Equity Aspects of Canadian Immunization Programs

Differences within and between countries

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Abstract

There is a global recognition that immunization is one of the most cost-effective public health interventions which should be available to everyone. The equity approach to immunization provides a holistic and integrated framework for addressing inequalities and disproportions in the realization of human rights. The aim of this study is to review the performance of the immunization programs in Canada through an equity lens using two analytical frameworks for immunization programs. It focuses on four elements of the programs: a) the burden of disease; b) immunization strategy; c) ability to evaluate; and d) research questions. To achieve universal access to vaccination, Canada should have a strong connection with human rights, where realities and outreach need to be prioritized. Preventable diseases such as influenza, H1N1, and varicella have been reported specifically in Aboriginal Canadians, immigrants and refugees. Our study seeks to demonstrate that access to vaccines should be considered one of the most vital human rights and as a matter of fundamental intervention to achieve health equity.

Keywords: immunization; population; canada; human rights; community health; health policy

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Mirella Veras[1] & David Zakus[2]

I. Introduction

Health equity is defined as an "absence of systematic disparities in health (or in the major social determinants of health) between groups with different social advantages/disadvantages (eg., wealth; power; prestige).[3]" The concept of equity is consequently an ethical principle essential to human rights and its discourses – a principle bolstering contemporary strategies of national health and the possible future epistemological preoccupation[1]. Article 25 of the Universal Declaration of Human Rights, for example, affirms the rights (that is, the equal availability and access) of medical care and necessary social services for everyone. The United Nations Committee on Economic, Social and Cultural Rights further illustrates, and very much underlines, the importance of immunization accessibility in the attempt to reduce major infectious diseases in risk groups such as children and other vulnerable populations. [4]

The introduction of mass immunization into the global sphere and strategy of health practice and protocol, is one of the foremost public health interventions to control (manage) and eliminate endemic disease.[5;6] The first vaccine, we recall, was developed more than 200 years ago and since then millions of lives have been saved, with several infectious diseases being eradicated through vaccination strategies[7]. For example, smallpox was eliminated worldwide by 1977 and the threat of paralytic poliomyelitis has since diminished completely in most countries across the globe. Deaths caused by certain diseases including polio, measles, mumps, rubella, hepatitis A, hepatitis B, pneumococcal, meningococcal disease and tetanus have also significantly decreased in the wake of effective immunization programs.[8]

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[3] Braveman P, Gruskin S. *Defining equity in health*. J Epidemiol Community Health 57: 254-258. 2003.

[4] Braveman P, Gruskin S. *Defining equity in health*. J Epidemiol Community Health 57: 254-258. 2003.

[5] MMWR Morb Mortal WR. *Ten great public health achievement. United States* 1900-1999 48:241-24. 1999

[6] Advisory Committee in Population Health and Health Security. *National Immunization : Final Report 2003*. P 1-19. 2003

[7] Jimenez J. *Vaccines - A wonderful Tool for Equity in Health*. Vaccine 19: 2201-2205. 2001

[8] CIHR Institute of Infection and Immunity. *Vaccines for the 21 st Century: Taking Canada to the Next Level. Report prepared for CIHR* Institute of Infection and Immunity by Michelle French, Scientific Communication 1-63. 2008.

Yet although people living in developed countries are generally considered the healthiest in the world (owing to the structural and accessibility factors of systems), the opportunity and possibility to be healthy varies according to social class, geographic location, education level, socio-economic status, gender, ethnicity and other variables[9;10]. The idea of equal access to health is associated with the notion of equal human rights, which is a fundament to the concept of health equity amidst these very complex socio-economic, and at times, cultural, variables. Furthermore, equal opportunity and choice in the context of health implies that all people are able to achieve the highest possible level of physical and mental wellbeing within a given system, considering that many physical limitations can be overcome with appropriate resources and strategies which can properly consider, and steer through, these variables.[11]

It is presently estimated that 30,000 to 50,000 North Americans die each year from vaccine preventable illnesses.[12] Such statistics are a concern for Health Systems Research, especially when eliminating health inequalities and achieving social justice are the main priorities of population health.[13;14]Health disparities in Canada are presented among groups with particular characteristics such as socio-economic status (SES), aboriginal identity, geographic location and gender. For instance, Canadians who live in Northern remote communities have higher rates of smoking, obesity and heavy drinking when compared to the Canadian average. Such behavioral patterns result in the lowest life expectancy and the lowest disability-free life expectancy (DFLE) of the country. Moreover, First Nations on reserves have four times the rate of potential years of life lost caused by injuries, including suicides[15]. This, arguably, is not merely a question of behavior patterns and lifestyle habits, but equally one of access. It is further reported that Canadian women live six years longer than men even though they are more likely to have long term activity limitations and chronic conditions.

In Canada, it is nigh on a statistical given that many adults die of infectious diseases which could have been prevented through vaccination.[16] In 2010, 428 Canadians died from H1N1 and a great many thousands were infected in spite of 41% (excluding those residing in the respective territories) having received immunization by

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[9] Marmot MG, Smith GD, Stansfeld S, Patel C, North F, Head J, White I, Brunner E, Feeney A. *Health inequalities among British civil servants: the Whitehall II study*. Lancet 337: 1387-1393. 10.1016/0140-6736(91)93068-K. 1991.

[10] Marmot M. *The influence of income on health: views of an epidemiologist. Does money really matter? Or is it a marker for something else?* Health Aff (Millwood) 21: 31-46. 2002.

[11] Braveman P, Gruskin S. *Defining equity in health*. J Epidemiol Community Health 57: 254-258. 2003.

[12] Poland GA, Shefer AM, McCauley M, Webster PS, Whitley-Williams PN, Peter G, National Vaccine Advisory Committee, Ad Hoc Working Group for the Development of Standards for Adult Immunization Practices (2003. *Standards for Adult Immunization Practices*. American Journal of Preventive Medicine;25(2):144-150. American Journal of Preventive Medicine 25: 144-150. 2003.

[13] Hinman A. *Immunization, Equity and human Rights*. American Journal of Preventive Medicine 26: 84-88. 2004.

[14] Frohlich KL, Ross N, Rachmond C. *Health disparities in Canada today: Some evidence and a theoretical framework*. Health Policy December 2006 (Vol.79, Issue 2, Pages 132-143). 2011.

[15] Task Group of the Federal/Provincial/TerritorialAdvisory Committee on Population Health and Health Security. *Reducing Health Disparities – Roles of the Health Sector: Recommended Policy Directions and Activities Health Disparities*. Avaliable at:

http://www.phac-aspc.gc.ca/ph-sp/disparities/pdf06/disparities_recommended_policy.pdf Acessed on May 12. 2004.

[16] Parkins MD, McNeil S.A., Laupland KB. *Routine immunization of adults in Canada: Review of the epidemiology of vaccine-preventable diseases and current recommendations for primary prevention.* The Canadian Journal of Infectious Diseases & Medical Microbiology 20: e81-e90. 2009.

