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The Healthy Immigrant Effect and Immigrant Selection: Evidence from Four Countries

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SEDAP Research Paper No. 164

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THE HEALTHY IMMIGRANT EFFECT AND IMMIGRANT SELECTION: EVIDENCE FROM FOUR COUNTRIES[#]

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Abstract

The existence of a healthy immigrant effect – where immigrants are on average healthier than the native-born – is now a well accepted phenomenon. There are many competing explanations for this phenomenon including health screening by recipient countries, healthy behaviour prior to migration followed by the steady adoption of new country (less) healthy behaviours, and immigrant self-selection where healthier and wealthier people tend to be migrants. We explore the last two of these explanations for the healthy immigrant effect by examining the health outcomes, health behaviours, and socio-economic characteristics of immigrants from a range of source countries in the US, Canada, UK and Australia. We find evidence of strong positive selection effects for immigrants from all regions of origin in terms of education. However, we also find evidence that self-selection in terms of unobservable factors is an important determinant of the better health of recent immigrants.

Keywords: immigrant health, selection effects, smoking, obesity

JEL: I12, I00, J61

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Résumé

L'existence d'un « effet de l'immigrant en bonne santé » - où les immigrants sont en moyenne en meilleure santé que la population autochtone - est maintenant un phénomène bien accepté. Plusieurs explications concurrentes ont été avancées pour expliquer ce phénomène comme l'existence de programmes de dépistage systématique des pays d'accueil, de saines habitudes de vie avant la migration suivie de l'adoption progressive des nouveaux comportements (moins) sains du pays d'accueil, et l'autosélection des immigrants où les personnes en meilleure santé et en moyenne plus riches tendent davantage à devenir des migrants. Afin d'expliquer l'effet de l'immigrant en bonne santé, nous explorons les deux dernières hypothèses en examinant les résultats sur la santé, des comportements liés à la santé, et des caractéristiques socio-économiques des immigrants provenant d'un large échantillon de pays d'origine aux Etats-Unis, au Canada, au Royaume Unis et en Australie. Nous trouvons un effet de sélection positif important parmi les immigrants de toutes régions d'origine en termes d'éducation. Cependant, nous trouvons également que l'autosélection fondée sur des caractéristiques non observables est une déterminante importante de la meilleure santé des immigrants récents.

THE HEALTHY IMMIGRANT EFFECT AND IMMIGRANT SELECTION: EVIDENCE FROM FOUR COUNTRIES

INTRODUCTION

It is now well accepted that new immigrants to developed countries such as the US, Canada, and Australia enjoy significant health advantages relative to comparable native-born populations in these countries.[1] The relatively good health of recent immigrants to developed countries has come to be known as the 'healthy immigrant effect' (HIE). The HIE or 'health gap' is present even though a majority of immigrants come from developing countries where mortality and morbidity indicators are worse than the developed countries to which they are migrating.[2] There is also evidence that the gap is not due to differences between immigrants and the native-born in terms of observable socio-economic factors such as education and income.

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[1] For Canada, see Perez (2002), Newbold and Danforth (2003), Deri (2005), McDonald and Kennedy (2004), Ng. et.al. (2005) and Wu and Schimmele (2005). Biddle, Kennedy and McDonald (2006) document a healthy immigrant effect for immigrants to Australia, while Singh and Siahpush (2002), Jasso et.al. (2004) and Antecol and Bedard (2006) do so for immigrants to the US. The evidence for the healthy immigrant effect (HIE) is not unanimous however, and has been found to be sensitive to how physical health is measured. McDonald and Kennedy (2004) and Newbold (2005) find mixed evidence for the HIE in terms of self-assessed health status and the probability that an individual rates his or her health as 'fair' or 'poor'.

[2] Equally notable is the finding that the health gap narrows significantly with additional years in the new country, suggesting that immigrants' health is deteriorating over time relative to their native-born peers. The decline in health with years in countries such as Canada and Australia has been attributed to persistent barriers to access of health services, improved use of diagnostic services, environmental factors, and acculturation and the adoption of native-born behaviours relevant to health (including diet, physical activity, smoking and alcohol). This paper focuses on examining the initial health gap between immigrants and the native-born. See McDonald and Kennedy (2004) and Biddle, Kennedy and McDonald (2006) for a discussion of immigrant health trajectories following migration.

Despite the attention that the HIE has received in the literature, there has been little formal research that has sought to identify and disentangle potential reasons for the observed health gap, though a range of explanations have been cited. These include health screening by immigration officers, relatively healthier behaviours of new immigrants prior to migration, and immigrant self-selection whereby the healthiest and wealthiest individuals are the people most likely to migrate.

Understanding the factors that underpin the HIE is an issue of great interest and importance for policymakers and health practitioners. The health of a country's immigrants can figure prominently in the direct costs borne by the citizens of that country through public funding of the health system. Just as importantly, an immigrant's health will substantially affect the process through which he or she adjusts to the labour market and contributes to the economy of the new country of residence. Further, the determination of factors that contribute to good health at migration could yield valuable lessons about how the health and well-being of all of the recipient country's residents could be improved.

The main objective of this paper is to gain a better understanding of the factors that underpin the physical health of immigrants on arrival in their new country. We begin by describing three models that might explain the existence of a HIE. Then after describing the data upon which our analysis is based, we proceed by documenting, comparing and analysing the health profiles, health behaviours, and socio-economic characteristics of recent immigrants who have been in their new country for 10 years or less. This is done for immigrants from a range of source countries in four of the most important immigrant-receiving countries – the US, Canada, the UK, and Australia. We are particularly interested in two dimensions: 1) how the health of

immigrants from a particular source country or region varies across these immigrant recipient countries, and 2) how immigrant health compares to the health of non-immigrant residents of the same source country. This latter comparison is mainly done for immigrants from the US, Canada, UK and Australia owing to the availability of data on their non-immigrant populations, although we make some more limited comparisons of the health and health behaviours of immigrants from developing countries with their home countries. We also consider differences in estimated education-health gradients among immigrant and non-immigrant groups across our four destination countries in order to compare how the immigrant health gap varies by educational attainment. We conclude with a discussion of the insights our analysis generates into the alternative theories of the HIE and, more broadly, some of the drivers of immigrant health.

MODELS OF THE HEALTHY IMMIGRANT EFFECT

Three main explanations for an immigrant health gap on arrival in the host country have been advanced in the literature: health screening by host country authorities prior to migration, favorable habits and behaviours of individuals in the home country prior to migration, and immigrant self-selection whereby the healthiest and wealthiest source country residents are most likely to have the financial and physical means to migrate. Some recent literature suggests that host country health screening is not likely to be the principal determinant of the health gap. For example, Laroche (2000) reports that the percentage of applicants to Canada that are rejected on health grounds is very low. Uitenbroek and Verhoeff (2002) find that an explanation

based on selection by authorities 'is not convincing', in their study of the mortality of Mediterranean immigrants in Amsterdam.

The second theory is that favorable habits and behaviours in the home country prior to migration lead to potential immigrants who are relatively healthier than the average person in the recipient country. For example, if the source country is a developing country, typical pre-migration lifestyle might have involved high levels of physical activity and low fat/low calorie diets. These behaviours are more conducive to general good health, ceteris paribus. Thus, immigrants from developing countries who migrate to a developed country such as Canada enjoy 'the best of both worlds' (Powles, 1990, Khlat and Darmon, 2003) – both the favorable habits of their country of origin and the efficiency of the health care system in the host country.[3]

There is a large literature on this issue, with an important early paper being the research by Marmot and Syme (1976) on Japanese immigrants. Beneficial health behaviours are often cited as an explanation for the so-called 'Hispanic paradox', whereby when compared to non-Hispanic Whites, Hispanics in the US are poorer and less-educated but still have lower all-cause mortality rates. Khlat and Darmon (2003) cite similar results for Mediterranean immigrants to France and Germany. Further, Abraido-Lanza et.al. (1999) find that there may be a potentially important role for

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[3] This theory also leads to an explanation for why the health advantage is lost with years in the host country. A process of acculturation may mean that immigrants gradually adopt 'Western' habits and lifestyle – in terms of activity levels, diet, and consumption of alcohol and tobacco – that are deleterious to continued good health. There is a large body of literature on acculturation and health among immigrants and minority groups (see Beiser *et.al*.,1997, and Salant and Lauderdale, 2003, for recent surveys), and some research indicates convergence in certain health behaviours to native-born levels. For example, McDonald and Kennedy (2005) find that for most immigrants to Canada, the probability of being overweight or (for women) obese is lower on arrival than for comparable native-born Canadians, but increases gradually with additional years in their new country and meets or exceeds native-born levels after approximately 20-30 years in Canada. Antecol and Bedard (2006) find similar patterns for immigrants to the United States. For additional Canadian evidence on overweight/obesity, see Cairney and Ostbye (1999) and Perez (2002).

cultural factors involving favourable health behaviours to explain the immigrant health gap.

Given higher mortality rates in most immigrant source countries, for beneficial health behaviours to impart a health benefit *in the absence of selection effects*, it would be expected that, for younger age groups, source country health indices are better than recipient country indices. As well, the source country (developing country) lifestyle should eventually lead to poorer health outcomes – physical work takes its toll, longer term exposure to health risks in manual and/or risky employment, longer term health consequences of deficient pre/neo-natal care and childhood nutrition etc. – so that the age-health gradient would be significantly steeper in source countries than recipient countries. Razum and Twardella (2002) note that first generation immigrants on arrival in the host country may experience a lower mortality than the host population from conditions that take many years to develop, such as heart disease. Similarly, greater incidence of conditions that are associated with childhood deprivation, e.g., stomach cancer and stroke, may also only appear many years after immigration. This discussion suggests that age at migration should be an important element for consideration.

Furthermore, for developed countries, in particular the English-speaking countries of the UK, US, Australia, NZ and Canada, home country health behaviours on average would be similar. Thus, if it is a source country health behaviour

explanation that underlies the health gap, we would expect to observe a smaller (or negligible) gap for recent immigrants from culturally similar countries.[4]

The third theory is based on the notion of immigrant self-selection: the positive health gap between recent immigrants to a country and the native-born residents of that country arises from the fact that immigrants are self-selected to be both healthy and to have the financial means to migrate.[5] This theory takes as given the strong positive relationship between income and health that has been conclusively documented in the literature. In terms of approach, Jasso et.al. (2004) and others argue that the appropriate comparison with which to gauge the HIE is between immigrants and 'similar' people in the source countries, not native-born people from the host countries. Immigrant self-selection means that prospective migrants would be more likely to be at the high end of the income (and so health) distribution in their home countries. Their better health would be expected to arise from better diets, better access to clean water and sanitation, less exposure to environmental risks and better child/maternal healthcare. In addition, those individuals most likely to migrate might be those who are most forward-looking, suggesting a lower discount rate. Forward looking behaviour might mean current behavioural choices that emphasize future health at the expense of current time/effort, and these people might also be most likely to make an investment in migration that increases the future return to their human

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[4] However, there are exceptions for other developed countries, such as the so-called French and Mediterranean paradoxes.

[5] Jasso et.al. (2004) set out a theoretical model of immigrant self-selection effects in terms of health and attempt to gauge the extent to which the self-selection of healthy immigrants to the US is an explanation for the observed health gap between recent immigrants to the US and native-born Americans. They find evidence of positive self-selection in terms of health status though with substantial variation by source country. Swallen (1997) finds lower mortality rates among immigrants to the US compared with mortality rates of non-immigrants in their respective home countries.

capital. Thus, potential immigrants may also have healthier than average behaviours in their home countries.

