Received: 7 January 2022 | Revised: 15 April 2022 | Accepted: 5 May 2022

DOI: 10.1111/hsc.13847

Health and Social Care in the community WILEY

ORIGINAL ARTICLE

Associations between volunteering and cognitive impairment: The moderating role of race/ethnicity

Yi Wang PhD, MSW[1] | Roger Wong PhD, MPH, MSW[2] | Takashi Amano PhD, MSW[3] | Huei-Wern Shen PhD, MSW[4]

[1]School of Social Work, University of Iowa, Iowa City, Iowa, USA

[2]Department of Public Health and Preventive Medicine, State University of New York Upstate Medical University, Syracuse, New York, USA

[3]Department of Social Work, Rutgers University – Newark, Newark, New Jersey, USA

[4]Department of Social Work, University of North Texas, Denton, Texas, USA

Correspondence
Yi Wang, School of Social Work, University of Iowa, 225B North Hall, Iowa City, IA 52242, USA.
Email: yi-wang-5@uiowa.edu

Abstract

Although volunteering has been shown to benefit cognitive health, there is a paucity of evidence on informal volunteering and subjective measures of cognitive impairment. Also, little is known about whether such relationships vary by race/ethnicity. This study aimed to examine the associations of both formal and informal volunteering with older adults' objective and subjective cognition and explore the moderating role of race/ethnicity in such associations. Using data from the Health and Retirement Study in the United States (2010–2016), 9941 older adults (51+) who were cognitively unimpaired in 2010 and alive through 2016 were included. Ordered logistic regression models were performed to assess the relationships among volunteering, cognitive impairment and race/ethnicity. Findings showed that more years of formal and informal volunteering significantly reduced the odds of objective cognitive impairment; neither volunteering type was significant for subjective cognitive impairment. The relationship between informal volunteering and objective cognition varied by race/ethnicity. Compared to non-Hispanic Whites, non-Hispanic Black older adults who engaged in more years of informal volunteering had a significantly higher odds of cognitive impairment over time. The current study is one of the first to look at the associations between informal volunteering and cognition. The inclusion of subjective cognitive impairment, paired with objective measures of cognition, also adds value to the knowledge body. Our findings indicate any type of volunteering is a viable approach to prevent cognitive impairment for older populations. However, more research is needed to better understand why racial/ethnic minority, particularly non-Hispanic Black older adults, do not benefit from informal volunteering.

KEYWORDS
formal volunteering, informal volunteering, minority ageing, objective cognition, subjective cognition

1 | INTRODUCTION

Due to population ageing in the United States, cognitive impairment has gained increasing attention in gerontological research. In addition to numerous immutable risk factors such as age and genetics, cognitive impairment has been linked to modifiable risk factors such as health conditions and lifestyle behaviours (Alzheimer's Association, 2021). Among the modifiable risk factors for cognitive

impairment, multiple studies have shown participation in social activities decreases the risk for cognitive impairment over-and-above other risk and protective factors, including physical health, depression, socioeconomic status and physical activity (Bourassa et al., 2017; Cai, 2022; Hsu, 2007). A systematic review (Yates et al., 2016) of 19 studies also concluded that participation in cognitively stimulating activities may contribute to a reduction of risk of dementia and cognitive impairment in later life. It is theorised that lifetime engagement in such activities may delay cognitive decline by building cognitive reserve, which is a property of the brain that allows for sustained cognitive performance in the presence of age-related changes or brain insults (Stern, 2012). Another related psychological hypothesis is the 'mental-exercise hypothesis', also known as 'use it or lost it', which posits that continued engagement in mentally stimulating activities could maintain one's cognitive abilities and help one better cope with age-related cognitive deterioration (Salthouse, 2006).

