

*Research article*

## The Prevalence of Perceived Stress among U.S. Chinese Older Adults

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**Abstract: Background:** Perceived stress is an important indicator of well-being. However, we have limited understanding of the experience of stress in minority aging populations. **Methods:** This study aims to identify the stress level among U.S. Chinese older adults. **Results:** Our findings indicated that 74% of PINE participants have experienced some level of daily stress. Of the 10-items in the stress scale, the prevalence of individual items ranged from 11.4% to 31.8%. Higher levels of perceived stress were more likely to present among older adults with an older age, female gender, lower education and income level, and poorer health status and quality of life. Participants with zero years of education showed the highest level of perceived stress, with a mean score of 12.2. **Conclusions:** This study indicates that Chinese older adults in the U.S are experiencing stress in their daily lives. Future longitudinal studies are needed to improve the understanding of risk factors and outcomes associated with perceived stress in Chinese older adults.

**Keywords:** population studies; older adults; perceived stress; Chinese aging population

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### 1. Introduction

Perceived stress is an important indicator of mental and physical health. Stress occurs when individuals encounter situations they perceive as threatening, demanding, or that tax or exceed their capacity to address [1]. Perceived stress is associated with not only exposure to stressors, but also personal coping skills and resources to deal with stressful situations [2]. Unmanaged stress can result in a series of negative changes on physiological processes and behavioral patterns, including depression [3], physical inactivity [4], sleep disorders [5], obesity [6], immune dysfunction [7], cardiovascular disease [8], and mortality [9].

In particular, compared with other age groups, stress indicates more severe and intense health effects for older adults [10]. With increasing age, older adults are naturally exposed to new and unfamiliar stressors, but are challenged with obtaining adequate coping resources and skills. Older

adults are vulnerable to stress in their lives due to their increased risk of multiple losses, health-related problems in aging, dependence on caregivers, emotional loneliness, limited income and social support, and diminished resilience to transitions in later life [11–13]. However, despite the rapid growth of minority populations in the U.S., our understanding of perceived stress in Chinese older adults is limited.

An estimated 15.4% of the 4 million Chinese immigrants in the U.S. are age 65 or older [14]. Importantly, more than 80% of U.S. Chinese older adults were not born in the U.S., and approximately 30% of them immigrated to the U.S. after the age of 60 [14]. Immigrating to another country brought about tremendous lifetime changes—socially, economically, and environmentally [15]. Through immigration course, Chinese older adults are burdened from adjusting to their new lives in the U.S. [16], interrupted social relationships and social networks [19], and limited access to community resources due to language and cultural barriers [18].

Despite the emerging stressors that accompany aging, cultural factors contribute to the stress experience of ethnic minority aging populations. Chinese traditional cultural beliefs have special implications to how Chinese older adults perceive stress in their lives. For instance, an individual's duty and obligation to family and community are more strongly imposed in Chinese culture than in western cultures [19]. Failing to fulfill one's socially-desired role leads to moral questioning and stressed feelings of guilt and shame [17]. Research in Taiwan found that older grandparents are distressed from their socially accepted role as caregivers to their grandchildren [20]. Moreover, saving face—an important traditional Confucian concept to avoid embarrassment and negative interaction with others—limits coping resources for Chinese older adults since they would prefer to cope with stressful situations on their own rather than seek help from “outsiders” [21].

The rapid growth of U.S. Chinese aging population calls for a better understanding of perceived stress among this population. However, while there is a growing body of literature addressing perceived stress in other Chinese age groups [22–26], little effort has been devoted to providing a comprehensive interpretation of perceived stress among the Chinese aging population. Two recent studies targeting older Chinese assessed perceived stress with a dichotomous variable, which does not convey the cumulative effects of perceived stress [27,28]. Therefore, this study aims to: 1) describe the prevalence of perceived stress in a community-dwelling population of U.S. Chinese older adults; 2) examine the reliability of the Chinese Perceived Stress Scale; and 3) quantify the levels of perceived stress by socio-demographic factors in a population of community dwelling U.S. Chinese older adults.

## **2. Methods**

### *2.1. Population and settings*

The Population Study of Chinese Elderly in Chicago (PINE) is a community-engaged, population-based epidemiological study of U.S. Chinese older adults aged 60 and over conducted in the greater Chicago area. Briefly, the purpose of the PINE study is to collect community-level data of U.S. Chinese older adults to examine the key cultural determinants of health and well-being. The project was initiated by a synergistic community-academic collaboration among the Rush Institute for Healthy Aging, Northwestern University, and many community-based social services agencies and organizations throughout the greater Chicago area [29].

The PINE study invited older adults aged 60 and older who self-identified as Chinese and resided in the greater Chicago area to participate in the project. In order to ensure study relevance

and increase community participation, the PINE study implemented culturally and linguistically appropriate community recruitment strategies guided by a community-based participatory research (CBPR) approach [30]. With over twenty social services agencies, community centers, health advocacy agencies, faith-based organizations, senior apartments and social clubs serving as study recruitment sites, eligible participants were approached through routine social service and outreach efforts serving Chinese Americans families in the Chicago city and suburban areas [31]. In addition, other outreach channels were also utilized, such as local newspapers advertisements, flyers and posters, community-health educational workshops, word of mouth, and participants' referral etc. Due to the closely-knitted ethnic social network connecting the families of Chinese immigrants, over a third of our study participants learned about the project through family members, neighbors, acquaintance, or friends.