In its simplest form, the HIE suggests that self-selection should be present for immigrants but not native-born persons of the same minority. Thus, for example, the Hispanic paradox should not be present for native-born Hispanics. As well, if immigrants are self-selected from the top of the income and health distributions, both foreign-born Hispanics and foreign-born non-Hispanic whites should display positive selection effects. However, Razum et.al. (1998) note that the lower mortality rates of Turkish residents in Germany last for decades and also persist into the second generation of German-born Turks. As well, Abraido-Lanza et.al. (1999) argue that the marked differences in immigrants' relative health gap by source country are evidence against the basic self-selection theory.[6]

A number of authors have advanced theoretical models of immigrant self-selection, typically in terms of selection effects on labour market outcomes and not specifically for health. One of the best known models is outlined in Borjas (1987) who argues that in poor countries where the returns to education and the dispersion of wages are thought to be relatively high, those with the greatest incentive to migrate to the US will be individuals with below-average skill levels in their home countries. In other rich countries, where returns to education and wage dispersion are thought to be relatively low, those with the greatest incentive to migrate will be individuals with

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[6] Another explanation cited in the literature to explain immigrant self-selection has been termed the 'salmon bias' hypothesis of return migration whereby economically unsuccessful (and so presumably less healthy) immigrants are more likely to return to their country of origin. However, Abraido-Lanza et.al. (1999) and Razum et.al. (2000) find no evidence of this hypothesis for Hispanics in the US or for Turkish immigrants in Germany, respectively. Further, if this thesis was correct, then one would expect immigrant health to improve relative to native-born individuals with additional years in the new country, a prediction not in evidence in the literature.

above-average skill. Chiquiar and Hanson (2002) follow Borjas but allow migration costs to decrease with higher education levels, implying positive selection ceteris paribus. They find that Mexican immigrants, while less educated than the US born, are substantially more educated than native-born Mexicans – in contrast to predictions of the Borjas model.

Jasso et.al. (2004) adapt a basic model of migration to health and argue that self selection suggests that countries with higher skill prices will send fewer but more highly skilled immigrants. In terms of health, the magnitude of health selection will be negatively related to health levels in the sending countries. Countries with high output per worker and low average schooling levels are predicted to supply the healthiest immigrants, after controlling for own schooling levels. The authors find empirical support for their model and the prediction that immigrants from countries with high skill prices (high GDP per capita for a given stock of skills) will be both more skilled and healthier

Closely related to the idea of self-selection is the role that immigration policy plays in determining who migrates. As discussed above, few immigrants are denied entry to destination countries on the basis of poor health. However, most immigrant destination countries actively court highly skilled immigrants. For example, Canada and Australia both attempt to attract younger and more educated immigrants via a skilled immigrant intake based on a points system that explicitly considers age, education level and language fluency. The US accepts significant numbers of immigrants on the basis of education and skills that are in high demand in the US economy. Positive selection by immigration authorities means that better educated and skilled immigrants gain entry, and may also induce positive self-selection to

apply for migration by individuals who believe they have the greatest chance of gaining entry. (See Aydemir, 2004, for a formal model of these stages of immigrant selection.)

While the theory of self-selection might explain a health gap between recently arrived immigrants and the native-born it does not explain the subsequent decline in immigrant health that is another important feature of the HIE. Two other possible explanations for the HIE have been discussed in the literature which can explain an initial gap and subsequent decline in health. Jasso et.al. (2004) point out that reporting bias – in which recent immigrants understate the incidence of certain chronic conditions, either because of differences in perception or because such conditions have not yet been diagnosed - can give rise to the appearance of a healthy immigrant effect. However, they report that their results are robust to these considerations. Similarly, language or income constraints might inhibit the use of preventative health services, in turn contributing to worsening health over time. McDonald and Kennedy (2004) provide some evidence against this hypothesis by demonstrating that the use of basic health services among recent immigrants to Canada converges fairly rapidly to native-born levels.[7] Although the focus of this paper is on the health of recent immigrants and not on its subsequent time path, data issues (outlined below) mean it is still necessary to include variables for years since migration in our regression analysis in order to control for changes in immigrant health with years in the destination country.

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[7] Social/cultural barriers may still play a role, however. For example, there are persistent and significant differences in the use of cancer screening among immigrant women from certain ethnic groups (see for example, Raja-Jones, 1999, Juon et.al., 2003, and McDonald and Kennedy, 2006).

The various explanations for the immigrant health gap are not necessarily mutually exclusive and the problem for the empirical analysis is to disentangle these effects. Our empirical analysis is guided by the (sometimes conflicting) predictions of the theories discussed earlier. For example, differences in mean characteristics between source and target countries might be more reflective of differences in source country lifestyle factors, particularly if the differences are age-specific. Analysis on how immigrants compare in terms of health and socio-economic characteristics, with their home countries might be more reflective of selection effects.

DATA AND METHODS

The data used in this paper are drawn primarily from pooled national cross-sectional individual datasets for each of our four main immigrant recipient countries of interest (augmented by some selected aggregate level data for a range of source countries). The core datasets are the following: for the US, consecutive cross-sections of National Health Institutes Survey (NHIS) data from 2000-05 inclusive; for Canada, the 1996-97 National Health Population Survey (NPHS) cross-sectional file and the 2000-01 and 2002-03 Canadian Community Health Survey (CCHS) cross-sectional files; and for Australia, the National Health Surveys (NHS) from 1995 and 2001. For the UK there are two alternative sources of data: consecutive cross-sections of the General Household Survey (GHS) from 2000-01 to 2004-05 inclusive, and pooled cross-sections of data from the 1999 and 2004 waves of the Health Survey for England (HSE). Specific details of each dataset are contained in the appendix, and include discussion of the strengths and limitations of particular surveys, comparability issues across surveys for a particular country, and justification for why particular years have been used.

For our working datasets for each country, samples are restricted to native-born people aged 21 to 65 years and immigrants aged 21 to 65 years who arrived in their destination country within 10 years of the survey date. (The average length of stay for immigrants in each case is around 5 years.) In order to avoid the differential effects of time in the destination country on the health outcomes of particular immigrants, our sample ideally would have been limited to very recent immigrants as that would best capture immigrant health status and health behaviors 'on arrival' (though it might also amplify the effect of short-term barriers to the adjustment of new immigrants to a new health system). However, given sample size restrictions, we focus on relatively recent immigrant arrivals and control for years since migration in our regression analysis. The pooled sample sizes of recent immigrants and (for comparison) native-born individuals for the four destination countries are as follows: the US 121 003, Canada 179 136, for the UK GHS 45 959, for the UK HSE 11 217, and for Australia 25 200.

For each individual, we analyze information on demographic and socio-economic factors, health outcomes, health behaviors, and immigrant characteristics if relevant. In defining particular variables for analysis, we have attempted to maintain as much consistency as possible across the four country data sets. Maintaining consistency implies two limitations: first, some of our variables, including region of origin, must be categorized more broadly than is optimal; and second, certain health conditions and health behaviors must be omitted from consideration because a reasonably consistent definition across countries is not possible.

We measure health status in two main ways: self-reports of chronic conditions and self-reports of the general status of one's health. For the presence of chronic

conditions, we define a variable that takes a value one if the respondent reports suffering from any of the following conditions: cancer, heart disease (including coronary heart disease, angina, heart attack and other diseases of the heart), diabetes, ulcer, arthritis, hypertension, bronchitis/emphysema, asthma, and hay fever (non-food allergies in Canada). Since hay fever is not defined consistently for Canada, we define another indicator that excludes hay fever from the US, UK and Australian data and non-food allergies from the Canadian data. We also define an indicator variable for a narrower set of relatively serious chronic conditions including cancer, heart disease and diabetes, which we term serious chronic conditions.[8]

While reasonably consistently defined across countries, an important difference in how information on chronic conditions is collected arises with the UK data. In the US, Canada and Australia, the surveys ask individuals whether they have been diagnosed with a particular condition by a health care professional, for a given list of chronic conditions. For both UK data sets, however, individuals are asked to name up to six chronic conditions that they have suffered or are suffering from. Thus, without prompting, people might be less likely to report having a condition and partly for this reason, chronic condition incidence rates appear to be significantly lower for the UK compared with other countries.

For self assessed health status, there are also differences between the UK and the other countries. Self-assessed health in the US, Canada, and Australia is based on a five point scale: poor, fair, good, very good and excellent. For the UK GHS, self assessed health status is measured on a 3 point scale: poor, fair, and good, while for

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[8] This terminology is used for convenience and is not meant to imply that the other chronic conditions considered are not serious in a medical sense.

the HSE, self-assessed health is based on a five point scale: very poor, poor, fair, good, very good. For ease of comparison we adopt the approach of defining two indicators for self assessed health. The first is a binary indicator variable for people in 'better' health, defined to be the top two categories where there is a five point scale and the top category where there is a three point scale. Similarly, we define an indicator variable for 'worse' health that is the bottom two categories where there is a five point scale and the bottom category where there is a three point scale.

Our three measures of health behaviours are the incidence of obesity, whether a person smokes cigarettes every day, and whether a person has ever smoked cigarettes every day. Obesity data are only available for the UK HSEs and not for the UK GHSs, but these variables are otherwise consistently defined across the surveys. Unfortunately, it was not possible to define a consistent measure of current or past heavy alcohol consumption.

Measures of personal characteristics include age, gender, marital status and education. For ease of comparison and because of sample size considerations, we aggregate individuals into one of two education categories – those with a university degree or better, and those without a university degree. For immigrants, we also have data on years since arrival that is continuous in the Canadian, UK and Australian surveys and in five-year intervals in the US surveys.

Given the importance of region of origin to our analysis, we have sought to use regions of origin that are as narrowly defined as possible while at the same time ensuring that they are consistently defined across the four destination countries and preserve the anonymity of respondents with cells of sufficient sample size. The regions that are consistently defined across the four destination countries (with some

exceptions) are East Asia, South Asia including India, India only, Middle East and West Asia, Continental Africa, Continental Europe, UK and Ireland, USA, and other English-speaking primarily white countries (Canada, Australia and New Zealand). East Asia, India and Continental Europe are important source regions for recent immigrants, though not surprisingly there is substantial variation across destination countries in the composition of recent immigrants by source region. Summary statistics of the composition of recent immigrants by region of origin are reported in Table 1.

RESULTS

We begin this section by presenting descriptive statistics on the health outcomes and health behaviours of immigrants and native-born individuals by both origin and destination countries. Specifically, the health of immigrants from each region of origin in each of the four countries of interest are compared to 1) native-born residents of the host country; 2) immigrants from the same region of origin in each of the other three destination countries; and 3) immigrants from other source regions in the same destination country. These results will help to benchmark the existence and magnitude of the immigrant health gap and will lay the foundation for the rest of the empirical analysis.

For those immigrants who originate in one of the main destination countries and move to another of these countries (e.g. US immigrants to Canada or UK immigrants to Australia), benchmarking immigrant outcomes to outcomes of the home country population is particularly instructive. Since culture, language, socio-economic profile and health/medical technologies in home and destination countries are similar, and since it is possible to compare the health of native-born residents of a

country with individuals who chose to emigrate from that country, such a comparison provides some direct evidence of the degree of self-selection of immigrants. In the case of immigrants from other regions of the world, differences in outcomes across our four countries of interest may also be reflective of differences in the degree of immigrant selection, as well as other factors such as the presence in the destination country of established communities of ethnic minorities from the same region of origin.[9]

Measures of health

Charts 1 to 6 show the results for immigrants and the native-born for three measures of health – chronic conditions, serious chronic conditions and the proportion of people in 'better' health. In each destination country, the proportion of immigrants with a chronic condition is less than for the native-born. This is not only true of all immigrants as one group but also of each region of origin, with the exception of US immigrants to Canada. Among the source countries that are developing countries, there is relative little variation in the incidence of chronic conditions among immigrants and this is true in all four destination countries. However, for immigrants from developed countries there is more variation, and immigrants from English-speaking countries tend to have incidences of chronic conditions closer to native-born levels, in particular, Canadians and Australians who have migrated to the US, Americans who have migrated to Canada and Britons who have migrated to Australia.

The results for serious chronic conditions are similar to those for chronic conditions although the differences between the native- and foreign-born are much

[9] All descriptive statistics and regression results are generated using the relevant population weights. All differences in proportions or means that are discussed are significantly significant at the 5 per cent level unless otherwise indicated.

less marked, particularly for destination countries Canada and the UK. The results for the US, and Australia to a lesser extent, still show substantial differences in the incidence of serious chronic disease for those immigrants from developing countries and the native-born.