The present study focuses on the associations between volunteering and cognitive health. Two types of volunteering were examined. Formal volunteering is commonly referred to as an activity undertaken by an individual that is uncoerced, unpaid (or minimal compensation to offset costs), structured by an organisation and directed towards a community concern (Cnaan et al., 1996; Shandra, 2017; Shen et al., 2020). Informal volunteering, however, is typically considered to be unstructured helping behaviours outside of the auspices of a formal organisation, with the beneficiary generally being a known individual (Morrow-Howell, 2010; Shandra, 2017). Previous research has documented the cognitive benefits of formal volunteering, and such benefits included better attentional control (Guiney & Machado, 2018), decelerated cognitive decline (Gupta, 2018; Proulx et al., 2018) and lower risk of cognitive impairment (Guiney & Machado, 2018; Gupta, 2018; Infurna et al., 2016), most of which were measured objectively. Formal volunteering might protect against cognitive decline because it introduces older adults to complex tasks, some of which might be new, that likely require social, intellectual, mental and physical engagement (Park et al., 2014; Proulx et al., 2018).

In comparison, there is a paucity of research reporting the association between informal volunteering and cognitive health. As the most common type of human helping behaviour, informal volunteering, however, is one of the least studied (Einolf et al., 2016). One study in China (Luo et al., 2019) found that informal volunteering is associated with a reduced risk of cognitive decline over a 2-year period, and the association is stronger for older Chinese men in urban areas. Up to date, very few studies investigated the health benefits of informal volunteering, and the current empirical evidence is not yet sufficient to inform programme or policy.

As discussed, there are notable gaps in existing research on this topic, particularly limited analysis on informal volunteering experiences and subjective measures of cognitive impairment. Reflecting a state of cognitive decline from the perspective of the individual, subjective cognitive decline does not require observation using standardised cognitive tests or by others (Jessen et al., 2020). Although not a clinical diagnostic assessment, subjective cognitive decline receives increasing attention because of evidence of its association with an increased risk of future objective cognitive decline (Mitchell et al., 2014; Slot et al., 2019). Furthermore, both national estimates and empirical studies have documented racial/ethnic differences in volunteering. Among the major race and ethnicity groups, Whites generally volunteer at a higher rate than Blacks and Hispanics (Bureau of Labor Statistics, 2015; Johnson & Lee, 2017; Morrow-Howell & Wang, 2014). Given the different engagement levels of volunteering across racial/ethnic groups, investigation on cognitive benefits from volunteering across different racial/ethnic groups is warranted.

To address these gaps in the literature, this study aimed to examine the associations between both formal and informal volunteering engagement and older adults' objective and subjective cognition and explore the moderating role of race/ethnicity in such associations. Guided by the Cognitive Reserve Hypothesis (Stern, 2002), we hypothesised that both formal and informal volunteering would decrease objective and subjective cognitive impairment. As for the significantly higher risk for cognitive impairment among racial/ethnic minorities documented by previous research (Alzheimer's Association, 2021), the Glymour & Manly (2008) theoretical framework suggests these disparities may be partially attributed to social interactions, which can have a cascading influence on physical health, health behaviours and ultimately cognitive function. We, therefore, hypothesised that formal and informal volunteering experiences may provide insights into racial/ethnic disparities in cognitive impairment risk.

What is known about the topic?

- Formal volunteering can protect against cognitive decline with respect to objective global functioning.
- The notable gaps in existing research include limited analysis on informal volunteering experiences, subjective measures of cognitive impairment and the racial/ethnic differences in such associations.

What does this paper adds?

- More years of engagement in both formal and informal volunteering significantly reduced the odds of objective cognitive impairment.
- Neither formal nor informal volunteering was significant for subjective cognitive impairment.
- More years of informal volunteering is associated with a significantly higher odds of objective cognitive impairment for non-Hispanic Black older adults over time.

2 | MATERIALS & METHODS

2.1 | Data and sample

Four waves of prospective longitudinal cohort data (2010, 2012, 2014 and 2016) from the Health and Retirement Study (HRS) were used. We limited the analyses to community-dwelling self-respondents

aged 51 and above who were cognitively unimpaired in 2010, alive through 2016, and self-identified as Non-Hispanic White, Non-Hispanic Black or Hispanic. Individuals with missing on the variables in the model were dropped (2.4% of the sample). The final study sample was 9941 respondents.

