to the relevant audiences. As discussed above, aside from individuals themselves, friends, family members, social networks and healthcare providers are among those who will be involved in promoting the uptake of partially efficacious NPTs (or, indeed, hindering their uptake). Messages will also need to be developed specifically for these audiences.

Channels for reaching these audiences will also need to be determined. The mass media is a popular channel for health communication, and has been successful in changing behaviours at an individual level (144,145). Mass media has also been used to attempt to change behaviours at a social level—for example, to encourage individuals' social networks to play a role in encouraging behaviour change (144). Mass media campaigns have focused on changing social norms around risk-taking and preventive behaviours; for instance, to promote responsible drinking or safer sex (144). Less commonly, community-focused efforts have attempted to enhance the social capital of communities; for instance, campaigns to encourage civic engagement and community members becoming more active in their communities (e.g., voting, becoming involved in environmental causes) (144). New social media technologies (such as Facebook and Twitter) should also be considered as channels for health communication (146,147). Beyond the choice of channel(s), it will also be very important to use messengers who are seen by the target audiences as trustworthy and credible (104), such as trusted healthcare providers or community figures.

In any case, given the controversy that a partially efficacious vaccine might induce, an ecological approach that targets individuals, networks and communities/society seems necessary. For instance, a “people and places” framework has been proposed to focus health communication efforts (including

social marketing) on changing both people’s behaviour—as individuals and communities—as well as changing the places of behaviour—through “upstream” changes to policy, legislation and so on (148). With respect to NPTs, not only could such an approach target individual users as well as social networks and vaccination “cultures,” but it could also consider the ways that policies regarding the availability and distribution of NPTs, and other structural issues, will impact the uptake of NPTs (148).

Another important audience for the marketing of NPTs will be policy-makers. Social marketing has been criticized for failing to target policy-makers and for ignoring more preventive approaches to health that look upstream and address the root causes of health and illness (90). However, health communication approaches—such as media advocacy, which uses the media for the purpose of social and/or policy change (149)—may be an approach worth considering here.

6.3.2 Consumer orientation: formative research

Formative research is the cornerstone of social marketing (90), and health communication campaigns more generally (150). Formative research is essential to understanding the needs of target audiences (their perceptions about the product, benefits, costs and so on), so that appropriate messages can be designed and dissemination channels decided on (90,91). Formative research is central to decisions about all of the issues related to social marketing and health communication raised earlier.

Audience segmentation is a particularly important step of the formative research process. Audience segmentation is used to identify “subsegments” of the population that messages should be tailored for or target. It is also used to identify which messages are most likely to resonate with the identified groups. For instance, one study considered the reasons why individuals do not go for vaccinations (151). Through a series of focus groups, the authors delineated three audience segments within this group: “Plans to get [immunized],” “needs more information,” and “makes you sick” (p. 84). The messages were designed for each of these groups.

In a similar way, formative research played a “critical role” in the design of the marketing process and materials for the “Immunise Australia” Program (152, p. 59), which aimed to increase national immunization rates by funding free vaccination programs. The formative research identified six

groups among their target audience (the general public and healthcare providers): advocates, acceptors, defaulters, questioners, lapsed immunizers and rejectors. The marketing strategy they decided on focused on “acceptors,” “defaulters” and “questioners,” those most in need of targeted messages, and those who would be most receptive to the messages. The campaign focused on reinforcing existing positive views on immunization, reducing fears about side effects, and encouraging parents to inquire about and follow through on vaccination. They noted that a focus on the consumer’s understanding of costs and benefits facilitated the design of messages that resonated with those concerns and provided a sense of personal relevance. The campaign was assessed as having averted an estimated 17,500 cases of measles (152, p. 59). Another study used focus groups to develop materials tailored for two groups of mothers concerned about vaccinations for their children (“worried” and “fencesitter” mothers), identified using audience segmentation techniques (153). When reviewed by women in these groups, the materials received generally positive feedback, which was to be incorporated into revised versions of the materials.

The concepts of “tailored” and “targeted” messages have been prominent in health communication for some time. These concepts refer to the fact that “one-size-fits-all” messages will have limited currency with diverse audiences. Instead, it is important that health communication messages be “customized” for different audiences. “Targeted” communication refers to designing and communicating a message to a particular audience segment or group that share one or more characteristics (154). On the other hand, “tailored” messages refer to customizing a message for a specific individual, using information gained through an assessment (154). Tailoring is therefore more intensive, as it requires direct information from target audiences.

Given the dearth of literature to guide the marketing of NPTs and the dearth of “real world” data on the uptake of NPTs, formative (or consumer) research—across different segments of potential audiences—has been identified as an important first step to developing marketing materials (48,51,92,155). It has been observed that clinical trials may provide initial insight into users’ perspectives on the technologies (156). Formative research may also be an appropriate avenue for engaging communities in the process of implementing NPTs (86,92). Such research is an established first step to any health communication planning. It will be of particular importance to construct tailored and targeted messages for communicating NPTs (51).

7 Concluding Notes

This review has demonstrated that efficacy plays an important role in the uptake of new technologies by individuals, healthcare providers and policy-makers. It has also demonstrated that the literature on communicating this notion effectively is sparse.

