

LA VIE AVEC L'ASTHME: ANALYSIS OF ASTHMA SUSCEPTIBILITY DIFFERENCES BETWEEN IMMIGRANT AND NATIVE POPULATIONS IN FRANCE

EMILY ARSEN, BARNARD COLLEGE (2013)

ABSTRACT

This study analyzes the differences in asthma prevalence between the native-born French population and the immigrant population in an effort to measure the effect of nativity on the likelihood that an individual is asthmatic. Previous research has shown that immigrants report better health than the native population, which is a phenomenon known as the immigrant health paradox. Yet, significant research also suggests that populations with low socioeconomic status, as immigrants tend to be, are more prone to asthma than populations of higher socioeconomic status. Using the 2003 cycle of the *Enquête Santé*, I created models to estimate the influence of one's immigrant status on the likelihood of being asthmatic, as well as generating models to measure the effect of immigrant status on severity of one's asthma. My studies ultimately showed that immigrants in France are less likely to be asthmatic than the native-born population. Similarly, immigrants tend to have a lower propensity to have severe asthma. These results affirm the findings of previous studies on the immigrant health paradox and suggest that immigrants have better respiratory health than the native population.

Disparities in health status continue to plague societies, despite attempts to create health systems that provide individuals with equal access to care. Immigrant status is one integral factor that shapes inequalities among individuals' health. Extensive health research in the United States has established that, on the whole, immigrants tend to have better health than the native population. Studies that compare immigrant health to that of the native population report that, despite having lower socioeconomic status, immigrants are likely to have longer life expectancies and lower rates of chronic diseases than the native population.¹ Though this "immigrant health paradox" is a widely accepted phenomenon in North America, limited research has investigated this topic elsewhere in the world. France is a particularly interesting case to study nativity-related health questions because of its large immigrant population and because all residents, both native-born and immigrant, have access to the complimentary French health care system, which should theoretically alleviate many of the health inequalities. Yet, health inequalities persist in France, suggesting that other factors, such as nativity status, may influence health and access to care.

Although French research has not compared the

health status of native and immigrant populations, researchers have analyzed the effect of socioeconomic status on individuals' health. More specifically, epidemiologists, sociologists, and other health researchers have identified asthma as a chronic disease that disproportionately affects individuals of low socioeconomic status. Over the past 30 years, the prevalence of asthma has increased dramatically. The World Health Organization (WHO) estimates that currently around 235 million people worldwide are asthmatic.² As a result of this increase, the causes, distribution, and treatment of asthma have become important areas of research. In recognition of the seriousness of the public health problem posed by asthma, WHO founded the Global Initiative for Asthma (GINA) to investigate methods to control and decrease the prevalence of asthma. France has demonstrated its dedication to studying asthma by conducting various health surveys, such as the *Enquête Santé* (Health Study) and the Health, Health Care and Insurance Survey, which both designate specific sections of their questionnaires to the investigation of the state of asthma in France, in order to better understand the trends of asthma affliction. Despite the extensive data analysis, almost none of this research studies the influence of immigrant sta-

tus on individuals' respiratory health.

In this study, I examine the effect that nativity has both on the likelihood that an individual living in France is asthmatic and on the severity of an individual's asthma. With these methods, I hope to combine the research on the immigrant health paradox with the research on social aspects of asthma prevalence to analyze whether immigrants in France, despite socioeconomic factors, report better respiratory health than the native French population. To address this question, I analyzed data collected in the 2003 cycle of the *Enquête Santé* (Health Study).³ My results indicate that native-born French citizens are more likely to be asthmatic than immigrants are. Within the asthmatic population, the natives are likely to have more severe, uncontrolled asthma than immigrants. These results support the immigrant health paradox in that the immigrant population tends to report better respiratory health than the native population of the host country.

LITERATURE REVIEW

In an age in which people are constantly migrating, the status of immigrant health poses a question of great significance to researchers and policy makers. One might expect that immigrants would tend to have worse health than the native population due to lower socioeconomic status or lack of knowledge about the health care system.⁴ Yet, much of the research on immigrants' health supports the "immigrant health paradox." The theory behind this phenomenon states that immigrant populations tend to be in better health than the native population of their host country.⁵ The paradoxical nature of this phenomenon lies in the fact that despite socioeconomic disadvantages, immigrant populations still prove to have better bills of health than native populations.

Hispanic immigrants in the United States present a prime example of this, so much so that the immigrant health paradox is often simply referred to as the "Hispanic paradox." Despite Hispanic immigrants' low socioeconomic status, they generally report better health than native-born U.S. populations. In Cagney et al's study, Hispanic immigrants have lower propensity to have respiratory problems than other racial groups.⁶ However, this health benefit disappears in second-generation immigrants, who report worse health than U.S.-born whites. In addition, Hispanic immigrants and U.S.-born Hispanics living outside an urban enclave of other Hispanic immigrants experi-

ence higher rates of asthma and breathing problems. In another study, the Mexican-American population reports a higher mortality rate than both white Americans and their immigrant counterparts.⁷ In both studies, immigrant populations who are more closely connected to their immigrant roots, either by their community or recency of migration, are ultimately in better health. Because place of origin is the main difference between the Hispanic immigrants and U.S.-born Hispanics, nativity seems to be a significant predictor of an individual's health. Similar studies have compared the health of Asian-Americans to that of Asian immigrant populations. These studies provided comparable results to those that analyzed Hispanic health, again highlighting the importance of nativity on predicting an individual's health.⁸

Several hypotheses attempt to explain this immigrant health benefit. First, the healthy migrant effect hypothesizes that individuals who migrate have better health than those in their country of origin, so that overall, the healthiest individuals compose a majority of the migrating population.⁹ Similarly, the salmon-bias effect hypothesizes that ill and elderly immigrants return to their home country to take care of themselves.¹⁰ As a result, populations of immigrants in a host country report better health than the native population because only the healthiest stay in the host country. Both of these hypotheses are based on identifying the immigrant health benefit as a sampling bias, thereby nullifying the possible existence of an actual immigrant health benefit. Support for both these hypotheses about migrant selection is mixed.¹¹

A third hypothesis suggests that immigrant health benefits relate to acculturation effects. Research has shown that immigrants' health diminishes with increased acclimation to the host country. Immigrants' diets, participation in physical activity, and conceptions of health ultimately end up shifting and reflect American practices after an extended stay. Mothers of Hispanic origin report that they cooked more processed foods and walked less after moving to the United States. Immigrants who become acculturated to American lifestyles are more susceptible to obesity and generally lead less healthy lifestyles than they would have in their home countries.¹² After prolonged stay in the United States, immigrants' health status converges to that of the native population as immigrants alter their lifestyle and become enveloped in American culture. This suggests that immigrants' live

healthier lives before coming to United States, thus having better health than native-born Americans. In addition, the host country, specifically the United States, is generally more polluted than immigrants' country of origin, so they often become exposed to more toxicants that wear on their health. That is to say, immigrants have better health than the native population because they have maintained healthier lifestyles before their migration. This hypothesis posits that on average, immigrants are healthier than the native population because their lifestyles in their home country benefit their health more than the American lifestyle. In contrast to the first two hypotheses introduced, the acculturation hypothesis synthesizes the impact that length of stay has on immigrants' health and suggests that lifestyle, not the health of those who elect to migrate, determines the average health of the immigrant and native populations. Essentially, immigrants have better health because they take better care of themselves.

