J Immigrant Minority Health (2013) 15:462–471
DOI 10.1007/s10903-012-9708-1

ORIGINAL PAPER

Acculturation and Disability Rates Among Filipino-Americans

Leanne R. De Souza · Esme Fuller-Thomson

Published online: 11 October 2012

Abstract Filipinos are the fastest growing Asian subgroup in America. Among immigrants, higher acculturation (adaptation to host society) predicts disability outcomes and may relate to disability prevalence among older Filipinos. We conducted a secondary analysis of the 2006 American Community Survey using a representative sample of older Filipinos (2,113 males; 3,078 females) to measure functional limitations, limitations in activities of daily living, blindness/deafness and memory/learning problems. Filipino males who were Americans by birth/naturalization had higher odds of blindness/deafness (OR 2.94; 95 % CI = 1.69, 5.12) than non-citizens. Males who spoke English at home had higher odds of blindness/deafness (OR 1.82; 95 % CI = 1.05, 3.17) and memory/learning problems (OR 2.28; 95 % CI = 1.25, 4.15), while females had higher odds of memory/learning problems (OR 1.75; 95 % CI = 1.13, 2.73). Acculturation is associated with greater odds of disabilities for Filipino men. Males may be more sensitive to acculturation-effects than females due to culturally prescribed roles and gender-specific experiences at the time of immigration.

Keywords Filipino · Disability · Activities of daily living · Immigration · Assimilation · Functional limitations

L. R. De Souza (✉)
Institute of Medical Sciences, University of Toronto, Toronto, ON, Canada
e-mail: leanne.desouza@utoronto.ca

E. Fuller-Thomson
Sandra Rotman Chair in Social Work, Factor Inwentash Faculty of Social Work, University of Toronto, 246 Bloor Street West, Toronto, ON M5S 1V4, Canada
e-mail: esme.fuller.thomson@utoronto.ca

Introduction

The Asian American and Pacific Islander (AAPI) population is the fastest growing minority group in the United States, accounting for approximately 4 % of the total population, with estimates projecting increases to 11 % or 41 million U.S. residents by the year 2050 [1]. To date, studies about the health of Asian Americans have typically aggregated ethnic groups into one category despite the fact that there are considerable ethnic diversities in culture, language, and immigration history among the different Asian groups. However, recent research has highlighted the importance of separating the study of each AAPI group separately to focus on disparities among subpopulations [2–5].

Among AAPIs in the United States, Filipinos form the second largest subgroup after the Chinese, with one in five Asians reporting Filipino ancestry [6]. The number of Filipinos and other Asians immigrating to America increased dramatically following amendments to immigration laws in 1965 that removed Asian immigration quotas. As such, by 2007 over 90 % of Filipinos in the U.S. were foreign-born [7].

Older Filipino-Americans are comprised of three distinct groups based on their age at immigration: 35 % immigrated before age 40, 30 % immigrated between 40 and 59 years of age and 35 % immigrated at 60 years or older [7]. Growing evidence underscores the disparities in health outcomes among individuals of Filipino ancestry compared to their AAPI and Caucasian counterparts. Studies range from child and adolescent health showing higher prevalence of neonatal mortality, malnutrition, and obesity [8], to studies demonstrating higher rates of cancer, cardiovascular disease, diabetes, and mental illness among adults [9–15]. Many of these chronic diseases show

increasing prevalence with increasing age and acculturation [14]. Though only a few studies have compared older Filipinos to other AAPI subgroups, these consistently report substantial vulnerabilities with respect to self-reported mortality, depression, chronic diseases, physical inactivity and disabilities [5, 16–18]. Moreover, higher incidence and prevalence of blindness/deafness occurs among immigrants, which may be related to socioeconomic inequalities [19], type of employment and limited access to job-related resources [20]. In the same way, blindness may also be affected by similar socioeconomic variables and is associated with many chronic diseases as a common comorbidity [21].

In keeping with much of the recent gerontological research [22, 23], we define "older" as age 55 and over. Research indicates that functional health inequalities peak in the 55–64 year old group, whether socioeconomic status or differenes among visible minorities [24] are examined. Indeed, studies have also demonstrated gender disparities in disability outcomes that increase with age, where men have worse outcomes of a serious medical nature than women, while women have greater functional limitations as they age [25]. The association between gender differences and health outcomes is complex and is affected by variables such as reporting bias, acquired risk and biological risk [26], and these in turn translate into different mortality and morbidity outcomes [27].

A national survey study revealed that compared to their U.S.-born counterparts, Chinese, Japanese and Filipino immigrants had lower life expectancy and the risk of disability and chronic disease increased according to length of residence [28]. We recently showed that compared to Chinese respondents, Filipinos had lower odds of cognitive problems, higher odds of functional limitations and comparable odds of ADL limitations [18]. Similarly, Kim and colleagues [17] found that Filipinos exhibited marked differences in chronic diseases and disability rates, and tended to have poor overall physical health compared to Chinese, Japanese, and Koreans [17]. A growing body of research underscores the apparent need to disaggregate research of AAPIs to accurately portray the varying disease burden of especially vulnerable subgroups and to examine their respective life histories that lead to disparities in disability rates.

Socioeconomic status (SES) and indicators of acculturation are thought to influence health status [29]. A comparison of older Asian-Americans with U.S.-born non-Hispanic Whites showed that in later life, immigrant status confers few disability advantages [30]. Moreover, disability rates are influenced by the combined effects of age at immigration and duration of residence in the U.S. [30]. Indeed, Cho and Hummer [16] found marked differences in disability status across AAPI subgroups with variations attributable to nativity, age and SES status.

