International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

Sex-Specific Disability Prevalence in Immigrants from China, India, and Mexico and their US-Born Counterparts

Carlos Siordia

Department of Epidemiology, Graduate School of Public Health, University of Pittsburgh, PA, USA

Received: 06/03/2015 *Revised: 25/03/2015* *Accepted: 28/03/2015*

ABSTRACT

Understanding how the prevalence of disability varies as a function of important demographic factors is important for public health professionals. The specific aim of the project is to produce population estimates of "independent living" and "self-care" disability prevalence stratified by age, sex, and over six groups. This cross-sectional study of community-dwelling adults aged 18 to 64 uses data from the American Community Survey (ACS) Public Use Microdata Sample (PUMS) 5-year-file from 2008-2012. It only includes individuals residing in the continental United States (US). The sample of 7,935,725 people to show that while immigrants have lower disability prevalence than US-born individuals, after adjusting for several important confounders, immigrants from India have higher risk for disability than Non-Latino-Whites. Efforts should continue to better understand how disability rates differ in the population as a function of demographic factors and how social stratifying mechanisms play a role in health outcomes.

Keywords: disability; immigrants; Asia; China; India; Mexico; Mexican-American;

INTRODUCTION

Disability-free living directly affects quality of life and life expectancy in humans (Majer et al, 2011) and nonhuman primates (Turner et al, 2014). Disability, if defined as having difficulties with performing activities of daily living, is commonly the product of disease processes- with both social and financial implications (Shogren & Rutherford, 2014). Population profiles of disability have the ability to inform policy and service sectors on how best to prepare for the needs of an aging population. Yet relatively little work has been undertaken to understand how disability in the United States (US) population differs by race-ethnicity, age, sex, and place of birth ("native" vs "foreign" born). A large public debate has begun to explain why all research should stratify by sex and existing work shows that both race-ethnicity (Williams & Sternthal, 2010) and sex (Read & Reynolds, 2012) matters when investigating immigrant health.

Over the years, empirical evidence has been built to show that immigrants have better health than their counterparts born in the US (Frisbie et al, 2001).For example, while a gradient between socioeconomic status (SES) and health is commonly found in the population, a complex SES-health pattern appears for immigrants (John et al, 2012). Some have explained that "migration selectivity, social support, socio-economic,

and behavioral characteristics may account for health differentials between immigrants and the US-born" population (Singh & Miller, 2004). The phenomenon has sometimes been referred to as the "healthy immigrant effect" (McDonald & Kennedy, 2004). In an effort to advance this line of research, authors have begun to provide a "conceptual framework for understanding immigrant health from a cross-national perspective" (Acevedo-Garcia et al, 2012) and have proposed new approaches for assessing the "diachronic interaction of ecological factors…contributing to health disparities" amongst immigrants (Edberg et al, 2011).

Despite the growth of research on the topic, when comparing immigrants, most publications fail to make intra-ethnic distinctions amongst individuals born in the "Asia" region of the world. Quantitative investigations modeling different health outcomes rarely include a measure that captures at what age the immigrant arrived to the host country and consequently failed to account for how long (duration) the immigrant has been exposed to behavioral patterns of host society. This means the literature on immigrants and health does not provide results from a single study using large scale survey data(using millions of observations) to simultaneously estimate disability prevalence for US-born groups and immigrants from China, India, and Mexico residing in the continental US while accounting for age at time of immigration and duration in the US. Fortunately, the feasibility of studying disability rates of specific immigrant groups has recently become possible thanks to information banks with millions of individual level observations generated by the American Community Survey (ACS).

Descriptive epidemiology is the first stage of epidemiologic investigation. Understanding between-group differences requires that a detailed description on how disability differs by group be provided. The current study fills the gap in the literature by taking advantage of the largest dataset available for measuring disability in the US population. Understanding how disability prevalence varies in the population as a function of demographic factors may help illuminate how resources could be used to reduce between-group differences (i.e., health disparities).

In this report, information on about 8 million survey respondents is used to estimate disability prevalence stratified by sex, age, race, ethnicity, and place of birth. The study focuses on the three largest racial-ethnic groups in the US and the three largest immigrant groups in the US. The primary objective the investigation is to provide highly specified population estimates of disability. The project is complimented by estimating risk for disability with models that include the six groups, age at time of entry, "duration" in the US, and various important confounders.

MATERIALS AND METHODS

Data

Data from the American Community Survey (ACS), Public Use Microdata Sample (PUMS) 5-year file from 2008 to 2012 was used. ACS de-identified secondary data files can be downloaded by anyone with an internet connection (http://www2.census.gov/acs2012_5yr/pums/).The legally mandated ACS (Siordia, 2014c)is one of the most nationally representative surveys (Siordia,2014a) and has the ability to influence the distribution of hundreds of billions of dollars by US federal and state governments (Reamer, 2010; Siordia, 2014d).

Sample

Only individuals residing in one of the contiguous US states (i.e., the mainland) who were ages 18 to 64 were included in the sample. In addition, only non-Latino-White

(NLW), non-Latino-Black (NLB), US-born Mexicans (MEX) were included in the analysis along with immigrants from India (INDIA), China (CHINA), and Mexico (MEXICO) residing in the continental US during survey period. From the 15,318,124 available in the ACS-PUMS-2008-2012 file, a total of 7,935,725(female 51%) were included in the analysis. When population weights were applied, the sample was said to represent 161,379,070 individuals. While the "unweighted counts" refer to actual observations in data, "weighted counts" refer to counts after a single population weight was applied so as to make sample characteristics generalizable to the population.

