The economic burden of immigrants with HIV: When to say no?*

Principal investigators:
Peter Coyte, PhD, University of Toronto
Michael Battista, Barrister and Solicitor, Jordan Battista LLP

Co-investigators:
Ahmed Bayoumi, MD, University of Toronto
Alan Li, MD, Regent Park Community Health Centre
Dave Holmes, RN, PhD, University of Ottawa
Richard Elliott, Canadian HIV/AIDS Legal Network
Sandra Chu, Canadian HIV/AIDS Legal Network
Francisco Rico-Martinez, FCJ Refugee Centre

June 17, 2009

For further information:
Dr. Peter C. Coyte, Professor of Health Economics, CHSRF/CIHR Health Services Chair, Department of Health Policy, Management and Evaluation (HPME), Faculty of Medicine, 155 College Street 4th Floor, University of Toronto, Toronto, Ontario M5T 3M6.
Telephone (416) 978-8369; Fax (416) 978-7350; Email: peter.coyte@utoronto.ca

Word Count: 8,952 words

ABSTRACT

The Canadian *Immigration and Refugee Protection Act* (IRPA) of 2001 outlines the conditions under which individuals may be granted or denied admission to Canada. Specifically, Section 38(1) of the IRPA stipulates that applications for residence will be rejected if an applicant's health is expected to generate excessive demand on Canadian health or social services. The purpose of this research synthesis and knowledge dissemination paper is to derive a compelling statistical definition of excessive demand and to apply this threshold to persons with HIV who are seeking admission to Canada.

This paper represents a sixfold exercise in positive analysis. First, we review the application of Canadian immigration law and jurisprudence as it pertains to persons with HIV in the context of international restrictions on international mobility. Second, we review and assess the current threshold used to determine excessive demand on Canadian health or social services. Third, we synthesis the clinical, epidemiological and economics literatures concerning the expected economic burden placed on health or social services by persons with HIV. Fourth, we derive estimates of the economic burden associated with a new immigrant with HIV over a 5-year, 10-year, and lifetime horizon after stratifying for their underlying state of health, age and sex at the time of admission. Fifth, estimates of the economic burden are compared to the excessive demand thresholds in order to yield evidence-informed criteria for assessing medical inadmissibility. Finally, we assess the economic contributions of new immigrants in order to offer a more complete picture of the costs and benefits of immigrants.

The paper offers four substantive findings. First, the 2007 cost threshold used by Citizenship and Immigration Canada in assessing whether an applicant is likely to pose "excessive" demand (C$4,867.40/year) is too low. A statistically more appropriate threshold is three-fold greater at C$14,581.43/year. Second, there is an inverse relationship between disease progression (measured by CD4 cell counts) and health care costs, with annual costs (in 2007 C$) increasing from under C$8,000 for CD4 > 500 cells/mm^3 to over C$35,000 for CD4 < 100 cells/mm^3. Third, application of these cost estimates to the revised cost threshold for inadmissibility demonstrates classification depends on individual characteristics, including age, sex and health status, as well as on the time horizon over which each applicant's projected demand is assessed. "Excessive" demand is more likely to occur for applicants with low CD4 cell counts and a shorter time horizon for assessment (i.e., 5-years versus their lifetime). Women and younger applicants are slightly more likely to be deemed inadmissible than men and older immigration applicants. Finally, estimates of the economic contributions of new immigrants to the public treasury through taxes paid on labour market earnings are substantial, and often exceed estimates of their health care costs. These economic contributions are dependent on the age, sex, and region of origin of prospective immigrants as well as on other conventional determinants. Exclusive focus on the health care costs of prospective immigrants without consideration of the economic contributions (albeit measured in tax revenue terms) yields an incomplete evaluation of immigrants. Citizenship and Immigration Canada should develop more evidence-informed policy and admit to Canada some applicants otherwise denied admission based on current policy.

Word Count: 524 words

1.0   Introduction

In 2005, the *Canada Communicable Disease Report* estimated that 58,000 people in Canada were living with HIV.[a] During that year it was estimated that between 2,300 and 4,600 new cases of HIV emerged, with the incidence rate relatively uniform since 2002.[b] The number of people worldwide living with HIV is approximately 33 million and increasing.[c] As the worldwide HIV population expands, there is expected to be an increase in the number of HIV-positive immigrants applying for entry to Canada,[d] and accordingly, it is important to critically review federal immigration policies that affect such applicants.

The Canadian *Immigration and Refugee Protection Act* (IRPA)*,* states in Section 38(1) that:

A foreign national is inadmissible on health grounds if their health condition
      (a) is likely to be a danger to public health;
      (b) is likely to be a danger to public safety; or
      (c) might reasonably be expected to cause excessive demand on health or
      social services.

While IRPA does not specifically mention HIV or related illnesses, Canada generally excludes people infected with HIV if they can be expected to place an "excessive demand" on publicly funded health or social services. It is important to note that entry

---

[a] D. Boulos, P. Yan, D. Schanzer, R. S. Remis, and C.P. Archibald. Canada Communicable Disease Report 2006. Public Health Agency of Canada. Ottawa: Government of Canada, 2006. 165-176.

[b] "Estimates of the Number of People Living with HIV in Canada, 2005." Public Health Agency of Canada. 2005. Government of Canada. 14 Apr. 2008 <www.phac-aspc.gc.ca/media/nr-rp/2006/20060731-hiv-vih-eng.php>.

[c] World Health Organization. "Worldwide HIV Statistics." Avert. 2007. AVERT.Org. 14 Apr. 2008 <http://www.avert.org/worldstats.htm>.

[d] "Number of HIV Positive Immigrants to Canada Triples in One Year, Immigration Department Says," The Henry Kaiser Family Foundation. 14 May 2004, citing M Friscolanti, "Number of HIV-positive immigrants to Canada triples in one year, Immigration Department says," *National Post*, 13 May 2004 at A1. Accessible at www.kaisernetwork.org/daily_reports/print_report.cfm?DR_ID=23718&dr_cat=1

restrictions to Canada based on HIV status do not apply to short-term visitors staying for less than six months.[e] This is indicative of the underlying assumption that HIV is not highly contagious and therefore is not reason in itself for a person to be denied entry to Canada. The extent to which an immigrant is likely to place an excessive burden on the health care system is indicated as the primary concern and is evaluated based on whether an applicant's projected annual health care costs would exceed the annual health care costs of an average Canadian,[f] which in 2007 was $4,867.40.[g] It is not specified what constitutes an 'average' Canadian, given the large within-group variation that exists among the general population, but it is likely that an HIV-positive person receiving antiretroviral treatment will incur expenses that exceed that threshold. While the law has resulted in denial of admission due to "excessive burden" to only 3.4%[h] of all HIV-positive applicants between 2006 and 2007, the overwhelming majority (94.7%) of the remainder were exempt from this condition as they were admitted as spouses or legal dependents under family-class sponsorship or as officially recognized refugees. Consequently, 64.3% of those HIV-positive applicants who were at potential risk of denial of admission due to the potential "excessive burden" attributable to their HIV status were indeed denied admission between 2006 and 2007.[i]

---

[e] Recent Changes to Visitor Visa Process Affecting Entry Into Canada for People Living with HIV. XVI International AIDS Conference. Toronto: Canadian HIV Legal Network, 2005. 1-3.
[f] "Number of HIV Positive Immigrants to Canada Triples in One Year, Immigration Department Says," The Henry Kaiser Family Foundation. 14 May 2004, citing M Friscolanti, "Number of HIV-positive immigrants to Canada triples in one year, Immigration Department says," National Post, 13 May 2004 at A1. Accessible at http://www.kaisernetwork.org/daily_reports/print_report.cfm?DR_ID=23718&dr_cat=1.
[g] Canadian Institute for Health Information: National Health Expenditure Trends, 1975-2007. Canadian Institute for Health Information: Ottawa, 2007.
[h] Access to Information Request, Citizenship and Immigration Canada, May 12, 2008.
[i] Ibid.

The purpose of this paper is threefold: first, to review the application of Canadian immigration law and jurisprudence as it pertains to persons with HIV and to place this review within a broader international context of restrictions on international mobility; second, to derive a statistical definition of excessive demand and to apply that threshold to persons with HIV who are seeking admission to Canada; and third, to estimate the economic contributions of new immigrants associated with tax revenues on labour market earnings in order to obtain a more complete assessment of both the costs and benefits associated with immigration. In order to achieve this end, we review the application of Canadian immigration law in Section 2.0 as it pertains to persons with HIV. In Section 3.0, we review and assess the current threshold used to determine excessive demand on Canadian health or social services. Section 4.0 yields a synthesis of the clinical, epidemiological and economics literatures concerning the expected burden placed on health or social services by persons with HIV. In Section 5.0, we derive estimates of the 5-year, 10-year, and lifetime economic burden associated with a new immigrant with HIV after stratifying for their underlying state of health, age and sex at the time of admission. Section 6.0 affords a comparison between the thresholds derived to measure excessive demand with the expected economic burden that immigrants with HIV may place on Canadian health or social services in order to yield evidence-informed criteria for the determination of medical inadmissibility. Section 7.0 discusses the economic contributions of immigrants in terms of the tax revenues that flow from earned income. We end with a brief summary of our findings.

2.0   Canadian and International Experience with Medical Inadmissibility

While international standards do not prohibit the practice of screening prospective immigrants for communicable diseases prior to entry, the scope of restrictions on people with HIV is strictly constrained. According to the International Guidelines on HIV and Human Rights:

> The right to liberty of movement encompasses the rights of everyone lawfully within a territory of a State to liberty of movement within that State and the freedom to choose his/her residence, as well as the rights of nationals to enter and leave their own country….
>
> Where States prohibit people living with HIV from longer-term residency due to concerns about economic costs, States should not single out HIV, as opposed to comparable conditions, for such treatment and should establish that such costs would indeed be incurred in the case of the individual alien seeking residency.[j]

In the United Kingdom, Australia and the United States, it is common to deny admission to prospective immigrants with HIV. In the United Kingdom, denial of admission to HIV-positive immigration applicants has occurred on the basis that required treatments may be too expensive for the applicant to afford.[k] While a publicly funded National Health Service (NHS) allows citizens of the United Kingdom to seek health care treatment at minimal individual cost, the UK's immigration practice has been to stringently enforce its policy of medical inadmissibility to deter persons with HIV from engaging in 'treatment tourism'.[l]

---

[j] International Guidelines on HIV and Human Rights, 2006 Consolidated Version, Office of the United Nations High Commissioner for Human Rights and UNAIDS, paras, 126 and 128.
[k] "Countries and Their Entry Restrictions." AIDSmap Living with HIV. 2008. AIDSmap. 14 Apr. 2008 <http://www.aidsmap.com/en/docs/C92D5639-E779-44EC-B8F8-0CECCC23275A.asp>.
[l] Pembrey, Graham. "AIDS in the UK." Averting HIV. 9 May 2008. AVERT.org.   15   Apr.   2008 <http://www.avert.org/aidsuk.htm>.