2.2 | Measures

2.2.1 | Formal and informal volunteering

The key independent variables were number of years older adults volunteered formally and informally within the study window. In each wave, the respondents were asked 'Have you spent any time in the past 12 months doing volunteer work for religious, educational, health-related or other charitable organisations?' Individuals were considered engaging in formal volunteering that year when responding 'yes' to this question. Similarly, in each wave, the respondents were asked 'Have you spent any time in the past 12 months helping friends, neighbours, or relatives who did not live with them and did not pay them for the help'? Individuals who answered 'yes' to this question were considered participating in informal volunteering that year. The number of years individuals engaged in formal and informal volunteering (responded 'yes') was counted, ranging between 0 and 4 throughout the study window.

2.2.2 | Objective and subjective cognitive impairment

The key dependent variables included objective cognitive impairment and subjective impairment. Objective cognitive impairment was assessed using the Telephone Interview for Cognitive Status (TICS) (Brandt et al., 1988), a standardised test adapted for use in older respondents in the HRS (Langa et al., 2017). The TICS score is the sum of the following tests (range = 0–27): episodic memory, the serial 7 s test and a backward-counting test that measures mental processing speed. The TICS score was further categorised into three statuses: 'No impairment (12–27)', 'Cognitive impairment no dementia (CIND) (7–11)' and 'Dementia (0–6)' (Crimmins et al., 2011), and it was treated as a nominal variable.

Subjective cognitive impairment was measured with the question 'How would you rate your memory at the present time? Would you say it is excellent, very good, good, fair or poor'? This variable was treated as ordinal (1–5), with higher scores indicating worse subjective cognitive impairment.

2.2.3 | Race/ethnicity

Race/ethnicity was self-identified through three mutually exclusive categories: non-Hispanic White, non-Hispanic Black or Hispanic.

2.2.4 | Covariates

We controlled for four categories of variables. *Socio-demographic characteristics* included age (51–64, 65–74, 75–84, 85+), gender (male or female), education (range: 0–17 years) and marital status (married or not married). *Socio-economic status* included annual household income (log transformed) and total assets (inverse hyperbolic sine transformation applied because this variable is right skewed with zero or negative values). HRS collects detailed information on respondents' income (e.g. annuities, pension, social security, etc) and assets (e.g. real estate, vehicles, business, Individual Retirement Arrangement's [IRA's], stocks, mutual funds, checking and savings accounts, etc). In the present study, household income in the last calendar year and total assets variables were from the RAND Income and Wealth Imputation File. *Contextual features and social network* included neighbourhood safety (poor, fair, good, very good or excellent), religious attendance (not at all, one or more times a year, two or three times a month, once a week, more than once a week) and urbanicity (urban or not urban). *Health-related variables* included presence of ADL limitations (yes or no), depressive symptoms (range: 0–8), having any health conditions of the following (yes or no): diabetes, cancer, lung disease, heart disease, stroke, arthritis.

2.3 | Analytical plan

Given the nature of our dependent variables, we performed multinomial logistic regression for objective cognitive impairment and ordered logistic regression for subjective cognitive impairment, with complex survey sampling weights applied. Interaction terms between each type of volunteering (formal and informal) and race/ethnicity were added to analyse the moderating effect of race/ethnicity. We initially included covariates at both baseline (2010) and follow-up (2016), however, the diagnostic analysis for multicollinearity suggested dropping marital status and urbanicity at follow-up. Due to the reciprocal relationships between objective and subjective cognition (Snitz et al., 2008), they were also included as controls. Given that the correlation coefficient between subjective (baseline) and objective cognition (follow-up) is −0.15, indicating a weak correlation (Tabachnick & Fidell, 2012), we, therefore, decided to keep both in the multivariate model. The average variance inflation factor (VIF) value for our final model was 1.55, which is below the 'standard' 2.5 threshold (Johnston et al., 2018) and indicates no harmful multicollinearity.