Chronic health conditions often culminate in some form of disability with older age and in turn, disability can reflect the severity of chronic diseases and their co-morbidities [29, 30]. Accordingly, disability is considered a reliable quality-of-life indicator capturing the diseased and healthy conditions and has been proposed as a more accurate assessment of well-being than traditional morbidity and mortality data [31]. Careful monitoring of disability rates in vulnerable populations can facilitate intervention strategies [32, 33] and health promotion. Considering the disparities of chronic diseases among adult Filipinos compared to other AAPIs, it is evident that disability prevalence is an important issue to examine in this group.

Previously we described the variability in disability rates across seven AAPI subgroups [18]. In the present study, we conducted a secondary analysis of the Filipino subgroup to develop a profile of older Filipino-Americans living with disabilities. This may provide insight to help policy makers drive decision-making, resource allocation and development of social support programs targeting the needs of older Filipino-Americans. In addition, such an analysis may also improve health care professionals' ability to tailor services to the most vulnerable Filipino-Americans.

Methods

The American Community Health Survey (ACS) is a nationally representative survey of community-dwelling and institutionalized Americans, conducted annually by the U.S. Census Bureau [34]. The ACS replaces the long-form of the U.S. Census. Sampling is based on the US Census Bureau's Master Address File [35]. Data collection started with multiple mailed surveys; non-respondents were then contacted through computer-assisted telephone surveys. A random sample of those who were non-responders to both the mail and telephone survey were visited in person and interviewed face to face. This strategy resulted in a response rate of 97.5 %. Institutionalized community members included those living in nursing homes, in-patient hospice facilities, psychiatric hospitals, and adult correctional facilities were included [34].

In the present study, we use the 2006 ACS (98 % response rate) to examine disability outcomes of older Filipino adults aged 55 and older (n = 5,192) to characterize a disability profile in this cross-section of the population. Four self-reported disability outcomes were examined: Respondents were asked if they had any of the following long-lasting conditions: (a) "Blindness, deafness or a severe vision or hearing impairment" (*vision/hearing limitations)* (b) "A condition that substantially limits one or more basic physical activities such as walking, climbing

stairs, reaching, lifting, or carrying" (*functional limitations*); and whether "Because of a physical, mental, or emotional condition lasting 6 months or more" they had difficulty: (a) "Learning, remembering, or concentrating" (*memory loss and learning difficulties)* and/or (b) "Dressing, bathing, or getting around inside the home" (*ADL limitations)*. Each item included a dichotomous yes/no response option.

Demographic variables collected included age groups (55–64, 65–74, 75–84, and 85 years or older) and marital status (never married, separated, divorced or widowed versus "now married"). The socioeconomic variable measured was level of education (only primary school or less, some high school, high school graduate, bachelor degree and graduate degree). Factors of acculturation included age at immigration (U.S. born, immigrated prior to age 20, aged 20–39, 40–59, 60 or older), citizenship (American by birth or naturalization, non-citizen), and speaking English at home (yes, no).

Because the only socioeconomic variable available for the institutionalized respondents was level of education we used it as a surrogate for SES in our analysis.

Marital status, education level, speaking English at home, age at immigration and citizenship were included in each analysis in a nationally representative sample of Filipino-Americans. Each of these variables was included in a series of gender-specific multivariate logistic regression analyses to characterize factors associated with each of the four types of disability. The weighted prevalence, odds ratios (OR), and 95 % confidence intervals (CIs) for each disability type were calculated. All statistical analyses were conducted using SPSS 17.0. Due to the dichotomous outcome measure in logistic regression, a regular R-Square could not be used. The Nagelkerke R-square is a pseudo-R-Square measure for logistic regression analyses that provides a measure of the explained variability in the model.

Results

Results for demographic information and all four disability types: ADLs, functional limitations, blindness/deafness, and memory/learning disabilities are shown in Tables 1 through 5 respectively. We report the Odds Ratios (OR) and 95 % Confidence Intervals (CI) in the tables.

Acculturation Factors

The odds of memory or learning disabilities (Table 5) were significantly higher among women who spoke English at home compared to those who did not (OR 1.75; 95 % CI = 1.13, 2.73) and among women who immigrated at age 60 years or older in comparison to those born in the U.S. (OR 1.93; 95 % CI = 1.03, 3.62). Alternatively, among Filipino males, those who immigrated at age 20 years or younger had significantly higher odds for all four disability types, in comparison to those born in the U.S. as follows: ADLs (Table 2: OR 4.19; 95 % CI = 1.73, 10.15), functional limitations (Table 3: OR 1.95; 95 % CI = 1.13, 3.36), blindness or deafness (Table 4: OR 1.91; 95 % CI = 1.00, 3.67), and memory or learning problems (Table 5: OR 3.30; 95 % CI = 1.40, 7.78).

Compared to non-citizens, Filipino males with American citizenship had significantly higher odds of blindness or deafness (Table 4: OR 2.94; CI 1.69, 5.12). Compared to those who did not speak English at home, males who spoke English at home had significantly higher odds of blindness or deafness (Table 4: OR 2.09; 95 % CI = 1.29, 3.39) and memory or learning problems (Table 5: OR 2.28; 95 % CI = 1.25, 4.15). Women who spoke English at home in comparison to those who did not had increased odds of memory or learning problems (Table 5: OR 1.75; CI = 1.13, 2.73).