Out of 3,542 eligible participants who were approached, 3,159 agreed to participate in the study, yielding a response rate of 91.9%. All participants were consented and interviewed by trained bicultural research assistants in English or in a Chinese dialect, including Mandarin, Cantonese, Toishanese, and Teochow, according to participants' preference. Before conducting the interviews, interviewers were trained to have a sound understanding of the scale so that they could well administrate the scale and score the scale accurately and consistently. Based on the available census data drawn from U.S. Census 2010 and a random block census project conducted in Chicago's Chinese community, the PINE study is representative of the Chinese aging population in the greater Chicago area with respect to key demographic attributes, including age, sex, income, education, number of children, and country of origin [32]. The study was approved by the Institutional Review Board of the Rush University Medical Center.

## 2.2. Measurements

### 2.2.1. Socio-demographics

We collected demographic information including age (in years), sex, education (years completed), income (in USD), marital status, number of children, current living arrangement, and country of origin. Immigration data relating to participants' number of years in the U.S. and years residing in the current community were collected. Education was assessed by asking participants the years of education completed, ranging from 0 to 17 years. Living arrangement was assessed by asking participants how many people live in their household besides themselves. Self-reported annual income was divided into four groups: 1) \$0–\$4,999 per year; 2) \$5,000–\$9,000 per year; 3) \$10,000–14,999 per year; and 4) more than \$15,000 per year. Country of original was assessed by asking participants where they are from, which was then categorized into two groups: 1) Mainland China; 2) Hong Kong, Macau, Taiwan, and other areas.

### 2.2.2. Overall health status, quality of life and health changes over the last year

Overall health status was measured by “In general, how would you rate your health?” on a four point scale (1 = poor, 2 = fair, 3 = good, 4 = very good). Quality of life was assessed by asking “In general, how would you rate your quality of life?” on a four point scale ranging from (1 = poor, 2 = fair, 3 = good, 4 = very good). Health change in the last year was measured with the question: “Compared to one year ago, how would you rate your health now?” on a five point scale (1 = much worse; 2 = somewhat worse; 3 = about the same; 4 = somewhat better; and 5 = much better than one

year ago). Health changes were then categorized into three groups: 1) improved health; 2) same health; and 3) worsened health.

### 2.2.3. Perceived stress scale.

We used the Chinese Perceived Stress Scale (PSS-10) to assess the degree to which life situations are perceived as stressful among Chinese older adults [33,34]. The Chinese PSS-10 consists of ten items, each of them assessing how unpredictable, uncontrollable, and overloaded respondents felt in their lives. Participants were asked how often in the last month have they felt: 1) upset because of something that happened unexpectedly; 2) unable to control important things in life; 3) nervous and stressed; 4) confident about the ability to handle personal problems; 5) that things were going your way; 6) unable to cope with all the things had to do; 7) able to control irritations in life; 8) on top of things; 9) angered because of things that happened out of control; and 10) unable to overcome piled up difficulties. Respondents indicated answers to each question on a 5-point scale ranging from 0 = never to 4 = very often. Of the 10 items, four items (items 4,5,7,8) were worded in a positive direction, so they were reversely scored as 0 = very often to 4 = never.

The scores of all items were then summed. Total scores ranged from 0 to 40, with higher scores indicating greater psychological stress. Content validity was assessed by a group of bilingual and bicultural study researchers with expertise in Chinese cultural issues, health, and aging. Prior studies of the internal reliabilities (Cronbach's alpha) for the PSS-10 were 0.84 to 0.86 [34]. Studies in Hong Kong [35,36] found internal reliability scores of the PSS-10 between 0.70 to 0.76 among Chinese subgroups. However, to our best knowledge, we are not aware of any population-based study examining the internal reliability of the PSS-10 among Chinese older adults in the U.S.

### 2.3. Data analysis

Descriptive analyses were used to describe the general socio-demographic characteristics of sample population. Psychometric properties of aforementioned measures were examined to test their adequacy and expanded use to U.S. Chinese older adults. Internal consistency reliability was assessed by determining the coefficient alpha and inter-item correlation coefficients. Means and standard deviations were used to describe levels of perceived stress. *Chi*-squared tests were used to evaluate socio-demographic differences between participants. ANOVA *F*-test was used to examine whether perceived stress levels differed significantly by age, gender, income, and education. Multivariate regression was conducted to identify the high risk subgroups with a higher level of perceived stress. Statistical analyses were conducted using SAS, V9.2 (SAS Institute Inc., Cary, NC).

## 3. Results

### 3.1. Characteristics of the study sample

This study of the 3,159 participants who were enrolled in study, 58.9% were female and 71.3% were married. The majority of participants had less than a high school education (78.9%) and an annual income of less than \$10,000 (85.1%). Overall, 41.9% of participants were between 60 to 69 years of age, 36.8% of participants were 70 to 79, and 21.3% of participants were 80 years of age or older. Over 90% of participants come from mainland China. Characteristics of the study participants by age are reported in Table 1.

Compared to other groups, older adults aged 80 and over had the largest proportion of participants who had an education level of less than 6 years (59.8%), an annual income between \$5,000 to \$9,999 (72.5%), were widowed (49.3%), lived alone (38.3%), lived in the U.S. for more than 20 years (68.5%), and lived in the community for more than 20 years (34%). Participants were more likely to report poor overall health and worsened health status over the last year with increasing age. Poor health status was reported by 17.1% of participants aged 60 to 69 compared with 24.8% of participants aged 80 and over. As high as 49.7% of participants aged 80 and over reported worsened health over the last year compared with 37.8% of participants aged 60 to 69 and 44% of participants aged 70 to 79. Almost half of the participants reported a good or very good quality of life.

