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Development and validation of a predictive index of elder self-neglect risk among a Chinese population

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ABSTRACT

Objective: To develop a predictive index that estimates the individual risk of incident self-neglect onset among the US Chinese older adults.

Methods: The study used two waves of longitudinal data from 2713 participants of the Population Study of Chinese Elderly (PINE). Data were collected during 2011–2015 in Chicago, Illinois, with approximately 2-year follow-up intervals. The main outcomes are incident self-neglect cases. Variables in 14 potential predictive domains were considered, which are (1) sociodemographic/socioeconomic, (2) neighborhood/community, (3) immigration and acculturation, (4) adverse events, (5) culture, (6) general wellbeing, (7) health behavior, (8) medical health, (9) health care, (10) physical function, (11) cognitive function, (12) social wellbeing, (13) violence, and (14) psychological wellbeing. Stepwise selection in multivariable logistical regression models and bootstrapping were used to develop and validate the predictive index.

Results: The 2-year self-neglect incidence rate was 237 (8.7%). A 19-item predictive model (with a c-statistic of 0.74) was developed. After correcting for overfitting by validating in 100 bootstrapping samples, the model demonstrated moderate predictive accuracy by a c-statistic of 0.68. A point-based risk index was developed and has an area under the receiver operating characteristic curve of 0.73.

Discussion: The study developed an efficient index with a moderate-to-good predictive ability of self-neglect. With further external validation, modification, and impact studies, the index could be a culturally relevant tool for practitioners to quantify the risk of self-neglect among the US Chinese older population.

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prognosis;
Chinese American

Introduction

Elder self-neglect refers to the behavior of an older adult that threatens his/her health and safety. It generally manifests itself in a person's inability to (1) perform essential self-care tasks including food, clothing, shelter, and medical care; (2) obtain goods and services necessary to maintain health and safety; or (3) manage one's financial affairs (Teaster, Dugar, Mendiondo, Abner, & Cecil, 2006). As the most commonly reported and substantiated among US Adult Protective Services elder abuse cases, prevalence estimates of self-neglect range between 2% to 29% and are higher in minority populations (Dong, 2014; Dong, Simon, & Evans, 2012a; Lee & Kim, 2014). Consequences of self-neglect might include mental disorders (Dong, Xu, & Ding, 2017; Dyer, Goodwin, Pickens-Pace, Burnett, & Kelly, 2007), increased premature mortality (Dong, Simon, et al., 2009; Lachs, Williams, O'Brien, Pillemer, & Charlson, 1998), and increased healthcare utilization (Dong, Simon, & Evans, 2012b; Dong & Simon, 2013, 2015).

While self-neglect is particularly prevalent (29%) among the US Chinese older adults, there remains a substantial gap regarding culturally relevant preventive practice and knowledge. As the fastest growing and largest subgroup (4 million) of Asian Americans, the Chinese community is older on average compared to other US immigrant populations (U.S. Census Bureau, 2017). Limited English proficiency, poorer health, and inadequate health care faced by

immigrants (Derose, Escarce, & Lurie, 2007; Kim et al., 2011) may interact with self-neglect and leave profound effects on the public health system.

A research gap in this area is a lack of longitudinal studies to examine multilevel potential predictors considering the sociocultural factors. The only large longitudinal study to our knowledge tested the relationships between depressive symptoms and cognitive impairment with self-neglect (Abrams, Lachs, McAvay, Keohane, & Bruce, 2002). Other cross-sectional studies have linked self-neglect with medical comorbidities (Reyes-Ortiz, Burnett, Flores, Halphen, & Dyer, 2014), functional impairment (Dong, Mendes de Leon, & Evans, 2009; Dong & Simon, 2016; Fulmer et al., 2005), and poor social wellbeing (Burnett et al., 2006; Dong, Simon, Beck, & Evans, 2010). While important, the existing evidence is inadequate for a systematic understanding of the antecedents of self-neglect, which is necessary for developing preventive interventions.

