THE DIFFUSION OF HEALTH INNOVATIONS FROM DEVELOPING TO DEVELOPED COUNTRIES

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TABLE OF CONTENTS

ABSTRACT **3**

1. INTRODUCTION **4**

2. NORTH-SOUTH PARTNERSHIPS: BENEFITS TO THE NORTH? **8**

3. WHAT IS THE DIFFUSION OF INNOVATIONS? **12**

4. THE DIFFUSION OF HEALTH INNOVATIONS **17**

A) HEALTH INNOVATIONS **18**

B) CLASSIFYING INNOVATIONS **22**

I) INNOVATION CHARACTERISTICS 24

II) PRACTICES, PROGRAMMES, AND POLICIES 26

5. THE DIFFUSION OF HEALTH INNOVATIONS FROM DEVELOPING TO DEVELOPED COUNTRIES --AN ILLUSTRATION **31**

6. DISCUSSION AND WAY FORWARD **41**

APPENDIX A- GLOSSARY OF KEY TERMS **48**

APPENDIX B- LIST OF INNOVATIONS ARRANGED ACCORDING TO PRACTICES PROGRAMMES, AND POLICIES **49**

APPENDIX C- SEARCH STRATEGY **54**

APPENDIX D- BIBLIOGRAPHY **55**

ABSTRACT

Influencing the pace at which health innovations spread through geographic regions is a budding field of research of interest to health care professionals, development-aid agencies, private sector entrepreneurs, non-governmental organizations, and public institutions alike. There is however little diffusion research in the field of health that examines the importance of innovation characteristics in the innovation adoption process. There is also a gap in research literature when it comes to assessing the likelihood of diffusion of health innovations from developing to developed countries. As a result, our understanding of innovation diffusion processes between countries is fragile, and the existing theoretical literature on this phenomenon limited.

This paper is a first attempt at evaluating the conditions under which health care innovations from developing countries may or may not diffuse to developed country settings. As such, the paper is designed to articulate a conceptual model for evaluating the diffusion of health care innovations from developing to developed countries. The paper reviews prior research on the diffusion of innovations and focuses on the role of innovation characteristics in bringing about innovation adoption. In particular, Everett Rogers's work on the perception of innovation attributes aids in the development of a general model for studying the diffusion of innovations. The exploratory framework presented in this paper is also predicated on the need to distinguish between policy, programme, and practice-based health innovations. Three examples are then used to briefly illustrate why health policy-related innovations are less likely to diffuse than health programme-based innovations and why health programme-based innovations are less likely to diffuse than health practice-based innovations.

The conceptual model and brief illustrations provide new insights into the underlying mechanisms driving the diffusion of health innovations and bridges the shortfalls of prior work assumed in this area. These classifications shape the way decision-makers and the public evaluate and process innovation information when responding to new health innovations. In particular, the paper suggests that if the concept of innovation diffusion between countries can be clarified further, then it may become easier for policymakers and practitioners to evaluate, adopt and procure innovations in ways that can realistically recognize, encourage and give priority to truly valuable innovations.

1. INTRODUCTION

In order to survive in today's increasingly complex global landscape, economies must learn how to employ innovative practices that feed productivity and bring economic growth. The escalating levels of global competition, driven by instantaneous markets and expanding sources of innovation are forcing organizations and individuals to make dramatic changes and improvements to their operations (Fallah & Lechler, 2007). With such radical restructuring, competitors must keep pace by employing innovation strategies that can help with the successful adoption and diffusion of their latest ideas, techniques, practices, and processes.

The diffusion of innovations is a major challenge in all industries, including healthcare (Berwick, 2003). Despite the fact that health is a field rich in evidence-based innovations, even when such innovations are implemented successfully in one location, they often diffuse slowly—if at all to other locations (Berwick, 2003). For example, in 2001, less than 1% of articles from 12 leading public health and health promotion journals were categorized as diffusion research (Pankratz & Hallfors, 2001). Influencing the pace at which health innovations spread through health systems, across cultures and geographic regions, is a budding field of research, of interest to health care professionals, development-aid agencies, private sector entrepreneurs, non-governmental organizations, and public institutions alike. However, within the context of developed-developing country partnerships, assessing whether developed countries stand to gain from developing country innovations is an area underrepresented in research literature.

North-South partnerships: benefits to the North? is a report by the African Partnerships for Patient Safety program (APPS) at the World Health Organization (WHO) that gives an account of fifty innovative cases that anchor the creative work being undertaken in developing countries. Based on this evidence, the report argues that in a time of physical and financial resource constraints there is much developed countries stand to gain from partnering with developing countries (specifically, that developing countries offer many instances where developed countries stand to potentially gain from a bi-directional flow of knowledge and innovations) (APPS, 2010).

One major shortfall of the report is that it offers little by way of analysis of the likelihood that any given developing country innovation will be adopted in a developed country setting. Moreover, the report leaves a number of questions unanswered. For example, why do some health innovations spread much more rapidly between some countries than others? Can health technologies designed for a developing country setting be applicable to an industrially developed country setting? Why are some countries receptive to certain forms of innovations and others not? What criteria guide the choice of which health innovations will be diffused?

Validating the claim that developing country innovations can be adapted to developed countries could help promote learning that challenges and rethinks the traditional custom of developed-developing country partnerships. This paper is designed to offer a preliminary framework for evaluating the adoption of developing country health innovations

in developed countries. In the context of the bi-directional flow of benefits, the framework presented here will also suggest that there exist differences in the adoption rates of innovations based on their classification—a finding which will help decision-makers make better innovation decisions in the areas of (1) innovation portfolio assessment, (2) innovation portfolio management, and (3) resource allocation (i.e., time, workers, money).

Everett Rogers pioneered the field of diffusion studies by introducing a classical diffusion model in his seminal book titled *Diffusion of Innovations* (1962). Today, Rogers's insights on the diffusion of innovations have been tested in more than 6000 research studies and field tests and found to be amongst the most reliable in the social sciences (Robinson, 2009). The paper builds on prior research on the diffusion of innovations and focuses on the role of innovation characteristics in bringing about innovation adoption. Much diffusion research has studied people-based differences in innovations (i.e., determining diffusion based on different adopter categories) (Rogers, 2003). Much less effort has been devoted to analyzing innovation-based differences (i.e., how the perceived properties of innovations affect their rate of adoption) (Rogers, 2003). In other words, how do characteristics of innovations affect the rate at which they are adopted? Comprehensive literature reviews and meta-analyses have shown that innovation characteristics research is helpful in describing the relationship between the attributes or characteristics of an innovation and the adoption and/or implementation of that innovation (Tornatzky & Klein, 1982; Rogers, 1995).

There is however little diffusion research in the field of health that examines the importance of innovation characteristics in the innovation adoption process. There is also a

gap in research literature when it comes to assessing the likelihood of diffusion of health innovations from developing to developed countries. The only study that was identified on the diffusion of innovations from developing to developed countries was an independent project conducted in 2010, which very briefly examined developing country technologies and their application to the UK National Health Service (NHS) (Fry & Marjanovic, 2011). Even then, this study did not assess or utilize the importance of innovation characteristics in influencing health innovation adoption. Thus, there was little direction on how to develop a way of thinking about the diffusion of health innovations from developing to developed countries. As a result, the exploratory framework presented in this paper is based largely on the work of Rogers and those individuals who have tried to extend and/or critique his model. The framework is also predicated on the need to distinguish between policy, programme, and practice-based innovations. Organizing innovations according to whether they relate to a policy, programme, or practice can offer a tangible way of looking at the diffusion phenomenon. Whereas a comparative analysis with a narrow focus on specific countries would have been optimal for this exercise, accurately tracking countries' innovations and comparing and contrasting their diffusion was considered too large in scope for this project. As a result, this paper applies elements of diffusion theory qualitatively rather than quantitatively.

This paper begins with a short summary of the motivations behind and the conclusions of the WHO study *North-South partnerships: benefits to the North?* The conceptual framework of this paper is presented by summarizing the basic tenets of Rogers's theory on the diffusion of innovations, which helps us gain an understanding into how

innovations spread over time. The literature reviewed focuses on the concepts of diffusion, adoption, innovation-decision, persuasion, and innovation characteristics. Focusing on the last concept, this paper then advances the hypothesis that the nature of innovation characteristics drives the diffusion of innovations. By grouping health innovations into practice, programme, and policy-based typologies, this paper begins to articulate a conceptual model for evaluating the diffusion of health care innovations from developing to developed countries. Three examples from *North-South partnerships: benefits to the North?* are then used to briefly demonstrate why health policy-related innovations are less likely to diffuse than health programme-based innovations and why health programme-based innovations are less likely to diffuse than health practice-based innovations. The paper therefore suggests that the classification of health innovations into practices, programmes, and policies offers some insight into the limitations of innovation diffusion from developing to developed countries. The final section of the paper provides some general conclusions for readers, including implications for decision-makers. In particular, the paper suggests that if the concept of innovation diffusion between countries can be clarified further, then it may become easier for policymakers and practitioners to evaluate, adopt and procure innovations in ways that can realistically recognize, encourage and give priority to truly valuable innovations.

2. NORTH-SOUTH PARTNERSHIPS: BENEFITS TO THE NORTH?

The 21st century brings with it a number of challenges that no one country can overcome by itself. As health needs evolve, global attention transcends traditional perspectives and concerns of individual nation-states, focusing instead on the needs of

persons all around the world. There are significant changes in the global burden of disease with a transition to a pattern of "triple burden" – communicable disease, non-communicable disease, and injuries (Lopez & Mathers, 2006). Furthermore, demographic changes like population growth, immigration, aging populations, and urbanization, are expected to increase health expenditures across the world. At the same time, a global health worker and skills shortage is one of the greatest constraints to achieving progress on health (Global Health Workforce Alliance, 2012). Both the private and public sectors are losing ground in their efforts to balance the competing goals of sustainable cost, broad access, and good quality. As Govindarajan (2009) argues, whereas once companies could focus on winning market share by adapting viable and attractive global products to meet local needs, today's emerging mega-markets and micro-customers are forcing companies to focus more and more on developing products "in country, for the world". The realization that no one country has a monopoly on knowledge and innovations makes the subject of partnerships between developed and developing countries one that is relevant to all stakeholders in global health.

In this increasingly competitive world where industrialized economies cannot sustain earlier rates of growth because emerging economies are able to produce competitive products much more quickly, tracing the diffusion of innovations across cultures and geographic regions is a budding field of research. The term 'reverse innovation' refers to the case where an innovation is adopted first in poor economies before 'trickling up' to rich countries (Govindarajan & Ramamurti, 2011). For example, the General Electric Company (GE) is now selling a handheld electrocardiogram device developed in China in the US; the Indian company Tata Motors is planning to sell an upgraded version of the Tata Nano called

the Tata Europa in western markets; Procter & Gamble found that their honey-based cold remedy created for Mexico has a profitable market in Europe and the United States (Jana, 2009; Fitzgerald M. , 2009). That being said, the successful application of such innovations in public policy remains rare, raising interesting theoretical questions about what kinds of innovations emerging economies are likely to spawn, why such innovations might diffuse to rich countries, what competitive advantages local and foreign firms enjoy in this process, and how this affects the global strategy and organization of established firms (Govindarajan and Ramamurti, 2011).