The marketing of other health-related technologies may hold some lessons for the marketing of future technologies for HIV prevention. However, the NPTs differ substantially from vaccines that are currently available: the NPTs will have lower efficacy rates, the potential for arguably more serious consequences if one becomes infected after being immunized (for instance, the HIV as opposed to influenza), and the potential to increase the risk behaviours of people who use them, which could effectively reverse the gains of the NPTs or even worsen the current epidemic. For these reasons, it is of the utmost importance that the “partial efficacy” of the technologies be well communicated.

In the absence of research on strategies for communicating the concept of “partial efficacy,” it will be important that messages be designed in conjunction with target audiences to learn more about how the notion is understood and/or thought about by different audiences. It has been recommended that such research be carried out before technologies become available (45,56,93,11). It will be important that formative research include all of the relevant audiences that will be involved in promoting the vaccine, especially healthcare providers and policy-makers. As the NPTs and marketing campaigns roll out, it will be equally important to monitor people’s understandings of the NPTs, so that they can inform future messaging.

Communicating the notion of partial efficacy will be only one of many challenges of implementing the NPTs. There will be numerous other challenges to consider at the individual, social, economic and political levels that will play a role in the dissemination of NPTs.

7.1 Areas for further consideration

There are a number of other areas of research that may be helpful in providing guides about encouraging the eventual uptake of NPTs, although they may not be particularly relevant to addressing the issue of partial efficacy. These areas include:

- Best practices for promoting the adoption of vaccines and other technologies—an assessment of which strategies/techniques work best and for which audiences
- Best practices for communicating the concepts of individual protection and “herd immunity”
- Best practices in increasing the uptake of new technologies by healthcare providers
 - Changing attitudes about vaccination and vaccination behaviour
 - Improving discussion of sensitive topics, such as sexual behaviour and drug use
 - Creating open environments for the discussion of sensitive topics
- Best practices for influencing decision-making regarding the uptake of technologies at the policy level
- Potential lessons from the field of harm reduction on individual uptake, healthcare provider recommendations and policy perspectives
- Theoretical perspectives on the best ways to market prevention methods that are only partially effective
- Exploration of approaches to message design best suited/adaptable to partial efficacy

7.2 Areas for future inquiry

A number of areas seem particularly relevant for future inquiry. These include the following:

- Formative research to investigate how key audiences understand the concepts of partial efficacy and “herd immunity”
- Formative research on marketing partial efficacy and “herd immunity”
- Best practices in designing messages about partial efficacy and “herd immunity”

References

1. Lombardo AP. Biomedical Science of HIV Prevention: Socio-Behavioural Issues. Toronto, ON: Canadian AIDS Treatment Information Exchange; 2010.
2. Weller SC, Davis-Beaty K. Condom effectiveness in reducing heterosexual HIV transmission. *Cochrane Database of Systematic Reviews*. 2002;1:CD003255.
3. Centre for the AIDS Programme of Research in South Africa. Study of microbicide gel shows reduced risk of HIV and herpes infections in women [Internet]. 2010. Available from: www.capriska.org
4. Rerks-Ngarm S, Pitisuttithum P, Nitayaphan S, Kaewkungwal J, Chiu J, Paris R, et al. Vaccination with ALVAC and AIDSVAX to Prevent HIV-1 Infection in Thailand. *New England Journal of Medicine*. 2009;361(23):2209-2220.
5. Auvert B, Taljaard D, Lagarde E, Sobngwi-Tambekou J, Sitta R, Puren A. Randomized, Controlled Intervention Trial of Male Circumcision for Reduction of HIV Infection Risk: The ANRS 1265 Trial. *Plos Medicine*. 2005;2(11):e298.
6. Bailey RC, Moses S, Parker CB, Agot K, Maclean I, Krieger JN, et al. Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomised controlled trial. *Lancet*. 2007;369:643-656.
7. Gray RH, Kigozi G, Serwadda D, Makumbi F, Watya S, Nalugoda F, et al. Male circumcision for HIV prevention in men in Rakai, Uganda: a randomised trial. *Lancet*. 2007;369:657-666.
8. Eaton L, Kalichman SC. Behavioral aspects of male circumcision for the prevention of HIV infection. *Current HIV/AIDS Reports*. 2009;6:187-193.
9. Bryant J, Baxter L, Hird S. Non-occupational postexposure prophylaxis for HIV: a systematic review. *Health Technology Assessment*. 2009;13(14):iii, ix-x, 1-60.
10. Bass E. Partially effective vaccines. In: Kahn P, editor. *AIDS Vaccine Handbook*. New York: AIDS Vaccine Advocacy Coalition; 2005. p. 59-62.
11. Esparza J, Chang ML, Widdus R, Madrid Y, Walker N, Ghys PD. Estimation of "needs" and "probable uptake" for HIV/AIDS preventive vaccines based on possible policies and likely acceptance (a WHO/UNAIDS/IAVI study). *Vaccine*. 2003;21:2041-2050.
12. International AIDS Vaccine Initiative (IAVI). *Estimating the Global Impact of an AIDS Vaccine*. New York: IAVI; 2005.
13. John TJ, Samuel R. Herd immunity and herd effect: new insights and definitions. *European Journal of Epidemiology*. 2000;16:601-606.