Demographic Factors

In comparison to females in the 55–64 year old age bracket, each older age cohort had higher odds of disability. For example as shown in Table 2, the odds of limitations in ADLs were 2.05 (95 % CI 1.28, 3.28) times higher for 65-74 year old women, 6.20 times higher (95 % CI 3.79, 10.16) for 75–84 year olds and 20.26 (95 % CI = 11.18, 36.69) times higher for women aged 85 or older. Similarly, for females, odds of functional limitations were 2.6, 4.9 and 10.9 times higher, in the 65–74, 75–84 and 85+ cohorts, respectively (Table 3). The patterns were also similar for the other disability types: for those aged 85 and older in comparison to those aged 55–64, females odds of blindness/deafness reached 13.20 (Table 4: 95 % CI = 7.41, 23.53) and the odds of memory/learning problems was 11.05 (Table 5: 95 % CI = 6.47, 18.86). Similar outcomes were found for males (Tables 2, 3, 4, 5).

Unmarried females had significantly higher odds of functional limitations (Table 1: OR 1.28; 95 % CI = 1.05, 1.56), memory or learning problems (Table 5: OR 1.50; 95 % CI = 1.13, 2.00) and blindness or deafness (Table 4: OR 1.63; 95 % CI = 1.19, 2.22), in comparison to married females. Among males, unmarried status was associated with higher odds of functional limitations in comparison to married males (Table 3: OR 1.48; 95 % CI = 1.10, 2.01).

Socioeconomic Factors

Lower levels of education were associated with higher odds of disability. In comparison to those with a graduate

Table 1 Demographic description of Filipino male and female respondents to the 2006 ACS survey

Variables	Males (n = 2,113)	Females (n = 3,079)	Total (n = 5,192)	p value
ADL				
No	2,000 (94.7 %)	2,883 (93.0 %)	4,883 (93.7 %)	0.014
Yes	113 (5.3 %)	196 (7.0 %)	309 (6.3 %)	
Functional limitations				
No	1,742 (83.2 %)	2,452 (79.4 %)	4,194 (80.9 %)	0.001
Yes	371 (16.8 %)	627 (20.6 %)	998 (19.1 %)	
Blindness/deafness				
No	1,899 (89.5 %)	2,844 (92.1 %)	4,743 (91.1 %)	0.001
Yes	214 (10.5 %)	235 (7.9 %)	449 (8.9 %)	
Memory/learning				
No	1,970 (93.4 %)	2,808 (90.5 %)	4,778 (91.6 %)	0.000
Yes	143 (6.6 %)	271 (9.5 %)	414 (8.4 %)	
Demographics				
Age				
55–64	1,134 (53.7 %)	1,636 (50.9 %)	2,770 (52.0 %)	0.013
65–74	604 (27.9 %)	864 (28.5 %)	1,468 (28.3 %)	
75–84	296 (14.9 %)	457 (16.0 %)	753 (15.6 %)	
85+	79 (3.4 %)	122 (4.6 %)	201 (4.1 %)	
Marital status				
Never married/divorced/ separated/widowed	322 (16.1 %)	1,237 (44.2 %)	1,559 (33.1 %)	0.000
Yes	1,791 (83.9 %)	1,842 (55.8 %)	3,633 (66.9 %)	
Education in levels				
Primary	166 (7.8 %)	429 (14.8 %)	595 (12.0 %)	0.000
High school (no diploma)	110 (4.9 %)	210 (6.3 %)	320 (5.8 %)	
High school (diploma + other education/not bachelors)	913 (42.5 %)	1,047 (35.6 %)	1,960 (38.3 %)	
Bachelors degree	717 (34.5 %)	1,149 (35.5 %)	1,866 (35.1 %)	
Graduate degree	207 (10.4 %)	244 (7.7 %)	451 (8.8 %)	
Age at immigration				
Born in the US	245 (11.4 %)	240 (7.4 %)	485 (9.0 %)	0.000
< 20	146 (6.4 %)	84 (2.3 %)	230 (3.9 %)	
20–39	954 (43.1 %)	1,429 (43.0 %)	2,383 (43.0 %)	
40–59	553 (27.4 %)	984 (33.8 %)	1,537 (31.2 %)	
60–100	215 (11.8 %)	342 (13.6 %)	557 (12.9 %)	
Citizenship				
Not a citizen	370 (19.6 %)	637 (23.3 %)	1,007 (21.8 %)	0.002
Citizen by birth or naturalization	1,743 (80.4 %)	2,442 (76.7 %)	4,185 (78.2 %)	
English-speaking				
Does not speak English at home	1,829 (87.2 %)	2,697 (87.8 %)	4,526 (87.5 %)	0.52
Speaks english at home	284 (12.8 %)	382 (12.2 %)	666 (12.5 %)	

degree, higher odds of functional limitations were apparent for both males (OR 2.12; 95 % CI = 1.19, 3.77) and females (OR 2.01; 95 % CI = 1.28, 3.16) who had only completed primary school (Table 3). Similarly, the odds of blindness or deafness were higher among males (OR 2.32; 95 % CI = 1.09, 4.91) and females (Table 4: OR 3.26; 95 % CI = 1.19, 7.82) with only primary school education and the same was true for memory or learning problems among males (OR 6.98; 95 % CI = 2.07, 23.54) and females (OR 4.94; 95 % CI = 2.24, 10.90). The odds of