In Australia, travelers wishing to stay temporarily in the country for short visits may do so but are required to sign a declaration of good health, or otherwise state the health problems with which they are currently living.[m] Based on the information provided, a person may be deemed inadmissible for even a temporary visit, although such cases are typically reserved for severe circumstances. In order to immigrate to Australia, each applicant must undergo HIV testing and if it is suspected that the cost of health care treatment will be excessive, or will subsequently deny Australian citizens access to limited health care resources, an applicant may be denied admission.[n]

In the United States, no person with HIV, in principle, may be admitted to the country as an immigrant.[o] Under exceptional circumstances a person may be admitted temporarily (30 days or less) to visit family, seek medical treatment or to conduct business.[p] While admission to the United States does not require one to undergo a medical examination, it is important to note that if a foreign national knowingly declares that he or she is HIV-negative and is found to have HIV in the United States after arrival, that person will be deported to his or her country of origin.[q]

Such strict international migration policies are not the global standard, however, as in both Denmark and Sweden there are few entry restrictions for HIV-positive persons.[r] Indeed, highly regulated international immigration policies may generate positive

---

[m] "Countries and Their Entry Restrictions." AIDSmap Living with HIV. 2008. AIDSmap. 14 Apr. 2008 <http://www.aidsmap.com/en/docs/C92D5639-E779-44EC-B8F8-0CECCC23275A.asp>.
[n] Ibid.
[o] Ibid.
[p] Ibid.
[q] "Countries and Their Entry Restrictions." AIDSmap Living with HIV. 2008. AIDSmap. 14 Apr. 2008 <http://www.aidsmap.com/en/docs/C92D5639-E779-44EC-B8F8-0CECCC23275A.asp>.
[r] Ibid.

externalities by serving to increase worldwide HIV surveillance. Nevertheless, many resource-rich countries are denying medical treatment to persons with HIV who are often from countries in which access to antiretroviral (ARV) treatment is not readily available.[s] Further, the incidences of deportation which have been noted in both the United States and the United Kingdom,[t] on the grounds that HIV-positive persons tend to place excessive demands on health care services, has been questioned on the basis of health as a human right, while the act of deportation itself has been deplored as 'immoral'[u] and 'unjustifiable'.[v]

The financial burden of HIV on the general population is evaluated at the level of the individual and is typically based on a metric involving the calculation of hospitalization costs, ARV and drug treatment expenses as well as the use of other health care services.[w] In a 2001 study conducted by Chen et al., concerning the per capita costs of HIV based on medication and hospitalization expenditures in the United States, it was found that disbursements for highly active ARV therapy were relatively constant at $10,500 USD across all CD4 cell count strata.[x] However, patients with CD4 cell counts less than 50 cells/mm^3 incurred costs that were 2.6 times greater than the total annual expenditures of

---

[s] Sadoway, Geraldine. Personal interview. 29 Feb. 2008.

[t] Gibson, Katie. "UK: House of Lords Upholds Deportation Order." HIV Policy & Law Review 10 (2005). Aug. 2005 <http://www.aidslaw.ca/publications/publicationsdocEN.php?ref=224>.

[u] Pembrey, Graham. "AIDS in the UK." Averting HIV. 9 May 2008. AVERT.org.   15   Apr.   2008 <http://www.avert.org/aidsuk.htm>.

[v] Ibid.

[w] Bozette, Samuel A., Geoffrey Joyce, Daniel F. McCaffrey, Arleen A. Leibowitz, and et al. "Expenditures for the Care of HIV-Infected Patients in the Era of Highly Active Antiretroviral Therapy." New England Journal of Medicine 344 (2001): 817-824.

[x] Chen, Ray Y., Neil A. Accortt, Andrew O. Westfall, Michael J. Mugavero, James L. Raper, Gretchen A. Cloud, Beth K. Stone, Jerome Carter, Stephanie Call, Maria Pisu, Jeroan Allison, and Michael S. Saag. "Distribution of Health Expenditures for HIV-Infected Patients." Clinical Infectious Diseases (2006): 1003-1010.

patients with CD4 cell counts less than 350 cells/mm^3.[y] The study concluded that an increase in disease severity was positively correlated with increased health care costs.[z] The implications of this finding suggest that health care demands of persons with HIV increase over time and must be accounted for during the evaluation of applicants seeking to immigrate to countries such as Canada. At present, Citizenship and Immigration Canada (CIC) uses an Operational Processing Instruction manual to assess the eligibility of HIV-positive applicants that may enter Canada. The manual indicates that certain applicants may be Excessive Demand Exempt (EDE), according to section 38(2) of the IRPA, in cases where one

> (a) has been determined to be a member of the family class and to be the spouse, common-law partner or child of a sponsor within the meaning of the regulations;
>
> (b) has applied for a permanent resident visa as a Convention refugee or a person in similar circumstances;
>
> (c) is a protected person; or
>
> (d) is, where prescribed by the regulations, the spouse, common-law partner, child or other family member of a foreign national […]

Such applicants, as defined above, are assessed for entry based on whether or not they present a threat to public health or safety. Problematically, it is not clear from the IRPA guidelines what may constitute a public health or safety threat. Moreover, non-EDE applicants must undergo testing to determine their CD4 cell count. If the test indicates that an applicant has a CD4 cell count below 350 cells/mm^3, ARVs are required based on Canadian guidelines.[aa] In such cases, an applicant is said to represent excessive demand[bb]

---

[y] Ibid.

[z] Ibid.

[aa] <u>Operational Processing Instruction 2002-2004</u>. Citizenship and Immigration Canada. Ottawa: Government of Canada, 2002. 1-7.

irrespective of the source of finance for such mediations.[cc] The interpretation of excessive demand also includes those who may in the future require ARVs to mitigate the progression of the disease, substantially decreasing the possibility that any HIV-positive person would be found admissible without a separate claim to entry under family-class sponsorship or as a refugee.[dd]

While the cost of ARVs may be a long-term financial burden on the Canadian public health care system, the results of sustained ARV treatment have led to a decrease in the frequency and duration of hospitalizations by HIV-positive persons.[ee] In addition, the methods used by CIC to determine whether an applicant represents an excessive burden fail to account for the productivity that any given person could generate within Canada after immigrating.[ff] As CIC has affirmed, immigration plays "an increasingly important role in supporting Canada's economic prosperity and competitiveness" and immigration is "a key source of labour force growth in the future."[gg] Indeed, immigrants arriving in Canada between 1991 and 2001 represented 70 percent of the decade's total net labour force growth, and notably accounted for 24 percent of the labour force growth of the health and social services sector during that period.[hh] Moreover, immigration makes an

---

[bb] Ibid

[cc] Approximately one-third of all Canadian ARV expenditures are privately financed, personal communication, Bayer Inc Canada.

[dd] "Number of HIV Positive Immigrants to Canada Triples in One Year, Immigration Department Says." The Henry Kaiser Family Foundation. 14 May 2004. 14 Apr. 2008 <http://www.kaisernetwork.org/daily_reports/rep_index.cfm? DR_ID=23718>.

[ee] Mocroft, A, A Monforte, O Kirk, M A. Johnson, N Friis-Moller, D Banhegyi, A Blaxhult, F Mulcahy, J M. Gatell, and J D. Lundgren. "Changes in Hospital Admissions Across Europe: 1995-2003." HIV Medicine 5 (2004): 437-447.

[ff] Sadoway, Geraldine. Personal interview. 29 Feb. 2008.

[gg] Annual Report to Parliament on Immigration, 2007, Citizenship and Immigration Canada, 2007, available at http://www.cic.gc.ca/ENGLISH/resources/publications/annual-report2007/section1.asp

[hh] Immigration As A Source of Skills, Canadian Labour and Business Centre, 2003. In 2007, the national unemployment rate for immigrants was only 6.6%. See "The Canadian Immigrant Labour Market

enormous contribution to the pool of people in Canada with post-secondary qualifications. In 2006, among new immigrants 15 years of age and over, almost 42 percent of economic immigrants to Canada held a university degree and a further 15.5 percent held some other form of post-secondary credentials such as a non-university diploma or trade certificate.[ii] Therefore, the relative contribution of HIV-positive individuals to Canadian society needs to be evaluated in addition to the health care costs he or she may accrue in managing the progression of HIV in order to yield a comprehensive assessment of net cost (or net benefit) associated with each immigration applicant.

On October 21st, 2005, in a landmark decision made by the Supreme Court of Canada in the cases of *Hilewitz v. Minister of Citizenship and Immigration* and *de Jong v. Minister of Citizenship and Immigration*, it was decided that persons with disabilities could contribute valuably to Canadian society.[jj] Supreme Court Justice Abella wrote the majority decision in which CIC was directed to evaluate immigration applications on an individualized basis, so as to incorporate into admissibility decision-making schemes the ability of each applicant to invest personal resources of time, money, and social support to sustain the livelihood of themselves or family members with disabilities.[kk] The Supreme Court decision validated the concern that an objective metric for evaluating the eligibility of a prospective immigrant fails to account for important individualized circumstances, and it acknowledged the legitimate claim that an applicant's individual

---

in 2007," *The Immigrant Labour Force Analysis Series*, May 13, 2008 available at http://www.statcan.ca/english/freepub/71-606-XIE/71-606-XIE2008003.htm.
[ii] Facts and Figures 2006, Immigration Overview: Permanent and Temporary Residents, 2007, available at http://www.cic.gc.ca/english/resources/statistics/facts2006/permanent/25.asp.
[jj] Hilewitz V. Minister of Citizenship and Immigration. Supreme Court of Canada. 21 Oct.2005.
[kk] Ibid.

resources may offset the costs that would otherwise mean he or she would place an excessive burden on public costs in Canada. The *Hilewitz* decision concerned excessive demand in relation to social services; to date, no official court ruling has been made to extend the reasoning behind the *Hilewitz* decision to the context of health care services in Canada.