Many health leaders have advocated the view that developed countries have a lot to learn from the experiences of developing countries (Crisp, 2010; Singer, 2011; Frenk, 2006). As the ex-Chief Executive of the UK National Health Service, Lord Nigel Crisp (2010) puts it,

> (It is) precisely because they have so few resources, (that) poorer countries have to learn how to engage patients and communities in their care, (learn) how to prioritize promoting health over tackling illness, how to deploy new technologies effectively, and how to manage the ever-growing burden of disease. (p. 146)

North-South partnerships: benefits to the North? gives a systematic account of fifty innovative cases that confirm the idea that there is much developed countries stand to gain from partnering with developing countries (specifically, that developing countries offer many instances where developed countries may benefit from a bi-directional flow of knowledge and innovations) (APPS, 2010). Some famous heath care-related examples from

the study include kangaroo mother care from Colombia, oral rehydration therapy from Bangladesh, treatments of tuberculosis from the Directly Observed Treatment Short (DOTC) strategy in India and DOTS-plus in Peru, and treatment for Burkitt's lymphoma from Uganda (APPS, 2010). These and many other cases span over six pillars of a health system: health services; health workforce; health information; medicinal products, vaccines, and technologies; health financing; and leadership and governance. While the report is first of its kind, it nevertheless fails to assess the actual likelihood of developing country innovations diffusing to developed country settings.

Tracing the diffusion of innovations from developing to developed countries has been challenging task given the numerous diffusion processes triggered by the emergence of international, intergovernmental, and transnational institutions (Kern & Kissling, 2001); complications in dealing with the diverse political, institutional, and socioeconomic characteristics of countries; and the differing motivations and power structures of the plethora of potential innovation hosts within a country (i.e., individuals, groups, firms, networks, and industries). From an organizational perspective, the various structural features of a country and its hosts also pose difficulties in tracking the diffusion of innovations writ large. Is the decision-making process centralized or decentralized? What is the decision-making body responsible for? What is the ratio of experts in the decision-making body? What are the sources of funding for the decision-making body? What types of communication channels are carrying the message? Given that policy priorities are often based on self-interest and perceived importance of a particular issue (Boushey, 2010), a realistic approach to this process would also mean assessing power struggles between

different groups of decision-makers within a country. For example, professionals and managers within the healthcare system shift their attention to innovations that relate to policy priority targets; innovations supporting these targets have a higher possibility of being imported (Fitzgerald & Ewan, 2002). Researchers documenting the role of professional and/or political networks in the diffusion of innovation have also emphasized the impact of carriers in the innovation diffusion process (Mintrom, 1997). Oftentimes, innovations are communicated across countries by interest-group activities that enable the transfer of innovations from one country to another through organized networks. These groups display innovation-seeking behaviour that relates to their own motivations, interests, and expertise. Given these complications, this paper will steer clear of the numerous social elements of diffusion theory and focus solely on the characteristics of the innovation themselves.

3. WHAT IS THE DIFFUSION OF INNOVATIONS?

One of the most fundamental processes of social change is the diffusion of innovations. Diffusion of innovations theory seeks to explain how, why, and at what rate new ideas and technologies will be imported and adopted by members of a given culture. Diffusion research also offers pragmatic insight into research utilization and evidence-based decision-making for individuals or organizations that have invested research on some topic and seek to get their findings employed.

A number of conceptual and theoretical models exist concerning the adoption and diffusion of innovations. Perhaps the first famous account of diffusion research was undertaken by French sociologist Gabriel Tarde who noted the ‘laws of imitation’ and

sought to understand, "why, given one hundred different innovations conceived at the same time—innovations in the form of words, in mythological ideas, in industrial processes, etc.—ten will spread while ninety will be forgotten" (Tarde, 1903, p. 140). While Tarde never referred to the term diffusion, he did inspire the later more sophisticated and theoretical work by Rogers. Rogers's general diffusion model in rural sociology emerged to become one of the most influential pieces in the field. Rogers defined diffusion as the movement of (1) a given new idea, practice, or object that is perceived as new (2) over time, (3) through specific channels of communications, and (4) within a social structure (Rogers, 1962). From there he went on to compile inventories of findings on the diffusion of innovations from many disciplines, using this evidence to refine the theoretical structures aimed at explaining the diffusion of innovations (Perry, 2000). His contribution today stands as a mainstay of what is developing as a more cross-disciplinary focus on the diffusion of innovations.

Literature on diffusion studies differentiates strictly between adoption and diffusion: while the former focuses on analyzing the factors leading to an individual adoption by a decision-making body, the latter builds on these results and analyzes the cumulative adoptions in a social system (Rogers, 2003; Bell, 2006). In other words, diffusion of an innovation implies its adoption and use (Battista R. N., 1989). Adoption is therefore germane to the organizational and individual level of analysis, and diffusion to the community, population, or societal level (Bell, 2006). Yet, not all decision-makers adopt a particular innovation at the same time, which affects the rate of adoption, or the relative speed with which an innovation is adopted by members of a social system over time (Rogers, 2003).

This leads to a certain diffusion pattern for any particular innovation (Bell, 2006). Thus, while diffusion theory analyses the macro variables influencing diffusion patterns over time, the main focus of adoption theory lies in the analysis of the variables affecting the single adopter (Bell, 2006). This paper's thesis focuses on the diffusion of innovations as a consequence of the adoption of innovations. As such, the process of adoption forms the building block for diffusion analysis. The following paragraphs attempt to summarize prominent literature on adoption theory.

Adoption, or the decision to import and make use of an innovation, is contingent on the innovation-decision process, a process through which a decision-maker (of any unit of analysis) gains exposure to the existence of the innovation and chooses to adopt or reject it (Rogers, 2003). Rogers proposes a basic five-stage model of the innovation-decision process, which outlines some of the considerations that decision-making units undergo when making a decision about an innovation. Out of the five stages, the knowledge and persuasion stages play an initial role in helping the decision-making unit develop an attitude towards the innovation.[1]

Many researchers have acknowledged the special relevance of perception in influencing decision-making and ultimately the innovation diffusion process (Rogers, 2003; Negatu & Parikh, 1999; Yapa & Mayfield, 1978). In this respect, the attributes of the

[1] For more on the five stages of the innovation-decision process, see Rogers's Diffusion of Innovations (Fifth Edition), Chapter 5.

innovation serve as key variables that play a critical role in determining the rate of adoption of innovations (Rogers, 2003).[2] As Berwick (2003) describes it, for most people who accept or reject an innovation, "benefit is a relative matter—a matter of the balance between risks and gains and of risk aversion in comparing the known status quo with the unknown future if the innovation is adopted" (p. 1971). Perceptions about an innovation's attributes directly affects the amount of uncertainty a decision-maker may hold, which in turn shapes the innovation-decision, and possible adoption of the innovation.

A broad survey of literature on diffusion studies reveals that most of the contextual factors addressed in diffusion literature can be classified into three main categories: characteristics or perceptions of the innovation, characteristics of the people who adopt innovations, and other contextual factors such as communication channels, incentive systems, and other social and environmental factors (Aksarany, 2009; Boushey, 2010; Richerson, 2001; Berwick, 2003). Rogers's (2003) work suggests that the level of diffusion of an innovation depends more on its characteristics than either of the two other influencing factors, accounting for approximately 49-87% of variance in the rates of adoption. Rogers succinctly classifies the main characteristics of innovations as the: (1) relative advantage of an innovation, (2) compatibility of the innovation, (3) complexity of the innovation, (4) trialibility of the innovation, and (5) observability of the innovation. These characteristics are of crucial importance in determining success of adoption of the innovation because they

[2] Other variables that help determine the rate of adoption of innovations include the type of innovation decision, communications channels through which the innovation is conveyed (e.g., mass-media, interpersonal), the characteristics of the social system and decision-making unit (e.g., norms, networks), prior conditions (e.g., previous practice, innovativeness), and the extent of change agent's promotion efforts.

give rise to more or less uncertainty based on the decision-maker's perceptions (Rogers, 2003). Given their general scope, these attributes also have the potential to take into account a variety of other important influencing factors, including the amount of investment required to adopt the innovation; the extent of economic advantage of an innovation; the overall benefit of an innovation (including economic and non-economic advantages of an innovation); reinvention, profitability, flexibility and capability of modification of an innovation; and, availability of knowledge and information required to understand the innovation (Aksarany, 2009).

There are some dissenting voices that argue against this model of the structural role of innovations (Aksarany, 2009; Clark G. , 1984). Most notable are Goss (1979) and Gotsch (1972) who prefer placing less stress on the role of knowledge and innovation, and rather on the macro-level spatial characteristics of society (Aksarany, 2009; Clark G. , 1984; Goss, 1979). Even so, there exists a complex setting and bidirectional interaction between the innovation, adopters, and the context in which an innovation is diffused, which together collectively influence the spread process (Atun & Kyratsis, 2007). Consequently, accurately tracking the totality of interactions flowing from relationships between a community of actors and institutions is almost impossible unless studied through complex network theory and network visualization. One of the main advantages of pursuing a simplified model that recognizes the characteristics of innovations as being the main driving forces behind the diffusion of innovations is that it allows us to analyze and compare the diffusion of innovations between large units of measurement. This approach is particularly helpful in the context of studying the geographical diffusion of innovations and tracing if and how

innovations diffuse from developing to developed countries. This is the method adopted in this paper.

4. THE DIFFUSION OF HEALTH INNOVATIONS

Research on innovation characteristics describes the relationship between the attributes and the adoption of an innovation. A number of researchers have taken to studying the effects of the perceived attributes of innovations on their diffusion, offering theories on how specific characteristics of the innovation shape the rate and extent of diffusion (Rogers, 2003; Tornatzky & Klein, 1982; Morone, 2010; Makse & Volden, 2011). Most research on the attributes of innovations and their rate of adoption has used individuals and organizations as their units of analysis, but this need not necessarily be so. Recently, Makse and Volden (2011) extended Rogers's attribute typology to the diffusion of criminal justice policy between U.S. states and found policy attributes have an effect on policy diffusion. Similarly, Shipan and Volden (2006) examined diffusion across sub-national levels, namely from cities to states. Indeed, Rogers's work suggests that even in investigations where the units of measurement are larger, assessing innovation characteristics can serve as the first test for whether a particular innovation is likely to diffuse or not. In other words, no matter what the unit of measurement, the nature of the innovation will—first and foremost—influence interactions and perceptions of individual innovations hosts and carriers, and ultimately the diffusion of the innovation itself (Fitzgerald & Ewan, 2002; Rogers, 2003). As a result, drawing from research on the perception of innovation attributes can aid in the development of a general model for studying the diffusion of innovations between countries and in particular between developing to developed countries.

a) Health innovations

A health system is a structure within which people, institutions, and organizations interact to mobilize and allocate resources for preventing and treating diseases and injuries (The International Bank for Reconstruction and Development/The World Bank Group, 2006). A systems perspective is necessary in designing and evaluating health interventions and must consider possible effects across all major sub-systems of the health system (Savigny & Adam, 2009). The World Health Organization, in its report *Everybody's Business: Strengthening Health Systems to Improve Health Outcomes*, recognizes six building blocks of a health system (WHO, 2007). These essential elements of a health system, or health systems pillars were listed earlier in this paper and include everything from a well-performing health workforce, to equitable access to essential medicines, and a well-functioning health information system. Consequently, an expanded view of a country's healthcare system often requires a broad concept of innovation. This is due to the fact that health education and research institutions (universities and research hospitals); health and life sciences industries (including pharmaceuticals, biotech, medical devices, and medical informatics); health and healthcare organizations and professionals; and governments together synchronically play a role in the generation of a country's health innovation system (Prada, 2010).

All innovations have an element of novelty in them. In recent years, healthcare industries have experienced a proliferation of innovations aimed at enhancing life expectancy, quality of life, diagnostic and treatment options, as well as the efficiency and cost effectiveness of health systems. This expansion affects the number and complexity of

biomedical, administrative, and financial practices, planning and policy-procedures in various aspects of health systems, prompting a critical examination of the important differences between the general forms of health innovations. While there are many ways of defining health innovations, for the purpose of this paper, the definition of a health innovation will be shaped using Weberg's definition of an innovation as being any product which has the potential to drive change and redefine healthcare's economic and/or social potential (Weberg, 2009). That being said, the predominant focus in the literature to date has been on technical innovations (e.g., new products). As a result, researchers have been problematically aggregating all innovations into one category and as a discrete phenomenon (Nutley, 2002). By distinguishing amongst the many typologies of innovations, we can better manage and predict their diffusion. This section provides guidelines for characterizing innovations and then works towards illustrating how different health innovations can have different rate of diffusions over countries.