Studies consistently reported that immigrants have longer life expectancies as well as lower rates of mortality, heart disease, and hypertension than native-born individuals.¹³ However, in all the different immigrant health studies published on a wide range of diseases and health problems,¹⁴ Huh et al (2008) produced one of the only studies that analyzed the relationship between nativity and asthma. Their results indicated that immigrants had lower prevalence rates for asthma than did their U.S.-born counterparts. These results support the immigrant health paradox, but little work has been done to expand on their findings. Literature on the relationship between asthma and socioeconomic status, on the other hand, is abundant.

Asthma is a chronic respiratory disease highly correlated with exposure to air pollutants and toxicants. Individuals who live and work in areas with high concentrations of air pollutants are at higher risk for exhibiting asthmatic symptoms because the levels of exposure provoke asthma.¹⁵ Typically, individuals from low socioeconomic backgrounds tend to live in areas with higher concentrations of air pollutants and, as a result, asthma disproportionately affects individuals of low socioeconomic and minority backgrounds.¹⁶ Because of the strong correlation between asthmatic symptoms and socioeconomic status, asthma is often called a poor man's disease.

Individuals of low socioeconomic status not only are more likely to be asthmatic, but within the

asthmatic population, they are more likely to have more severe and more persistent symptoms than asthmatics of higher socioeconomic status. Based on the standards established by GINA, Afrite et al. analyzed the severity of the French population's asthma as influenced by various socioeconomic factors. The likelihood that an individual would have uncontrolled asthma symptoms increased dramatically for those with lower incomes and lower levels of education.¹⁷ These findings build upon the accepted notions that asthma is related to socioeconomic status and intensify its influence. As immigrants are often minorities in the host country, are of low socioeconomic status, and live in more densely populated and polluted areas, the pairing of asthma and immigrant health raises the question of whether the immigrant health effect provides a better estimation of immigrants' asthma than socioeconomic status.

Because immigrant health research depends entirely on access to data on individuals' nativity status, such research is extremely limited in France due to restrictions on the collection of individuals' ethnic information. Nonetheless, recent work published in France analyzes the relationship between immigrant and native-born French populations' health.¹⁸ The findings from Jusot et al. (2011) support the immigrant health paradox, but reiterate the necessity to control for socioeconomic status in order to observe the complete effect of nativity status on health. Berchet compared the uses of the French health care system by the immigrant and the native French populations.¹⁹ Her results indicated that the native and immigrant populations used health services differently, despite the fact that all French inhabitants have free access health care. Since 1945, all residents in France have had access to health care coverage from the government, paid for with income taxes, although individuals also have the choice to seek private medical care.²⁰ The system grants individuals the ability to visit doctors and hospitals for inexpensive treatment. Immigrants are also covered through the national French health care system with proof of legal residence or asylum in France.²¹ Despite both populations having complimentary access to general practitioners through the French health care system, immigrants are less likely than the native French population to take advantage of those services. Berchet argued that these results represent first access barriers to health care that immigrants experience. Because of language barriers and social exclusion,

immigrants ultimately have more difficulty visiting health services. Conversely, research supporting the immigrant health paradox may indicate that immigrants do not require medical services as frequently.

Analysis of French data on asthma and nativity could provide one of two results. First, one could find that the immigrants are less affected by asthma than the native French population, which would support the immigrant health paradox. Second, results could indicate that immigrants are more affected by asthma than the native French population because they do not have ready access to health care as indicated by Berchet's findings, are generally of low socioeconomic status, and are concentrated in more populated and polluted areas, thereby predisposing them to being more susceptible to asthma symptoms.

METHODS SECTION

This study addresses two research questions:

1. Are individuals born in France more likely to be asthmatic than individuals who have immigrated to France?
2. Of the currently asthmatic population, is the native French population more likely than the immigrant population to have severe asthma symptoms, in respect to the standards set by the Global Initiative for Asthma (GINA)?

The first research question addresses whether the native French population is more affected by asthma than the immigrant population. The second question investigates, more specifically, the relationship between the severity of an individual's asthma and their nativity status. The measure of asthma severity allows for a more nuanced analysis of the state of individuals' asthma based on how many symptoms respondents report. The literature review generates two sets of competing, yet equally valid hypotheses:

- 1a. My results could indicate that a higher percentage of the native-born French population are asthmatic, supporting the immigrant health paradox.
- b. My results could also indicate that a lower percentage of the native-born French population is asthmatic, supporting research on the prevalence of asthma in individuals with low socioeconomic status.

2a. My results could indicate that asthmatics who are native to France have more severe asthma than asthmatics who have immigrated to France, supporting the immigrant health paradox.

b. My results could indicate that asthmatics that are native to France have less severe asthma than asthmatics that have immigrated to France, supporting research on the prevalence of asthma in individuals with low socioeconomic status.

To answer these questions, I analyzed survey data from the *Enquête Santé* collected in 2002-03 by l'Institut National de la Statistique et des Études Économiques (the National Institute for Statistics and Economic Studies). This French study is conducted every ten years, focusing on the Nord-Pas de Calais, Picardie, Champagne-Ardenne, Ile-de-France, and Provence-Alpes-Côte d'Azur regions. About 112,000 individuals, eighteen years and older from 40,000 different households, participated in this cycle of the study.²² The survey includes extensive data on individuals' health care use, health status, and health history, as well as respondents' socioeconomic and nativity status. Not only is this one of the only French datasets that collects data on respondents' health and nativity status, but it also aptly measures a wide sample of French residents, making this attractive data for my research question.