Table 2 Logistic regression of limitations in activities of daily living (ADL) according to demographic, socioeconomic and immigration-related variables in older Filipino males (n = 2,113) and Females (n = 3,079)

	Male		Female	
	OR	95 % CI	OR	95 % CI
Demographic variables				
Age				
55–64	1.00	Referent	1.00	Referent
65–74	1.05	(0.56, 1.93)	2.05	(1.28, 3.28)
75–84	4.23	(2.36, 7.58)	6.20	(3.79, 10.16)
85+	12.04	(5.85, 24.77)	20.26	(11.18, 36.69)
Marital status				
Marital status				
Not married	1.19	(0.72, 1.96)	1.21	(0.87, 1.69)
Married	1.00	Referent	1.00	Referent
Adult socioeconomic status				
Education				
Primary	1.59	(0.60, 4.25)	2.48	(1.06, 5.83)
Some high school	2.66	(0.96, 7.36)	2.00	(0.77, 5.20)
High school graduate	1.51	(0.64, 3.55)	2.15	(0.93, 4.94)
Bachelor degree	1.36	(0.55, 3.34)	1.46	(0.62, 3.42)
Graduate degree	1.00	Referent	1.00	Referent
Immigration and citizenship				
Age at immigration				
U.S. born	1.00	Referent	1.00	Referent
< 20	4.19	(1.73, 10.15)	0.97	(0.27, 3.44)
20–39	0.90	(0.37, 2.23)	1.42	(0.69, 2.90)
40–59	1.33	(0.53, 3.31)	1.48	(0.74, 2.97)
60–100	1.58	(0.61, 4.09)	1.74	(0.84, 3.61)
Citizenship				
American by birth or naturalization	1.44	(0.76, 2.72)	1.05	(0.71, 1.56)
Not a citizen	1.00	Referent	1.00	Referent
Speaks english at home				
Yes	0.98	(0.48, 1.99)	1.25	(0.73, 2.15)
No	1.00	Referent	1.00	Referent

Per cent change in Nagelkerke R Square associated with the addition of education level = 0.8 % male, 0.6 % female

Per cent change in Nagelkerke R Square associated with addition of age at immigration = 2.6 % male, 0.2 % female

Per cent change in Nagelkerke R Square associated with addition of citizenship status and language spoken at home = 0.01 % male, 0.1 % female

Total Nagelkerke R-Square value for full model = 0.179 male, 0.207 female

Nagelkerke R Square associated with age and marital status = 0.144 male, 0.198 female

ADL disabilities were increased among females with only primary school education (OR 2.48; 95 % CI = 1.06, 5.83) compared to those with a graduate degree (Table 2). Furthermore, women with only some high school had higher odds of blindness or deafness (Table 4: OR 4.08; 95 % CI = 1.60, 10.40) and memory or learning problems (Table 5: OR 3.10; 95 % CI = 1.30, 7.41) than women with a graduate degree. Women with a high school diploma reported greater odds of memory or learning problems than their peers with a graduate degree (Table 5: OR 2.54; 95 % CI = 1.16, 5.55).

Males with only a high school diploma had higher odds of blindness or deafness (Table 4: OR 2.53; 95 % CI = 1.33, 4.80) compared to those with a graduate degree. There was also a graded increase in the odds of functional limitations among males who graduated from high school (OR 1.64; CI 1.02, 2.63), to completion of only some high school (OR 2.06; CI 1.09, 3.89), to only primary school education (reported above) compared to those with a graduate degree (Table 3). This increasing risk compared to those with a graduate degree, was also observed for memory or learning problems among Filipino males (Table 5), from high school graduate (OR 5.42; CI 1.71, 17.18), to only some high school completed (OR 6.62; CI 1.83, 23.97), to only primary school (reported above).

Discussion

Few studies have investigated health outcomes of older adults from distinct AAPI subpopulations [5, 16–18]. Disaggregating the study of AAPIs to evaluate the impact

Table 3 Logistic regression of functional limitations according to demographic, socioeconomic and immigration-related variables in older Filipino males (n = 2,113) and females (n = 3,079)

	Male		Female	
	OR	95 % CI	OR	95 % CI
Demographic variables				
Age				
55–64	1.00	Referent	1.00	Referent
65–74	1.37	(1.00, 1.88)	2.62	(2.05, 3.34)
75–84	4.49	(3.15, 6.41)	4.90	(3.64, 6.60)
85+	7.82	(4.45, 13.72)	10.88	(6.98, 16.94)
Marital status				
Marital status				
Not married	1.48	(1.10, 2.01)	1.28	(1.05, 1.56)
Married	1.00	Referent	1.00	Referent
Adult socioeconomic status				
Education				
Primary	2.12	(1.19, 3.77)	2.01	(1.28, 3.16)
Some high school	2.06	(1.09, 3.89)	1.58	(0.93, 2.67)
High school graduate	1.64	(1.02, 2.63)	1.45	(0.95, 2.22)
Bachelor degree	1.16	(0.70, 1.89)	1.21	(0.79, 1.85)
Graduate degree	1.00	Referent	1.00	Referent
Immigration and citizenship				
Age at immigration				
U.S. born	1.00	Referent	1.00	Referent
< 20	1.95	(1.13, 3.36)	0.90	(0.43, 1.90)
20–39	0.94	(0.58, 1.52)	0.91	(0.60, 1.40)
40–59	0.88	(0.53, 1.48)	0.90	(0.59, 1.39)
60–100	1.16	(0.65, 2.05)	0.96	(0.60, 1.55)
Citizenship				
American by birth or naturalization	1.42	(0.98, 2.08)	1.03	(0.80, 1.33)
Not a citizen	1.00	Referent	1.00	Referent
Speaks english at home				
Yes	1.25	(0.83, 1.90)	0.84	(0.59, 1.19)
No	1.00	Referent	1.00	Referent