Disability

Six disability-related questions were asked in the ACS. The term "disability" is used to describe these "difficulty" items as the language is used the US federal government (Siordia, 2013a). Self-care disability was assessed with a single survey question: *Does this person have difficulty bathing or dressing*? Independent living disability was assessed with a single survey question: *Because of a physical, mental, or emotional condition, does this person have difficulty doing errands alone such as visiting a doctor's office or shopping*? Respondents were allowed to respond with a "yes" or "no" in a forced choice format (Siordia, 2013d). Difficulties with functional tasks were referred to as disability (Fuller-Thompson et al, 2009).

Duration in the US amongst Immigrants

Previous work has found that "age at migration is an important factor for understanding health status" (Gubernskaya, 2014). Few studies use "duration" to investigate the health of immigrants. For example, Acevedo-Garcia and colleagues (2010) used year of arrival to classify "duration of residence" into 5-year age groups. They found a crude effect of duration by race-ethnicity groups when modeling self-rated health. In their study, duration was interchangeably referred to as "generation" and was meant to capture the immigrants' level of exposure to host society. In this study, duration was determined from the data and for immigrants by subtracting current age from "age at time of entry" to the US.

Age at time of entry to the US was estimated for immigrants by using the "year of entry" and "age" variables in the ACS data. The year of entry was subtracted from the value "2011" and the age is subtracted from the difference of the first subtraction. For example, if a person reports entering the US in 1990 and their age is 33, then age at time of immigration is 12- [(33)-(2011-1990)]=12.To compute duration, the 33 is subtracted from 12: [33-12]=21. Thus, this hypothetical person would be said to have 21 years of duration in the US.

Group-Sex-Age-Specific Disability Rate (GSASDR)

The main goal was to produce population estimates of disability by sex, age, race, ethnicity, and place of birth. Disability prevalence for NLWs is presented in table form. Because they are normally considered the race-ethnic majority group, they are treated as the reference group in the formation of graphs for the other groups. Group-Sex-Age-Specific Disability Rate ($GSAS^{DR}$) was computed for all groups. More formally, $GSAS^{DR}$ was computed as follows:

$$GSAS^{DR}{}_i = \frac{Disable_{gsa_i}}{\left(Disable_{gsa_i} + Nondisable_{gsa_i}\right)}$$

Where g was the group; s was the sex; a was the age; and i was the specific disability item. The total number from individuals with disability from gsa_i was divided by the sum of disable and nondisabled from gsa_i (i.e., the universe). Table 1 displays NLW's$GSAS^{DR}$s. For all

the other groups, the NLWGSAS^{DR} is subtracted from group's GSAS^{DR}.

$$GroupDifference_i = (GSAS^{DR}{}_i - NLWSAS^{DR}{}_i)$$

Where $NLWSAS^{DR}{}_i$ was the GSAS^{DR} for NLWs; and $GSAS^{DR}{}_i$was the disability rate for *g* group; *s* sex; *a* age; and *i* specific disability item. The group difference for a particular disability items was thus obtained by subtracting the GSAS^{DR} in the group (e.g., NLB, MEX, etc.) from the NLWSAS^{DR}.

A detailed example may help explain the procedure. For example, there are a total of 1,226,889 NLW 18 year-old females in the sample. From these, there are 20,723 with independent living difficulties. Thus, the group, sex, age, specific disability rate for NLW-female-18-disabiliy rate= (20,723÷1,226,889)×100=1.69- more technically, theNLWF18^{DR}≈ 1.69%. There were a total of 330,839 NLB 18 year-old females in the sample and 6,691 of them have difficulties with independent living. Thus, the NLBF18^{DR} = (6,691 ÷ 330,839) × 100 ≈ 2.02%. After obtaining the GSAS^{DR} for both NLWs and NLBs, group differences were then computed as follows: (2.02%-1.69%) ≈ 0.33%.In the graphs, the "0%" horizontal line represents the NLW GSAS^{DR}. Thus, *positive* numbers in the graphs indicate the minority group has *higher* disability prevalence than the majority group (i.e., NLWs). In contrast, *negative* numbers in the graphs indicate the minority group has *lower* disability prevalence than NLWs.

Sex Stratified Logistic Regressions

Four sex-stratified multivariable logistic regression models were used to predict the likelihood of having an independent living or self-care disability. Regressions models included all the groups under investigation and treat NLWs as the referent. The models also contained the following confounders: immigrant's age at time of entry- where native-born are the reference group; marital status (married, never married, or the referent of divorced/ separated/widowed); educational attainment (ranges from 1 'no schooling' to 24 'doctorate degree'); if person is in-poverty (=1 if poverty ratio in 0 to 100); and if person only speaks English (referent), is bilingual (English well or very well), or speaks English not well or not at all. Documentation on how the US Census Bureau measures poverty is readily available (http://www.census.gov/hhes/www/poverty/about/overview/measure.html). For example, in 2011, the poverty threshold for a family with one child and two adults (both under age 65) was $15,504. Thus, if family income is estimated below this threshold, each person is said to be in-poverty. All data coding and regressions were conducted using SAS 9.3®.

RESULTS

GSAS^{DR}s for Non-Latino-Whites

Tables 1 and 2 display the GSAS^{DR}s for NLWs. The GSAS^{DR} of the other groups is subtracted from the numbers shown in Tables 1 and 2 to create the graphs in Figure 1 and 2 - which depict group differences. Tables 1 and 2 clearly show disability prevalence is larger in NLW groups of individuals with older ages. The tables also make it evident that disability is most prevalent in NLW females than NLW males. Negative numbers in the "F-M" column (i.e., female disability rate minus male disability rate) indicate disability is *less* prevalent in NLW females. In contrast, positive numbers in the F-M column signal disability is *more* frequent in NLW females. With independent living disability, younger (age 18 to 32) NLW females have less disability than NLW males; the trend is reversed after about age 33. It is similar in the self-care item.