Estimating prognosis is important in practice to provide better care to older adults who are at risk. However, it has received less attention compared to diagnosis and treatment (Gill, 2012; Yourman, Lee, Schonberg, Widera, & Smith, 2012), which have been difficult for self-neglect. It is not feasible for clinicians to conduct in-home assessments to diagnose patients as required by current evaluation tools (Dong, Mendes de Leon, et al., 2009; Dyer et al., 2006; Iris, Conrad, & Ridings, 2014). Treating self-neglect has

been challenging not only because there is limited epidemiological evidence to support intervention studies (Pavlou & Lachs, 2008), but also self-neglect cases often have become severe, costly, and treatment-resistant upon diagnosis (Pavlou & Lachs, 2008; Snowden & Halliday, 2011). Health care and social service providers need prognostic tools of self-neglect onset to intervene at early stages.

Therefore, our goal is to develop a prognostic index that can predict self-neglect onset among a US Chinese older population. We aim to 1) examine independent predictive factors of self-neglect onset and 2) develop a simple point-based predictive index to estimate risk prognostication of self-neglect onset.

Methods

Study populations

The Population Study of Chinese Elderly (PINE) is a longitudinal study of socio-cultural determinants of health outcomes among the Chinese older population in the Great Chicago area (Dong, Wong, & Simon, 2014). Eligibility criteria for PINE were Chinese community residents aged 60 years and older. We used two waves of data from 2713 participants who completed interviews at both times. Time 1 data were collected during 2011–2013, and time 2 data were collected during 2013–2015. The intervals between interviews were approximately two years. With informed written consent, the participants were interviewed by research assistants in private and in-person context.

Dependent variable: incident self-neglect

The main outcome was incident self-neglect case developed by the time 2 follow-up interviews. A widely used and validated 25-item measurement was adopted to assess five phenotypes of self-neglect: 1) hoarding, 2) poor personal hygiene, 3) unsanitary conditions, 4) need home repair, and 5) inadequate utilities. The measurement has good content, construct, convergent, and predictive validity (Dong, 2016; Dong, Simon, et al., 2009; Dong et al., 2012b). Cronbach's alpha of the measurement was 0.79 in PINE.

A total score of self-neglect was identified by research assistants rating on a 4-point scale (0 = none, 1 = mild, 2 = moderate, 3 = severe) for each item. People who scored 0 (none) at time 1 and scored 1 or greater at time 2 were considered as having incident self-neglect.

Independent variable: potential predictive factors of self-neglect

Based on the current literature, we systematically considered variables in 14 potential predictive domains including (1) sociodemographic/socioeconomic: age (years), gender (male and female), personal income, education (years); (2) neighborhood/community: years living in the neighborhood, sense of community (Perkins, Florin, Rich, Wandersman, & Chavis, 1990), neighborhood cohesion and disorder (Mendes de Leon et al., 2009); (3) Immigration and acculturation: years in the US, country of origin, language preferences, acculturation (Marin, Sabogal, Marin, Otero-

Sabogal, & Perez-Stable, 1987); (4) Adverse events: discrimination (Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005), bereavement (Pudelek, Hanis-Martin, Kozloski, Howe, & Henning, 2017); (5) Culture: filial piety receipt and expectation (Chang, Beck, Simon, & Dong, 2014); (6) General wellbeing: overall health status, quality of life, health change (Lyons, Perry, & LITTLEPAGE, 1994), Bodily Pain Subscale (SF-36 BP) (Ware, Kosinski, & Keller, 2001); (7) Health behavior: smoking, drinking (Saunders, Aasland, Babor, De la Fuente, & Grant, 1993), gambling (Chen & Dong, 2015), health literacy (Bass, III, Wilson, & Griffith, 2003); (8) Medical health: medical conditions (Dong, Chen, & Simon, 2014b), review of system (Fortin, Dwamena, & Smith, 2012); (9) Health care: trust in physician (Anderson & Dedrick, 1990), emergency room, hospitalization, rehabilitation, nursing home admission, medication, preventive health (Simon, Li, & Dong, 2014), health insurance; (10) physical function: Katz Index of Activities Of Daily Living (ADL) (Katz, Downs, Cash, & Grotz, 1970), Lawton Instrumental Activities of Daily Living (IADL) (Lawton & Brody, 1969), Index of Mobility Scale (Rosow & Breslau, 1966), Index of Basic Physical Activities Scale (Nagi, 1976), Short Physical Performance Battery (Guralnik et al., 1994); (11) Cognitive function: Chinese Mini-Mental State Exam, Symbol Digit Modalities Test, East Boston Memory Test, Digit Span Backwards (Chang & Dong, 2014); (12) Social wellbeing: social engagement (Chen, Simon, Chang, Zhen, & Dong, 2014), NSHAP social network (Cornwell, Schumm, Laumann, & Graber, 2009); (13) Violence: child maltreatment, intimate partner violence (Chan, Chan, Au, & Cheung, 2010), elder abuse (Dong & Wang, 2019); (14) psychological wellbeing: depression (PHQ-9), R-UCLA loneliness, suicidality (Chang et al., 2014), anxiety (Dong, Chen, & Simon, 2014a), self-mastery, hopelessness (Beck, Weissman, Lester, & Trexler, 1974), perceived stress (Cohen, Kamarck, & Mermelstein, 1983), NEO personality inventory-revised (NEO PI-R) (Costa & Mac Crae, 1992), religiosity (Koenig & Büssing, 2010).