The decision to deny an HIV-positive applicant admission into Canada can bear grave implications. In countries with high HIV prevalence, people living with HIV are often subject to stigma, social isolation, exclusion and denial of treatment.[ll] In such situations, people may seek to immigrate or seek asylum in countries such as Canada. There are countless circumstances, however, in which appeals made by applicants to remain in Canada on humanitarian and compassionate grounds have failed - to the severe detriment of the appellants.[mm] There are several areas of concern that need to be addressed when examining the process by which permanent resident status is gained in Canada for people with HIV.

For an HIV-positive person to obtain permanent resident status in Canada as a refugee, it must be proven that the individual would face persecution, torture, cruel or unusual treatment or punishment or a risk to life if the individual returns to his or her country of origin.[nn] The risk to life cannot arise due to the inability of the claimant's country to provide adequate health or medical care.[oo] This can often be difficult to prove, as stigma,

---

[ll] Allen, Tim, and Alan Thomas. <u>Poverty and Development Into the 21st Century</u>. New York: Oxford UP, 2000.
[mm] Sadoway, Geraldine. Personal interview. 29 Feb. 2008.
[nn] Ibid., , IRPA, ss. 96, 97
[oo] IRPA, ss. 97(1)(b)(iv)

social exclusion, isolation, persecution and limited access to ARVs are not easily established.

An application for permanent residence in Canada on humanitarian and compassionate grounds is legally rooted in Section 25(1) of IRPA, which states that:

> The Minister shall, upon request of a foreign national who is inadmissible or who does not meet the requirements of this Act, and may, on the Minister's own initiative, examine the circumstances concerning the foreign national and may grant the foreign national permanent resident status or an exemption from any applicable criteria or obligation of this Act if the Minister is of the opinion that it is justified by humanitarian and compassionate considerations relating to them, taking into account the best interests of a child directly affected, or by public policy considerations.

This section of the Act allows people to apply to remain in Canada as a permanent resident based upon evidence that they would face unusual, undeserved or disproportionate hardship if they return to their country of origin.[pp] Therefore, this section can be used by people with HIV to obtain Canadian permanent residence if they face harsh treatment or denial of health care in their countries of origin.

Unlike refugees and some sponsored family class members, successful applicants for permanent residence on humanitarian and compassionate grounds under s. 25 of IRPA are not exempt from medical inadmissibility criteria. Therefore, a person with HIV initially accepted under this section due to the harsh circumstances in his or her country of origin can be rejected if her HIV status is expected to cause an "excessive demand" in Canada.

[pp] Citizenship and Immigration Canada Processing Manuel IP5

Applicants for permanent residence on humanitarian and compassionate grounds can apply for an exemption from medical inadmissibility criteria under Operational Bulletin 021 (June 22, 2006). However, the processing of such exemption requests is problematic. There presently stands only one delegate appointed by the Minister of Citizenship and Immigration, who has for thirty years acted as the sole immigration officer at the CIC responsible for overseeing petitions by immigration applicants to be exempt from the medical inadmissibility clause. The reasoning behind some of this officer's decisions have been challenged as vague and unclear, resulting in several Federal Court judicial review applications.[qq]

In the event that an applicant is determined medically inadmissible, an application can be made to enter or reside in Canada via a temporary resident permit (TRP).[rr] In such cases, the temporary residency permit with code number 90 is administered to the refugee or asylum seeker.[ss] This permit allows individuals to reside in Canada, but does not allow them access to provincial health care, for a period of up to three years.

Sections 15(1) and 15(2) of the Canadian *Charter of Rights and Freedoms* (Charter) state that:

> **15.** (1) Every individual is equal before and under the law and has the right to the equal protection and equal benefit of the law without discrimination and, in particular, without discrimination based on race, national or ethnic origin, colour, religion, sex, age or mental or physical disability.
>
> (2) Subsection (1) does not preclude any law, program or activity that has as its object the amelioration of conditions of disadvantaged individuals or

---

[qq] Battista, Michael. Personal Interview. 10 Mar. 2008.
[rr] IRPA, s. 24
[ss] Sadoway, Geraldine. Personal interview. 29 Feb. 2008.

groups including those that are disadvantaged because of race, national or
ethnic origin, colour, religion, sex, age or mental or physical disability[tt]

It has been argued in Canadian courts that Section 15(1) of the Charter is meant to prevent discrimination in the provision of health care, and to therefore promote equal access to health care services.[uu] While the response to such legal challenges has been that *cost* discrimination is distinct from discrimination against a *person*, the impact of such decisions on prospective immigrants always result in their removal from Canada, denial of entry to Canada, and denial of access to essential medical treatment.[vv]

In sum, the literature suggests that fair treatment of people with HIV requires evidence-based policies at home and abroad. Immigration policies for persons with HIV will become increasingly important as legal, political and humanitarian concepts of access to health care services evolve. Presently, Canadian federal immigration policies reflect somewhat arbitrary and rigid standards for determining excessive demand for persons with HIV. These assessments are conducted without individualized assessments of those who are not exempt from IRPA's medical inadmissibility clause. Whether or not such standards serve to protect the Canadian health care system and the citizens of Canada has yet to be affirmed, given: the positive contributions HIV-positive persons may make to Canada; and the possibility that applicants' private financial and social resources may reduce their relative demand on health care services.

[tt] "Equality Rights." Canadian Charter of Rights and Freedoms. 1982. Government of Canada. 14 Apr. 2008 <http://laws.justice.gc.ca/en/Charter/index.html#egalite>.
[uu] Sadoway, Geraldine. Personal interview. 29 Feb. 2008.
[vv] Ibid.

3.0 Threshold for Excessive Demand on Canadian Health or Social Services

In this Section, we review and assess the current threshold used to determine excessive demand on Canadian health or social services in the light of Canadian health expenditure characteristics.

Although the provision of health care is a provincial concern in Canada, the federal government has influenced the development of policy. Since January 1, 1971, all ten provinces and the territories have had public health insurance plans covering all necessary medical and hospital services. Since the federal government covers a substantial portion of all health expenditures, it has been able to establish certain criteria that the provinces and territories must meet if they were to qualify for their full share of federal transfers. Reasonable access by all residents to the full range of insured services without financial impediments to utilization captures the essence of the federal funding criteria.[ww]

In 2007, average per capita Canadian health care expenditures were $4,867.40.[xx] These expenditures included various categories of health service expenditures whether financed publicly or privately. While the public share accounts (in 2007) for 70.6% of total expenditures, most services are delivered privately. For example, physicians are generally self-employed, but reimbursed by provincial health insurance plans on a fee-for-service basis; while hospitals, which are owned and operated on a not-for-profit basis by

[ww] Vayda E, Deber RB.: The Canadian Health Care System: An Overview. Social Science and Medicine 1984; 3: 191-197. and Evans RG, Lomas J, Barer ML et al.: Controlling Health Expenditures: The Canadian Reality. New England Journal of Medicine 1989; 320:9, 571-577.
[xx] Canadian Institute for Health Information: National Health Expenditure Trends, 1975-2007. Canadian Institute for Health Information: Ottawa, 2007.

various organizations, receive prospective global budgets from provincial governments to finance ambulatory and inpatient services.

To assess whether a potential immigrant represents an "excessive" demand on Canadian health or social services, a threshold is required as stipulated in the legislation. Current practice by CIC has been to set the annual cost threshold at the same value as that for average per capita Canadian health care expenditures. However, that threshold is arbitrary and may be shown to be neither a reasonable nor statistically appropriate interpretation of the term "excessive" demand used in IRPA.

We propose that "excessive" demand on Canadian health or social services be defined as a cost profile for a prospective immigrant that is *statistically greater* than that for Canadians. To establish this "excessive" demand threshold, we construct a statistical test to determine how large costs need to be before a prospective immigrant "might reasonably be expected to cause "excessive" demand on health or social services" in accordance with Section 38(1) of the Canadian *Immigration and Refugee Protection Act* (IRPA) of 2001.

To operationalize this statistical test, the distribution of Canadian health care costs, the cost profile of a prospective immigrant, and the level of statistical significance all need to be established.

Based on the distribution of Canadian health care costs, we may test whether the expected health care cost experience of an immigration applicant is the same as or is greater than that for Canadians. Specifically, we construct a statistical test to determine how large costs might need to be before a prospective immigrant's cost profile is deemed to be "excessive", ie statistically different from that for a representative Canadian.

While average per capita health expenditures in Canada in 2007 were $4,867.40, there is a paucity of data on the distribution of such costs across all Canadians. It may be convenient to hypothesize that health care costs follow a normal (or bell-shaped) distribution; however, experience suggests that health care costs are non-negative and positively skewed, i.e. skewed towards the high end. A distribution that is consistent with such costs (i.e. non-negative and positively skewed) is a Gamma distribution. This distribution has been used previously in modeling health care costs,[yy,zz,aaa,bbb] and it is relatively simple to describe because it is defined in terms of a scale and a shape factor. These factors may be estimated as the ratio of the variance of costs to average costs (σ^2/μ) and the ratio of squared average cost to the variance of costs (μ^2/σ^2), respectively. The scale parameter determines the practical range of costs, while the shape parameter determines the distributional profile of costs. In other words, the Gamma distribution is based on two parameters: average costs; and the relative variance in costs (i.e. the

---

[yy] Diehr P, Yanez D, Ash A, Hornbrook M, Lin DY: Methods for analyzing health care utilization and costs. Annu Rev Public Health 1999; 20:125–44.
[zz] Fryback DG, Chinnis JO Jr, Ulvila JW. Bayesian cost-effectiveness analysis. An example using the GUSTO trial. Int J Technol Assess Health Care. 2001; 17(1):83-97.
[aaa] Nixon RM, Thompson SG. Parametric modeling of cost data in medical studies. Stat Med. 2004; 23(8):1311-31.
[bbb] Briggs A, Gray A. The distribution of health care costs and their statistical analysis for economic evaluation. J Health Services Res Pol 1998; 3(4):233–245.

coefficient of variation which is defined as the ratio of the standard deviation of costs to its mean, σ/μ. A low relative variance yields cost observations concentrated around average costs, while observations are more dispersed when the relative variance is high.