Table 1: Disability prevalence for Non-Latino-Whites by sex (ages 18 through 40)

	Independent Living			Self-Care		
	Females	Male	(F-M)	Females	Male	(F-M)
18	1.70%	2.30%	-0.60%	0.60%	0.80%	-0.10%
19	1.80%	2.30%	-0.50%	0.60%	0.80%	-0.20%
20	1.70%	2.50%	-0.80%	0.60%	0.80%	-0.30%
21	1.80%	2.20%	-0.40%	0.70%	0.80%	-0.10%
22	1.70%	2.50%	-0.80%	0.60%	0.90%	-0.30%
23	1.80%	2.30%	-0.50%	0.60%	0.90%	-0.30%
24	1.90%	2.20%	-0.30%	0.80%	0.80%	0.00%
25	2.10%	2.20%	-0.20%	0.80%	0.90%	-0.10%
26	1.90%	2.30%	-0.50%	0.70%	0.80%	-0.10%
27	2.20%	2.40%	-0.20%	0.80%	0.90%	0.00%
28	2.20%	2.30%	-0.10%	0.90%	0.90%	-0.10%
29	2.10%	2.30%	-0.20%	0.80%	0.90%	-0.10%
30	2.20%	2.30%	0.00%	0.80%	0.90%	-0.10%
31	2.30%	2.30%	0.00%	0.90%	1.00%	-0.10%
32	2.30%	2.30%	0.00%	0.90%	1.00%	-0.10%
33	2.40%	2.30%	0.10%	1.00%	1.00%	0.00%
34	2.80%	2.40%	0.40%	1.20%	1.00%	0.10%
35	2.60%	2.50%	0.10%	1.00%	1.00%	0.00%
36	2.90%	2.50%	0.40%	1.10%	1.10%	0.10%
37	2.80%	2.60%	0.30%	1.20%	1.30%	0.00%
38	3.10%	2.60%	0.50%	1.30%	1.20%	0.10%
39	3.30%	2.50%	0.70%	1.50%	1.20%	0.30%
40	3.30%	2.80%	0.50%	1.50%	1.40%	0.10%

Table 2: Disability prevalence for Non-Latino-Whites by sex (ages 41 to 64)

	Independent Living			Self-Care		
	Females	Male	(F-M)	Females	Male	(F-M)
41	3.40%	3.00%	0.40%	1.50%	1.50%	0.00%
42	3.60%	3.10%	0.40%	1.60%	1.70%	-0.10%
43	3.60%	3.20%	0.50%	1.70%	1.60%	0.10%
44	3.90%	3.30%	0.70%	1.90%	1.70%	0.20%
45	4.00%	3.20%	0.80%	1.90%	1.70%	0.20%
46	4.20%	3.50%	0.70%	2.10%	1.90%	0.20%
47	4.50%	3.70%	0.70%	2.20%	2.10%	0.10%
48	4.50%	3.90%	0.60%	2.30%	2.30%	0.00%
49	4.60%	4.00%	0.60%	2.20%	2.20%	0.00%
50	4.80%	4.00%	0.80%	2.50%	2.30%	0.20%
51	5.20%	4.30%	1.00%	2.70%	2.50%	0.30%
52	5.10%	4.30%	0.90%	2.70%	2.60%	0.10%
53	5.50%	4.40%	1.00%	3.00%	2.70%	0.30%
54	5.60%	4.60%	0.90%	3.10%	2.90%	0.20%
55	5.80%	4.80%	0.90%	3.10%	2.80%	0.30%
56	6.10%	5.00%	1.10%	3.30%	3.10%	0.20%
57	5.90%	5.10%	0.70%	3.20%	3.20%	0.00%
58	6.00%	5.30%	0.70%	3.10%	3.30%	-0.20%
59	6.20%	5.50%	0.70%	3.40%	3.40%	0.00%
60	6.10%	5.70%	0.40%	3.50%	3.60%	-0.10%
61	6.60%	5.70%	0.90%	3.70%	3.70%	0.00%
62	6.60%	5.60%	1.00%	3.70%	3.50%	0.20%
63	6.60%	5.60%	1.00%	3.60%	3.50%	0.10%
64	6.60%	5.90%	0.80%	3.90%	4.00%	-0.10%

Group Differences for Independent Living GSAS^{DR}s

Figure 1 shows how difficulties with independent living differ between the 5 groups and NLWs numbers shown in Table 1. Please note estimates of disability prevalence in all graphs are not adjusted for any other factors other than those shown in the figure. The "0%" horizontal line represents the NLW group's GSAS^{DR}. Thus, lines over the 0% horizontal line indicate the GSAS^{DR} is *larger* in the minority group relative to NLWs. Lines below the 0% line indicate disability prevalence is *lower* in minority group than in NLWs.