Aside from Rogers's five characteristics of innovations, the idea that the common characteristics of innovations can be sorted according to typologies has also been captured in other research frameworks to examine the diffusion of particular innovations (Battista & Contrandriopo, 1989; Clark J. , 1985; Gray, 1973). These typologies help clarify how different innovations offer different opportunities (and pose different demands) on innovation producers, users, and regulators (Shilling, 2010). However, since health-related research and innovations have long covered a broad range of topics, these typologies have generally existed in isolation from each other in the literature on innovation diffusion (Chandy & Prabhu, 2010). Moreover, investigators from various disciplines disagree on how

to organize knowledge in a way that more easily facilitates communication on innovation diffusion among decision-makers. For instance, Damanpour (1992) classified six types of innovations (namely product, process, administrative, technical, radical, and incremental) in his study. Mavondo, and Chimhanzi, instead categorized innovations into three types (i.e., product innovation, process innovation, and administrative innovations). Yet other researchers expound further on the features and dimensions of innovations, including: radical versus incremental innovations; competence enhancing versus competence destroying innovations; architectural versus component innovations; drastic or revolutionary innovations; continuous and discontinuous innovations; and disruptive versus non-disruptive innovations (Chandy & Prabhu, 2010; Shilling, 2010; Rogers & Shoemaker , 1971; Harvard Business Essentials, 2003).

Using some of the prominent innovation typologies mentioned above, Varkey et al. define innovations in healthcare as being disruptive or non-disruptive, and typically relating to product, process, or structure. Non-disruptive health innovations can be incremental, evolutionary, linear, or sustaining in nature and improve on something that already exists but in a way that allows expanded opportunities to be met, or existing problems to be solved (Varkey & Horne, 2008). Conversely, disruptive health innovations, are radical, revolutionary, transformational, or nonlinear innovations that disorder old systems, create new players and new markets while marginalizing old ones, and deliver dramatic value to stakeholders who successfully implement and adapt to the innovation (Varkey & Horne, 2008). Meanwhile, other health researchers find it helpful to study innovation diffusion patterns by their terms of scope and design. For example, the Canadian Institutes of Health

Research (CIHR) target priority health research governance, funding, innovations, and knowledge in the three categories of health practices, programmes, and policies. Battista et al., and Stone also classify health-related interventions according to their level of complexity as practices, programmes, and policies.

According to Battista, health techniques and practices are clearly defined activities or procedures that result from implicit or explicit technological advancements and are implemented by healthcare professionals. Techniques and practices at the individual, community, or population levels are most influenced by epidemiological research and technological advancements (Battista & Contrandriopo, 1989). A health-related programme is an organized series of activities initiated usually by an organization or institution that involves a number of healthcare providers who work to attain defined health objectives within a specific group of individuals or clients (Battista & Contrandriopo, 1989; WHO, 1998; Public Health Agency of Canada, 2010). A health policy, however, is in response to health needs, a mandated set of actions or principles that are directed towards various health agencies and health care providers by an administrative authority or legislative body (Battista & Contrandriopo, 1989; WHO, 1998; Public Health Agency of Canada, 2010). Health programmes or policy, including programme and policy development, assessment, and evaluation are broader in scope and design and often draw on a greater variety of disciplines, including epidemiology, behavioural sciences, sociology, anthropology, economics, organizational theory, and decision analysis (Battista & Contrandriopo, 1989).

Given that there is no existing literature or consensus on how to assess the diffusion of health innovations—or innovations generally—between countries, it is proposed that mapping health innovations according to whether they are practices, programmes, or policies can serve as a convenient method to trace the success of health innovation diffusion. These three categories have consequences for the nature of the diffusion process.

The following section will draw together information from literature on the classifications of innovations, namely health practices, programmes, and policies, and compare them using Rogers's six attributes of innovations. This will be done to allow further analysis on the role of innovation characteristics in the processes of health innovation diffusion and adoption between developing and developed countries, in a way that is also more easily communicable to decision-makers.

b) Classifying innovations

The first implication of the framework outlined in this paper is that innovations possess distinct attributes that influence their adoption. Each of these attributes shapes the way decision-makers and the public evaluate and process innovation information when responding to new health innovations. Though this paper treats the attributes of innovations as similar across decision-making bodies, the vast differences in values, system norms, social and communication structures, opinion leaders, types of innovation-decisions, and other numerous relationships between various sectors of society also affect choices made by potential adopters. For example, consider the implications of the role of entrepreneurs, interest groups, peer networks and professional associations in the study of innovation attributes. The presence of such actors can make complex innovations more comprehensible

to decision-makers. Or consider the role of societal norms on the diffusion of innovations; the structure of the social system can facilitate or impede the diffusion of innovations by potential adopters (Rogers, 2003). Observations such as these illustrate the mutual influences between innovations and their adopting systems. As Denis et al. (2002), rightly recognize, "the diffusion and adoption of innovations is a social and political process in which the benefits and risks of technologies are distributed unevenly, are locally defined, and thus have differentiated influences on individual decision-makers" (p. 71).

As such, the designations of health innovations into practice, programmes, and policies helps to highlight the differences between innovations and offers deeper insight on where these respective classifications fit in the larger context of theories on diffusion. To be clear, policy analysts have extensively studied a number of metaphors for the spread of policies in recent years. This literature directly and indirectly references, discusses, and analyzes the labels of 'lesson drawing', 'policy transfer', 'policy learning', 'policy emulation', 'policy dissemination', 'policy convergence', and a number of other related concepts (Dolowitz & Marsh, 2000; Stone, 2001; Greenhalgh & Robert, 2005). While the terminology and focus often vary, all of these studies are concerned with a similar process in which knowledge about policy innovations in one setting is used in the development of policy innovations in another (Dolowitz & Marsh, 2000). For the purposes of this paper however, policy diffusion is considered to be conceptually different from many of the labels mentioned above, as it is an organic, and social, rather than overtly managerial or logical process (Greenhalgh & Robert, 2005). In the context of Dolowitz's (2000) proposed heuristic device describing the continuum of policy transfer, the mechanism of policy

diffusion would fall somewhere between 'lesson-drawing' and "voluntary but driven by perceived necessity" (p.13).

As mentioned previously, Rogers emphasizes perceived attributes of innovations as uncertainty reducing processes that have been shown to explain significant variance in adoption decision and has consistently sought to generate a general classification system of innovations that could help explain rates of adoption (Rogers, 2003). A number of findings confirm the expected association between innovation perception and innovation adoption and further demonstrate how the perceived attributes of an innovation are potentially useful in studying the adoption of innovations (Rogers, 2003).

i) Innovation characteristics

The *compatibility* of the innovation with potential adopters and their social system is an important factor that plays a role in the successful diffusion of an innovation. Rogers (2003) states compatibility as the "degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (p. 15). An idea that is incompatible with user values and beliefs will not be adopted as rapidly as a more compatible innovation (i.e., normative or cognitive compatibility). Another indication of the compatibility of an innovation is its congruence with the existing practices of adopters (i.e., practical or operational compatibility) (Tornatzky & Klein, 1982). The perceived compatibility of an innovation thus has a positive correlation to its rate of adoption.

The *complexity* of an innovation can also have an effect on the successful diffusion of the innovation to first-time users and non-experts. Rogers (2003) defined complexity as

the "degree to which an innovation is perceived as relatively difficult to understand and use" (p. 15). Unlike the previous attribute, complexity is negatively correlated with the rate of adoption. Thus, excessive complexity of an innovation may pose an important obstacle in its adoption. Increasing programme complexity and costs slow patterns of diffusion, as these innovations require greater evaluation and emulation before adoption.

Trialability, or the ability to replicate benefits of an innovation through experimentation is positively correlated with the rate of adoption. Rogers (2003) defines trialability as the "degree to which an innovation may be experimented with on a limited basis" (p. 16). Often, highly divisible innovations can be tried (Tornatzky & Klein, 1982); the more an innovation is tried, the faster its adoption is. This is because an innovation that has been tried and proven useful represents less uncertainty to the individual who is considering it.

The change created by the innovation must be *observable* or visible, so that it may be communicated to others with ease. According to this perspective, the easier it is for individuals to see the results of the innovations, the more likely they are to adopt it. This is because uncertainty is lowered when results are visible. In the diffusion of technological innovations, observability also leads to peer discussion and interest surrounding the innovation, which leads to further spread of the innovation. Similar to compatibility, and trialability, observability is also positively correlated with the rate of adoption of an innovation.

The final characteristic of Rogers's model, the *relative advantage* of innovation (or the perception of profitability) can emphasize or retard the rate of adoption based on a negative or positive outlook of the innovation. Rogers (2003) defined relative advantage as the "degree to which an innovation is perceived as being better than the idea it supersedes" (p. 229). To be adopted, innovations must create the idea of a competitive advantage within the receiving group, or the perception of being better than the existing practice. As a result, relative advantage is somewhat of an omnibus category, expressed in profitability, or time saved, or social benefits, or hazards removed (Dearing, 2007; Tornatzky & Klein, 1982). Having said that, this attribute is often operationalized narrowly, based on effectiveness and cost (Dearing, 2007). According to this reasoning, the greater the perceived relative advantage of an innovation, the more rapid its rate of adoption is likely to be.

ii) Practices, Programmes, and Policies

Not all innovations can be assumed to diffuse equally because certain types of innovations are more likely to be adopted than others. This will be explained by using Rogers's characteristics of innovations and an innovation typology scheme that divides innovations according to practice, program, and policy. There are inherent differences between the innovations within this scheme, whether due to differing scopes or designs, number of decision-makers involved, implementation mechanisms, or returns offered. Based on the work of Rogers and his successors, the relative advantage, compatibility, observability, and trialability of an innovation are shown to be positively associated with its rate of adoption and the complexity of an innovation are shown to be negatively associated with its rate of adoption.

The rest of this section applies Roger's innovation characteristics to review the perceived benefits and limitations affecting adoption within the three distinct health innovation categories. This is a helpful practical exercise in so far as it allows the reader to become acquainted with an application of the conceptual framework as a prelude to tracing the diffusion of health innovations between developing and developed countries, which is the main focus of this paper. In particular, these examples aim to demonstrate first and foremost the applicability of Rogers's proposed innovation characteristics to the mechanism of diffusion of health innovations. These brief examples also attempt to articulate the heuristic differences between health practices, programmes, and policies.

The first example assesses the attributes driving the adoption of a practice-based innovation, the Healthy Heart Kit (HHK), a risk-management and patient education package for the prevention of cardiovascular disease and promotion of cardiovascular health (Orr, 1999). The second example looks at the perceived attributes influencing adoption of a programme-based innovation on the subject of telemedicine, a telecommunications technology based service that marries medicine and technology. The third example is a health information technology tool, a policy-based innovation, referred to as the electronic health record.

Practice-based innovations are generally relatively less technically and organizationally complex than programme and policy-based innovations and thus have a higher chance of adoption. In the example of the HHK, Scott and Plotnikoff (2008) found that confidence in the relevance, clarity, and usability of the Kit was associated with a higher

score of Kit use. HHK was not found to be incompatible with the personal beliefs and values of doctors, nor deviated from any prior organizational practices. Hands-on trial and experimentation of the innovation was also less problematic for a practice-based innovation like the HHK because such innovations often play on an adopter's autonomy and require less investments of time, energy, and resources compared to programme and policy-based innovations. According to Scott and Plotnikoff (2008), physicians assessed the Kit as a comprehensive tool for cardiovascular disease health promotion, complementary to existing practices. The scientific evidence behind HHK resulted in a greater likelihood for adoption of the innovation among physicians (Scott & Plotnikoff, 2008).