Once the cost distribution for Canadians and for a prospective immigrant have been established, the level of statistical significance used to test the null hypothesis that a prospective immigrant exhibits a cost profile that is the *same* as that for Canadians against the alternative that such costs are *greater* than those for Canadians needs to be established. While it is conventional in the health services research literature to use a 5 percent significance level (ie Fisher, 1925)[ccc], this level of significance is discretionary and depends on the confidence warranted in the test. Use of a 5 percent significance level implies that the statistical test correctly rejects the null hypothesis that a prospective immigrant has the same cost distribution as a Canadian 95 percent of the time. A less stringent requirement to be correct (ie only 90 percent) yields a significance level of 10 percent, while a more stringent requirement to be correct (ie 98 percent) yields a significance level of 2 percent. A less stringent requirements increases the chance that the null hypothesis is rejected when a prospective immigrant has the same cost distribution as a Canadian. Based on the distribution of costs for Canadians and for a prospective immigrant, the significance level invoked yields a unique "excessive" demand threshold as described in Figures 1(i) and 1(ii).


[ccc]

http://books.google.ca/books?id=Mo7NUGTqb1QC&pg=PA465&lpg=PA465&dq=fischer+5+percent+sig nificance+level&source=bl&ots=Xop73TC9yW&sig=TV3fKZulfCympDJYybaRsDe9veQ&hl=en&ei=8z3 1SeTAM9WUkAX1l9zzCg&sa=X&oi=book_result&ct=result&resnum=6

Figures 1(i) and 1(ii) represent two sets of simulated distributions of Canadian health care expenditures when we know average per capita health care expenditures, but where assumptions are made about both their relative variance and proposed distribution. Figure 1(i) represents four possible normal (or bell-shaped) distributions for Canadian health care costs, while Figure 1(ii) offers equivalent Gamma distributions for the same set of values for the relative variance of costs. The solid curves represent continuous probability density functions, while the bar charts represent the proportion of observations that fall within various intervals. As the relative variance increases, from 0.5 to 2.0, the simulated distributions of health care costs become more dispersed. Consequently, the red arrows that represent the threshold of health care costs experienced by 5 percent or fewer Canadians grow as the relative variance of costs increase, and is consistent with a significance level of 5 percent.

Figures 1: Annual Cost Thresholds for Excessive Demand for a (i) Normal Distribution; and (ii) for a Gamma Distribution
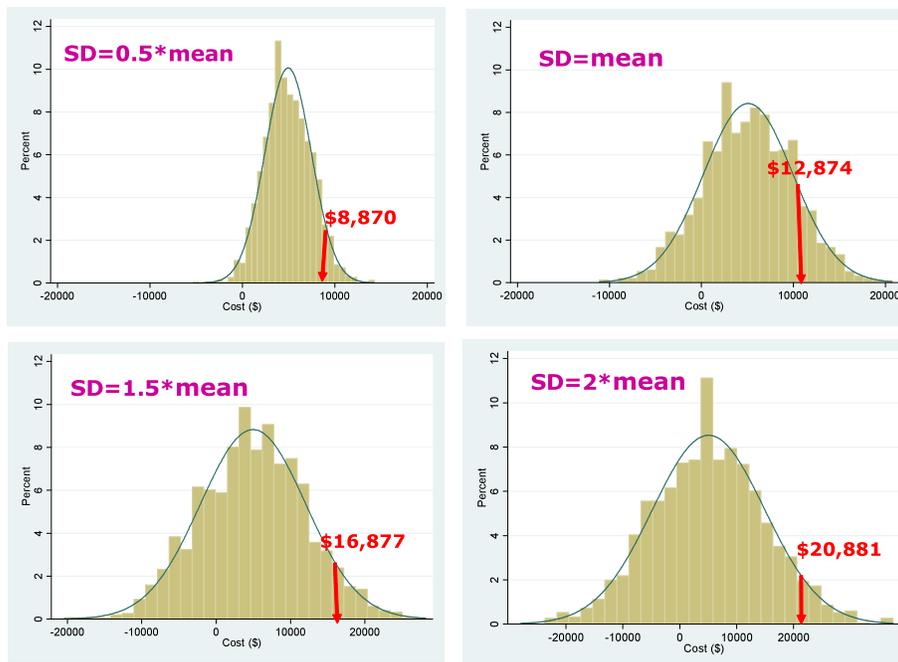
(ii) Gamma Distribution:
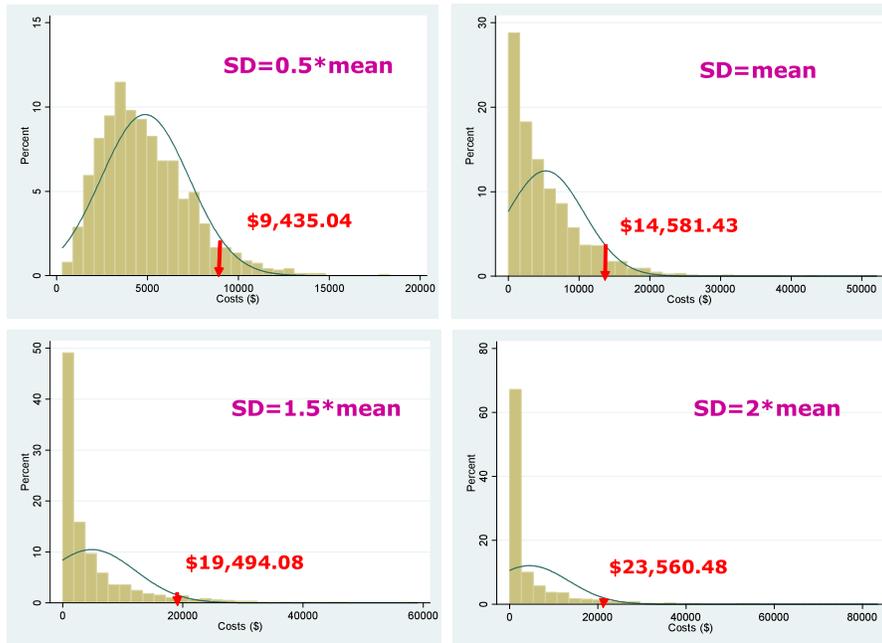
In general, annual cost thresholds for excessive demand are reported in Table 1 that dependent on the assumed cost distribution (normal or gamma), the relative variance of such costs (0, 0.5, 1, 1.5, or 2), and the significance level used to test the null hypothesis that an immigration applicant exhibits a cost profile that is the *same* as that for a Canadian or is _higher_. Three findings may be summarized. First, the Gamma distribution consistently yields a larger cost threshold than that obtained when using a normal distribution. This occurs because the Gamma distribution yields only positive values for health expenditures and incorporates a positive skew to such costs. In contrast, non-positive costs are possible under a normal distribution, with the distribution of costs symmetric around the mean of such costs. Second, for both the normal and the gamma distribution, and for each invoked level of statistical significance, the annual cost threshold for excessive demand consistently increases with the relative variance in costs. Only when the relative variance in costs is zero, ie all Canadians incur the same annual

costs for health care, would that threshold be the same as that currently used by CIC. In all other instances, the cost threshold is higher. Finally, the annual cost threshold for "excessive" demand increases with a decline in the invoked level of statistical significance, i.e. if the statistical test is designed to be correct in rejecting the null hypothesis that a prospective immigrant has the same cost profile as a Canadian, the threshold needs to be higher.

Table 1: Annual Cost Thresholds for "Excessive" Demand Contingent of the Distribution of Costs, the Relative Variance in Costs, and Significance Levels.

| | | Cost Threshold in 2007 C$ | | | | | |
| | | Normal Distribution | | | Gamma Distribution | | |
		2 percent	5 percent	10 percent	2 percent	5 percent	10 percent
Relative Variance (or Coefficient of Variation, CV = σ /μ)	0	4,867.40	4,867.40	4,867.40	4,867.40	4,867.40	_4,867.40_
	0.5	9,866.22	8,870.84	7,987.40	11,054.01	9,435.04	8,129.51
	1	14,865.04	12,874.27	11,107.41	19,041.38	_14,581.43_	11,207.60
	1.5	19,863.86	16,877.71	14,227.41	27,879.94	19,494.08	13,483.14
	2	24,862.68	20,881.15	17,347.41	_36,739.56_	23,560.48	14,609.86

Table 1 yields wide variations in the cost threshold that may be used to determine "excessive" demand. Thresholds vary from a low of $4,867.40 (the current threshold used by CIC) when the relative variance of costs is zero to a threshold of $36,739.56,

which is almost eight-fold greater. While there are circumstances in which each threshold is appropriate, there is compelling evidence to support a Gamma distribution in contrast to a Normal distribution. Moreover, for those who have studied the distribution of health care costs they have tended to invoke a Gamma distribution and have used unity as the relative variance of costs.[ddd,eee,fff,ggg] Moreover, use of a conventional level of statistical significance of 5 percent, yields a health care cost threshold for "excessive" demand as $14,581.43, as reported in Table 1. If a potential immigrant were to exhibit a cost profile yielding higher costs, then the hypothesis that that potential immigrant had a cost profile that is the same as that for a representative Canadian would be rejected. Consequently, this is how we interpret, in a statistical sense, the meaning of "excessive" demand within Section 38(1) of IRPA, ie statistically different from that for a representative Canadian.