To identify the asthmatic population, I created two variables. Respondents who had an asthma attack in the last twelve months or were currently taking asthma medication were coded as "currently asthmatic." Respondents who reported ever having an asthma attack in their lives were coded as "lifetime asthmatics." The currently asthmatic variable served as my dependent variable in Question 1. I created an index variable using four other questions related to respondents' asthmatic symptoms to measure the level of severity of individuals' asthma. The measure has three levels of severity, depending on the level of control individuals had over their symptoms. The standards used were based on those published by GINA, which created an index variable with three ordered response categories: controlled, partially controlled, and uncontrolled.²³ A higher GINA score reflects that an individual had more severe and less controlled asthma. The asthma control index variable served as the dependent variable in Question 2.

Equation 1 presents my model for addressing Question 1:

$$\text{ASTHMA} = \beta_1 \text{NATIVE}_1 + \beta_2 \text{DEM} + \beta_3 \text{SES} + \beta_4 \text{HEALTH} + \varepsilon \quad (1)$$

Where:

- ASTHMA is the likelihood that an individual is asthmatic based on influencing independent variables.
- NATIVE_1 is the focus variable of E1 reporting the influence that being born in France has on the odd ratio that an individual has asthma.
 - If β_1 is larger than 1, this suggests that being native-born French increases the likelihood that an individual is asthmatic.
 - If β_1 is less than 1, then the coefficient suggests that being native-born French decreases the likelihood that an individual is asthmatic.
- DEM, SES, and HEALTH are vectors of multiple variables.
 - DEM corresponds to a group of demographic control variables, including respondents' age, gender, and urbanity of their residence.
 - SES corresponds to a group of socioeconomic control variables, including the respondent's employment status, respondent's family income, and respondent's level of education.
 - HEALTH corresponds to a group of health control variables, including respondent's self-reported health status and whether the respondent has health coverage.

To estimate Equation 1, I employ logistic regression, which is ideal for estimating the probability between binary outcomes, such as whether or not an individual is asthmatic. Results are given as odds ratios, which is the increase or decrease in the odds that an individual is asthmatic based on a one-unit change in the independent variable.

Equation 2 presents my model for addressing Question 2:

$$\text{CONTROL} = C + \beta_1 \text{NATIVE}_2 + \beta_2 \text{DEM} + \beta_3 \text{SES} + \beta_4 \text{HEALTH} + \varepsilon \quad (2)$$

Where:

- CONTROL is the level of control that a currently asthmatic individual has over his/her asthma symptoms, in respect to the GINA standards.
- NATIVE_2 is the focus variable of E2 reporting the influence that being born in France has on asthmatics' control of their symptoms.
 - If β_1 is positive, this suggests that being native-born French increases the likelihood that one has severe, uncontrolled asthma.
 - If β_1 is negative, then the coefficient suggests that being native-born French decreases the likelihood that an individual has severe, uncontrolled asthma.
- Again, DEM, SES, and HEALTH are vectors of multiple variables.
 - DEM corresponds to a group of demographic control variables, including respondents' age, gender, and urbanity of their residence.
 - SES corresponds to a group of socioeconomic control variables, including whether the respondent is employed, respondent's family income, and respondent's level of education.
 - HEALTH corresponds to a group of health control variables, including respondent's self-reported health status and whether the respondent has health coverage.

I used both ordinary least squares (OLS) and multinomial logistic regression to estimate Equation 2. OLS presents a simple, straightforward estimate of the impact of the independent variables on asthmatics' control of their asthma based on the GINA scale. OLS assumes that the dependent variable is continuous, though it is actually an ordinal variable based on the level of control of respondents' asthma. Multinomial logistic regression recognizes that the dependent variable is categorical, so it captures the difference in the likelihood that an individual has controlled asthma versus partially controlled or uncontrolled asthma. Only respondents who are currently asthmatic are included in this model.

The demographic, socioeconomic, and health variables I include in my models are standard in studies that analyze health inequalities.²⁴ Refer to Table 1 for descriptions of all the variables included in both models.

Table 1: Descriptive statistics

Variable Name	Variable Description	Variable Type	Codes	Percent
Native	Whether respondent was born in France; Dummy	Focus independent	1=French-born	90.8%
			0=Foreign born	9.2
Gender	Respondent's gender Dummy	Demographic	1=Male	40.6
			0=Female	59.4
Age	Respondent's age at time of interview (years)	Demographic	Continuous	Mean: 52.7 yrs SD: 17.8
Urbanity	Size of the town in which respondent lives*	Demographic	Rural	23.5
			Town	29.7
			City	29.0
			Paris	17.9
Employment	Whether respondent is employed Dummy	Socioeconomic	1=Employed	45.0
			0=Not in workforce, unemployed	55.0
Income	Household yearly income (Euros)	Socioeconomic	Continuous	Mean= 27,639 € SD= 19,727
Education	Highest degree respondent has earned**	Socioeconomic	0=No degree or education	20.8
			1=CEP/DFEO, Equivalent to elementary school diploma	17.1
			2=BEPC, Equivalent to middle school diploma	6.8
			3=CAP/BEP, Equivalent to pre-professional high school diploma	20.9
			4=Bac technique, Equivalent to technical high school diploma	4.3
			5=Bac général, equivalent to pre-college high school diploma	9.4
			6=Bac + 2, equivalent to completing a BA	10.5
			7=Supérieur à Bac + 2, Equivalent to completing a MA or higher	10.2
Coverage	Whether respondent has health care coverage; Dummy	Health	1=Yes	91.5
			0=No	8.5

*Coded as 3 separate dummy variables, rural is excluded as control

**Treated as continuous variable in regressions

RESULTS

About 6 percent of the sample is asthmatic, which early matches the French national average (6.7 percent).²⁵ Just over 9 percent of the sampled population was foreign-born, which is also comparable to the national average (10.7 percent). These statistics suggest that the sample from this study is fairly representative of the French population, at least with respect to the two main areas of interest in this study. The sample had a majority female (59.4 percent), which is consistent with research that shows that women live longer than men. The mean age of respondents at the time of their interview was 52.7 years, though this older mean age may be a result of only including respondents over the age of eighteen.