April 2010.[17] Regarding the Human Papillomavirus (HPV), the Society of Obstetricians and Gynecologists of Canada estimates that 10% to 30% of the Canadian adult population is infected with HPV and around 75% of Canadians will have at least one HPV infection in their lifetime. Additionally, each year, approximately 580 women die from cervical cancer, which is strongly associated with the HPV infection[18].

Added to these disparities and the dissymmetry of the national picture, access to vaccines varies among different groups within the population, among the ten provinces and three territories of Canada. In many provinces the distribution of vaccines is based on location of residence (geo-demographic data) instead of scientific evidence (epidemiological research data). People living in some Canadian provinces therefore have access to vaccines that people in other provinces frankly do not have,[19] further evidencing a problem of availability, access and disproportion. What's more, internal migration in Canada results inadequate immunization because the vaccination schedules among the provinces differ significantly and are not necessarily synchronized.[20] In 2008/2009, almost 400,000 Canadians moved between provinces[21]. A person who moves to another province is at risk to missing important doses of specific vaccines because of differences in these provincial schedules.

Our article focuses on the equity aspects of the immunization programs within Canada and how equity in immunization initiatives can be assessed from a population health perspective (considering the problems of dissymmetry and access). Four elements of immunization in Canada will be presented following a brief summary of the Canadian immunization system and its inequalities. The first element of the immunization program focuses on the burden of vaccine preventable diseases. The second focuses on the immunization strategies themselves, the third on evaluation and, finally, the fourth element on the need to develop research to enhance equity in immunization programs in Canada as well as to better understand the main determinants and variables of immunization inequalities of the country (Figure1).

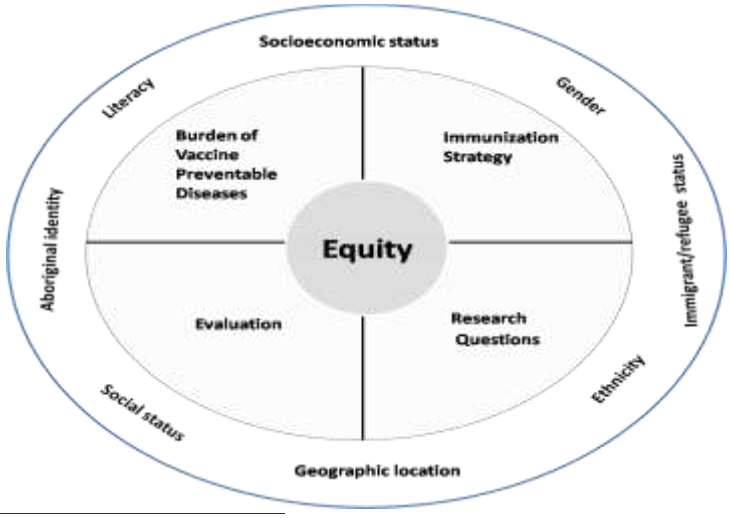

Figure 1: Elements for assessing equity within the Canadian Immunization Program

[17] Gilmour H, Hofmann N. *H1N1 vaccination. Statistics Canada Health Report 21.*2010.

[18] *HPV: incidence and prevalence in Canada*. Available at: http://www.hpvinfoca/hpvinfo/professionals/overview-3aspx Accessed on February 28, 2011.

[19] For example, the HPV vaccine is available to adolescent girls in some provinces but not in others.

[20] Ibid., 17

[21] Statistics Canada. *Annual estimates of demographic components, national perspective - Interprovincial in-migrants*. Available at: http://www.statcan.gc.ca/pub/91-215-x/91-215-x2010000-eng.pdf Accessed on February 24. 2011.

II. The Canadian Immunization System

Immunization programs in Canada vary between the ten provinces and three territories with each constitutionally mandated to determine and deliver their own health services.[22] The responsibility for immunization is shared between federal, provincial and territorial (FPT) governments.[23] The development of a national immunization strategy was initiated in 1999 by the FPT Deputy Minister of Health[24]. In 2003 a National Immunization Strategy was published as proof and consequence to developments in the discourse of population health. This document sets out the major elements and supporting activities related to a national immunization strategy, its broader protocols, remit of application and outreach capability. According to the National Strategy, FPT jurisdictions should work "in partnership" to improve the consistency and synchrony of immunization programs. A mechanism to thus achieve a national collaboration between jurisdictions was implemented to support equitable access to recommended vaccines; improve the efficiency of public health human resources; engage in global immunization initiatives; ably introduce new immunizations; and facilitate inter-sectoral collaboration related to immunization issues.[25]

Despite recognition of the National Immunization Strategy, many provinces and/or territories lacked the required funding to implement the strategy outlined in the report.[26]Each jurisdiction independently planned and delivered their immunization programs, which ultimately led to health disparities in access to vaccines. The result was that a complicated dissymmetry and disproportionate national picture emerged.

Our investigation draws upon equity aspects of the Canadian immunization system using the analytical framework for immunization programs in Canada developed by Erickson, DeWals and Farand[27] and the Global Framework for Immunization Monitoring and Surveillance (GFIMS) of the World Health Organization.[28] The Erickson framework allows for a comparison and examination of immunization programs in Canada, with 58 criteria classified into 13 categories. The categories included are: burden of disease; vaccine characteristics; immunization strategy; cost-effectiveness; acceptability; feasibility; evaluability of programs; research questions; equity; ethical legal considerations; and political considerations. This framework has been specifically employed to structure immunization program reports in consensus building and prioritization conferences. We focus our analysis on four categories using an equity lens for the following aspects of the immunization programs: a) burden of disease; b) immunization strategy; c) ability to evaluate; and d) research questions. Although we acknowledge the importance of the other elements, we did not encounter sufficient literature to analyze them. The GFIMS framework provides

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[22] MacDonald N, Bortolussi R, Canadian Paediatric Society. *A harmonized immunization schedule for Canada: A call to action*. Paediatr Child Health 16: 29-31. 2011.

[23] F/P/T Advisory Committee on Population Health and Health Security (ACPHHS). *National Immunization Strategy. Final Report.*2003.

[24] Ibid., 20

[25] F/P/T Advisory Committee on Population Health and Health Security (ACPHHS). *National Immunization Strategy. Final Report.* 2003

[26] Ibid., 23

[27] Erickson LJ, De Wals P, Farand L. *An analytical framework for immunization programs in Canada*. Vaccine 23: 2470-2476: DOI: 10.1016/j.vaccine.2004.10.029. 2005.