**Table 1. Demographic characteristics of study participants by age groups.**

	60–69	70–79	80 and over	$\chi^2$	d.f.	P value
Sex, No. (%)						
Male	547 (41.3)	479 (41.2)	270 (40.1)	0.5	2	0.86
Female	777 (58.7)	683 (58.8)	403 (59.9)			
Education level, No. (%)						
0 year	35 (2.7)	70 (6.1)	90 (13.6)	232.6	8	< 0.001
1–6 years	500 (37.9)	372 (32.2)	307 (46.2)			
7–12 years	579 (43.9)	378 (32.7)	146 (22.0)			
13–16 years	173 (13.1)	290 (25.1)	113 (17.0)			
17 and over	32 (2.4)	47 (4.1)	8 (1.2)			
Income in USD, No. (%)						
\$0–\$4,999	549 (41.8)	371 (32.3)	121 (18.4)	286.7	8	< 0.001
\$5,000–\$9,999	476 (36.2)	664 (57.7)	477 (72.5)			
\$10,000–\$14,999	180 (13.7)	85 (7.4)	45 (6.8)			
\$15,000–\$19,999	51 (3.9)	7 (0.6)	110 (1.5)			
Over \$20,000	59 (4.5)	23 (2.0)	5 (0.8)			
Marital status, No. (%)						
Married	1,107 (84.5)	810 (70.0)	320 (47.8)			

Divorced	46 (3.5)	19 (1.6)	9 (1.4)			
Separated	25 (1.9)	22 (1.9)	10 (1.5)			
Widowed	132 (10.1)	307 (26.5)	330 (49.3)	378.6	6	< 0.001
Number of children, No. (%)						
0	64 (4.8)	42 (3.6)	22 (3.3)			
1	191 (14.5)	103 (8.9)	47 (7.0)			
2–3	855 (64.7)	645 (55.6)	247 (36.9)			
More than 4	211 (16.0)	371 (32.0)	353 (52.8)	300.4	6	< 0.001
Living arrangement, No. (%) (%)						
Alone	126 (9.5)	295 (25.4)	258 (38.3)			
With 1 person	506 (38.3)	532 (45.8)	280 (41.6)			
With 2–3 persons	290 (21.9)	122 (10.5)	68 (10.1)			
With 4 or more persons	401 (30.3)	213 (18.3)	67 (10.0)	355.9	6	< 0.001
Country of origin, No. (%)						
China	1,208 (91.2)	1,091 (93.9)	633 (94.1)			
Others	116 (8.8)	71 (6.1)	40 (5.9)	8.5	2	0.01
Years in the U.S., No. (%)						
0–10	506 (38.3)	289 (24.9)	45 (6.8)			
11–20	403 (30.5)	402 (34.7)	164 (24.7)			
21–30	255 (19.3)	275 (23.7)	237 (35.8)			
31 and more	157 (11.9)	194 (16.7)	217 (32.7)	337.2	6	< 0.001
Years in the community, No. (%)						
0–10	853 (64.6)	711 (61.2)	247 (37.0)			
11–20	288 (21.8)	259 (22.3)	193 (28.9)			
21–30	130 (9.8)	124 (10.7)	134 (20.1)			
31 and more	50 (3.8)	67 (5.8)	93 (13.9)	186.2	6	< 0.001

Overall health status, No. (%)						
Very good	71 (5.4)	49 (4.2)	20 (3.0)			
Good	488 (36.9)	391 (33.7)	218 (32.4)			
Fair	539 (40.7)	513 (44.2)	268 (39.8)			
Poor	226 (17.1)	209 (18.0)	167 (24.8)	26.8	6	< 0.001
Quality of life, No. (%)						
Very good	77 (5.8)	102 (8.8)	37 (5.5)			
Good	526 (39.7)	553 (47.6)	304 (45.3)			
Fair	666 (50.3)	476 (41.0)	315 (46.9)			
Poor	55 (4.2)	31 (2.7)	15 (2.2)	37.9	6	< 0.001
Health changes over last year, No. (%)						
Improved	122 (9.2)	123 (10.6)	32 (4.8)			
No change	701 (53.0)	528 (45.4)	306 (45.5)			
Worse	500 (37.8)	511 (44.0)	334 (49.7)	41.5	4	< 0.001

### 3.2. Scale reliability

In our cohort, the alpha coefficient of reliability for the Perceived Stress Scale (PSS-10) was 0.86. Item 7 (being able to control irritations in life) had a weaker correlation with the other items, although the alpha remained at 0.86 if this item was removed. All correlations were significant at the 0.001 level (Table 2). Four items, including upset because something happened unexpectedly, unable to control important things in life, nervous and stressed, and could not overcome piled up difficulties, showed some of the highest inter-item correlation coefficients, ranging from 0.49 to 0.61.