3 | RESULTS

Among the 9941 individuals with no cognitive impairment at baseline, 86.01% remained unimpaired, 12.49% met study criteria for CIND and 1.50% met study criteria for dementia at the end of the study window in 2016. Table 1 describes the characteristics of the study sample. Results in Table 2 (Model 1) show that more years

TABLE 1 Description of sample and bivariate test results of cognitively unimpaired individuals at baseline (2010)

Variables	Mean (SD)/%				
	Entire sample ($N = 9941$)	Non-Hispanic white($N = 7105$)	Non-Hispanic black($N = 1686$)	Hispanic($N = 1150$)	ANOVA/Chi-Square
Age					***
51–64	55.59%	48.52%	72.36%	74.70%	
65–74	29.19%	32.64%	21.35%	19.39%	
75–84	13.68%	16.90%	5.81%	5.30%	
85+	1.54%	1.94%	0.47%	0.61%	
Education (0–17)	13.33 (2.75)	13.77 (2.31)	13.18 (2.35)	10.80 (4.07)	***
Female	59.62%	58.58%	65.84%	56.96%	***
Race/Ethnicity					—
Non-Hispanic White	71.47%	—	—	—	
Non-Hispanic Black	16.96%	—	—	—	
Hispanic	11.57%	—	—	—	
Married	63.27%	68.02%	41.87%	65.30%	***
Neighbourhood safety (1–5)	3.92 (1.02)	4.18 (0.88)	3.23 (1.07)	3.37 (1.09)	***
Religious attendance (1–5)	2.89 (1.43)	2.73 (1.42)	3.40 (1.37)	3.07 (1.33)	***
Urbanicity	53.48%	48.09%	68.27%	65.04%	***
Total household income (log transformed)	10.65 (1.43)	10.89 (1.07)	10.19 (1.73)	9.84 (2.22)	***
Total assets (inverse hyperbolic sine transformation applied)	10.54 (6.69)	11.81 (5.48)	7.36 (8.15)	7.35 (8.27)	***
Self-rated memory					***
Excellent	2.48%	1.96%	3.56%	4.17%	
Very good	19.57%	17.45%	21.77%	29.39%	
Good	44.19%	45.62%	40.69%	40.52%	
Fair	27.28%	29.33%	25.68%	16.96%	
Poor	6.48%	5.64%	8.30%	8.96%	
Self-rated health (1–5)	3.36 (1.01)	3.51 (0.96)	3.05 (1.02)	2.92 (1.05)	***
Depressive symptoms (0–8)	1.23 (1.86)	1.07 (1.74)	1.58 (1.97)	1.74 (2.22)	***
Presence of co-morbidities	73.75%	76.07%	70.28%	64.43%	***
Having ADL limitations	10.31%	7.80%	15.84%	17.74%	***
Years of formal volunteering (0–4)	1.65 (1.64)	1.71 (1.65)	1.74 (1.61)	1.12 (1.48)	***
Years of informal volunteering (0–4)	2.29 (1.48)	2.43 (1.45)	2.26 (1.47)	1.54 (1.45)	***

***$p < 0.001$.

of formal (Relative Risk Ratio, RRR = 0.92, $p < 0.05$) and informal (RRR = 0.94, $p < 0.05$) volunteering engagement significantly reduced the likelihood of CIND. More years of formal volunteering engagement (RRR = 0.81, $p < 0.05$) also significantly reduced the likelihood of dementia (Table 2, Model 3). Results in Table 3 (Model 1) show that, neither formal nor informal volunteering was significantly related to subjective cognitive impairment.

In addition, the relationships between informal volunteering and objective cognition varied by race/ethnicity (Figure 1). As Table 2 (Model 2) indicated, compared to non-Hispanic White participants, non-Hispanic Black participants with more years of informal volunteering were significantly more likely to meet study criteria for CIND over time (RRR = 1.25, $p < 0.01$). A similar trend was observed for Hispanic participants, although only of marginal significance (RRR = 1.25, $p = 0.09$). No statistically significant interactions were observed between formal volunteering and race/ethnicity (Table 2, Models 2 & 4).

4 | DISCUSSION

Using a sample that was cognitively unimpaired at baseline, this study investigated the cognitive effects of volunteering engagement in a

TABLE 2 Multinomial logistic regression of the Association between different types of volunteering and objective cognitive impairment