14. Newman PA, Logie C. HIV vaccine acceptability: a systematic review and meta-analysis. *AIDS*. 2010;24:1749-1756.
15. Brewer NT, Chapman GB, Gibbons FX, Gerrard M, McCaul KD, Weinstein ND. Meta-analysis of the relationship between risk perception and health behavior: The example of vaccination. *Health Psychology*. 2007;26(2):136-145.
16. Roberts KJ, Newman PA, Duan N, Rudy ET. HIV vaccine knowledge and beliefs among communities at elevated risk: conspiracies, questions and confusion. *Journal of the National Medical Association*. 2005;97(12):1662-1671.
17. Brewer NT, Fazekas KI. Predictors of HPV vaccine acceptability: A theory-informed, systematic review. *Preventive Medicine*. 2007;45:107-114.
18. Reiter PL, Brewer NT, McRee A, Gilbert P, Smith JS. Acceptability of HPV Vaccine Among a National Sample of Gay and Bisexual Men. *Sexually Transmitted Diseases*. 2010;37(3):197-203.
19. Das E, de Wit JB, Vet R, Frijns T. 'Feeling' Risk and Seeing Solutions: Predicting Vaccination Intention against Hepatitis B Infection among Men Who Have Sex with Men. *Journal of Health Psychology*. 2008;13(6):728-732.
20. Ward L, Draper J. A review of the factors involved in older people's decision making with regard to influenza vaccination: a literature review. *Journal of Clinical Nursing*. 2007;17:5-16.
21. Bovier PA, Chamot E, Bouvier Gallacchi M, Loutan L. Importance of patients' perceptions and general practitioners' recommendations in understanding missed opportunities for immunisations in Swiss adults. *Vaccine*. 2001;19:4760-4767.
22. Eastwood K, Durrheim DN, Jones A, Butler M. Acceptance of pandemic (H1N1) 2009 influenza vaccination by the Australian public. *Medical Journal of Australia*. 2010;192(1):33-36.
23. Lau JTF, Yeung NCY, Choi KC, Cheng MYM, Tsui HY, Griffiths S. Acceptability of A/H1N1 vaccination during pandemic phase of influenza A/H1N1 in Hong Kong: population based cross sectional survey. *BMJ*. 2009;339:b4164.
24. Maurer J, Uscher-Pines L, Harris KM. Perceived seriousness of seasonal and A(H1N1) influenzas, attitudes toward vaccination, and vaccine uptake among U.S. adults: Does the source of information matter? *Preventive Medicine*. 2010;51:185-187.
25. Seale H, Heywood AE, McLaws M, Ward KF, Lowbridge CP, Van D, et al. Why do I need it? I am not at risk! Public perceptions towards the pandemic (H1N1) 2009 vaccine. *BMC Infectious Diseases*. 2010;10:99.
26. SteelFisher GK, Blendon RJ, Bekheit MM, Lubell K. The Public's Response to the 2009 H1N1 Influenza Pandemic. *New England Journal of Medicine*. 2010;362(22):e65.
27. Sypsa V, Livanios T, Psychogiou M, Malliori M, Tsiodras S, Nikolakopoulos I, et al. Public

- perceptions in relation to intention to receive pandemic influenza vaccination in a random population sample: evidence from a cross-sectional telephone survey. *Eurosurveillance*. 2009;14(49):19437.
28. Maltezou HC, Dedoukou X, Patrinos S, Maragos A, Poufta S, Gargalianos P, et al. Determinants of intention to get vaccinated against novel (pandemic) influenza A H1N1 among health-care workers in a nationwide survey. *Journal of Infection*. 2010;61(3):252-258.
 29. Rachiotis G, Mouchtouri VA, Kremastinou J, Gourgoulianis K, Hadjichristodoulou C. Low acceptance of vaccination against the 2009 pandemic influenza A(H1N1) among healthcare workers in Greece. *Eurosurveillance*. 2010;15(6):19486.
 30. Torun SD, Torun F. Vaccination against pandemic influenza A/H1N1 among healthcare workers and reasons for refusing vaccination in Istanbul in last pandemic alert phase. *Vaccine*. 2010;28:5703-5710.
 31. Dubé E, Gilca V, Sauvageau C, Boulianne N, Boucher FD, Bettinger JA, et al. Canadian family physicians' and paediatricians' knowledge, attitudes and practices regarding A(H1N1) pandemic vaccine. *BMC Research Notes*. 2010;3:102.
 32. Simsekoglu O, Lajunen T. Why Turks do not use seat belts? An interview study. *Accident Analysis & Prevention*. 2008;40:470-478.
 33. Barss P, Al-Obthani M, Al-Hammadi A, Al-Shamsi H, El-Sadig M, Grivna M. Prevalence and Issues in Non-Use of Safety Belts and Child Restraints in a High-Income Developing Country: Lessons for the Future. *Traffic Injury Prevention*. 2008;9:256-263.
 34. Chaudhary N, Northrup VS. Predictive Models of Safety Belt Use: A Regression Analysis of MVOSS Data. *GCPI*. 2004;5:137-143.
 35. Rodrigue JR. Promoting healthier behaviors, attitudes, and beliefs toward sun exposure in parents of young children. *Journal of Consulting and Clinical Psychology*. 1996;64(6):1431-1436.
 36. Turrisi R, Hillhouse J, Gebert C, Grimes J. Examination of cognitive variables relevant to sunscreen use. *Journal of Behavioral Medicine*. 1999;22(5):493-509.
 37. Germeni E, Lionis C, Davou B, Th Petridou E. Understanding reasons for non-compliance in motorcycle helmet use among adolescents in Greece. *Injury Prevention*. 2009;15:19-23.
 38. Lau JTF, Yang X, Tsui H, Pang E, Kim JH. SARS preventive and risk behaviours of Hong Kong air travellers. *Epidemiology and Infection*. 2004;132:727-736.
 39. Banek K, Kilian A, Allan R. Evaluation of Interceptor long-lasting insecticidal nets in eight communities in Liberia. *Malaria Journal*. 2010;9:84.
 40. Belay M, Deressa W. Use of insecticide treated nets by pregnant women and associated factors in a pre-dominantly rural population in northern Ethiopia. *Tropical Medicine and International Health*. 2008;13(10):1303-1313.

