Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world-wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

_____ ___04/23/2020__

Alicia Dunajcik

ON THE BASIS OF VISA TYPE: THE ASSOCIATION OF VISA TYPE AND HEALTH AMONG U.S. IMMIGRANTS

By

ALICIA DUNAJCIK
MASTER OF PUBLIC HEALTH

GLOBAL EPIDEMIOLOGY

_____
SOLVEIG A. CUNNINGHAM, PHD MSC
COMMITTEE CHAIR

ON THE BASIS OF VISA TYPE: THE ASSOCIATION OF VISA TYPE AND HEALTH AMONG U.S. IMMIGRANTS

By

ALICIA DUNAJCIK
BACHELOR OF SCIENCE
UNIVERSITY OF MISSOURI-COLUMBIA
2015

Faculty Thesis Advisor: SOLVEIG A. CUNNINGHAM, PHD MSC

An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Global Epidemiology
2020

ABSTRACT

ON THE BASIS OF VISA TYPE: THE ASSOCIATION OF VISA TYPE AND HEALTH AMONG U.S. IMMIGRANTS
BY ALICIA DUNAJCIK

OBJECTIVE
Each year, millions of people immigrate to the U.S. Experiences of legal permanent residents before migration may influence one's selected visa type, and experiences during and after immigration may be influenced by visa type. Due to limited prior research, it is unknown if health for each visa group is different due to unique immigration-related circumstances. This study aims to determine if an association between visa type and health exists using self-reported health status, overall chronic conditions, diabetes, high blood pressure, lung conditions, heart conditions (including stroke), arthritis, and psychiatric conditions.

METHODS
This association was explored using the New Immigrant Survey (NIS), a cohort of 8,573 immigrants who gained permanent residence in 2003. Visa information for immigrants was provided by the U.S. Immigration and Naturalization Services (INS), and health outcomes were reported by individuals. This study used multivariate logistic regression to determine the odds of each chronic condition and odds of having fair or poor self-rated health by visa group. Regression controlled for confounding by employment status, sex, marital status, health insurance coverage, smoking status, geographic region of origin, U.S. region of residence, education, age, and time spent in the U.S.

RESULTS
For both self-rated health and overall chronic conditions, a significant association by visa group was found. For self-rated health, refugee and legalization visa holders had the highest odds of fair or poor health [Refugee Odds Ratio = 2.74 ($p<0.001$), Legalization Odds Ratio = 1.94 ($p<0.001$); reference=family sponsored]. Refugee and legalization visa holders also had the highest odds of overall chronic conditions [Refugee Odds Ratio = 1.81 ($p<0.001$), Legalization Odds Ratio = 1.58 ($p=0.001$)]. Findings for diabetes, high blood pressure, lung conditions, heart conditions, arthritis, and psychiatric conditions mirrored what was seen for overall chronic conditions.

CONCLUSIONS
This association suggests that refugee and legalization visa holders are in worse overall health at the time of gaining permanent residence. Existing health programs for these groups is limited and largely focused on infectious diseases. Methods including health screenings for legalization visa holders and expanding mental health and chronic disease resources for refugees may improve health of these groups.

ON THE BASIS OF VISA TYPE: THE ASSOCIATION OF VISA TYPE AND HEALTH AMONG U.S. IMMIGRANTS

By

ALICIA DUNAJCIK

BACHELOR OF SCIENCE
UNIVERSITY OF MISSOURI-COLUMBIA
2015

Faculty Thesis Advisor: SOLVEIG A. CUNNINGHAM, PHD MSC

A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Global Epidemiology
2020

Acknowledgements

I would like to express gratitude towards all who have guided me throughout my MPH and thesis process. The journey has not been easy but having support has helped me immensely. I would like to thank Dr. Solveig Cunningham for her hard work in advising me and reading every single word of this document multiple times. Dr. Cunningham has a passion for migration and demography that has certainly rubbed off on me in this process. I also want to thank PhD candidate Rebecca Jones for helping me navigate the New Immigrant Survey and offering sage advice. I would like to thank Dr. Lauren Christiansen-Lindquist, Dr. Penny Howards, and Dr. Carmen Ng for course content and resources that made my models and data cleaning process successful. Finally, a thank you to Princeton University and the administrators of the New Immigrant Survey for providing this dataset and permitting me to use it.

Table of Contents

INTRODUCTION

In the 2019 fiscal year, a total of 1,031,000 foreign born individuals immigrated to the U.S. (1).These new immigrants joined a community of over 44 million foreign born people residing in the U.S. (2). Immigrants, or people who come to live in the U.S. from another country, have unique lifestyles, rights, diets, neighborhoods, and health access in comparison to U.S. born residents (3) (4) (5). A striking difference among immigrants and non-immigrant, US born residents, lies in their health. Health outcomes including morbidity, mortality, and perceived health are known to be different in immigrants and non-immigrants (3). Notably, immigrants have favorable health compared to similar U.S. natives (6) in many instances including: mortality rates, cardiovascular diseases, overweight and obesity rates, and some cancers (3). This tendency to have better health than comparable native residents is called the "healthy immigrant effect" (6). While immigrants may enjoy some health benefits, critical health outcomes such as diabetes, infections, and occupational injuries appear to be generally worse among immigrants (3).

Immigrants in and of themselves are not a homogenous group, they come from various countries around the world, they apply under different application types, and they immigrate due to various circumstances. One factor that separates immigrants is the visa type they are assigned when applying for immigration. While this visa type is read as a set of numbers on a passport, it tells the story of why one came to the U.S. Reasons for coming to the U.S. range from specialized employment to escaping devastation. Some visa types may symbolize wealth and privilege, whereas, other visas may reveal the opposite. One study investigated the impact of refugee vs non-refugee status on health

outcomes among immigrants in 2003. This study found significant differences in refugee and non-refugee health conditions, perceived health, and working ability (7). This study did not include the association of all green card types, and whether other groups are disadvantaged is unknown. An additional study went on to include all visa types and found that visa type affects BMI, but did not explore other health outcomes (8). Because few practitioners and surveyors collect data on visa type, there is a lack of understanding on how visa type and exposures related to migrating under different admission categories affects health.

The purpose of this study is to assess the association between visa types among immigrants and their health status at the time of permanent residence. This work aims to understand whether refugees, asylees, and parolees or any other visa class of immigrants are disproportionately disadvantaged in health outcomes. Health status is measured by self-rated health, seven selected chronic conditions (diabetes, high blood pressure, lung conditions, heart conditions/stroke, arthritis, cancer, psychiatric conditions), and tuberculosis test results. Results of this study are intended to be used for advocacy, understanding how pre-migration and migration experiences affect immigrant health, and determining if future immigrant studies should account for visa type.

LITERATURE REVIEW

Immigrants in the United States

Migration

Migration, or the movement of people away from their residence, either within or beyond their country of residence is a key indicator of populations (9). Migration to and from the U.S. is quite common, and millions of people pass through U.S. customs each year on either a temporary or permanent basis. Migrants who spend months and years in the U.S. are particularly important because they can influence economy, health, and diversity of communities in the U.S. One group of migrants that contributes to the U.S. is immigrants.

Legal Immigration Definitions

According to the United States Internal Revenue Service (IRS), a U.S. immigrant is defined as a noncitizen permanently residing in the U.S. (10). In order to legally be labeled as an immigrant, one must possess Lawful Permanent Residence (LPR), or what is more commonly known as a green card (10). While the government only formally recognizes green card holders as immigrants, foreign-born residents of the U.S. who have transitioned into citizenship and foreign-born residents living permanently in the U.S. without legal documentation are also considered immigrants. Globally, the International Organization for Migration defines an immigrant as any person who leaves their country of nationality to reside in another country as a permanent destination (9).

Foreign-born people with visitor or temporary visas are legally defined as non-immigrants (10). Non-immigrants possess a visa and are permitted be in the U.S., but they have established dates by which they must exit the U.S. (10). Undocumented

immigrants, workers, and visitors with no visa or acceptable passport lack legal authorization to be in the U.S. temporarily or permanently and are recognized by the government as illegal aliens (10).

Legally, foreign-born people who become U.S. citizens are not considered immigrants (10). Upon gaining citizenship, they are classified as naturalized citizens of the U.S. and are legally no different than U.S. born citizens (49).

Immigration Process

Applying for U.S. immigration is a multi-step process that takes months to complete. The process can differ depending on whether the immigrant is in the U.S. or overseas prior to immigrating and based on the immigrant visa type one is applies for (11). Those applying for immigration from the U.S. are eligible to apply via an adjustment of status process where their non-immigrant visa is then changed to an immigrant visa (11). In other cases, immigrants may apply for permanent residence overseas through a U.S. consulate or embassy. Immigrants without visas or applying through consular processing are referred to as new-arrival immigrants (11). In 2003, the proportion of immigrants who adjusted vs immigrants who entered as new arrival immigrants was nearly split (358,000 new arrivals and 347,000 persons who adjusted their status (12).

Upon being accepted for immigration, one is first given an immigrant visa. This visa allows one to enter the U.S., gain a formal U.S. mailing address, and continue the immigration application process(11). There are many types of immigrant visas that can be given. The visa type one selects depends on whether they receive sponsorship from a U.S. citizen, their employment, being referred, and additional social factors (11).

While this immigrant visa is required for legal immigration and permits travel to the U.S., the visa must be changed to a green card before one is permitted to reside in the U.S. permanently (11). The green card process must be completed within the U.S. and one must have a legal U.S. address for their green card to be sent to once processed. While applying for a green card, or lawful permanent residence (LPR), one will be given a class of admission that also depends on sponsorship, employment, and additional social factors (11). Generally, the class of admission is related to one's initial visa type; however, anomalies exist.

Benefits of Immigration

Possessing a green card provides one permission to live and work permanently in the U.S., receive education in the U.S., and own property in the U.S (13). In theory, the green card is designed to provide immigrants with benefits needed to survive in the U.S. long-term (14). While permanent residents are afforded extended rights in comparison to non-immigrants and undocumented immigrants, they do not possess citizenship. Without citizenship, permanent residents have limited access to certain forms of government assistance such as Medicaid and Unemployment, they cannot vote in federal elections, and they cannot obtain a U.S. passport (15) (16).

Naturalization Process and Benefits

Once an immigrant has resided in the U.S. for at least 5 years, they are eligible for naturalization, or becoming an official U.S. citizen (17). Green card holders are eligible to live and work in the U.S.; however, they are not recognized as citizens until they make this transition. While a green card allows people to live an act as citizens in many ways, there are restrictions accompanying LPR that will be uplifted upon obtaining citizenship.

Advantages of becoming a naturalized citizen include: voting, running for public office, less restricted travel, obtaining a U.S. passport, obtaining citizenship for dependents (15). The process may also take many years to complete due to required documentation and testing. Naturalizing into citizenship is not required to continue residing within the United States and can be done when one chooses (18). According to 2015 statistics, 67% of all immigrants who have reached eligibility for naturalization have already went through the process and become citizens (19).

Visa Types

Pre-immigration circumstances including sponsorship, employment, and other social factors ultimately determine which visa types one is eligible for (20). If someone is eligible under multiple visa types, they may select the type that permits them the fastest entry into the U.S. or that is easiest to obtain. Little research on why one chooses a particular visa type exists. This initial visa type is significant because it can provide some rationale for why one chose to immigrate. The five broad visa categories recognized by the New Immigrant Survey are as follows: family sponsored, employment, diversity, refugee, and legalization.

Family Sponsored

This group includes all immigrants who are either an immediate family member of a U.S. citizen or a non-immediate family member being sponsored by a citizen or permanent resident (20). Immediate family members apply for an immediate family visa and non-immediate family members file for a family preference visa (20). While the two groups have a slightly different visa application processes, they are considered in aggregate by many researchers and in the public-access version of the New Immigrant

Survey. Family-based immigration is the most common method of immigration into the U.S.; immediate family members alone constitute seventy percent of all 2003 immigrants (12).

Employment

This class includes all immigrants who are sponsored for immigration by an employer (20). The employer must provide verification to the government of their willingness to hire an immigrant as well as proof that they can compensate this immigrant adequately to survive without needing government assistance (20). Typically, these immigrants have special skills, experiences, or education that are needed in the U.S. Immediate family members of immigrants seeking employment will also be granted a visa through a sub-class within this admission type (20).

Refugees, Asylum Seekers, and Parolees

Refugees in the U.S. are defined as immigrants who were forced to leave their country of origin due to war, disaster, or some other form of devastation (21). Forced migrants may enter the U.S. as official refugees through a process called resettlement. Resettlement is facilitated by the United Nations High Commissioner for Refugees (UNHCR) (22). UNHCR identifies vulnerable people and recommends them for resettlement within the U.S. The U.S. government then decides which refugees to admit among this pool of potential immigrants (22). All refugees entering the U.S. are paired with a nonprofit that will aid them in their immigration process and provide them receive necessary goods and services (22).

Asylum seekers, like refugees, have been forced their country of origin. Asylum status is given to all people within the U.S. who cannot return to their country of origin

without persecution (21). Asylum seekers lack referral from the United Nations or prior approval from the U.S. government (21). The U.S. is legally required to offer asylum to people in the U.S. who cannot return to their country of origin (21). Within the first year of residence within the U.S., asylum seekers are responsible for requesting asylum status (20). U.S. Asylum seekers do not get automatically paired with an agency as refugees do (21).

A third form of immigration related to forced migration and asylum is parole. Parole is a form of immigration that is granted to people who are otherwise inadmissible to the U.S. People who apply for parole must demonstrate an urgent humanitarian reason or way the public would benefit from their parole (23). All parole cases are assessed on a case by case basis. Generally, parolees are given non-immigrant visas rather than immigrant visas (23). In 2017 only 26 out of 1.1 million immigrants used this class of admission (24). Parole generally grants individuals temporary visas to enter the U.S. while awaiting permanent residence visas (23).

Diversity

The diversity visa category was officially created in 1990 to increase the number of immigrants from countries with low immigration to the U.S. (14). Identifying low immigration countries involves calculating immigration rates for all countries in the 5 years prior to date (25). Any country with less than 50,000 immigrants qualifies as "low admission" and tentatively eligible for the program (25).

The diversity visa grants 50,000 people immigration annually (14). The diversity visa is also called the lottery visa, as people from around the world may fill out applications for free each year, and people are then randomly selected (14). In 2018, 23

million primary and derivative applications for the diversity visa were received (26). The diversity visa is unique in that it does not require sponsorship by a U.S. citizen (14).

Legalization

The legalization category is based on the Immigration Reform and Control Act (IRCA) of 1986, and it provides a path to permanent residence for people living or working in the U.S. without legal admission (27). The visa type provides immigration status in phases to people who entered the U.S. before 1982 or who were U.S. agricultural workers for at least 90 days before May 1, 1986 (27). First, these immigrants must spend a specified waiting period as temporary visa holders, and then these people become eligible for transition into LPR (27)The temporary residence waiting period is 12-18 months, depending on how one qualifies for legalization (27). This immigration category became particularly relevant between 1989 and 1991 and led to a large spike in immigration in this period. Immigrants still may apply for this category to date (24).

Immigrant Characteristics

2003 Immigration Profile

For the year 2003, when the first wave of the New Immigrant Survey was conducted, the U.S. received a total of 706,000 immigrants (12). Notably, in 2003, the number of immigrants to the U.S. had dropped significantly from the year before; in 2002, there were 1.06 million immigrants to the U.S. (12). While 2003 had lower rates of immigration than 2002, it's noted that the 2000s had higher immigration rates than the 1990s (12). The years 1995-1999 had a total of around 2.4 million immigrants, whereas, 2000 to 2003 alone had over 3.2 million immigrants (12). In 2003, there were 358,000 new arrivals and 347,000 adjustees (12). Compared to 2002, the rates of new arrival

immigration were similar to 2003; however, there was a significant drop in adjustee immigrants in 2003 (12).