[28] World Health Organization -WHO. *Global framework for immunization monitoring and surveillance* . Department of Immunization, Vaccines and Biologicals. Switzerland 1-56. 2007.

elements to assess immunization strategy and the ability of the governments to evaluate their programs, describing key components of a functioning system and its essential requirements. The GFIMS focuses on two strategic areas: (1) surveillance of vaccine preventable diseases and, (2) immunization program monitoring.[29]

The Burden of vaccine preventable diseases and equity

Immunization is one of the most cost-effective public health interventions curtailing disease (cost per life saved or disability prevented), saving millions of lives around the word annually[30]. In Canada, however, many continue to suffer and die from vaccine-preventable diseases.[31]

Varicella (commonly called chickenpox), for example, is a vaccine-preventable viral disease. However, this infection is significantly under-reported in Canada. The percentage of Canadians aged between 18 and 64 who reported having had varicella currently stands at 84%. Each year, around 350,000 cases are expected to occur and it is estimated that 90% of Canadians will have contracted varicella before they reach 12 years old.[32] The infection, moreover, is associated with significant mortality, morbidity and as having an economic impact.[33]

The incidence of chickenpox presents geographic and gender differences in Canadian provinces and territories Tables 2 and 3 included in our sudy evidence the incidence and occurrence of chickenpox in FPT jurisdictions. For both sexes, the province of Newfoundland and the Yukon and Northwest Territories had the highest incidence of Chickenpox in 2004, with these territories being hit by the highest incidence of chickenpox in women compared to men.[34] All Canadian jurisdictions implemented a universal, publicly-funded childhood varicella program between 2000 and 2007. The last jurisdictions to establish this program were Quebec and Yukon Territory, which implemented their programs in 2006 and 2007, respectively.[35]

[29] Ibid., 26

[30] F/P/T Advisory Committee on Population Health and Health Security -ACPHHS. *National Immunization Strategy. Final Report*. 2003

[31] Statistics Canada. *Annual Demographic Estimates: Canada, Provinces and Territories - 2008.* Table 4-8: Annual estimates of demographic components, national perspective - interprovincial in-migrants. Available at http://www.statcan.gc.ca/pub/91-215-x/2008000/5220891-eng.pdf . Accessed on February. 2011.

[32] Public Health Agency of Canada. *CCDR Canada Communicable Disease Report RMTC- Relevé des maladies transmissibles au Canada*. Volume 36 • ACS-8. 2010

[33] Canadian Paediatric Society -CPS . *Prevention of varicella in children and adolescents Infectious Diseases and Immunization Committee* . Paediatrics & Child Health;10,7:409-412. 2005.

[34] Although the data is old, requiring renewal, it was the only data available after extensive search.

[35] Public Health Agency of Canada. *CCDR Canada Communicable Disease Report RMTC- Relevé des maladies transmissibles au Canada*. Volume 36 • ACS-8 . 2010.

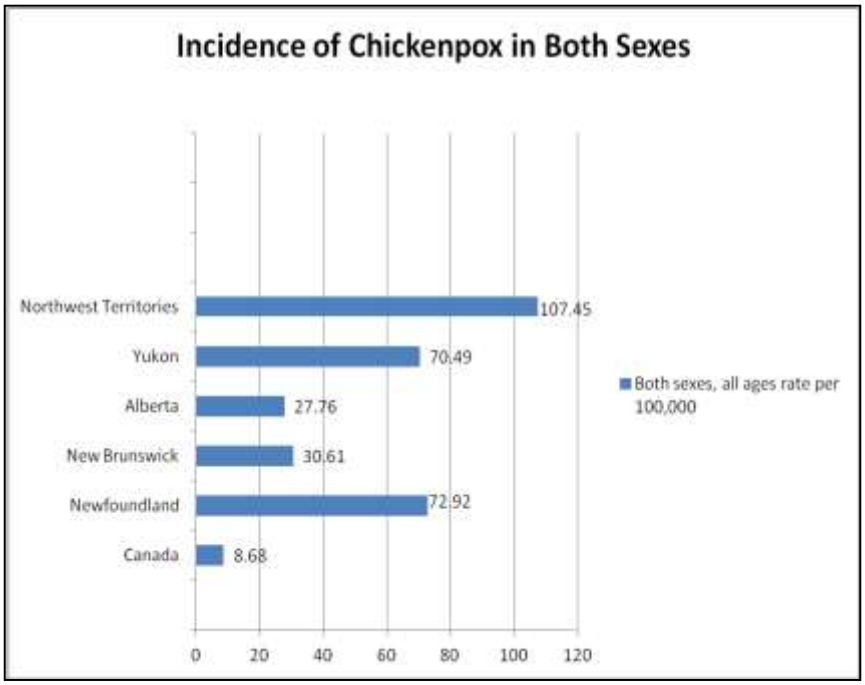

Table 2: Incidence of Chickenpox in Canadian male and females, Provinces and Territories, 2004. Source: Public Health Agency of Canada. Available at: http://dsol-smed.phac-aspc.gc.ca/dsol-smed/ndis/cgi-bin/ndischart2?3DLOOK=3D&DATA_TYPE=R&CAUSE1=020&YEAR1=04&AGE1=0&SEX1=3&CPROV1=View+Chart

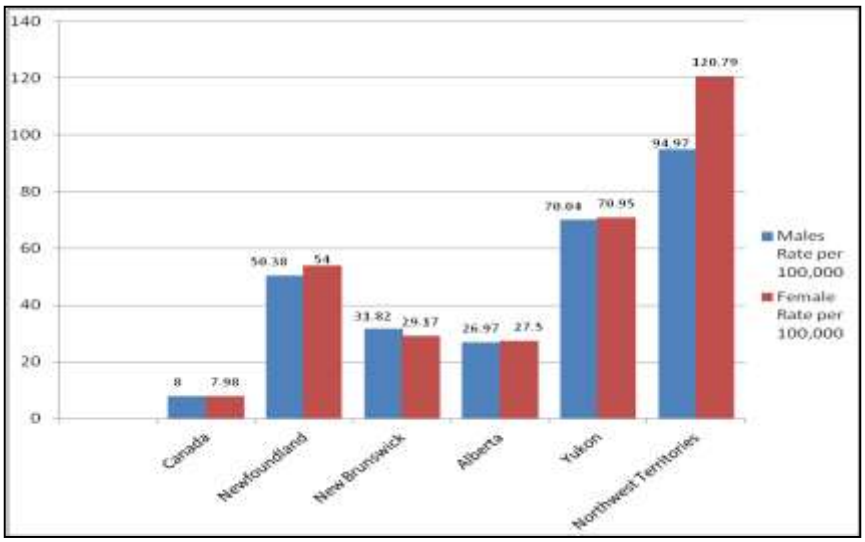

Table 3: Incidence of Chickenpox in both sexes in Canada, Province and Territory, 2004. Source: Public Health Agency of Canada. Available at: http://dsol-smed.phac-aspc.gc.ca/dsol-smed/ndis/cgi-bin/ndischart2?3DLOOK=3D&DATA_TYPE=R&CAUSE1=020&YEAR1=04&AGE1=0&SEX1=3&CPROV1=View+Chart