For 'better' health (the self-assessed health status measure), there is considerably more variation than for the measures of chronic conditions but as was the case for chronic conditions, the foreign-born tend to report better health than the native-born. The only exception to this outcome is for immigrants to Canada where the native-born report 'better' health, although the difference is small. Though not reported, results for 'worse' health are more consistent with those for chronic conditions – native born residents of each destination country are more likely to have worse self assessed health than immigrants in those countries, both overall and for each group of immigrants by region of origin. There is no tendency for immigrants from developing countries to be in relatively better self assessed health than immigrants from developed countries.

In summary, the descriptive statistics for the three health measures show that the HIE is present in all four destination countries and is larger for immigrants from developing countries compared with those from developed countries. While overall levels of health vary across destination countries, how immigrant groups compare to their respective destination native-born counterparts is similar across destination countries.

Health behaviours

In Charts 7 to 12 we show results for the three sets of health behaviours, obesity, daily smoker and ever a daily smoker. As was found with the results for

chronic conditions, immigrants from developing countries have much lower incidences of obesity than the native-born in all four destination countries. However, there was more variation across developing countries for obesity than for chronic conditions, with immigrants from Asia having very low rates compared with all other immigrant groups. For immigrants from Africa there is more variation, with African residents of the UK having relatively high rates of obesity compared with African immigrants to other countries. Also notable is the fact that even with the high rate of obesity among native-born Americans, obesity rates among immigrants in the US are comparable to obesity rates among immigrants in other destination countries.

Among the developed countries, immigrants from the US were as or more obese than native-born Canadians and Australians (this difference is not statistically significant for Australia), and were close to UK native-born levels, although they still had lower obesity rates than the native-born in the US. As well, British immigrants in Australia and Canada were less likely to be obese than native-born Britons, and Canadian/Australian immigrants in the US were less likely to be obese than native-born Canadians and Australians. Immigrants from Europe consistently had low rates of obesity across the destination countries.

We obtain comparable results for daily smoking, with the general result that immigrants are less likely to smoke daily than the native-born. However, there are some strong country specific effects, with immigrants from Europe and the Middle East generally more likely to be daily smokers compared with other immigrants and in some cases the native-born (the Middle East for Australia and Europe for the UK). In terms of immigrants from the four destination countries, there is some evidence of selection effects, with immigrants from these countries less likely to smoke daily than

residents of their home country (the only exception being British immigrants in Australia.

To gain some additional insights into the extent of immigrant self-selection in terms of health behaviors, we use World Health Organization Data[10] to compare average smoking rates for developing countries with smoking rates among recent immigrants illustrated in Figures 7-12. Overall, average smoking rates among immigrants are substantially lower than for their respective home country peers. For example, average rates of daily smoking in China are 24%, in India 16%, in Egypt 29% and in Vietnam 27%.[11] All of these rates are considerably higher than are those for immigrants from these country areas, in all four destination countries.

The results for people who report that they were ever a daily smoker are quite similar to those who are currently a daily smoker. This suggests that lower currently daily smoking rates among immigrants are unlikely to have arisen from immigrants stopping daily smoking at immigration but rather reflect consistently lower smoking rates among these immigrants in their home countries.

Our results for health behaviours are consistent with the results for health measures, with recent immigrants likely to be healthier and exhibiting healthier behaviours. Moreover, the differences among immigrants from the four destination

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[10] Data on smoking rates by country are taken from *The World Tobacco Atlas* by J. MacKay and M. Eriksen, published in 2002 by The World Health Organization (www.who.int/tobacco)

[11] There are wide difference in smoking rates by gender in developing countries that are not apparent from these averages: for example, 4 per cent of females and 44 per cent of males were daily smokers in China; comparable figures for India are 4 per cent and 28 per cent, for Egypt 18 per cent and 40 per cent, and Vietnam 4 per cent and 51 per cent.

countries and those from developing countries strongly suggest the presence of immigrant selection effects.

Socioeconomic characteristics – education

Next we consider the extent to which we can identify the sources of immigrants' better health outcomes and healthier behaviours. Positive immigrant selection in terms of health can arise due to selection on observable characteristics such as age and education, as well as unobservable characteristics As discussed earlier, there are also reasons to expect that immigrants to countries with a large 'skilled' immigration intake will tend to be relatively better educated than their home country non-immigrant peers. In figures 13 and 14 we present the proportion of immigrants and native-born residents with at least a university degree, and the results are quite striking. In each destination country, the immigrants (overall and for every individual foreign-born group) are more likely to have university education than the developed country native-born, and these differences are all significant at the 5 per cent level except for African immigrants in the UK and Middle-Eastern immigrants in Australia. The most educated foreign-born are immigrants from both developing and developed source countries: Indian immigrants in the US, UK, and Australia; American immigrants in the UK, Australia and Canada; and Canadian/Australian immigrants in the US and UK.

Self selection on education is also readily apparent. Even though US native-born residents on average are the most educated of the four destination countries, immigrants from the US are even more highly educated. As well, immigrants from Britain are significantly more educated than UK native-born, and immigrants from Canada/Australia are more educated than their home-country native-born peers. This

immigrant selection effect is even more pronounced for developing countries where education levels are markedly lower. To illustrate, data on average years of education (Barro and Lee, 2000) for 2000 indicates that the native-born in India aged 25-64 years have an average number of years of education of 6.1 for men and 3.3 for women. Similarly, in China in 2000, the native-born have an average of 6.9 years of education for men and 4.5 years for women This compares with 11.5 and 11.4 years of education for men and women on average in Canada, 10.9 and 10.3 years in Australia, 12.3 and 12.2 years in the US, and 9.4 and 9.3 years in the UK.

Clearly, immigrants are self-selecting to migrate (and are also being selected by immigration authorities) on the basis of educational attainment, higher education levels may explain the observed differences in health outcomes and health behaviours of those immigrants. Immigrants are also younger on average than native-born residents of their respective destination countries, and this may also contribute to differences in health. In the next section, we examine the extent to which observable factors important to health, such as education, age, gender and marital status explain the observed differences in health outcomes and health behaviours. If differences remain after controlling for these factors, then that is evidence of immigrant self-selection but in terms of unobservable factors.

REGRESSION RESULTS

Our main regression approach involves estimating reduced form destination country-specific specifications separately for the native-born and for each group of immigrants defined by region of origin. Health status is expressed as a function of personal demographic and socio-economic characteristics (including age as a quadratic, education, gender and marital status) as well as the survey year, and years

since migration for the foreign-born. Using each set of regression results, we then calculate adjusted proportions for the various measures of health status and health behaviours by standardizing each immigrant and native-born group in each destination country to have the characteristics of the 'average' native-born Canadian. For immigrants, years since migration is set to 2.5. Thus, what we obtain are predicted health measures for each group that control for differences in observable characteristics that are likely important determinants of health. If there is no selection on unobservable factors, then we would not expect to see any significant differences in the standardized results. Also, by setting years since migration to a low value, we are controlling to some extent for acculturation effects that might affect health outcomes and behaviours. We estimate Logit models in Stata for each (dichotomous) measure of health and health behaviours. Full regression results are available from the authors on request.

Measures of health

For chronic conditions, standardizing immigrant proportions using native-born Canadian characteristics tend to diminish the health gap between particular immigrant groups and (standarized) native-born residents of the same destination country. However, immigrants still have a statistically significant lower incidence of chronic conditions and the patterns are generally comparable to those based on unadjusted data (see Charts 15 and 16). This suggests that the presence of positive self selection for immigrants cannot be fully explained by our education, age and other controls. The pattern of results for serious chronic conditions is similar to that for chronic conditions (see Charts 17 and 18) although, as with the descriptive statistics the differences are much smaller for serious chronic conditions. One exception to the

general result of a lower incidence among the foreign-born is in Australia, where immigrants from the UK, Africa and Middle East have marginally higher levels of serious chronic conditions than the Australian native-born after controlling for observable factors.

For the self assessed health status measure of ‘better’ health, results were similar to the unadjusted results. However, for immigrants from English-speaking countries self selection appears weaker with only US immigrants being in better health than the native-born after controlling for education and other factors.

Health behaviours

In the case of health behaviours, standardizing changes a number of results compared with the descriptive statistics. For example, after controlling for differences in education, age and other observable factors, immigrants from Africa are now more obese in Australia, UK and Canada. As well, immigrants from India have relatively high rates of obesity in the UK and Canada. That is, if immigrants from these regions had the same education and age as the average native-born Canadian, they would experience comparable rates of obesity. In other words, lower obesity rates appear to be due to the fact that such immigrants are younger on average and have higher education levels compared to native-born residents of the destination countries. In contrast, immigrants from East Asia continue to have much lower rates of obesity than the native-born in all destination countries after controlling for observable factors, and this is also the case for immigrants from continental Europe. The results for immigrants from English-speaking backgrounds are also mixed, with immigrants from the UK in Canada and those from the US in Australia having relatively high rates of obesity. However, even though the US has the highest rate of adult obesity of

the four destination countries considered, standardized obesity rates for US immigrants to Canada and for Canadian/Australian immigrants to the US are still relatively low.

For smoking, standardized native-born rates are higher than immigrant smoking rates in all four destination countries. Further, they are higher than the native-born for immigrants from each region/country with the exception of immigrants from Europe and the Middle East. Immigrants from these areas have higher rates of daily smoking even after controlling for socio-economic and demographic characteristics, although for other immigrant groups daily smoking rates remain significantly lower than native-born levels. The results are similar for those who had ever previously smoked daily.

Comparing education health gradients

Thus far, the analysis has focused on the health outcomes and health behaviours of, respectively, the average immigrant and native-born person, and a hypothetical person with a standardized set of observable characteristics. In this section, we explore the distribution of health outcomes and behaviours by educational attainment and how it varies across our various groups of immigrants and native-born people. We do this by estimating the health 'return' to having a degree relative to not having a degree, which we term the education health gradient. Using the regression results obtained for each group of immigrants and native-born for each destination country, we predict the health outcome or health behaviour for an average person but with a degree and the health outcome or behaviour for the same average person but without a degree. The difference in these predictions is our health gradient and can be interpreted as the proportional improvement (or deterioration) in the health measure

arising from having a university degree. Significant differences in education health gradients would also provide some evidence that differences in education levels and other observable factors are not sufficient to explain the immigrant health gap – that is, selection is occurring on unobservable characteristics.

Results are reported in Tables 2 and 3. Note that we report health gradients only for pooled immigrants by destination country. Other results based on estimated health gradients for particular immigrant groups are comparable, although gradients for a number of immigrant groups could not be estimated reliably owing to small sample sizes. As can be seen from the tables, the education health and health behaviours gradients are smaller for immigrants than for the native-born in each of the destination countries. That is, the health gap between people without a degree and people with a degree is narrower for immigrants in each destination country, and is often not significantly different from zero. This implies that less educated immigrants are relatively healthy, and that positive self selection for recent immigrants is present even for immigrants with relatively low levels of education.[12] Also notable is the result that education health gradients for the various measures of health outcomes and behaviours were reasonably similar for the native-born individuals in each destination country.

DISCUSSION

We establish that there is clear evidence of a healthy immigrant effect across all immigrant groups in each of our destination countries of interest – the US, the UK,

[12] This conclusion follows from the fact that if immigrants are in better health overall for a given education level and the education health gradient is significantly smaller than for native-born individuals, it must be the case that the less educated immigrants are in proportionately better health.

Canada, and Australia – in terms of both physical health and in terms of healthy behaviours. There is also evidence that the HIE is stronger for immigrants from developing countries than for those from developed countries. Certain health behaviours of immigrants from developing countries are superior to those of immigrants from developed countries, although evidence from other research (e.g., McDonald and Kennedy, 2005, Antecol and Bedard, 2006) suggests that there is some reduction in the gap the longer immigrants are exposed to their new environment. As well there is very significant evidence that immigrants from all regions are positively selected on the basis of educational attainment, and the most highly educated immigrants come from both developed and developing countries. However, this does not fully explain the HIE, since in general, this gap holds even after controlling for education, age and other characteristics. Comparing immigrants from the US, Canada, UK and Australia with their own native-born counterparts provides a more direct test of the immigrant selection hypothesis, and we find evidence that immigrants from developed countries also tend to be healthier than both the native-born in their new country as well as their source country or region of origin. This suggests that immigrant self-selection effects are important given the relatively small differences in the cultures and diets of the four destination countries examined in this study.