Per cent change in Nagelkerke R Square associated with the addition of education level = 1.3 % male, 0.7 % female

Per cent change in Nagelkerke R Square associated with addition of age at immigration = 1.1 % male, 0.0 % female

Per cent change in Nagelkerke R Square associated with addition of citizenship status and language spoken at home = 0.3 % male, 0.1 % female

Total Nagelkerke R-Square value for full model = 0.168 male, 0.182 female

Nagelkerke R Square associated with age and marital status = 0.141 male, 0.174 female

of migration histories, indicators of acculturation and socio-demographic variables on health outcomes reveals important insights into the health of vulnerable subgroups [5] such as older Filipino-Americans.

Among the adult Filipino population we found that older age, marriage, education and common indicators of acculturation: speaking English at home, age at immigration and citizenship, were associated with higher odds of functional disability, limitations in ADLs, memory or learning problems and blindness or deafness. These associations were different between men and women, indicating unique sex-specific factors associated with disability outcomes.

Older age often involves some deterioration in physical (functional limitations, ADLs, blindness or deafness) and cognitive function (memory or learning problems) that varies between genders regardless of ethnicity [36–38]. Research indicates that older women have a higher prevalence of disability and functional limitations than their male peers [39]. The incidence of new disability among older adults is generally higher in women, than in men [40]. However, a systematic review of the literature indicates that when studies control for socioeconomic factors and health conditions, the gender differences in incidence of functional disability are often reduced to non-significance [40].

We found that unmarried females demonstrated significantly higher odds of functional limitations, blindness or deafness and memory or learning problems in comparison to married women. Conversely, marital status of males showed no significant association with any of the four types of disability and only approached significance with functional limitations. Approximately half of Filipinos in America are married, according to the 2000 U.S. census

Table 4 Logistic regression of blindness/deafness/severe sensory impairment according to demographic, socioeconomic and immigration-related variables in older Filipino males (n = 2,113) and females (n = 3,079)

	Male		Female	
	OR	95 % CI	OR	95 % CI
Demographic variables				
Age				
55–64	1.00	Referent	1.00	Referent
65–74	2.76	(1.83, 4.17)	2.49	(1.61, 3.87)
75–84	6.66	(4.23, 10.50)	6.17	(3.87, 9.84)
85+	15.66	(8.39, 29.22)	13.20	(7.41, 23.53)
Marital status				
Marital status				
Not married	0.92	(0.62, 1.36)	1.63	(1.19, 2.22)
Married	1.00	Referent	1.00	Referent
Adult socioeconomic status				
Education				
Primary	2.32	(1.09, 4.91)	3.26	(1.36, 7.82)
Some high school	2.02	(0.88, 4.63)	4.08	(1.60, 10.40)
High school graduate	2.53	(1.33, 4.80)	2.31	(0.98, 5.47)
Bachelor degree	1.32	(0.66, 2.63)	1.90	(0.79, 4.57)
Graduate degree	1.00	Referent	1.00	Referent
Immigration and citizenship				
Age at immigration				
U.S. born	1.00	Referent	1.00	Referent
< 20	1.91	(1.00, 3.67)	0.37	(0.08, 1.62)
20–39	1.06	(0.59, 1.91)	0.78	(0.41, 1.50)
40–59	1.30	(0.70, 2.41)	1.35	(0.73, 2.48)
60–100	1.75	(0.90, 3.40)	0.97	(0.50, 1.88)
Citizenship				
American by birth or naturalization	2.94	(1.69, 5.12)	1.19	(0.82, 1.72)
Not a citizen	1.00	Referent	1.00	Referent
Speaks English at home				
Yes	2.09	(1.29, 3.39)	0.97	(0.56, 1.67)
No	1.00	Referent	1.00	Referent

Per cent change in Nagelkerke R Square associated with the addition of education level = 1.9 % male, 1.4 % female

Per cent change in Nagelkerke R Square associated with addition of age at immigration = 1.0 % male, 0.8 % female

Per cent change in Nagelkerke R Square associated with addition of citizenship status and language spoken at home = 2.1 % male, 0.0 % female

Total Nagelkerke R-Square value for full model = 0.220 male, 0.211 female

Nagelkerke R Square associated with age and marital status = 0.170 male, 0.189 female

[6]. Research studies have described marriage as a protective factor for disability outcomes [7]. Moreover, evidence shows that cognitive decline is more apparent in women without a stable partnership [7].

Higher levels of education are considered protective against cognitive problems and other disabilities [16]. In the present study, for both genders, lower education levels were associated with higher odds of functional limitations, blindness or deafness and memory or learning problems. A particularly strong association was apparent between lower education level and memory or learning disabilities. Education is a surrogate indicator of SES as it usually indicates the propensity for job acquisition and career development [7, 38, 41, 42]. Those individuals with higher education are more likely to be employed and may receive benefits that support resources for medical care and improved quality of life, important factors to delaying disability. Even with lower education, men in this cohort may have been able to access job opportunities for financial security. Moreover, men in our cohort may have belonged to a population of early immigrant Filipino men who were active members of the U.S. military and as such, acquired citizenship through the U.S. Immigration and Naturalization Act, which in 1990 permitted special provision of U.S. citizenship to Filipino male veterans. Many of the older Filipino males in our sample may have belonged to this unique group, which could in turn contribute to some specific cohort effects in our study [43].