According to the National Advisory Committee on Immunization (NACI), the varicella vaccine (Var) should be administered to children aged between 1 and 12 years old. Susceptible individuals, 13 of years' or more, should receive two doses at least 28 days apart. NACI recommends an emphasis on promoting varicella immunization within immigrant and refugee populations from tropical countries, as well as women of childbearing age; health and child care workers; people in contact with immuno-compromised persons; those with cystic fibrosis, and those susceptible adults exposed to a case of varicella.[36] Outbreaks of varicella in immigrant populations have been reported in developed countries and for reasons that remain unclear, immigrant adults are disproportionately

[36] National Advisory Committee on Immunization. *Canadian Immunization Guide 2006*. 7th edition . 2006.

susceptible to the infection.[37;38]A cost-effectiveness study was conducted to identify the best vaccination strategy for adult immigrants and refugees arriving in industrialized countries with the results highlighting the importance of screening adult immigrants and refugees.[39]

Another study conducted in Canada to determine the susceptibility of newly arrived immigrants and refugees to measles, mumps and rubella showed that 36% of the immigrant populations were not immune to at least one of the three diseases. The study demonstrated in a multivariable analysis adjusted for demographic and socioeconomic covariates, that immigrant women are more susceptible to measles (odds ratio, 2.1 [CI,1.2 to 3.8]) and rubella (odds ratio, 1.7 [CI, 1.2 to 2.6]) but not to mumps (odds ratio, 1.1 [CI, 0.8 to 1.5]) when compared to immigrant men.[40]

The medical examinations which are required by Canadian immigration policy are urinalysis, a serological test for syphilis, an HIV test, a chest X-Ray and serum creatinine if the applicant suffers with hypertension.[41] However, there are no requirements for a vaccine-record and no policy is in place to specify immunization before arriving to Canada or, in fact, *how* to be immunized once on Canadian soil.

Inequalities related to Aboriginal identity were demonstrated in the 2009 UNICEF report: First Nation[42] children under one year of age are 80 times more likely to have chickenpox compared to non-Aboriginal children.[43] They are also more likely to have a higher incidence of vaccine-preventable diseases, in particular those living on reserves.[44] A study focusing on the mothers' perception of childhood immunizations in First Nation communities of the Sioux Lookout Zone in Northwestern Ontario identified several key factors that negatively influence immunization uptake: knowledge barriers; the influence of others; vaccine barriers; and missed opportunities. Mothers claimed that they had limited knowledge of preventable diseases and how vaccines can indeed act as prevention. In addition, they reported negative side affects attributed to the vaccine related by others, such as fever, pain and swelling. Another barrier to immunization uptake was illness of the children at the time of immunization, even if illness was relatively minor[45] (tables 2 and 3 respectfully).

Yet another example of the vulnerability of specific groups to infection by preventable diseases is the H1N1 influenza pandemic of 2009. The effect of H1N1 in socially disadvantaged populations very much demonstrated

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[37] Centers for Disease Control and Prevention -CDC. *Varicella outbreaks among Mexican adults-Alabama* . MMWR Morb Mortal Wkly Rep ; Aug 18;49(32):735-6. 2000.

[38] Kjersem H, Jepsen S. *Varicella among immigrants from the tropics, a health problem*. Scand J Soc Med. 1990

[39] Merrett P, Schwartzman K, Rivest P, Greenaway C. *Strategies to Prevent Varicella among Newly Arrived Adult Immigrants and Refugees: A Cost-Effectiveness Analysis. Clinical Infectious Diseases*. 44: 1040-1048. 2007.

[40] Greenaway C, Dongier P, Boivin JF, Tapiero B, Miller M, Schwartzman K. *Susceptibility to Measles, Mumps, and Rubella in Newly Arrived Adult Immigrants and Refugees*. Annals of Internal Medicine 146: 20-24. 2007.

[41] Canada.Citizenship and Immigration. *Designated Medical Practitioner Handbook*. Available at: http://www.cic.gc.ca/english/pdf/pub/dmp-handbook.pdf. Accessed on: April 30. 2011.

[42] *Refers to the Indian peoples in Canada, both Status and non-Status." Terminology. Aboriginal Affairs and Northern Development Canada Aboriginal Affairs and Northern Development Canada.* Available at: http://www.ainc-inac.gc.ca/ap/tln-eng.asp. Accessed on Sep 01, 2011.

[43] MacMillan H.L., MacMillan A.B, Offord D.R., Dingle J.L. *Aboriginal health*'. Canadian Medical Association. CMAJ. 2009.

[44] Tarrant M, Greory D. *Mothers' Perceptions of Childhood Immunizations in First Nations Communities of the Sioux Lookout Zone*. Canadian Journal of Public Health 92: 42-45. 2001.

[45] Ibid.,38

how disease can disproportionately affect a population:[46] Globally, more than 10,000 people have died from H1N1 with more than 400 in Canada.[47;48]According to the 2010 Canadian Community Health Survey (CCHS), immigrants were less likely to have been vaccinated compared to non-immigrants: 38% versus 42%. The survey covered household populations aged from 12 upwards in all Canadian provinces, excluding members of the Canadian Forces; residents of Indian reserves; institutions; certain remote areas, and civilian residents of Canadian military bases.[49]

In June 2009, an outbreak of H1N1 in a northern First Nation community in Manitoba was documented by the Public Health Agency of Canada. In spite of 8% of the population of Manitoba being First Nation peoples, 17% of the H1N1 cases that required hospitalization in the province belonged to the First Nation demographic.[50]Overall in Canada, 3% of the population is Aboriginal, which accounted for 11% of the H1N1 cases requiring hospitalization. Statistically, Aboriginal people are more susceptible to being exposed to poverty; environmental contamination; poor health status; a high incidence of hepatitis B and C,[51]and inadequate access to healthy food.[52] This vulnerability has also been reported in other countries. In 1918, the mortality rate in Aboriginal communities across North America was significantly higher compared to non-Aboriginal peoples (9% to 3%).[53] In Australia, 2.5% of the population constitutes Aboriginal and Torres Strait Islanders, though they accounted for 9.7% of patients hospitalized with H1N1 in 2009.[54]

Disparities in Human Papilloma Virus (HPV) related diseases are an additional example of inequity in preventable diseases worldwide.[55] HPV is considered the most preventable sexually transmitted infection known.[56] The global burden of cervical cancer is approximately 500,000 new cases each year and around 274,000 deaths.[57]It is further estimated that 75% of all sexually active women will have at least one HPV infection in their life time.[58]

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[46] Silva DS, Nie JX, Rossiter K, Sahni S, Ross EG. *Upshur on behalf of the Canadian Program of Research on Ethics in a Pandemic Contextualizing Ethics, Ventilators, H1N1 and marginalized Populations*. Healthcare Quarterly 13: 32-36. 2010

[47] Gilmour H, Hofmann N. *H1N1 vaccination*. *Statistics Canada Health Report 21. 2010.*

[48] Clarke SP. *What we have learned from H1N1 crisis?* CJNR Vol 42 No 1, 3 -6. 2010.