	Objective cognitive impairment			
	Relative risk ratios			
	CIND vs no impairment		Dementia vs no impairment	
Variables	Model 1	Model 2	Model 3	Model 4
Years of formal volunteering	0.92*	0.92*	0.81*	0.78*
Years of informal volunteering	0.94*	0.90**	0.92	0.88
Race/Ethnicity (ref: White)				
Non-Hispanic Black	2.52***	1.68*	1.95	1.13
Hispanic	0.98	0.74	0.91	0.60
Age (ref: 51–64)				
65–74	2.16***	2.15***	3.29***	3.30***
75–84	5.11***	4.98***	10.20***	9.97***
85+	9.69***	9.32***	22.36***	21.74***
Education	0.86***	0.86***	0.87***	0.87***
Female	0.79*	0.78**	1.00	0.99
Married baseline	0.91	0.91	1.05	1.04
Neighbourhood safety baseline	1.08	1.07	1.04	1.04
Neighbourhood safety follow-up	0.87**	0.87**	0.82	0.83
Religious attendance baseline	1.02	1.02	1.34**	1.34**
Religious attendance follow-up	0.98	0.97	0.87	0.87
Urbanicity baseline	0.82*	0.82*	0.78	0.77
Total household income baseline	0.99	0.99	0.92	0.92
Total household income follow-up	0.94	0.93*	0.87**	0.86**
Total assets baseline	1.00	1.00	1.01	1.01
Total assets follow-up	0.99	0.99	0.98	0.98
Self-rated memory baseline	1.06	1.07	0.72*	0.73*
Self-rated memory follow-up	1.31***	1.31***	2.11***	2.11***
Self-rated health baseline	0.93	0.93	0.97	0.97
Self-rated health follow-up	1.03	1.03	0.87	0.88
Depressive symptoms baseline	1.07**	1.07**	1.08	1.08
Depressive symptoms follow-up	1.07*	1.07**	0.98	0.98
Having health conditions baseline	1.06	1.06	0.93	0.94
Having health conditions follow-up	0.76	0.75	0.67	0.66
Having ADL limitations baseline	1.01	1.02	1.31	1.32
Having ADL limitations follow-up	0.98	0.99	1.11	1.11
Years of formal volunteering X Race				
Non-Hispanic Black		0.95		1.17
Hispanic		0.92		1.06
Years of informal volunteering X Race				
Non-Hispanic Black		1.25**		1.19
Hispanic		1.25		1.31

*$p<0.05$; **$p<0.01$; ***$p<0.001$.

national older adult sample including multiple racial/ethnic groups. Our first hypothesis was partially supported: both formal and informal volunteering are beneficial for objective cognition over time, but no relationship with subjective cognition. Although previous studies have documented associations with risk of cognitive decline by different types of cognitively stimulating social activities, such as one-on-one social activities (e.g. talk to friends or family) and group social activities (e.g. attending social clubs) (Bielak et al., 2014; Jopp

TABLE 3 Ordered logistic regression of the Association between different types of volunteering and subjective cognitive impairment

	Subjective cognitive impairment	
	Odds ratio	
Variables	Model 1	Model 2
Years of formal volunteering	1.01	1.01
Years of informal volunteering	0.98	0.98
Race/Ethnicity (ref: Non-Hispanic White)		
Non-Hispanic Black	1.02	1.03
Hispanic	1.04	1.10
Age (ref: 51–64)		
65–74	1.06	1.06
75–84	0.99	0.99
85+	0.96	0.96
Education	0.95***	0.95***
Female	0.92	0.92
Married baseline	1.02	1.01
Neighbourhood safety baseline	1.02	1.02
Neighbourhood safety follow-up	0.85***	0.85***
Religious attendance baseline	0.97	0.97
Religious attendance follow-up	1.03	1.03
Urbanicity baseline	0.83***	0.83***
Total household income baseline	1.07**	1.07**
Total household income follow-up	0.95*	0.95*
Total assets baseline	1.01	1.01
Total assets follow-up	1.01*	1.01*
Self-rated memory baseline	3.94***	3.95***
Self-rated memory follow-up	—	—
TICS follow-up	1.50***	1.50***
Self-rated health baseline	0.97	0.97
Self-rated health follow-up	0.67***	0.67***
Depressive symptoms baseline	0.94***	0.94***
Depressive symptoms follow-up	1.13***	1.13***
Having health conditions baseline	0.90	0.90
Having health conditions follow-up	1.01	1.01
Having ADL limitations baseline	0.87	0.87
Having ADL limitations follow-up	1.06	1.05
Years of formal volunteering X Race		
Non-Hispanic Black		1.07
Hispanic		0.87
Years of informal volunteering X Race		
Non-Hispanic Black		0.95
Hispanic		1.06