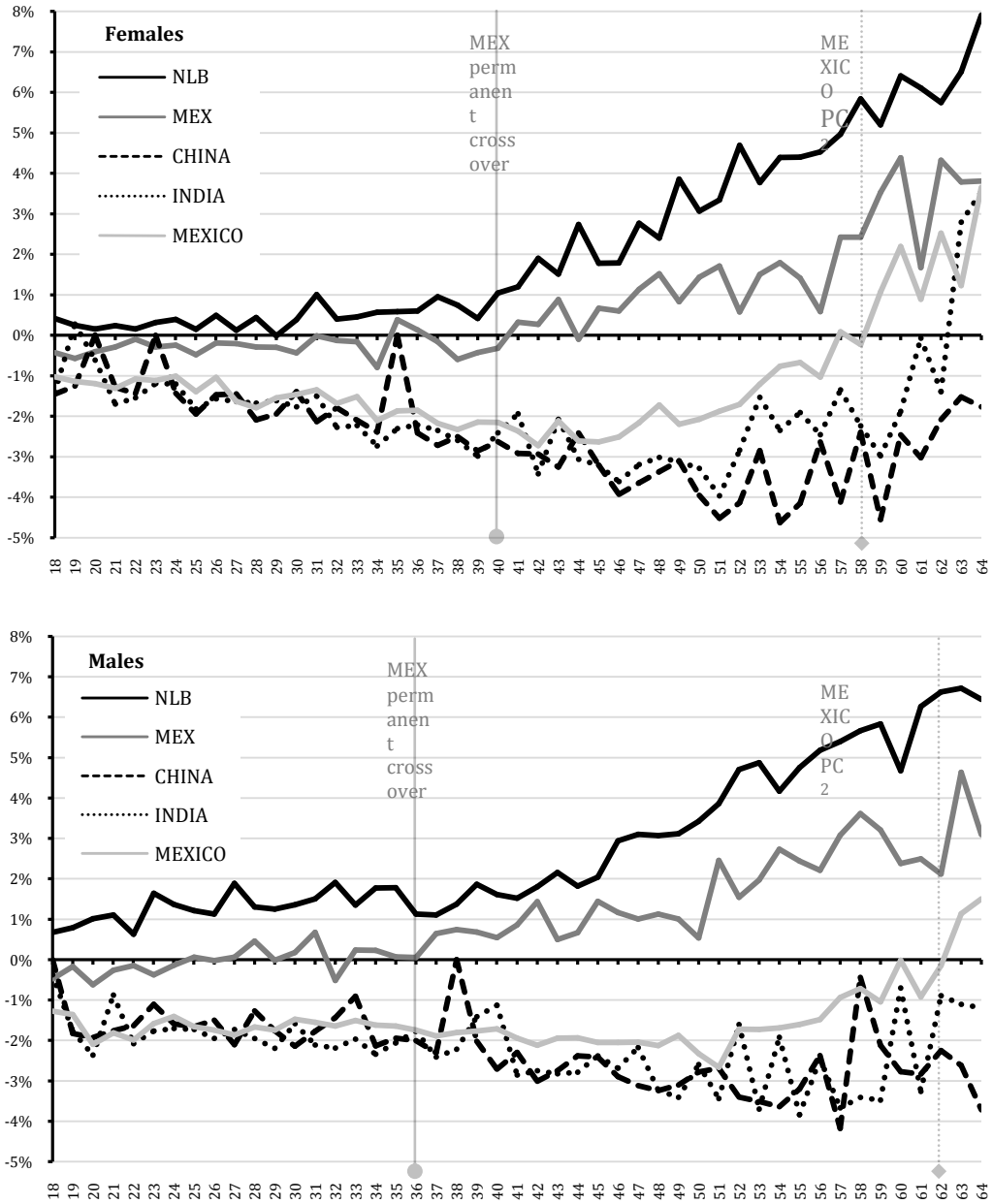
Many interpretations can be made from the graph in Figure 1 showing between-group differences in independent living GSAS^{DR}s. To show how information from the graph can be interpreted, only a few interpretations are made. As can be seen amongst females, the line for NLBs is always above the 0% line - indicating disability prevalence is higher in NLB females than NLW females at all ages from 18 to 64. In stark contrast, the line for CHINA females is always at or lowers than the 0% line - indicating disability prevalence is lower in CHINA females than NLW females in most ages from 18 to 64.This pattern holds true amongst males. Also note MEX females "permanently crossover" to having higher disability rates after age 40 while MEXICO females do so until about age 58 - and for MEX males the permanent crossover is at 36 and for MEXICO males at 62.

Group Differences for Self-Care GSAS^{DR}s

Figure 2 display how difficulties with self-care differ between the 5 groups and NLWs numbers shown in Table 1. As with the previous graphs, a multitude of comparisons could be made from the results. A few general and qualitative comparisons are made to guide the reader. Although less notable, we see the same pattern as before: NLWs always have a higher disability rate than NLWs and individuals from immigrant groups have lower disability prevalence than NLWs. Note MEX females permanently crossover to having a higher disability prevalence than NLW females by age 40- while MEX males crossover at around age

32. MEXICO females crossover by age 54 and MEXICO males by around age 61. With both independent living and self-care; MEXs (Latinos/as of Mexican-origin) crossover to having higher disability rates than NLWs at an earlier age than MEXICOs (immigrants from Mexico); and MEXICO females crossover to "disadvantage" at a younger age than MEXICO males.

Fig 1: Independent living[1] difficulties between groups by age and sex.