We also find significant evidence that education health gradients for immigrants are very small and in many cases not significantly different from zero, unlike the case for the native-born where there are large and highly significant education health gradients. This suggests that less educated immigrants are relatively healthy and importantly, that immigrant selection is occurring on other unobservable factors that are strongly related to health and health behaviours. Possible unobservable characteristics include the degree to which immigrants are forward looking and

therefore look after both their health and choose to migrate because of the potential higher returns to their skills, though educational attainment would be picking up at least part of such a factor.

In future research we intend to make use of developing country micro data on health outcomes and health behaviours to distinguish more carefully selection effects in immigrants from these countries and to compare these with those we have found for immigrants from developed countries.

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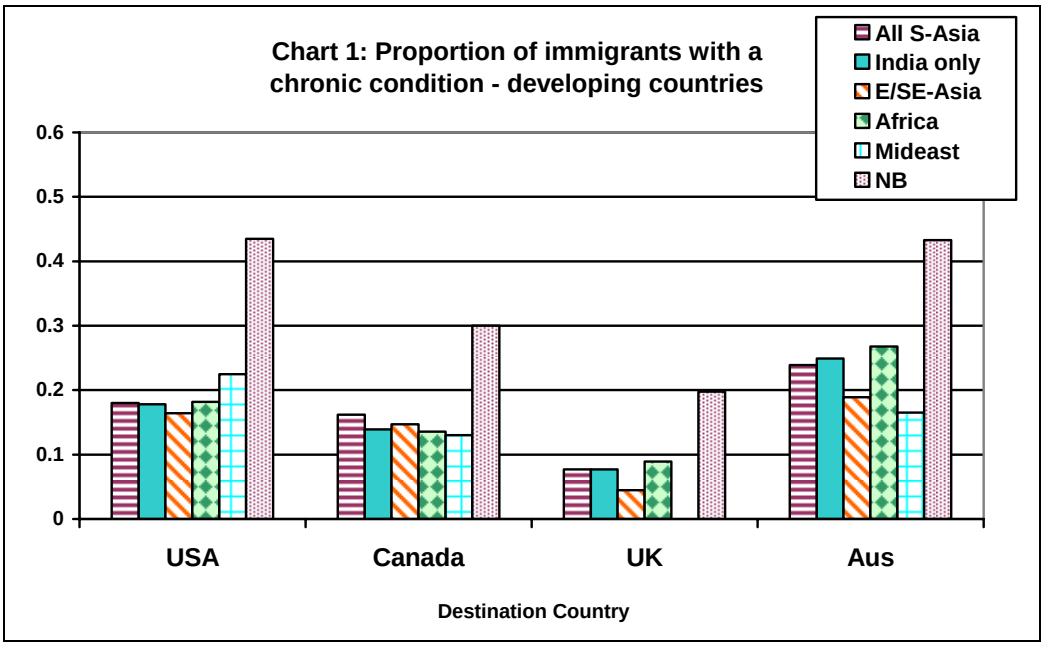
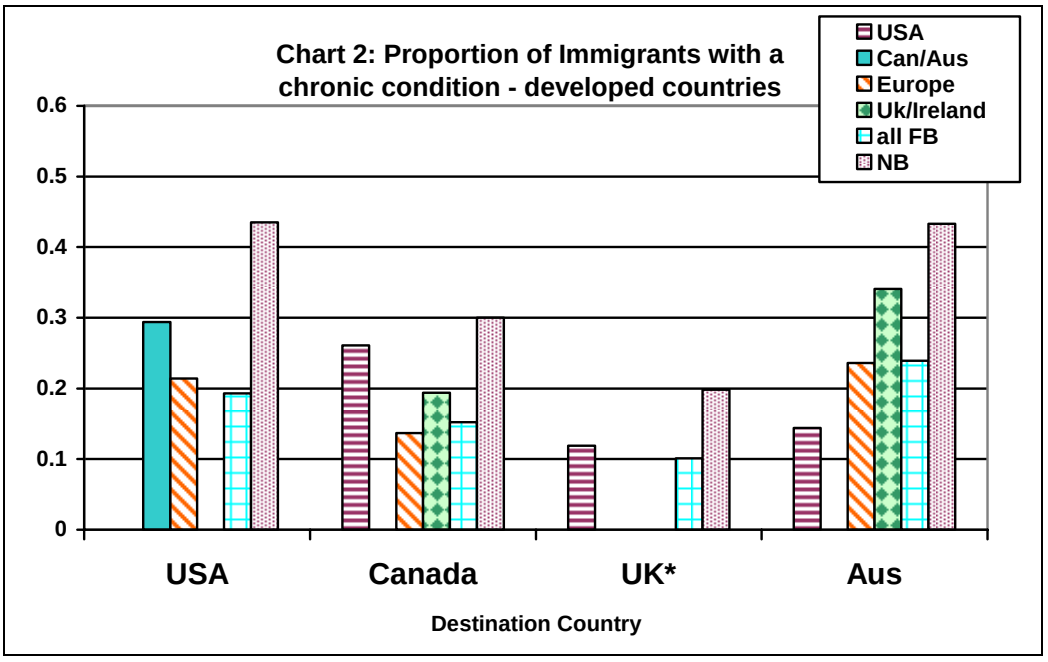
Charts and Tables

Table 1: Immigrant region of origin

	US	*UK - General Survey*	*UK - Health Survey*	*Canada*	*Australia*
Proportion of Recent FB (less than 11 years)					
Continental Europe	0.214	0.258	*	0.191	0.161
South Asia	0.135	0.150	0.151	0.158	0.085
India only	0.117	0.063	0.076	0.095	0.049
Other South Asia	0.018	0.087	0.075	0.063	0.036
North East and South East Asia	0.247	0.130	0.032	0.319	0.370
Africa	0.088	0.248	0.198	0.077	0.066
Middle East	0.048	0.050	*	0.072	0.064
Canada/Australia/New Zealand	0.044	0.071	*	n/a	n/a
UK-Ireland	*	n/a	n/a	0.028	0.202
Caribbean	0.058	0.023	0.021	0.042	0.021
US	n/a	0.071	*	0.025	0.025
Other (white race)	0.259	0.400	0.423	0.243	0.388
North East Asia	0.117	*	*	0.218	0.160
Southeast Asia	0.130	*	*	0.101	0.210
Proportion of ALL residents					
Foreign-born	0.150	0.093	0.094	0.206	0.269
Recent Foreign-born	0.035	0.035	0.033	0.065	0.063
Mexican Foreign-born	0.049				
Recent Mexican Foreign-born	0.016				

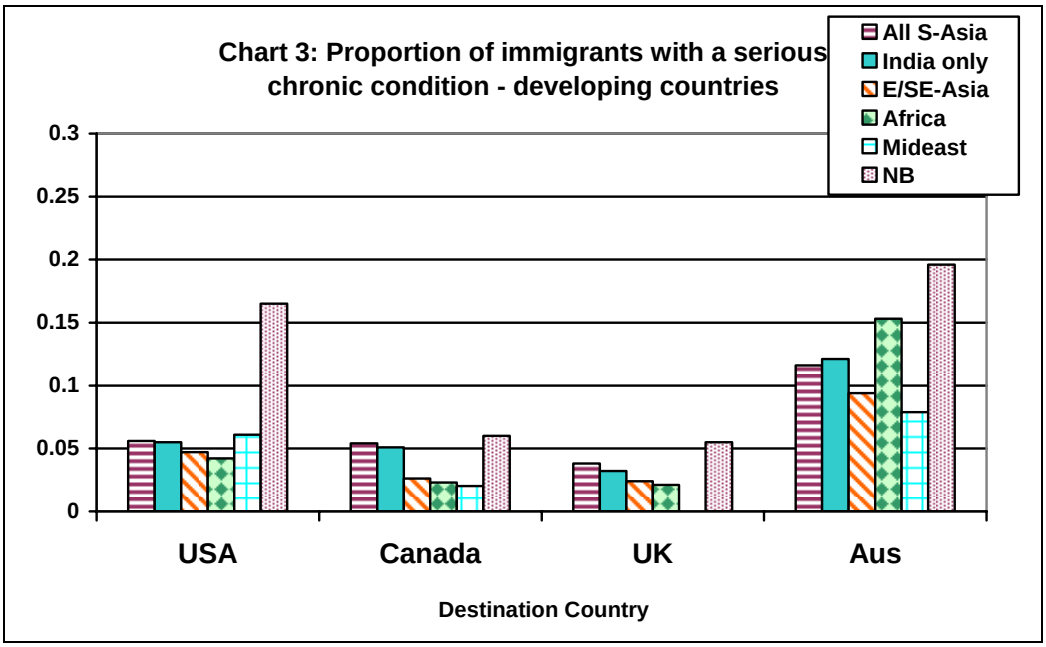
*: not available
n/a: home country
Other-white: refers to immigrants from Europe, UK, US, Canada, Australia/New Zealand where applicable. For UK-health data, all immigrants of white race are included.
Continental Europe' for US includes UK/Ireland
North East and South East Asia' for UK-health includes only immigrants of Chinese ethnicity
For Australia, Middle East includes Central Asia including Afghanistan, and Caribbean includes non-US and non-Canada America.

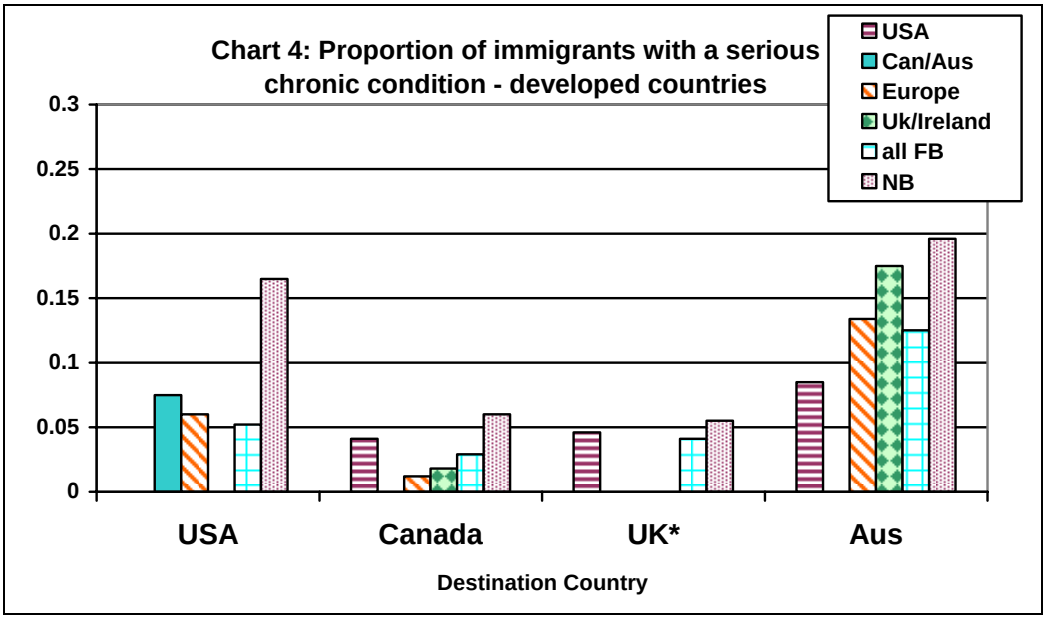




* For the UK destination where indicated, UK health data are used and the column for immigrants from the USA includes all white immigrants from the USA, Canada, Australia, New Zealand, and Continental Europe.

For the USA destination, the column for immigrants from Europe includes immigrants from the UK/Ireland in all figures.