Cross-tabulations between the nativity and asthmatic variables created a basic picture of the composition of asthmatic population. Within the native-born French population, 6 percent were asthmatic, and 9.3 percent reported having ever been asthmatic. Only 5 percent of the immigrant population reported being currently asthmatic, and 7.2 percent reported having ever been asthmatic (Table 2). These results indicate that the percentage of the native French population that is asthmatic is larger than that of the immigrant population. Both of the distributions within the current and lifetime asthmatic populations were statistically significant ($\chi^2 = 0.00$). Of the currently asthmatic

population, a larger percentage of the immigrant population had controlled asthma symptoms than the native French population did (0.93 percent of native-born French and 2.3 percent of immigrants, $\chi^2 = 0.011$, Table 3). Of lifetime asthmatics, 1.7 percent of native-born French and 2.4 percent of immigrants had controlled asthma at the time of the survey, but these cross tabulations were not statistically significant. The immigrant population reports better respiratory health than the native-born French population, despite being less likely to have health coverage (93 percent of native French covered, 75 percent immigrant, Table 4).

Table 5 presents the estimated coefficients for Equation 1. Throughout the model iterations, individuals native to France report an increased likelihood of being asthmatic, and each coefficient was statistically significant. The basic model shows that being born in France makes an individual 1.22 times more likely to be asthmatic than immigrants. When adding in the demographic variable controls, native French are only 1.214 times more likely to be asthmatic. Controlling for demographic and socioeconomic variables, French-born individuals are 1.282 times more likely than immigrants to be asthmatic. For French-born individuals, the odds of being asthmatic are 1.327 times greater than for immigrants when controlling for demographic, socioeconomic, and health variables. These results support the hypothesis that the native

Table 2: Percent of French-born and immigrant populations that are asthmatic

	Currently Asthmatic		Ever Asthmatic	
	Yes	No	Yes	No
French Born (%)	5.99	94.01	9.36	90.64
Immigrant	4.97	95.03	7.18	92.82
$\chi^2 = 0.00$	N = 112,535			

Table 3: Percent of French-born and immigrant current asthmatics with controlled, partially controlled and uncontrolled asthma

	Level of asthma control, currently asthmatic		
	Controlled	Partially controlled	Uncontrolled
French Born (%)	0.93	5.00	94.07
Immigrant	2.32	5.22	92.46
$\chi^2 = 0.011$	N = 6,639		

Percent of French-born and immigrant lifetime asthmatics with controlled, partially controlled and uncontrolled asthma

	Level of asthma control, ever asthmatic		
	Controlled	Partially controlled	Uncontrolled
French Born (%)	1.73	4.08	94.2
Immigrant	2.41	4.28	93.3
$\chi^2 = 0.375$ (not significant)	N = 10,312		

Table 4: Percent of French-born and immigrants with health care coverage

	Health care coverage	
	Yes	No
French Born (%)	93.2	6.8
Immigrant	75.0	25.0
$\chi^2 = 0.000$	N = 112,534	

Table 5: Coefficients for equation 1, Whether or not an individual has asthma, Logistic

E1 Logistic	Odds Ratios			
	Basic Model, 1 (p-value)	2	3	4
Native	1.218* (0.000)	1.214* (0.000)	1.282* (0.000)	1.327* (0.000)
Age	-	0.993* (0.000)	0.988* (0.000)	0.982* (0.000)
Gender	-	0.936* (0.011)	0.970 (0.251)	1.020 (0.445)
Town	-	1.098* (0.008)	1.089* (0.016)	1.068 (0.065)
City	-	1.085* (0.023)	1.083* (0.026)	1.061 (0.097)
Paris	-	1.034 (0.421)	1.091* (0.039)	1.078 (0.076)
Employment	-	-	0.745* (0.000)	0.775* (0.000)
Income	-	-	0.999* (0.027)	1 (0.591)
Education	-	-	0.976* (0.000)	1.001 (0.869)
Coverage	-	-	-	1.091 (0.069)
Health	-	-	-	0.422* (0.000)

Significant at 95% CI: *

N = 110,150

French population is more likely to be asthmatic than the immigrant population.

When all controls for Equation 1 are included, employment, good health, and, strangely enough, older age each lower the odds that an individual will be asthmatic. The odds that an individual would be asthmatic increased for individuals who were male and lived in more populated areas when controlling for all other demographic, socioeconomic, and health variables. In Model 4, education and income had almost no effect on the odds of whether an individual would be asthmatic, which may result from multi-collinearity between the variables because they measure similar aspects of individuals' socioeconomic status, thereby canceling out the individual influence the variables may have. In this fourth model, only nativity, age, employment, and health status had statistically significant coefficients, though in Models 2 and 3, the urbanity of where a respondent lived was a significant predictor of whether an individual has asthma.

The results from Equation 2 indicated that nativ-

ity status had a statistically significant effect on predicting the level of severity of an individuals' asthma (Table 6). In Models 1-4 (OLS regression), the nativity variable coefficient was consistently positive and significant at the 95 percent confidence level, which suggests that being native French makes asthmatics more likely to have more severe, uncontrolled asthma. As more control variables were added to the models, the nativity coefficient became larger. In the basic model, being native French increased an individual's asthma severity score by 0.03 units. In Model 2, being native French increased an individual's reported asthma severity score by 0.033 units when controlling for demographic variables. When controlling for demographic and socioeconomic variables, being a native as opposed to an immigrant increased the severity of an individual's asthma by 0.0336 units. The fourth model—including demographic, socioeconomic, and health control variables—reported that being native French increased the severity of an individual's asthma by 0.034 units. These results suggest that if an asthmatic

Table 6: Coefficients for equation 2, Severity of Individuals' Asthma, OLS

E2₁ OLS	Basic Model (p-value)	2	3	4
Constant	2.90* (0.000)	2.85* (0.000)	2.84* (0.000)	2.83* (0.000)
Native	0.030* (0.026)	0.033* (0.017)	0.0336* (0.015)	0.034* (0.014)
Age	-	0.001* (0.000)	0.001* (0.000)	0.001* (0.000)
Gender	-	-0.005 (0.501)	-0.008 (0.305)	-0.005 (0.532)
Town	-	0.018 (0.075)	0.017 (0.083)	0.013 (0.202)
City	-	0.007 (0.517)	0.004 (0.643)	0.001 (0.907)
Paris	-	0.008 (0.521)	0.008 (0.486)	0.008 (0.520)
Employment	-	-	0.016 (0.064)	0.014 (0.116)
Income	-	-	-6.72 e ⁻⁰⁷ * (0.001)	7.04e ⁻⁰⁷ * (0.001)
Education	-	-	0.003* (0.074)	0.003 (0.125)
Coverage	-	-	-	0.026 (0.052)
Health	-	-	-	-0.005 (0.532)

Significant at 95% CI: *

N = 6,610

is native-born French, he/she is more likely to have severe asthma characterized by more uncontrolled asthma symptoms. Controlling for demographic, socioeconomic, and health variables makes this effect more pronounced.

