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Volunteering as a predictor of all-cause mortality: what aspects of volunteering really matter?

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ABSTRACT

Background: This study evaluates the predictive effects of different aspects of volunteering (e.g. volunteering status, number of hours, number of years, and type of volunteering activity) on all-cause mortality.

Methods: A seven-year follow-up dataset of a nationally representative sample of Israelis, 60 years and older was used.

Results: As expected, volunteering was associated with a reduced mortality risk even after adjusting for age, gender, education, baseline mental health and physical health, activity level, and social engagement. Those who volunteered for 10 to 14 years had a reduced mortality risk relative to non-volunteers. In addition, those who volunteered privately, not as part of an official organization, also had a reduced mortality risk compared to non-volunteers. The number of hours of volunteering was not a significant predictor of all-cause mortality in the fully adjusted model. In additional sensitivity analyses limited to those who volunteered, none of the various aspects of volunteering was associated with a reduced mortality risk.

Conclusions: Results suggest that not all aspects of volunteering have the same predictive value and that the protective effects of length of volunteering time and type of volunteering are particularly important. However, whether or not volunteering is the most consistent predictor of mortality and whether once a person volunteers the various aspects of volunteering are no longer associated with mortality risk.

Key words: death, role theory, continuity theory, role strain, activity theory, resilience

Introduction

With the increase in life span, many older adults have opportunities to contribute to society, even after retirement, by engaging in voluntary activities. Research

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has shown that the effects of volunteering go well beyond the potential benefits to society (Wheeler, *et al.*, 1998; van Willigen, 2000). Currently, there is a plethora of research demonstrating a positive association between volunteering, well-being and physical health (Morrow-Howell *et al.*, 2003; Greenfield and Marks, 2004). Furthermore, research has shown that volunteering is associated with a lower risk for all-cause mortality (Musick *et al.*, 1999; Shmotkin *et al.*, 2003; Harris and Thoresen, 2005).

Writers from several theoretical backgrounds have attempted to explain the positive effects of volunteering. First, activity theory (Lemon *et al.*, 1972; Gubrium, 1973; Herzog and House, 1991) suggests that volunteering, like other leisure time activities, provides the individual with a sense of purpose and control, increased energy, and an opportunity to take on an active stance in life. This theory suggests that the more active one is the healthier one will be (Adelmann, 1994a; 1994b; Musick *et al.*, 1999). Similarly, role theory (Chambre, 1987) suggests that volunteering allows the older adult to maintain the role of a productive individual in society (Morrow-Howell *et al.*, 2003). Whereas some have argued that the more social roles one is engaged in the better one's mental and physical health (Moen *et al.*, 1992; Adelmann, 1994a; 1994b), others suggest that it is not the number of roles that matters, but the congruity between one's roles and one's self identity (Herzog *et al.*, 1990). This approach is in line with the continuity theory (Atchley, 1989), which suggests that maintaining similar roles and role identities throughout life is an important protective factor. Some have also suggested that too many roles can result in role strain and may even have a negative effect on the individual (Merton, 1957; Goode, 1960; Pearlin, 1983). An alternative explanation comes from social engagement theory, which suggests that being part of society and maintaining social ties are important factors that contribute to older adults' mental and physical well-being (House *et al.*, 1988). Volunteering provides the individual with a variety of opportunities to engage in social activities (Midlarsky and Kahana, 1994; Oman *et al.*, 1999) and these, in turn, account for the positive effects of volunteering (Young and Glasgow, 1998).

Epidemiological studies of volunteering and mortality have concluded that those who volunteer have a lower risk for mortality than those who do not volunteer, even after age, education, physical and mental health, activity level, and social ties are taken into account (Musick *et al.*, 1999; Harris and Thoresen, 2005). Despite these encouraging and unequivocal findings, several questions remain unanswered. First, whereas some found that more frequent volunteering is associated with a lower risk for death in a linear fashion (van Willigen, 2000; Louh and Herzog, 2002; Harris and Thoresen, 2005), others suggested a curvilinear relationship, in which only moderate levels of volunteering are associated with a lower risk for mortality (Musick *et al.*, 1999). Thus, further evaluation is needed in order to decipher whether volunteering has a dose effect, so that more is better or is there a threshold effect, so that volunteering in moderation provides the optimal effect. If a dose effect is found, findings could potentially provide support for the activity theory (Lemon *et al.*, 1972) and social engagement theory (House *et al.*, 1988). Alternatively, if a threshold effect

is found, findings could potentially provide support for the role strain theory (Goode, 1960), which suggests that too much volunteering may burden the individual and that an optimal level of volunteering activity is needed.