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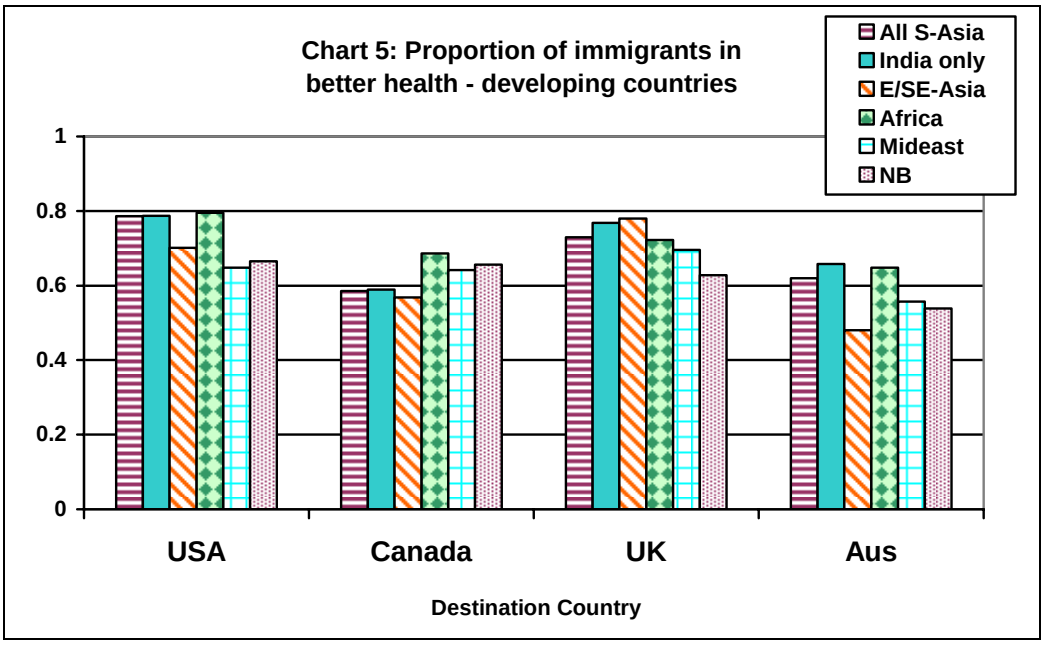

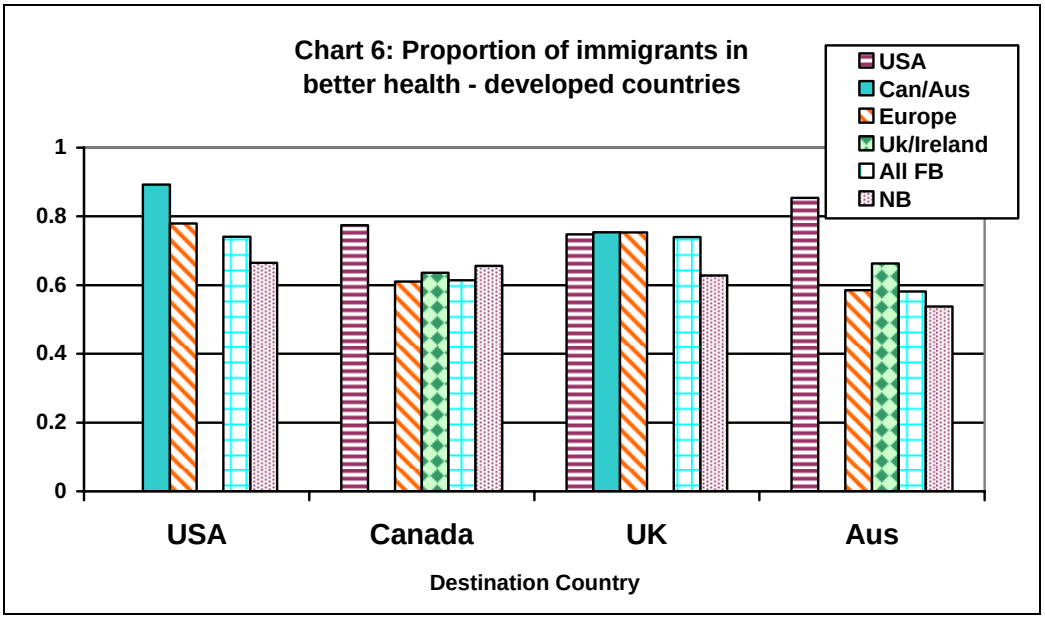

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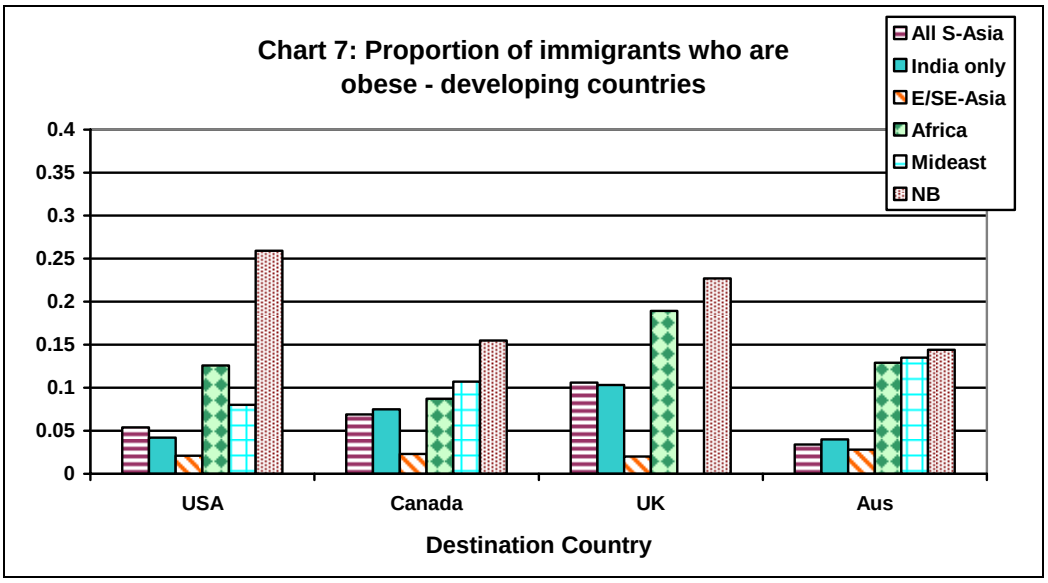

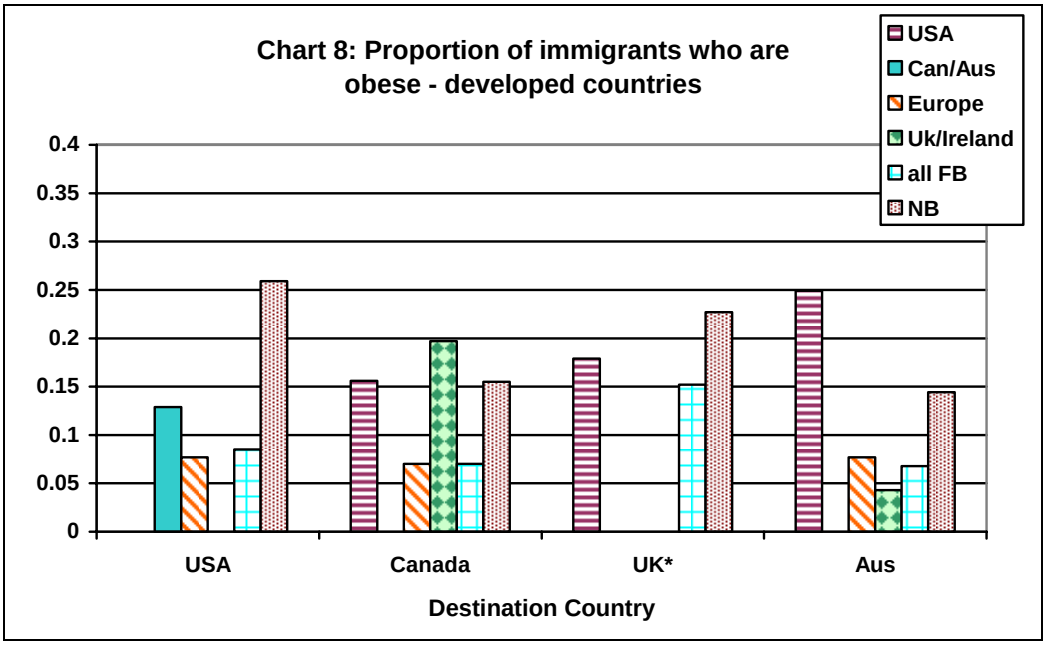

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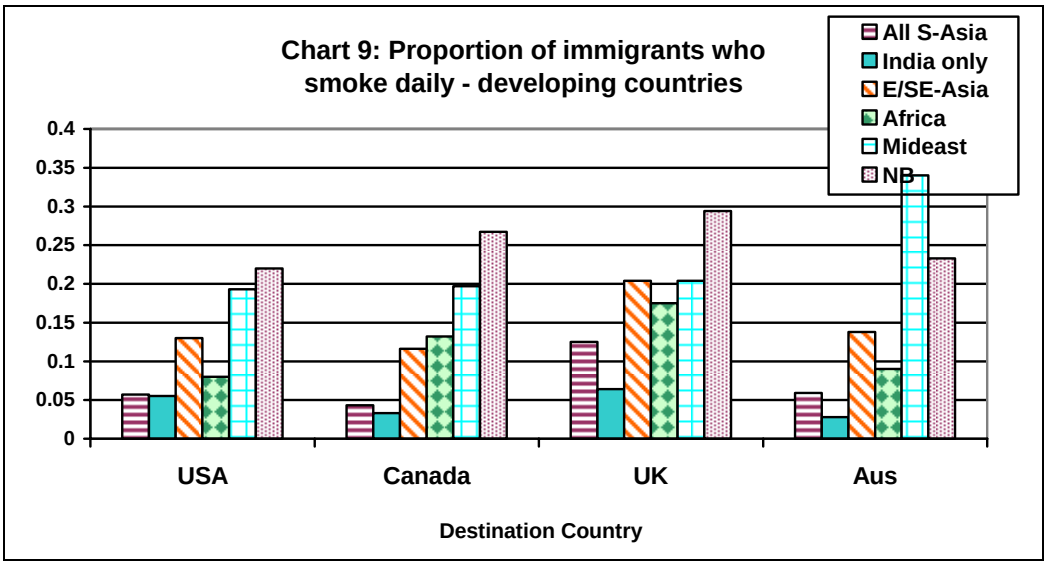