Older age, living in a more populated area, and not having health insurance slightly increased the severity of an individual's asthma when controlling for all other demographic, socioeconomic, and health variables. Most of the estimated coefficients in this set of models were small and statistically insignificant at the 95 percent confidence level, which limits the practical importance of the impact of these variables on the predicting model.

As shown in the results from the OLS analysis of Models 1-4, the results from the E2 multinomial logistic regression indicated that there is a higher probability that the native-born French population would have uncontrolled asthma symptoms than the immigrant population does (Table 6). In the basic model (Model 5), being native French increases the log odds of uncontrolled versus controlled asthma by 0.931 units and increases the log odds of partially controlled

versus controlled asthma by 0.870 units. Controlling for demographic variables and being native French, as opposed to immigrant, increase the log odds of uncontrolled versus controlled asthma by 1.07 units, and increases the log odds for partially controlled versus controlled asthma by 0.992 units. When both demographic and socioeconomic control variables are included in the model, the log odds of uncontrolled versus controlled asthma increased by 1.156 units for native French individuals, and the logs odds of partially-controlled versus controlled asthma increased 1.68 units for native French individuals as opposed to immigrant individuals. Finally, when controlling for all demographic, socioeconomic, and health variables, individuals born in France increased the log odds of uncontrolled versus controlled asthma by 1.067 units and increased the logs odds of partially-controlled versus controlled asthma by 0.987 units. As exhibited in the OLS models, being part of the native-born French population increases the likelihood that an asthmatic will have severe, uncontrolled asthma. This effect becomes more pronounced when controlling for demographic, socioeconomic, and other control variables.

Table 7: Coefficients for equation 2, Asthmatics' control of their asthmatic symptoms, Multinomial logistic

E2₂: Multinomial logistic	Partially Controlled (vs. Controlled)				Uncontrolled (vs. Controlled)			
	Basic Model, 5 (p-value)	6	7	8	Basic Model, 5 (p-value)	6	7	8
Constant	0.81* (0.019)	0.02 (0.977)	0.984 (0.170)	0.16 (0.835)	3.68* (0.000)	2.43* (0.000)	2.932* (0.000)	2.34* (0.001)
Native	0.870* (0.021)	0.992* (0.011)	1.156* (0.003)	0.987* (0.013)	0.931* (0.004)	1.070* (0.001)	1.168* (0.000)	1.067* (0.002)
Age	-	0.009 (0.262)	-0.001 (0.942)	-0.004 (0.702)	-	0.018* (0.012)	0.015 (0.068)	0.012 (0.177)
Gender	-	-0.562* (0.038)	-0.495 (0.074)	-0.511 (0.066)	-	-0.467 (0.058)	-0.471 (0.062)	-0.435 (0.085)
Town	-	0.302 (0.385)	0.261 (0.459)	0.301 (0.396)	-	0.480 (0.121)	0.432 (0.168)	0.389 (0.216)
City	-	1.133* (0.003)	1.084* (0.005)	1.203* (0.002)	-	0.915* (0.010)	0.844* (0.019)	0.881* (0.015)
Paris	-	0.673 (0.097)	0.840* (0.041)	1.059* (0.012)	-	0.573 (0.119)	0.657 (0.076)	0.801* (0.035)
Employment	-	-	-0.227 (0.451)	-0.309 (0.312)	-	-	0.035 (0.899)	-0.061 (0.827)
Income	-	-	-9.47e ⁻⁶ (0.051)	-9.36e ⁻⁶ (0.055)	-	-	-0.001* (0.001)	-0.001* (0.001)
Education	-	-	-0.103 (0.112)	-0.114 (0.089)	-	-	-0.028 (0.633)	-0.040 (0.514)
Coverage	-	-	-	1.328* (0.001)	-	-	-	1.148* (0.000)
Health	-	-	-	0.163 (0.662)	-	-	-	-0.180 (0.511)

Significant at 95% CI. *

N = 6, 610

Controlled asthma is the reference group

Controlling for all other demographic, socioeconomic, and health variables, individuals who live in a more populated area have an increased likelihood of having uncontrolled asthmatic symptoms. Not having health insurance also increased the likelihood that an individual would have uncontrolled asthma. Relative to females, males had lower log odds ratios when all controls were included. This suggests that males have less severe, better-controlled asthma than females. Individuals who were employed and had more education were less likely to have severe asthma symptoms. Though the coefficients of the control variables were less important for these research questions, which primarily address the effect that nativity has on asthma, they still provide important information for understanding the whole model.

DISCUSSION

In this study, I analyzed the applicability of the immigrant health paradox to French immigrants for the case of asthma, a disease that disproportionately affects individuals living in poor, urban areas. My results support the nativity effect of immigrants on

health outcomes and the immigrant health paradox. French immigrants were less likely to be asthmatic and generally reported better respiratory health than the native French population. Native French individuals had a higher odds ratio to be asthmatic relative to immigrants. Within the currently asthmatic population, the native French population was more likely to have severe, uncontrolled asthma than the immigrant population. Both of these trends were statistically significant when controlling for the effect of demographic, socioeconomic, and health variables. Although the coefficients were generally small, nativity consistently had a statistically significant effect on determining an individual's respiratory health. Also important to note, the entire influence that nativity has on an individual's health is partially muted by his or her demographic, socioeconomic, and health characteristics. By controlling for these variables, we are able to see that despite having lower socioeconomic status, worse health coverage, and living in more urban areas, immigrants still report better respiratory health than the native French. Ultimately, my research indicated that the combined impact of nativity and socioeconomic

status influence an immigrant's health. These results more strongly affirm my hypotheses that conjectured that the immigrant health paradox and nativity have a stronger influence on determining the likelihood that an individual would be asthmatic and the severity of their asthma than one's socioeconomic status.

As such, these results more strongly support my proposed Hypotheses 1a and 2a.

In the estimated models, the various control variables did not introduce much variation into the models, and their coefficients were often statistically insignificant. It is surprising that, given the extensive research supporting the hypothesis that poorer, less educated individuals are more affected by asthma, neither of these variables had a practically significant impact on determining whether an individual is asthmatic or on predicting the severity of an individual's asthma. Perhaps this may result from a diagnostic effect, in that individuals of higher socioeconomic status and more education are more likely to go to the doctor and have their asthma diagnosed, thereby creating a larger sample of asthmatics of higher socioeconomic status.