In 2003, more than 50% of immigrants originated from the following countries: Mexico (N=116,000, 16%), India (N=50,000, 7.0%), the Philippines (N=45,000, 6.4%), China (N=41,000, 5.8%), El Salvador (N=28,000, 4.0%), the Dominican Republic (N=26,000, 3.7%), Vietnam (N=22,000, 3.1%), Colombia (N=15,000, 2.1%), Guatemala (N=14,000, 2.0%), and Russia (N=14,000, 2.0%) (12). Immigration was heavily concentrated in six particular states; California, New York, Texas, Florida, New Jersey, and Illinois (12).

For 2003, 70% of all immigrants qualified for permanent residence through family sponsorship (12). The second largest immigrant group qualified through employment preferences, which accounted for 12% of all immigrants (12). In 2003, the U.S. specified that they would allow up to 70,000 refugees to enter the U.S. (12). In reality, only 28,000 entered the U.S. in total (12). The number of refugees admitted to the U.S. in 2003 actually was higher than in 2002 (27,000 refugees admitted) (12). While the 2003 count of refugees is slightly higher than 2002, this time frame is highlighted by the number of refugees entering the U.S. plummeting (28) . In 2001, the U.S. admitted 68,000 refugees and dropped the number to 27,000, a 25-year low, in 2002 (28).

Political Considerations

Surprisingly, 9/11 (terrorist attacks against the U.S. occurring on September 11, 2001) had almost no impact on the overall numbers of immigrants obtaining permanent residence in the 2000s, despite causing drops in the number of refugees admitted (12). This occurred, in part, because over two thirds of the immigrants obtaining permanent

residence were already in the U.S. (28). 9/11 had a stronger impact the number of temporary, nonimmigrants coming to the U.S. in 2002 and 2003 (28). Finally, the number of people coming to the U.S. on both non-immigrant and immigrant visa types was noted as lower in 2003 and 2004 (28). The years following 9/11 are a time marked by xenophobia directed towards non-developed countries, prejudice against Islamic communities, and prejudice against refugees (29).

2017 and 2018 Immigrant Demographics

While 2003 demographics are detailed for comparison of the NIS and the immigrant population at that time, it is important to note that demographics of legal permanent residents have change over time. In 2017, the latest year in which complete immigrant demographics are available, there were 1.2 million immigrants to the U.S. (24). Notably, this is much larger than the number of immigrants in 2003. In 2017, U.S. Customs and Immigration Services announced that they admitted 120,000 refugees for immigration. While many visa adjustments of refugees already in the U.S. were made, it is noted that policy changes in 2017 led to a large drop in the number of refugees being admitted into the U.S. from UNHCR (30). It is expected that adjustment numbers in 2018 will be much lower due to the fact that the U.S. only resettled 33,000 refugees from UNHCR (30).

Many countries of origin from 2003 continued to have large numbers of immigrants in 2017. Countries that continued to be prominent countries of origin included Mexico, China, India, the Dominican Republic, the Philippines, El Salvador, and Vietnam (24). Some additional countries not contributing as large of a proportion of immigrants in 2003 had risen to contribute many immigrants by 2017. As of 2017, Cuba

has become the third largest country for new immigrants (24). Jamaica and Haiti have also increased in their number of immigrants to the U.S., with both countries being listed in the top 10 immigrant countries of birth for 2017 immigrants (24).

Health of Immigrants

Healthy Immigrant Effect

When observing health patterns of foreign-born people in an industrialized country, such as the U.S., Canada, or Europe, foreign-born people are generally in better health than native-born populations in the country (31). In the U.S., this advantage cannot be explained by healthcare, as immigrants were noted as having worse access to care, lower prevalence of health insurance, and lower quality healthcare than U.S. natives (32).

The unique beliefs, diet, and social support of fellow foreign-born citizens have been noted as potential contributors to favorable health (33). The immigrant advantage also has been theorized to arise for two reasons: 1) the social support received in-country is so significant that immigrants experience better health and 2) selective immigration, or the ability of only those in better health to migrate paired with the emigration of those in poor health (34). Data entry and translation errors have also been attributed for favorable health outcomes; however, consistent studies showing favorable outcomes of immigrants have largely refuted this notion (31).

Degradation of health is hypothesized to begin once an immigrant completes their initial migration into the U.S. Reasons for degrading health that have been proposed: 1) visa stress, or stress related to obtaining LPR, 2) migration stress, or stress related to

moving between countries, 3) U.S. exposure, or the unique diet, lifestyle, and environmental factors in the U.S. (3) (31) (32).

It should be noted that the Healthy Immigrant Effect is a theoretical model to explain favorable health outcomes of foreign-born people living in the U.S. While this theory suggests favorable lifestyles before migrating and migration and acculturation as stressors degrading health, it should be noted that little longitudinal research on immigrants has been conducted and it's not known exactly how pre-migration, migration, and post-migration experiences affect an immigrant's health (3). For some groups, it's also possible that migrating to the U.S. brings individuals new economic opportunities or closer to quality health care that is unavailable in their home country, in contrast to what is hypothesized for all immigrants.

While the immigrant advantage may explain the health of immigrants overall, some populations experience greater or lessened effects on health (34). Research suggests that the extent to which the Healthy Immigrant Effect can explain health varies on the basis of country of origin and ethnicity (3) (34). A particular study, based on the first wave of the New Immigrant Survey, found that Western European and African immigrants were most likely to rate their health at the time of applying for a visa positively (self-rated health status of excellent or very good) and Mexican immigrants were the least likely to rate their health positively (34).

Healthy Immigrant Effect by Visa Type

In terms of the healthy immigrant effect, little research on how visa type may modify this effect has been conducted. It is noted that refugees are likely to have the

worst health prior to migrating to the U.S., which could impact their health once living in the U.S. (51).

One study on health selection among new immigrants, using the NIS, noted that refugees, asylees, and parolees were the visa group most likely to have a degradation in health between applying for a visa and the date in which they were interviewed, or that this group was more likely to report that their health became worse since applying for immigration (34). This study also noted that family sponsored visa holders had negative health selection but with a smaller magnitude than the refugee group (34).

In a New York City study analyzing immigrants' health at first filing for a visa and immigrants' health during childhood, legalization immigrants were found to have favorable health during childhood and worse health when filing their visas (51). Refugees visa holders were in the worst health both during childhood and when applying for a visa (51).

Health Outcomes

Health Conditions Known to Vary by Visa Type

Some health conditions have been analyzed at the time of permanent residence by visa type. Research exists showing the effect of visa type on BMI and research on refugee versus non-refugee diagnosed conditions, ability to work, and chronic health exists.

The study of BMI by visa type found that there was an association of visa type and BMI at the time of being interviewed (8). The study noted that refugees, asylees, and parolees, legalization visa holders, and employment visa holders had significantly higher BMIs than immigrants of the family and diversity visa types (8).

In the New Immigrant Survey study comparing refugees and non-refugees, refugees were determined to be in worse health at the time of receiving permanent residence (7). The study found that refugee category immigrants were 2.39 times more likely than non-refugees to self-report their health as poor or fair (95% CI: 1.78, 3.21) (7). Refugees were 1.88 times more likely to have at least one of the following health conditions: 1) high blood pressure or hypertension, 2) heart problems (heart disease or other cardiac condition), 3) stroke; 4) lung disease (bronchitis or emphysema), 5) diabetes (high blood sugar or borderline diabetes), 6) cancer (95% CI: 1.44, 2.47) (7). Finally, immigrants were asked if they had any limitations to their ability to complete everyday tasks due to any of their chronic conditions. The number of people who reported any limitations to their activities for refugees vs nonrefugees is reported: refugees were 2.48 times more likely to have limitations than nonrefugees (95% CI: 1.89, 3.25) (7).

Self-Rated Health

Overall, immigrants are more likely to have a high self-reported health status than non-immigrants (3). Exact ratings of health depend on the scale used in a study and thus cannot be directly compared. No research on self-reported health at the time of receiving LPR exists.

Chronic Health Conditions

Among all immigrant and non-immigrant populations in the U.S., chronic diseases are known to be the leading cause of morbidity. Approximately 45% of all people living in the U.S. have at least one chronic condition (35).

Diabetes is a very common chronic condition in the U.S., and between 2003 and 2006, 7.4% of all adults living in the U.S. had diagnosed diabetes, according to CDC

(36). Current literature notes diabetes as more common among foreign-born people in the U.S. than U.S. natives (3). Prior research suggests that diagnosed diabetes varies greatly by one's region of origin (37). A study that calculated diagnosed diabetes prevalence of diabetes by region of birth found that the prevalence for each region ranged from 1.2% to 10.0%, with those from Russia having the lowest prevalence of diabetes and those from India having the highest prevalence of diabetes (37).

High blood pressure is also of the most common chronic diseases in the U.S. The National Health and Nutrition Examination survey conducted 1999-2004 concluded that 28.9% of all U.S. adults had high blood pressure (50). Foreign born people are known to have lower high blood pressure than U.S. born natives (3). Hypertension varied greatly among immigrants by their region of origin. Prevalence of high blood pressure ranged from 20.0% to 29.1% among immigrants, with South American immigrants having the lowest prevalence and Southeast Asians having the highest prevalence (38).

There are numerous lung diseases of public health importance in the U.S., with asthma being the most common disease. Because different studies on chronic lung diseases consider different conditions, it is hard to estimate the prevalence of all lung diseases in people in the U.S. The third National Health and Nutrition Examination Survey (NHANES III) estimated that the prevalence of asthma in all people in the U.S. was 4.5%, as of 2002 (39). A study based on the National Health Interview Survey found that U.S. adult immigrants have a lower prevalence of asthma than those born in the U.S. (40). It was also noted that the prevalence of asthma rose as immigrants spent time in the U.S. (40).

Another set of chronic diseases of interest in this study is heart diseases and stroke. Included in this group are conditions including heart attack, coronary heart disease, angina, congestive heart failure, and "other" heart problems. Foreign born citizens are generally less likely to suffer from a stroke or diagnosed heart disease (3).

Mental health is quite common in the U.S.; it is estimated that one in five people living in the U.S. has some mental health conditions (41). Foreign born citizens are noted as having generally better mental health outcomes than U.S. citizens of the same ethnicity (3). Existing literature notes that refugees living in the U.S. have a particularly high prevalence of both depression and post-traumatic stress disorder (41).

CONCEPTUAL FRAMEWORK

Study Population

Immigrants included in the New Immigrant Survey come from a variety of backgrounds. While all U.S. immigrants share their overseas upbringing and LPR status, immigrants are a multifarious group that is difficult to aggregate. While the Healthy Immigrant Effect is generally used to describe immigrants, it has been determined that this model has limitations and does not apply to all immigrants to the same extent. Immigrants are distinguished from one another by their culture, language, socioeconomic status, employment, time in the U.S., education, and health (33). Experiences of immigrants may deviate before migration to the U.S., during migration, and after migration.

Differences in Immigrants by Visa Type

Among factors that diversify immigrants is their visa type. Both health and experiences of immigrants before immigration may influence the visa type one is eligible for and the visa type an immigrant chooses to apply for (20). In this study, five consolidated visa groups are of interest: refugee/asylee/parolee, employment, family sponsored, diversity, and legalization. In addition to pre-migration experiences potentially influencing an immigrant's selected visa type, this selected visa type may lead to consequences on migration and post-migration. One's experiences, lifestyle, and health may be altered as a result of their visa type. While this visa type is merely a set of numbers on a passport, these numbers may alter the rights of a permanent resident and how a permanent resident is treated socially .

Existing literature suggests that refugees and asylum seekers are unique in that they most often experience distressing events prior to migration, such as victimization and living in a camp setting (21). UNHCR furthermore refers immigrants for resettlement in the U.S. on the basis of exposure to an event, being "at-risk", or being in poor overall health (22). The process of resettlement and entering the U.S. additionally takes years and can induce added stress during migration (22). Once refugees and asylum seekers are admitted to the U.S., they receive assistance that helps them access healthcare and integrate into the U.S. lifestyle, and they are required to complete a series of health screenings in the U.S. (22).

For other visa groups, immigrating may be a privilege rather than a method of escaping humanitarian problems in one's region of origin. Generally, people of the employment, family, diversity, and legalization visa types generally must demonstrate financial means to survive in the U.S. without government assistance (42). In addition to having sufficient financial means, these immigrants may be in better health due to undergoing required pre-immigration health screenings (43).

The proposed relationship of pre-migration experiences, visa type, migration experiences, post-migration experiences, and health are summarized in Figure A. It's important to note this cross-sectional study does not allow one to discriminate whether differences in health at the time of gaining permanent residence are attributed to pre-migration or migration and post-migration. It's suspected based on prior studies that immigrants enter the U.S. with health that is already different (34).

MATERIALS AND METHODS

Study Background

Data Source

The New Immigrant Survey (NIS) "NIS-2003-1" dataset is a nationally representative survey of new immigrants who obtained their legal permanent residence (LPR) between May 2003 and November 2003. The study sample consists of adult immigrants, or those aged 18 and older at the time of LPR. The dataset includes both immigrants who arrived to the U.S. upon obtaining an immigrant visa and immigrants who lived in the U.S. prior to obtaining an immigrant visa. The sampling frame was initially 12,500 new adult immigrants, and interviews were completed with 8,573 (68.6%) of those immigrants. Immigrant names, classes of admission, and contact information were provided by the U.S. Immigration and Naturalization Services (INS) - now known as U.S. Citizenship and Immigration Services (USCIS). Upon obtaining information on immigrants from May-November 2003, interviews were conducted June 2003-June 2004. Interviews were conducted via telephone or in-person and in the language of an interviewee's choosing. While the survey was initially developed in English, questionnaires were adapted in seven additional languages. In some instances, the survey language selected by the respondent lacked a developed questionnaire. In this instance, bilingual interviewers or interpreters were used to facilitate surveying.

Data Preparation and Selected Variables

Survey Weighting

Across all NIS versions, weighting is utilized to adjust for under-sampled and over-sampled populations. NIS intentionally over-sampled certain populations to ensure

their representation. Specifically, the employment-type and diversity immigrants were over-sampled and employment immigrants were under-sampled.

The survey also used post-stratification weights to account for differences in the total population of new immigrants selected versus those selected to be represented in the survey.

For the sampling weights, selection of adult immigrants was stratified by visa-related factors (i.e. spouses of U.S. citizens, employment principals, diversity principals, and all other immigrants). The survey consisted of eight separate replicates or rounds of surveying. In weighting, all four strata and all eight replicates, 48 total groups, or sampling fractions, were represented. Each of the 48 sampling fractions have a design weight assigned under variable wgtsamp1. Using the variablewgtsamp1 in analysis makes data for NIS-1 nationally representative.

Software and Study Assumptions

Analysis will be completed using STATA/SE 16.0, and publicly available and downloadable NIS data. While restricted versions of NIS exist, all needed data was found in the public-use dataset.

For all variables used in analysis, all responses with don't know or a refusal to respond to a given question will be converted to missing. It is expected that few refusals or unknown responses exist, and it is assumed that refusal and don't know responses are random.

For this analysis, any respondent who has a missing answer for any question of interest will be dropped from the study. Only respondents with answers to all questions will be retained in the final analytic dataset.