Our findings are consistent with other research demonstrating that higher SES as indicated by education corresponds to lower mortality and morbidity rates [5, 44]. The major exception in this study was the lack of a significant

Table 5 Logistic regression of memory/learning problems according to demographic, socioeconomic and immigration-related variables for older Filipino males (n = 2,113) and females (n = 3,079)

	Male		Female	
	OR	95 % CI	OR	95 % CI
Demographic variables				
Age				
55–64	1.00	Referent	1.00	Referent
65–74	1.19	(0.70, 2.02)	2.36	(1.61, 3.47)
75–84	3.63	(2.13, 6.19)	4.82	(3.16, 7.37)
85+	8.89	(4.48, 17.62)	11.05	(6.47, 18.86)
Marital status				
Marital status				
Not married	0.94	(0.59, 1.50)	1.50	(1.13, 2.00)
Married	1.00	Referent	1.00	Referent
Adult socioeconomic status				
Education				
Primary	6.98	(2.07, 23.54)	4.94	(2.24, 10.90)
Some high school	6.62	(1.83, 23.97)	3.10	(1.30, 7.41)
High school graduate	5.42	(1.71, 17.18)	2.54	(1.16, 5.55)
Bachelor degree	3.17	(0.97, 10.42)	1.70	(0.77, 3.78)
Graduate degree	1.00	Referent	1.00	Referent
Immigration and citizenship				
Age at immigration				
U.S. born	1.00	Referent	1.00	Referent
< 20	3.30	(1.40, 7.78)	0.56	(0.15, 2.19)
20–39	1.84	(0.80, 4.21)	1.48	(0.81, 2.71)
40–59	2.26	(0.96, 5.30)	1.69	(0.93, 3.04)
60–100	4.71	(1.95, 11.41)	1.93	(1.03, 3.62)
Citizenship				
American by birth or naturalization	1.24	(0.74, 2.09)	1.04	(0.74, 1.45)
Not a citizen	1.00	Referent	1.00	Referent
Speaks english at home				
Yes	2.28	(1.25, 4.15)	1.75	(1.13, 2.73)
No	1.00	Referent	1.00	Referent

Per cent change in Nagelkerke R Square associated with the addition of education level = 2.6 % male, 2.6 % female

Per cent change in Nagelkerke R Square associated with addition of age at immigration = 1.7 % male, 0.4 % female

Per cent change in Nagelkerke R Square associated with addition of citizenship status and language spoken at home = 0.8 % male, 0.3 % female

Total Nagelkerke R-Square value for full model = 0.189 male, 0.212 female

Nagelkerke R Square associated with age and marital status = 0.138 male, 0.179 female

link between education and ADL limitations for males. Speaking English at home and citizenship status were each measured as common indicators of acculturation. The 2000 U.S. census reports that 29 % of Filipinos have less than a 9th grade education and that 17 % are linguistically isolated, with 56 % reporting that they do not speak English very well [6]. Males who speak English at home had higher odds of blindness or deafness. Speaking English at home was also associated with higher odds of memory or learning problems for both males and females. These surprising findings should be replicated in other, large, nationally representative surveys. Future research is also needed to examine possible pathways and/or confounding factors that may shed light on this association.

We also found that Filipino males who were U.S. citizens had increased odds of blindness or deafness compared to non-citizens. Foreign-born persons are thought to be healthier than their U.S.-born counterparts because of the self-selectivity of immigration and prerequisite health requirements to migrate to the U.S. [45], their strong family support systems [46] and resilience [7]. These characteristics that describe the 'healthy migrant effect' are thought to diminish over time with longer residence in the U.S. due to deterioration of healthy behaviours [7, 28] and adoption of American lifestyle and practices. In addition, reasons for migration such as family reunification and pursuit of job opportunities, alongside acculturation factors can also have a positive influence toward improved opportunities, access to healthy behaviours in the host nation, knowledge and attitudes about health, stress management and accumulation of health resources [5].

In comparison to the US-born, only Filipino males who immigrated before 20 years old had significantly higher odds of all four disability types. This may be due to the

early age at immigration, or potential cohort effects of this particular age group. On the other hand, both men and women who immigrated over the age of 60 years had higher odds of memory or learning disabilities than US born Filipino-Americans, which may reflect the reason for immigration. The reasons for immigrating and timing of migration among Filipinos are diverse and their experience in the U.S. varies accordingly [7, 32]. Perhaps adult children established in the U.S. sponsor their parents to immigrate through family reunification policies when their parents are in need of care, as would be the case for those with Alzheimers disease or other chronic disease. [47].

There are a several limitations of this study that should be considered when interpreting the results. Income and wealth vary greatly among AAPI subpopulations [4, 42, 43,48] and are highly correlated with level of disability in older adults. However, information about wealth was not available in the dataset, which precluded our analysis of this relationship. Additionally, this data is based on a cross-sectional sample that did not provide information about the onset and progression of disability; therefore we cannot determine causal relationships in our findings [7]. Also, as described earlier, another limitation inherent to the cross-sectional design of this study is the potential cohort effects of particular waves of immigrants that may render some of our findings specific to this population.