In the models for both questions, not having health coverage increased the likelihood that an individual would show asthmatic symptoms. A large portion of the French immigrant population did not have health insurance at the time of the survey (25 percent), which puts them at risk for having worse respiratory health. Though immigrants have better respiratory health than the native population, they may lose these health advantages over time because of a combined impact of obstructed access to health care and acculturation. Over extended time, without reliable access to doctors and other health services, immigrants' health benefits may diminish. If this is the case, then policy makers should investigate how they might restructure the health care system to facilitate immigrants' access to services to aid the preservation of immigrants' good health.

Currently, health reforms seem to be mostly instituted on a regional level, but are starting to take into account inequalities resulting from nativity. For example, the Agence Régionale de Santé (ARS) of l'Ile-de-France has recently instituted a public health plan to address its local health problems, focusing on the vast health disparities that result from socioeconomic inequalities.²⁶ The plan also notes that large immigrant populations in the region necessitate the inclu-

sion of health frameworks that address nativity effects on health. To resolve health inequalities, ARS aims to increase available information on health services provided to the public and on how the system of health care coverage functions in Ile-de-France, so that individuals are better equipped to use the system. Such policies, if implemented well, may be an appropriate approach to addressing health care inequalities. Considering that disease control is related to understanding how to use the health care system effectively, this plan could greatly aid immigrants who are currently unfamiliar with the French health system to better maintain their good health status. With more information provided, a wider, more diverse portion of the native French would also be encouraged to take advantage of services, so that they are more effectively use health care services. Though France has historically ignored ethnic differences for the sake of equality, this strategic plan suggests that policy makers are beginning to consider nativity and ethnicity an important determiner of individuals' health. This policy change corroborates the implications of this study, stressing the important influence that nativity has on one's health.

LIMITATIONS

The sampled population is fairly representative of the whole French population, as previously noted, so the results from Equation 1 should be generalizable. Problems with the results may lay in the index variable that measures asthmatics' control over their symptoms. The estimated OLS models for Equation 2 produced small coefficients. These coefficients were small, largely as a result of the lack of variation in the dependent variable. The dependent variable is on a scale that ranges from 1 to 3 (controlled, partially controlled, and uncontrolled asthma). The lack of variation within the actual variable did not allow for very large coefficients in the independent variables. Secondly, the proportion of asthmatic respondents with uncontrolled asthma in the sample was very large. This distribution results from the way the index variable was created.²⁷ As a combined effect of how I created the variable and the total number of symptoms that asthmatics reported having, the variable measuring level of asthma control has a distribution skewed towards the uncontrolled asthma response category.

In Equation 2, Models 1-4, each of the nativity variable coefficients was statistically significant,

though they may not be practically significant. The increase of 0.034 units in an individual's uncontrolled symptoms is equivalent to about 1/10 of a standard deviation for the dependent variable ($SD_{GINA \text{ level of control}} = 0.294$). Even in respect to the amount of variation observed in the dependent variable, nativity did not produce a substantial effect on the model.

FUTURE RESEARCH

Because this study may not have accurately captured the question of control that individuals have over their asthma symptoms, future research with different, more recent data may provide further insight into the question of control of asthma. As studies in the United States have found that immigrants' home country contributes further information to health status, future research could analyze the effect of region of origin on French immigrants' asthma cases. A comparison between French and American immigrants' asthma would allow for a comparison of the different health care systems and their effectiveness in servicing the needs of both the native and immigrant populations in countries with significant immigrant populations.

CONCLUSION

My findings suggest that nativity contributes significant information to the understanding of public health inequalities in France. Results support the immigrant health paradox, suggesting that the phenomenon perhaps has universal applicability. Given this analysis, nativity is shown to be a more significant predictor of health than one's socioeconomic status, suggesting that French researchers and policy analysts should more actively consider the implications of the health care system on the entire population's health, both native French and immigrant. It is recommended that public policy aim to maintain immigrants' health benefits by improving their access to health care coverage and by increasing information available on asthma control for the native French population. This is needed so that both populations may better control their asthma, especially considering the potential threat of acculturation to immigrants' health if they cannot maintain a healthy lifestyle in France.

APPENDIX

I created three variables to measure respondents' asthma. The first measured whether a respondent was asthmatic at the time of the survey, which served as the dependent variable for Equation 1. The second measured if the respondent had ever been asthmatic during his or her life. The third variable measured the "level of control" that a currently asthmatic respondent had over his or her asthma symptoms, which served as the dependent variable for Equation 2. I used the Global Initiative for Asthma's (GINA) guidelines to determine the categories included in my variables.

Currently Asthmatic Population

GINA definition: Individual experiences restricted airways that limits air flow

Included ENS variables:

-Whether respondent had an asthma attack in the last 12 months²⁸ (asj5/asv21)²⁹

-Whether respondent is currently taking asthma medication (asj6/asv22)

Coding:

If a respondent answered "yes" to either of these questions, they were counted as "currently asthmatic."

Lifetime Asthmatic Population

GINA definition: Whether individual has ever experienced restricted/inflamed airways that limit air flow

Included ENS variables:

Whether respondent has ever had an asthma attack (asj8/asv24)

Coding:

If a respondent answered "yes" to this question, they were counted as "lifetime asthmatic." If a respondent was counted as "currently asthmatic," they were automatically included in the lifetime asthmatic population.

Level of control of asthma symptoms

GINA definition:

Controlled (Intermittent) –

- a. Symptoms less than once a week
- b. Nocturnal symptoms not more than twice a month
- c. Normal lung function between episodes

Partially controlled (Moderate persistent) –

- a. Symptoms more than once a week
- b. Nocturnal symptoms more than twice a month
- c. Normal lung function between episodes

Uncontrolled (Persistent) –

- a. Symptoms daily
- b. Frequent exacerbations
- c. Frequent nocturnal asthma symptoms

Included ENS variables:

- Whether respondent has moments of wheezing in the last 12 months (asj1/asv17)
- Whether respondent has woken up due to breathing problems in the last 12 months (asj2/asv18)
- Whether respondent has woken up short of breath in the last 12 months (asj3/asv19)
- Whether respondent has ever woken up coughing in the last 12 months (asj4/asv20)

Coding: Only currently asthmatic respondents were included in the variable.