To validate this assumption of little missingness and unknown responses, tables to show the count and proportion of unknown, refused, and missing responses will be developed and shown in the results.

Variables

Variables of interest in this study are broken into three groups: outcomes of interest, exposures of interest, and proposed sources of confounding and interaction. The exposure of interest was provided by the U.S. Immigration and Naturalization Services for all immigrants included in this study. All outcomes and confounders of interest were self-reported through the oral interview.

1. Outcome Data

Two types of health data are of interest in this study 1) self-reported health status 2) diagnosed chronic conditions.

The NIS self-rated health variable is ranked on a Likert scale where one can rate their health as excellent, very good, good, fair, or poor.

Several chronic condition variables will be utilized to assess chronic conditions in immigrants. Diagnosed chronic conditions in NIS are based on questions that ask if a doctor has ever diagnosed one with [condition of interest]. Diagnosed conditions of interest included in the survey include high blood pressure, diabetes, cancer/tumor, chronic lung diseases (not including asthma), any heart problem, stroke, psychiatric problems, arthritis/rheumatism, and asthma. All responses are dichotomous yes/no answers and whether one is cured or being treated for a given disease was not taken into consideration.

For this analysis, asthma and chronic lung diseases were combined to make a single lung diseases variable, and stroke and heart problems were combined into a single variable. Combination of certain conditions was done because many conditions are quite rare, with less than 1% of the study population expected to be diagnosed with such a condition.

In addition to making new variables to combine similar conditions, an additional variable was made to encompass all diagnosed chronic conditions. For this variable, a person is identified as having a chronic condition if they responded that they had at least one of the conditions of high blood pressure, diabetes, cancer/tumor, lung diseases, heart problems, stroke, psychiatric problems, or arthritis/rheumatism. If an individual did not have any of these conditioned, they were coded as not having a chronic condition. This variable will be referred to throughout this paper as "any chronic condition", although it does not encompass chronic conditions not included in this survey.

2. Exposure Data

Visa types pre-populated by INS are originally split into the following categories: Spouse of U.S. Citizen, Spouse of Legal Permanent Resident, Parent of U.S. Citizen, Child of U.S. Citizen, Family Fourth Preference, Employment Preferences, Diversity Immigrants, Refugee/Asylee/Parolee, Legalization, and Other (Family-Based). For this analysis, variables will be recoded into five condensed groups to represent the main immigrant classes. The five groups for analysis are family sponsored, employment preferences, diversity, refugee/asylee/parolee, and legalization. The family sponsored visa group has the most people in it and will thus be used as the reference group in all analysis.

3. Covariates

Both confounding and effect modification, or interaction of a confounder and the exposure of interest, are suspected. Confounders that will be assessed are as follows: education, time in the U.S., region of birth, employment status, U.S. region of residence, gender, health insurance, marital status, age, and smoking status. Interaction is suspected for gender and health insurance.

Education is based on a survey question that asks respondents how many years of education they have received in total, whether in or outside of the U.S. This indicator will be kept linear and measured in years.

Time in the U.S. is a self-constructed variable that is linear and measured in years. This variable measures the length of time between the year one first migrated to the U.S. and the year that one was surveyed. While many immigrants in the survey traveled outside of the U.S. one or many times, the U.S. is considered as an exposure that impacts health, and these subsequent trips are not taken out of the amount of time one spends in the U.S.

The region of birth variable is split into four disparate regions: 1) Europe and Central Asia, North America [Non-Latin], 2) Latin America and the Caribbean 3) Africa and the Middle East 4) East Asia, South Asia, the Pacific, and Oceania. This variable is derived from the survey question that asks respondents their country of birth. In modeling, the group including Europe and North America will be used as the reference group, as it is suspected to be most similar to the U.S.

Because of limitations in calculating household income and socioeconomic status, one's employment type will be used as a proxy for socioeconomic status. The survey asks

respondents if they are employed full-time, part-time, or unemployed. If they are unemployed, the survey further asks if one is a homemaker, laid off, retired, disabled, or under some other an unspecified employment circumstance. For this analysis, employment is broken into the following categories: 1) employed 2) unemployed and seeking work 3) unemployed due to being laid off, disabled, on leave, or retired 4) unemployed homemakers 5) unemployed under other circumstances. The employed group is the largest and will be used as the referent group in modeling.

One's U.S. region of residence is based on a pre-populated INS variable that provided the state or region where one's green card was sent. While it's possible that someone moved between getting their green card and being interviewed, it's the only regional variable available. This initial variable was modified and divided into four regional categories, based on U.S census regions. The regions are the West, Midwest, South, and Northeast. Because the west coast is the biggest in terms of number of respondents, it will be used as the referent group in modeling

Gender is a dichotomous variable that asks whether someone is male or female. Non-binary gender options were not provided in this variable titled as gender, and it is assumed that the responses of "male" and "female" represent one's biological sex. Male will be used as the reference group for models.

Health insurance is a self-generated variable based on a series of questions in the NIS. If one indicates that they have insurance outside of the U.S., self-insurance, employer provided insurance, or government insurance of Medicare or Medicaid, they are considered as covered by a health insurance plan. All others are considered not

covered. Those covered by some form of identified insurance will be used as the reference group.

Marital status is based on a survey question directly asking if one is married. The variable is split into the following categories: married or living with a partner, single and never married, and divorced or widowed. The married and partnered group will be used as the reference group in models.

Age is a linear variable that is measured in years. Age was calculated by subtracting one's year of birth from the year that the survey was conducted in.

Smoking status is a dichotomous variable where smokers are defined as people who have ever smoked, and non-smokers are defined as people who have never smoked. The non-smokers are used as the reference group in models.

Data Analysis

Descriptive Models

For every single exposure, outcome, and confounder in this study, a weighted descriptive analysis will be conducted. First, this study will describe variables for all immigrants in the study, and then descriptive statistics for each visa type will be presented. These descriptive statistics will be used to understand the demographic profile of our study and identify any crude differences between visa groups, such as a particular visa type containing older people.

Testing Modeling Assumptions

Before running any multivariate models, tests to ensure collinearity is not strongly influencing models will be conducted. Identifying and eliminating collinear variables ensures that the exposure-outcome relationship is not altered by two or more confounders

being too similar to one another. Collinearity will be assessed by using pairwise correlation coefficients. This collinearity testing will be conducted to compare all exposures and confounders of interest and all outcomes of interest with one another. Any set of variables with a coefficient greater in magnitude than 0.7 will be addressed by dropping one of the problematic variables from all subsequent analysis.

General Modeling Techniques

For this study, modeling will be used to assess the exposure-outcome relationship while controlling for potential sources of confounding. All suspected confounders will be expressed in every statistical model regardless of whether they reach significance, and confounder selection techniques will not be used. This is done to ensure that confounders that do not reach significance are still accounted for and to keep consistency among all models.

Interaction will be tested for any indicated variables, and the p-value for each variable suspected to interact with the outcome will be reported using a likelihood ratio test of interaction. Interaction terms will not be included in any final models. P-values will be included as footnotes for modeling tables.

Self-Rated Health Model

Because self-rated health is measured on a Likert scale, we will begin by testing if ordinal logistic regression techniques can be used for this variable. Specifically, we will test the independence (proportional odds) assumption, or we will test to see if the difference between different ratings is independent.

If the independence assumption for using ordinal regression fails, the self-rated health will be changed into a dichotomous variable where having fair or poor health

represents being exposed and having good, very good, or excellent health represents being unexposed.

The outcome will be analyzed with ordinal logistic regression after checking the proportional odds assumption, which tests to see if the differences between each Likert ranking (e.g. excellent to good vs fair to poor) are similar enough to be described by a single odds ratio. If this assumption passes, a single outcome to represent the odds as health score increases by 1 or gets one level worse. If the assumption fails, logistic regression will instead be used, so that scores can be treated independently, with good, very good, or excellent health as the reference outcome.

The ordinal and logistic models to be used are as follows:

Model Ia: $\ln(P[SRHS \geq \text{rating}]/ P[SRHS < \text{rating}]) = \alpha + \beta(\text{visa type}) + \gamma_1(\text{employment}) + \gamma_2(\text{sex}) + \gamma_3(\text{marital status}) + \gamma_4(\text{health insurance}) + \gamma_5(\text{smoking status}) + \gamma_6(\text{birth region}) + \gamma_7(\text{U.S. region of residence}) + \gamma_8(\text{years education}) + \gamma_9(\text{age}) + \gamma_{10}(\text{age squared}) + \gamma_{11}(\text{time in U.S.})$

Model Ib: $\ln(\text{odds fair/poor health}) = \alpha + \beta(\text{visa type}) + \gamma_1(\text{employment}) + \gamma_2(\text{sex}) + \gamma_3(\text{marital status}) + \gamma_4(\text{health insurance}) + \gamma_5(\text{smoking status}) + \gamma_6(\text{birth region}) + \gamma_7(\text{U.S. region of residence}) + \gamma_8(\text{years education}) + \gamma_9(\text{age}) + \gamma_{10}(\text{age squared}) + \gamma_{11}(\text{time in U.S.})$

Note that STATA automatically generates indicator variables for all categorical variables, so that the given exposure or confounder of interest is always compared to the reference group without further covariates.

Chronic Condition Models

Logistic regression models will be used first for the any chronic condition variable and then for individual conditions. This regression will produce the odds of having a given chronic condition.

The models to be ran are as follows:

Model II: ln(odds any chronic condition) = $\alpha + \beta$(visa type) + γ_1(employment) + γ_2(sex) + γ_3(marital status) + γ_4(health insurance) + γ_5(smoking status) + γ_6(birth region) + γ_7(U.S. region of residence) + γ_8(years education) + γ_9(age) + γ_{10}(age squared) + γ_{11}(time in U.S.)

Model III: ln(odds diabetes) = $\alpha + \beta$(visa type) + γ_1(employment) + γ_2(sex) + γ_3(marital status) + γ_4(health insurance) + γ_5(smoking status) + γ_6(birth region) + γ_7(U.S. region of residence) + γ_8(years education) + γ_9(age) + γ_{10}(age squared) + γ_{11}(time in U.S.)

Model IV: ln(odds high blood pressure) = $\alpha + \beta$(visa type) + γ_1(employment) + γ_2(sex) + γ_3(marital status) + γ_4(health insurance) + γ_5(smoking status) + γ_6(birth region) + γ_7(U.S. region of residence) + γ_8(years education) + γ_9(age) + γ_{10}(age squared) + γ_{11}(time in U.S.)

Model V: ln(odds lung disease) = $\alpha + \beta$(visa type) + γ_1(employment) + γ_2(sex) + γ_3(marital status) + γ_4(health insurance) + γ_5(smoking status) + γ_6(birth region) + γ_7(U.S. region of residence) + γ_8(years education) + γ_9(age) + γ_{10}(age squared) + γ_{11}(time in U.S.)

Model VI: $\ln(\text{odds stroke/heart problem}) = \alpha + \beta(\text{visa type}) + \gamma_1(\text{employment}) + \gamma_2(\text{sex}) + \gamma_3(\text{marital status}) + \gamma_4(\text{health insurance}) + \gamma_5(\text{smoking status}) + \gamma_6(\text{birth region}) + \gamma_7(\text{U.S. region of residence}) + \gamma_8(\text{years education}) + \gamma_9(\text{age}) + \gamma_{10}(\text{age squared}) + \gamma_{11}(\text{time in U.S.})$

Model VII: $\ln(\text{odds psychiatric condition}) = \alpha + \beta(\text{visa type}) + \gamma_1(\text{employment}) + \gamma_2(\text{sex}) + \gamma_3(\text{marital status}) + \gamma_4(\text{health insurance}) + \gamma_5(\text{smoking status}) + \gamma_6(\text{birth region}) + \gamma_7(\text{U.S. region of residence}) + \gamma_8(\text{years education}) + \gamma_9(\text{age}) + \gamma_{10}(\text{age squared}) + \gamma_{11}(\text{time in U.S.})$

Model VIII: $\ln(\text{odds arthritis}) = \alpha + \beta(\text{visa type}) + \gamma_1(\text{employment}) + \gamma_2(\text{sex}) + \gamma_3(\text{marital status}) + \gamma_4(\text{health insurance}) + \gamma_5(\text{smoking status}) + \gamma_6(\text{birth region}) + \gamma_7(\text{U.S. region of residence}) + \gamma_8(\text{years education}) + \gamma_9(\text{age}) + \gamma_{10}(\text{age squared}) + \gamma_{11}(\text{time in U.S.})$

RESULTS

Preliminary Analysis: Missingness Results

The selected dataset for this study began with 8,573 observations. 601 survey respondents were dropped from analysis due to having one or more variable of interest, either an exposure, outcome, or confounder, missing. Because all responses had few refusals and unknown responses, such responses were converted to missing after an item analysis. The final analytic dataset consists of 7,972 respondents.

For health outcomes, 321 respondents were initially missing all health outcomes, with the exception of self-rated health status, as seen in Table 1. An additional 45 observations were dropped due to a respondent refusing to respond or answering unknown for any health question of interest (Table 1). Refusal and don't know responses were split similarly between health outcomes, and no single health outcome was responsible for most of the losses, proportionally. Therefore, the distribution of don't know and refusal responses is assumed to be random.

After dropping variables on the basis of missing health data, covariates were assessed. An additional 189 respondents were dropped due to missing covariates, as seen in Table 2. Finally, 46 more respondents were dropped due to having missing or unknown responses for at least one covariate of interest in the study (Table 2). Missingness, refusal, and don't know responses that were deleted appeared to be randomly distributed. While smoking status had 321 missing respondents, according to Table 2, all respondents missing smoking information were previously dropped due to missing other health outcomes.

Further validation of results was not explored because missingness appeared to be random and not linked with the exposure of interest, visa type.

Descriptive Results

All Immigrants

Survey-weights were applied to variables, and the demographic profile for all immigrants and each visa type can be seen in Table 3. Notably, over one-third of all immigrants were in excellent health (34.70%), and most others were in very good (28.65%) or good (27.28%) health. Having fair or poor health was experienced by few immigrants; 7.97% and 1.40% respectively reported such health statuses. For health conditions, the indicator variable created to identify any of the following conditions: diabetes, high blood pressure, cancer/tumors, chronic lung diseases including asthma, heart diseases and stroke, psychiatric conditions, and arthritis identified that 19.55% of the immigrant population had at least one condition. Most individual conditions were rare, with high blood pressure being the most common (9.51%), followed by arthritis/rheumatism (4.39%), diabetes (3.79%), and chronic lung diseases (3.35%).

The exposure of interest, visa type, was found to consist of mostly family sponsored immigrants (66.92%). All remaining groups had significantly fewer immigrants proportionally. Listed from most to least prevalent, employment (9.94%), legalization (8.20%), diversity (8.11%), and refugee, asylees, and parolees (6.82%).

Other suspected confounders and sources of interaction with the exposure of interest are also described in Table 3. Most notably, more than half of immigrants were found to be employed either part-time or full-time (55.91%); however, a significant population were unemployed and seeking work (16.10%), playing supportive homemaker roles (16.37%), unemployed (4.92%), or what was described as an “other”

unemployment circumstance (6.70%). Immigrants were more likely to be female (56.27%), and most immigrants were married (76.54%). More than half of immigrants were not covered under a specified form of insurance asked about in the survey (58.05%). Most immigrants reported never smoking (75.26%).