Analytic approach

We used descriptive analyses (means, standard deviations, proportions) to characterize participants. To enhance user convenience in practice, we created dichotomous variables for each potential predictive factor using multiple cut-off points (e.g. income cut-offs: $< \$10,000/\geq \$10,000$, $< \$15,000/\geq \$15,000$, $< \$20,000/\geq \$20,000$, $< \$25,000/\geq \$25,000$, $< \$30,000/\geq \$30,000$). We first tested the bivariate association between each variable and incident self-neglect to generate a pool of variables that have $p < 0.1$. These variables entered into a step of stepwise selection in multivariable logistical regression models. This step determines a final model of variables that were independently associated with incident self-neglect at the $p < 0.05$ level. The model was evaluated in terms of its discrimination (the Harrell's c-statistic) and calibration (The Hosmer-Lemeshow (HL) p -value). A c-statistic within 0.60 to 0.69, 0.70 to 0.79, 0.80 to 0.89, and 0.90 or greater indicate moderate, good, very good, and excellent discrimination (Steyerberg et al., 2010; Yourman et al., 2012).

We validated this model by estimating a correction for overfitting ('optimism') (Harrell, Lee, & Mark, 1996). First, we

drew 100 repeated bootstraps based on the original sample. Second, we repeated the stepwise regression to fit 100 models with 100 c-statistics (Cboot). Third, we applied the fitted model from bootstrap data to original data to calculate another 100 c-statistics (Cbo). The average 'Cboot minus Cbo' is a measure of 'optimism'. An 'optimism-corrected' c-statistics of the model is the result of the original c-statistics minus the 'optimism'. Additionally, we estimated the frequency of each candidate variable being selected as an independent predictor in the 100 bootstrap samples (Austin & Tu, 2004), which measures the strength of a variable being repeatedly selected as a predictor.

To create a simple point-based risk index of self-neglect, we assigned each predictive factor a score by dividing its parameter estimate by the smallest parameter estimates in the logistic regression model and rounded to integers. Affirmative answers to items will add their scores to a total risk score of self-neglect. The accuracy of the point-based index was judged by the Receiver Operating Characteristic (ROC) curves to contrast the true positive rates (sensitivity) against the false positive rate ($1 - \text{specificity}$).

We also provide an additional interpretation of the risk scores by converting them into a probability (0%–100%) of developing self-neglect. We first averaged the sum of intercept and all parameter estimates by the number of items in the final logistic regression model. We then used this average value to calculate a logistic number for each risk score. A one-point increase in the risk score corresponds to a one-unit increase by the average value in its logistic number. The logistic numbers were then converted into logistic probabilities using ' $\exp(n)/[1 + \exp(n)] \times 100\%$ '.

Results

Descriptive statistics and incidence of self-neglect

Among the 2713 participants, 237 (8.7%) had incident self-neglect cases. Table 1 describes the characteristics of the population. The mean (\pm SD) age of all participants was 72.6 (\pm 8.1). 1584 (58.4%) were women.

Predictive models of self-neglect, model performance, and internal validation using 100 bootstrap samples

Seventy-eighth dichotomous variables were significant predictors of incident self-neglect at the $p < 0.1$ level in bivariate analysis. These variables entered multivariable logistic regression analyses using stepwise selection, which resulted in a 19-item model (Table 2). The model has a c-statistic of 0.74 and an HL p -value of 0.21. Table 2 also presents the validation results using 100 bootstrap samples drawn from the original dataset. The c-statistic was corrected to 0.68.