- Counted as controlled if respondent answered “no” to all four questions
- Counted as partially controlled if respondent answered “yes” to 1 or 2 of the questions
- Counted as uncontrolled if respondent answered “yes” to at least 3 of the questions

As the questions used to create the index variable ask about experiences over the past year, as opposed to the last week or month, this may cause the disproportionately large number of respondents who are counted as having uncontrolled asthma.

Works Cited

1. Orsolya Lelkes, “Poverty Among Migrants in Europe: Policy Brief April 2007,” European Centre (April 2007), accessed November 18, 2013, http://www.euro.centre.org/data/1178099907_77304.pdf; Jimi Huh, Jo Prause, and C. Dooley, “The Impact of Nativity on Chronic Diseases, Self-Rated Health and Comorbidity Status of Asian and Hispanic Immigrants,” *Journal of Immigrant and Minority Health* 10 (2008).
2. World Health Organization. “Asthma Fact Sheet,” last modified May 2011, <http://www.who.int/mediacentre/factsheets/fs307/en/index.html>
3. Santé, 2003 (standard version), (2003) [electronic file], INSEE [producer], Centre Maurice Halbwachs (CMH) [distributor].
4. Jan Sunquist, “Migration, Equality and Access to Health Care Services,” *Journal of Epidemiology and Community Health* 55 (October 2001).
5. Huh, Prause, and Dooley, “Impact of Nativity,” 2008.
6. Kathleen Cagney, Christopher Browning, and Danielle Wallace, “The Latino Paradox in Neighborhood Context: the Case of Asthma and Other Respiratory Conditions,” *American Journal of Public Health* 97, no. 5 (2007).
7. Ming Wei et al., “Migration Status, Socioeconomic Status, and Mortality Rates in Mexican Americans and non-Hispanic Whites,” *Annual Epidemiology* 6 (1996).
8. Huh, Prause, and Dooley, “Impact of Nativity,” 2008.
9. Luis N. Rubalcava, Graciela M. Terue, and Noreen Goldman, “The Healthy Migrant Effect: New Findings from the Mexican Family Life Survey,” *American Journal of Public Health* 98 (January 2008): pp. 78-84.
10. Alberto Palloni and Elizabeth Arias. “Paradox Lost : Explaining the Hispanic Adult Mortality Advantage,” *Demography* 41 (2004): pp. 385-415.
11. Georgiana Bostean, “Does Selective Migration Explain the Hispanic Paradox? A Comparative Analysis of Mexicans in the US and Mexico.” *Journal of Immigrant and Minority Health*, Online First: 2012 (10): pp 1-12; Palloni and Arias, “Paradox Lost: Explaining the Hispanic Adult Mortality Advantage,” *Demography* 41(2004); Michael O. Harhay,. “The Hispanic Paradox and Chronic Obstructive Pulmonary Disease.” *American Journal of Respiratory and Critical Care Medicine*. 185 (2012): pp.12-46.
12. Katerina Sussner et al., “The Influence of Immigrant Status and Acculturation on the Development of Overweight in Latino Families: A Qualitative Study,” *Journal of Immigrant and Minority Health* 10 (2008): pp. 497-505.
13. Huh, Prause, and Dooley, “Impact of Nativity,” 2008.
14. Palloni and Arias, “Paradox Lost,” (2004); Paul Norman, Paul Boyle, and Philip Rees, “Selective Migration, Health and Deprivation: a Longitudinal Analysis,” *Social Science and Medicine* 6 (2005); Jane H. Lasseter and Lynn C. Callister, “The Impact of Migration on the Health of Voluntary Migrants in Western Societies A Review of the Literature,” *Journal of Transcultural Nursing* 20 (2009); Harhay, “The Hispanic Paradox and Chronic Obstructive Pulmonary Disease,” (2012): p. 185.
15. Isabella Annesi-Maesano et al., “Poor Air Quality in Classrooms Related to Asthma and Rhinitis in Primary Schoolchildren of the French 6 Cities Study,” *Thorax* (2011), doi:10.1136/thoraxjnl-2011-200391.
16. Sabrina Havard, “Contribution de la Pollution Atmosphérique aux Inégalités Socio-Spatiales de Santé Analyse Écologique du Risque d’Infarctus du Myocarde dans l’Agglomération de Strasbourg,” (PhD diss., l’Université de Rennes, 2008); Daniel Gottlieb, Arthur Beiser, and George O’Connor, “Poverty, Race and Medicalization are Correlates of Asthma Hospitalization.” *Chest* 108 (1995) : pp. 28-35.
17. Anissa Afrite et al., “L’asthme en France en 2006: Prévalence, contrôle et déterminants,” *Institut de Recherche et Documentation en Economie de la Santé* (January 2011): pp.1820.
18. Florence Jusot, et al. “Inégalités de santé liées à l’immigration en France : Effet des conditions de vie ou sélection à la migration?” *Presses de Sciences Po*, 60 (2009): pp. 385-411; Caroline Berchet, et

- al. "Etat de Santé et Recours aux Soins des Immigrés : Une synthèse des travaux française." IRDES 172 (2012).
19. Caroline Berchet, "Immigration and Health Care Utilisation in France: An Analysis of the Main Drivers of Health Care use Inequalities Related to Migrants." *Revue d'Epidémiologie et de Santé Publique*. 61 (2013).
 20. Ministère des Affaires Étrangères, "Info Synthèse: France à la Loupe," February 2007.
 21. "L'Aide Médicale de l'Etat," last modified February, 2011, <http://www.cmu.fr/site/cmu.php4?Id=8/>.
 22. Though respondents as young as thirteen are surveyed, I only include respondents eighteen years and older in my analysis because older respondents were given questionnaires that provided more complete information on asthmatic symptoms than the surveys given to younger respondents.
 23. "Global Initiative for Asthma (GINA)," last modified 2006, from <http://www.GINAsthma.com>.
 24. Such studies include: Ronald Andersen, "Behavioral Model for Families Use of Health Services," Research Series, Center for Health Administration Studies, University of Chicago (1968); Veronique Massari et al., "Gender, Socio-Economic Status, Migration Origin and Neighborhood of Residence Are Barriers to HIV Testing in Paris Metropolitan Area," *AIDS Care: Psychological and Socio-medical Aspects of AIDS/HIV* 23, no.12 (2011); As well as most of the other studies previously cited.
 25. Afrite et al., "Asthme en France en 2006," 2011.
 26. Projet Régional de Santé, "Plan Stratégique: 2011-2016." Paris and its suburbs are included in this region.
 27. See Appendix for specific coding details.
 28. Questions originally in French, translated by researcher.
 29. The "asj" variables correspond to responses from individuals eighteen to forty-four years old. The "asv" variables correspond to responses from individuals 45 years and older. Both sets were included to measure the entire population 18 years and older.