[49] Gilmour H, Hofmann N. *H1N1 vaccination. Statistics Canada Health Report 2.* 2010

[50] Silva DS, Nie JX, Rossiter K, Sahni S, Ross EG, *Upshur on behalf of the Canadian Program of Research on Ethics in a Pandemic Contextualizing Ethics, Ventilators, H1N1 and marginalized Populations*. Healthcare Quarterly 13: 32-36. 2010.

[51] Public Health Agency of Canada. *2009-10 Departmental Performance Report*. Canada. 2011.

[52] Gracey M, King M*. Indigenous Health Part 1: determinants and disease patterns*. Lancet 374: 65-75. 2009.

[53] Johnson N, Mueller J. *Updating the accounts: Global mortality of the 1918-1920 "Spanish" influenza pandemic*. B. Hist. Med 76: 105-115. 2002.

[54] ANZIC Influenza Investigators. *Critical care services and 2009 H1N1 influenza in Australia and New Zealand*. New Engl. J Med 361: 1925-1934. 2009.

[55] Parikh S, Brennan P, Offetta P. *Meta-analysis of social inequality and the risk of cervical cancer.* Int. J Cancer Jul 10;105(5):687-91. 2003.

[56] National Advisory Committee on Immunization -NACI. *"An Advisory Committee Statement (ACS): Statement on human papillomavirus vaccine" . Canada Communicable Disease Report 1 at 4: Estimated prevalence and incidence may vary because HPV "is not a nationally notifiable disease in Canada and, to date, no population-based studies have been published. "* 2007

[57] Parkin D, Bray F. *Chapter 2: The burden of HPV-related cancers* . Vaccine 21: S11-S25. 2006

[58] HPVINFO. *Incidence and Prevalence in Canada*. Available at: http://www.hpvinfo.ca/health-care-professionals/what-is-hpv/incidence-and-prevalence-of-hpv-in-canada/ . Accessed on March, 19. 2011.

A meta-analysis study revealed that what we commonly call "social class" is a factor associated with invasive cervical cancer, appearing to be higher in North America and low/middle income countries than in Europe. Women from low social class have an increased risk of approximately 100% to develop invasive cervical cancer when compared to those of higher social class.[59] In Canada, the highest rates of cervical cancer are among women belonging to socially disadvantaged groups such as those of lower income; low literacy; recent immigrant and aboriginal ethnicity (this underlying the importance of education, awareness and access).[60] Each year, these women represent an unequal burden of the 1,300 cases of cervical cancer.[61]There are nearly twice as many cases of HPV in Nunavut compared to other Canadian provinces and territories[62] and studies have shown that Canadian Aboriginal women are three times more likely to develop cervical cancer than non-Aboriginal women.[63]

Prevention of the HPV infection encompasses three strategies: sexual behavior modification, screening and vaccination.[64].Sexual behavior modification is a strategy that involves upstream determinants of this sexually transmitted disease. On the other hand, screening (Papanicolaou) and immunization programs focus on the biomedical causes of HPV infection.[65] The Papanicolaou smear pap test has significantly reduced the incidence and mortality of cervical cancer. In spite of the success of the strategy, in 2006 approximately 1,350 new cases of cervical cancer and 390 cervical cancer-related deaths were reported. Sixty percent of those diagnosed women had not been screened or had received inadequate treatment. The infection mostly affects women from socially and diverse disadvantaged groups that face barriers to screening or treatment.[66]

The vaccine to prevent HPV meet Canadian approval in 2006, and was consequently recommended for girls aged 9–13 years in 2007 by the National Advisory Committee on Immunization (NACI). The vaccine protects against two high risk types of HPV (16 and 18) responsible for approximately 70% of cervical cancers and two low-risk types (6 and 11), responsible for 90% of anogenital warts.[67] In 2007, the Federal government allocated $300

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[59] Parikh S, Brennan P, Offetta P. *Meta-analysis of social inequality and the risk of cervical cancer.* Int. J Cancer Jul 10;105(5):687-91. 2003

[60] Canadian Cancer Society et al. *Canadian Cancer Statistics 2007* . (Toronto: Canadian Cancer Society/National Cancer Institute of Canada, 2007) at 17 . 2007.

[61] Canadian Cancer Society. *Canadian Cancer Statistics 2010: Table 1a: Actual Data for New Cases of Cancer, 2006*. Available at http://www.cancer.ca/Canadawide/About%20cancer/Cancer%20statistics/~/media/CCS/Canada%20wide/Files%20List/English%20files%20heading/PDF%20-%20Policy%20-%20Canadian%20Cancer%20Statistics%20-%20English/Canadian%20Cancer%20Statistics%202010%20-%20English.ashx . Accessed on March 02, 2010.

[62] Healey SM, Aronson KJ, Mao Y, Mery LS, Ferenczy A eal. *Oncogenic human papillomavirus infection and cervical lesions in aboriginal women of Nunavut, Canada*. Sex. Transm. Dis 2001;28:694-700 . 2011.

[63] Health Canada. *Screening for Cervical Cancer*. Available at: http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/diseases-maladies/cervical-uterus-eng.php Accessed on March 20. 2011.

[64] Erdman JN. *Health Equity, HPV and the Cervical Cancer Vaccine*. Health Law Journal - Special Edition 2008 127-144. 2008

[65] Ibid.,63

[66] National Advisory Committee on Immunization -NACI. *"An Advisory Committee Statement (ACS): Statement on human papillomavirus vaccine" . Canada Communicable Disease Report 1 at 4: Estimated prevalence and incidence may vary because HPV "is not a nationally notifiable disease in Canada and, to date, no population-based studies have been published ."* 2007.

[67] Macdonald L, Deeks S, Doyle C. *Response to The HPV Vaccination Campaign: A Project of Moral Regulation in an Era of Biopolitics*. Canadian Journal of Sociology/Cahiers Canadians de sociologies 35(4) 629-631. 2010.

million to support a national HPV vaccination in all jurisdictions of Canada.[68] Although all the provinces and one territory do provide HPV vaccination, the strategies of access and implementation vary across the jurisdictions. The HPV vaccine is provided free to all females in at least one of the educational clusters (grades 4 to 9) through school programs. Some provinces only cover one age group of females, while other provinces cover a second age group including all females under 18 years old. Quebec has the most inclusive program, providing vaccination for girls in grades 4 and 9 – girls up to the age of 18 can also be vaccinated upon request. For those under 14, a consent form must be signed by the parent or guardian.[69;70]The most restrictive programs are in Nova Scotia, Prince Edward Island, Ontario and Manitoba where the HPV vaccination is restricted to one school grade. Additionally, the strategies for immunization programs seem to be unassociated with the incidence of cervical cancer in each jurisdiction since many jurisdictions have a high incidence and low vaccine coverage.[71]

In addition to the preventive benefits of the HPV vaccine in women, the risk of anogenital warts and pre-cancerous lesions in men is said to be effectively reduced by 90%. Health Canada approved the HPV vaccine for use in men in 2010, yet this move was not publicly funded. Men who are interested in being vaccinated are advised to purchase the vaccine through prescription from a doctor, pharmacist or travel clinic.[72] An international comparison between member countries of the Organization for Economic Co-operation and Development (OECD) shows that Canada has the lowest coverage for the third dose of diphtheria toxoid, tetanus toxoid and pertussis vaccine (DTP3) (table 3). Likewise, poor coverage for the almost standard third dose of polio vaccine (POL3) and measles' immunization means that Canada's overall ranking among OECD nations is dismal: 11th out of 12 in the ranking for DTP3 vaccine; 10th out of 11 for POL3 and 6th out of 13 for measles.