The slow diffusion of telemedicine programmes can be explained in part by adopter perceptions. Research shows that telemedicine programmes seldom work well if patients believe in traditional modes of delivery that requires the physical presence of the healthcare provider(Menachemi & Burke, 2004; Greenhalgh & Robert, 2005). Similarly, if physicians find telemedicine technology discomforting and hard to utilize, it is unlikely that they will seek to adopt the innovation (Rahman & John, 2009; Ilie & Courtney, 2007). In these instances, perceptions about the technical and regulatory complexities and user-friendliness of telemedicine remain a high barrier for adoption. Increasing the trialability of such programs through funding grants has resulted in positive rates of adoption (Canada Health Infoway, 2011). However, one of the greatest barriers to the increased use of telemedicine remains the lack of observability of its benefits(Menachemi & Burke, 2004). Unless telemedicine users publicize their experiences, there are little spill-over effects outside the participants in the network (Pereira & Fife, 1996). The relative advantage of shifting from a

provider-centered to a patient-centered health care delivery model also plays a role in the adoption of telemedicine. On one hand, telemedicine can produce improved access, outcomes and expedited quality and continuity of care (Scott & Plotnikoff, 2008; Roh, 2008; Rahman & John, 2009; Menachemi & Burke, 2004). On the other, patient's perceptions of security, confidentiality and Internet privacy related vulnerabilities (Menachemi & Burke, 2004); doctor's perceptions regarding the licensing requirements and technological effectiveness of the programme (Scott & Plotnikoff, 2008); and administrator's perceptions of compliance with federal and accreditation standards (Menachemi & Burke, 2004) can have a negative impact on the perceived relative advantage of the innovation.

As in the case of telemedicine, electronic health records are often perceived incompatible with prevalent workflow and values of healthcare professionals, and organizationally inconsistent with existing practices of data collection (Kleinman, 2009; Greenhalgh & Robert, 2005; Bower, 2005). In its highest form, a comprehensive system of electronic health records represents bundling information from of a complex array of actors (Kleinman, 2009). In this respect, complexities in resolving issues of structure, ownership, and privacy of the information collected can serve as barriers to the wide-scale adoption of the innovation (Bower, 2005; Greenhalgh & Robert, 2005). A large-scale innovation like the electronic health record is not only very complex, but also hard to test out because it requires a critical mass of users and the inherent collaboration of organizations (Kleinman, 2009). To what degree is the electronic health record perceived to be better than the practice it aims to supersede? While some researchers have recognized the basic benefits of electronic health records in particular settings (Greenhalgh & Robert, 2005; Wallis & Ronald, 2005), others

cite the need to develop more context-dependent approaches instead of a one-size-fits-all solution (Kleinman, 2009). Thus, even though the relative advantage of electronic health records may be theoretically high, perceived technical and practical barriers of information technology can stand in the way of adoption (Greenhalgh & Robert, 2005).

Holding all else constant[3], some generalizations can be made from these observations, shedding light on how one ought to look at the diffusion of the three categories of health innovations between countries (a task undertaken in the next section). First, more often than not, because health practices are usually assessed at the level of the individual, it is easier to consider and judge their compatibility, complexity, observability, trialability, and relative advantage. Conversely, since health programme and health policy–based innovations are assessed at the level of a community or population they require greater insight and preparation due to increasing implementation size and scopes, a step which delays the innovation-decision process and hampers the rate of adoption. Second, health practice-based innovations are also commonly characterized by elevated innovation compatibility, high levels of trialability and observability, relative advantage, and low technical complexity. These attributes make the adoption of these innovations especially easy. Conversely, health programme and health policy-based innovations are typically characterized by higher technical complexity, lower observability, lower salience and compatibility, and uncertain relative advantage. Third, whether the innovation is radical or incremental, innovation-

[3] In other words, being cognizant of the multiple differences of values, system norms, social and communication structures, opinion leaders, types of innovation-decisions, and other infinite relationships between various sectors of society and the fact that not all practices, programs, or policies are created equal.

decision processes regarding health practice-based innovations do not have to conform to the same type of restrictive decision-making models and bureaucratic inertia as those concerning health programmes and health policy-based innovations. As illustrated, the characteristics of innovations can be organized to explain patterns of diffusion across common classes of health innovations. Thus, corollary to the theory that not all innovations adopt and are diffused equally, most health practice-based innovations are adopted at a faster rate than health programme-based innovations, and most health programme-based innovations are adopted at a faster rate than health policy-based innovations.

5. THE DIFFUSION OF HEALTH INNOVATIONS FROM DEVELOPING TO DEVELOPED COUNTRIES –AN ILLUSTRATION

Organizing health innovations according to whether they relate to a practice, programme, or policy offers decision-makers a familiar framework within which to orient themselves and make the innovation-decision process more tangible and easier to convey. Having established a research model flexible enough to investigate the diffusion of health care innovations within larger units like countries, the paper now turns to demonstrating which types of developing country health innovations are more likely to diffuse to developed country settings. This section applies Rogers's innovation characteristics to illustrate some of the perceived benefits and limitations affecting the adoption of health practice, programme, and policy-based innovations between developing and developed countries. Three health innovations have been chosen from the compilation of cases presented in the report *North-South partnerships: benefits to the North?* Potential adopters' perceptions of

these three innovation types will be compared briefly below, keeping in mind the diverse array of differences within and between developed and developed country settings.

The first health innovation is a practice-based product called 'Kangaroo Mother Care' (KMC). KMC was developed in Bogota, Colombia in the 1970s in response to overcrowding and insufficient resources in neonatal intensive care units which were associated with high morbidity and mortality among low-birth weight infants (Ruiz-Peláez, 2004). Charpak et al., describe the intervention as conceptually simple and elegant, involving continuous skin-to-skin contact between the mother and the infant, exclusive breastfeeding, and early home discharge in the kangaroo position. The technique has come to be considered by many as the most feasible, readily available, and preferred intervention for decreasing neonatal morbidity and mortality and is used even in developed country settings where there are little or no restrictions on access to high-technology neonatal care (Charpak & Ruiz, 2005).

There are a number of reasons as to why KMC would diffuse easily from developing to developed countries. KMC is evidenced to have positive effects not only the physiology of the premature infant, but also the social and psychological impact on the family (Charpak & Ruiz, 2005). Research has also shown positive perceptions of mothers and health personnel towards KMC in developed country settings, due to the 'human heartedness' (McCord, 2011) of subjective bonding, empowerment, reunification, comfort, and humanization(Nirmala & Swarna, 2006; Tessier & Cristo, 1998; McCord, 2011). A study on a focus group of nurses describing their experience of utilizing KMC found that nurses

became motivated to use KMC right after bearing witness to its effects (McCord, 2011). Being able to directly observe the results of an intervention vis-à-vis infant/parent response solidifies the commitment of health professionals to the intervention (McCord, 2011; Wallina & Rudberg, 2005). This "seeing is believing" phenomenon, pertains strongly to user's attitudes and beliefs about the direct implications of an innovation, and is an important factor that fuels innovation adoption in expert-based communities. Furthermore, since KMC is a basic intervention, it does not need any expensive or sophisticated equipment. As a result, it can be applied and put to trial almost everywhere (Cattaneo & Davanzo, 1998). Health professionals have at their disposal numerous educational materials on how to perform KMC, which they can adapt to local conditions (WHO, 2003). Furthermore, appropriate training, simulations, and information strategies, can be undertaken by health professionals to familiarize parents about how and when to use KMC. Compared to more complex neonatal care interventions, KMC thus represents an effective and efficient approach for reducing neonatal morbidity and mortality due to the fact that it frees up significant resources while maintaining—if not improving—health quality outcomes in low birth-weight infants (Victora & Rubens, 2010; Charpak & Ruiz, 2005; Dippenaar & Joubert, 2006). These are some of the reasons that have lead to its spread over the world (WHO, 2003).

The second innovation is community health worker programme called Pakistan's Lady Health Workers (LHW). Community health workers are employed around the world to address the shortage of doctors and nurses in vulnerable communities and reduce health disparities (Valesky, 2011). In Pakistan, the LHW programme aims at providing essential

primary health services in the community to fulfil unmet health needs in rural and urban slums (WHO & Global Health Workforce Alliance, 2008; Government of Pakistan, 2009). Enhanced workforce participation for women and increasing health awareness and improved child and maternal health in remote tribal communities of Pakistan has been one of the greatest contributions of the programme. Over 100 000 lady health workers have been deployed to date, reaching out to over 90 Million Pakistanis in all 135 districts of the country (Government of Pakistan, 2009). Lady health workers are community-based liaisons between the formal health system and communities, often working from their homes, and each covering a radius of 150-200 houses (Garwood, 2006). While community health worker programmes are not limited to developing countries, there has been slow diffusion of such programmes in the developed world (WHO, 2011).

Community health worker programmes are vulnerable unless they are driven, owned by, and firmly embedded in the communities they serve (Lehmann & Sanders, 2007). A key challenge in introducing a programme like the LHW to a developed country setting is in institutionalizing and mainstreaming community participation/buy-in (Lehmann & Sanders, 2007; Cherrington & Ayala, 2008). Developed countries also have much to learn on how to focus and tailor community health worker programmes to their settings. For example, the scope and complexities of implementation strategies, delivery models, incentive structures, integration of primary and community-based healthcare, language and other cultural considerations, and utilization information and management, all require careful design and planning (Lewis & Hader, 1994; CIHR, 2011; Rothschild & Martin, 2011). Full integration of community health workers into health and human services systems also requires vigorous

effort to support community health workforce development and retention through training, certification, and sustainable funding, and strengthening of community-based organizations employing community health organizations in outreach and education efforts (APHA, 2009). While programmes whose impacts can be easily and rapidly assessed are found to spread more quickly compared to programmes whose benefits take time to become apparent (Rogers, 1995), the lack of standards for research studies concerning community health workers makes research findings on the issue difficult to assess, compare, and replicate (APHA, 2009; Schmidt & Baltussen, 2000; Judd & Frankish, 2001). This in turn limits the full extent of observable impacts of such programmes. Community-based models of care have been shown to be largely equivalent in cost to the services they replace, which reduces their appeal as cost-saving or cost-containing measures (WHO, 2003). While programmes whose impacts can be easily and rapidly assessed are found to spread more quickly compared to programmes whose benefits take time to become apparent (Rogers, 1995), the lack of standards for research studies concerning community health workers makes research findings on the issue difficult to assess, compare, and replicate (APHA, 2009; Schmidt & Baltussen, 2000; Judd & Frankish, 2001). This in turn limits the full extent of observable impacts of such programmes. Furthermore, in comparison to developing country settings where there is a lack the resources to successfully deliver primary healthcare, most developed countries have established infrastructure of delivering high standard of care. Community-based models of care have been shown to be largely equivalent in cost to the services they replace, a finding which reduces their appeal as and cost-saving or cost-containing measures as of yet (WHO, 2003). Instead, the perceived increases in costs of researching, emulating, and adopting a new innovation without any necessary gains in

effectiveness results in slowed patterns of diffusion amongst potential adopters. As a result, the adoption and diffusion of community health worker programmes inspired by developing country successes remains relatively protracted in developed country settings.