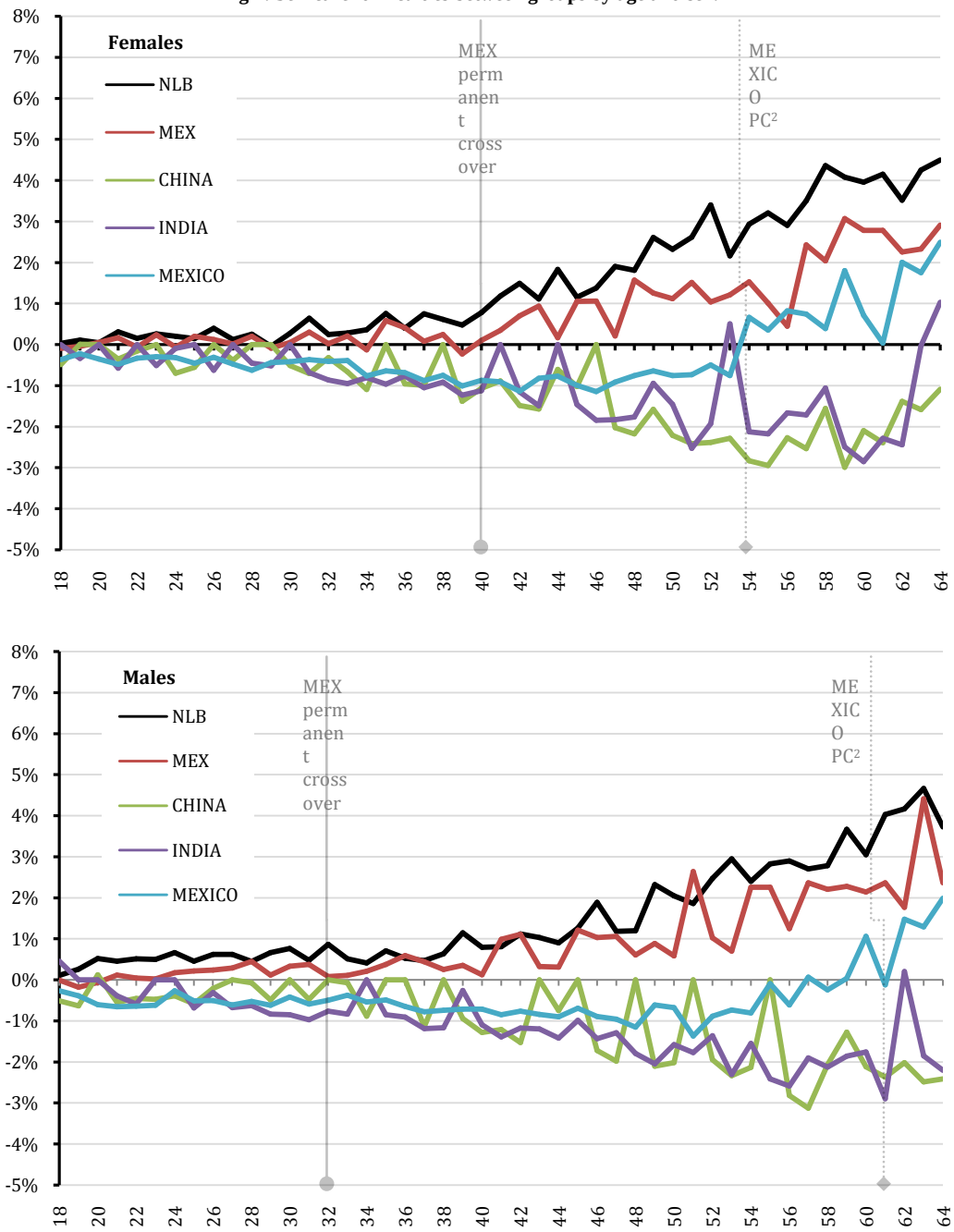


Note: NLW=US mainland Non-Latino-Whites are the reference group captured by the "0%" horizontal line; the lines for the other groups = [(disability rate) – (NLW rate)].

[1] Because of a physical, mental, or emotional condition, does this person have difficulty doing errands alone such as visiting a doctor's office or shopping? [2] PC=Permanent crossover.

NLB= Non-Latino-Blacks in US mainland; MEX=US-born Latinos/as of Mexican origin in US mainland; China=Born in China and residing in US mainland; India=Born in India and residing in US mainland; Mexico=Born in Mexico and residing in US mainland

Fig 2: Self-care[1] difficulties between groups by age and sex.



Note: NLW=US mainland Non-Latino-Whites are the reference group captured by the "0%" horizontal line;
The lines for the other groups = [(disability rate) – (NLW rate)].
[1] Does this person have difficulty bathing or dressing? [2] PC=Permanent crossover
NLB= Non-Latino-Blacks in US mainland; MEX=US-born Latinos/as of Mexican origin in US mainland;
China=Born in China and residing in US mainland; India=Born in India and residing in US mainland;
Mexico=Born in Mexico and residing in US mainland

Descriptive Statistics for Analytic Sample

Tables3 and 4 show the descriptive statistics for the analytic sample of 4,021,491 females and 3,914,234 males. Descriptive statistics do not use PWGT variable (are not population weighed)

because the population weight is not included in the regression models. Most in the female sample are NLW (76%), US-born (95%), married (56%), and only speak English (89%). Amongst females, the average age is 42, about 13% are in-poverty, and have 'some college' (education=18).Males have a similar set of characteristics.

Table 3: Descriptive statistics for population-weighted sample characteristics

	Females[1]		Males[2]	
	Mean	**SD[3]**	**Mean**	**SD**
Non-Latino-Whites	0.76	0.42	0.78	0.41
Non-Latino-Blacks	0.12	0.32	0.1	0.31
US-born Mexicans	0.05	0.22	0.05	0.22
Immigrants from China	0.01	0.09	0.01	0.08
Immigrants from India	0.01	0.09	0.01	0.09
Immigrants from Mexico	0.05	0.21	0.05	0.22
Duration				
US-Born	0.95	0.22	0.95	0.23
0 to 4 years	0.003	0.06	0.004	0.06
5 to 9 years	0.007	0.08	0.008	0.09
10 to 14 years	0.009	0.1	0.011	0.1
15 to 19 years	0.008	0.09	0.008	0.09
20 to 24 years	0.007	0.09	0.008	0.09
25 to 29 years	0.004	0.06	0.006	0.07
30 to 34 years	0.004	0.06	0.005	0.07
35 to 39 years	0.003	0.05	0.003	0.05
40 or more years	0.003	0.05	0.003	0.06
Age at Immigration				
US-born	0.95	0.22	0.95	0.23
Entered at age < 4	0.004	0.06	0.004	0.06
Entered at age 5-9	0.004	0.06	0.004	0.07
Entered at age 10-14	0.006	0.08	0.008	0.09
Entered at age 15-19	0.012	0.11	0.017	0.13
Entered at age 20-24	0.014	0.12	0.014	0.12
Entered at age 25-29	0.009	0.09	0.009	0.09
Entered at age 30-34	0.005	0.07	0.005	0.07
Entered at age 35-39	0.003	0.05	0.003	0.05
Entered at age 40-44	0.002	0.04	0.002	0.04
Entered at age 45-49	0.001	0.03	0.001	0.03
Entered at age > 50	0.001	0.03	0.001	0.03

[1] N=4,021,491; [2] N=3,914,234; [3] Standard Deviation;

Regression Results

Table 5 provides odds ratios from multivariable logistic regressions adjusting for age, marital status, educational attainment, poverty status, citizenship, and language use. As the main interest is on the risk associate with belonging with a particular group, with the 'duration exposure,' and age at immigration to US as an important confounder, the interpretations will focus on these.