41. Ramirez JI, Gossett DR, Ginsburg KR, Taylor SL, Slap GB. Preventing HIV transmission: the perspective of inner-city Puerto Rican adolescents. *Journal of Adolescent Health*. 2000;26:258-267.
42. Bailey RC, Muga R, Poulussen R, Abicht H. The acceptability of male circumcision to reduce HIV infections in Nyanza Province, Kenya. *AIDS Care*. 2002;14(1):27-40.
43. Brito MO, Caso LM, Balbuena H, Bailey RC. Acceptability of male circumcision for the prevention of HIV/AIDS in the Dominican Republic. *PLoS ONE*. 2009;4(11):e7687.
44. Omer SB, Salmon DA, Orenstein WA, deHart MP, Halsey N. Vaccine refusal, mandatory immunization, and the risks of vaccine-preventable diseases. *New England Journal of Medicine*. 2009;360(19):1981-1988.
45. Newman P. Social and Behavioral Challenges of HIV Vaccines: Implications for Social Work and Social Science. *Journal of HIV/AIDS and Social Services*. 2009;8:313-330.
46. Hobson-West P. "Trusting blindly can be the biggest risk of all": organised resistance to childhood vaccination in the UK. *Sociology of Health & Illness*. 2007;29(2):198-215.
47. Wilson K, Barakat M, Vohra S, Ritvo P, Boon H. Parental views on pediatric vaccination: the impact of competing advocacy coalitions. *Public Understanding of Science*. 2008;17:231-243.
48. Streefland PH. Introduction of a HIV vaccine in developing countries: social and cultural dimensions. *Vaccine*. 2003;21:1304-1309.
49. Kaler A. Health interventions and the persistence of rumour: The circulation of sterility stories in African public health campaigns. *Social Science & Medicine*. 2009;68:1711-1719.
50. Hershey J. The Roles of Altruism, Free Riding, and Bandwagoning in Vaccination Decisions. *Organizational Behavior and Human Decision Processes*. 1994;59:177-187.
51. Newman PA, Duan N, Rudy ET, Roberts KJ, Swendeman D. Posttrial HIV vaccine adoption: concerns, motivators, and intentions among persons at risk for HIV. *Journal of Acquired Immune Deficiency Syndromes*. 2004;37(3):1393-1403.
52. Forster A, Wardle J, Stephenson J, Waller J. Passport to Promiscuity or Lifesaver: Press Coverage of HPV Vaccination and Risky Sexual Behavior. *Journal of Health Communication*. 2010;15(2):205-217.
53. Goodyear-Smith F, Petousis-Harris H, Vanlaar C, Turner N, Ram S. Immunization in the Print Media - Perspectives Presented by the Press. *Journal of Health Communication*. 2007;12(8):759-770.
54. Wang AL, Duke W, Schmid GP. Print media reporting of male circumcision for preventing HIV infection in sub-Saharan Africa. *Bulletin of the World Health Organization*. 2009;87:595-603.