Bibliography

- Afrite, Anissa, Caroline Allonier, Laure Com-Ruelle, and Nelly Le Guen. "Asthme en France en 2006: Prévalence, contrôle et déterminants." *Institut de Recherche et Documentation en Economie de la Santé* (January 2011): p. 1820.
- Andersen, Ronald. "A Behavioral Model of Families Use of Health Services." Research Series, Center for Health Administration Studies, University of Chicago (1968): pp. 125-127.
- Annesi-Maesano, Isabella, Marion Hulín, François Lavaud, Chantal Raheison, Christine Kopferschmitt, Frederic de Blay, Denis André Charpin, and Caillaud Denis. 2012. "Poor Air Quality in Classrooms Related to Asthma and Rhinitis in Primary Schoolchildren of the French: 6 Cities Study." *Thorax* 67 (8): pp. 682-688.
- Berchet, Caroline. "Immigration and Health Care Utilisation in France: An Analysis of the Main Drivers of Health Care use Inequalities Related to Migrants." *Revue d'Epidémiologie et de Santé Publique*. 61 (2013): pp. 68-79.
- Berchet, Caroline, and Florence Jusot. "Etat de Santé et Recours aux Soins des Immigrés: Une synthèse des travaux française." IRDES, no. 172 (January 2012).
- Bostean, Georgiana. "Does Selective Migration Explain the Hispanic Paradox? A Comparative Analysis of Mexicans in the US and Mexico." *Journal of Immigrant and Minority Health*, Online First 10 (2012): pp. 1-12.
- Cagney, Kathleen, Christopher Browning, and Danielle Wallace. "The Latino Paradox in Neighborhood Context: the Case of Asthma and Other Respiratory Conditions." *American Journal of Public Health* 97, no. 5 (2007): pp. 919-925.
- Couverture Maladie Universelle. "L'Aide Médicale de l'Etat." Last modified February, 2011, <http://www.cmu.fr/site/cmu.php4?Id=8/>.
- "Global Initiative for Asthma (GINA): Global strategy for asthma management and prevention." Last modified 2006, from <http://www.GINAsthma.com>.
- Gottlieb, Daniel, Arthur Beiser, and George O'Connor. "Poverty, Race and Medicalization are Correlates of Asthma Hospitalization." *Chest* 108 (1995): pp. 28-35.
- Harhay, Michael O. "The Hispanic Paradox and Chronic Obstructive Pulmonary Disease." *American Journal of Respiratory and Critical Care Medicine* 185 (2012): pp. 12-46.
- Havard, Sabrina. "Contribution de la Pollution Atmosphérique aux Inégalités Socio-Spatiales de Santé Analyse Écologique du Risque d'Infarctus du Myocarde dans l'Agglomération de Strasbourg." (PhD diss., l'Université de Rennes, 2008).
- Huh, Jimi, Jo Prause, and C. Dooley. "The Impact of Nativity on Chronic Diseases, Self-Rated Health and Comorbidity Status of Asian and Hispanic Immigrants." *Journal of Immigrant and Minority Health*, 10 (2008): 103-118.
- Jusot, Florence, Jérôme Silva, Paul Dourgon, and Catherine Sermet. "Inégalités de santé liées à l'immigration en France: Effet des conditions de vie ou sélection à la migration?" *Presses de Sciences Po* 60 (2009): pp. 385-411.
- "L'Aide Médicale de l'Etat." Last modified February, 2011. <http://www.cmu.fr/site/cmu.php4?Id=8/>.
- Lassetter, Jane H., and Lynn C. Callister. "The Impact of Migration on the Health of Voluntary Migrants in Western Societies A Review of the Literature." *Journal of Transcultural Nursing* 20 (2009): 93-104.
- Lelkes, Orsolya. "Poverty Among Migrants in Europe: Policy Brief April 2007." *European Centre* (April 2007). Accessed November 18, 2013. http://www.euro.centre.org/data/1178099907_77304.pdf.
- Massari, Veronique, Annabelle Lapostle, Emmanuelle Cadot, Isabelle Parizot, Rosemary Dray-Spira, and Pierre Chauvin. "Gender, Socio-Economic Status, Migration Origin and Other Neighborhood of Residence Are Barriers to HIV Testing in Paris Metropolitan Area." *AIDS Care: Psychological and Socio-medical Aspects of AIDS/HIV* 23, no.12 (2011): pp. 1609-1618.
- Ministère des Affaires Étrangères. "Info Synthèse: France à la Loupe." (February 2007).
- Norman, Paul, Paul Boyle, and Philip Rees. "Selective Migration, Health and Deprivation: a Longitudinal Analysis." *Social Science and Medicine* 6 (2005).
- Palloni, Alberto, and Elizabeth Arias. "Paradox Lost : Explaining the Hispanic Adult Mortality Advantage." *Demography* 41 (2004): pp. 385-415.
- Projet Régional de Santé, Agence Régional de Santé- l'Ile-de-France. "Plan Stratégique: 2011-2016."
- Rubalcava, Luis N., Graciela M. Terue, and Noreen Goldman. "The Healthy Migrant Effect: New Findings from the Mexican Family Life Survey." *American Journal of Public Health* 98 (2008): pp. 78-84.
- Santé, 2003 (standard version), (2003) [electronic file], INSEE [producer], Centre Maurice Halbwachs (CMH) [distributer].
- Sunquist, Jan. "Migration, Equality and Access to Health Care Services." *Journal of Epidemiology and Community Health* 55 (2001): pp. 691-692.
- Sussner, Katarina, Ana Lindsay, Mary Greaney, and Karen Peterson. "The Influence of Immigrant Status and Acculturation on the Development of Overweight in Latino Families: A Qualitative Study." *Journal of Immigrant and Minority Health* 10 (2008): pp. 497-505.
- Wei, Ming, Rodolfo Valdez, Braxton Mitchell, Steven Haffner, Michael Stern, and Helen Hazuda. "Migration Status, Socioeconomic Status, and Mortality Rates in Mexican Americans and non-Hispanic Whites." *Annual Epidemiology* 6 (1996): pp. 307-313.
- World Health Organization. "Asthma Fact Sheet." Last modified May 2011. <http://www.who.int/mediacentre/factsheets/fs307/en/index.html>