Repeatability of predictive factors in 100 bootstrap samples

Table 3 presents the frequency of each model variable that was selected as an independent predictor of self-neglect by repeating the stepwise regression in 100 bootstrap samples. Three variables ('No colonoscopy exam', 'Live in the neighborhood ≥ 18 years', 'Live in the U.S. < 10 years') were selected as independent predictors of self-neglect in more

Table 1. Descriptive statistics of the PINE participants included in this study.

	Sample ($n = 2713$)	No (%)
Self-neglect incidence		237 (8.7)
Age	M (\pm SD) = 72.6 (\pm 8.1)	
	60–64	595 (21.9)
	65–69	551 (20.3)
	70–74	532 (19.6)
	75–79	483 (17.8)
	80–84	339 (12.5)
	≥ 85	213 (7.9)
Sex	Women	1584 (58.4)
	Men	1129 (41.6)
Annual income (U.S. dollars)	4999–9999	887 (33.1)
	10,000–14,999	1415 (52.8)
	$\geq 15,000$	380 (14.2)
Education (years)	M (\pm SD) = 8.7 (\pm 5.0)	
	≤ 12	2142 (79.3)
	13–15	123 (4.6)
	≥ 16	436 (16.1)
Marital status	Married	1920 (70.1)
	Not Married	790 (29.2)
General health	Poor	500 (18.4)
	Fair	1161 (42.8)
	Good	941 (34.7)
	Very good	110 (4.1)
Medical comorbidities	0	415 (15.3)
	1	617 (22.8)
	2	690 (25.4)
	≥ 3	990 (36.5)

than 93% of the bootstrap samples. Four variables ('Poor life quality', 'Disappearance of money', 'Able to control irritations', 'Relative recently passed away') were selected in more than 72% of the bootstrap samples. Three variables ('Poorer family social support', 'Hospitalization', 'Herbal products self-medication') were selected in more than 50% of the bootstrap samples. Two variables ('Being told bring too much trouble' and 'Not strive for excellence') were selected in 40% of the bootstrap samples. Four variables ('Watch TV $<$ every day', 'Living with one person', 'Not look forward to good times', 'Alive children ≤ 2 ') were selected in only a small proportion (9%–35%) of the bootstrap samples. Another three variables ('Diabetes', 'Not feel tense and jittery', 'No breast self-exam') were selected as independent predictors of self-neglect in none of the bootstrap samples.

Point-based vulnerability risk index of self-neglect

Table 4 is a point-based predictive index of self-neglect. The index score ranges from 0 to 37 or (probability: $< 10\%$ to $> 90\%$) depending on response. Figure 1 compares the ROC curves of the validated predictive model and the risk score index. The index has an area under the receiver operating characteristic curve of 0.73.

Discussion

In a prospective cohort of 2713 US Chinese community-dwelling older adults, we developed a predictive index that can estimate the 2-year risk of developing self-neglect onset. The 19-item index has moderate-to-good predictive

Table 2. A 19-item predictive vulnerability model for self-neglect, model performance, and validation in 100 bootstrap samples drawn from the original PINE dataset.