Immigrants surveyed came from across the world, with 43.91% coming from Latin America or the Caribbean, 29.69% coming from East Asia, South Asia, the Pacific, or Oceania, 15.35% coming from Europe, Central Asia, or North America (Non-Latin), and 11.04% coming from Africa or Middle East. Immigrants also had their permanent resident green cards mailed to addresses across all states and regions of the U.S. Most immigrants settled in the West (37.90%), followed by the East (29.15%), South (22.10%), and Midwest (10.86%).

On average, immigrants had 12.25 years of education attained either in the U.S. or overseas. Immigrants were 38.45 years old on average and had spent an average of 5.77 years in the U.S. between first entering and being surveyed.

Health Outcomes by Visa Type

When looking at the individual visa categories in Table 3, crude frequencies showed that diversity and employment immigrants were most likely to report both excellent and very good health. For employment immigrants, 42.35% were in excellent health and 32.58% were in very good health. This exemplifies how employment immigrants often consider themselves in good health to seek jobs overseas. For diversity immigrants, 47.03% were in excellent health and 30.77% in very good health. Because diversity immigrants, like employment immigrants, often actively seek living in the U.S., self-rated health status may influence one's decision to apply for a diversity visa. Both

refugee/asylee/parolee immigrants and legalization immigrants had the lowest proportion of people with excellent and very good health. Moreover, the refugee/asylee/parolee and legalization groups had the highest proportion of respondents with fair and poor self-rated health. For the refugee/parolee/asylum seeker group, 11.47% rated their health as fair and 5.33% rated their health as poor. For legalization immigrants, 17.92% had fair health and 1.58% had poor health. By comparison, the employment group, which had the least people with fair/poor health proportionally, with 2.96% rating their health as fair and .15% rating their health as poor.

Differences for each self-ranking can visually be expressed in Figure 1. In this figure, diversity and employment visa holders are much more likely to have excellent health than other groups and slightly more likely to have very good health. The diversity and employment visa holders have the lowest prevalence for fair, and poor self-rated health. For legalization and refugee immigrants, the opposite is seen. These immigrants have the lowest prevalence of excellent and very good health but are slightly higher than other visa groups for self-rated health as good. For fair and poor health, refugee and legalization visa holders have much higher prevalence for each self-rating when compared with family, employment, and diversity prevalence.

For the any diagnosed condition variable, the diversity visa group again appeared to be better off. Diversity immigrants had the lowest prevalence of diagnosed conditions; only 8.57% of these immigrants were living with a condition of interest. The second best off group was the employment immigrants, who had a prevalence of 15.20% for specified chronic conditions. Family immigrants appeared to be similar to the overall immigrant prevalence, which can partially be explained by the fact that most immigrants were from

this group. 19.92% of family immigrants had at least one of the chronic conditions of interest. Diversity and refugee groups again had higher prevalence of diagnosed conditions, again suggesting that these groups may be the worst off in terms of health. 24.15% of legalization immigrants had a specified condition, and 28.88% of refugee/asylees/parolees had a condition. Figure 2 visually shows the differences in visa type explained above, and a clear distinction among visa types can be seen.

The proportional patterns for each specific chronic condition largely mimicked what was seen for all health conditions. For almost all individual conditions, refugees had the highest prevalence of the condition, followed by legalization immigrants. For diagnosed lung conditions and diabetes only, the legalization immigrants surpassed the refugee immigrants in prevalence of the disease (Table 3). For every single health condition, the diversity immigrants had the lowest prevalence of the condition. For arthritis, family visa holders had a strikingly high prevalence of disease that surpassed legalization immigrants but not refugees (Table 3).

Figure 3 provides a visual representation of the prevalence of each chronic condition by visa type. In Figure 3, one can see that the prevalence for each disease was quite different, with high blood pressure overall being somewhat common, and heart diseases and stroke being rarer. While overall prevalence between conditions varied, one can see that the same visa groups, the refugee and legalization groups, were the worst off

It's possible that differences in health outcomes can be explained some or largely by identified confounders. For confounding variables, employment immigrants were much more likely to be insured than other visa groups, likely as a result of employment-provided benefits. Employment immigrants additionally mostly originated from Asia and

the Pacific (64.59%). For all other visa types, most people did not come from Asia. Finally, employment immigrants had the highest level of education, by far, with the average employment immigrant having 16.17 years of schooling. For diversity immigrants, they were the least likely to be insured by a form of insurance included in the survey. Diversity visa holders were also the most likely to be unemployed and seeking work (29.20%). Finally, diversity immigrants are the youngest group on average (mean age 33.22) and the newest group to enter the U.S., with an average of only 1.40 years spent in the U.S. Refugee/asylee/parolee immigrants were notably the oldest group of immigrants (mean age 40.25). Legalization immigrants almost exclusively originated from Latin America and the Caribbean (97.53%) and had by far spent the most time in the U.S. (15.38 years).

Analytic Results

Collinearity

Before completing regression, collinearity assessment between independent variables of interest and between outcomes of interest were conducted using pairwise correlation coefficients. Overall, no significant collinear relationships were identified, as exemplified by Tables 4a and 4b. Because of this, no additional variables were dropped, and adjustment of models was not indicated. Age and age squared had a collinear relationship; however, this collinearity is a result of age squared being a modification of the age variable. This single instance of collinearity is expected and retained in future models as it will reveal whether age is linear or has some other non-linear relationship.

Self-Rated Health Model

First the regression to explain the relationship between self-rated health, visa type, and all confounders was explored (table 5). It was initially tested as an ordinal model, where each value, 1-5, represented a value on a Likert scale. When tested, the assumption that numbers were independent failed ($p<.0001$); it is extremely unlikely that numbers, or health rankings, are independent of one another.

To alleviate ordinal modeling challenges, the self-rated status variable was converted to equal 1 when an individual self-reported poor or fair health and 0 when an individual reported good, very good, or excellent health. Results of the logistic regression model are displayed below in Table 5.

According to the regression model, employment-based immigrants had lower odds of fair or poor self-rated health in comparison to family immigrants ($\beta = .82$, $p=.317$). Diversity immigrants were also at lower odds of fair or poor self-rated health ($\beta = .50$, $p=.005$**); this group notably has the lowest odds of all visa groups. Refugees/asylees/parolees were by far the worst, in contrast ($\beta = 2.74$, $p<.001$+). Legalization immigrants were also noted as at elevated odds of fair/poor outcomes ($\beta = 1.94$, $p<.001$+).

Confounding analysis revealed that employment, had a drastic confounding relationship, with those who were laid off, disabled, or on leave from work having significantly elevated odds of poor/fair health (Table 5). Those with "other" unemployment circumstances were also found to have elevated odds of fair or poor health. Females were also slightly more likely to have fair/poor self-rated health. Region of settlement in the U.S. also was related to poor/fair health; those on the West coast had

the poorest health rating, and those on the East coast had the most favorable health rating. As age and time spent in the U.S. increased, the odds of fair/poor health increased. Conversely, as years of education increased, the odds of fair/poor health decreased.

Finally, both marital status and health insurance were tested for interaction with visa type. Results suggest that marital status interacts with visa type (p=.012, under likelihood ratio testing). Health insurance, on the other hand did not interact with visa type, according to tests (p=.372, under likelihood ratio testing).

Diagnosed Chronic Condition Models

Next, all diagnosed health outcomes that were asked about in the survey were compared with immigrant visa type and the same confounders from table 5, for consistency. Table 6 shows the results of a logistic regression to predict a visa group's prevalence of chronic conditions. The chronic conditions represent an individual having one or more of the following conditions: diabetes, high blood pressure, cancer, lung conditions, heart conditions, stroke, psychiatric conditions, arthritis.

According to the regression model, employment-based immigrants had a slightly elevated odds ratio ($\beta = 1.05$, p=.651). Diversity immigrants, however, were at lower odds of having a condition ($\beta = .65$, p=.004***). This group notably has the lowest odds of all visa groups and is the only visa type that is protective in comparison to the family visa type. Refugees/asylees/parolees were again the worst off ($\beta = 1.81$, p<.001+). Legalization immigrants also had an elevated odds ratio that was slightly lower in magnitude than that of the refugees/asylees/parolees ($\beta = 1.58$, p=.001).

Confounding analysis showed all groups that weren't employed were at risk for a chronic condition. It's possible that these odds ratios may be elevated due to the fact that

a condition limits one's ability to work outside. Females were overall more likely to have a condition than males. Those who were uninsured were less likely to have a diagnosed condition, and this is possibly explained by the fact that many of these people do not have a primary care provider or specialist to diagnose them with a condition. It's possible that the true prevalence of chronic conditions in insured and uninsured is similar.

In addition to testing exposures and confounders, an interaction assessment was again conducted to understand if health insurance or marriage modify the effect of visa type on the outcome of interest. A likelihood ratio chunk test where both insurance and marital status were simultaneously assessed showed that neither variable contributed significant interaction with visa type (p=.166). For this reason, interaction terms are left out of the final model displayed in Table 6.

After analyzing all chronic conditions in aggregate, individual chronic conditions were then analyzed to understand if they would produce different results than what was generally noted for chronic conditions. Table 7 shows the odds ratios and 95% confidence interval for the six chronic conditions of diabetes, high blood pressure, lung conditions, stroke/heart conditions, psychiatric conditions, and arthritis/rheumatism.

For the employment visa type, four of the six individual chronic conditions had harmful odds ratios, or odds ratios above the null value of 1.00, in comparison to family sponsored visa holders. The remaining two chronic conditions were below the null of 1.00 or protective. While the directionality of employment visas was varied, magnitude of covariates was generally near the null. The only odds ratio that was below the cut point of p=.05 was that for heart conditions and stroke, and in this model employment visa holders had the lowest odds of stroke/heart conditions of all immigrants ($\beta = .35^*$).

Employment visa holders had a notably high odds ratio for psychiatric conditions (β = 1.57). For psychiatric conditions, employment visa holders were the second worst off.

The diversity visa conditions largely followed suit with the variable to measure all chronic conditions. The diversity visa was protective for all six chronic conditions of interest. For all chronic conditions except heart conditions/stroke, the diversity visa group has the lowest odds ratio of all visa types. The odds ratios for stroke (β = .39), lung conditions (β = .58), and psychiatric conditions (β = .44) were particularly low in magnitude. Notably, no conditions were below the significance cut point of p=.05 in significance.

Refugee/asylee/parolees were at higher odds than family visa holders (reference group) for every single health condition. For four of the six health conditions of interest, this group had the highest odds ratio of all immigrant visa groups. Refugee odds ratios for diabetes (β = 1.86*), high blood pressure (β = 1.68***), psychiatric conditions (β = 1.84), and arthritis/rheumatism (β = 1.89***) were the highest. For the remaining two health conditions, lung conditions and stroke/heart conditions, the refugees were the second worst off.

Immigrants of the legalization visa type, like refugee immigrants, were worse off than other groups. They had the overall highest odds ratios for two of the six conditions of interest, and the second highest odds ratios for three others. Legalization immigrants were the worst off for stroke/heart (β = 2.72***) conditions and lung conditions (β = 2.11**). Legalization visa holders had an elevated odds ratio in comparison to our reference group of family immigrants for every condition.

A matrix of the odds ratios for all logistic regression models can be seen in Table 8. In this table, it becomes further apparent that the legalization and refugee/asylee/parolee immigrants are the worst off. For every single health indicator, these two groups produced the highest odds ratios. Diversity visa holders were almost ubiquitously the best-off group, with the lowest odds ratio for every condition except for stroke/heart conditions, where employment visa holders had a slightly more protective odds ratio. The greatest distinctions in health by visa type can be seen in self-rated health, any diagnosed condition, stroke/heart conditions, and high blood pressure. This matrix reveals that visa holders tend to follow a natural order across each health condition studied. The diversity visa holders are the best off, followed by employment and family visa holders. Legalization and refugee visa holders are consistently disadvantaged in outcomes of interest. Refugees are furthermore the worst off of the two groups identified with worse health outcomes.

DISCUSSION

This study initially aimed to find the association between visa type and health at the time of gaining permanent residence into the U.S. Based on the selected indicators of health, self-rated health status and diagnosed chronic health conditions, visa type was found to be associated with health. Both self-rated health and diagnosed chronic conditions differed significantly based on one's visa type, even after controlling for other relevant variables including age, time in the U.S., education, region of birth, region of residence in the U.S. smoking status, health insurance, marital status, sex, and employment status. Visa type is an important consideration because it provides an explanation for why one came to the U.S. Certain experiences, such as getting married or getting a job, may urge one to apply for immigration. These experiences may also affect one's selected visa type. While visa type itself is merely a code on someone's passport, it reflects pre-migration experiences that permitted immigration and how one may be treated socially and politically during and after their migration to the U.S.

This study hypothesized that the refugee, asylee, and parolee visa group would have the worst overall health due to their unique humanitarian circumstances. Results of this study show the refugee, asylee, and parolee visa group was indeed in the worst health at the time of their immigration. They had the highest prevalence of having any chronic condition and the highest prevalence of fair or poor self-rated health. This finding is consistent with previous literature that found that refugees were often referred for immigration on the basis of poor health or being identified by UNHCR as vulnerable (22). Poorer health may also be explained by mentally and physically damaging experiences before, during, and after immigration. Research among refugee and non-

refugee immigrant children found that refugees were more likely to be exposed to trauma before immigrating to the U.S. (46). It is unknown exactly what percent of refugees, asylum seekers, and parolees experienced physical or mental trauma, as most are not asked about such experiences during mandatory health screenings (45). However, prior research found that pre-migration victimization was associated with chronic conditions including cardiovascular diseases, metabolic diseases, and arthritis (44). It is unknown exactly why refugees are in the worst health, but trauma and prioritization of unhealthy refugees may explain their health

In addition to finding that the visa group containing refugees, asylees, and parolees was in the worst health of all visa groups, this study also concluded that those who gained permanent residence under the legalization visa type also had poorer health outcomes. In comparison to the family, employment, and diversity type visa holders, legalization visa holders were at higher odds of fair or poor self-rated health and diagnosed heath conditions. Because legalization visa holders resided in the U.S. as unlawful residents or non-immigrant aliens for a typically extended period of time, 15.38 years on average, it is possible that their lack of LPR hindered their access to health. People who are not legal permanent residents cannot qualify for Medicare or Medicaid even for emergency use (16). Furthermore, non-permanent residents are often unauthorized to work in the U.S. or have restrictions on where and for how long they can work if authorized (47). Many legalization visa holders had limited job mobility and an inability to obtain a fair salary before being granted permanent residence (27). Both suspected lack of access to healthcare before immigrating and unfair job circumstances may explain why legalization visa holders have worse health.

In contrast to the legalization and refugee visa groups, diversity immigrants were found to be in the best health. They were most likely to have high self-ratings of health and had the lowest prevalence of diagnosed health conditions. To qualify for the diversity visa type, one must have a high school diploma and two years of work experience in a profession that requires at least two years of training to obtain (25). Diversity visa holders must additionally have financial means to travel and live in the U.S. prior to being admitted as a permanent resident (11). This means that diversity immigrants must have either a job in the U.S. or sufficient property and assets to survive without employment (11). While this study was able to control for education and post-migration employment, it was unable to control for one's professional working level and socioeconomic status before immigrating, these factors may explain why diversity visa holders have the most favorable health.