4.0 Potential economic burden on health or social services by persons with HIV

This Section offers a synthesis of the clinical, epidemiological and economics literatures concerning the economic burden placed on health or social services by persons with HIV. In reviewing data for inclusion in our assessment of the relationship between disease

---

[ddd] Diehr P, Yanez D, Ash A, Hornbrook M, Lin DY: Methods for analyzing health care utilization and costs. Annu Rev Public Health 1999; 20:125–44.
[eee] Fryback DG, Chinnis JO Jr, Ulvila JW. Bayesian cost-effectiveness analysis. An example using the GUSTO trial. Int J Technol Assess Health Care. 2001; 17(1):83-97.
[fff] Nixon RM, Thompson SG. Parametric modeling of cost data in medical studies. Stat Med. 2004; 23(8):1311-31.
[ggg] Briggs A, Gray A. The distribution of health care costs and their statistical analysis for economic evaluation. J Health Services Res Pol 1998; 3(4):233–245.

progression and health care costs, studies reviewed in a publication by Levy et al[hhh] were used. Only nine studies met three inclusion criteria: (i) peer-reviewed publication in English; (ii) original, patient-level data yielding mean monthly or annual direct estimates of medical costs of treating people with HIV, where anti-retroviral medication was included as routine clinical practice even when CD4 cell counts were over 500 cells/mm^3; and (iii) medical cost estimates stratified by CD4 cell counts. A recent Canadian study, which was not included in the review by Levy et al, yields slightly lower cost estimates than those reported below.[iii] Data from the studies reported by Levy et al were extracted from either the original article or directly from the author(s). Monthly health care costs in 2007 US dollars were presented after stratification by CD4 cell count categories as shown in Figure 2. A wide range of cost components were captured, including inpatient, outpatient, laboratory, and medication costs.

There is a general tendency for health care costs to increase with disease progression, but our confidence in some of the point estimates are limited by the underlying sample size. Specifically, while there are only 71 and 385 patients captured for the CD4 cell count categories 51-100 cells/mm^3 and 201-350 cells/mm^3, respectively, all other cost estimates were based on samples of more than 23,000 patients.

[hhh] Levy AR, Annemans L, Tramarin A, Montaner JS: The impact of disease progression on direct medical costs of treating persons with HIV: a review of the international literature. Pharmaco-economics, forthcoming, 2009

[iii] Krentz HB, Gill MJ: Cost of medical care for HIV-infected patients within a regional population from 1997 to 2006. HIV Medicine 9 (2008): 721-730.

Figure 2: Disease Progression & Average Monthly Health Care Costs in 2007 US$
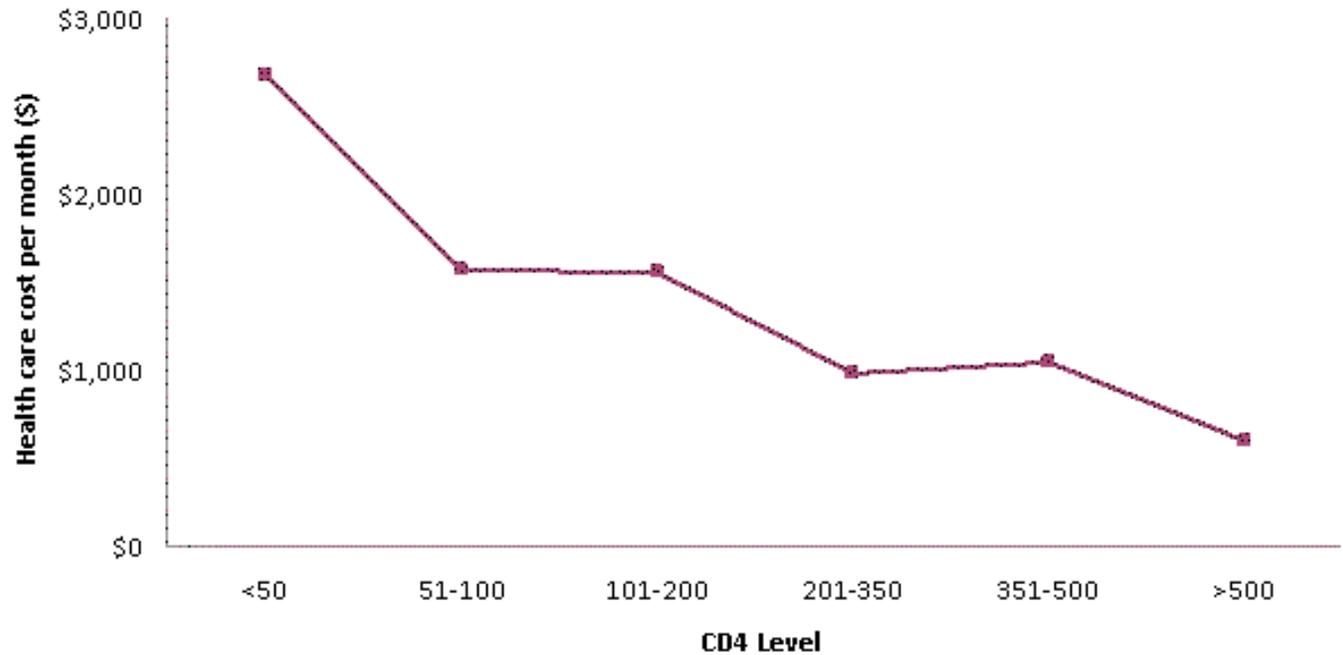
5.0 The economic burden of persons with HIV over various time horizons

Estimates of the economic burden of new immigrants with HIV are derived over three different time horizons (5-years, 10-years, and the remaining lifetime) after stratifying for underlying health states, age and sex at the time of admission to Canada.

In order to derive estimates of the economic burden a Markov model was developed, as shown in Figure 3 that describes the transition of a cohort of immigrates with HIV through various health states, here defined as CD4 cell count categories.

Figure 3: Health-State Transition for the Markov Model
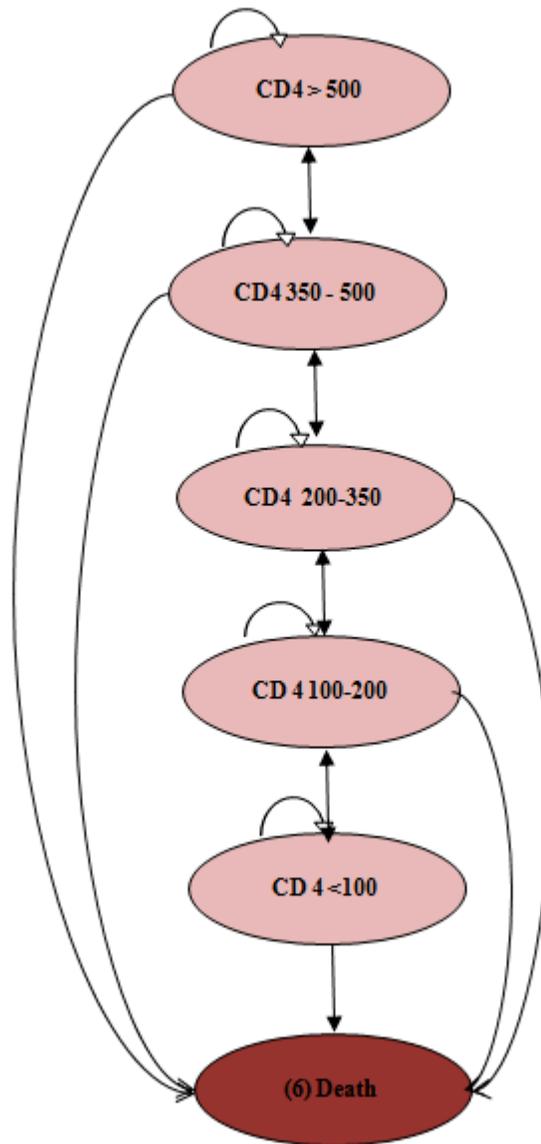
In Figure 3, a cohort of immigrants is classified into initial health states according to the CD4 count measured at the time of application for admission to Canada. Transitions between health states are assessed on an annual basis. Potential health state transitions are: death; progression to a lower CD4 cell count health state; disease improvement to a higher CD4 cell count health state; or the status quo in which individuals remain in their

current health state. The model tracks the proportion of individuals in each health state after each cycle. Transitions are based on conditional probabilities that depend on average age, the sex distribution, and the current CD4 cell count category. Table 2 reports transition probabilities for each CD4 cell count category.

Table 2: Transitional Probabilities Used in the Markov Model for Immigration Applicants with HIV

Input Parameters		Source
Transition probabilities from "CD4 > 500" state		
Annual risk of having "CD4 350-500"	**7.59%**	**#1**
Relative risk of death[#]	**5.00**	**#2**
Transition probabilities from "CD4 350-500" state		
Annual risk of having "CD4 200-350"	**6.92%**	**#1**
Annual risk of recovering to "CD4 > 500"	**2.71%**	**#1**
Relative risk of death[#]	**7.00**	**#2**
Transition probabilities from "CD4 200-350" state		
Annual risk of having "CD4 100-200"	**3.13%**	**#1**
Annual risk of recovering to "CD4 350-500"	**2.71%**	**#1**
Relative risk of death[#]	**9.00**	**#2**
Transition probabilities from "CD4 100-200" state		
Annual risk of having "CD4 < 100"	**1.79%**	**#1**
Annual risk of recovering to "CD4 200-350"	**1.22%**	**#1**
Relative risk of death[#]	**13.00**	**#2**
Transition probabilities from "CD4 < 100" state		
Annual risk of recovering to "CD4 100-200"	**1.22%**	**#1**
Relative risk of death[#]	**20.00**	**#2**

[#] Baseline age-sex adjusted general population mortality

1. Sypsa V, Touloumi G, Karafoulidou A, Hatzakis A. Comparison of smoothing techniques for CD4 data in a Markov model with states defined by CD4: an example on the estimation of the HIV incubation time distribution. Statist. Med. 2001; 20:3667–3676.

2. Sighem, A, Sven D, Azra C, Luuk G, Roy A, Frank de W. Mortality in patients with successful initial response to highly active antiretroviral therapy is still higher than in non-HIV-infected individuals. Journal of AIDS 2005; 40(2):212-8.

Economic burden estimates for immigrant applicants with HIV depend crucially on the projected trajectory of disease, the anticipated incidence of mortality, health care cost estimates stratified by CD4 cell count categories, the rate at which future care costs are discounted to present values, and the time horizon over which cost are assessed. In order to derive economic burden estimates for each immigration applicant with HIV, costing weights (as discussed in Section 4.0) and reported in 2007 Canadian dollars in Table 3, are applied to each health state as represented by CD4 cell count categories.