A second question that has not yet been examined in past research concerns the optimal length of volunteering time required to accrue these benefits. It is unknown whether taking on volunteering activities recently has the same beneficial effect as being engaged in volunteering activities for many years. If those who have been volunteering for many years have a lower risk for mortality relative to those who have taken on volunteering recently then further support of the continuity and role theories is provided as these theories would predict that those who have been able to maintain a stable and productive role throughout their lives are better off than those who had to go through changes of roles (Atchley, 1989). On the other hand, if number of years of volunteering has no effect over one's mortality risk then activity theory (Lemon *et al.*, 1972; Gubrium, 1973; Herzog and House, 1991) is supported as this theory suggests that merely being active is enough for impacting positively one's mental and physical health.

Furthermore, to date, none of the studies reviewed has evaluated whether volunteering as part of an organization is the same as volunteering privately, independent of an official organization (e.g. providing assistance to the sick, the elderly and children). Evaluating this question can assist in further examining the role theory. Based on role theory and given the expectation that volunteering as part of an official organization provides a more defined social role than volunteering privately, one would expect volunteering as part of an official organization to serve as a better protective mechanism against mortality.

Last, whereas some researchers found a moderating effect of social engagement on volunteering, so that those who are less socially engaged or have experienced more losses benefit the most from volunteering (Musick *et al.*, 1999; Greenfield and Marks, 2004), others found the opposite effects, so that those who are more socially active receive the greatest benefits associated with volunteering (Harris and Thorethen, 2005; Oman *et al.*, 1999). Thus, further research is required in order to assess the relationship between volunteering and social engagement.

Finally, to date, all the studies reviewed here used non-volunteers as the reference group and failed to evaluate whether the various aspects of volunteering have a significantly different association with all-cause mortality within the group of volunteers.

In the present study, I used a nationally representative sample of Israeli older adults to identify the specific aspects of volunteering that are associated with a lower mortality risk. Based on past research and the activity theory, I expected higher frequency of volunteering activity to be associated with a lower mortality risk. In support of the continuity and the role theories, I expected those who have been volunteering for longer periods of time to have a lower risk for mortality. In addition, I expected volunteering for an official organization to be associated with a reduced risk for mortality compared with non-volunteers. In accordance with past research, I also expected those who are less active (i.e. do not work, do not attend religious services, do not exercise) and those who have fewer social

ties (not married, live alone) to receive the greatest benefits from volunteering. Finally, I expected these associations to hold even when the analyses are restricted to only those who volunteer.

Methods

Sample

Between the years 1997 and 1998, the Israeli Central Bureau of Statistics conducted a face-to-face national survey of Israelis aged 60 years and older in order to gain a broad perspective on the lives of older adults in Israel. The Israeli Central Bureau of Statistics drew a random sample of all individuals born prior to 1938 using data from the 1995 census to guide the sampling procedure. A clustered sampling method was employed to obtain representation of older Jews who came to Israel prior to 1989, those who came to Israel after 1990, and Arabs. Sampling also obtained representative samples of those living alone, living with a partner, and living with younger people. Males and females were stratified based on age (60–64; 65–69; 70–74; 75–79; 80+). The sampling population did not include those who lived outside of Israel for over a year, those who lived in long-term care settings other than senior housing, those who were hospitalized for over six months, and those who lived in a Kibbutz or a Moshav (i.e. a rural settlement). The final sample included 5055 individuals, yielding a response rate of 83.2%.

Measures

Time to death was obtained from Israel's National Death Record, available for the years 1997–2004. All other information was gathered in a face-to-face interview, conducted by trained interviewers during the years 1997 and 1998.

Outcome variable

Time of death. The Israeli Central Bureau of Statistics linked the survey with Israel's National Death Record, which contains information about all deaths occurring in Israel. Year of death was available for the years 1997 to 2004. All legal Israeli residents have a Personal Identity Numbers (PINS) given by the Israeli National Population Register (INPR). These PINS were available for all sample participants. All death records in Israel are linked to the INPR though PINS. More than 96% of sample participants were identified not only by their PIN number but also by year of birth and sex (through the INPR). In addition, over 98% of the death records in the sample were identified not only by their PIN, but also by year of birth and sex. With regard to time of death, for 97.7% of sample participants there was complete follow-up. The only loss to follow-up was of those participants who had moved abroad and died over there.