Findings of this study were consistent with previous studies. In the study that assessed the relationship of visa type and BMI, both the refugee and legalization visa groups were found to have higher BMIs. In the study that compared refugee, asylum, and parole visa holders to all other new permanent residents, the visa group containing refugees was the worst off, similar to our study. Because this study combined all non-refugee visa groups to make a larger non-refugee referent group, it produced strong associations ($p<0.001$) with higher magnitude than our own study. While results of this study taught us that refugees were in poorer health than others, it did not tell us if there were any other visa types that had poor health. Our own study expands knowledge on health of legalization, diversity, employment, and family groups and corroborates the

finding that refugees have the worst health in terms of chronic diseases and self-rated health.

Strengths and Limitations

Strengths

Selection of the New Immigrant Survey dataset allowed stratification of a large cohort of immigrants by visa type. Other large cohort studies including immigrants in the U.S. do not include visa information. The selected dataset also over-selected certain visa types so that each of the five visa groups had adequate representation. Without over-sampling by visa type, analysis of health by visa type would not have been possible, as many health conditions are rare. Without stratified sampling methods, family sponsored visa holders would have likely made up more than two thirds of all interviews, and the diversity and employment visa holders would likely compromise a smaller proportion of all respondents.

Selection of the New Immigrant Survey also allowed for our analysis to control for several proposed confounders. The New Immigrant Survey collects expansive demographic information on all respondents. The New Immigrant Survey included questions not only on health, but also non-health factors such as age and sex, migration, family members, employment, and education.

Limitations

Because the New Immigrant Survey collects information through interviews, this study relies on respondents to provide truthful and unbiased responses. For health outcomes, diagnosed health conditions were used as an indicator of health, as it is often easy for someone to recall if a doctor has ever diagnosed them with a condition. The self-reported health outcome is designed to be influenced personal perceptions of oneself,

therefore, it is expected that self-esteem will affect how one rates their health. Prior studies have suggested that scales for ranking health vary greatly by one's country of residence, and this study therefore controlled for one's region of birth to minimize this bias (52). Because findings for chronic conditions and self-rated health were similar, variation in self-esteem is suspected to be random.

Despite the New Immigrant Survey only being able to complete 8,573 interviews out of the selected sampling frame of 12,500 new immigrants, non-response bias has been minimized. Post-stratification survey weights account for differences in visa type in the initial sampling frame and the study population. Because the New Immigrant Survey contacted people using information from green card applications, it is possible that some people could not be contacted due to moving to a new residence since applying for permanent residence. Moving residences is not suspected to be associated with visa type; therefore, it is not expected that study results will be biased by only including immigrants who could be contacted.

Conclusions

Implications

In knowing that the group including refugees, asylum seekers, and parolees have more chronic diseases and poorer self-rated health, this study concludes that gaps in refugee health exist and that programming to address the poor health of refugees should be considered. Currently, refugees are examined for infectious diseases prior to and after admission to the U.S. This group may benefit from additional screenings on chronic conditions and mental health. Currently, CDC recommends one mental health evaluation upon resettlement in the U.S. and provides some guidance to clinicians for components to

include in an examination (48). Adapting a series of mental health exams and counseling services may improve overall health of refugees. For chronic conditions, no standard guidelines for assessing and managing chronic conditions in refugees could be located on CDC's website (48). CDC's only recommendation for chronic health was for a physician to ask for a refugee's history of chronic conditions during screenings (48). Developing guidance for screening chronic health among refugees may also improve refugee health.

Because legalization visa holders also have lower self-rated health and a higher prevalence of chronic conditions, this study also recommends implementing mandated monitoring of legalization visa holders. It is expected that increased job mobility and recognition alone will improve the health of legalization visa holders and their ability to access healthcare. Health screenings may help legalization visa holders learn how to access care in the U.S., and it may link legalization visa holders with necessary treatment and care programs.

Future Research Needs

While this study shows that health varies by visa type, the study cannot discriminate whether differences in health are attributed to experiences prior to migration, during migration, or after migrating to the U.S. It's expected that each of these experiences influences an immigrant's health in some way. This study largely discussed pre-migration exposures, such as trauma in refugees, that may urge an immigrant to apply for a certain visa type. The study additionally touched on exposures occurring after travelling to the U.S., particularly for legalization immigrants who spent a long time in the U.S. before transitioning into permanent residence. Further research linking differential health with pre-migration and post-migration experiences is needed to

validate the impact of life before and after entering and understand when health interventions are most needed.

To help explain the impact of post-migration experiences on health by visa type, it is proposed that the second wave of the New Immigrant Survey, which was conducted five years later, is used for longitudinal analysis. Analysis may show if the differential health by visa type increases, decreases, or remains similar as immigrants spend time in the U.S. Although the New Immigrant Survey does not include data on health conditions prior to immigration, such data could be used to explore the impact of pre-migration experiences on health.

Notably, only documented immigrants are included in this study. Information on people who reside in the U.S. without documentation is unavailable. It is possible that undocumented immigrants have different health from legal immigrants; however, this study cannot make any conclusions or reccomendations for undocumented immigrants.

This study additionally does not include any U.S.-born reference groups. While existing research suggests that immigrants are in different health than U.S. born citizens when given their green card, it is not possible to know where each visa group falls in relation to the general population. It's possible that some visa groups may have health more similar to U.S. born citizens than others; however, additional data is needed.

While chronic conditions and self-rated health were included in this survey, infectious disease indicators and mortality indicators were not included. Further research to verify if refugee and legalization visa holders were the worst off in these areas is needed for a comprehensive understanding of immigrant health. It's possible that visa type has a different association with mortality and infectious diseases.

Finally, the first wave of the New Immigrant Survey was conducted in 2003, which is over 15 years ago. Several changes in immigration have occurred in this time, and it is unknown how these changes affect today's new immigrants. While some immigration-related challenges have been alleviated and new challenges have emerged since 2003, many social and political challenges to immigration remain unchanged since 2003. Further research to compare 2003 and present day is needed.

REFERENCES

1. U.S. Department of Homeland Security. Legal Immigration and Adjustment of Status Report. *Department of Homeland Security*. 2020;(https://www.dhs.gov/immigration-statistics/special-reports/legal-immigration). (Accessed April 15, 2020)

2. Batalova J, Blizzard B, Bolter J. Frequently Requested Statistics on Immigrants and Immigration in the United States. *Migration Policy Institute*. 2020;(https://www.migrationpolicy.org/article/frequently-requested-statistics-immigrants-and-immigration-united-states). (Accessed April 15, 2020)

3. Argeseanu Cunningham S, Ruben JD, Venkat Narayan KM. Health of foreign-born people in the United States: A review. *Health & Place*. 2008;14(4):623–635.

4. Gordon-Larsen P, Harris KM, Ward DS, et al. Acculturation and overweight-related behaviors among Hispanic immigrants to the US: the National Longitudinal Study of Adolescent Health. *Social Science & Medicine*. 2003;57(11):2023–2034.

5. Daniel M, Wilbur J, Marquez D, et al. Lifestyle Physical Activity Behavior Among South Asian Indian Immigrants. *J Immigrant Minority Health*. 2013;15(6):1082–1089.

6. Kennedy S, McDonald JT, Biddle N. The Healthy Immigrant Effect and Immigrant Selection: Evidence from Four Countries. *Social and Economic Dimensions of an Aging Population Research Papers* [electronic article]. 2006;(http://pdfs.semanticscholar.org/75ab/d0284c629f564c2294c54929ea4d6995d441.pdf)

7. Reed HE, Barbosa GY. Investigating the Refugee Health Disadvantage Among the U.S. Immigrant Population. *Journal of Immigrant & Refugee Studies*. 2017;15(1):53–70.

8. Yeh M-C, Parikh NS, Megliola AE, et al. Immigration Status, Visa Types, and Body Weight Among New Immigrants in the United States. *Am J Health Promot*. 2016;32(3):771–778.

9. International Organization for Migration. Key Migration Terms. *International Organization for Migration*. 2020;(https://www.iom.int/key-migration-terms). (Accessed April 16, 2020)

10. Internal Revenue Service. Immigration Terms and Definitions Involving Aliens. 2020;(https://www.irs.gov/individuals/international-taxpayers/immigration-terms-and-definitions-involving-aliens). (Accessed April 17, 2020)

11. U.S. Customs and Immigration Services. Green Card. *USCIS*. 2020;(https://www.uscis.gov/greencard). (Accessed April 18, 2020)

12. U.S. Department of Homeland Security. 2003 Yearbook of Immigration Statistics. 2004;(https://www.dhs.gov/sites/default/files/publications/Yearbook_Immigration_Statistics_2003.pdf). (Accessed April 17, 2020)

13. U.S. Customs and Immigration Services. Your Rights as a Permanent Resident. *USCIS*. 2015;(https://www.uscis.gov/green-card/after-we-grant-your-green-card/rights-and-responsibilities-a-green-card-holder-permanent-resident). (Accessed April 21, 2020)

14. U.S. Department of Homeland Security. Lawful Permanent Residents. 2016;(https://www.dhs.gov/immigration-statistics/lawful-permanent-residents). (Accessed April 17, 2020)

15. U.S. Customs and Immigration Services. A Guide to Naturalization: What Are the Benefits and Responsibilities of Citizenship? (https://www.uscis.gov/sites/default/files/files/article/chapter2.pdf). (Accessed April 17, 2020)

16. Brooks T, Wagnerman K, Cornachione E, et al. Medicaid and CHIP Eligibility, Enrollment, Renewal, and Cost Sharing Policies as of January 2017: Findings from a 50-State Survey. *The Henry J. Kaiser Family Foundation*. 2017;(https://www.kff.org/medicaid/report/medicaid-and-chip-eligibility-enrollment-renewal-and-cost-sharing-policies-as-of-january-2017-findings-from-a-50-state-survey/). (Accessed April 18, 2020)

17. U.S. Customs and Immigration Services. Citizenship Through Naturalization. *USCIS*. 2019;(https://www.uscis.gov/us-citizenship/citizenship-through-naturalization). (Accessed April 22, 2020)

18. Blizzard B, Batalova J. Naturalization Trends in the United States. *Migration Policy Institute*. 2019;(https://www.migrationpolicy.org/article/naturalization-trends-united-states). (Accessed April 22, 2020)

19. Gonzalez-Barrera A. Mexican Lawful Immigrants Among the Least Likely to Become Citizens. 2017;(https://www.pewresearch.org/hispanic/2017/06/29/recent-trends-in-naturalization-1995-2015/). (Accessed April 22, 2020)

20. U.S. Department of State. Directory of Visa Categories. *Travel.state.gov*. 2020;(https://travel.state.gov/content/travel/en/us-visas/visa-information-resources/all-visa-categories.html). (Accessed April 22, 2020)

21. Mossaad N. Refugees and Asylees: 2018. 2018 (Accessed April 20, 2020).(https://www.dhs.gov/sites/default/files/publications/immigration-statistics/yearbook/2018/refugees_asylees_2018.pdf). (Accessed April 20, 2020)

22. United Nations High Commissioner for Refugees. Resettlement in the United States. *UNHCR*. 2020;(https://www.unhcr.org/en-us/resettlement-in-the-united-states.html). (Accessed April 22, 2020)

23. U.S. Customs and Immigration Services. Humanitarian or Significant Public Benefit Parole for Individuals Outside the United States. *USCIS*. 2019;(https://www.uscis.gov/humanitarian/humanitarian-or-significant-public-benefit-parole-individuals-outside-united-states). (Accessed April 22, 2020)

24. Witsman K. U.S. Lawful Permanent Residents: 2017. U.S. Department of Homeland Security; 2018 (Accessed April 20, 2020).(https://www.dhs.gov/sites/default/files/publications/Lawful_Permanent_Residents_2017.pdf). (Accessed April 20, 2020)

25. U.S. Department of State. Instructions for the 2020 Diversity Immigrant Visa Program (DV-2020). 2019;(https://travel.state.gov/content/dam/visas/Diversity-Visa/DV-Instructions-Translations/DV-2020-Instructions-Translations/DV-2020-Instructions-English.pdf). (Accessed April 20, 2020)

26. U.S. Department of State. Diversity Visa Program, DV 2016-2018: Number of Entries Received During EachOnline Registration Period by Country of Chargeability. (https://travel.state.gov/content/dam/visas/Diversity-Visa/DVStatistics/DV%20AES%20statistics%20by%20FSC%202016-2018.pdf). (Accessed April 20, 2020)

27. Enchautegui ME. Legalization Programs and the Integration of Unauthorized Immigrants: A Comparison of S. 744 and IRCA. 2013;(https://www.urban.org/sites/default/files/publication/24316/412981-Legalization-Programs-and-the-Integration-of-Unauthorized-Immigrants-A-Comparison-of-S-and-IRCA.PDF). (Accessed April 20, 2020)

28. Chishti M, Bergeron C. Post-9/11 Policies Dramatically Alter the U.S. Immigration Landscape. 2011;(https://www.migrationpolicy.org/article/post-911-policies-dramatically-alter-us-immigration-landscape). (Accessed April 22, 2020)

29. AWAN MS. Global Terror and the Rise of Xenophobia/Islamophobia: An Analysis of American Cultural Production since September 11. *Islamic Studies*. 2010;49(4):521–537.

30. Connor P, Manuel Krogstad J. US resettled fewer refugees than rest of world in 2017 for first time. *Pew Research Center*. 2018;(https://www.pewresearch.org/fact-tank/2018/07/05/for-the-first-time-u-s-resettles-fewer-refugees-than-the-rest-of-the-world/). (Accessed April 23, 2020)

31. Sanou D, O'Reilly E, Ngnie-Teta I, et al. Acculturation and nutritional health of immigrants in Canada: a scoping review. *J Immigr Minor Health*. 2014;16(1):24–34.

32. Pitkin Derose K, Bahney BW, Lurie N, et al. Review: Immigrants and Health Care Access, Quality, and Cost. *Med Care Res Rev*. 2009;66(4):355–408.

33. Franks P, Gold MR, Fiscella K. Sociodemographics, self-rated health, and mortality in the US. *Social Science & Medicine*. 2003;56(12):2505–2514.

34. Akresh IR, Frank R. Health Selection Among New Immigrants. *Am J Public Health*. 2008;98(11):2058–2064.

35. Raghupathi W, Raghupathi V. An Empirical Study of Chronic Diseases in the United States: A Visual Analytics Approach. *Int J Environ Res Public Health*. 2018;15(3):431.

36. Centers for Disease Control and Prevention. National Diabetes Statistics Report 2020. Estimates of diabetes and its burden in the United States. 2020;32.

37. Oza-Frank R, Narayan KMV. Overweight and diabetes prevalence among US immigrants. *Am J Public Health*. 2010;100(4):661–668.

38. Commodore-Mensah Y, Selvin E, Aboagye J, et al. Hypertension, overweight/obesity, and diabetes among immigrants in the United States: an analysis of the 2010–2016 National Health Interview Survey. *BMC Public Health*. 2018;18(1):773.

39. Agrawal S, Pearce N, Ebrahim S. Prevalence and risk factors for self-reported asthma in an adult Indian population: a cross-sectional survey. *The International Journal of Tuberculosis and Lung Disease*. 2013;17(2):275–282.

40. Iqbal S, Oraka E, Chew GL, et al. Association between birthplace and current asthma: the role of environment and acculturation. *Am J Public Health*. 2014;104 Suppl 1(Suppl 1):S175–S182.

41. Shekunov J. Immigration and Risk of Psychiatric Disorders: A Review of Existing Literature. *American Journal of Psychiatry Residents' Journal*. 2016;11(2):3–5.