**Table 2. Perceived stress scale item-total correlations and correlation coefficients.**

Perceived Stress Scale items	Alpha if item deleted	1	2	3	4	5	6	7	8	9	10
1.Upset because something happened unexpectedly	0.84	1.0									

2.Felt unable to control important things	0.84	0.61***	1.0								
3.Felt nervous and stressed	0.84	0.61***	0.60***	1.0							
4.Confident about the ability to handle personal problems	0.84	0.29***	0.37***	0.35***	1.0						
5.Felt things were going your way	0.85	0.28***	0.33***	0.34***	0.55***	1.0					
6.Could not cope with all the things had to	0.84	0.43***	0.51***	0.45***	0.34***	0.30***	1.0				
7.Been able to control irritations in life	0.86	0.20***	0.18***	0.20***	0.29***	0.28***	0.16***	1.0			
8.Felt you were on top of things	0.85	0.28***	0.36***	0.32***	0.49***	0.47***	0.37***	0.34***	1.0		
9.Angered because things happened out of control	0.85	0.43***	0.40***	0.43***	0.27***	0.26***	0.38***	0.29***	0.28***	1.0	
10. Felt could not overcome piled up difficulties	0.83	0.49***	0.53***	0.55***	0.36***	0.34***	0.38***	0.22***	0.36***	0.50***	1.0

*P* < 0.05, \*\**P* < 0.01, \*\*\**P* < 0.001.

3.3. Prevalence of perceived stress symptoms

We examined the prevalence of perceived stress by presenting how frequently respondents perceived specific types of stress in their lives (Table 3). Overall, 74% of PINE participants have felt some level of stress in their daily lives. Feeling that they could not cope with things they had to do was the most commonly appraised stressful situation. A total of 31.8% of older adults in our survey reported that they sometimes, fairly often, or often felt they could not cope with things they had to do in their lives. With respect to other stressful situations participants felt sometimes, fairly often, or often—14.8% felt they could not overcome piled up difficulties, 19.4% felt angered because of things that happened out of their control, 20.5% felt nervous or stressed, 23.3% felt upset because of unexpected things, and 23.5% felt unable to control important things in life. Of the four items worded in a positive direction, never or almost never able to control irritations in life was reported by 11.4% of participants. We found that 12.3% of participants never or almost never felt they were on top of things; 12.8% never or almost never felt confident about the ability to handle personal problems; and 12.9% never or almost never felt things were going their way.

**Table 3. Presence of perceived stress.**

Perceived Stress Scale Items	Never (%)	Almost never (%)	Sometimes (%)	Fairly often (%)	Very often
Felt upset because of something happened unexpectedly	1,760 (56.2)	643 (20.5)	517 (16.5)	154 (4.9)	56 (1.8)
Felt unable to control important things in life	1,616 (51.8)	774 (24.8)	461 (14.8)	205 (6.6)	66 (2.1)



Felt nervous and stressed	1,713 (54.8)	773 (24.7)	434 (13.9)	151 (4.8)	56 (1.8)
Felt confident about the ability to handle personal problems	106 (3.4)	291 (9.4)	657 (21.1)	1290 (47.5)	767 (24.7)
Felt things were going your way	95 (3.1)	304 (9.8)	868 (28.1)	1,313 (42.5)	509 (16.5)
Could not cope with all the things had to do	1,085 (34.9)	1,034 (33.3)	641 (20.6)	266 (8.6)	81 (2.6)
Been able to control irritations in life	144 (4.6)	211 (6.8)	551 (17.7)	1,328 (42.7)	879 (28.2)
Felt you were on top of things	103 (3.3)	278 (9.0)	841 (27.1)	1,404 (45.2)	478 (15.4)
Angered because of things happened out of control	1,459 (46.8)	1,056 (33.9)	469 (15.0)	105 (3.4)	31 (1.0)
Felt could not overcome piled up difficulties	1,634 (52.4)	1,026 (32.9)	298 (9.6)	117 (3.8)	45 (1.4)

### 3.4. Perceived stress level

Perceived stress levels differed significantly across the three age groups,  $F(2,3,117) = 10.9$ ,  $P < 0.001$  (Table 4). On a scale of 0 to 40, the mean aggregate score of the Perceived Stress Scale (PSS-10) was 9.7 (SD = 6.5) among participants aged 60–69, 10.0 (SD = 6.4) among participants aged 70–79, and 11.2 (SD = 6.8) among participants aged 80 and over. Participants who were older were more likely to perceive higher levels of stress. With regards to gender, perceived stress levels differed significantly between men and women,  $F(1,3,118) = 24.8$ ,  $P < 0.001$  (Table 4). The mean aggregate PSS-10 score was 9.4 (SD = 6.4) among men compared to 10.6 (SD = 6.6) among women. Overall, women had a higher level of perceived stress than men.

**Table 4. Perceived stress by age and sex.**

Age	60–69 ( $N = 1,319$ )		70–79 ( $N = 1,155$ )		80+ ( $N = 646$ )		<i>F</i> -value	<i>P</i> -value
	Mean	SD	Mean	SD	Mean	SD		
	9.7	6.5	10.0	6.4	11.2	6.8	10.9	< 0.001
Sex	Men ( $N = 1,283$ )			Women ( $N = 1,837$ )			<i>F</i> -value	<i>P</i> -value
	Mean	SD	Mean	SD	Mean	SD		
	9.4	6.4	10.6	6.6			24.8	< 0.001

Perceived stress levels differed significantly across education levels,  $F(4,3,109) = 6.0$ ,  $P < 0.001$  (Table 5). Participants with a higher educational level tended to perceive lower levels of stress. The mean aggregate PSS-10 score was 12.2 (SD = 7.0) among participants with no

education, 10.2 (SD = 6.5) among participants with 1-6 years of education, 9.9 (SD = 6.5) among participants with 7–12 years of education, 9.8 (SD = 6.4) among participants with 13-16 years of education and 8.9 (SD = 6.7) among participants with 17 or more years of education.