Indeed, although polio has been eliminated from the Americas and the number of polio cases worldwide has been drastically reduced, the risk remains for imported cases of polio from countries where the virus still circulates. The Pan-American Health Organization (PAHO) recommends maintaining 95% vaccine coverage. Canada, meanwhile, has 80% vaccine coverage for POL3[73] (table 4[74]).

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[68] Colucci R, Hryniuk W, Savage C. *HPV Vaccination Programs in Canada. Are we hitting the mark? Report Card on Cancer in Canada 2008*. Available at http://www.canceradvocacy.ca/reportcard/2008/HPV%20Vaccination%20Programs%20in%20Canada.pdf Accessed on March 23. 2008.

[69] Ibid., 67

[70] Erdman JN. *Health Equity, HPV and the Cervical Cancer Vaccine*. Health Law Journal - Special Edition 2008 127-144. 2008.

[71] Ibid., 67

[72] British Columbia.Immunize BC. *Human Papilloma Virus Vaccine and Men*. Available at: http://immunizebc.ca/diseases-vaccinations/hpv/men Accessed on March 23. 2010.

[73] Pan American Health Organization- PAHO. *XIX Meeting of the PAHO. Technical Advisory Group on Vaccine Preventable Diseases.Conclusions and Recommendations - Final Report*. Foz do Iguacu- Brazil. Available at: http://www.paho.org/english/hvp/hvi/tag14_conclusions.pdf Accessed on April 30 . 2000.

[74] Estimates from WHO/UNICEF: Source: WHO/ UNICEF/ WORLD and World Bank. Available at: http://www.app.collinsindicate.com/worldbankatlas-global/en?cid=EXT_WBPubsAlerts_P_EXT and http://apps.who.int/immunization_monitoring/en/globalsummary/countryprofileresult.cfm for measles.

III. Immunization Strategy

Erickson's Framework emphasizes the importance and indispensability of having a guideline for vaccine use. Although Canada boasts a National Immunization Strategy, published in 2003, and a National Advisory Committee on Immunization (NACI), all jurisdictions have varying, autonomous strategies and schedules for immunization.[75] The NACI recommends, for example, Hepatitis B vaccine for infants (three doses) or pre-adolescents (two or three doses). In the province of Alberta, hepatitis B administers three doses in grade 5 while in Ontario two doses are administrated in grade 7, and in Quebec two doses of hepatitis A and B are administrated in grade 4. And while some provinces have a catch-up program for the HPV vaccine in teenage girls, others do not. The differences between doses and the age of administration, however, repeat in all provinces and territories.[76]

Internationally, many countries have advanced to develop harmonized and well synchronized immunization programs. The United States has a harmonized immunization schedule for children 0 to 6 years, 7 to 18 years, as well as a catch-up and adult immunization schedule.[77] Australia has an integrated and harmonized national system across three levels of government. It has also a huge Aboriginal population living in remote areas and vaccine recommendations highlight the need to target Aboriginal people and other vulnerable populations if disease risk is to be reduced and wellbeing both developed and maintained.[78]

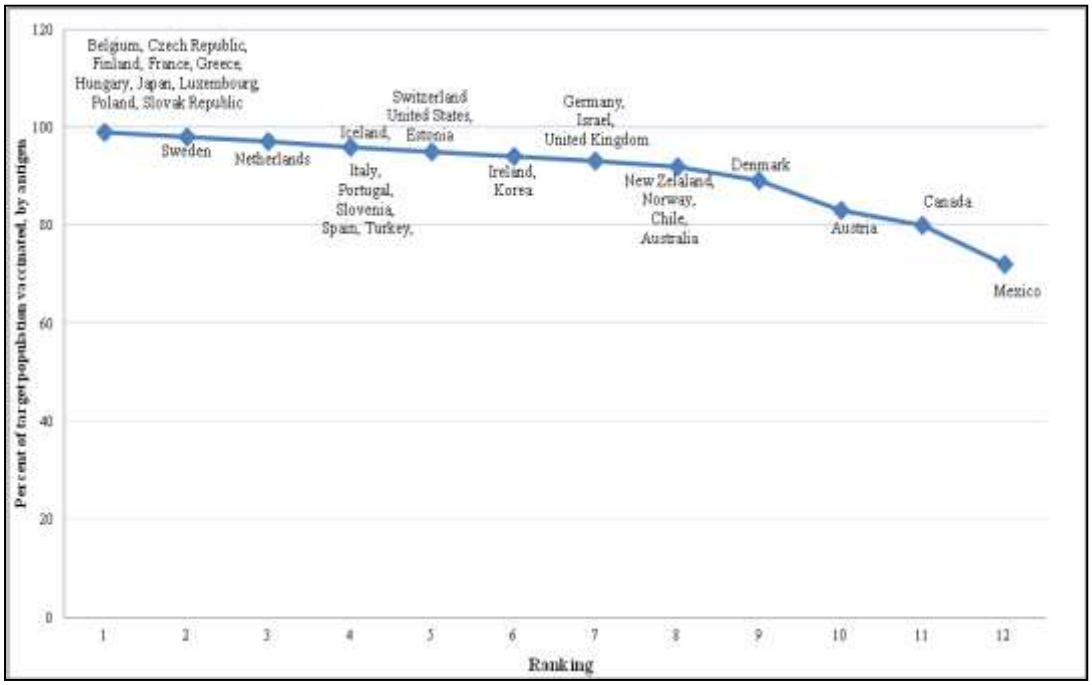

Table 4:

Percentage of target populations vaccinated for DPT3 in countries within the remit and activity of the OECD (Organization for Economic Cooperation and Development)

[75] F/P/T Advisory Committee on Population Health and Health Security -ACPHHS. *National Immunization Strategy. Final Report.* 2003

[76] MacDonald N, Bortolussi R, Canadian Paediatric Society. *A harmonized immunization schedule for Canada: A call to action*. Paediatr. Child Health 16: 29-31. 2011.

[77] Centers for Disease Control and Prevention. *CDC Schedules.* Available at: http://www.immunize.org/cdc/schedules Accessed on April, 20 . 2011.