55. Ofri D. The Emotional Epidemiology of H1N1 Influenza Vaccination. *New England Journal of Medicine*. 2009;361(27):2594-2595.
56. Hoffman S, Cooper D, Ramjee G, Higgins JA, Mantell JE. Microbicide Acceptability: Insights For Future Directions From Providers and Policy Makers. *AIDS Education and Prevention*. 2008;20(2):188-202.
57. Kohlhammer Y, Schnoor M, Schwartz M, Raspe H, Schäfer T. Determinants of influenza and pneumococcal vaccination in elderly people: a systematic review. *Public Health*. 2007;121:742–751.
58. Evans MR, Watson PA. Why do older people not get immunised against influenza? A community survey. *Vaccine*. 2003;21:2421-2427.
59. Rhodes SD, Yee LJ. Using hepatitis A and B vaccination as a paradigm for effective HIV vaccine delivery. *Sex Health*. 2007;4:121.
60. Ishibashi KL, Koopmans J, Curlin FA, Alexander KA, Ross LF. Paediatricians' attitudes and practices towards HPV vaccination. *Acta Paediatrica*. 2008;97:1550-1556.
61. Gust D, Weber D, Weintraub E, Kennedy A, Soud F, Burns A. Physicians Who Do and Do Not Recommend Children Get All Vaccinations. *Journal of Health Communication*. 2008;13(6):573-582.
62. Nichol KL, Zimmerman R. Generalist and subspecialist physicians' knowledge, attitudes, and practices regarding influenza and pneumococcal vaccinations for elderly and other high-risk patients: a nationwide survey. *Archives of Internal Medicine*. 2001;161:2702-2708.
63. Kahn JA, Rosenthal SL, Tissot AM, Bernstein DI, Wetzel C, Zimet GD. Factors influencing pediatricians' intention to recommend human papillomavirus vaccines. *Ambulatory Pediatrics*. 2007;7(5):367–373.
64. Golden NH, Seigel WM, Fisher M, Schneider M, Quijano E, Suss A, et al. Emergency contraception: pediatricians' knowledge, attitudes, and opinions. *Pediatrics*. 2001 Feb;107(2):287-292.
65. Stubbs E, Schamp A. The evidence is in. Why are IUDs still out?: family physicians' perceptions of risk and indications. *Canadian Family Physician*. 2008 Apr;54:560-566.
66. Merchant R, Keshavarz R. HIV postexposure prophylaxis practices by US ED practitioners. *American Journal of Emergency Medicine*. 2003;21:309-312.
67. Merchant RC, Mayer KH, Becker BM, DeLong AK, Hogan JW. Predictors of the Initiation of HIV Postexposure Prophylaxis in Rhode Island Emergency Departments. *AIDS Patient Care and STDs*. 2008;22(1):41-52.
68. Hayter M. Knowledge and attitudes of nurses working in sexual health clinics in the United Kingdom toward post-sexual exposure prophylaxis for HIV infection. *Public Health Nurse*.

2004;21(1):66-72.

69. Giele CM, Maw R, Carne CA, Evans BG. Post-exposure prophylaxis for non-occupational exposure to HIV: current clinical practice and opinions in the UK. *Sexually Transmitted Infections*. 2002;78:130-132.
70. Schnatz PF, Humphrey K, O'Sullivan DM. Assessment of the Perceptions and Administration of the Human Papillomavirus Vaccine. *Journal of Lower Genital Tract Disease*. 2010;14(2):103-107.
71. Daley MF, Liddon N, Crane LA, Beaty BL, Barrow J, Babbel C, et al. A National Survey of Pediatrician Knowledge and Attitudes Regarding Human Papillomavirus Vaccination. *Pediatrics*. 2006;118(6):2280-2289.
72. Rhodes SD, Hergenrather KC. Exploring hepatitis B vaccination acceptance among young men who have sex with men: Facilitators and barriers. *Preventive Medicine*. 2002;35:128-134.
73. Yee LJ, Rhodes SD. Understanding correlates of hepatitis B virus vaccination in men who have sex with men: what have we learned? *Sexually Transmitted Infections*. 2002;78:374-377.
74. Rhodes SD, Yee LJ, Hergenrather KC. Hepatitis A vaccination among young African American men who have sex with men in the Deep South: Psychosocial predictors. *Journal of the National Medical Association*. 2003;95(Suppl. 4):31S-36S.
75. Schwappach DL, Bruggmann P. An integrated model of care to counter high incidence of HIV and sexually transmitted diseases in men who have sex with men – initial analysis of service utilizers in Zurich. *BMC Public Health*. 2008;8:180.
76. Cassell MM, Halperin DT, Shelton JD, Stanton D. Risk compensation: the Achilles' heel of innovations in HIV prevention? *British Medical Journal*. 2006;332:605-607.
77. Eaton LA, Kalichman SC. Risk compensation in HIV prevention: implications for vaccines, microbicides, and other biomedical HIV prevention technologies. *Current HIV/AIDS Reports*. 2007;4(4):165–172.
78. Newman PA, Rongprakhon S, Tepjan S, Yim S. Preventive HIV vaccine acceptability and behavioral risk compensation among high-risk men who have sex with men and transgenders in Thailand. *Vaccine*. 2009;
79. AIDS Partnership California. Pre-exposure Prophylaxis and HIV Prevention: Assessing Community Needs and Preparedness in California—Summary Report. 2009.
80. Crosby RA, Holtgrave DR. Will sexual risk behaviour increase after being vaccinated for AIDS? *International Journal of STD & AIDS*. 2006;17(3):180-184.
81. Carballo-Diéguez A, O'Sullivan LF, Lin P, Dolezal C, Pollack L, Catania J. Awareness and Attitudes Regarding Microbicides and Nonoxynol-9 use in a Probability Sample of Gay Men. *AIDS and Behavior*. 2007;11:271-276.