**Table 5. Perceived stress by education and income.**

Education	0 year (N = 182)		1–6 years (N = 1,169)		7–12 years (N = 1,103)		13–16 years (N = 573)		17 and more (N = 87)		F-value	P-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
	12.2	7.0	10.2	6.5	9.9	6.5	9.8	6.4	8.9	6.7		
Income	\$0–\$4,999 (N = 1,032)		\$5,000–\$9,999 (N = 1,603)		\$10,000–\$14,999 (N = 308)		\$15,000–\$19,999 (N = 68)		\$20,000 and over (N = 97)		F-value	P-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
	10.2	6.7	10.4	6.5	8.8	6.3	9.8	6.1	8.4	5.3		

Perceived stress levels differed significantly across the five income groups,  $F(4,3,103) = 5.3$ ,  $P < 0.001$  (Table 5). Higher levels of perceived stress were presented among lower income groups. The mean PSS-10 score was 10.2 (SD = 6.7) among the participants with an annual income lower than \$4,999 and 8.4 (SD = 5.3) among the participants with an annual income higher than \$20,000. The group with an annual income of \$15,000 to \$19,000 fell out of the trend, with a relatively high PSS-10 score of 9.8 (SD = 6.1).

### 3.5. Regression model

In the regression model (Table 6), perceived stress was the independent variable and dependent variables include age, education, income, marital status, number of children, years in the community, general health, quality of life, and health changes, all of which are significant in the univariate ANOVA analyses. Statistic differences were found on participants with 0 years of education (PE = 1.44,  $P < 0.01$ ), female (PE = 0.86,  $P < 0.001$ ), participants have 0 children (PE = 1.61,  $P < 0.05$ ), participants with 21-30 years in community (PE = -1.15,  $P < 0.001$ ), general health status as fair (PE = 1.21,  $P < 0.001$ ) and poor (PE = 5.07,  $P < 0.001$ ), quality of life as very good (PE = -1.52,  $P < 0.001$ ), fair (PE = 1.52,  $P < 0.001$ ) or poor (PE = 3.47,  $P < 0.001$ ), and both improved (PE = 1.61,  $P < 0.001$ ) and worsened health change (PE = 1.94,  $P < 0.001$ ) over the last year. Among those variables, general health and quality of life were stronger predictors. Participants reported fair and poor health status were 1.21 and 5.07 points higher, respectively, in perceived stress compared to participants in good health. Similarly, participants with fair and poor quality of life were 1.52 and 3.47 points higher in perceived stress level compared with participants with good quality of life.

**Table 6. Perceived stress regression model estimated parameter (SE)**

Intercept	6.67***				
Age	60–64	65–69	70–74	75–79	80+
	reference	-0.04 (0.33)	0.13 (0.35)	0.21 (0.37)	0.72 (0.38)
Genders	Female			Male	
	0.86 (0.23)***			reference	
Education	0	1–6	7–12	13–16	17+
	1.44 (0.50)**	0.12 (0.26)	reference	-0.04 (0.32)	-0.70 (0.70)
Income	\$0-\$4,999	\$5,000-\$9,999	\$10,000-\$14,999	\$15,000-\$19,999	\$20,000+
	-0.27 (0.70)	-0.13 (0.69)	-0.91 (0.74)	0.18 (0.96)	Reference
Marital status	Married			Widowed, divorced, or separated	
	-0.22 (0.27)			reference	
Number of children	0	1	2–3	4+	
	1.61* (0.55)	0.16 (0.36)	reference	0.24 (0.26)	
Years in the community	0–10	11–20	21–30	31+	
	reference	-0.45 (0.27)	-1.15 (0.34)***	0.34 (0.45)	
General health	Very good	Good	Fair	Poor	
	-0.60 (0.56)	reference	1.21 (0.26)***	5.07 (0.34)***	
Quality of life	Very good	Good	Fair	Poor	
	-1.52 (0.45)***	Reference	1.52 (0.23)***	3.47 (0.65)***	
Health changes	Improved	No change		Worse	
	1.61 (0.39)***	reference		1.94 (0.24)***	

We also examined the correlates of any depressive symptom in older men. Older age ( $r = 0.08$ ,  $P < 0.001$ ), being unmarried ( $r = 0.06$ ,  $P < 0.05$ ), lower income ( $r = 0.11$ ,  $P < 0.01$ ), fewer years in the community ( $r = 0.06$ ,  $P < 0.05$ ), poorer health status ( $r = 0.28$ ,  $P < 0.001$ ), inferior quality of life ( $r = 0.12$ ,  $P < 0.001$ ) and worsening health changes over the past year ( $r = 0.25$ ,  $P < 0.001$ ) were positively correlated with any depressive symptom in older men.

#### 4. Discussion

This is the first population-based study reporting the experiences of perceived stress among U.S. Chinese older adults. We found that 74% of the study participants have experienced some form of stress in their daily lives; of the 10-items in the stress scale, the prevalence of individual items ranged from 11.4% to 31.8%. Approximately one third of Chinese older adults in the U.S. experienced stress from not being able to cope with things they had to do in their lives. Higher levels of perceived stress was more likely to present among older adults with an older age, female gender, and lower education and income level. Participants with zero year of education had the highest level of perceived stress.