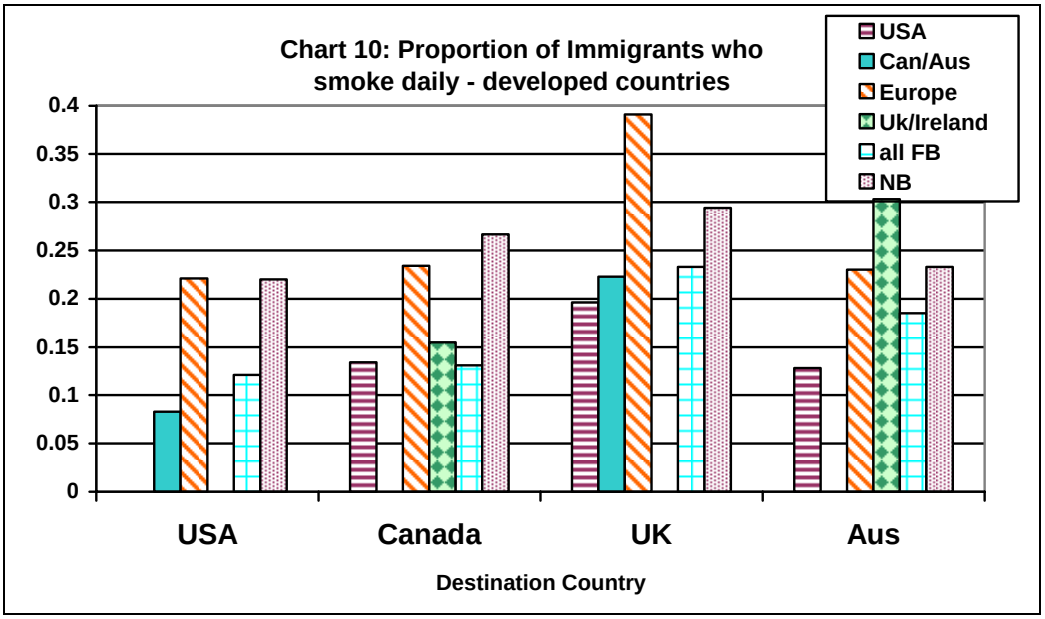

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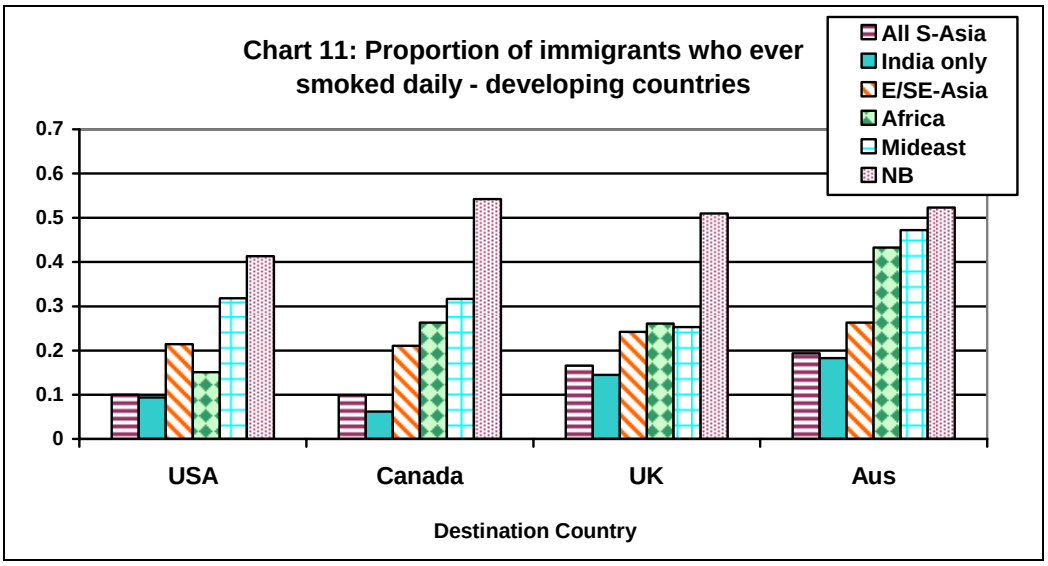

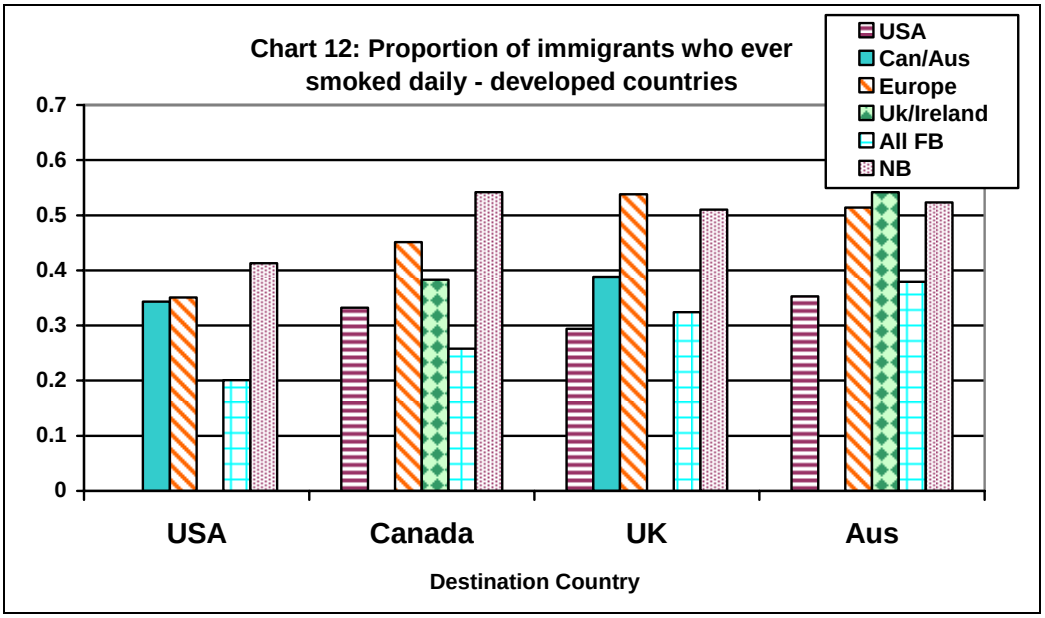

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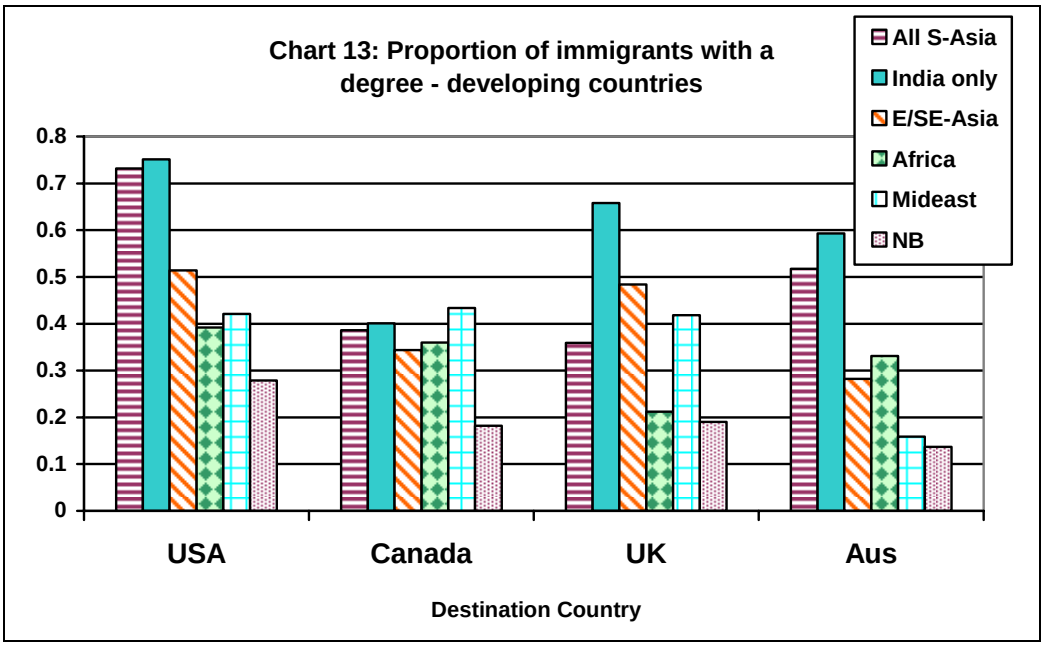

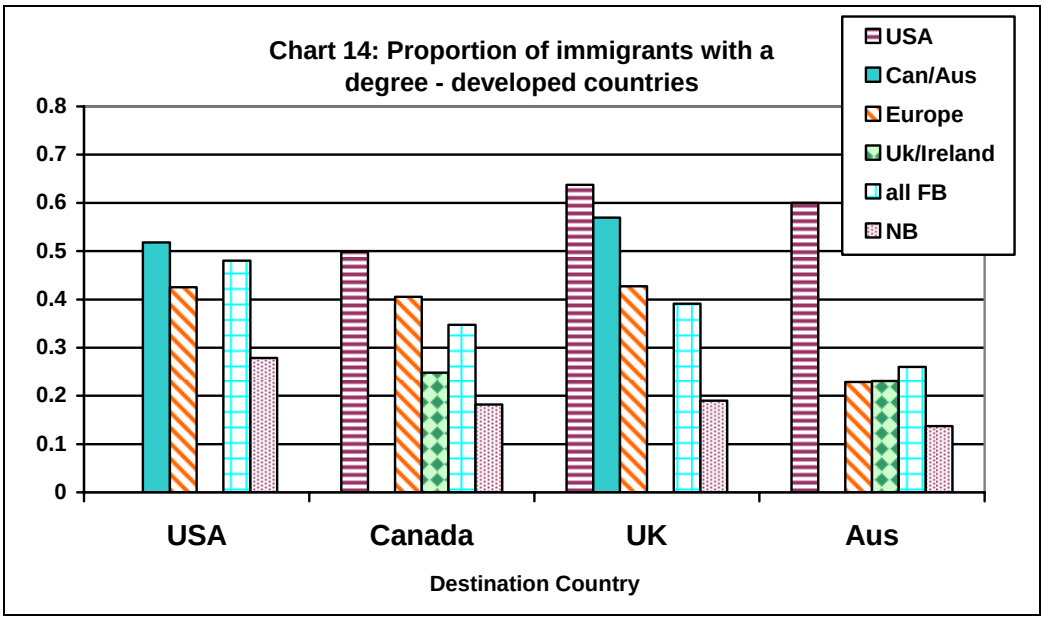

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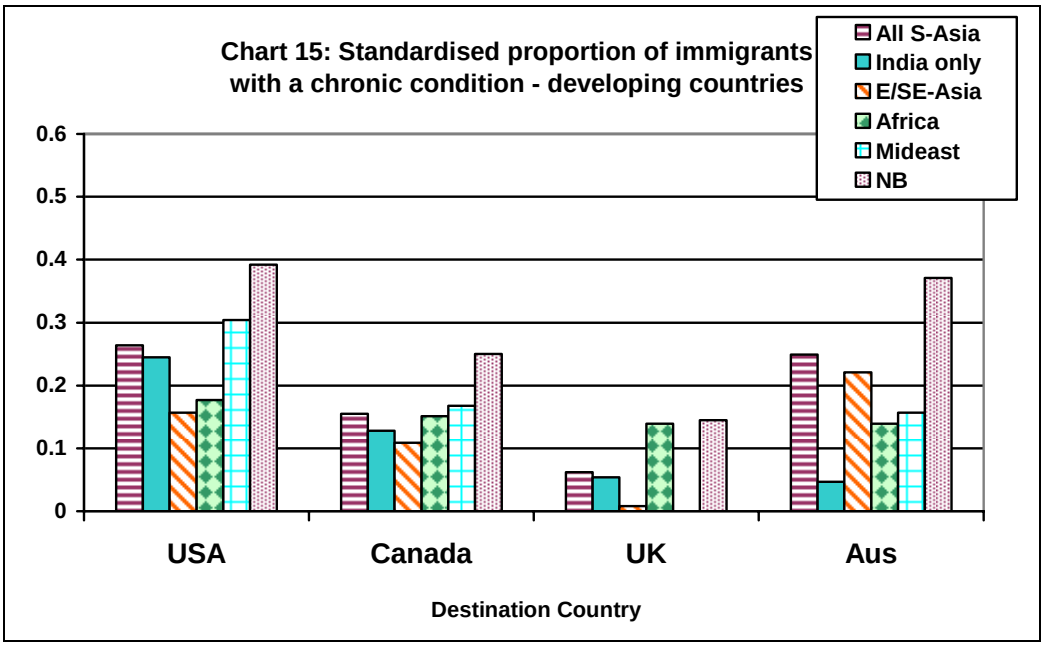