Predictors

Volunteering activity. First, participants were asked whether they are volunteers within an organization (e.g. the Israeli equivalent of the Salvation Army, Citizen's

Police, etc.) or provide ongoing unpaid assistance to the sick, older adults or children (but not to one's own family members or grandchildren). Those who acknowledged being volunteers were then asked about the number of hours per week they volunteer (response options available to participants were: not at all, <1hour, 5–9 hours, >10 hours, a varied number of hours) and the number of years they have been volunteering (available response options were: not at all, ≤ 4 years, 5–9 years, 10–14 years, >15 years). Lastly, participants were asked whether they volunteer as part of an organization or on their own initiative, such as providing assistance to the sick, to older adults or to children (but not one's own family members or grandchildren).

Covariates. As with past research, I classified covariates into four groups: (a) sociodemographic variables, (b) physical and mental health; (c) activity level; and (d) social engagement.

(a) Sociodemographic variables included: age (60–69, 70–79, 80+), gender, and education (0–8, 9–12, 13+).
(b) Physical and mental health variables included: activities of daily living (ADL; Katz *et al.*, 1970), instrumental activities of daily living (IADL; Lawton and Brody, 1969), physical health (a list of common medical conditions, such as cancer, heart attack, diabetes, etc.; Israel Central Bureau of Statistics, 1985), and mental health (General Health Questionnaire-12; Goldberg and Williams, 1988). These variables were categorized into no impairments/symptoms, 1–2 impairments/symptoms, and >2 impairments/symptoms.
(c) Activity level was determined by the following variables: regular physical exercise (yes/no), employment status (employed/not employed), and attendance at synagogue or another praying facility (yes/no).
(d) Social engagement was indicated by marital status (married/not married) and living situation (alone/not alone).

Analysis

I first ran descriptive analyses to explore the frequencies and distributions of the variables of interest. Owing to multi-collinearity among the different aspects of volunteering, I conducted separate Cox analyses, examining the unique contribution of each volunteering characteristic (e.g. volunteer status, number of hours of volunteering per week, number of years of volunteering, and volunteering as part of an official organization versus privately) to all-cause mortality risk. Those who did not die within the study period (1997–2004) were censored at the end of this period (i.e. 2004). All analyses were adjusted for the four classes of covariates listed above.

To evaluate the moderating effects of volunteering with one's social ties and activities; I conducted moderation analyses (Baron and Kenny, 1986), examining the interaction between volunteering and each of the social ties (marital status, and living arrangement) and activity (employment status, attendance

at religious services, exercise) variables separately. I also evaluated gender and age interactions with volunteering.

In an additional sensitivity analyses, I repeated the same analyses only with those who volunteered in order to evaluate the risk of the various aspects of volunteering among the group of volunteers.

Results

Overall, 10.7% of the sample acknowledged being a volunteer. Of these, 45.1% volunteered for less than one hour per week, 22.6% volunteered between five to nine hours, 20.7% volunteered for 10 or more hours, and 10.6% volunteered on a varied schedule. In addition, of those who volunteered, 32.4% volunteered for four or fewer years, 24.8% volunteered for five to nine years, 13.4% volunteered for 10 to 14 years, and 29.2% volunteered for 15 or more years. Last, of those who volunteered, 60.9% volunteered as part of an organization, whereas 38.5% volunteered privately, with no involvement in an organization.

There were significant differences between those who volunteered and those who did not volunteer on most variables (see Table 1). Volunteers were significantly younger, more educated, and of better mental and physical health. In addition, volunteers were less likely to engage in a regular physical activity and more likely to be employed, to live alone, and to attend a praying facility.

Some 23.5% of the entire sample died during the seven-year follow-up of the study. Relative to those who did not volunteer (24.8% mortality), those who volunteered had a lower mortality rate (12.2%) even after adjusting for all covariates (Table 2).

Unadjusted for any of the covariates, the number of volunteering hours per week was a significant predictor of all-cause mortality (see Table 2). Relative to non-volunteers (24.8%), those who volunteered for less than one hour (13.1% mortality), between five to nine hours (11.0% mortality) and more than 10 hours (10.9% mortality) had a lower risk for all-cause mortality, whereas those who reported volunteering for varied amounts of time (14.5% mortality) did not have a reduced mortality risk. However, in the fully adjusted model, the number of hours one volunteered was no longer a significant predictor of all-cause mortality.

Number of years of volunteering was a significant predictor of all-cause mortality in the unadjusted model. Relative to those who did not volunteer, those who volunteered for less than four years (10.3% mortality), between five and nine years (14.4% mortality), between 10 and 14 years (7.7% mortality) and for 15 years or more (14.8% mortality), all had a reduced risk for death. However, in the adjusted model, only those who volunteered for 10 to 14 years had a reduced risk for death compared to those who reported no volunteering activity.