Table 4: Demographic statistics for population-weighted sample characteristics

	Females[1]		Males[2]	
	Mean	**SD[3]**	**Mean**	**SD**
Demographics				
Age[4]	42.37	13.5	41.84	13.56
Married[5]	0.56	0.5	0.55	0.5
Never Married[5]	0.26	0.44	0.32	0.47
Naturalized[6]	0.02	0.14	0.02	0.14
Non-citizen[6]	0.04	0.2	0.05	0.21
Socioeconomics				
Education[7]	18.23	3.25	17.83	3.45
In-poverty[8]	0.13	0.34	0.1	0.3
Bilingual[9]	0.08	0.27	0.09	0.28
Little English[10]	0.03	0.17	0.03	0.17

[1] N=4,021,491; [2] N=3,914,234;
[3] Standard Deviation;
[4] Ranges from 18 to 64;
[5] Divorced, separated, or widowed is the referent in models;
[6] US-born is the referent in models;
[7] Ranges from 1 to 24;
[8] Poverty ratio ≤ 100;
[9]Speaks English very well or well (only English referent);
[10]Speaks English not well or not at all (only English referent)

From Model-1, predicting likelihood of having an independent living difficulty amongst females, we see that being a NLB or INDIAN is associated with a *higher* risk while being a MEX, CHINA, or MEXICO is associated with *lower* risk. This model also shows that when immigrants are compared to native-born, higher duration periods are associated with higher risk for reporting having difficulty with independent living. The results also make it clear when immigrants are compared to native-born; immigrating to the US at an earlier age is associated with greater risk for disability. Even though a few coefficients change in their statistical significance forModel-2, -3,and -4, the same patterns can be observed in males and with the self-care disability item.

After adjusting for duration, age at time of entry to US, age, marital status, educational attainment, poverty status, citizenship, language use, evidence for the *healthy immigrant effect* is not always present. Since the models are predicting disability, "healthy" refers to "no disability"; and in the context of the models refers to low likelihood of having a disability. The healthy immigrant effect (i.e., likelihood of

not being disable) is not present for immigrants from India residing the continental US (i.e., INDIA) when predicting the likelihood of reporting an independent living or self-care difficulty. Only female immigrants from China who resided in the continental US during survey period between 2008 and 2012 show the healthy immigrant effect while their male counterparts only show the advantage with self-care disability. Male immigrants from Mexico residing in the continental US between 2008 and 2012 do not show the healthy immigrant effect while evidence for the healthy immigrant effect is found for MEXICO females.

Table 5: Logistic models predicting disability type

	Females[1]				**Males[2]**			
	Model-1		**Model-2**		**Model-1**		**Model-2**	
	IL[3]		**SC[4]**		**IL[5]**		**SC[6]**	
	OR7		**OR**		**OR**		**OR**	
Non-Latino-Whites	1.00	ref	1.00	ref	1.00	ref	1.00	ref
Non-Latino-Blacks	1.03	***	1.21	***	1.11	***	1.18	***
US-born Mexicans	0.79	***	0.90	***	0.92	***	1.00	
Immigrants from China	0.56	***	0.41	***	1.01		0.61	**
Immigrants from India	1.87	***	1.05		2.33	***	1.68	***
Immigrants from Mexico	0.66	***	0.63	**	0.82		0.90	
Duration								
US-Born	1.00	ref	1.00	ref	1.00	ref	1.00	ref
0 to 4 years	0.69	***	0.72	*	0.77	**	0.86	
5 to 9 years	0.63	***	0.73	***	0.53	***	0.70	***
10 to 14 years	0.69	***	0.73	***	0.68	***	0.70	***
15 to 19 years	0.74	***	0.77	***	0.83	*	0.94	
20 to 24 years	0.96		0.96		0.94		1.01	
25 to 29 years	1.12		1.06		0.99		1.16	*
30 to 34 years	1.34	***	1.18	*	1.08		1.05	
35 to 39 years	1.46	***	1.39	***	1.35	***	1.33	***
40 or more years	1.50	***	1.26	***	1.45	***	1.35	***
Age at Immigration								
US-born	1.00	ref	1.00	ref	1.00	ref	1.00	ref
Entered at age < 4	1.03		1.14		0.88		1.05	
Entered at age 5-9	1.10		1.42	**	0.72	***	0.76	*
Entered at age 10-14	0.63	***	0.86		0.43	***	0.52	***
Entered at age 15-19	0.52	***	0.66	***	0.31	***	0.42	***
Entered at age 20-24	0.55	***	0.68	***	0.34	***	0.40	***
Entered at age 25-29	0.59	***	0.69	***	0.35	***	0.39	***
Entered at age 30-34	0.65	***	0.63	***	0.37	***	0.42	***
Entered at age 35-39	0.71	***	0.73	*	0.33	***	0.32	***
Entered at age 40-44	0.85		0.69	**	0.42	***	0.48	***
Entered at age 45-49	0.87		0.71	*	0.44	***	0.45	***
Entered at age > 50	0.93		0.59	***	0.48	***	0.45	***

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

[1] N=4,021,491; [2] N=3,914,234; [3] Independent living [170,004 (4.23%) disable]; [4] Self-care [87,113 (2.17%) disable]; [5] Independent living [151,609 (3.87%) disable]; [6] Self-care [82,015 (2.10%) disable]; [7] Odds ratio;

Note: All multivariable logistic regression models adjusted for age; marital status; educational attainment; poverty status; citizenship; language.