Table 3: Input Cost Parameters for the Markov Model in 2007 Canadian Dollars

Input Cost Parameters	Values	Source
Annual Health Costs by CD4 Cell Count Categories		
(in 2007 Canadian Dollars)		
CD4 > 500	$ 7,919.84	#3
350 < CD4 < 500	$13,807.59	#3
200 < CD4 < 350	$12,985.83	#3
100 < CD4 < 200	$20,438.48	#3
CD4 < 100	$35,372.88	#3

3. Levy AR, Annemans L, Tramarin A, Montaner JS: The impact of disease progression on direct medical costs of treating persons with HIV: a review of the international literature. Pharmaco-economics, forthcoming, 2009

Because standard practice in the economic evaluation requires adjustment for the timing of costs, the analysis follows current practice and invokes a discount rate of 3 percent to convert the annual stream of expected health care costs to present valve terms.[iii] Moreover, in order to assess the economic burden of immigrants with HIV, three separate

---

[iii] Drummond ME, O'Brien BJ, Stoddart GL, Torrance GW: Methods for the Economic Evaluation of Health Care Programmes Second Edition, Oxford University Press: Oxford), 1997.

time horizons are considered, 5-years, 10-years, and lifetime for both men and women using mortality rates derived from Canadian life tables.[kkk]

Application of the Markov model yields estimates of the economic burden of new immigrants with HIV that depend on the time horizon used to assess the impact on health care costs (5-years, 10-years, and the remaining lifetime) as well as baseline CD4 cell count, age and sex of individuals at the time of admission to Canada. These estimates are reported in Tables 4(i)-4(iii).

There are four notable findings regarding the economic burden of new immigrants. First, the economic burden of immigration applicants increases with disease progression, i.e. the burden is larger if immigration applicants have smaller CD4 cell counts, indicating more serious symptoms. This occurs because such immigrants present a higher cost profile than other immigrants. Second, the burden increases when the time horizon over which health care costs are assessed increases. This occurs because more years are included in the assessment of the burden on health or social services. Third, the burden is greater for women than for men, and particularly so if the time horizon for assessment is longer. This occurs because women face a lower mortality rate, and consequently a longer life expectancy. Forth, the burden falls with the age of the immigration applicant, because older immigrants face a higher mortality rate than younger immigrants.

[kkk] Statistics Canada: Canadian Life Tables, Ottawa: 2007. http://www.statcan.ca/english/freepub/84-537-XIE/tables.htm, Last accessed February 8, 2007.

Table 4: Present Value of Health Care Expenditures in 2007 Canadian Dollars for

(i) Immigration Applicants aged 30 years with HIV.

Baseline CD4	Males			Females		
	5-Year	10-Year	Lifetime	5-Year	10-Year	Lifetime
>500	$36,151	$71,384	$183,612	$36,339	$72,263	$205,176
351-500	$55,945	$100,969	$222,100	$56,320	$102,503	$247,959
201-350	$55,562	$104,361	$233,254	$56,055	$106,477	$264,464
101-200	$85,181	$155,631	$311,042	$86,263	$160,089	$356,852
<100	$142,023	$248,953	$437,669	$144,725	$259,282	$508,296

(ii) Immigration Applicants aged 40 years with HIV.

Baseline CD4	Males			Females		
	5-Year	10-Year	Lifetime	5-Year	10-Year	Lifetime
>500	$35,871	$69,725	$144,155	$36,117	$71,024	$165,621
351-500	$55,393	$98,151	$175,847	$55,881	$100,374	$201,258
201-350	$54,836	$100,494	$179,028	$55,476	$103,536	$208,807
101-200	$83,599	$147,659	$234,983	$84,995	$153,932	$277,205
<100	$138,115	$231,178	$326,926	$141,565	$245,214	$390,022

(iii) Immigration Applicants aged 50 years with HIV

Baseline CD4	Males			Females		
	5-Year	10-Year	Lifetime	5-Year	10-Year	Lifetime
>500	$35,005	$65,028	$102,997	$35,541	$67,872	$124,277
351-500	$53,687	$90,283	$126,832	$54,742	$95,027	$152,061
201-350	$52,608	$89,965	$122,940	$53,983	$96,265	$151,367
101-200	$78,807	$126,838	$156,726	$81,754	$139,139	$195,700
<100	$126,522	$187,344	$211,688	$133,610	$212,772	$268,164

6.0 Inadmissibility depends on an applicant's characteristics and time horizon

Thresholds used to define excessive demand are determined in this Section and applied to estimates of the economic burden of persons with HIV in order to identify which immigration applicants may be deemed to be inadmissible on medical grounds.

In Section 3.0, we demonstrated that the current annual cost threshold used by CIC to determine whether an applicant is likely to pose "excessive" demand ($4,867.40) is too low, and that there might be justification under some circumstances for a threshold that is almost eight-fold greater at $36,739.56. Under there extreme positions either all individuals with HIV would be denied admission or all would be accepted. In Section 3.0, we proposed a middle position that we felt was a statistically more appropriate annual cost threshold at $14,581.43 (or three-fold greater than the current CIV threshold). Application of this annual cost threshold to assessment periods extending for multiple years warrant even higher cost thresholds to be compared to the cost profile of each immigration applicant. Table 5 reports the present value of cost thresholds (in 2007 Canadian dollars) for representative Canadians based on their age, sex, and the time horizon for assessment. Consequently, in order to assess whether immigrant applicants present a cost profile that is higher than that for a matched representative Canadian warrants a comparison between the figure in each cell in Table 5 and an appropriate figure from Tables 4(i)-4(iii).

Table 5: Thresholds for the Present Value of Health Care Costs by Age, Sex and Time Horizon discounted in advance at 3% in 2007 Canadian Dollars ($14,581.43)

Age	Males			Females		
	5-Year	10-Year	Lifetime	5-Year	10-Year	Lifetime
30 years	$68,892	$130,702	$441,832	$68,958	$130,982	$468,558
40 years	$68,793	$130,175	$383,757	$68,880	$130,593	$414,254
50 years	$68,483	$128,595	$316,614	$68,676	$129,568	$351,073

Comparison between the figures in Tables 4(i)-4(iii) and Table 5 yields the shaded regions in Tables 4(i)-4(iii). These shaded regions identify individuals who **do not**

represent an excessive burden on Canadian health or social services. Classification as medically inadmissible depends on the unique characteristics of each potential immigrant including their age, sex and baseline CD4 cell count as well as on the time horizon over which an applicant is assessed to impact health or social services.

The baseline CD4 cell count category, at which immigration applicants with HIV are deemed to represent an excessive burden on Canadian health or social care, falls as the time horizon for assessment increases. Specifically, a five-year or ten-year time horizon generally warrants individuals with CD4 cell counts <200 cells/mm^3 to be deemed inadmissible, while a lifetime horizon provides for admission to all except for women aged 30 years with CD4 cell counts <100 cells/mm^3. These finding occurs because persons with HIV are at a greater risk of death than the general population which lowers the present value of their potential economic burden. Similarly, as women have greater life expectancies than men, their potential economic burden on Canadian health or social care is accordingly greater. This only makes a difference in Table 4 in two instances: when a ten-year horizon is employed for immigration applicants at 50 years of age; and when a lifetime horizon is employed for immigration applicants at 30 years of age. Moreover, as the age of the applicant increases, their life expectancy falls. This decline lowers their potential economic burden on health or social services, and accordingly, lowers the CD4 cell count threshold at which potential immigrants may be classified as being medically inadmissible. This effect is only noticeable in two instances: first, when a ten-year horizon is used whereby the threshold for being medically inadmissible drops for men aged 40 to 50 from CD4 cell counts <200 cells/mm^3 to <100 cells/mm^3; and

second, when a lifetime horizon is used whereby the threshold for being deemed medically inadmissible drops for women aged 30 to 40 from CD4 cell counts <100 cells/mm^3 to include all women irrespective of their CD4 cell count when aged 40 years. These are interesting sex related differences and suggest that women face a greater likelihood of being deemed medically inadmissible than men.

7.0 Economic Contributions of Immigrants

Estimates of the contributions of new immigrants to the public treasury through taxes paid on labour market earnings are constructed in this Section in two steps. First, earnings projection equations are estimated using data from the master files of the 2001 and 2006 Canadian censuses.[lll] Second, the federal and provincial tax revenues due on these earnings are estimated using the Canadian Tax and Credit Simulator (CTaCS).[mmm] Separate calculations are made for immigrants who (alternatively) arrive in Canada at ages 30, 40 and 50.

Earnings Projections

The samples from the censuses consist of wage and salary workers in Ontario, exclude non-permanent residents, and were drawn separately for males and females. The age restrictions imposed vary by the assumed age when the immigrant arrived in Canada. For example, the sample used to project the earnings of immigrants who arrived in Canada at age 30 consists of immigrants who arrived in Canada between ages 25 and 35 who are

---

[lll] The master files of these censuses were access through the Toronto Region Statistics Canada Research Data Centre.

[mmm] CTaCS was created by Kevin Milligan of the Department of Economics, University of British Columbia.

aged 25 through 59, and native born individuals aged 25 through 59. The native born subsample is restricted to start at age 25 because by definition that is the youngest age possible for any member of the immigrant subsample; however, there is no corresponding definitional limit to the upper age in the immigrant subsample. Someone who arrived in Canada at age 25 in 1968 would be 63 when observed in the 2006 census. An upper age limit of 59 was chosen to avoid early retirement issues for those sample members who have CPP/QPP benefits available at age 60. Similarly, the samples used to project earnings of immigrants who arrived in Canada at age 40 (or age 50) comprises immigrants who arrived in Canada between ages 35 and 45 (or between 45 and 55) who are aged 35 (or 45) through 59, and native born individuals aged 35 (or 45) through 59.