82. Piso B, Wild C. Decision support in vaccination policies. *Vaccine*. 2009;27:5923-5928.
83. Erickson L, Dewals P, Farand L. An analytical framework for immunization programs in Canada. *Vaccine*. 2005;23:2470-2476.
84. International AIDS Vaccine Initiative (IAVI). *AIDS Vaccine Literacy: Core Content*. New York: IAVI; 2009.
85. Van Damme P, Pecorelli S, Joura EA. The introduction of policies for human papillomavirus vaccination in Europe. *Journal of Public Health*. 2008;16:291-298.
86. Hu DJ, Vitek CR, Bartholow B, Mastro TD. Key issues for a potential human immunodeficiency virus vaccine. *Clinical Infectious Diseases*. 2003;36:638–644.
87. Kane MA. Global implementation of human papillomavirus (HPV) vaccine: Lessons from hepatitis B vaccine. *Gynecologic Oncology*. 2010;117:S32-S35.
88. Ault K, Reisinger K. Programmatic issues in the implementation of an HPV vaccination program to prevent cervical cancer. *International Journal of Infectious Diseases*. 2007;11(Suppl. 2):S26–S28.
89. Smith DK, Taylor A, Kilmarx PH, Sullivan P, Warner L, Kamb M, et al. Male circumcision in the United States for the prevention of HIV infection and other adverse health outcomes: report from a CDC consultation. *Public Health Reports*. 2010;125(Suppl. 1):72-82.
90. Grier S, Bryant CA. Social marketing in public health. *Annual Review of Public Health*. 2005;26:319-339.
91. Storey JD, Saffitz GB, Rimón JG. Social marketing. In: Glanz K, Rimer BK, Viswanath K, editors. *Health behavior and health education*. San Francisco: Jossey-Bass; 2008. p. 435-464.
92. Newman PA, Lee S, Duan N, Rudy E, Nakazono TK, Boscardin J, et al. Preventive HIV Vaccine Acceptability and Behavioral Risk Compensation among a Random Sample of High-Risk Adults in Los Angeles (LA VOICES). *Health Services Research*. 2009;44(6):2167-2179.
93. Newman PA, Seiden DS, Roberts KJ, Kakinami L, Duan N. A Small Dose of HIV? HIV Vaccine Mental Models and Risk Communication. *Health Education & Behavior*. 2009;36(2):321-333.
94. Chang M, Vitek C, Esparza J. Public health considerations for the use of a first generation HIV vaccine. Report from a WHO-UNAIDS-CDC consultation, Geneva, 20-21 November 2002. *AIDS*. 2003;17:W1-W10.
95. Gonik B. Strategies for Fostering HPV Vaccine Acceptance. *Infectious Diseases in Obstetrics & Gynecology*. 2006;2006(36797):1-4.
96. Friedman AL, Sheppard H. Exploring the Knowledge, Attitudes, Beliefs, and Communication

Preferences of the General Public Regarding HPV: Findings From CDC Focus Group Research and Implications for Practice. *Health Education & Behavior*. 2006;34(3):471-485.

97. Cameron K, Rintamaki L, Kamanda-Kosseh M, Noskin G, Baker D, Makoul G. Using Theoretical Constructs to Identify Key Issues for Targeted Message Design: African American Seniors' Perceptions About Influenza and Influenza Vaccination. *Health Communication*. 2009;24(4):316-326.
98. Rubin GJ, Potts HWW, Michie S. The impact of communications about swine flu (influenza A H1N1v) on public responses to the outbreak: results from 36 national telephone surveys in the UK. *Health Technology Assessment*. 2010;14(34):183-266.
99. Kamate SK, Agrawal A, Chaudhary H, Singh K, Mishra P, Asawa K. Public knowledge, attitude and behavioural changes in an Indian population during the Influenza A (H1N1) outbreak. *Journal of Infection in Developing Countries*. 2009;4(1):007-014.
100. Skea Z, Entwistle V, Watt I, Russell E. 'Avoiding harm to others': Considerations in relation to parental measles, mumps and rubella (MMR) vaccination discussions – An analysis of an online chat forum. *Social Science & Medicine*. 2008;67:1382-1390.
101. McMurray R, Cheater FM, Weighall A, Nelson C, Schweiger M, Mukherjee S. Managing controversy through consultation: a qualitative study of communication and trust around MMR vaccination decisions. *British Journal of General Practice*. 2004;54:520-525.
102. Holmes B. Communicating about emerging infectious disease: The importance of research. *Health, Risk and Society*. 2008;10(4):349-360.
103. Telford R, Rogers A. What influences elderly peoples' decisions about whether to accept the influenza vaccination? A qualitative study. *Health Education Research*. 2003;18(6):743-753.
104. Opel DJ, Diekema DS, Lee NR, Marcuse EK. Social marketing as a strategy to increase immunization rates. *Archives of Pediatrics and Adolescent Medicine*. 2009;163(5):432-437.
105. Hobson-West P. Understanding vaccination resistance: moving beyond risk. *Health, Risk and Society*. 2003;5(3):273-283.
106. Lau JT, Griffiths S, Choi KC, Tsui HY. Widespread public misconception in the early phase of the H1N1 influenza epidemic. *Journal of Infection*. 2009;59:122-127.
107. Oguonu T, Okafor H, Obu H. Caregivers's knowledge, attitude and practice on childhood malaria and treatment in urban and rural communities in Enugu, south-east Nigeria. *Public Health*. 2005;119:409-414.
108. Nuttall J. Microbicides in the prevention of HIV infection: current status and future directions. *Drugs*. 2010;70(10):1231-1243.
109. Brooks RA, Etzel M, Klosinski LE, Leibowitz AA, Sawires S, Szekeres G, et al. Male Circumcision and HIV Prevention: Looking to the Future. *AIDS and Behavior*. in press;