[78] Ruff T, Taylor K, Lester R, Nolan R. *Australia's Contribution to Global Immunization* . The University of Melbourne. 2011

The GFIMS and Erickson Frameworks highlight the role of an immunization strategy to ensure program efficiency. Programs should have a specific strategy in terms of reduction of morbidity and mortality as well as an objective in terms of coverage for target groups. Improved coverage monitoring of vaccines, other linked health interventions, the use of information at all government levels as well as increased human resources are all essential factors to an immunization strategy and its success.[79;80]

The WHO emphasizes use surveillance and data monitoring to promote improved access. Documenting the short and long term effects of vaccination strategy on disease burden as well as monitoring program effectiveness are two of the main purposes of a surveillance system.[81] The WHO provides online information related to planning and management, system performance and surveillance among other indicators for each country.[82] Canada, however, does not provide information related to work-plan costing for immunization strategies. Additionally there is a visible lack of information regarding surveillance and system performance.[83] Although there is no national level information available, some provinces have documented their experience. In Quebec, results of surveys, consultations and discussions with different stakeholders are used to refine decision making processes before implementing a new program, tailored education and promotion programs.[84] The province of Alberta, moreover, developed a strategic plan for 2007-2017 in order to address barriers through an evidence-based strategy.[85] The strategy includes collaboration with other ministries and the federal First Nations and Inuit Health Branch. It recognizes that low socio-economic status is the major barrier for immunization in adults and children.[86] British Columbia, also, had developed a strategic framework that underlines the need to identify barriers and improve access to immunization services. This involved consultation with British Columbia health and correction authorities, family physicians, as well as Citizenship and Immigration Canada, BC Corrections, First Nations and Inuit Health (Health Canada).[87]

Overall, in the case of Canada, there is a visible and felt need to further develop immunization strategies and programs in order to meet FPT goals, and the program objectives which aim to reduce morbidity and mortality, increase coverage for different target groups, and achieve harmonized program delivery.

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[79] Erickson LJ, De Wals P, Farand L. *An analytical framework for immunization programs in Canada*. Vaccine 23: 2470-2476. doi: DOI: 10.1016/j.vaccine.2004.10.029. 2005.

[80] World Health Organization (WHO). *Global framework for immunization monitoring and surveillance* . Department of Immunization, Vaccines and Biologicals. Switzerland 1-56. 2007.

[81] World Health Organization -WHO. *Global framework for immunization monitoring and surveillance* . Department of Immunization, Vaccines and Biologicals. Switzerland 1-56. 2007.

[82] World Health Organization -WHO . *Immunization Profile* - Canada. Available at: http://apps.who.int/immunization_monitoring/en/globalsummary/countryprofileselect.cfm Accessed on April, 27 . 2011.

[83] Ibid., 81

[84] De Wals P. *Optimizing the Acceptability, Effectiveness and Costs of Immunization Programs: The Quebec Experience.* Expert Rev Vaccines 10: 55-62. 2011.

[85] Alberta Health and Wellness Communications. *Alberta Immunization Strategy 2007-2017.* Available at: http://www.health.alberta.ca/documents/Immunization-Strategy-07.pdf Accessed on April, 27. 2011.

[86] Ibid., 84

[87] British Columbia. Ministry of Health. *Immunize BC: A strategic framework for immunization in BC*. Available at: http://www.health.gov.bc.ca/library/publications/year/2007/immunizebc.pdf Accessed on April, 27 . 2011.

Evaluation of immunization programs in Canada

Safety of vaccines and population effectiveness are the most important elements to be evaluated in an immunization program or strategy.[88] Regular monitoring regarding the coverage, access to vaccines and safety are crucial to program evaluation through an equity lens.[89] Furthermore, information systems play an important role in monitoring the burden of diseases, adverse events associated with vaccines and respective coverage.[90]

In Canada, FPT governments share responsibility in delivering immunization programs. Each jurisdiction is responsible for planning, funding and delivering immunization program packages. The federal government holds responsibility for monitoring national coverage rates, adverse events following immunization and the incidence of vaccine preventable diseases.[91]The National Advisory Committee on Immunization (NACI) publishes recommendations for all vaccines that are approved for use in Canada which are included in the Canadian Immunization Guide.[92] The recommendations are based on disease risk; vaccine efficacy; safety, and targeting healthcare providers. Some aspects such as feasibility, acceptability and cost are, however, not considered.[93]

The Quebec immunization program is considered effective. It targets 15 diseases and only 20 injections are offered up to 15 years of age. Quebec is one of the few provinces that reserves a fraction of its budget for program evaluation and monitoring.[94]The evaluation process is mainly based on a complete report of available vaccines, potential vaccine strategies, and schedules approved by the Quebec Immunization Committee. Existing evidence is utilized, and sometimes experts are consulted, as well as surveys conducted to evaluate disease burden when and where necessary. The committee estimates cost-effectiveness ratios for several strategies and identifies barriers for program implementation. In addition, the recommendations of the NACI and Advisory Committee on Immunization Practices are a constant point of reference and guideline.[95]Paralleling the example of Quebec is that of British Columbia which developed an assessment program for delivery effectiveness, including information on coverage, disease epidemiology and vaccine safety. The BC framework also aims to assess if its immunization program works within the guidelines established in the Canadian Immunization Guide[96].

Accessing coverage data allows for the identification of social, geographic, cultural and ethnic barriers to

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[88] Erickson LJ, De Wals P, Farand L. *An analytical framework for immunization programs in Canada.* Vaccine 23: 2470-2476. doi: DOI: 10.1016/j.vaccine.2004.10.029. 2005.

[89] Delamonica E, Minujin A, Gulaid J. *Monitoring equity in immunization coverage.* Bulletin of the World Health Organization 83: 384-391. 2005.

[90] Ibid., 87

[91] Public Health Agency of Canada. *Interim evaluation of the National Immunization Strategy - Abril 2003 to June 2007*. Original submitted September 2007 Approved July . 2008.

[92] Public Health Agency of Canada. *Canadian Immunization Guide -7th Edition*. Public Health Agency of Canada, Ottawa, ON, Canada. 2006

[93] De Wals P. *Optimizing the Acceptability, Effectiveness and Costs of Immunization Programs: The Quebec Experience.* Expert Rev Vaccines 10: 55-62. 2011.

[94] Ibid., 92

[95] Ibid., 92

[96] British Columbia.Ministry of Health. *Immunize BC: A strategic framework for immunization in BC.* Available at http://www.health.gov.bc.ca/library/publications/year/2007/immunizebc.pdf Accessed on April, 27 . 2011.

vaccination.[97]The evaluation of Aboriginal, immigrant and refugee coverage rates serve to implement strategies to improve vaccine uptake in remote areas and in territories where the coverage is lower than the national average.