DISCUSSION

In all cases and when compared to native-born, those with more years of residence in the US (i.e., duration is high) and those who immigrated to US at younger ages have greater risk for disability. Results indicate that Non-Latino-Blacks (NLBs) are always at a disadvantage when it comes to disability and when compared to Non-Latino-Whites (NLWs). Given the history of oppression NLBs have experienced in the US, this may not be a unexpected finding (Krieger, 2012). In comparison, Latinos/as of Mexican-origin (MEX) have higher rates of disability after the mid-30s and the MEX status is associated with a *lower* risk for disability after adjusting for important confounders. The finding give support to the

"Mexican Paradox" hypothesis (Hunt et al, 2014)—where despite their minority status and SES disadvantaged, Latinos/as of Mexican-origin have lower risks for adverse health when important confounders are included in regressions models.

Immigrants from China (CHINA) in general have a lower prevalence of disability at all ages from 18 to 64 and the CHINA status is associated with a *lower* risk for disability after adjusting for important confounders. Immigrants from Mexico (MEXICO) in general have a lower prevalence of disability at all ages from 18 to 64 and the MEXICO status is also associated with a *lower* risk for disability after adjusting for important confounders. Immigrants from India (INDIA) in general have a lower prevalence of disability at all ages from 18 to 64, however, the INDIA status is associated with a *higher* risk for disability after adjusting for important confounders. In summary, support for the healthy immigrant effect is found amongst immigrants from China and Mexico. However, no support is found for the healthy immigrant effect amongst immigrants from India.

It is important to note that differences between native-born and immigrants have been attributed to many factors, including: positive selection and cultural buffering (Hunt et al, 2014). The positive selection hypothesis in general posits that migration is selective for healthier individuals. The cultural buffering hypothesis has been used to argue that immigrants engage in low-risk behaviors, have better diets, and stronger familial support (Gong & Takeuchi, 2014). Cultural buffering could be said to refer to the amount of social or financial resources available to the immigrant as they seek to resist or adapt social influences in the host society. High cultural buffering could mean immigrant has retained many of the homeland norms. Low cultural buffering could mean immigrant has largely adapted the norms of the host society. In theory, both beneficial and harmful health behaviors are found in both host and homeland societies.

Immigration scholars have used age 12 as the threshold for differentiating between those who were socialized in their homeland (age $\geq$ 13) and those who were primarily socialized in the US (age $\leq$ 12) (Van Hook, 2007). This study does not use this threshold. Instead, it uses 5-year age groups to capture age at time of immigration and duration in the US. Age at time of immigration may be related to "adaptation" - i.e., the elected or forced abandonment of presumably healthier homeland cultural norms for behaviors and diets promoted in the host society. Little discussion exists on how well age at time of immigration to the US can serve as a proxy measure of culture buffering. Age at time of immigration in health research has generally been treated only as an "immigration-related characteristic" (Abe-Kim 2007).

Little conceptual discussion has been offered regarding an immigrant's duration in the US as it pertains to health outcomes. No publication has speculated how age at time of immigration and duration may be affect factors associated with the disablement process. In early life, immigration may primarily be the product of caregiver dynamics, in middle ages of individual dynamics, and at older ages more likely to be affected by diminishing individual resources. Migration selectivity may be strongest in middle ages. This is the first publication to show how disability rates differ amongst immigrants and how risks for disability vary as a function of duration and age at time of immigration.

There are some limitations in the study. For example, disability rates are only presented for the continental US. It may be that they differ in important ways visible

only when smaller geographical units are used. For example, NLBs in North Dakota may have a lower disability rate than NLWs in the same US state. Even though age at time of immigration is included in the models, it is difficult to precisely ascertain the *primary reason* the individual is immigrating to the US (e.g., forced vs optional). The national focus also limits what can be inferred from the duration (time in the US) measure. For example, immigrants from India who reside in Houston, Texas, US (where there is a large immigrant population from India) may have different effects from duration on disability than immigrants from India residing in North Dakota, US (where a very small immigrant population from India exists). The models are also limited in that a measure of comorbidity is not included. With regards to survey methodology and measurement error, it is difficult to know if individuals immigrating from different parts of the world understand disability questions in the same way - if the outcomes measure 'real' disability.

Notwithstanding limitations, the project is noble in that it is the first to use almost 8 million observations to investigate how disability prevalence varies between native- and foreign-born stratified by sex, age, country of origin, and disability item. The complexity of the results indicates much work remains to be done to understand the processes by which native- and foreign-born report difficulties with independent living and self-care. The clinical significance of the study is on highlighting the need for health practitioners to invest greater effort in building rapport with vulnerable minority populations.

Funding: Work was supported by grant number T32 AG000181 and U01 AG023744 from the National Institute of Aging at the National Institutes of Health (AB Newman).

Under Review: Manuscript has not been published elsewhere and is only under review with IJHSR.

Conflict of Interest: Author does not have any conflict of interest with IJHSR for publication of article in the journal.