Health reforms seek to ameliorate the problems of costs, quality, and access to health care by balancing equity and efficiency concerns. The third innovation is a policy-based public health insurance scheme from Mexico called *Seguro Popular*. It was ambitiously introduced in 2003, at a time, when Mexico was suffering from a wave of declining health trends resulting from lack of citizen access to the health system (Jaff, 2010). Using evidence-based planning, the financial aspects of the insurance policy were to rely on a threefold approach: the financial involvement of the federal government, the financial involvement of Mexican states, and the financial involvement of individuals (as determined by their socio-economic status) (Frenk 2006). The scheme, a highly visible and politically sensitive national issue, was designed to extend medical services, preventive care, pharmaceuticals, and financial health protection to Mexicans, and especially to the non-insured, low-income populations (King & Gakidou, 2007). This innovative social protection scheme was highly successful and hailed as revolutionary, with some researchers believing that such a system could offer developed countries insights on how to establish a sustainable financing and social protection for health for all (Frenk 2006). Though most analysts would argue in favour of evidence-based policies, many limitations constrain countries from drawing maximum learning from the experience of others (Scott C. , 2002). The effects of some of these limitations on the diffusion of the innovation are offered below.

In many instances, it is easier for a jurisdiction to wait and model themselves after others, rather than to undertake the policy development cycle for each specific issue (Nykiforuk, 2008; Dolowitz & Marsh, 2000). As such, bandwagon pressures exist among proximate networks and countries that influence adoption decisions (Dobbins & Ciliska, 2002). However, there are significant limitations to policy diffusion between countries that do not share similar institutional arrangements and design features(Scott C. , 2002). For one, reform experiences have demonstrated the importance of taking full account of the specific country context when applying a specific reform design (Scott C. , 2002). In such instances, the complexity of an innovation has a strong impact on the adoption of that innovation. Since policy-based innovations are often more complex than programme-based innovations, which in turn are often more complex than practice-based innovations, policy innovations are not as easy to adopt in contrast to practice and programme-based innovations. Health reform policies may also be more or less compatible based on the numerous ethical and value-based considerations in health policy decision-making. The policy goals of equity and choice take on diverse interpretations when placed in the context of different healthcare systems (Scott C. , 2002) and a principled debate within any client system on these goals takes time, effort, and political commitment—which can delay or altogether defeat the adoption of the innovation. As such, policy-based innovations often require the creation or evaluation of context-specific policy instruments that require highly technical expert analysis on issues (Hussey & Anderson, 2003; Boushey, 2010). For example, which type of health insurance system is best suited for a particular country? How and from whom should such revenue be collected? There are other bureaucratic complexities associated with the transfer of monies between governments and providers, as well as political complexities of which

health services will be included in health insurance schemes (King & Gakidou, 2007). Finally, the need to assess the impact of large-scale innovations plays an important role in the decision to adopt an innovation. Yet, in the real world, it is rarely possible to construct controlled experiments which will allow analysts to observe causal linkages between changes to system design and changes in system performance (Scott C. , 2002). At face value, the increased flow of funds into the Mexican reform undoubtedly raised its immediate profile and visibility as it reduced out-of-pocket health expenditures. However, the programme was later criticized as having a negligible effect on the health of beneficiaries, perhaps because the quality of care was low (Barros, 2008). This is consistent with the cost-benefit analysis by Martínez and Aguilera (2010), who also found no evidence of survival and quality of life improvements from the Mexican reform. Admittedly, the limited scope of these analyses carry with them high levels of uncertainty given the inherent nature of health and the inherent difficulties in matching specific returns with specific costs (Dössel & Schlegel, 2009; Sack, 2007). But an interpretation of Rogers's theory on the diffusion of innovations and the uncertainty principle would suggest that potential adopters immediately engage in risk averse behaviour, considering potential losses, not potential gains of adopting a new innovation. Policies that are incompatible with past practices and whose effects are not easily observed are unlikely to diffuse broadly (Makse & Volden, 2011; Boushey, 2010; Battista R. N., 1989).

Consistent with other studies of innovations outside the field of health, the attributes of health innovations affect the likelihood of their adoption and the nature of their diffusion. Variations in the perceived complexity, trialability, observabitlity, compatibility, and relative

advantage of health innovations shapes the way in which decision-makers respond to emerging innovations. Technically complicated health policies will spread less rapidly than unsophisticated practice-based health solutions between countries, as higher issue complexity requires significantly more analysis by the decision-maker. Not only this, but health practices from developing countries are more likely to be adopted in developed countries simply because the pool of adopters is theoretically very large. This is aided by the fact that observability of innovations within target populations is easier to discern with practice-based health innovations as these innovations are often catered towards specific groups rather than a broad plethora of responsible parties. This is much less the case for health programmes and policies where the adopters will be, for the most part, either large organizations (e.g., regional health authorities adopting programme innovation) or governments. That is not to say health programme and policy-based innovations are not observable, but rather that the ability to quickly monitor and assess the impact of innovations has an impact on the rate of adoption of innovations. A large number of individuals are often responsible for, and play a role in assessing a programme and/or policy-based health innovation, which can tend to decrease the rate of diffusion compared to practice-based innovations. Understanding the degree to which an innovation is perceived as being better than the idea it supersedes, or the relative advantage, of an innovation is also more apparent in practice-based health innovation. This is because determining the relative advantage of new health practices or techniques is often less stickier than determining the relative advantage of new health policy and/or programme— perhaps due to the immediacy within which health practices can be implemented and evaluated. Since innovations require decision-makers to dedicate scarce resources to their cause, ineffective and costly health

programme and/or policy innovations, which have unclear or little obvious advantage over the current way of doing things will also diffuse more slowly than practice-based health innovations that require fewer new resources and costs. Unlike developing countries, which are able to afford one-time costs due to lack of alternative systems, developed countries must carefully assess their situations to replace any existing infrastructures and ways of doing things. Likewise, the needs and compatibility of an innovation either elevates or lessens the urgency and priority decision-makers place on immediate innovation adoption.

The above findings suggest that innovation adoption and diffusion represents a complex interaction between susceptible hosts and innovations. It is not simply that health innovations with distinct characteristics spread at different rates, but more importantly that these patterns emerge because different health innovations activate different perceptions and decision-making considerations within innovation hosts and change agents. In the developed-developing country context, because policy-based health innovations often require sophisticated analyses, these innovations may emerge first in economies that have the decision-making bandwidth to engage in and technically evaluate such innovations. Economies that have less professional expertise may desire the benefits of a new policy-based innovation, but will depend on other economies to first experiment with and adopt such innovations and then tailor them to suit their needs. In comparison, technical and practice-based health innovations rely highly on expert-based communities and evidence-based movements for their advocacy.

6. DISCUSSION AND WAY FORWARD

Evidence-based decision-making or the promotion of practices grounded in scientific evidence has become an influential movement in the health care arena in both Europe and North America (Denis & Hébert, 2002). This movement draws its vitality from the observation that there seems to be a significant gap between what is known and what ends up being used in practice. Many researchers have taken to tackling this gap by focusing on the choices of individual professionals, and by examining factors such as information availability, cognitive styles, the nature of "evidence," professional networks, and opinion leaders (Denis & Hébert, 2002). However, many of today's innovations cannot be easily reduced to choices within one individual. Second-generation studies that attempt to understand the factors that predict and facilitate the use of research evidence utilize Rogers's theory on the diffusion of innovations to understand the utilization of research in healthcare decision-making (Dobbins & Ciliska, 2002).

Building on Rogers's framework, the conceptual model proposed in this paper and the brief illustrations on the diffusion of the health innovations across countries provides useful insights into how perceived differences between innovation characteristics can be organized to explain patterns of diffusion across common classes of innovations. The method employed is an exploratory piece aimed at looking the broader range of diffusion patterns of emerging health innovations between countries. Results from this exercise confirm the fact that not all health innovations can be assumed to diffuse equally and that, in general, policy-related health innovations are less likely to diffuse than programme-based health innovations and programme-based health innovations are less likely to diffuse than

practice-based health innovations. The extent to which these findings can be readily generalized is open to debate, as the evidence collected comes from a number of different countries, with a variety of different health systems structures, organization, financing and delivery modes—factors which were too difficult to control in the scope of this research.

A number of health leaders have called for increased attention to the dissemination of healthcare innovations, particularly the rule on "finding sound innovations" (Berwick, 2003, p. 1973). *North-South partnerships: benefits to the North?* concluded that developing countries can offer developed countries much in the form of bi-directional flow of knowledge and innovations. However, a major complication arising from this study was the lack of assessment of which developing country innovations could diffuse to developed country settings. Research findings identified herein help in the identification of sound health innovations by advancing a conceptual model on the diffusion of health innovations from developing to developed countries. The conceptual model provides new insights into the underlying mechanisms driving the diffusion of health innovations and bridges the shortfalls of prior work assumed in this area. This has strong implications for partner expectations between developed and developing countries, including development-aid agencies, private sector entrepreneurs, non-governmental organizations, and public institutions.

Using the innovation characteristics in any framework is a useful guide for organizing research in innovation diffusion dynamics, allowing us to draw a number of compelling implications for the diffusion of health innovations. The first implication to

extend from the framework is that health innovations possess distinct attributes that make them more or less prone to triggering adoptions across countries. These characteristics vary according to adopter perceptions on the compatibility, complexity, trialability, observability, and relative advantage of the innovation and shape the way decision-makers process information in the innovation-decision process. The second implication is that not all health innovations diffuse equally, and some innovations diffuse faster than others. There are also clear limitations to the impacts of innovation characteristics in the diffusion of health innovations across countries. For example, political decision-making and policy diffusion are shaped by social choices that are often hard to predict and trace. In developed countries, interest groups can freely choose to embark on a campaign for or against a particular health policy, and interest-group activists often attempt to critique innovation characteristics through policy targeting and issue framing. Government receptivity to policy-based health innovations too can shift suddenly, either in response to exogenous events or because of governmental cycles. Even the characteristics of innovations can be seen as evolving, and in so doing, are viewed differently by the masses from time to time.

Just as disease spreads through a population through a combination of its own characteristics, the receptivity of hosts, and the behaviour of carriers, the spread and extent of diffusion of innovations is shaped by the interaction of potential adopters, individual innovations, and the unique attributes of interest-group carriers (Boushey, 2010; Aksarany, 2009; Richerson, 2001; Berwick, 2003; Berwick, 2003). Given its limited scope, the paper does not fully conceptualize, nor control for, how variation among the agents, hosts and carriers of health innovations shape diffusion dynamics. These interactions help explain the

tendency for some health innovations to diffuse faster than others, and can be used to explain why the diffusion of health innovations remains a complex subject of study for political scientists, public health researchers, healthcare providers and organizations, alike (Rogers, 2003). Certainly, it takes an entire system, not just a single factor, for innovation diffusion of either pattern to occur. A change to any of the three elements of this system mentioned above can cause a reaction within the diffusion cycle, and any break in this chain can cause the diffusion of the innovation to fall short (Boushey, 2010). While the paper has only focused on innovation characteristics, this research is meant to complement other work that explores the characteristics of hosts and the role of interest groups.

Notwithstanding the voluminous amount of literature on policy transfer and learning, an examination of transnational diffusion research in the field of health care produced little guidance in terms of way forward. There was also a lack of diffusion research in the field of health that examined the importance of perceptions of innovation characteristics and how to best classify innovations in the innovation adoption process. Most importantly, few researchers distinguished between developed and developing country diffusion mechanisms when studying diffusion. Thus, there seems to be a significant gap in research literature when it comes to assessing the likelihood of diffusion of health innovations from developing to developed countries (see Appendix C). As a result, our understanding of innovation diffusion processes between countries is fragile, and the existing theoretical literature on this phenomenon limited.