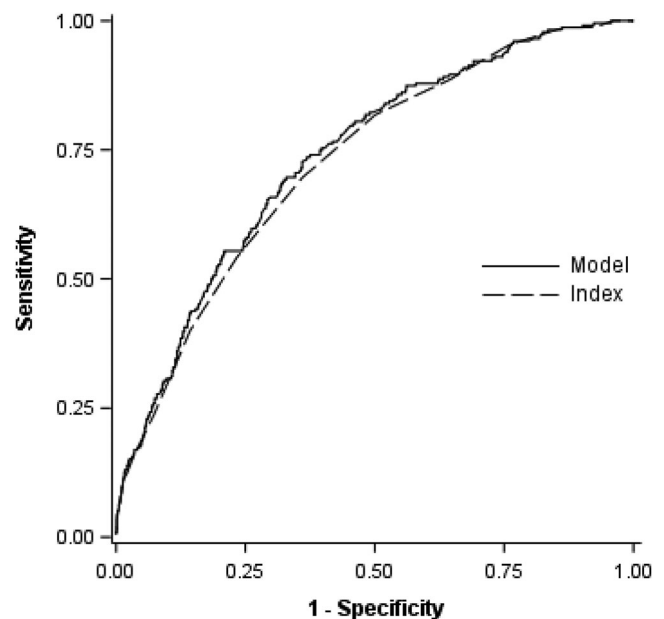
Model performance	C-statistic	0.74	
	Hosmer-Lemeshow <i>p</i> -value	0.21	
	Optimism-corrected c-statistic	0.68	
19-item predictive model			
Predictive domains	Predictive factors	Adjusted OR (95% CI)	<i>p</i> -Value
Neighborhood and community	Live in the neighborhood ≥ 18 years	2.27 (1.58,3.25)	<0.0001
Immigration	Live in the U.S. <10 years	2.17 (1.50,3.14)	<0.0001
General well-being	Poor life quality	1.64 (1.21,2.21)	0.00
Medical health	Diabetes	1.38 (1.02,1.87)	0.04
Health care	No breast self-exam	2.10 (1.00,4.41)	0.05
	No colonoscopy exam	2.06 (1.42,3.00)	0.00
	Herbal products self-medication	1.41 (1.04, 1.91)	0.03
	Hospitalization	1.60 (1.10,2.31)	0.01
Psychological well-being	Able to control irritations	2.41 (1.29,4.52)	0.01
	Not look forward to good times	1.82 (1.21,2.74)	0.00
	Not feel tense and jittery	1.46 (1.00,2.14)	0.05
	Not strive for excellence	1.39 (1.00,1.93)	0.05
Social engagement	Watch TV < everyday	1.53 (1.05,2.23)	0.03
Social network	Live with one person	1.45 (1.01,2.07)	0.04
	Alive children ≤ 2	1.73 (1.17,2.57)	0.01
	Relatives recently passed away	1.70 (1.19,2.43)	0.00
	Poorer family social support	2.01 (1.25,3.23)	0.00
Elder abuse	Being told bring too much trouble	3.09 (1.57,6.10)	0.00
	Disappearance of money	4.96 (1.73,14.21)	0.00

Table 3. Frequency of each item was selected using stepwise selection in 100 bootstrap samples drawn from the original PINE dataset.

Predictive factors	Frequency selected
No colonoscopy exam	100
Live in the neighborhood ≥ 18 years	99
Live in the U.S. <10 years	93
Poor life quality	79
Disappearance of money	76
Able to control irritations	73
Relative recently passed away	72
Poorer family social support	65
Hospitalization	57
Herbal products self-medication	50
Being told bring too much trouble	40
Not strive for excellence	40
Watch TV < everyday	35
Living with one person	31
Not look forward to good times	31
Alive children ≤ 2	9
Diabetes	0
Not feel tense and jittery	0
No breast self-exam	0

accuracy with a c-statistic of 0.74 and an optimism-corrected c-statistic of 0.68. Factors in various social and medical aspects were found predictive of self-neglect. With external validation and modification in future confirmatory studies, the index has the potential to provide practitioners an efficient and culturally-relevant assessment of self-neglect risk among the US Chinese population.

Our findings suggest that people who live in a neighborhood longer or migrated to the US more recently were associated with higher risks of self-neglect. Living settlement of immigrants is closely related to historical, social, and political factors. This might because people who migrated to escape severe poverty or political instability are more likely to settle permanently in ethnic enclaves such as Chinatowns (Kwong, 1996). Inadequate socioeconomic resources within this group and its neighborhoods might contribute to elder self-neglect. Moreover, it is common for Chinese adults to relocate to the US in older age to reunite with family (Tienda, 2017). More recent older immigrants might be subject to higher vulnerability of self-

**Figure 1.** Accuracy of risk score indices compared against predictive models using receiver operating characteristic curves.

neglect because of acculturation, language, access barriers, and grandparenting burden (Dong, Chang, & Bergren, 2014; Xu, Chi, & Wu, 2018).

Lacking preventive health care (colonoscopy) and using over-the-counter herbal products were found predictive of higher risks of self-neglect. Besides the traditional beliefs of older Chinese generations, barriers faced by the immigrants when seeking health care in the US might explain our findings (Derose et al., 2007). It was suggested that underusing cancer screening among the Chinese immigrants is related to lower socioeconomic status, language barriers, and lack of knowledge (Liang, Yuan, Mandelblatt, & Pasick, 2004; Wang et al., 2009). As for over-the-counter herbal products, it is the most commonly used (19%) traditional Chinese medicine (TCM) (Dong, Bergren, & Chang, 2015b) despite inconclusive evidence about its safety (Chan, Zhang, & Lin,

Table 4. A point-based predictive index of two-year incident self-neglect.