Future cohorts of AAPI elders will differ with respect to their early life experiences, education and economic status that may correspond to improvements to functional status [49].

Finally, the behavioural risk factors of Asian subpopulations may change with time and could affect future cohorts of aging Filipinos. For example, current neonatal and childhood diabetes and obesity trends [8], and a shift in employment opportunities away from agricultural jobs [3–5], may change future disability trends. The rapid growth of the AAPI population necessitates accurate and representative data to make informed health policy and planning decisions. Each AAPI ethnic group deserves distinct attention in order to offer culturally-sensitive recommendations for vulnerable populations. The data reported here were obtained from a nationally-representative sample including community-based and institutionalized elders. This study identified factors associated with each of the four types of disabilities among older male and female Filipino-Americans. Older adults, those who speak English at home, the unmarried and those with only a primary school education had higher odds of disability and therefore Filipino-Americans with these characteristics should be targeted for improved prevention and treatment interventions.

Continued surveillance of national surveys and prospective studies will permit further understanding of the trends in disability outcomes among older Filipinos and other under investigated AAPI subgroups. There is likely a complex interplay between migrant selection effects, positive versus negative acculturation effects, and SES factors that relate to both timing of immigration and country of origin [50]. This area of public health research is especially important given the high prevalence and incidence rates of chronic diseases and disability. Both chronic diseases and disabilities result in a substantial economic burden for the country as well as decreased quality of life for the individual.

Acknowledgments The authors would like to thank Rachel Zhou for her assistance with preparation of the tables.

References

1. Ghosh C. Healthy people 2010 and Asian Americans or Pacific Islanders: defining a baseline of information. Am J Public Health. 2003;93:2093–8.
2. Yu ESH, Liu WT. U.S. national health data on Asian Americans and Pacific Islanders: a research agenda for the 1990s. Am J Public Health. 1992;82:1645–52.
3. Chen MS, Hawks BL. A debunking of the myth of healthy Asian Americans and Pacific Islanders. Am J Health Promot. 1995;9:261–8.
4. Douglas KC, Fujimoto D. Asian Pacific elders: implications for health care providers. Clin Geriatr Med. 1995;11:69–82.
5. Kuo J, Porter K. Health status of Asian Americans: United States, 1992–94. Adv Data. 1998;298:1–16.
6. U.S. Census Bureau. We the people: Asians in the United States, Census 2000 special reports. Available at http://www.census.gov/prod/2004pubs/censr-17.pdf. Updated 2004. Accessed 20 Oct 2010.
7. Mui AC, Shibusawa T. Asian American elders in the twenty-first century: key indicators of well-being. 2008. p. 208.
8. Javier J, Huffman L, Mendoza F. Filipino child health in the United States: do health and health care disparities exist? Prev Chronic Dis. 2007;4:A36.
9. DeLaCruz F, McBride M, Compas L, Calixto PR, Van Derveer C. White paper on the health status of Filipino Americans and recommendations for research. Nurs Outlook. 2002;50:7–15.
10. Halfon N, Hochstein M. Life course health development: an integrated framework for developing health, policy, and research. Milbank Q. 2002; 80:433–79, iii.
11. Gomez S, Kelsey J, Glaser S, Lee M, Sidney S. Immigration and acculturation in relation to health and health-related risk factors among specific Asian subgroups in a health maintenance organization. Am J Public Health. 2004;94:1977–84.
12. Wise P. The transformation of child health in the United States. Health affairs (Project Hope). 2004;23:9–25.
13. Fuller-Thomson E, Rotermann M, Ray JG. Elevated risk factors for adverse pregnancy outcomes among Filipina-Canadian women. J Obstet Gynaecol Can. 2010;32:113–9.
14. Cuasay LC, Sue Lee E, Orlander PP, Steffen-Batey L, Hans CL. Prevalence and determinants of Type 2 Diabetes among Filipino-Americans in the Houston, Texas metropolitan statistics area. Diabetes Care. 2001;24:2054–8.
15. Chu KC, Chu KT. 1999–2001 cancer mortality rates for Asian and Pacific Islander ethnic groups with comparisons to their 1988–1992 rates. Cancer. 2005;104(12 Suppl):2989–98.