In contrast with previous research indicating that U.S. older adults experienced reduced levels of daily life stress [37], our research suggests that a considerable proportion of Chinese older adults experience a significant amount of stress in their daily lives. In previous research, less than 22% of U.S. older adults reported stressful situations happening in their lives [37]. Among our participants, nearly one third (31.8%) felt that they could not cope with the things they had to do in their lives, and nearly one in four (23.5%) felt unable to control important things in life. The inconsistency with previous research suggests that immigration experiences might result in Chinese older adults having to face additional challenges in coping with their daily lives in the U.S. Our conjecture is supported by evidence showing that life stress and acculturation stress are still prevalent among Asian immigrants [11].

The perceived stress level based on the PSS-10 among Chinese older adults in our study was 10.1. Participants with income higher than \$20,000 had the lowest stress level (8.4). Older adults with zero years of education (12.2) and older adults aged 80 and over (11.2) perceived higher levels of stress. Up to now, comparing stress levels across studies was impeded by the lack of consistent measurements [38]. Utilizing the same scale, a recent study based on three national surveys in the U.S. reported perceived stress level scores of 11.98 in 1983, 10.80 in 2006, and 11.09 in 2009 among U.S. older adults aged 65 and over [39]. However, Caucasians accounted for more than 85% of their sample. Moreover, our study collected data through inter-personal interviewing with community-dwelling participants while the U.S. national surveys collected data through phone and emails with randomly selected regions. In consideration of the differences in methodologies and populations sampled, future in-depth analyses are needed to make better comparisons of the perceived stress level between U.S. older adults and Chinese older adults in the U.S.

In addition, consistent with prior findings, our study indicates that stress levels were higher among participants with an older age. Older age is associated with increased risk of losing significant others, life partners, close friends, as well as intensified feelings of loneliness, abandonment, and insecurity. Specifically among older immigrants in the U.S, the psychological burden of exposure to same stressors might be heavier [18]. For instance, it might be more stressful for Asian older adults to deal with multiple losses due to their family-oriented social support system and limited coping resources in U.S. society caused by linguistic and cultural barriers [40,41]. With respect to gender, women in our study had higher stress levels than men. A study on gender differences among Chinese older adults in Beijing suggests that women are more likely to survive and be functionally dependent compared to men [42]. Women tend to have longer life expectancies and therefore more likely to be widowed, live alone, and experience feelings of loss.

Consistent with previous research among Chinese older adults in China, our research suggests better-educated older Chinese in the U.S. have lower levels of stress [43]. Some possible contributing factors include better-educated older adults being more likely to engage in cognitively stimulating

activities, having better economic circumstances, eating healthier, and spending more time participating in physical activities [43,44]. In contrast, there is evidence showing that better-educated Chinese older adults in the U.S. are more likely to live alone and thus less likely to receive help from family member to deal with stressful situations in their lives [45]. Our finding of higher educated adults perceiving lower levels of stress highlights the importance of having the necessary coping skills when there is a lack of coping resources.

Our study suggests that higher income older adults perceived lower levels of stress, which is consistent with previous research on older adults living in China [46]. Higher income may affect levels of perceived stress in two aspects, by lowering risks of exposure to stressors and enriching coping resources. Financial strain among Chinese older adults might indicate negative interaction with close social network members and thus result in less emotional support and diminished social networks [47]. However, the impact of income should be interpreted with consideration of interactions with factors such as age, gender, education, health status, etc. For example, the oldest-old are of higher risk for experiencing economic stress in China [46]. Evidence also support that financial strain contributes to greater distress among older women than older men [48]. We found that the perceived stress level for the \$15,000 to \$19,000 income group fell outside the trend, suggesting an interaction among exposure to stressors, coping skills, and coping resources.

Our multivariate analysis furthermore identified that self reported over health status and quality of life were stronger predictors for perceived stress. It is notable that age was no longer significant while health variables, including general health, quality of life and health changes were added into the model. Our finding highlights that aging accompanied deterioration in health might explain a greater proportion of the “age effect”—the presentation of higher perceived stress among older age groups. Moreover, both participants with positive and negative health change over the last year presented higher perceived stress than participants reported no health change. We surmised that the process of health change may bring about additional stress for older adults. For participants with positive health change, even though they were moving towards a better health status, they were experiencing a less pleasant health status some point in last year.

We identified social-demographic factors associated with higher levels of perceived stress, and found that women, the oldest old, low income, less-educated, and poorer health status and quality of life had higher risk of living with stressful situations and encountering difficulties managing the stress in their lives. Stress left unmanaged may be associated with increased risk of developing depression [3]. Given the high prevalence of depressive symptoms among the Chinese older adults in the U.S. [49–52], this study points to the need of additional research to better understand the developmental process of stress and its relevance to depression among the Chinese older community in the U.S.

The findings of this study should be interpreted with limitations in mind. First, this study was representative of Chinese older adults in the greater Chicago area. However, its findings may not be generalizable to other Chinese populations in the U.S. or in Asia. Second, due to the in-person interview design of the PINE study and the tabooed perception toward psychological distress in traditional Chinese culture, experiences of stress were likely underreported. Third, the quantitative data based on the PSS-10 is a global measurement of stress but limited in specifying the type of stress associated with immigration and acculturation among the immigrant elderly. Special efforts should be given into developing instruments to detect stressors related to cultural factors and immigration among Chinese older adults in the U.S. The estimations of health status, quality of life, and health change based on self-reported data are subjective and may be biased. Validated scales could be applied to improve our measure the actual health outcomes in future research. Lastly, the

cross-sectional design makes it difficult to separate age from cohort effects and examine the distress process. Future studies applying mixed research strategies and longitudinal designs are needed to better understand the experience of stress and its adverse health outcomes among Chinese older adults.