REFERENCES

- Abe-Kim, J., Takeuchi, D. T., Hong, S., Zane, N., Sue, S., Spencer, M. S. & Alegría, M. (2007). Use of mental health–related services among immigrant and US-born Asian Americans: Results from the National Latino and Asian American Study. *American Journal of Public Health*, 97(1), 91.
- Acevedo-Garcia, D., Sanchez-Vaznaugh, E. V., Viruell-Fuentes, E. A., & Almeida, J. (2012). Integrating social epidemiology into immigrant health research: A cross-national framework. *Social Science & Medicine*, 75(12), 2060-2068.
- Acevedo-Garcia, D., Bates, L. M., Osypuk, T. L., & McArdle, N. (2010). The effect of immigrant generation and duration on self-rated health among US adults 2003–2007. *Social Science & Medicine*, 71(6), 1161-1172.
- Edberg, M., Cleary, S., & Vyas, A. (2011). A trajectory model for understanding and assessing health disparities in immigrant/refugee communities. *Journal of Immigrant and Minority Health*, 13(3), 576-584.
- Frisbie, W. P., Cho, Y., & Hummer, R. A. (2001). Immigration and the health of Asian and Pacific Islander adults in the United States. *American Journal of Epidemiology*, 153(4), 372-380.
- Fuller-Thomson, E., Yu, B., Nuru-Jeter, A., Guralnik, J. M., & Minkler, M. (2009). Basic ADL disability and functional limitation rates among older Americans from 2000–2005: the end of the decline?. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 64(12), 1333-1336.

- Gong, F., & Takeuchi, D. T. (2014). *Mental Health and Immigrant Status*. The Wiley Blackwell Encyclopedia of Health, Illness, Behavior, and Society. DOI: 10.1002/9781118410868.
- Gubernskaya, Z. (2014). Age at Migration and Self-Rated Health Trajectories After Age 50: Understanding the Older Immigrant Health Paradox. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, gbu049.
- Hunt, B. R., Deot, D., & Whitman, S. (2014). Stroke Mortality Rates Vary in Local Communities in a Metropolitan Area Racial and Spatial Disparities and Correlates. *Stroke*, STROKEAHA-114.
- John, D. A., de Castro, A. B., Martin, D. P., Duran, B., & Takeuchi, D. T. (2012). Does an immigrant health paradox exist among Asian Americans? Associations of nativity and occupational class with self-rated health and mental disorders. *Social Science & Medicine*, 75(12), 2085-2098.
- Krieger, N. (2012). Methods for the scientific study of discrimination and health: an ecosocial approach. *American Journal of Public Health*, 102(5), 936-944.
- Majer, I. M., Nusselder, W. J., Mackenbach, J. P., & Kunst, A. E. (2011). Life expectancy and life expectancy with disability of normal weight, overweight, and obese smokers and nonsmokers in Europe. *Obesity*, 19(7), 1451-1459.
- McDonald, J. T., & Kennedy, S. (2004). Insights into the 'healthy immigrant effect': health status and health service use of immigrants to Canada. *Social Science & Medicine*, 59(8), 1613-1627.
- Reamer, A. D. (2010). *Surveying For Dollars: The Role of The American Community Survey in The Geographic Distribution Of Federal Funds*. Metropolitan Policy Program at Brookings, Washington D.C.
- Shogren, K. A., & Turnbull, H. R. (2014). Core Concepts of Disability Policy, the Convention on the Rights of Persons with Disabilities, and Public Policy Research With Respect to Developmental Disabilities. *Journal of Policy and Practice in Intellectual Disabilities*, 11(1), 19-26.
- Read, J. N. G., & Reynolds, M. M. (2012). Gender Differences in Immigrant Health The Case of Mexican and Middle Eastern Immigrants. *Journal Of Health And Social Behavior*, 53(1), 99-123.
- Siordia, C. (2013a). Number of people in the Unites States experiencing ambulatory and independent living difficulties. *Journal of Social Work and Disability and Rehabilitation*, Vol. 13; Issue 3.1.
- Siordia, C. (2013b). Are health insurance item allocations in the American Community Survey missing completely at random? *Journal of Frailty and Aging*, 2(4):198-204.
- Siordia, C. (2014a). Detecting "real" population changes with American Community Survey data: The implicit assumption of treating between-year differences as "trends." *Journal Of Sociological Research*, 4(2): 494-509.
- Siordia, C. (2014c). Disability estimates between same-sex and different-sex couples: data from the 2009-2011 American Community Survey. *Sexuality and Disability*, 1:6.
- Siordia, C. (2014d). Proxy-reports in the ascertainment of disability prevalence with American Community Survey Data. *Journal Frailty and Aging*, in-press.
- Siordia, C and Vi Donna Le. 2013. Precision of disability estimates for Southeast Asians in American Community Survey 2008-2010 Microdata. *Central Asian Journal of Global Health*, 1(2).
- Siordia, C and Rebekah Lynn Young. 2013. Methodological note: allocation of disability items in the American Community Survey. *Disability and Health Journal*, 6(2):149-153.

- Singh, G. K., & Miller, B. A. (2004). Health, life expectancy, and mortality patterns among immigrant populations in the United States. *Canadian Journal of Public Health*, 95.
- Turner, S. E., Fedigan, L. M., Matthews, H. D., & Nakamichi, M. (2014). Social consequences of disability in a nonhuman primate. *Journal of Human Evolution*, 68, 47-57.
- Van Hook, J., &Balistreri, K. S. (2007). Immigrant generation, socioeconomic status,and economic development of countries of origin: A longitudinal study ofbody mass index among children. *Soc Sci Med*, 65:976-989.
- Williams, D. R., & Sternthal, M. (2010). Understanding racial-ethnic disparities in health sociological contributions. *Journal of Health and Social Behavior*, 51(1 suppl), S15-S27.

How to cite this article: Siordia C. Sex-specific disability prevalence in immigrants from china, India, and Mexico and their US-born counterparts. Int J Health Sci Res. 2015; 5(4):267-279.

****