16. Cho Y, Hummer R. Disability status differentials across fifteen Asian and Pacific Islander groups and the effect of nativity and duration of residence in the U.S. Soc Biol. 2001;48:171–95.
17. Kim G, Chiriboga DA, Jang Y, Lee S, Huang C, Parmelee P. Heatlh status of older Asian Americans in California. J Am Geriatr Soc. 2010;58:2003–8.
18. Fuller-Thomson E, Brennenstuhl S, Hurd M. Comparison of disability rates among older adults in aggregated and separate Asian American or Pacific Islander subpopulations. Am J Public Health. 2010;101:94–100.
19. Helvik AS, Krokstad S, Tambs K. Socioeconomic inequalities in hearing loss in a healthy population sample: The HUNT Study. Am J Public Health. 2009;99(8):1376–8.
20. Rabinowitz PM, Kanta D, Sircar KD, Tarabar S, Galusha D, Slade MD. Hearing loss among migrant agricultural workers. J Agromedicine. 2005;10(4):9–17.
21. Roodhooft JM. Leading causes of blindness worldwide. Bull Soc Belge Ophtalmol. 2002;283:19–25.
22. Anton SD, Manini TM, Milsom VA, et al. Effects of a weight loss plus exercise program on physical function in overweight, older women: a randomized controlled trial. Clin Interv Aging. 2011;6:141–9.
23. Paterson K, Hill K, Lythgo N. Stride dynamics, gait variability and prospective falls risk in active community dwelling older women. Gait Posture. 2011;33(2):251–5.
24. Nuru-Jeter AM, Thorpe RJ Jr, Fuller-Thomson E. Black-white differences in self-reported disability outcomes in the U.S.: early childhood to older adulthood. Public Health Rep. 2011;126(6): 834–43.
25. Gorman BK, Read JG. Gender disparities in adult health: an examination of three measures of morbidity. J Health Social Behav. 2006;47(2):95–110.
26. Macintyre S, Hunt K, Sweeting H. Gender differences in health: are things really as simple as they seem? Soc Sci Med. 1996;42(4):617–24.
27. Murray JLC, Lopez AD. Alternative projections of mortality and disability by cause 1990–2020: global burden of disease study. Lancet. 1997;349(9064):1498–504.
28. Singh G, Miller B. Health, life expectancy, and mortality patterns among immigrant populations in the United States. Can Journal Public Health. 2004;95:I14–21.
29. Minkler M, Fuller-Thomson E, Guralnik J. Gradient of disability across the socioeconomic spectrum in the United States. N Engl J Med. 2006;355:695–703.
30. Mutchler JE, Pracash A, Burr JA. The demography of disability and the effects of immigrant history: older Asians in the United States. Demography. 2007;44:251–63.
31. Fuller-Thomson E, Yu B, Nuru-Jeter A, Guralnik J, Minkler M. Basic ADL disability and functional limitation rates among older Americans from 2000–2005: the end of the decline? J Gerontol Ser A Biol Sci Medical Sci. 2009;64:1333–6.
32. Mui A, Kang SY. Acculturation stress and depression among Asian immigrant elders. Soc Work. 2006;51:243–55.
33. Jane Field M, Jette MA, & of Medicine (U.S.). Committee on disability in America: a new look, I. The future of disability in America. 2007. p. 592.
34. U.S. Census Bureau. American Community Survey (ACS). Available at: http://www.census.gov/acs/www/acs-php/quality_measures_response_ 2006.php. Updated 2007. Accessed Jan 2011.
35. Use A—US Bureau of the Census. Design and methodology, American Community Survey. Washington, US Government Printing Office, 2009.
36. McBride M. Health and health care of Filipino American elders [online]. Available at http:ororwww.standford.eduorgrouporethnogerorfilipino.html. Accessed Jan 2011.
37. Dey A, Lucas J. Physical and mental health characteristics of U.S.- and foreign-born adults: United States, 1998–2003. Advance data. 2006;369:1–19.
38. Frisbie W, Cho Y, Hummer R. Immigration and the health of Asian and Pacific Islander adults in the United States. Am J Epidemiol. 2001;153:372–80.
39. Merrill SS, Seeman TE, Kasl SV, Berkman LF. Gender differences in the comparison of self-reported disability and performance measures. J Gerontol A Biol Sci Med Sci. 1997;52(1): M19–26.
40. Rodrigues MA, Facchini LA, Thumé E, Maia F. Gender and incidence of functional disability in the elderly: a systematic review. Cad Saúde Pública Rio de Janeiro. 2009;25(Sup 3):S464–76.
41. Braveman PA, Cubbin C, Egerter S, Chideya S, Marchi KS, Metzler M, et al. Socioeconomic status in health research: one size does not fit all. J Am Med Assoc. 2005;294:2879–88.
42. Schoeni RF, Martin LG, Andreski PM, Freedman VA. Persistent and growing socioeconomic disparities in disability among the elderly: 1982–2002. Am J Public Health. 2005;95:2065–70.
43. American Coalition for Filipino Veterans Inc. History. Available at: http://usfilvets.tripod.com/id10.html. Accessed May 2012.
44. Williams DR. Socioeconomic differences in health: A review and redirection. Soc Phsychol Q. 53: 81–99. 1990. In Williams DR, Lavizzo-Mourey R, Warren RC. The concept of race and health status in America. Public Health Rep 1994: 26–41.
45. Marmot MG, Adelstein AM, Bulusu L. Lessons from the study of immigrant mortality. Lancet. 1984;112:1455–7.
46. Landale NS, Oropesa RS, Lanes DL, Gorman BK. Does Americanization have adverse effects on health?: stress, health habits, and infant health outcomes among Puerto Ricans. Soc Forces. 1999;78:613–42.
47. Lee RD, Enmsminger ME, LaVeist TA. The responsibility continuum: never primary, coresident and caregiver heterogeneity in the African American grandmother experience. Int J Aging Human Dev. 2005;60:295–304.
48. Kington RS, Smith JP. Socioeconomic status and racial and ethnic differences in functional status associated with chronic diseases. Am J Public Health. 1997;87:805–10.
49. Ofstedal MB, Zimmer Z, Hermalin AI, Chan A, Chuang Y, Natividad J, Tang Z. Short-term trends in functional limitation and disability among older Asians: a comparison of five Asian settings. J Cross Cult Gerontol. 2007;22:243–61.
50. Oza-Frank R, Stephenson R, Venkat Narayan KM. Diabetes prevalence by length of residence among US immigrants. J Immigrant Minority Health. 2011;13:1–8.