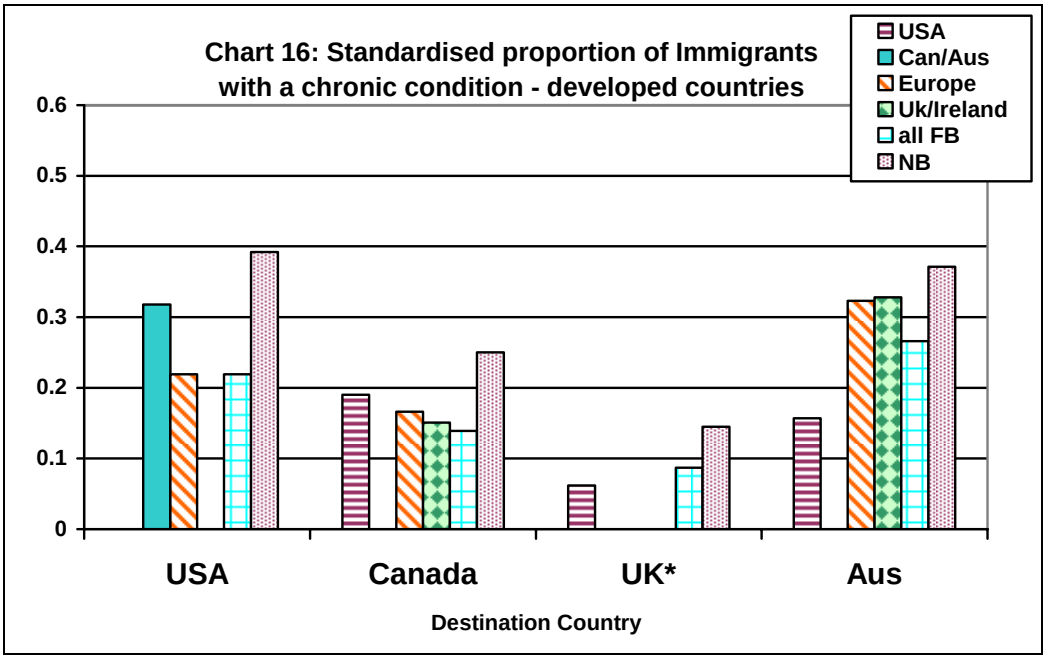

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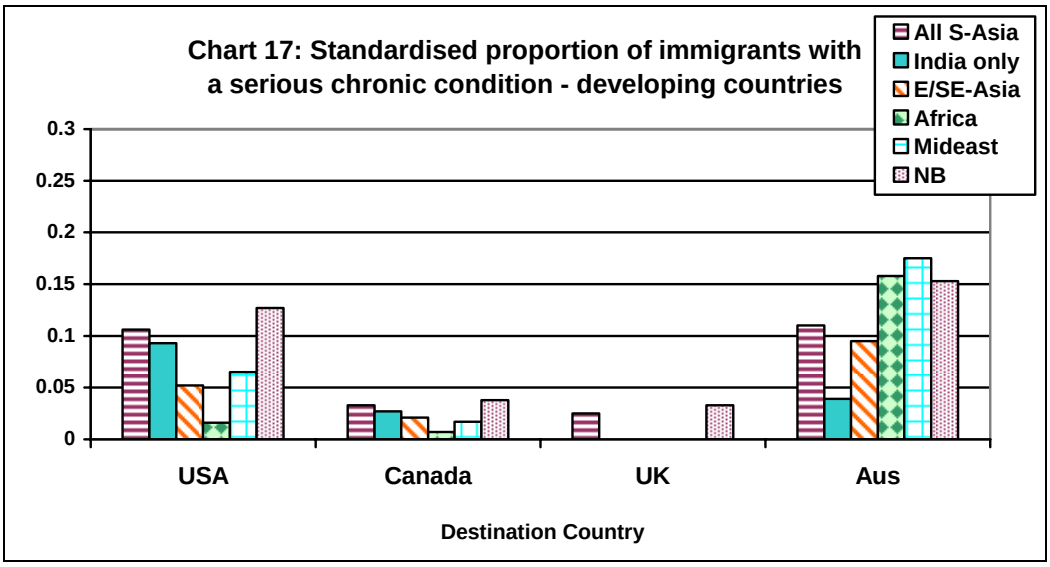

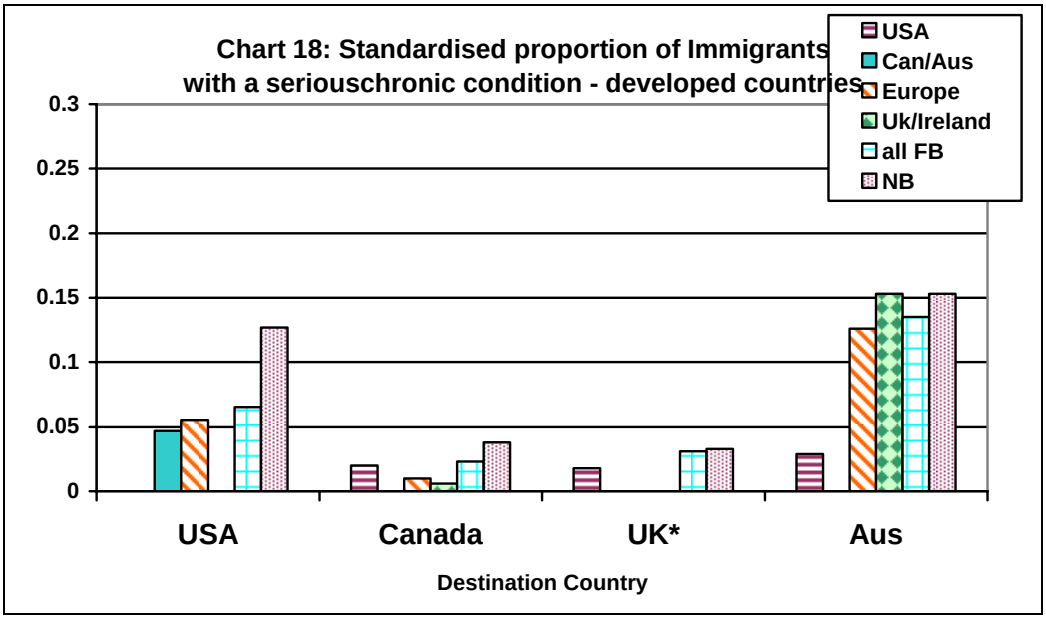

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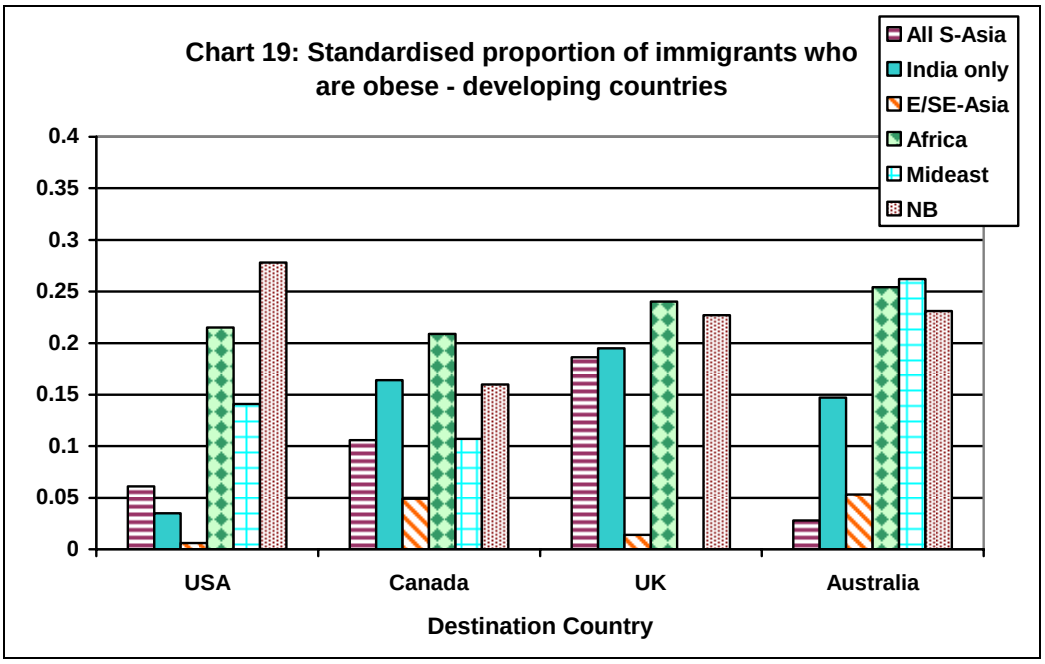

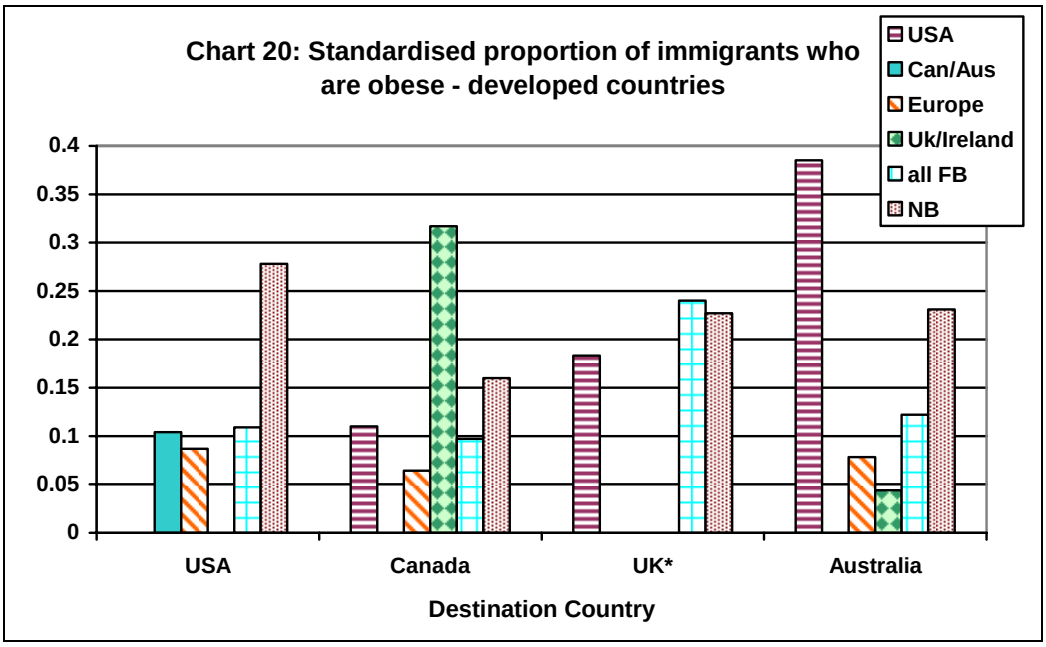

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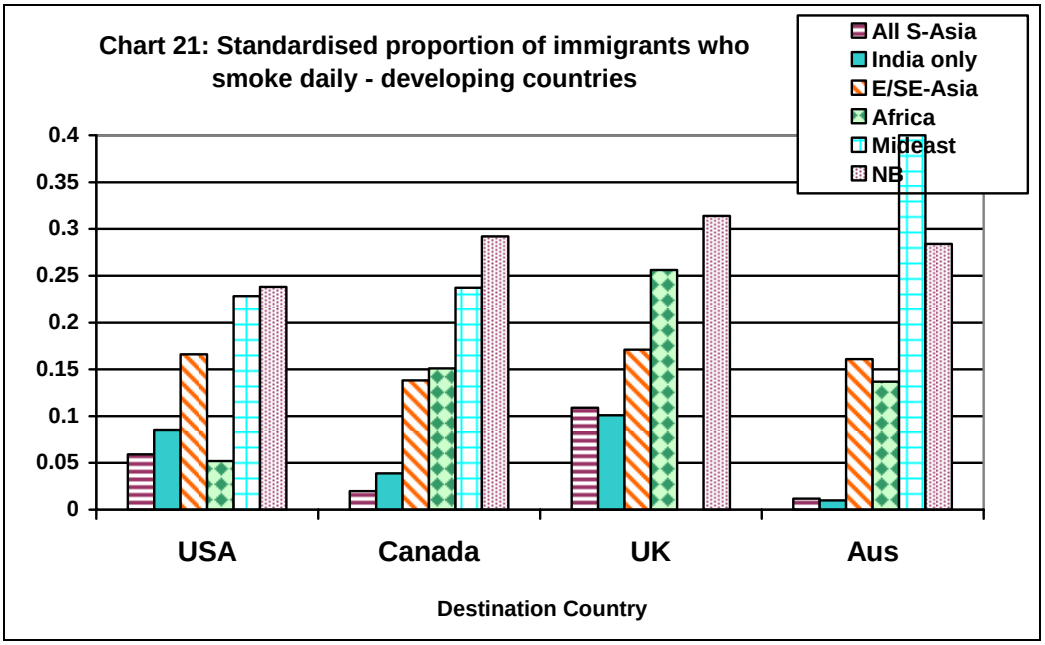