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

& Hertzog, 2010; Park et al., 2014), the evidence of protective impacts of volunteering was limited to formal volunteering (e.g. Kail & Carr, 2020; Proulx et al., 2018). Our findings add important evidence to the literature that informal volunteering could be beneficial to the cognitive health of older adults as well. While participation in formal and informal volunteering is likely to be interrelated, formal volunteering may be more selective (i.e. increased human capital) than informal volunteering (Lee & Brudney, 2012). Given the significant cognitive benefits, promoting informal volunteering in old age may be a good alternative for those who are not suitable for formal volunteering or vice versa, although we should be cautious about the unequal or even opposite effects of informal volunteering among racial/ethnic minority groups.

Contrary to our hypothesis, neither formal nor informal volunteering was significantly associated with subjective cognition. This finding suggested a discrepancy between objective and subjective cognition in older adults. As was implied by previous research (Zlatar et al., 2018), subjective measures of cognitive function may not accurately reflect concurrent cognitive performance. Nonetheless, the inclusion of subjective cognitive impairment as one of our outcomes of interest is worthwhile given that multiple studies have found subjective cognitive impairment is associated longitudinal decline in objective memory measures, higher levels of Alzheimer's brain pathology and increased risk of future cognitive impairment (John et al., 2020; Kryscio et al., 2014).

As for our second hypothesis, we found evidence of race/ethnicity moderating the association between informal volunteering and cognitive function. For White older adults, more years of engagement in informal volunteering was associated with better cognitive function. In contrast, more years of informal volunteering significantly increased the risk for CIND among non-Hispanic Black older adults. A similar racially differentiated relationship has been documented by a previous study (Tavares et al., 2013) using the same data source on a different health outcome: engagement in formal volunteering significantly decreased hypertension risk and lowered blood pressure among White older adults only, but not non-Hispanic Black older adults. Aligning with the Tavares study, we believe our results could be linked to racial disparities in hypertension, arguably the biggest risk factor following age for cognitive impairment (Alzheimer's Association, 2021). Another possibility for this result may relate to racial differences in informal volunteering engagement and the health burden associated with it. Often unrecognised and excluded from official counts (Crittenden, 2019), people of colour, including Black older adults, were found significantly more likely to provide and to spend more hours on informal care compared to Whites by previous research (Cohen et al., 2017). Moreover, informal volunteering plays a more significant role in the lives of traditionally disadvantaged and socially discriminated against groups (e.g. people of colour) than those in hegemonic social groups (Dean, 2021). Therefore, as an activity that is easier to access without bureaucracy associated or transportation arrangement needed, informal volunteering (e.g. neighbouring, mutual aid) for Black older adults may be an obligatory form of help given to friends and family in their social networks. While other factors may play a role in this unexpected finding, one possibility could be that due to the burden associated with the high prevalence of informal volunteering, in comparison