110. Minja H, Obrist B. Integrating local and biomedical knowledge and communication: Experiences from KINET Project in Southern Tanzania. *Human Organization*. 2005;64(2):157-65.
111. Atkinson JM, Fitzgerald L, Toaliu H, Taleo G, Tynan A, Whittaker M, et al. Community participation for malaria elimination in Tafea Province, Vanuatu: Part I. Maintaining motivation for prevention practices in the context of disappearing disease. *Malaria Journal*. 2010;9:93.
112. Kamat VR, Nyato DJ. Community response to artemisinin-based combination therapy for childhood malaria: a case study from Dar es Salaam, Tanzania. *Malaria Journal*. 2010;9:61.
113. Sawires S, Dworkin S, Fiamma A, Peacock D, Szekeres G, Coates T. Male circumcision and HIV/AIDS: challenges and opportunities. *Lancet*. 2007;369:708-713.
114. Rhodes SD, Hergenrather KC. Using an integrated approach to understand vaccination behavior among young men who have sex with men: stages of change, the health belief model, and self-efficacy. *Journal of Community Health*. 2003;28(5):347-362.
115. Rothman AJ, Bartels RD, Wlaschin J, Salovey P. The strategic use of gain-and loss-framed messages to promote healthy behavior: How theory can inform practice. *Journal of Communication*. 2006;56:S202-S220.
116. O'Doherty K, Suthers GK. Risky Communication: Pitfalls in Counseling About Risk, and How to Avoid Them. *Journal of Genetic Counseling*. 2007;16(4):409-417.
117. Gerend MA, Shepherd JE, Monday KA. Behavioral Frequency Moderates the Effects of Message Framing on HPV Vaccine Acceptability. *Annals of Behavioral Medicine*. 2008;35(2):221-229.
118. Gerend MA, Shepherd JE. Using message framing to promote acceptance of the human papillomavirus vaccine. *Health Psychology*. 2007;26(6):745-752.
119. Abhyankar P, O'connor D, Lawton R. The role of message framing in promoting MMR vaccination: Evidence of a loss-frame advantage. *Psychology, Health and Medicine*. 2008;13(1):1-16.
120. Donovan RJ, Jalleh G. Positive versus Negative Framing of a Hypothetical Infant Immunization: The Influence of Involvement. *Health Education & Behavior*. 2000;27(1):82-95.
121. O'Connor AM, Pennie RA, Dales RE. Framing effects on expectations, decisions, and side effects experienced: the case of influenza immunization. *Journal of Clinical Epidemiology*. 1996;49(11):1271-1276.
122. McCaul KD, Johnson RJ, Rothman AJ. The effects of framing and action instructions on whether older adults obtain flu shots. *Health Psychology*. 2002;21(6):624-628.
123. Gilliam FD, Brooks RA, Leibowitz AA, Klosinski LE, Sawires S, Szekeres G, et al. Framing Male Circumcision to Promote its Adoption in Different Settings. *AIDS Behav*. in press;