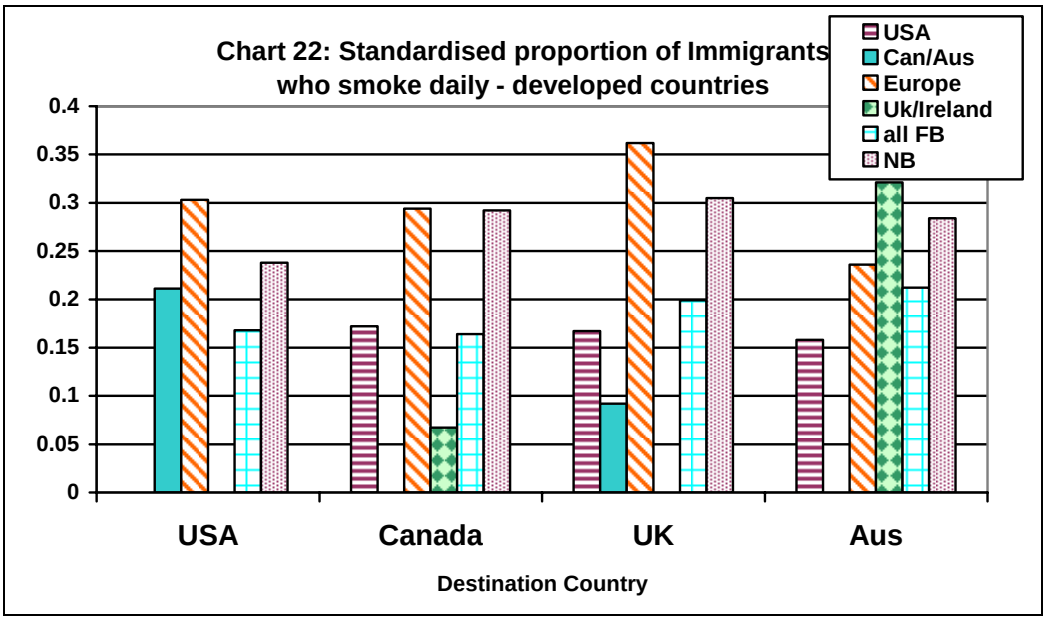

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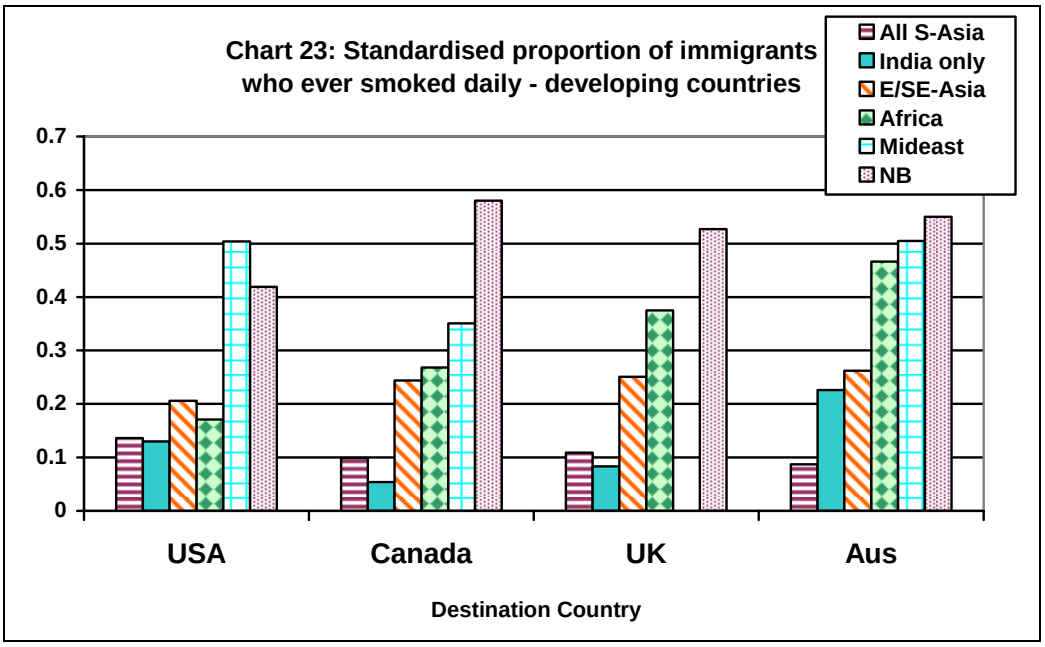

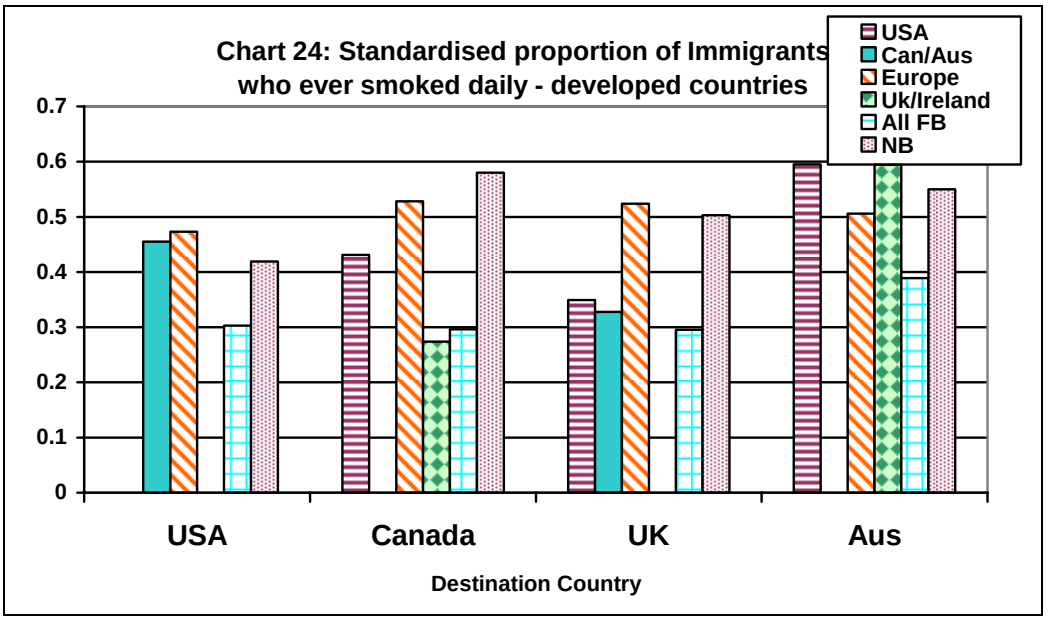

For the USA destination, the column for immigrants from Europe includes immigrants from the UK/Ireland in all figures.

Table 2: Education/Health gradients for health measures

		Chronic Disease		*Serious Chronic Disease*		*Better than average SAHS*	
Canada	Native-born	-0.060	-13.49	-0.015	-9.88	0.155	31.93
	Foreign-born	0.003	0.21	-0.002	-0.42	0.080	4.04
US	Native-born	-0.082	-22.59	-0.028	-13.09	0.200	65.89
	Foreign-born*	-0.023	-1.27	-0.006	-0.51	0.115	5.92
UK	Native-born	-0.027	-2.95	-0.008	-1.86	0.122	21.91
	Foreign-born	**0.001**	0.01	**0.002**	0.13	0.041	1.58
Australia	Native-born	-0.065	-5.76	-0.020	-2.54	0.139	12.39
	Foreign-born**	-0.012	-0.39	**-0.003**	-0.11	0.070	2.00
	*: excluding Mexican immigrants ** excluding New Zealand immigrants						
	Bold indicates that the difference between the NB and FB gradients is **NOT** significant at the 5% level						

Table 3: Education/Health gradients for health behaviours

		Obese		*Current daily smoking*		*Ever smoked daily*	
Canada	Native-born	-0.066	-18.80	-0.226	-46.35	-0.264	-46.12
	Foreign-born	-0.035	-1.68	-0.062	-3.15	-0.044	-2.27
US	Native-born	-0.115	-36.00	-0.204	-71.14	-0.201	-58.80
	Foreign-born*	-0.054	-4.09	-0.078	-4.84	-0.065	-3.33
UK	Native-born	-0.074	-6.39	-0.204	-40.79	-0.193	-32.29
	Foreign-born	**-0.004**	-0.07	-0.022	-1.04	0.000	0.00
Australia	Native-born	-0.089	-9.78	-0.183	-18.91	-0.199	-17.08
	Foreign-born**	**-0.060**	-2.80	-0.117	-4.20	-0.089	-2.69
	*: excluding Mexican immigrants ** excluding New Zealand immigrants						
	Bold indicates that the difference between the NB and FB gradients is **NOT** significant at the 5% level						

Appendix: Data Sources and Characteristics

The US data are drawn from the public-use National Health Interview Surveys (NHIS) for the years 2000 to 2005. While earlier years of data are available for the NHIS they do not contain immigrant region of origin information. We exclude from the US data Mexican immigrants, who constitute 32.8 per cent of all immigrants and 46.4 per cent of recent immigrants, as statistically they are very different from other immigrants. US-born Hispanics are included in the native-born US but their exclusion has little impact on the results. When measuring region of origin in the US data, immigrants from Europe include those from the UK as well as from Continental Europe. Moreover, there are no data on mother tongue or language first spoken. Australian and Canadian immigrants are not explicitly identified in the US data but are assumed to be immigrants from other areas who are white ('other' areas include Canada, Australia, New Zealand and the pacific islands – thus, this approximation seems reasonable). Immigrants from India are not explicitly identified but we impute this category based on immigrants from South Asia who are of 'Indian' descent.[13]

The Canadian micro-data are based on confidential versions of recent large-scale datasets collected by Statistics Canada: the National Population Health Survey (1996) and the Canadian Community Health Survey (2001 and 2003). Specific country of origin is available in the Canadian data so it is possible to combine groups of countries in order to be consistent with the more limited data on region of origin available in the US and UK data.

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[13] The 'public use' NHIS data only began reporting region of origin for immigrants in the 2000 NHIS, although data on year of arrival and race of immigrants is available from earlier NHIS surveys. As well, although there is detailed information on race/ethnicity, data on region of origin are reported for groups of countries rather than individual countries. However, this is not prove to be a serious obstacle, as either the regions of origin represent relatively homogeneous sets of countries, or a single country dominates the supply of immigrants (for example immigrants from 'East Asia' are mainly Chinese).

Two sets of comparable micro-data for the UK are drawn from two separate sources: the General Population Surveys 2000 to 2004 and the UK Health Surveys for 1999 and 2004. (Note that people born in Ireland who are in the UK are not considered immigrants for the purposes of this study.) While the General Population Survey has more disaggregated information on region of origin, it also appears seriously to under-report the incidence of particular chronic conditions, as the reported incidence is very low for all conditions. There are also no data on Body Mass Index and obesity in this survey. For these reasons, we also utilize the UK Health Surveys for 1999 and 2004. Unfortunately, while Health Surveys are available for other years, it is only for these two years that information on year of arrival and region of origin are both available. Also, only a limited number of regions of origin are identified for immigrants. Asians outside of South Asia are grouped into a single category – thus, to approximate the region East Asia we include only those immigrants who report being of Chinese descent. Therefore, the percentage of this group among all foreign-born is much lower than for the UK General Survey. Further, Europe, US, Canada, and Australia are not separately identified, so to approximate developed country foreign-born, we select foreign-born white immigrants and report them as one pooled category. The incidence of chronic conditions as measured by the UK Health Surveys is still lower than for other countries but higher than for the UK General Surveys.

Australian micro-data are sourced from confidential versions of cross-sections of the Australian Bureau of Statistics National Health Surveys from 1995 and 2001. New Zealanders are excluded from the subsample of immigrants owing to the reciprocal rights of residency, employment, and income support between Australia and New Zealand. As the data are confidential files, detailed country of origin is

available and so immigrants can be categorized for consistency with the regions of origin available in the UK and US data.

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