It is very likely that the diffusion of innovations will remain an important subject for future research. Rogers's theory on the diffusion of innovations offers valuable insights into the process of social change, including insight on how the characteristics of innovations affect innovation diffusion. This paper reviews prior research on the characteristics of health innovations and extends its applications to the diffusion of innovations from developing to developed countries. It does so by first assessing innovation characteristics and then organizing them in ways to explain patterns of diffusions across common classes of health innovations. Results from this exercise suggest that not all health innovations can be assumed to diffuse equally and that policy-related health innovations are less likely to diffuse than programme-based health innovations and why programme-based health innovations are less likely to diffuse than practice-based health innovations. These observations serve as valuable guidelines for the future direction of health innovation diffusion studies between countries**.**

By reviewing the major findings of research on innovation characteristics and evaluating how certain components of innovation diffusion interact to encourage or discourage diffusion dynamics, one gains insight into the mechanisms of innovation diffusion dynamics between countries, presenting a number of intriguing directions for future research on the diffusion of public-policy innovations. Firstly, it is well recognized that factors other than innovation attributes play a role in influencing the adoption of innovations. There has been little research to determine the co-dependence of innovation attributes on other variables (e.g., type of innovation decision, communication channels, nature of social structure, etc.,) in determining the rate of adoption of health innovations and

vice versa. Likewise, there is some reason to believe that research exploring the diffusion of health innovation types through come other typology than practices, programmes, and policies can improve our comprehension of how effectively innovation classifications relay knowledge and information on patterns of diffusion across countries. Thirdly, in view of the fact that there exists a plethora of potential health innovations hosts within countries, future research should seek to develop a more holistic survey of the total number of potential adopters within a country and the pressures and incentives they face. Fourthly, future research should also explore how the characteristics of health innovations evolve over the course of diffusion. Users often alter and customize innovations to suit their needs, as a result of which innovations are likely to change in scope, complexity, and target as they spread, through time, from one country to another. For example, the so-called disruptive innovations introduce new sets of features, performance measures, and price attributes compared to existing products, which makes them unattractive for some decision-makers and customers. Subsequent developments of such innovations over time raise the new product's attributes to a level sufficient to satisfy customers and decision-makers (Chandy & Prabhu, 2010). This stream of work will likely offer much on how to import programme and policy-based health innovations from developing countries and apply them to suit the structures and needs of developed country settings. Fifthly, geographical patterns of knowledge diffusion that were once based on physical distance have increasingly been distorted by air travel; cultural globalization; and by the Internet and telecommunications revolution. In light of this, it is not at all obvious at the outset how the erosion distance affects the perception of health innovations and influences the once localized innovation-decision process. Sixthly, research linking the characteristics of innovation to diffusion

dynamics could address the common complaint that diffusion studies are of limited generalizability because they do not examine the large and largely unknown set of innovations that fail to diffuse across countries. If the attributes of complexity, compatibility, trialability, observability, and relative advantage are associated with the speed and scope of diffusion, then researchers should also be able to use these characteristics to model the 'non-diffusion' of health innovations to determine the other side of the equation. Finally, considerable amount work needs to be undertaken to improve research designs and scale diffusion studies to country units. Increased data collection on the perceptions of health innovation attributes will also provide an empirical basis on which to rest this conceptual model. Future work in these key areas can provide an even more robust understanding of comparative policy diffusion that will not only help decision-makers orient themselves in relation to health literature, but also help understand where the respective contributions of health care fit into the larger picture of innovation diffusion.

APPENDIX A- GLOSSARY OF KEY TERMS

Adoption: a decision to make full use of an innovation as the best course of action available.

Diffusion: the process in which an innovation is communicated through certain channels over time among the members of a social system.

Health innovation: any product which has the potential to drive change and redefine healthcare's economic and/or social potential.

Innovation: an idea, practice, or object that is perceived as new by an individual or other unit of adoption.

Innovation-decision: the process though which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject the innovation, to implementation and use of the new idea, and to confirmation of this decision.

Knowledge: that which occurs when an individual learns of the innovation's existence and gains some understanding of how it functions.

Persuasion: that which takes place when an individual forms a favourable or unfavourable attitude toward an innovation.

Reverse innovation: reverse innovation or trickle-up innovation is a term referring to an innovation seen first, or likely to be used first, in the developing world before spreading to the industrialized world.

Uncertainty: the degree to which a number of alternatives are perceived with respect to the occurrence of an event and the relative probabilities of these alternatives.

APPENDIX B- LIST OF INNOVATIONS ARRANGED ACCORDING TO PRACTICES, PROGRAMMES, AND POLICIES

	Title	Author	Source	P/P/P
1	**Destigmatizing day-to-day practices: what developed countries can learn from developing countries**	Rosen A	World Psychiatry. 2006 February; 5(1): 21–24.	**Policy**
2	**Learning from low income countries: health is a dynamic process**	PC Das	BMJ 2004;329:1185-1186 (13 November), doi:10.1136/bmj.329.7475.1185-c	**Policy**
3	**Managing the global burden of depression: lessons from the developing world**	Swartz H, Rollman B	World Psychiatry. 2003 October; 2(3): 162–163.	**Policy**
4	**Lessons on integration from the developing world's experience**	Bodeker G	BMJ 2001;322:164-167	**Policy**
5	**Cost-effectivness of a primary care treatment programme for depression in low-income women in Santiago, Chile**	KM van Steenbergen-Weijenburg	BMC Health Serv Res. 2010; 10: 19.	**Policy**
6	**Flat medicine? Exploring trends in the globalization of health care.**	Crone RK.	Acad Med. 2008 Feb;83(2):117-21.	**Policy**
7	**Involvement abroad of U.S. academic health centers and major teaching hospitals: the developing landscape**	Merritt MG Jr, Railey CJ, Levin SA, Crone RK.	Acad Med. 2008 Jun;83(6):541-9.	**Policy**
8	**International care. Crossing borders.**	Ladika S.	Hosp Health Netw. 2002 Jun;76(6):26, 28.	**Policy**
9	**Outcomes of Community Health Worker Interventions**	Viswanathan M, Kraschnewski J, Nishikawa B, Morgan LC, Thieda P	AHRQ Evidence Report	**Policy**

10	**A primary healthcare approach to the management of chronic disease in Ethiopia: :an example for other countries**	Mamo Y, Seid E, Adams S, Gardiner A, Parry E.	Clin Med. 2007 Jun;7(3):228-31.	**Policy**
11	**A traditional healers' training model in rural Nepal: strengthening their roles in community health**	Poudyal AK, Jimba M, Murakami I, Silwal RC, Wakai S, Kuratsuji T.	Trop Med Int Health. 2003 Oct;8(10):956-60.	**Policy**
12	**Pathologists going "live": lessons from a developing country on giving a human face to pathology**	Obenson K	CMAJ December 9, 2003; 169 (12)	**Policy**
13	**An extra dollar can go a long way**	Watts Geoff	BMJ 2004;329:1126 (13 November), doi:10.1136/bmj.329.7475.1126	**Policy**
14	**Bridging the divide: global lessons from evidence-based health policy in Mexico**	Frenk J	The Lancet, 2006 368;9539, 954 - 961	**Policy**
15	**The 100% Condom Use Programmes in Asia**	Rojanapithayakorn W	Reproductive Health Matters, Vol. 14, No. 28, Condoms, Yes! "Abstinence", No (Nov., 2006), pp. 41-52	**Policy**
16	**Lessons for health care reform from the less developed world: the case of the Philippines**	Obermann K, Jowett MR, Taleon JD, Mercado MC.	Eur J Health Econ. 2008 Nov;9(4):343-9. Epub 2007 Oct 20.	**Policy**
17	**Lessons from developing nations on improving health care**	Berwick DM.	Berwick BMJ.2004; 328: 1124-1129	**Policy**
18	**Flawed but fair: Brazil's health system reaches out to the poor**		WHO Bulletin 2008 86:4, 241-320	**Policy**
19	**Topics for our times: can we learn from the care of persons with mental illness in developing countries?**	Susser E, Collins P, Schanzer B, Varma VK, Gittelman M.	Am J Public Health. 1996 Jul;86(7):926-8	**Programme**
20	**Women health workers: improving eye care in Pakistan.**	Khan NU, Khan AA, Awan HR.	Community Eye Health. 2009 Jun;22(70):26.	**Programme**

21	**Pakistan, Afghanistan look to women to improve health care**	Garwood P	WHO Bulletin 2006 84:11, 841-920	**Programme**
22	**To fix health care, some study developing world**	Marcus A	The Wall Street Journal, 2 July 2009, A9	**Programme**
23	**Building Capacity for Multidrug-Resistant Tuberculosis Treatment:Health Systems Strengthening in Lesotho**	Keshavjee SSeung KSatti HFurin JFarmer PKim JYBecerra M	Innovations: Technology, Governance, Globalization, MIT Press, vol. 2(4), pages 87-106, October.	**Programme**
24	**Lessons from India in Organizational Innovation: A tale of two heart hospitals**	Richman B Mitchell W Udayakumar K Schulman K	Health Aff (Millwood). 2008 Sep-Oct;27(5):1260-70.	**Programme**
25	**Hospital management in the context of health sector reform: a planning model in Ethiopia**	K Hartwig	Int J Health Plann Manage. 2008 Jul-Sep;23(3):203-18.	**Programme**
26	**The cost-effectiveness of technology transfer using telemedicine.**	Johnston K, Kennedy C, Murdoch I, Taylor P, Cook C.	Health Policy Plan. 2004 Sep;19(5):302-9.	**Programme**
27	**Implementation of an international teleradiology staffing model.**	Kalyanpur A, Neklesa VP, Pham DT, Forman HP, Stein ST, Brink JA.	Radiology. 2004 Aug;232(2):415-9.	**Programme**
28	**Demystifying health care**	K Ahmad	BMJ 2004;329:1127 (13 November), doi:10.1136/bmj.329.7475.1127	**Programme**
29	**Learning from low income countries: palliative care can be delivered through neighbourhood networks**	S Kumar	BMJ 2004;329:1184 (13 November), doi:10.1136/bmj.329.7475.1184	**Programme**
30	**Learning from low income countries: trained medical assistants can successfully do work of doctors**	P Bewes	BMJ 2004;329:1184 (13 November), doi:10.1136/bmj.329.7475.1184-a	**Programme**
31	**Training medical assistants for surgery**	Vaz F, Bergström S, Vaz Mda L, Langa J, Bugalho A.	Bull World Health Organ. 1999;77(8):688-91.	**Programme**

32	**Economic evaluation of surgically trained assistant medical officers in performing major obstetric surgery in Mozambique.**	Kruk ME, Pereira C, Vaz F, Bergström S, Galea S.	BJOG. 2007 Oct;114(10):1253-60.	**Programme**
33	**Meeting the need for emergency obstetric care in Mozambique: work performance and histories of medical doctors and assistant medical officers trained for surgery.**	Pereira C, Cumbi A, Malalane R, Vaz F, McCord C, Bacci A, Bergström S.	BJOG. 2007 Dec;114(12):1530-3.	**Programme**
34	**A model of prehospital trauma training for lay persons devised in Africa**	M Tiska, M Adu-Ampofo, G Boakye, L Tuuli, and C Mock	Emerg Med J. 2004 March; 21(2): 237–239.	**Programme**
35	**The International HIV Dementia Scale: a new rapid screening test for HIV dementia.**	Sacktor NC, Wong M, Nakasujja N, Skolasky RL, Selnes OA, Musisi S, Robertson K,	AIDS. 2005 Sep 2;19(13):1367-74.	**Programme**
36	**Thalassaemia screening in Iran provides evidence for programmeme in Lancashire**		BMJ 2005;330:478 (26 February), doi:10.1136/bmj.330.7489.478-b	**Programme**
37	**Surgery in developing countries: essential training in residency.**	Ozgediz D, Roayaie K, Debas H, Schecter W, Farmer D.	Arch Surg. 2005 Aug;140(8):795-800.	**Practice**
38	**Poor countries still provide reasons to train doctors in diseases of poverty**	Yogendra S	BMJ. 2005 February 26; 330(7489): 478.	**Practice**
39	**Hands across the equator: the Hereford-Muheza link eight years on.**	J. B. Wood, E. Hills, and F. J. Keto	BMJ. 1994 April 16; 308(6935): 1029–1032.	**Practice**
40	**Research into practice: 10 years of international public health partnership between the UK and Swaziland**	Wright J, Walley J, Philip A, Petros H, Ford H.	J Public Health (Oxf). 2010 Jun;32(2):277-82. Epub 2010 Feb 6.	**Practice**
41	**Kangaroo Mother Care, an example to follow from developing countries**	Pelaez JGR Charpak N Cuervo LG	BMJ 2004;329:1179-1181 (13 November)	**Practice**
42	**PCR Detection and Identification of Leishmania Parasites in Clinical Speciments in Ecuador: a comparison with classical diagnostic methods**	Coloma J, Harris E.	BMJ. 2004 Nov 13;329(7475):1160-2.	**Practice**