Nonetheless, this study has wide implications for researchers, health professionals, social workers, and policy makers. First, this study lays the groundwork for investigations on perceived stress among older Chinese immigrants in the U.S. that take into account immigration and acculturation experiences living in a foreign country. A community-based participatory research approach to overcome cultural barriers pertaining to psychological and social well-being research in older adults is a suitable model for further investigations of these important health indicators among the Chinese aging population.

Second, it is important to raise awareness that certain vulnerable Chinese aging subgroups perceive stress at higher levels, especially the less-educated and the oldest-old. Health professionals who work directly with patients could play important roles connecting their stressed patients with the necessary coping resources. Community and social services providers should design culturally and linguistically appropriate prevention interventions towards the needs of these vulnerable subgroups of older adults. For instance, physical activity has been found to be associated with reductions of perceived stress [53]. Tai Chi and Qigong (TCQG) programs have been shown to be effective in alleviating stress levels among U.S. Chinese older adults [54]. Third, it is equally important to draw attention to our finding that one-third of Chinese older adults somewhat felt that they could not deal with things they had to do in their lives. Policy makers should consider institutional support to alleviate linguistic and cultural barriers among Chinese older adults in the U.S.

## **5. Conclusion**

In summary, this study indicates that a significant amount of Chinese older adults in the U.S. experience some level of stress in their daily lives. Approximately one third of participants experienced stress from not being able to cope with things they had to do in their lives. The alpha coefficient of reliability for the Perceived Stress Scale (PSS-10) was 0.86. Higher levels of perceived stress was more likely to present among older adults with an older age, female gender, and lower education and income.

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### Conflict of Interest

All authors declare no conflicts of interest in this paper.

### References

1. Lazarus RS, Folkman S. (1984) *Stress, appraisal, coping*. New York: Springer Publishing Company.
2. Pearlin LI, Skaff MM. (1996) Stress and the life course: a paradigmatic alliance. *Gerontologist* 36: 239-247.
3. Hammen C. (2005) Stress and depression. *Annu Rev Clin Psychol* 1: 293-319.
4. Stults-Kolehmainen MA, Sinha R. (2013) The effects of stress on physical activity and exercise. *Sports Med* 44: 81-121.
5. Friedman L, Brooks JO, Bliwise DL, et al. (1995) Perceptions of life stress and chronic insomnia in older adults. *Psychol Aging* 10: 352-357.
6. Marcellini F, Giuli C, Papa R, et al. (2010) BMI, life-style and psychological conditions in a sample of elderly Italian men and women. *J Nutr Health Aging* 14: 515-522.
7. Stowell JR, Kiecolt-Glaser JK, Glase R. (2001) Perceived stress and cellular immunity: when coping counts. *J Behav Med* 24: 323-339.
8. Henderson KM, Clark CJ, Lewis TT, et al. (2013) Psychosocial distress and stroke risk in older adults. *Stroke* 44: 367-372.
9. Nielsen NR, Kristensen TS, Schnohr P, et al. (2008) Perceived stress and cause-specific mortality among men and women: results from a prospective cohort study. *Am J Epidemiol* 168: 481-491.
10. Hamarat E, Thompson D, Zabrocky KM, et al. (2001) Perceived stress and coping resource availability as predictors of life satisfaction in young, middle-aged, and older adults. *Exp Aging Res: Int J Devoted Sci Study Aging Proc* 27: 181-196.
11. Donaldson JM, Watson R. (1996) Loneliness in elderly people: an important area for nursing research. *J Adv Nurs* 24: 952-959.
12. Ryan MC, Patterson J. (1987) Loneliness in the elderly. *J Gerontol Nurs* 13(5): 6-12.
13. Chioi N, Jun J. (2009) Life regrets and pride among low-income older adults: Relationship with depressive symptoms, current life stressors and coping resources. *Aging Ment Health* 13: 213-225.
14. US Census Bureau. (2010) American Community Survey.
15. Wu B, Chi I, Plassman BL, et al. (2010) Depressive symptoms and health problems among Chinese immigrant elders in the US and Chinese elders in China. *Aging Ment Health* 14: 695-704.
16. Lau AS, Feng JJ, Yung V. (2010) Group parent training with immigrant Chinese families: Enhancing engagement and augmenting skills training. *J Clin Psychol* 66: 880-894.
17. Dong X, Chang ES, Wong E, et al. (2012) Perception and negative effect of loneliness in a Chicago Chinese population of older adults. *Arch Gerontol Geriat* 54: 151-159.
18. Mui AC, Kang SY. (2006) Acculturation stress and depression among Asian immigrant elders. *Soc Work* 51: 243-255.
19. Bedford O, Hwang K. (2003) Guilt and shame in Chinese culture: a cross-cultural framework from the perspective of morality and identity. *J Theory Soc Behav* 33: 127-144.