The methods used to estimate the earnings projection equations are well known in the literature (Baker and Benjamin 1994, Bloom and Gunderson 1991, Borjas 1985, Grant 1999). They require the use of at least two cross sectional data sets on immigrant (and native born) outcomes, and the assumption that any year (secular) effects are common to the immigrant and native sub-samples. We satisfy these requirements by using data from both the 2001 and 2006 censuses and assume that any labour market shocks in 2006 are common to immigrants and the native born. The measure of earnings in each census is for the previous calendar or "reference" year (2000 and 2005, respectively)

The earnings projections allow immigrants' earnings to vary by both their period of arrival in Canada and by the number of years they have lived in Canada. The following specification of the earning equation is used:

(1) $\ln w = f(AGE) + g(YSM) + h(yoa) + j(pob) + \gamma t + X\beta + \varepsilon$

where:

- $\ln w$ is the log of an individual's wages and salary measured in 2005 Cdn dollars;

- $f(AGE)$ is cubic in the individual's current age;

- $g(YSM)$ is cubic in years since arrival in Canada (0 for the native born);

- $h(yoa)$ are a series of dummy variables for the following Canadian arrival periods: 1975 or before, 1976-1980, 1981-1985, 1986-1990, 1991-1995, 1996-2000, 2001-2005 (all 0 for the native born);

- $j(pob)$ are a series of dummy variables for the birthplace: US, UK, West Indies, Other Americas, Europe, Central Asia, East Asia, South Asia, South East Asia, Oceania, Other (all 0 for the native born);

- t is a dummy variable for observations from the 2006 census; and

- X are control variables that include dummy variables for: living in an urban area; married or in a common law relationship; activity limitation at work, school or in other activities; presence of at least one child aged 5 or less in the household; education levels; knowledge of Canada's official languages; and use of one of the official languages at home.

Equation (1) is estimated separately using individuals who work full year full time (FYFT: 48 weeks or more in the reference year) and for "other workers".[nnn]

Once estimates of equation (1) are obtained, they are used to project inflation-adjusted earnings growth for an immigrant who arrived in Canada in the period 2001-2005, at the assumed age of arrival. The explanatory variables are set for these projections following

---

[nnn] This sample will include part time workers and part year full time workers.

specific client profiles. A life profile of earnings is then created starting in 2005 allowing both age and years in Canada to change over time. A separate earnings projection equation is used for immigrants who arrive in Canada at ages 30, 40 and 50, respectively.

Estimating Tax Revenues

The tax obligations resulting from the estimated life profiles of earnings are estimated using CTaCS. CTaCS simulates the Canadian federal and provincial personal income tax and transfer system in any year between 1962 and 2005. For current purposes the tax parameters for 2005 were used matching the reference year for the 2006 census. Although CTaCS incorporates the full set of deductions and tax credits, the tax simulations are specified quite modestly—age, gender and residence in Ontario—to maximize the generality of the results.

The simulation results yield the sum of federal and provincial taxes owed assuming the 2005 tax system is in place. To translate the tax burden in each year to a common basis, the present value of the sum of the taxes to be paid at different points over the life course is reported, assuming a discount rate of 3 percent. The simulations presented use the provincial tax parameters for Ontario.

Results

The results of these calculations are presented in Table 6 for three hypothetical clients. For each, we present the sum of the present value of federal and provincial tax payments, under different scenarios that vary by the age at which the individual arrives in Canada

and the year in which their labour market employment ends. The ages of arrival are 30, 40 or 50 respectively, and the assumed working lives are 5 or 10 years, or a "lifetime" which is to age 59. For example, the first client in Table 6 is a female from southeast Asia, who is a high school graduate and lives in an urban area. Assuming she arrives in Canada at age 30 and works just 5 years the present discounted sum of the tax payments she will make is estimated to be $14,101.40 measured in 2005 dollars.

Table 6: Present Value of Federal and Provincial (Ontario) Tax Revenues for a Full-Time Full-Year Working Immigrant by Age, Sex and Time Horizon discounted in advance at 3% in 2005 $CAD

	Working Life		
Age at Immigration	**5 Years**	**10 Years**	**Lifetime**
Client 1: Female, High School Graduate, Single, from Southeast Asia, living in an urban area			
30 years	$14,101.40	$31,906.20	$99,664.93
40 years	$14,418.09	$31,136.55	$64,659.76
50 years	$15,328.54	$29,471.16	$29,471.16
Client 2: Male, M.A. degree, Single, from the U.S.A., living in an urban area.			
30 years	$55,430.21	$115,862.49	$341,782.96
40 years	$66,869.10	$138,341.10	$264,021.80
50 years	$71,997.23	$140,803.65	$140,803.65
Client 3: Female, B.A. degree, Single, from Africa, living in an urban area.			
30 years	$35,492.40	$77,923.98	$234,343.62
40 years	$38,228.15	$80,801.26	$162,627.03
50 years	$46,717.60	$89,159.59	$89,159.59

Notes: Lifetime is to age 59.

There are some common patterns across the results by client. First, because earnings (and therefore tax obligations) generally rise with age, five years of employment after immigration at age 40 will generate more tax revenue than five years of employment after

immigration at age 30. However, since the age profile of earnings typically flattens at later ages this is not always true for a comparison of the results for immigration at age 40 versus age 50. Second, because the samples used to project earnings had an upper age limit of age 59, the lifetime tax obligations when immigration is at age 50 are the same as the 10 year estimate.

The differences in the results across clients reflect both corresponding differences in their earnings capacities and the progressivity of the Canadian tax system. For example, the highest tax revenues are recorded for Client 2. This is because this individual is male, highly educated and from the United States (US). Immigrants from the US and the United Kingdom generally command higher earnings in the Canadian labour market than immigrants from other locations.

A comparison of clients 1 and 3 highlights the impact of education and country of origin holding gender constant. Client 3 has much larger revenues both because of the earnings premium to a university degree, and because among females working full year full time immigrants from Africa command higher earnings than those from south east Asia.

8.0 Conclusions and Limitations

There are a paucity of studies assessing thresholds used by immigration officials in the determination of medical inadmissibility. Despite the need for evidence informed immigration policy, and the substantive findings contained in this report, there are a number of limitations that warrant discussion. First, the definition of "excessive" demand

is inherently subjective. While we offer a statistical definition of "excessive", we demonstrate that the precise threshold is discretionary; it depends on the confidence warranted in the test that a prospective immigrant has a cost profile that is the same as that for Canadians. A more stringent confidence requirement (i.e. that we are correct in rejecting this hypothesis) than the customarily 5 percent significance level, warrants a higher threshold. Second, while we have shown how the statistical threshold used to determine "excessive" demand depends on the underlying distribution of health care costs, unless precise estimates of that distribution are acquired the resulting threshold will always be an approximation. Third, present value estimates of the economic burden of illness are limited by the available literature and the sophistication in the modeling of the underlying health conditions. This is also true in the context of HIV and is crucially dependent not just on the unit cost of specific CD4 cell count health states, but also in the transition from one health state to another. We should never forget that the estimates reported herein are just point estimates, and furthermore, are dependent on current medical practices in the settings that yielded the original data. Fourth, in order to engineer an assessment of which HIV-positive individuals would be deemed to be medically inadmissible, consideration of the trajectory of costs for both HIV-positive individuals and those for Canadians were converted to present value terms for particular assessment horizons. Variation in underlying assumptions concerning discounting practices, disease progression and relative rates of mortality influence the findings and should be considered in a comprehensive assessment of current policy. Finally, in order to have a balanced assessment of the costs and contributions of a prospective immigrant, the economic contribution of a new immigrant in terms of tax revenues generated from

earned income is estimated; however, such estimates reflect only a specific type of monetary contributions and even then only a subset of such contributions.

Notwithstanding the limitations, four substantive findings are offered in this paper. First, the current cost threshold used by CIC in assessing whether an applicant is likely to pose "excessive" demand on Canadian health or social services is too low. A statistically more appropriate threshold is three-fold greater at $14,581.43. Second, there is a close relationship between disease progression (measured by CD4 cell counts) and health care costs, with annual costs increasing from under C$8,000 for CD4 >500 cells/mm^3 to over C$35,000 for CD4 <100 cells/mm^3. Third, application of these cost estimates to a revised cost threshold for inadmissibility indicates that classification depends on individual characteristics, including age, sex and baseline CD4 cell count as well as on the time horizon over which each applicant's projected demand for health or social services is assessed. "Excessive" demand is more likely to occur for applicants with low CD4 cell counts and a shorter time horizon for assessment (i.e., 5-years versus their lifetime). Women and younger applicants are slightly more likely to be deemed inadmissible than men and older immigration applicants. Finally, estimates of the economic contributions of new immigrants to the public treasury through taxes paid on labour market earnings are substantial, and often exceed estimates of their health care costs. These economic contributions are dependent on the age, sex, and region of origin of prospective immigrants as well as on other conventional determinants. Exclusive focus on the health care costs of prospective immigrants without consideration of the economic contributions (albeit measured in tax revenue terms) yields an incomplete evaluation of immigrants

Our findings suggest that the adjudication guidelines and policies used by CIC warrant urgent review so that they are informed by the existing clinical, epidemiological and economics evidence, and that they conform to an appropriate statistical interpretation of "excessive" demand. In the absence of this review, current policy results in immigration denial on medical inadmissibility grounds and the consequent loss to Canadian society of some gifted individuals.

9.0 References:

Ahmad, Khabir. "Foreign Nationals with HIV Face Deportation From the UK." <u>Lancet Infectious Disease</u> 6 (2006): 399. July 2006 <http://infection.thelancet.com>.

Allen, Tim, and Alan Thomas. <u>Poverty and Development Into the 21st Century</u>. New York: Oxford UP, 2000.

"Asylum Law Basics – Brief History of Lesbian, Gay, Bisexual, Transgender and HIV (LGBT/H Asylum) Law." <u>Immigration Equality</u>. 2005. Immigration Equality. 14 Apr. 2008 <http://www.immigrationequality.org/manual_template.php?id=1064>.

Baker, M. and D. Benjamin, "The Performance of Immigrants in the Canadian Labour Market", <u>Journal of Labor Economics</u>, 12 July 1994, 369-405.

Basuyau, F, V Josset, V Merle, and P Cznernichow. "Case Fatality and Health Care Costs in HIV-Infected Patients: Evolution From 1992 to 2000 in Rouen University Hospital in France." <u>International Journal of STD & AIDS</u> 15 (2004): 679-684.

Battista, Michael. Personal Interview. 10 Mar. 2008.

Beck, Eduard J., Alec H. Miners, and Keith Tolley. "The Cost of HIV Treatment and Care: a Global Review." <u>Pharmacoeconomics</u> 19 (2001): 13-39.