42. U.S. Department of State. Immigrant Visa Process. *Travel.State.Gov*. 2020;(https://travel.state.gov/content/travel/en/us-visas/immigrate/the-immigrant-visa-process/step-5-collect-financial-evidence-and-other-supporting-documents.html). (Accessed April 23, 2020)

43. Russell Hollberg M, Pogemiller H, Barnett E. Newly Arrived Immigrants & Refugees. In: *CDC Yellow Book*. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2020 (Accessed April 23, 2020)(https://wwwnc.cdc.gov/travel/yellowbook/2020/posttravel-evaluation/newly-arrived-immigrants-and-refugees). (Accessed April 23, 2020)

44. Sugihara M. Pre-migration experiences of victimization and chronic disease among foreign-born people. Atlanta, GA: Emory University; 2018 (Accessed April 20, 2020) 86 p.(https://etd.library.emory.edu/concern/etds/tt44pm866?locale=en). (Accessed April 20, 2020)

45. Shannon P, Im H, Becher E, et al. Screening for War Trauma, Torture, and Mental Health Symptoms Among Newly Arrived Refugees: A National Survey of U.S. Refugee Health Coordinators. *Journal of Immigrant & Refugee Studies*. 2012;10(4):380–394.

46. Betancourt TS, Newnham EA, Birman D, et al. Comparing Trauma Exposure, Mental Health Needs, and Service Utilization Across Clinical Samples of Refugee, Immigrant, and U.S.-Origin Children. *J Trauma Stress*. 2017;30(3):209–218.

47. U.S. Customs and Immigration Services. Working in the U.S. *USCIS*. 2020;(https://www.uscis.gov/working-united-states). (Accessed April 23, 2020)

48. Centers for Disease Control and Prevention. CDC - Domestic Mental Health Screening Guidelines - Immigrant and Refugee Health. *Centers for Disease Control and Prevention*. 2019;(https://www.cdc.gov/immigrantrefugeehealth/guidelines/domestic/mental-health-screening-guidelines.html). (Accessed April 23, 2020)

49. Osborn v. Bank of the United States, 22 U.S. (9 Wheat.) 737, 827 (1824)

50. Institute of Medicine (US) Committee on Public Health Priorities to Reduce and Control Hypertension. A Population-Based Policy and Systems Change Approach to Prevent and Control Hypertension. Washington (DC): National Academies Press (US); 2010. 2, Public Health Importance of Hypertension. Available from: https://www.ncbi.nlm.nih.gov/books/NBK220098/

51. Guillermina Jasso & Douglas S. Massey & Mark R. Rosenzweig & James P. Smith, 2005. "Immigration, health, and New York City: early results based on the U.S. new immigrant cohort of 2003," Economic Policy Review, Federal Reserve Bank of New York, issue Dec, pages 127-151.

52. National Research Council (US) Panel on Race, Ethnicity, and Health in Later Life; Anderson NB, Bulatao RA, Cohen B, editors. Critical Perspectives on Racial and Ethnic Differences in Health in Late Life. Washington (DC): National Academies Press (US); 2004. 7, Immigrant Health: Selectivity and Acculturation. Available from: https://www.ncbi.nlm.nih.gov/books/NBK25533/

FIGURES AND TABLES

Figure A. Proposed Conceptual Framework to Describe Effect of Visa Type on Health

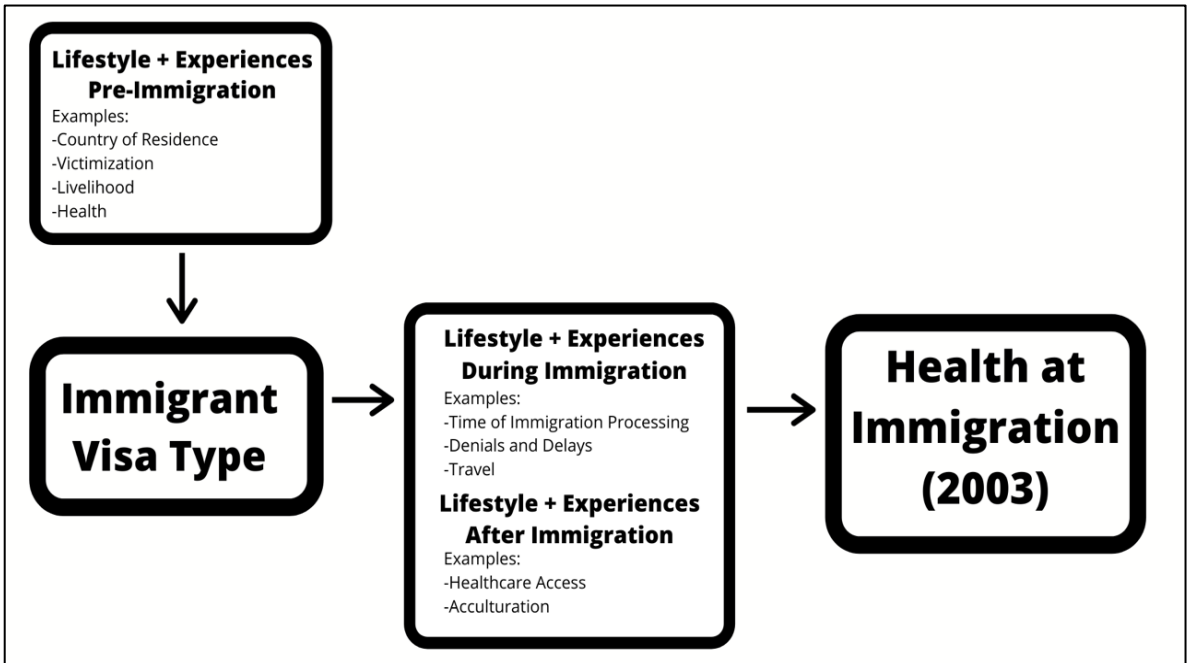
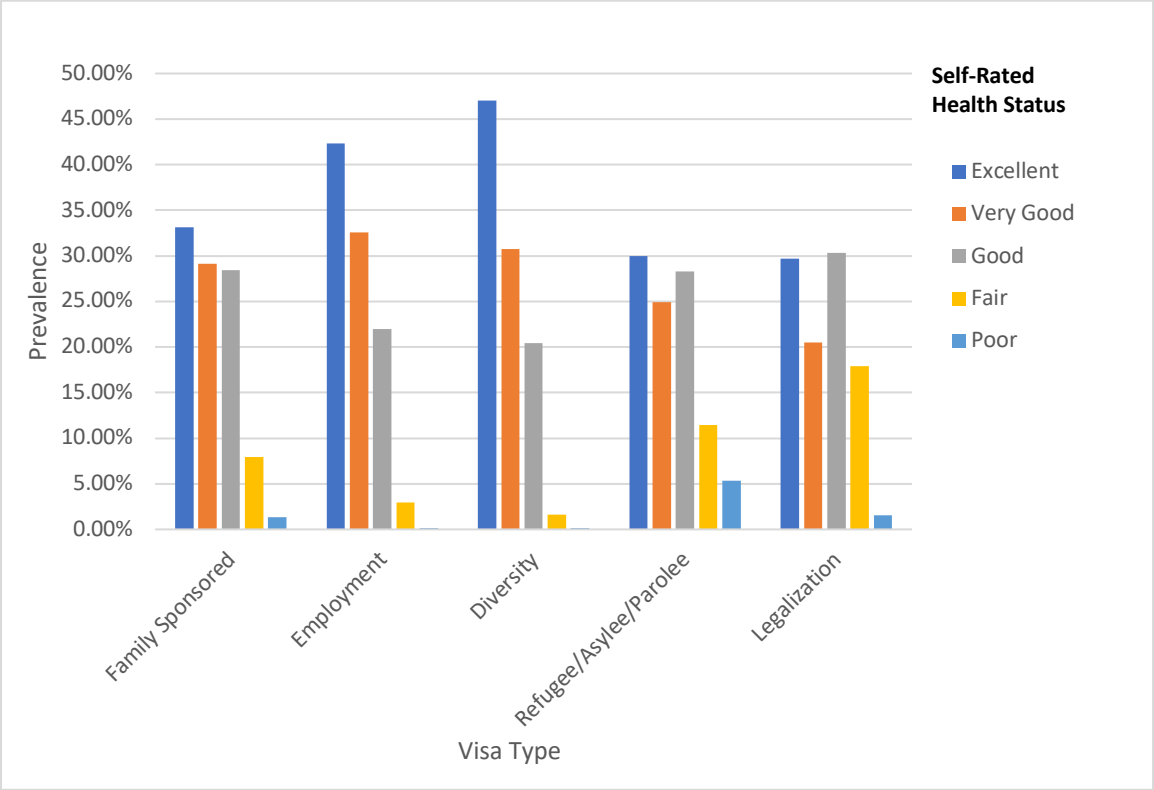


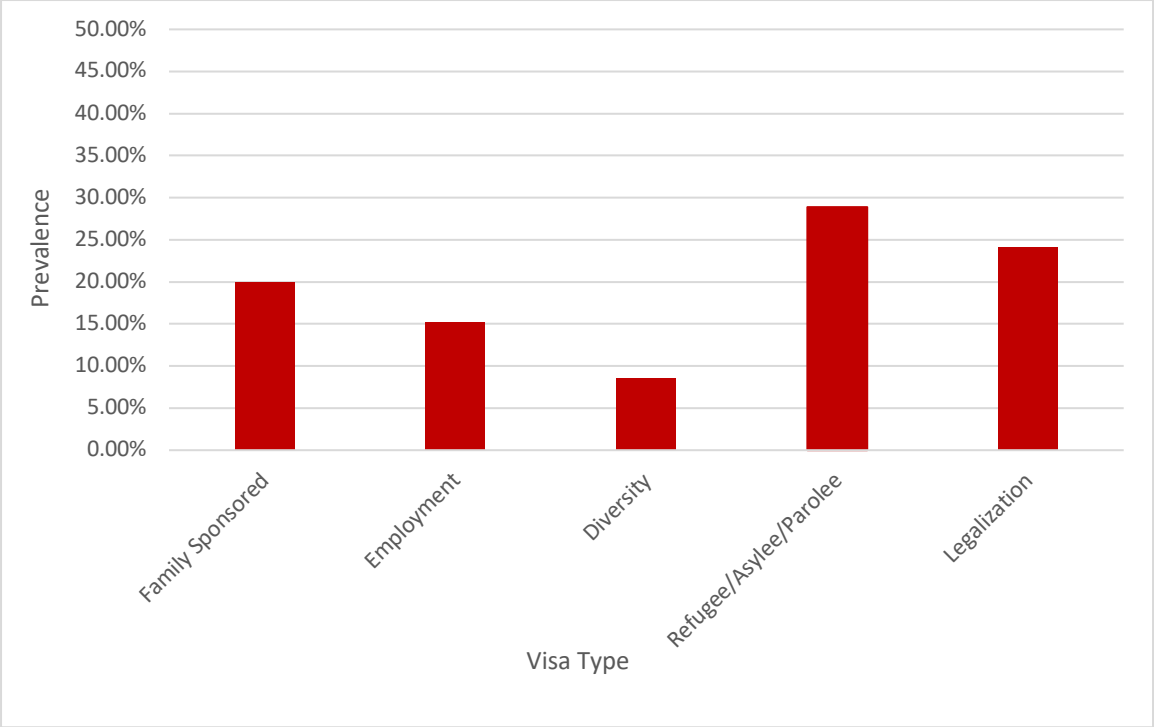
Figure 1. Survey-Adjusted Self-Rated Health Status of New Immigrants to the U.S. in 2003 by Visa Type



Notes

Study population (all new immigrants) (n=7,972) compromised of 66.88% family sponsored, 10.00% employment, 8.11% diversity, 6.84% refugee/asylee/parolee, and 8.17% legalization
Data Source: NIS-1-2003 Dataset

Figure 2. Survey-Adjusted Prevalence of Diagnosed Conditions among New Immigrants to the U.S. in 2003 by Visa Type



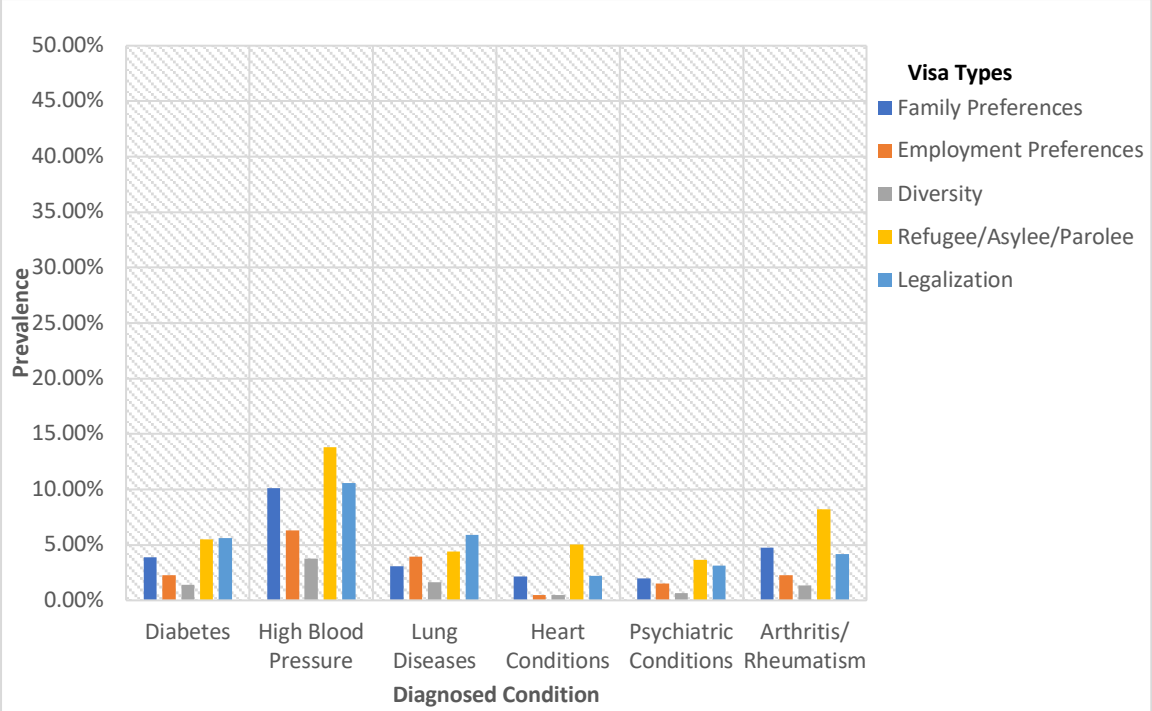
Notes

Study population (all new immigrants) (n=7,972) compromised of 66.88% family sponsored, 10.00% employment, 8.11% diversity, 6.84% refugee/asylee/parolee, and 8.17% legalization

Diagnosed Conditions include Diabetes, High Blood Pressure, Cancer/Tumors, Chronic Lung Diseases, Stroke, Heart Problems, Psychiatric Conditions, and Arthritis/Rheumatism

Data Source: NIS-1-2003 Dataset

Figure 3. Survey-Adjusted Prevalence of Individual Diagnosed Conditions in New Immigrants to the U.S. by Visa Type



Notes

Study population (all new immigrants) (n=7,972) compromised of 66.88% family sponsored, 10.00% employment, 8.11% diversity, 6.84% refugee/asylee/parolee, and 8.17% legalization

Data Source: NIS-1-2003 Dataset

Table 1. Unweighted Descriptive Health Characteristics of a Cohort[a] of Newly Admitted Legal Permanent Residents to the U.S. in 2003