Little information, however, is available regarding how provinces and territories evaluate their immunization programs, and a risk rather than a virtue to jurisdictional autonomy is presented. The monitoring of indicators that focus on health equity should be disaggregated and accessible for monitoring over time at the geographic level. A set of indicators is needed to show the links between health and main determinants.[98] An equity analysis can assess the interaction between inequities and evaluate the gaps and dissymmetry in immunization programs over time. These aspects are fundamental to tailoring strategies to specific geographic areas, regions and populations where uptake is low, barriers are substantial and disease is prevalent.[99]Further evidence indicates that appropriately targeted incentives can reduce inequalities in health outcomes.[100]

IV. Research questions regarding Immunization

Research is an important tool for tackling the negative impact of health interventions, the programs and policies on equity as well as the disparity between population groups. Beyond the description of health inequalities and measuring immunization disparities, equity-oriented research has the potential to identify which interventions, programs or practices reduce inequities.[101] According to the Public Health Agency of Canada (PHAC) the immunization research community in Canada is small, focusing on the development and pre-licensure testing of new vaccines, with funding mostly from private industry or government grants.[102]There is a lack of research not only regarding program implementation and monitoring, but also regarding models which predict the effect and impact of new vaccines, of cost-effectiveness as well as the evaluation of the specialization needs of professionals. Furthermore, in order to protect health and decrease existing inequalities, it is crucial to prioritize immunization research in Canada as well as to identify and document the needs of immunization research,[103] including research on sociological and demand issues at the community level.

There is a lack of information about inequalities in immunization programs. Priority questions for immunization research should be based upon the identification of the most relevant gaps in current knowledge

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[97] World Health Organization -WHO. *Global framework for immunization monitoring and surveillance* . Department of Immunization, Vaccines and Biologicals Switzerland 1-56. 2007.

[98] Braveman P. *Monitoring equity in health: a policy-oriented approach in low- and middle-income countries*. WHO/CHS/HSS/981, Equity Initiative Paper No 3 . 1998.

[99] Wirth M, Delamonica E, Sacks E, Balk D, Storeygard A, Minujin A. *Monitoring Health Equity in the MDGs: A Practical Guide.* Available at: http://www.ciesin.columbia.edu/repository/povmap/analysis/Health_equity_Guidelines.pdf 2006.

[100] Szmukler G. *Financial incentives for patients in the treatment of 11 psychosis.* J Med Ethics 35: 224-228. 2009.

[101] Petticrew M, Whitehead M, Macintyre SJ, Graham H, Egan M. *Evidence for public health policy on inequalities: 1: The reality according to policymakers*. J Epidemiol. Community Health 58: 811-816. 2004.

[102] British Columbia.Ministry of Health . *Immunize BC: A strategic framework for immunization in BC.* Available at: http://www.healthgovbcca/library/publications/year/2007/immunize.bc.pdf Accessed on April, 27. 2011.

[103] Public Health Agency of Canada. *Immunization research*. Available at: http://www.phac-aspc.gc.ca/im/rg-rs/index-eng.php Accessed in April, 04. 2011

regarding access to vaccines and should have a framework with an equity lens to guide the design and analysis of research. Many questions need to be answered in order to enhance health equity: are the vaccines available for those who are in need? Is there a difference in incidence of vaccine preventable disease between non-Aboriginal and Aboriginal Canadians? Is there a difference in immunization levels between girls and boys? Have immigrant and refugee children the same access to vaccines as Canadian children? How can immunization evaluation be incorporated most effectively into the design of immunization programs? Why is the incidence of chickenpox higher in females compared to males in Northwest Territories? What are the reasons for Canada having a lower coverage rate when compared to other countries constituting the OECD?

Research can provide evidence and influence policymakers as well as inform the production or reduction of health inequalities in immunization strategies.[104] Equity is thus an important component in the formulation of research question and strategy. An equity lens adopted in research can identify vulnerable populations that should be targeted by a program or given strategy, and indeed pinpoint the weaknesses and virtues of such programs and strategies.[105;106].

V. Conclusion

Achieving equity and fostering human rights in immunization programs is the *sine qua non* condition for enhancing equity in health care. Immunization is a right that should be respected and protected by government to ensure that vaccines will be accessible to all populations in need. It must be accomplished independently of geographical place, gender, socioeconomic condition, ethnicity, education level and religion, thereby enabling diverse groups to have equal access.

Universal access to vaccination in Canada will remain a distant almost unachievable reality if human rights remain unaddressed. Morbidity and mortality due to vaccine preventable diseases have been reported specifically in Aboriginal Canadians, immigrants and refugees. Disparities in influenza, H1N1 and varicella have also been reported. These conditions signal inequalities and disproportions. An increase in health care costs results in the decline of population health as well as impacting on other areas of social reality.

Reducing barriers to improve equity in immunization coverage-rates requires a commitment to enhancing the opportunity for all people to be vaccinated. It requires that health professionals must provide appropriate care in a culturally sensitive way and that populations be informed to increase demand for these services. It requires planning and delivering programs based on an awareness of such differences.

It is important to achieve equity in preventing diseases and in immunization strategy, evaluation and research. The implementation and monitoring of strategies should themselves be evaluated to further ensure that goals will be achieved and that equity is included as a key criterion. The development of evaluation tools based on equity to monitor coverage rates, safety, and access to vaccines, is essential for decision making at the national and

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[104] Petticrew M, Whitehead M, Macintyre SJ, Graham H, Egan M. *Evidence for public health policy on inequalities: 1: The reality according to policymakers.* J Epidemiol. Community Health 58: 811-816. 2004.

[105] Signal L. *Tacking inequalities through health promotion action*. Health promotion forum of New Zeeland: Newsletter 56:10. 2002.

[106] Gardner B. *Health Equity Impact Assessment: Potential for LHINs*. Presented October 19th, 2009. Available at: http://resources.cpha.ca/CPHA/Conf/Data/A10-908e.pdf Accessed on April 05. 2011.

provincial/territorial levels. Furthermore, research using an equity lens can furnish information regarding interventions that can increase vaccination coverage, evaluate program impact and identify barriers to access of vaccines for different populations in order to enhance health equity. These elements are key to eliminating immunization inequalities and to ensuring that all Canadians will have protection against vaccine-preventable diseases independently of their geographic location and/or social, economic and ethnic identity.

The improvement of immunization research capacity in Canada must establish a strong partnership between the research community, industry and funding agencies, such as the Canadian Association for Immunization Research and Evaluation (CAIRE), the Canadian Institutes of Health Research (CIHR), Canadian Population Health Institute (CPHI), and the Canadian Network for Vaccines and Immunotherapeutics (CANVAC).[107]

Research designs should monitor the indicators of vulnerable populations that will be targeted. The data on incidence of vaccine-preventable disease must be disaggregated by gender, ethnicity, socioeconomic status, language, age, Aboriginal status, disability and immigration status by the respective provinces and territories. This can constitute an equity-sensitive framework for monitoring Canadian immunization programs.

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