20. Lo M, Liu Y. (2009) Quality of life among older grandparent caregivers: a pilot study. *J Adv Nurs* 65: 1475-1484.
21. Kwong EW, Kwan AY. (2004) Stress-management methods of the community-dwelling elderly in Hong Kong: implications for tailoring a stress-reduction program. *Geriatr Nur* 25: 102-106.
22. Chen J, Wang Z, Guo B, et al. (2012) Negative affect mediates effects of psychological stress on disordered eating in young Chinese women. *PLoS One*: e46878.
23. Chen CM, Kuo SF, Chou YH, et al. (2007) Postpartum Taiwanese women: their postpartum depression, social support and health-promoting lifestyle profiles. *J Clin Nurs* 16: 1550-1560.
24. Zhang X, Wang H, Xia Y, et al. (2012) Stress, coping and suicide ideation in Chinese college students. *J Adol* 35: 683-690.
25. Chan I, Au A, Li P, et al. (2006) Illness-related factors, stress and coping strategies in relation to psychological distress in HIV-infected persons in Hong Kong. *AIDS Care* 18: 977-982.
26. Lou VWQ, Kwan CW, Leung AYM, et al. (2011) Psychological distress among Chinese adult-child caregivers: the effects of behavioral and cognitive components of care. *Home Health Care Serv Quart* 30: 133-146.
27. Tsai AC, Chi SH, Wang JY. (2013) The association of perceived stress with depressive symptoms in older Taiwanese-Result of a longitudinal national cohort study. *Prev Med* 57: 646-651.
28. Goldman N, Gleib DA, Seplaki C, et al. (2005) Perceived stress and physiological dysregulation in older adults. *Stress* 8(2): 95-105.
29. Dong X, Wong E, Simon MA. (2014) Study design and implementation of the PINE study. *J Aging Health* doi:10.1177/0898264314526620.
30. Dong X, Chang E, Wong W, et al. (2011) Sustaining community-university partnerships: Lessons learned from a participatory research project with elderly Chinese. *Gateways Int J Commun Res Engag* 4: 31-47.
31. Dong X, Chang ES, Wong E, et al. (2011) Working with culture: lessons learned from a community-engaged project in a Chinese aging population. *Aging Health* 7: 529-537.
32. Simon M, Chang E, Rajan K, et al. (2014) Demographic characteristics of U.S. Chinese older adults in the greater Chicago area: assessing the representativeness of the PINE study. *J Aging Health*. In Press.
33. Cohen S, Wills TA. (1985) Stress, social support, and the buffering hypothesis. *Psychol Bull* 98(2): 310.
34. Cohen S, Kamarck T, Mermelstein R. (1983) A global measure of perceived stress. *J Health Soc Behav* 24: 385-396.
35. Ng S. (2013) Validation of the 10-item Chinese perceived stress scale in elderly service workers: one-factor versus two-factor structure. *BMC Psychol* 1: 9.
36. Leung D, Lam T, Chan S. (2010) Three versions of perceived stress scale: validation in a sample of Chinese cardiac patients who smoke. *BMC Public Health* 10 513.
37. Stawski RS, Sliwinski MJ, Almeida DM, et al. (2008) Reported exposure and emotional reactivity to daily stressors: the roles of adult age and global perceived stress. *Psychol Aging* 23: 52-61.
38. Yang T, Wu D, Zhang W, et al. (2012) Comparative stress levels among residents in three Chinese provincial capitals, 2001 and 2008. *PLoS One* 7: e30521.
39. Cohen, S, Janicki-Deverts J. (2012) Who's Stressed? Distributions of psychological stress in the United States in probability samples from 1983, 2006, and 2009. *J Appl Soc Psychol* 42: 1320-1334.
40. Shibusawa T, Mui AC. (2002) Stress, coping, and depression among Japanese American elders. *J*



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*Gerontological Soc Work* 36: 63-81.

41. Mui AC. (1996) Depression among elderly Chinese immigrants: An exploratory study. *Soc Work* 41: 633-645.
42. Kaneda T, Zimmer Z, Fang X, et al. (2009) Gender differences in functional health and mortality among the Chinese elderly: testing an exposure versus vulnerability hypothesis. *Res Aging* 31: 361-388.
43. Ross CE, Zhang W. (2008) Education and psychological distress among older Chinese. *J Aging Health* 20: 273-289.
44. Wei Z. (2006) *Education and distress among elderly Chinese, a SEM analysis*. Quebec: American Sociological Association.
45. Mui AC. (1998) Living alone and depression among older Chinese immigrants. *J Gerontol Soc Work* 30: 147-166.
46. Yeung W, Xu Z. (2012) Economic stress, quality of life, and mortality for the oldest-old in China. *Soc Indic Res* 108: 131-152.
47. Krause N, Liang J. (1993) Stress, social support, and psychological distress among the Chinese elderly. *J Gerontol* 48: 282-291.
48. Keith VM. (1993) Gender, financial strain, and psychological distress among older adults. *Res Aging* 15: 123-147.
49. Dong X, Chang ES, Wong E, et al. (2012) The perceptions, social determinants, and negative health outcomes associated with depressive symptoms among US Chinese older adults. *Gerontolists* 52: 650-663.
50. Dong X, Simon MA, Odwazny R, et al. (2008) Depression and elder abuse and neglect among a community-dwelling Chinese elderly population. *J Elder Abuse Negl* 20: 25-41.
51. Zunzunegui MV, Minicuci N, Blumstein T, et al. (2007) Gender differences in depressive symptoms among older adults: a cross-national comparison. *Soc Psychiat Psychiat Epidemiol* 4: 198-207.
52. Stokes SC, Thompson LW, Murphy S, et al. (2002) Screening for depression in immigrant Chinese-American elders: Results of a pilot study. *J Gerontol Soc Work* 36: 27-44.
53. Rueggeberg R, Wrosch C, Miller G. (2012) The different roles of perceived stress in the association between older adults' physical activity and physical health. *Health Psychol* 31: 164-171.
54. Jahnke RA, Larkey LK, Rogers C. (2010) Dissemination and benefits of a replicable Tai Chi and Qigong program for older adults. *Geriatr Nurs* 31: 272-280.

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