Assessments/Questions	Responses	Points
1. Altogether, how many years have you lived in this neighborhood? (years)	Write down a number: () years	≥18 years: 3 point
2. How many years have you been living in the U.S.?	Write down a number: () years	<10 years: 2 points
3. Not including yourself, how many people are there in your household?	Write down a number: () people	Living with 1 person only: 1 point
4. In general, would you say the quality of your life is:	Choose one from: <ul style="list-style-type: none"> • Very good • Good • Fair • Poor 	0 0 0 2 points
5. Have you ever been told by a doctor, nurse or therapist that you had diabetes, sugar in the urine, or high blood sugar?	Choose one from: <ul style="list-style-type: none"> • Yes • No 	1 point 0
6. Have you ever checked your breast on your own for abnormalities?	Choose one from: <ul style="list-style-type: none"> • Yes • No 	0 2 points
<i>Colonoscopy is an exam in which a long tube is inserted in the rectum to view the entire colon for signs of cancer, causes of rectal bleeding or other health problems.</i>		
7. Have you ever had a colonoscopy?	Choose one from: <ul style="list-style-type: none"> • Yes • No 	0 2 points
8. How many times per year do you use over-the-counter herbal products?	Choose one from: <ul style="list-style-type: none"> • None • At least once in the previous year • At least once a month • At least once a week • At least once a day 	0 1 point 1 point 1 point 1 point
9. How many times have you been hospitalized in the past 2 years?	Write down a number: () times	More than once: 1 point
10. In the last month, have you been able to control irritations in your life?	Choose one from: <ul style="list-style-type: none"> • Never • Almost never • Sometimes • Fairly often • Very often 	0 0 3 points 3 points 3 points
11. How well do you think the following statement describes you? 'I can look forward to more good times than bad times'.	Choose one from: <ul style="list-style-type: none"> • Strongly agree • Moderately agree • Slightly agree • Slightly disagree • Moderately disagree • Strongly disagree 	0 0 0 2 points 2 points 2 points
12. How well do you think the following statement describes you? 'I often feel tense and jittery'.	Choose one from: <ul style="list-style-type: none"> • Strongly agree • Agree • Neither disagree nor agree • Disagree • Strongly disagree 	1 point 1 point 0 0 0
13. How well do you think the following statement describes you? 'I strive for excellence in everything I do'.	Choose one from: <ul style="list-style-type: none"> • Strongly agree • Agree • Neither disagree nor agree • Disagree • Strongly disagree 	0 0 1 point 1 point 1 point
14. How often do you watch television?	Choose one from: <ul style="list-style-type: none"> • Every day or almost every day • Several times a week • Several times a month • Several times a year • Once a year or less 	0 1 point 1 point 1 point 1 point
15. How many of your (biological) children are alive?	Write down a number: () children	≤ 2: 2 points
16. Not including a spouse, have any of your close relatives died in the past five years?	Choose one from: <ul style="list-style-type: none"> • Yes • No 	2 points 0
17. How often can you rely on them for help if you have a problem?	Choose one from: <ul style="list-style-type: none"> • Hardly ever • Some of the time • Often 	2 points 0 0
<i>I would like to ask you some questions regarding your relationships with the trusted ones around you (e.g., family).</i>		
18. Since 60 years old, have you ever been told bring too much trouble?	Choose one from: <ul style="list-style-type: none"> • Yes • No 	4 points 0
19. Since 60 years old, have there been unexplained disappearances of your money or possessions? (Yes/No)	Choose one from: <ul style="list-style-type: none"> • Yes • No 	5 points 0

Total points (Risk score):**Risk score interpretation: probability of self-neglect**

Score 0–9: <10%

Score 10–13: 10–30%

Score 14–17: 31–60%

Score 18–22: 61–90%

Score 23–37: >90%

2015). The popularity might have been reinforced by the fact that many US physicians are not adequately prepared to consult patients about alternative medicine (Wahner-Roedler et al., 2006).

Additionally, hospitalization (past two years) and self-rated poor life quality are independent predictors of self-neglect. The results resonate with previous findings of poorer health-related quality among Chinese older immigrants compared to other older adults in the US (Kim et al., 2011). Poorer health requires more complicated self-care tasks, which might increase one's vulnerability to self-neglect.