43	**Innovative Low Cost Technologies for Biomedical Research and Diagnosis in Developing Countries**	Aviles H, Belli A, Armijos R, Monroy FP, Harris E.	J Parasitol. 1999 Apr;85(2):181-7.	**Practice**
44	**Treatment of Burkitt Lymphoma in children and Adults: Lessons from Africa**	Magrath IT.	Curr Hematol Malig Rep. 2006 Dec;1(4):230-40.	**Practice**
45	**Learning from low income countries: effective surgery can be cheap and innovative**	AM Abeygunasekera	BMJ 2004;329:1185 (13 November), doi:10.1136/bmj.329.7475.1185	**Practice**
46	**Superdoctors- one small step**	Diana Hall	http://news.bbc.co.uk/2/hi/health/7572792.stm	**Practice**
47	**Home-made spacers for bronchodilator therapy in children with acute asthma: a randomised trial.**	Zar HJ, Brown G, Donson H, Brathwaite N, Mann MD, Weinberg EG.	Lancet. 1999 Sep 18;354(9183):979-82.	**Practice**
48	**Knowledge can flow from developing to developed countries**	Lam LKC	BMJ 2000;321:830	**Practice**
49	**Developing world's innovations find a way to the West**	Kaiser Health News	Science and Development Network	**Practice**
50	**Community based approaches to the control of multidrug resistant tuberculosis: introducing 'DOTS-plus'**	P Farmer	BMJ. 1998 Sep 5;317(7159):671-4.	**Practice**

APPENDIX C- SEARCH STRATEGY

Database	Keywords	Hits (articles)	Retrieved (articles)
Pubmed	(diffusion of innovation AND developing country)	377	1
	(diffusion of innovation AND health AND South to north)	18	0
Google Scholar	(diffusion of innovation AND health AND "South to north")	356	0
	(diffusion of innovation AND health AND "from developing countries to developed countries")	26	0
JSTOR	(((diffusion of innovation) AND (from south to north)) AND ca:(health))	25	0
	(((diffusion of innovation) AND (from developing countr* to developed countr*)) AND ca:(health))	11	0
Web of Science	Topic=(diffusion of innovation) AND Topic=(health) AND Topic=(from developing countr* to developed countr*)	15	0
	(diffusion of innovation) AND Topic=(from south to north)	7	0

APPENDIX D- BIBLIOGRAPHY

Aksarany, D. (2009, March 31). *Innovation Generation and Innovation Adoption* . Retrieved October 22, 2011 from Social Science Research Network: Working Paper Series : http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1370775

APHA. (2009). *Support for Community Health Workers to Increase Health Access and to Reduce Health Inequities* . American Public Health Association.

APPS. (2010). *Developed-developing country partnerships: benefits to "developed" countries?* Geneva: World Health Organization.

Atun, R., & Kyratsis, I. (2007). Diffusion of complex health innovations—implementation of primary health care reforms in Bosnia and Herzegovina. *Health Policy and Planning , 22* (1), 28-39.

Australian Department of Immigration and Multicultural Affairs. (2006). *Quality Case Management and Community Care Pilot.* Australian Government, Department of Immigration and Multicultural Affairs (DIMA). Australian Department of Immigration and Multicultural Affairs.

Barros, R. (2008, November). *Wealthier But Not Much Healthier: Effects of a Health Insurance Program for the Poor in Mexico*. Retrieved November 18, 2011 from Stanford University: http://www.stanford.edu/~rbarros/JMP_RBarros

Battista, R. N. (1989). Innovation and diffusion of health related technologies: a conceptual framework. *Internatoinal Journal of Technology Assessment In Health Care* , 227-248.

Battista, R., & Contrandriopo, A.-P. (1989). An Integrative Framework for Health-related Research. *Journal of Clinical Epidemiology , 42* (12), 115501160.

Bell, P. (2006). *Modeling the diffusion of system-effect technologies.* Frankfurt: Deutscher Universitats-Verlag.

Berwick, D. (2003). Disseminating Innovations in Health Care . *Journal of the American Medical Association , 289* (15), 1969-1975.

Boushey, G. T. (2010). *Policy Diffusion Dynamics in America.* Cambridge: Cambridge University Press.

Canada Health Infoway. (2011). *Quebec patients benefit from Televisit service*. Retrieved November 7, 2011 from Canada Health Infoway: https://www.infoway-inforoute.ca/lang-en/about-ehr/ehr-success-stories/quebec-patients-benefit-from-televisit-service

Cantlupe, J. (2010, January 15). *Health Reform Pilot Projects Look to Transform Healthcare* . Retrieved November 06, 2011 from HealthLeaders Media:

http://www.healthleadersmedia.com/content/LED-244998/Health-Reform-Pilot-Projects-Look-to-Transform-Healthcare.html##

Cattaneo, A., & Davanzo, R. (1998). Recommendations for the implementation of Kangaroo Mother Care for low birthweight infants. *Acta Paediatrica , 87* (4), 440-445.

Chandy, R., & Prabhu, J. (2010). Innovation Typologies. *Wiley International Encyclopedia of Marketing* .

Charpak, N., & Ruiz, J. (2005). Kangaroo Mother Care: 25 years after. *Acta Paediatrica , 94* (5), 514-22.

Cherrington, A., & Ayala, G. (2008). Implementing the community health worker model within diabetes management: challenges and lessons learned from programs across the United States. *The Diabetes Educator , 34* (5), 824-833.

CIHR. (2011, April 06). *CIHR Roadmap Signature Initiative in Community-Based Primary Healthcare*. Retrieved November 11, 2011 from Canadian Institutes of Health Research: http://www.cihr-irsc.gc.ca/e/43249.html

CIHR. (2010, JUne 22). *CIHR-IHSPR Strategic Priority Research Areas*. Retrieved November 06, 2011 from Canadian Institutes of Health Research: http://www.cihr-irsc.gc.ca/e/35337.html

Clark, G. (1984). *Innovation diffusion: contemporary geographical approaches* (Vol. 40). London: Institute of British Geographers.

Clark, J. (1985). Policy Diffusion and Program Scope: Research Directions. *Publius , 15* (4), 61-70.

Crisp, N. (2010). *Turning the world upside down - the search for global health in the 21st century* . London: Royal Society of Medicine Press.

Dössel, O., & Schlegel, W. (2009). *IFMBE Proceedings: World Congress on Medical Physics and Biomedical Engineering.* Munich: International Federation for Medical and Biological Engineering.

Dearing, J. (2007, August 15). *Measurement of Innovation Attributes* . (C. Kaiser Permanente, Producer) Retrieved November 08, 2011 from Center for Health Dissemination and Implementation Research in the Institute for Health Research: http://research-practice.org/tools/measures/Innovation%20attributes%20measurement.pdf

Denis, J.-L., & Hébert, Y. (2002). Explaining Diffusion Patterns for Complex Health Care Innovations. *Health Care Management Review , 27* (3), 60-73.

Dippenaar, H., & Joubert, G. (2006). Guidelines for kangaroo care in district hospitals and primary healthcare maternity sections in the Free State . *South African Family Practice , 48* (9).

Dobbins, M., & Ciliska, D. (2002). A Framework for the Dissemination and Utilization of Research for Health-Care Policy and Practice . *The Online Journal of Knowledge Synthesis for Nursing , 9* (7).

Dolowitz, D., & Marsh, D. (2000). Learning from Abroad: The Role of Policy Transfer in Contemporary Policy-Making. *Governance: An International Journal of Policy and Administration , 13* (1), 5-24.

Fallah, H., & Lechler, T. (2007, September 08). *Competing in the New Paradigm of Global Innovation Management*. Retrieved October 21, 2011 from International Association for Management of Technology Conference Archive : http://www.iamot.org/conference/index.php/ocs/4/paper/view/689

Fitzgerald, L., & Ewan, F. (2002). Interlocking interactions, the diffusion of innovations in health care. *Human Relations , 55* (12), 1429–1449.

Fitzgerald, M. (2009, March 01). *How Innovations from Developing Nations Trickle-Up to the West*. Retrieved October 22, 2011 from Fast Company: http://www.fastcompany.com/magazine/133/as-the-world-turns.html

Frenk, J. (2006). Bridging the divide: global lessons from evidence-based health policy in Mexico. *Lancet , 368* (9539), 954-61.

Fry, C. V., & Marjanovic, S. (2011). *Health Innovation Transfer from South to North EUROPE.* RAND Europe. Cambridge: RAND Corporation.

Garwood, P. (2006). Pakistan, Afghanistan look to women to improve health care. *Bulletin of the World Health Organization , 84* (11), 841-920 .

Giacomini, M., & Hurley, G. (2004). The policy analysis of 'values talk': lessons from Canadian health reform. *Health Policy , 67* (1), 15-24.

Global Health Workforce Alliance. (2012). *WHO| About the Alliance*. Retrieved January 04, 2012 from Global Health Workforce Alliance: http://www.who.int/workforcealliance/about/en/

Goss, K. (1979). Consequences of diffusion of innovations. *Rural Sociology , 44* , 754-772.

Government of Pakistan. (2009). *The National Programme for Family Planning & Primary Health Care - an overview*. Retrieved November 12, 2011 from Ministry of Health, Government of Pakistan: http://www.phc.gov.pk/site/component/content/article/48-the-national-programme-for-family-planning-a-primary-health-care-an-overview.html

Govindarajan, V. (2009, October 26). *The Case for 'Reverse Innovation' Now*. Retrieved November 21, 2011 from Bloomberg Businessweek: http://www.businessweek.com/innovate/content/oct2009/id20091026_724658.htm

Govindarajan, V., & Ramamurti, R. (2011). Reverse innovation, emerging markets, and global strategy. *Global Strategy Journal , 1* (3-4), 191-205.

Gray, V. (1973). Innovation in the States: A Diffusion Study. *American Political Science Review , 67*, 1174-1185.

Greenhalgh, T., & Robert, G. (2005). *Diffusion of innovations in health service organizations: a systematic literature review.* Oxford: Blackwell Publishing Ltd.

Hussey, P., & Anderson, G. (2003). A comparison of single- and multi-payer health insurance systems and options for reform . *Health Policy , 66*, 215-228.

Ilie, V., & Courtney, J. (2007). Paper versus Electronic: Challenges Associated with Physicians' Usage of Electronic Medical Records. *40th Hawaii International Conference on System Sciences* . Waikoloa: IEEE.