Bernstein M. Daniel, Vishal Trivedi, and Cecilia Volk. <u>HIV and Lawful Permanent Residency: An Analysis of the HIV Bar, Waivers and Prospects for Change</u>. Gay Men's Health Crisis Inc. GMHC, 1999. 1-21.

Bertha President Bradford V. the Minister of Citizenship and Immigration. No. IMM 6110-06. Federal Court. 29 Oct. 2007.

Bloom, D. and M. Gunderson, "An Analysis of the Earnings of Canadian Immigrants". In <u>Trade and the Labor Market</u>, edited by John M. Abowd and Richard B. Freeman. Chicago: University of Chicago Press, 1991.

Borjas, G. " Assimilation, Changes in Cohort Quality and the Earnings of Immigrants", <u>Journal of Labor Economics</u>, 3 July 1985, 463-89.

Boulos, D, P Yan, D Schanzer, R S. Remis, and C P. Archibald. <u>Canada Communicable Disease Report 2006</u>. Public Health Agency of Canada. Ottawa: Government of Canada, 2006. 165-176.

Bozette, Samuel A., Geoffrey Joyce, Daniel F. McCaffrey, Arleen A. Leibowitz, and et al. "Expenditures for the Care of HIV-Infected Patients in the Era of Highly Active Antiretroviral Therapy." <u>New England Journal of Medicine</u> 344 (2001): 817-824.

Briggs A, Gray A. The distribution of health care costs and their statistical analysis for economic evaluation. <u>J Health Services Res Pol</u> 1998; 3(4):233–245.

Canadian Institute for Health Information: <u>National Health Expenditure Trends, 1975-2007</u>. Canadian Institute for Health Information: Ottawa, 2007.

Chen, Ray Y., Neil A. Accortt, Andrew O. Westfall, Michael J. Mugavero, James L. Raper, Gretchen A. Cloud, Beth K. Stone, Jerome Carter, Stephanie Call, Maria Pisu, Jeroan Allison, and Michael S. Saag. "Distribution of Health Expenditures for HIV-Infected Patients." <u>Clinical Infectious Diseases</u> (2006): 1003-1010.

"Countries and Their Entry Restrictions." <u>AIDSmap Living with HIV</u>. 2008.AIDSmap. 14 Apr. 2008 <http://www.aidsmap.com/en/docs/C92D5639-E779-44EC-B8F8-0CECCC23275A.asp>.

Diehr P, Yanez D, Ash A, Hornbrook M, Lin DY: Methods for analyzing health care utilization and costs. <u>Annu Rev Public Health</u> 1999; 20:125–44.

Drummond ME, O'Brien BJ, Stoddart GL, Torrance GW: <u>Methods for the Economic Evaluation of Health Care Programmes</u> Second Edition, Oxford University Press: Oxford), 1997.

Elliott, Richard, and David Garmaise. "Canada's Immigration Policy as It Affects People Living with HIV." <u>Canadian HIV Legal Network</u>. Feb. 2007. 14 Apr. 2008 <http://www.aidslaw.ca>.

"Equality Rights." <u>Canadian Charter of Rights and Freedoms</u>. 1982. Government of Canada. 14 Apr. 2008 <http://laws.justice.gc.ca/en/Charter/index.html#egalite>.

"Estimates of the Number of People Living with HIV in Canada, 2005." <u>Public Health Agency of Canada</u>. 2005. Government of Canada. 14 Apr. 2008 <www.phac-aspc.gc.ca/media/nr-rp/2006/20060731-hiv-vih-eng.php>.

Evans RG, Lomas J, Barer ML et al.: Controlling Health Expenditures: The Canadian Reality. <u>New England Journal of Medicine</u> 1989; 320:9, 571-577

Fisher RA: <u>Statistical Methods for Research Workers</u>. Oliver and Boyd: Edinburgh, 1925

Fryback DG, Chinnis JO Jr, Ulvila JW. Bayesian cost-effectiveness analysis. An example using the GUSTO trial. <u>Int J Technol Assess Health Care</u>. 2001; 17(1):83-97.

Gibson, Katie. "UK: House of Lords Upholds Deportation Order." <u>HIV Policy & Law Review</u> 10 (2005). Aug. 2005 <http://www.aidslaw.ca/publications/publicationsdocEN.php?ref=224>.

Grant, M. "Evidence of New Immigrant Assimilation in Canada", <u>Canadian Journal of Economics</u>, 32 1999, pp. 930-955.

Hilewitz V. Minister of Citizenship and Immigration. Supreme Court of Canada. 21 Oct. 2005.

"HIV Manual 2004: Part 2 -Understanding the Impact of HIV on Immigration Status." <u>National Immigration Project</u>. 2004. National Lawyers Guild. 14 Apr. 2008 <http://www.nationalimmigrationproject.org/HIV/2004HIVManual/2004hivmanu al/page7.html>.

<u>HIV Epi Update 2007</u>. Public Health Agency of Canada. Ottawa: Government of Canada, 2007. 1-140.

Humanitarian and Compassionate Decision. Case Review. Citizenship and Immigration Canada. 19 Jan. 2007.

Humanitarian and Compassionate Decision. Case Review. Citizenship and Immigration Canada. 28 July. 2006.

"Immigration and Refugee Protection Act" Section 38(2). 2001. Department of Justice Canada. 14 Apr. 2008 <http://laws.justice.gc.ca>.

Krentz HB, Gill MJ: Cost of medical care for HIV-infected patients within a regional population from 1997 to 2006. <u>HIV Medicine</u> 9 (2008): 721-730.

Levy, Adrian R., Douglas James, Karissa M. Johnston, Robert S. Hogg, P R. Harrigan, Brian P. Harrigan, Boris Sobolev, and Julio S. Montaner. "The Direct Costs of HIV Care." <u>Lancet Infectious Diseases</u> 6 (2006): 171-177.

Levy AR, Annemans L, Tramarin A, Montaner JS: The impact of disease progression on direct medical costs of treating persons with HIV: a review of the international literature. <u>Pharmaco-economics</u>, forthcoming, 2009

Milligan, Kevin (2008), <u>Canadian Tax and Credit Simulator</u>. Database, software and documentation, Version 2008-1.

Mocroft, A, A Monforte, O Kirk, M A. Johnson, N Friis-Moller, D Banhegyi, A Blaxhult, F Mulcahy, J M. Gatell, and J D. Lundgren. "Changes in Hospital Admissions Across Europe: 1995-2003." <u>HIV Medicine</u> 5 (2004): 437-447.

Nixon RM, Thompson SG. Parametric modeling of cost data in medical studies. <u>Stat Med</u>. 2004; 23(8):1311-31.

"Number of HIV Positive Immigrants to Canada Triples in One Year, Immigration Department Says." <u>The Henry Kaiser Family Foundation</u>. 14 May 2004. 14 Apr. 2008 <http://www.kaisernetwork.org/daily_reports/rep_index.cfm? DR_ID=23718>.

Olsen, Jan, Louise Nordstrom, Mike Corder "Sweden Keeps Doors, Minds Open to Immigrants." <u>International Herald Tribune:Europe</u>. 27 Dec. 2006. International Herald Tribune. 14 Apr. 2008.
http://www.iht.com/articles/ap/2006/12/27/europe/EU_GEN_Welcome_to_Sweden.php.

<u>Operational Processing Instruction 2002-2004</u>. Citizenship and Immigration Canada. Ottawa: Government of Canada, 2002. 1-7.

Pembrey, Graham. "AIDS in the UK." <u>Averting HIV</u>. 9 May 2008. AVERT.org. 15 Apr. 2008 <http://www.avert.org/aidsuk.htm>.

Pincock, Stephen. "Australia Seeks Ban on HIV+ Immigrants." <u>The Scientist</u>. 7 June 2007. The Scientist Magazine. 14 Apr. 2008 <http://www.thescientist.com/news/home/53273/>.

<u>Recent Changes to Visitor Visa Process Affecting Entry Into Canada for People Living with HIV</u>. XVI International AIDS Conference. Toronto: Canadian HIV Legal Network, 2005. 1-3.

Roberts, Rebecca R., Linda M. Kampe, Martha Hammerman, R D. Scott, T Soto, and T Ciavarella. "The Cost of Care for Patients with HIV From the Provider Economic Perspective." <u>AIDS Patient Care and STDs</u> 20 (2006): 876-886.

Sadoway, Geraldine. Personal interview. 29 Feb. 2008.

Sighem, A, Sven D, Azra C, Luuk G, Roy A, Frank de W. Mortality in patients with successful initial response to highly active antiretroviral therapy is still higher than in non-HIV-infected individuals. <u>Journal of AIDS</u> 2005; 40(2):212-8.

Statistics Canada: Canadian Life Tables, Ottawa: 2007. http://www.statcan.ca/english/freepub/84-537-XIE/tables.htm, Last accessed February 8, 2007.

Sypsa V, Touloumi G, Karafoulidou A, Hatzakis A. Comparison of smoothing techniques for CD4 data in a Markov model with states defined by CD4: an example on the estimation of the HIV incubation time distribution. <u>Statist. Med</u>. 2001; 20:3667–3676.

<u>Temporary Residency Permits</u>. Citizenship and Immigration Canada. Ottawa: Government of Canada, 2007. 1-54.

"UNAIDS." <u>Joint United Nations Program on HIV</u>. 2007. United Nations. 14 Apr. 2008 <http://www.unaids.org>.

UNGASS Country Progress Report. Government of Canada. Ottawa, 2007. 1-31.

Vayda E, Deber RB.: The Canadian Health Care System: An Overview. Social Science and Medicine 1984; 3: 191-197.

Weissner, P, K Lemmen, and D Haerry. "Travel and Residency Restrictions for People Living with HIV - Legal Discrimination, Recent Developments." German AIDS Federation. International Conference on AIDS. Bangkok, Thailand. 11-16 July 2004.

Wojcik, Nadine. "Deportation Despite AIDS? German Laws Have No Clear Answer." Deutsche Welle. 28 July 2007. Deutsche Welle World. 21 Apr. 2008 <http://www.dw-world.de/dw/article/0,2144,2703780,00.html>.

World Health Organization. "Worldwide HIV Statistics." Avert. 2007. AVERT.Org. 14 Apr. 2008 <http://www.avert.org/worldstats.htm>.