Variable	n=8,573	Frequency (%)
Overall Health		
Self-Rated Health Status		
Excellent	3,085	35.99%
Very Good	2,446	28.53%
Good	2,257	26.33%
Fair	662	7.72%
Poor	113	1.32%
DONT KNOW	1	0.01%
REFUSED	8	0.09%
MISSING	1	0.01%
Diagnosed Conditions		
Any Diagnosed Condition[b]		
Yes	1,585	18.49%
No	6,632	77.36%
DONT KNOW	0	0.00%
REFUSED	6	0.07%
MISSING	321	3.74%
Diabetes		
Yes	319	3.72%
No	7,923	92.42%
DONT KNOW	1	0.01%
REFUSED	9	0.10%
MISSING	321	3.74%
High Blood Pressure		
Yes	780	9.10%
No	7,459	87.01%
DONT KNOW	6	0.07%
REFUSED	7	0.08%
MISSING	321	3.74%

Variable (continued)	n=8,573	Frequency (%)
Cancer/Tumors		
Yes	45	0.52%
No	8,189	95.52%
DONT KNOW	4	0.05%
REFUSED	13	0.15%
MISSING	322	3.76%
Chronic Lung Diseases		
Yes	273	3.18%
No	7,690	92.85%
DONT KNOW	5	0.06%
REFUSED	14	0.16%
MISSING	321	3.74%
Stroke or Any Heart Problem		
Yes	134	1.56%
No	8,100	94.48%
DONT KNOW	7	0.08%
REFUSED	11	0.13%
MISSING	321	3.74%
Psychiatric Conditions		
Yes	151	1.76%
No	8,087	94.33%
DONT KNOW	2	0.02%
REFUSED	12	0.14%
MISSING	321	3.74%
Arthritis/Rheumatism		
Yes	357	4.16%
No	7,872	91.82%
DONT KNOW	9	0.10%
REFUSED	13	0.15%
MISSING	322	3.76%

Notes

[a]Cohort Provided by Immigration and Naturalization Services (INS) in the New Immigrant Survey 2003, Wave 1 Dataset

[b]Self-constructed variable, to indicate if individual had any of the diagnosed conditions individually listed

Table 2. Unweighted Demographic Characteristics of a Cohort[a] of Newly Admitted Legal Permanent Residents to the U.S. in 2003

Variable	n=8,573	Frequency (%)
Visa Type		
Family Sponsored	4,234	49.39%
Employment	1,673	19.51%
Diversity	1,451	16.93%
Refugee/Asylee/Parolee	554	6.46%
Legalization	661	7.71%
MISSING	0	0.00%
Employment Status		
Employed	4,993	58.24%
Unemployed, Seeking Work	1,407	16.41%
Unemployed, Laid off/Leave/Disabled/Retired	422	4.92%
Unemployed, homemaker	1,160	13.53%
Other	579	6.75%
DONT KNOW	4	0.05%
REFUSED	7	0.08%
MISSING	1	0.01%
Sex		
Male	4,133	48.21%
Female	4,440	51.79%
MISSING	0	0.00%
Marital Status		
Married/Living with Partner	6,069	70.79%
Separated/Divorced/Widowed	715	8.34%
Not married	1,783	20.80%
DONT KNOW	1	0.01%
REFUSED	5	0.06%
MISSING	0	0.00%
Health Insurance Coverage		
Covered	3,583	41.79%
Not Covered	4,972	58.00%
DONT KNOW	3	0.03%
REFUSED	13	0.15%
MISSING	2	0.02%
Smoking Status		
Smoker (ever)	1,989	23.20%
Non-smoker (never)	6,258	73.00%
DONT KNOW	5	0.06%
REFUSED	11	0.13%
MISSING	321	3.74%

Table 2 continued. Unweighted Demographic Characteristics of a Cohort[a] of Newly Admitted Legal Permanent Residents to the U.S. in 2003

Variable (continued)	n=8,573	Frequency (%)
Geographic Region of Origin[c]		
Latin America and Caribbean	3,165	36.92%
Africa and Middle East	1,154	13.46%
Europe and Central Asia, North America (Non-Latin)	1,490	17.38%
East Asia, South Asia, the Pacific, and Oceania	2,748	32.05%
MISSING	16	0.19%
U.S. Place of Residence[c]		
South	1,853	21.61%
East	2,769	32.30%
Midwest	1,049	12.24%
West	2,902	33.85%
MISSING	0	0.00%
Education (years received U.S. or overseas)		
0-36 years (mean: 12.7, SD: 5.1)	8,543	99.65%
DONT KNOW	20	0.23%
REFUSED	9	0.10%
MISSING[b]	1	0.01%
Age (measured in years)		
18-94 years (mean: 39.09, SD: 13.5)	8,533	99.53%
DONT KNOW	17	0.20%
REFUSED	23	0.27%
MISSING	0	0.00%
Time in U.S.[c]		
0-66 years (mean: 5.36, SD: 6.87)	8,411	98.11%
MISSING	162	1.89%

[a]Cohort Provided by Immigration and Naturalization Services (INS) in the New Immigrant Survey 2003, Wave 1 Dataset
[b]Implausible value of 86 years changed to missing; influential outlier meaningfully changes results
[c]Refusal and don't know responses included within missing category; self-constructed variable

Table 3. Survey-Adjusted Descriptive Health Characteristics of Analytic Sample of New Immigrants in the U.S. in 2003[a,b]

	All New Immigrants (n=7,972)	Family Sponsored (n= 3,838)	Employment Preferences (n=1,620)	Diversity (n=1,353)	Refugee/ Asylee/ Parolee (n=534)	Legalization (n=627)
Variable	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**
Overall Health						
Self-Rated Health Status						
Excellent	34.70%	33.15%	42.35%	47.03%	29.98%	29.70%
Very Good	28.65%	29.16%	32.58%	30.77%	24.93%	20.49%
Good	27.28%	28.43%	21.95%	20.42%	28.30%	30.30%
Fair	7.97%	7.91%	2.96%	1.64%	11.47%	17.92%
Poor	1.40%	1.35%	0.15%	0.14%	5.33%	1.58%
Diagnosed Conditions						
Any Diagnosed Condition						
Yes	19.48%	19.92%	15.20%	8.57%	28.88%	24.15%
No	80.52%	80.08%	84.80%	91.43%	71.12%	75.85%
Diabetes						
Yes	3.76%	3.86%	2.29%	1.38%	5.52%	5.60%
No	96.24%	96.14%	97.71%	98.62%	94.48%	94.40%
High Blood Pressure						
Yes	9.50%	10.10%	6.32%	3.74%	13.83%	10.55%
No	90.50%	89.90%	93.68%	96.26%	86.17%	89.45%
Cancer/Tumors						
Yes	0.57%	0.56%	0.39%	0.22%	1.07%	0.85%
No	99.43%	99.44%	99.61%	99.78%	98.93%	99.15%
Chronic Lung Diseases						
Yes	3.36%	3.06%	3.94%	1.66%	4.41%	5.91%
No	96.64%	96.94%	96.06%	98.34%	95.59%	94.09%
Stroke or Any Heart Problem						
Yes	2.05%	2.16%	0.47%	0.46%	5.01%	2.23%
No	97.95%	97.84%	99.53%	99.54%	94.99%	97.77%
Psychiatric Conditions						
Yes	2.05%	2.00%	1.49%	0.66%	3.66%	3.16%
No	97.95%	98.00%	98.51%	99.34%	96.34%	96.84%
Arthritis/Rheumatism						
Yes	4.40%	4.73%	2.28%	1.33%	8.21%	4.16%
No	95.60%	95.27%	97.72%	98.67%	91.79%	95.84%

Table 3 continued. Survey-Adjusted Descriptive Health Characteristics of Analytic Sample of New Immigrants in the U.S. in 2003[a,b]

	All New Immigrants (n=7,972)	Family Sponsored (n= 3,838)	Employment Sponsored (n=1,620)	Diversity (n=1,353)	Refugee/ Asylee/ Parolee (n=534)	Legalization (n=627)
Variable	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**
Independent Covariates						
Visa Type						
Family Sponsored	66.88%	100.00%				
Employment Preferences	10.00%		100.00%			
Diversity	8.11%			100.00%		
Refugee/Asylee/Parolee	6.84%				100.00%	
Legalization	8.17%					100.00%
Employment Status						
Employed	55.76%	48.44%	74.73%	55.38%	74.12%	77.44%
Unemployed, Seeking Work	16.17%	18.13%	6.61%	29.20%	7.69%	6.01%
Unemployed, Laid off/Leave/Disabled/ Retired	4.95%	5.96%	0.94%	0.98%	7.27%	3.56%
Unemployed, homemaker	16.39%	19.67%	12.68%	6.71%	7.61%	10.98%
Other	6.73%	7.79%	5.05%	7.72%	3.30%	2.00%
Sex						
Male	43.82%	39.58%	50.89%	57.05%	51.23%	50.61%
Female	56.18%	60.42%	49.11%	42.95%	48.77%	49.39%
Marital Status						
Married/Living with Partner	76.54%	78.31%	83.43%	67.50%	71.16%	67.05%
Separated/Divorced/Widowed	7.87%	8.34%	3.70%	3.61%	12.09%	9.75%
Not Married	15.60%	13.35%	12.87%	28.89%	16.75%	23.20%
Health Insurance Coverage						
Covered	42.07%	39.33%	71.21%	22.22%	53.14%	39.25%
Not Covered	57.93%	60.67%	28.79%	77.78%	46.86%	60.75%
Smoking Status						
Smoker (ever)	24.69%	24.80%	23.32%	25.58%	26.57%	23.06%
Non-smoker (never)	75.31%	75.20%	76.68%	74.42%	73.43%	76.94%

Table 3 continued. Survey-Adjusted Descriptive Health Characteristics of Analytic Sample of New Immigrants in the U.S. in 2003[a,b]

	All New Immigrants (n=7,972)	Family Sponsored (n= 3,838)	Employment Preferences (n=1,620)	Diversity (n=1,353)	Refugee/ Asylee/ Parolee (n=534)	Legalization (n=627)
Variable	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**
Geographic Region of Origin						
Latin America and Caribbean	43.77%	48.32%	12.70%	4.23%	27.40%	97.53%
Africa and Middle East	11.05%	8.18%	5.65%	40.12%	24.62%	0.92%
Europe and Central Asia, North America (Non-Latin)	15.45%	11.54%	17.06%	43.26%	36.09%	0.62%
East Asia, South Asia, the Pacific, and Oceania	29.73%	31.96%	64.59%	12.39%	11.89%	0.93%
U.S. Place of Residence						
South	22.13%	22.41%	20.94%	19.52%	30.85%	16.61%
East	29.15%	26.92%	41.42%	44.63%	27.74%	18.16%
Midwest	10.91%	9.90%	17.51%	19.81%	12.05%	1.30%
West	37.81%	40.76%	20.13%	16.05%	29.36%	63.93%
Years of Education[c]	12.25 (4.94)	11.78 (4.89)	16.17 (3.91)	14.53 (3.35)	12.43 (4.43)	8.85 (4.48)
Age (years)[c]	38.41 (13.51)	39.10 (14.90)	36.75 (8.32)	33.22 (9.10)	40.25 (11.80)	38.41 (9.91)
Age Squared (years^2)[c]	1657.81 (1236.33)	1750.48 (1381.91)	1420 (694.51)	1185.97 (689.42)	1759.34 (1052.63)	1573.64 (845.91)
Years in U.S.[c]	5.76 (6.92)	5.00 (6.84)	6.26 (5.40)	1.40 (3.34)	6.10 (4.61)	15.38 (4.77)

[a]Cohort Provided by Immigration and Naturalization Services (INS) in the New Immigrant Survey 2003, Wave 1 Dataset

[b]Analytic dataset created by deleting any subjects with missingness for any variable in Unweighted Tables (1&2)

[c]Linear variables displayed with Mean(Standard Deviation) in lieu of frequency

Table 4a. Pairwise Correlation Coefficients* Among Outcomes of Interest

	Self-Rated Health Status	Any Diagnosed Condition	Diabetes	High Blood Pressure	Chronic Lung Diseases	Stroke or Any Heart Problem	Psychiatric Conditions	Arthritis/ Rheumatism
Self-Rated Health Status	1.0000							
Any Diagnosed Condition	0.3517	1.0000						
Diabetes	0.2069	0.4076	1.0000					
High Blood Pressure	0.2639	0.6603	0.1930	1.0000				
Chronic Lung Diseases	0.0647	0.3844	-0.0040	0.0217	1.0000			
Stroke or Any Heart Problem	0.2147	0.2902	0.1154	0.2019	0.0241	1.0000		
Psychiatric Conditions	0.1255	0.2805	0.0520	0.0856	0.0579	0.0488	1.0000	
Arthritis/Rheumatism	0.2180	0.4337	0.0860	0.1511	0.0436	0.1462	0.0599	1.0000

*Ranges from -1.0 to 1.0 and a magnitude larger than ~0.7 indicates sufficient evidence of collinearity

Table 4b. Pairwise Correlation Coefficients* Among Exposures of Interest

	Visa Type	Employment Status	Sex	Marital Status	Health Insurance Coverage	Smoking Status	Geographic Region of Origin	U.S. Region of Residence	Years of Education	Age (years)	Age Squared (years2)	Years in U.S.
Visa Type	1.0000											
Employment Status	-0.1943	1.0000										
Sex	-0.1007	0.3151	1.0000									
Marital Status	0.0651	-0.0247	-0.0090	1.0000								
Health Insurance Coverage	-0.0157	0.1035	-0.0122	0.1316	1.0000							
Smoking Status	0.0027	-0.1108	-0.2351	-0.0452	-0.0580	1.0000						
Geographic Region of Origin	0.0717	0.0351	-0.0209	0.1543	0.1389	-0.1214	1.0000					
U.S. Region of Residence	-0.0016	-0.0543	-0.0358	-0.0200	-0.0243	0.0270	-0.0241	1.0000				
Years of Education	0.0117	-0.2115	-0.1342	-0.0170	-0.2387	0.0239	-0.2289	0.1579	1.0000			
Age (years)	-0.1295	0.2073	0.0347	-0.2202	0.0671	0.0314	-0.0674	-0.0724	-0.2889	1.0000		
Age Squared (years^2)	-0.1574	0.2461	0.0405	-0.1673	0.0793	0.0237	-0.0523	-0.0725	-0.3152	0.9825	1.0000	
Years in U.S.	0.2389	-0.1425	-0.0415	-0.0584	-0.1696	0.0697	0.1016	-0.1137	-0.0879	0.0730	0.0529	1.0000

*Ranges from -1.0 to 1.0 and a magnitude larger than ~0.7 indicates sufficient evidence of collinearity

Table 5. Survey-Weighted Logistic Regression Model(a) for Predicting Self-Rated Health Status[a] of Newly Admitted Immigrants to the U.S. in 2003 (n = 7,972)

Covariate	Odds Ratio	Standard Error	p-value	95% Confidence Interval	
Visa Type (ref= Family Sponsored)					
Employment Preferences	0.82	0.20	0.317	0.55	1.22
Diversity	0.50	0.24	0.005**	0.31	0.81
Refugee/Asylee/Parolee	2.74	0.16	<.001+	2.01	3.75
Legalization	1.94	0.16	<.001+	1.42	2.65
Employment Status (ref= Employed)					
Unemployed, Seeking Work	1.02	0.16	0.894	0.75	1.39
Unemployed, Laid off/Leave/Disabled/Retired	3.11	0.19	<.001+	2.15	4.49
Unemployed, homemaker	1.15	0.15	0.35	0.86	1.54
Other	2.03	0.18	<.001+	1.42	2.91
Sex (ref= Male)					
Female	1.37	0.11	0.005**	1.10	1.71
Marital Status (ref = Married/Living with Partner)[c]					
Separated/Divorced/Widowed	0.81	0.14	0.149	0.61	1.08
Not married	1.04	0.15	0.816	0.77	1.39
Health Insurance Coverage (ref= Covered)					
Not Covered	0.94	0.11	0.536	0.76	1.15
Smoking Status (ref= Never Smoked)					
Smoker (ever)	1.22	0.12	0.090	0.97	1.53
Geographic Region of Origin (ref=Europe and Central Asia, North America Non-Latin])					
Latin America and Caribbean	0.99	0.17	0.955	0.70	1.39
Africa and Middle East	0.67	0.24	0.087	0.42	1.06
East Asia, South Asia, the Pacific, and Oceania	0.79	0.18	0.182	0.56	1.12
U.S. Place of Residence (ref = West)					
South	0.91	0.13	0.478	0.70	1.18
East	0.61	0.12	<.001+	0.48	0.78
Midwest	0.74	0.19	0.115	0.52	1.07
Education (years)[b]	0.90	0.01	<.001+	0.88	0.92
Age (years)[b]	1.04	0.02	0.055	1.00	1.08
Age Squared (years^2)[b]	1.00	0.00	0.778	1.00	1.00
Time in U.S. (years since first arrival)[b]	1.01	0.01	0.042*	1.00	1.03

[a]Self-rated health status measured on Likert Scale where 1= Excellent, 2=Very Good, 3= Good, 4= Fair, 5= Poor, converted to 1 = Fair/Poor, 0= Excellent/Very Good/Good because ordinal logistic regression assumptions not met. Odds of having fair/poor health expressed in model.