Jaff, H. (2010, March 27). *The Right to Health in Mexico: Seguro Popular*. Retrieved October 28, 2011 from World Poverty and Human Rights Online : http://wphr.org/2010/hanna-jaff/the-right-to-health-in-mexico-seguro-popular/

Jana, R. (2009, March 11). *Innovation Trickles in a New Direction*. Retrieved October 21, 2011 from Bloomberg Businessweek: http://www.businessweek.com/magazine/content/09_12/b4124038287365.htm

Judd, J., & Frankish, J. (2001). Setting standards in the evaluation of community-based health promotion programmes— a unifying approach. *Health Promotion International , 16* (4), 367-380.

Kern, K., & Kissling, I. (2001). *Policy Convergence and Policy Diffusion by Governmental and Non-governmental Institutions. An International Comparison of Eco-labeling Systems.* Berlin: Wissenschaftszentrum Berlin für Sozialforschung.

Khushf, G. (1994). Ethics, Politics, and Health Care Reform. *The Journal of Medicine and Philosophy , 19*, 397-405.

King, G., & Gakidou, E. (2007). A "Politically Robust" Experimental Design for Public Policy Evaluation, with Application to the Mexican Universal Health Insurance Program. *Journal of Policy Analysis and Management , 26* (3), 479–506.

Kleinman, S. (2009). *The culture of efficiency: technology in everyday life* . New York: Peter Lang Publishing.

Lakin, J. (2010). The End of Insurance? Mexico's Seguro Popular, 2001 – 2007 . *Journal of Health Politics, Policy and Law , 35* (3), 313-352.

Lehmann, U., & Sanders, D. (2007). *Community health workers: What do we know about them?* . Evidence and Information for Policy. Geneva: World Health Organization.

Lewis, S., & Hader, J. (1994). *Barriers to Community Care.* Health Services Utilization and Research Commission .

Lloyd, J., & Wise, M. (2009). The influence of professional values on the implementation of Aboriginal health policy. *Journal of Health Services and Research Policy , 14*, 6-12.

Lopez, A. D., & Mathers, C. (2006). Measuring the Global Burden of Disease and Risk Factors, 1990—2001 . In A. D. Lopez, & C. Mathers, *In Global Burden of Disease and Risk Factors* (pp. 1-13). New York: Oxford University Press.

Makse, T., & Volden, C. (2010, March). *The Role of Policy Attributes in the Diffusion of Innovations*. Retrieved November 08, 2011 from The Ohio State University: polisci.osu.edu/faculty/cvolden/MVAttributesJoP.pdf

Makse, T., & Volden, C. (2011). The Role of Policy Attributes in the Diffusion of Innovations. *The Journal of Politics , 73* (1), 108-124.

Martínez, G., & Aguilera, N. (2010). Working paper: The value of health and longevity in Mexico. *Inter-American Conference on Social Security.* IACSS.

McCord, H. C. (2011, March). Exploring Nurses' Perceptions on the Use of Kangaroo Mother Care to Reduce Pain During Heel Lance Procedures. *Submitted in partial fulfillment of the requirements for the degree of Master of Nursing, Dalhousie University* . Halifax, Nova Scotia, Canada: Dalhousie University.

Menachemi, N., & Burke, D. (2004). Factors Affecting the Adoption of Telemedicine—A Multiple Adopter Perspective. *Journal of Medical Systems , 28* (6), 617-632.

Mintrom, M. (1997). Policy Entrepreneurs and the Diffusion of Innovations. *American Journal of Political Science , 41* (3), 738-70.

National Bureau of Asian Research. (2010). Reforming the Global Health System: Lessons from Asia . *Asia Policy , 10*, 146.

Negatu, W., & Parikh, A. (1999). The Impact of Perception and Other factors on the Adoption of Agricultural Technology in the Moret and Jiru Woreda (District) of Ethiopia. *Agricultural Economics* , 205-216.

NHS Scotland. (2003, October). *Family Health - Nursing in Scotland: A report on the WHO Europe pilot*. Retrieved November 06, 2011 from The Scottish Government: Report of the Scottish Pilot of Family Health Nursing: http://www.scotland.gov.uk/Publications/2003/10/18428/28399

Nirmala, P., & Swarna, R. (2006). Kangaroo Mother Care: Effect and perception of mothers and health personnel. *Journal of Neonatal Nursing , 12* (5), 177-184.

Nutley, S. (2002, October). *Conceptual Synthesis 1: Learning from the Diffusion of Innovations*. (U. o. London, Producer) Retrieved November 3, 2011 from ESRC UK Centre for Evidence Based Policy and Practice: http://www.ruru.ac.uk/PDFs/Learning%20from%20the%20Diffusion%20of%20Innovations.pdf

Nykiforuk, C. I. (2008). Smoke-free spaces over time: a policy diffusion study of bylaw development in Alberta and Ontario, Canada. *Health and Social Care in the Community , 16* (1), 64–74.

OECD. (2011). *Economic Outlook 2011.* OECD Publishing.

Oliver, A. (2006). *Integrating community health and social care*. Retrieved November 06, 2011 from Health Policy Monitor: London School of Economics and Political Science: http://www.hpm.org/en/Surveys/LSE_-_UK/07/Integrating_community_health_and_social_care.html

Orr, V. (1999). Healthy Heart Kit Launched by Minister Allan Rock. *Canadian Family Physician , 45*, 1097-1098.

Pankratz, M., & Hallfors, D. (2001). Measuring perceptions of innovation adoption: the diffusion of a federal drug prevention policy . *Health Education Research , 17* (3), 315-326.

Perry, R. (2000). Chapter Three: Theories of Sociology. In E. Borgatta, & R. Montgomery, *Encyclopedia of Sociology 2nd Edition* (pp. 674-681). New York: Macmillan .

Porche, D. (2011). *Health Policy: Application for Nurses and Other Health Professionals.* London: Jones & Bartlett Publishers.

Prada, G. (2010). *The Health Enterprise: Charting a Path for Health Innovation.* Ottawa: The Conference Board of Canada.

Public Health Agency of Canada. (2010, October 27). *Glossary of Terms*. Retrieved November 3, 2011 from Public Health Agency of Canada: http://www.phac-aspc.gc.ca/php-psp/ccph-cesp/glos-eng.php

Rahman, M., & John, C. (2009). *Telemedicine in the San Joaquin Valley: Opportunities and Barriers in Adoption* . Central Valley Health Policy Institute. Central Valley: The California Endowment.

Richerson, P. J. (2001). *Chapter 19: Diffusion of Innovations.* Retrieved October 21, 2011 from Principles of Human Ecology: www.des.ucdavis.edu/faculty/Richerson/BooksOnline/He19-95.pdf

Robinson, L. (2009). *A summary of Diffusion of Innovations.* Enabling Change.

Rogers, E. (1995). *Diffusion of Innovations.* New York: The Free Press.

Rogers, E. (2003). *Diffusion of Innovations, Fifth Edition.* New York: Free Press.

Roh, C.-Y. (2008). Telemedicine: What It Is, Where It Came From, and Where It Will Go . *Comparative Technology Transfer and Society , 6* (1), 35-55.

Rothschild, S., & Martin, M. (2011). The Mexican-American Trial of Community Health workers (MATCH): Design and baseline characteristics of a randomized controlled trial testing a culturally tailored community diabetes self-management intervention. *Contemporary Clinical Trials* .

Ruiz-Peláez, J. (2004). Kangaroo Mother Care, an example to follow from developing countries. *BMJ , 329* (7475), 1179-81.

Sack, S. (2007, May 25). Return on Investment: Initial Considerations for Measuring Cost-Savings of AT Reuse. *What is ROI Analysis?* . USA: Assistive Technology for Kansans .

Saltman, R., & Bankauskaite, V. (2007). *Decentralization in healthcare.* New York: McGraw-Hill.

Savigny, D. d., & Adam, T. (2009). *Systems thinking for health systems strengthening.* Geneva: Alliance for Health Policy and Systems Research, World Health Organization.

Schmidt, C., & Baltussen, R. (2000). *The Evaluation of Community-Based Interventions: Group Randomization, Limits and Alternatives.* Bonn: Institute for the Study of Labour (IZA).

Scott, C. (2002). Comparative policy analysis and health-system reform . *Expert Review of Pharmacoeconomics & Outcomes Research , 2* (6), 511-515 .

Scott, S., & Plotnikoff, R. (2008). Factors influencing the adoption of an innovation: An examination of the uptake of the Canadian Heart Health Kit (HHK). *Implementation Science* , 3-41.

Shilling, M. (2010). *Strategic Management of Technological Innovation* . London: McGraw-Hill.

Shipan, C., & Volden, C. (2006). Bottom-Up Federalism: The Diffusion of Antismoking Policies from U.S. Cities to States. *American Journal of Political Science , 50* (4), 825–843.

Singer, P. (2011, January 14). Look at the developing world to cut health costs. *Globe and Mail* .

Solberga, L., & Van Royenb, P. (2009). The medical home: is it a blind men and elephant tale? *Family Practice , 26* (6), 425-427.

Spratt, K. (2009). *Policy Implementation Barriers Analysis: Conceptual Framework and Pilot Test in Three Countries.* Washington, DC: Futures Group, Health Policy Initiative, Task Order 1.

Stone, D. (2001). *Learning Lessons, Policy Transfer and the International Diffusion of Policy Ideas.* Coventry: Centre for the Study of Globalisation and Regionalisation, University of Warwick.

Tessier, R., & Cristo, M. (1998). Kangaroo mother care and the bonding hypothesis. *Pediatrics , 102* (2), e17.

The International Bank for Reconstruction and Development/The World Bank Group. (2006). *Pillars of the Health System- Priorities in Health- NCBI Bookshelf*. Retrieved October 20, 2011 from The National Center for Biotechnology Information: http://www.ncbi.nlm.nih.gov/books/NBK10265/

Tornatzky, L., & Klein, R. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management* , 28–45.

Valesky, K. (2011). *Community Health Workers in Health care for the Homeless: a guide for administrators.* U.S. Department of Health and Human Services.

Varkey, P., & Horne, A. (2008). Innovation in Health Care: A Primer. *American Journal of Medical Quailty , 23* (5), 382-388.

Victora, C., & Rubens, C. (2010). Global report on preterm birth and stillbirth (4 of 7): delivery of interventions. *BMC Pregnancy and Childbirth* , S4.

Wallina, L., & Rudberg, A. (2005). Staff experiences in implementing guidelines for Kangaroo Mother Care—a qualitative study . *International Journal of Nursing Studies , 42*, 61-73.

Wallis, K., & Ronald, R. (2005). Technology and Health Information Privacy: Consumers and the Implementation of the Digital Medical Records Technology. *Technology and Health Information Policy* .

Weberg, D. (2009). Innovation in Healthcare: A Concept Analysis . *Nursing Administration Quarterly , 33* (3), 227–237.

White, I. (2011, April 04). *Innovation Definition - How to define innovation - The Ideas Economy*. Retrieved October 19, 2011 from The Economist: http://ideas.economist.com/blog/defining-innovation

WHO & Global Health Workforce Alliance. (2008). *Case study: Pakistan's Lady Health Worker Programme.* Geneva: World Health Organization.

WHO. (2007). *Everybody's business: strengthening Health Systems to Improve Health Outcomes.* Geneva: World Health Organization.

WHO. (2003). *Kangaroo mother care: a practical guide.* Geneva: World Health Organization.

WHO. (1998). *The WHO Health Promotion Glossary*. Retrieved November 3, 2011 from World Health Organization: http://www.who.int/healthpromotion/about/HPG/en/

WHO. (2008). *The World Health Report 2008 - Primary Health Care (Now More Than Ever).* Geneva: World Health Organization.

WHO. (2003). *What are the arguments for community-based mental health care?* Copenhagen : World Health Organization.

WHO. (2011). *World Health Statistics.* Geneva: World Health Organization.

Yapa, L., & Mayfield, R. (1978). Non- Adoption of Innovations: Evidence from Discriminant Analysis. *Economic Geography , 54* (2), 145–156.