Together, these findings indicate that the Chinese older adults who self-neglect may be prone to the combined effects of poorer health and immigration-related vulnerability in health care. They may also resist interventions that are not culturally tailored. Therefore, there are opportunities for health care providers to play a crucial role at the intersection of self-neglect and health care. More efforts should be devoted to enhancing physicians' cultural competency and cross-cultural communication in clinical settings.

For psychological indicators, single items from the measurements of perceived stress (Cohen et al., 1983), conscientiousness (Costa & Mac Crae, 1992), and hopelessness (Beck et al., 1974) were shown to be independently associated with higher risks of incident self-neglect. More specifically, people who 'are able to control irritations', 'not strive for excellence', and 'not look forward to good times' are subject to higher risks. These subjective measurements reflect a tendency of inattention, undependability, and hopelessness, suggesting unwillingness or refusal to care for self and the surroundings.

Familial resources appeared to be significantly related to self-neglect among Chinese older adults. Individuals who live with fewer people, perceive poorer family social support, had relatives passed away recently, and experienced elder abuse were at higher risks. These results are consistent with existing knowledge about Confucianism and older immigrants (Treas, 2008). Chinese aging parents might traditionally rely on family or children for care and support (Dong, Chang, Wong, & Simon, 2012); absent caregiver and inability to provide self-care might lead to self-neglect.

Moreover, our study revealed an interesting negative association between watching TV and self-neglect. In contrast, excessive TV watching has been linked to various negative consequences such as obesity (Vioque, Torres, & Quiles, 2000), cognitive decline (Fancourt & Steptoe, 2019), and social isolation (Bickham & Rich, 2006). In the context of immigration, participation in traditional leisure activities such as going to a movie or restaurant might be replaced by TV watching because of acculturation, language, and transportation barriers. A prior study found that more than 80% of the US Chinese older adults watch TV daily, and more than 80% of them prefer TV programs in Chinese languages (Dong, Bergren, & Chang, 2015a; Dong, Li, & Simon, 2014). TV watching might largely represent the levels of social involvement and entertainment of the US Chinese older adults, and therefore is negatively associated with self-neglect.

As the first to develop a predictive index of self-neglect among a US Chinese population, the study has limitations. First, the index has not been validated externally for generalizability. Our internal validation corrected the c-statistic

from 0.74 to 0.68, suggesting overfitting and decreased performance when applied to another population. A few factors in the predictive model were not repeatable in the bootstrap samples. Confirmatory studies are necessary to validate the index externally and re-examine potential false-positive variables (Janssen, Moons, Kalkman, Grobbee, & Vergouwe, 2008). Second, predictors of incident elder self-neglect might not be risk factors, which requires more longitudinal studies and theoretical explorations to clarify. Third, although measurements of the study have demonstrated adequate psychometric properties, some were developed from western populations and might not capture certain socio-cultural factors associated with the Chinese population. This might also explain the moderate-to-good predictive accuracy of the predictive index despite the rigorous development process. More culturally relevant measurements should be included in similar studies to update the index. For example, the Chinese cultural measurements of Face, Harmony, and RenQing may be added in addition to the NEO PI-R (used in this study) to better describe personality traits in future studies (Cheung et al., 2001). Last, the benefits and harms of using a self-neglect predictive index were not evaluated by the study.

Despite these limitations, the study has important practical and epidemiological implications for the field of self-neglect. With further validations and modifications, the index has the potential to assist health care and social service providers in estimating risks for self-neglect. When screening and treatment are difficult, the prognosis information might be critical to improving the health outcomes of patients and clients. For research, as the first to longitudinally examine predictors of self-neglect among a US Chinese older population, the findings expanded our understanding of the indicators of self-neglect. It also demonstrated that self-neglect is culturally constructed. Several key components, such as acculturation and language barriers, cultural beliefs in health and health care, and familial resources, should be considered in future intervention studies.

To sum up, elder self-neglect is understudied but has significant health implications, particularly among minority aging populations. More efforts and resources from researchers, practitioners, and policymakers are necessary given the fast-growing aging population and diversity. More longitudinal studies are needed to elucidate the causes and trajectories of self-neglect. Effectiveness of exiting screening and treatment for self-neglect should be quantified through rigorously designed impact studies.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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