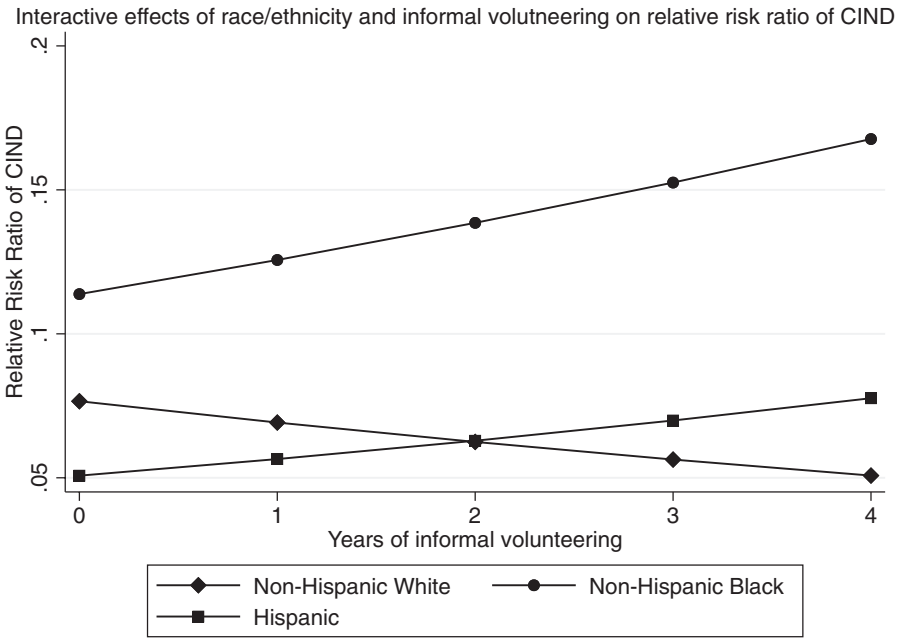

FIGURE 1 Interactive effects of race/ethnicity and informal volunteering on relative risk ratio of CIND.

with other racial/ethnic groups, Black older adults with multiple informal support roles are significantly more likely to have worse self-rated health (Kim et al., 2019), which is linked to a higher risk of cognitive impairment (Bond et al., 2006). Future research is urged to explore pathways through which informal volunteering influence cognitive impairment across racial/ethnic groups.

Several limitations are worth noting. First, we used a sample that was cognitively normal at baseline and remained alive throughout the study window. Thus, the findings of this study apply to a relatively healthy study sample and cannot be generalised to individuals who already have cognitive impairment. Second, the non-Hispanic Black participants in our study were comparatively young, predominantly female, and were more likely to be single, implying that racial/ethnic minority groups were not well sampled in HRS. Third, the TICS score was used as our measure for classifying individuals with cognitive impairment. Although this has been demonstrated to have sufficient psychometric properties, it is not equivalent to a formal cognitive impairment diagnosis from a health professional.

5 | CONCLUSION

Volunteering has been shown to benefit both physical and mental health for older adults (Morrow-Howell et al., 2003). Our findings further suggest that volunteering, both formal and informal, could be considered to promote cognitive health among older populations. This adds evidence to the importance of modifiable lifestyle preventative measures for cognitive health, especially since there are limited options to treat dementia (Alzheimer's Association, 2021). Given the broad definitions for both formal and informal volunteering utilised in this study, however, future research is needed to explore whether certain types of volunteering activities, such as in religious, educational or non-institutional settings, may particularly benefit cognitive health.

The racial/ethnic differences detected in our study suggest that future research should avoid focusing too much on a 'White model' (Gonzales et al., 2016) that uses predominantly Caucasian sample and race/ethnicity as 'control' variables rather than variables of inquiry. Researchers are encouraged to extrapolate the potential pathway of the health and mental health toll from heavy informal helping demands on the cognitive health of minority populations. Also, given that objective cognition declined among non-Hispanic Black older adults with more years of informal volunteering, practitioners are urged to monitor cognitive health among older Black adults who are long-term informal volunteers.

Despite the limitations, findings from this study advance the current knowledge by adding evidence on how both formal and informal volunteering are associated with subjective and objective cognition across different racial/ethnic groups. Our findings indicate any type of volunteering is a viable approach to prevent cognitive impairment. However, more research is needed to better understand why racial/ethnic minority older adults do not benefit from informal volunteering.

AUTHORS' CONTRIBUTION

All the authors contributed to the conceptualisation and study design. Wang did data management, analysis and visualisation. Wang and Wong prepared the manuscript. Amano and Shen reviewed, revised and edited the manuscript.

ACKNOWLEDGEMENT

The authors thank Dr. Shenyang Guo for his Generalised Linear Models course offered at Washington University in St. Louis.

FUNDING INFORMATION

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in the Health and Retirement Study (HRS) at https://hrs.isr.umich.edu. The HRS is supported by the National Institute on Aging (NIA U01AG009740) and the Social Security Administration.

ORCID

Yi Wang https://orcid.org/0000-0003-1359-5712
Roger Wong https://orcid.org/0000-0002-2243-1990

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How to cite this article: Wang, Y., Wong, R., Amano, T., & Shen, H-W (2022). Associations between volunteering and cognitive impairment: The moderating role of race/ethnicity. *Health & Social Care in the Community*, *30*, e4433–e4441. https://doi.org/10.1111/hsc.13847