124. Gilliam FDJ. Framing lessons from the cognitive and social sciences: Implications for communicating male circumcision. In: *From Scalpel to Scale-Up: Shaping Perceptions of Male Circumcision*. Mexico City: 2008.
125. Korn D, Gibbins R, Azmier J. Framing public policy towards a public health paradigm for gambling. *Journal of Gambling Studies*. 2003;19(2):235-256.
126. Lawrence RG. Framing Obesity: The Evolution of News Discourse on a Public Health Issue. *Press/Politics*. 2004;9(3):56-75.
127. Montgomery CM, Munguambe K, Pool R. Group-based citizenship in the acceptance of indoor residual spraying (IRS) for malaria control in Mozambique. *Social Science & Medicine*. 2010;70:1648-1655.
128. Leader AE, Weiner JL, Kelly BJ, Hornik RC, Cappella JN. Effects of Information Framing on Human Papillomavirus Vaccination. *Journal of Women's Health*. 2009;18(2):225-233.
129. Wray RJ, Buskirk TD, Jupka K, Lapka C, Jacobsen H, Pakpahan R, et al. Influenza Vaccination Concerns Among Older Blacks: A Randomized Controlled Trial. *American Journal of Preventive Medicine*. 2009;36(5):429-434.e6.
130. Schutten M, de Wit JBF, van Steenberghe JE. Why do gay men want to be vaccinated against hepatitis B? An assessment of psychosocial determinants of vaccination intention. *International Journal of STD and AIDS*. 2002;13:86-90.
131. De Wit JBF, Das E, Vet R. What works best: Objective statistics or a personal testimonial? An assessment of the persuasive effects of different types of message evidence on risk perception. *Health Psychology*. 2008;27(1):110-115.
132. Newman TB. The power of stories over statistics. *BMJ*. 2003;327:1424-1427.
133. Natter H, Berry D. Effects of presenting the baseline risk when communicating absolute and relative risk reductions. *Psychology, Health & Medicine*. 2005;10(4):326-334.
134. Lipkus IM. Numeric, Verbal, and Visual Formats of Conveying Health Risks: Suggested Best Practices and Future Recommendations. *Medical Decision Making*. 2007;27(5):696-713.
135. Politi MC, Han PKJ, Col NF. Communicating the Uncertainty of Harms and Benefits of Medical Interventions. *Medical Decision Making*. 2007;27(5):681-695.
136. Miller LC, Murphy ST, Clark LF, Hamburger M, Moore J. Hierarchical messages for introducing multiple HIV prevention options: promise and pitfalls. *AIDS Education and Prevention*. 2004;16(6):509-525.
137. Gollub EL, French P, Latka M, Rogers C, Stein Z. Achieving safer sex with choice: studying a women's sexual risk reduction hierarchy in an STD clinic. *Journal of Women's Health and Gender-Based Medicine*. 2001;10(8):771-783.

138. Gollub EL, French P, Loundou A, Latka M, Rogers C, Stein Z. A randomized trial of hierarchical counseling in a short, clinic-based intervention to reduce the risk of sexually transmitted diseases in women. *AIDS*. 2000;14:1249-1255.
139. Milhausen R, DiClemente R, Lang D, Spitalnick J, Sales JM, Hardin J. Frequency of sex after an intervention to decrease sexual risk-taking among African-American adolescent girls: results of a randomized, controlled clinical trial. *Sex Educ*. 2008;8(1):47-57.
140. Noar S. A 10-Year Retrospective of Research in Health Mass Media Campaigns: Where Do We Go From Here? *Journal of Health Communication*. 2006;11:21-42.
141. Witte K, Allen M. A meta-analysis of fear appeals: implications for effective public health campaigns. *Health Educ Behav*. 2000;27(5):591-615.
142. Smith S. The effective use of fear appeals in persuasive immunization: An analysis of national immunization intervention messages. *J. of Appl. Comm. Res*. 1997 11;25(4):264-292.
143. Kline KN, Mattson M. Breast self-examination pamphlets: a content analysis grounded in fear appeal research. *Health Commun*. 2000;12(1):1-21.
144. Abroms LC, Maibach EW. The Effectiveness of Mass Communication to Change Public Behavior. *Annu Rev Publ Health*. 2008;29:219-234.
145. Keller SN, Brown JD. Media interventions to promote responsible sexual behavior. *J Sex Res*. 2002;39(1):67-72.
146. Rietmeijer CA, McFarlane M. Web 2.0 and beyond: risks for sexually transmitted infections and opportunities for prevention. *Curr. Opin. Infect. Dis*. 2009;22:67-71.
147. Bennett GG, Glasgow RE. The delivery of public health interventions via the Internet: actualizing their potential. *Annu Rev Public Health*. 2009;30:273-292.
148. Maibach EW, Abroms LC, Marosits M. Communication and marketing as tools to cultivate the public's health: a proposed "people and places" framework. *BMC Public Health*. 2007;7(1):88.
149. Wallack L, Dorfman L. Putting policy into health communication. In: Rice RE, Atkin CK, editors. *Public communication campaigns*. Thousand Oaks, CA: Sage; 2001. p. 389-406.
150. Atkin CS, Freimuth VS. Formative evaluation research in campaign design. In: Rice RE, Atkin CK, editors. *Public communication campaigns*. Thousand Oaks, CA: Sage; 2001. p. 125-145.
151. John R, Cheney M. Resistance to Influenza Vaccination: Psychographics, Audience Segments, and Potential Promotions to Increase Vaccination. *Soc Market Q*. 2008;14(2):67-90.
152. Carroll TE, Veen LV. Public Health Social Marketing: The Immunise Australia Program. *Soc Market Q*. 2002;8(1):55-61.

153. Gust DA, Kennedy A, Wolfe S, Sheedy K, Nguyen C, Campbell S. Developing tailored immunization materials for concerned mothers. *Health Educ Res.* 2007;23(3):499-511.
154. Kreuter MW, Wray RJ. Tailored and targeted health communication: strategies for enhancing information relevance. *American Journal of Health Behaviour.* 2003;27(Suppl. 3):S227-S232.
155. Duan N. Listening to consumers and HIV vaccine preparedness. *Lancet.* 2005;365:1119–1121.
156. Newman PA, Duan N, Kakinami L, Roberts K. What can HIV vaccine trials teach us about future HIV vaccine dissemination? *Vaccine.* 2008;26:2528–2536.