[b]Odds Ratio represents the average ratio when the linear variable increases by one unit

[c]Marital status found to interact with visa type (p=.012). Not included in table as no individual interaction terms had p-value less than .05. Health insurance also tested for interaction with visa type, no significant relationship found (p=.372)

Data Source: Cohort Provided by Immigration and Naturalization Services (INS) in the New Immigrant Survey 2003, Wave 1 Dataset

*p<.05, ** p<.01,***p<.005,+p<.001

Table 6. Survey-Adjusted Logistic Regression Model for Predicting a Diagnosed Health Condition Among Newly Admitted Immigrants to the U.S. in 2003[a] (n = 7,972)

Covariate	Odds Ratio	Standard Error	p-value	95% Confidence Interval	
Visa Type (ref= Family Sponsored)					
Employment Preferences	1.05	0.11	0.651	0.84	1.31
Diversity	0.65	0.15	0.004***	0.49	0.87
Refugee/Asylee/Parolee	1.81	0.13	<0.001+	1.41	2.33
Legalization	1.58	0.14	0.001***	1.21	2.06
Employment Status (ref= Employed)					
Unemployed, Seeking Work	1.24	0.11	0.048*	1.00	1.53
Unemployed, Laid off/Leave/Disabled/Retired	1.83	0.16	<0.001+	1.35	2.50
Unemployed, homemaker	1.60	0.11	<0.001+	1.28	2.00
Other	1.43	0.15	0.022*	1.05	1.93
Sex (ref= Male)					
Female	1.34	0.08	0.001***	1.14	1.58
Marital Status (ref = Married/Living with Partner)					
Separated/Divorced/Widowed	1.04	0.12	0.714	0.83	1.32
Not married	1.31	0.11	0.011*	1.06	1.61
Health Insurance Coverage (ref= Covered)					
Not Covered	0.71	0.08	<0.001+	0.61	0.83
Smoking Status (ref= Never Smoked)					
Smoker (ever)	1.45	0.09	<0.001+	1.22	1.72
Geographic Region of Origin (ref=Europe and Central Asia, North America [Non-Latin])					
Latin America and Caribbean	1.01	0.13	0.950	0.78	1.31
Africa and Middle East	1.04	0.15	0.778	0.78	1.39
East Asia, South Asia, the Pacific, and Oceania	0.80	0.12	0.067	0.63	1.02
U.S. Place of Residence (ref = West)					
South	0.79	0.10	0.020*	0.65	0.96
East	0.78	0.09	0.006**	0.65	0.93
Midwest	1.07	0.12	0.606	0.84	1.36
Education (years)[b]	1.01	0.01	0.451	0.99	1.02
Age (years)[b]	1.06	0.02	0.001***	1.03	1.10
Age Squared (years^2)[b]	1.00	0.00	0.910	1.00	1.00
Time in U.S. (years since first arrival)[b]	1.00	0.01	0.609	0.99	1.01

[a]Diagnosed conditions of diabetes, high blood pressure, cancer, lung conditions, heart conditions, stroke, psychiatric conditions, and arthritis included in any condition. Variable set to equal one if respondent has at least one condition.

[b]Odds Ratio represents the average ratio when the linear variable increases by one unit

Marital status and health insurance additionally tested for interaction with visa type. In a simultaneous test of interaction for both variables, neither were found to interact significantly (p=0.166)

Data Source: Cohort Provided by Immigration and Naturalization Services (INS) in the New Immigrant Survey 2003, Wave 1 Dataset

*p<.05, ** p<.01,***p<.005,+p<.001

Table 7. Survey-Adjusted Logistic Regression Models for Predicting Each Individual Health Condition Among New Immigrants to the U.S. in 2003 (n = 7,972)

Covariate	Diabetes: Odds Ratio	Diabetes: 95% Confidence Interval		sig.[a]	High Blood Pressure: Odds Ratio	High Blood Pressure: 95% Confidence Interval		sig.[a]
Visa Type (ref= Family Sponsored)								
Employment Preferences	1.16	0.72	1.86		1.06	0.78	1.44	
Diversity	0.98	0.53	1.79		0.72	0.47	1.10	
Refugee/Asylee/Parolee	1.86	1.14	3.02	*	1.68	1.19	2.39	***
Legalization	1.45	0.90	2.35		1.52	1.06	2.17	*
Employment Status (ref= Employed)								
Unemployed, Seeking Work	1.44	0.92	2.25		1.19	0.88	1.60	
Unemployed, Laid off/Leave/Disabled/Retired	2.46	1.56	3.87	+	1.80	1.27	2.55	***
Unemployed, homemaker	2.27	1.48	3.47	+	1.75	1.33	2.32	+
Other	2.48	1.43	4.28	***	1.83	1.23	2.71	***
Sex (ref= Male)								
Female	0.84	0.61	1.17		1.05	0.85	1.30	
Marital Status (ref = Married/Living with Partner)								
Separated/Divorced/Widowed	0.99	0.69	1.41		0.92	0.70	1.19	
Not married	1.04	0.66	1.65		0.94	0.69	1.29	
Health Insurance Coverage (ref= Covered)								
Not Covered	0.72	0.53	0.96	*	0.89	0.73	1.09	
Smoking Status (ref= Never Smoked)								
Smoker (ever)	0.94	0.66	1.33		1.25	1.01	1.56	*
Geographic Region of Origin (ref=Europe and Central Asia, North America (Non-Latin))								
Latin America and Caribbean	3.00	1.77	5.11	+	0.95	0.67	1.34	
Africa and Middle East	3.07	1.67	5.65	+	0.76	0.51	1.13	
East Asia, South Asia, the Pacific, and Oceania	1.89	1.09	3.26	*	0.73	0.53	1.01	
U.S. Place of Residence (ref = West)								
South	0.78	0.54	1.12		0.93	0.72	1.20	
East	0.72	0.52	1.00	*	1.12	0.89	1.41	
Midwest	0.88	0.55	1.42		1.08	0.78	1.51	
Education (years)(b)	0.99	0.96	1.01		1.00	0.98	1.02	
Age (years)(b)	1.21	1.13	1.29	+	1.16	1.11	1.21	+
Age Squared (years2)(b)	1.00	1.00	1.00	+	1.00	1.00	1.00	***
Time in U.S. (years since first arrival)(b)	1.01	0.99	1.02		1.00	0.99	1.01	

[a]Sig. = Level of significance, where *p<.05, ** p<.01,***p<.005,+p<.001

[b]Odds Ratio represents the average ratio when the linear variable increases by one unit

Data Source: Cohort Provided by Immigration and Naturalization Services (INS) in the New Immigrant Survey 2003, Wave 1 Dataset

Table 7 continued. Survey-Adjusted Logistic Regression Models for Predicting Each Individual Health Condition Among New Immigrants to the U.S. in 2003 (n = 7,972)

Covariate	Lung Conditions: Odds Ratio	Lung Conditions: 95% Confidence Interval		sig.[a]	Stroke/Heart Conditions: Odds Ratio	Stroke/Heart Conditions: 95% Confidence Interval		sig.[a]
Visa Type (ref= Family Sponsored)								
Employment Preferences	1.11	0.72	1.70		0.35	0.14	0.83	*
Diversity	0.58	0.32	1.03		0.39	0.12	1.24	
Refugee/Asylee/Parolee	1.37	0.81	2.29	***	2.68	1.51	4.75	***
Legalization	2.11	1.32	3.39		2.72	1.30	5.66	**
Employment Status (ref= Employed)								
Unemployed, Seeking Work	0.84	0.54	1.31		2.14	1.18	3.88	*
Unemployed, Laid off/Leave/Disabled/Retired	1.21	0.61	2.41		1.79	0.99	3.21	
Unemployed, homemaker	1.39	0.88	2.18		1.29	0.72	2.30	
Other	0.71	0.36	1.41		1.62	0.79	3.33	
Sex (ref= Male)				*				
Female	1.46	1.05	2.02		1.17	0.79	1.75	
Marital Status (ref = Married/Living with Partner)								
Separated/Divorced/Widowed	1.36	0.78	2.39	+	1.11	0.71	1.75	
Not married	1.88	1.32	2.68		1.01	0.49	2.08	
Health Insurance Coverage (ref= Covered)				***				
Not Covered	0.61	0.44	0.83		0.54	0.36	0.80	***
Smoking Status (ref= Never Smoked)				+				
Smoker (ever)	1.84	1.31	2.59		1.30	0.87	1.93	
Geographic Region of Origin (ref=Europe and Central Asia, North America (Non-Latin))								
Latin America and Caribbean	0.85	0.51	1.41		0.52	0.27	1.00	
Africa and Middle East	0.89	0.49	1.63		0.59	0.29	1.21	
East Asia, South Asia, the Pacific, and Oceania	0.89	0.55	1.44		0.69	0.39	1.22	
U.S. Place of Residence (ref = West)								
South	0.97	0.67	1.40		0.84	0.50	1.40	
East	0.77	0.53	1.11		0.70	0.44	1.10	
Midwest	0.90	0.55	1.48	*	1.48	0.79	2.76	
Education (years)[b]	1.04	1.00	1.08	*	1.01	0.97	1.05	
Age (years)[b]	0.95	0.90	1.00	*	1.06	0.98	1.15	
Age Squared (years^2)[b]	1.00	1.00	1.00		1.00	1.00	1.00	
Time in U.S. (years since first arrival)[b]	1.01	0.99	1.03		0.99	0.97	1.01	

[a]Sig. = Level of significance, where *p<.05, ** p<.01,***p<.005,+p<.001

[b]Odds Ratio represents the average ratio when the linear variable increases by one unit

Data Source: Cohort Provided by Immigration and Naturalization Services (INS) in the New Immigrant Survey 2003, Wave 1 Dataset

Table 7 continued. Survey-Adjusted Logistic Regression Models for Predicting Each Individual Health Condition Among New Immigrants to the U.S. in 2003 (n = 7,972)

Covariate	Psychiatric Conditions: Odds Ratio	Psychiatric Conditions: 95% Confidence Interval		sig.[a]	Arthritis/ Rheumatism: Odds Ratio	Arthritis/ Rheumatism: 95% Confidence Interval		sig.[a]
Visa Type (ref= Family Sponsored)								
Employment Preferences	1.57	0.81	3.06		0.85	0.53	1.36	
Diversity	0.44	0.19	1.02		0.62	0.32	1.19	
Refugee/Asylee/Parolee	1.84	1.00	3.39		1.89	1.25	2.86	***
Legalization	1.23	0.67	2.25		1.13	0.67	1.93	
Employment Status (ref= Employed)								
Unemployed, Seeking Work	1.47	0.81	2.67		0.98	0.64	1.49	
Unemployed, Laid off/Leave/Disabled/Retired	2.78	1.39	5.58	***	1.10	0.67	1.79	
Unemployed, homemaker	1.28	0.74	2.21		1.06	0.69	1.62	
Other	0.78	0.35	1.78		1.13	0.65	1.95	
Sex (ref= Male)								
Female	2.72	1.62	4.58	+	1.96	1.44	2.68	+
Marital Status (ref = Married/Living with Partner)								
Separated/Divorced/Widowed	1.66	0.95	2.91		1.34	0.98	1.83	
Not married	1.07	0.63	1.82		1.77	1.15	2.70	**
Health Insurance Coverage (ref= Covered)								
Not Covered	0.74	0.50	1.09		0.74	0.56	0.99	*
Smoking Status (ref= Never Smoked)								
Smoker (ever)	1.73	1.12	2.69	*	1.53	1.11	2.09	**
Geographic Region of Origin (ref=Europe and Central Asia, North America (Non-Latin))								
Latin America and Caribbean	0.95	0.54	1.69		0.56	0.34	0.91	*
Africa and Middle East	0.75	0.34	1.64		0.75	0.45	1.24	
East Asia, South Asia, the Pacific, and Oceania	0.28	0.11	0.49	***	0.66	0.43	1.01	
U.S. Place of Residence (ref = West)								
South	0.58	0.34	0.98	*	0.88	0.61	1.28	
East	0.78	0.46	1.32		0.79	0.57	1.09	
Midwest	1.25	0.65	2.40		1.13	0.72	1.80	
Education (years)(b)	0.96	0.92	0.99	*	0.97	0.94	1.00	*
Age (years)(b)	0.97	0.90	1.04		1.18	1.11	1.25	+
Age Squared (years2)(b)	1.00	1.00	1.00		1.00	1.00	1.00	***
Time in U.S. (years since first arrival)(b)	1.01	0.98	1.03		1.01	1.00	1.03	

[a]Sig. = Level of significance, where *p<.05, ** p<.01,***p<.005,+p<.001

[b]Odds Ratio represents the average ratio when the linear variable increases by one unit

Data Source: Cohort Provided by Immigration and Naturalization Services (INS) in the New Immigrant Survey 2003, Wave 1 Dataset

Table 8. Matrix of Modeled Odds Ratios for all Outcomes of Interest, stratified by Visa Type (n = 7,972)

Outcome / Exposure	Self-Rated Health Status	Any Diagnosed Condition	Diabetes	High Blood Pressure	Stroke/ Heart Conditions	Lung Conditions	Psychiatric Condition	Arthritis/ Rheumatism
Family Sponsored (ref.)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Employment Preferences	0.82	1.05	1.16	1.06	0.35*	1.11	1.57	0.85
Diversity	0.50**	0.65***	0.98	0.72	0.39	0.58	0.44	0.62
Refugee/Asylee/Parolee	2.74+	1.81+	1.86*	1.68***	2.68***	1.37	1.84	1.89***
Legalization	1.94+	1.58***	1.45	1.52*	2.72**	2.11***	1.23	1.13

Data Source: Cohort Provided by Immigration and Naturalization Services (INS) in the New Immigrant Survey 2003, Wave 1 Dataset

*p<.05, ** p<.01,***p<.005,+p<.001