In the unadjusted model, type of organization was a significant predictor of all-cause mortality, with both those who volunteered as part of an organization (12.8% mortality) and those who volunteered indepndently (11.5% mortality)

Table 1. Demographic and clinical characteristics of the sample (n = 5,055)[a]

	NON-VOLUNTEERS (89.2%)	VOLUNTEERS (10.7%)	χ^2	P
Age			15.10	0.005
60–69 years	47.0	45.7		
70–79 years	36.6	43.4		
80+	16.2	10.8		
Gender			4.31	0.07
Female	56.5	51.9		
Education			106.74	<0.001
0–8 years	48.5	26.1		
9–12 years	28.3	35.1		
13+	23.1	38.6		
Number of ADL impairments			88.75	<0.001
0	74.8	92.6		
1–2	9.8	4.4		
>2	15.3	2.9		
Number of IADL impairments			147.85	<0.001
0	42.1	66.9		
1–2	21.2	20.3		
>2	36.5	12.6		
Number of medical conditions			18.50	0.002
0	22.9	30.2		
1–2	54.7	53.2		
>2	22.3	16.5		
Number of mental health symptoms			18.50	0.002
0	22.9	30.2		
1–2	54.7	53.2		
>2	22.3	16.5		
Physical exercise			164.87	<0.001
No	32.5	60.4		
Employment status			8.03	0.03
Not employed	84.8	80.2		
Attendance at praying facility			32.8	<0.001
No	42.1	29.3		
Marital status			2.92	0.18
Not married	37.3	33.5		
Living situation			25.8	<0.001
Not alone	78.5	68.9		

[a] Weighted percentages are reported.

having a reduced risk for death. However, in the fully adjusted model, only those who volunteered independently had a reduced mortality risk (see Table 2).

In five separate Cox analyses, which examined each of the five interactions separately, there was no interaction between volunteering and any of the social ties (volunteering * marital status HR = 0.83, 95%CI: 0.45–1.54, volunteering * living situation HR = 0.99, 95% CI: 0.53–1.86) or the social activity indicators

Table 2. The various aspects of volunteering as predictors of all-cause mortality

	%	INCIDENCE OF DEATH	UNADJUSTED HR(95%CI)	χ^2 (DF)	P	ADJUSTED HR(95%CI)[a]	χ^2 (DF)	P
Volunteering				25.6 (1)	<0.001		933.5 (18)	<0.001
No (reference)	10.7	24.8						
Yes		12.2	0.47 (0.35–0.63)			.69 (0.51–0.92)		
Hours volunteering				25.1 (4)	<0.001		949.1 (21)	<0.001
None (reference)								
<1	4.8	13.1	0.49 (0.32–0.75)			0.76 (0.49–1.17)		
5–9	2.4	11.0	0.44 (0.22–0.86)			0.61 (0.30–1.25)		
10+	2.2	10.9	0.42 (0.22–0.79)			0.60 (0.32–1.10)		
Varied	1.1	14.5	0.57 (0.29–1.14)			0.87 (0.44–1.68)		
Years volunteering				27.1 (4)	<0.001		944.2 (21)	<0.001
None (reference)								
≤4	3.4	10.3	0.36 (0.21–0.64)			0.62 (0.35–1.11)		
5–9	2.6	14.4	0.57 (0.33–0.99)			0.84 (0.48–1.48)		
10–14	1.4	7.7	0.27 (0.11–0.67)			0.36 (0.15–0.86)		
≥15	3.1	14.8	0.61 (0.39–0.96)			0.79 (0.50–1.25)		
Type of volunteering				25.2 (2)	<0.001		935.5 (19)	<0.001
None (reference)								
Organization	6.5	12.8	0.49 (0.34–0.71)			0.77 (0.52–1.12)		
No organization	4.1	11.5	0.44 (0.28–0.71)			0.59 (0.37–0.95)		

[a] Analyses were adjusted for age, gender, education, baseline physical health and mental health, activity level, and social ties.
HR = Hazard Ration; CI = Confidence Interval. Cox regression analyses were conducted with each of the aspects of volunteering separately.

Table 3. The various aspects of volunteering as predictors of all-cause mortality only among volunteers

	UNADJUSTED HR(95%CI)	χ^2 (DF)	P	ADJUSTED HR(95%CI)[a]	χ^2 (DF)	P
Hours volunteering		0.5(3)	0.91		73.73(23)	<0.001
<1 (reference)						
5–9	0.89 (0.40–1.97)			0.73 (0.32–1.70)		
10+	0.86 (0.41–1.81)			0.57 (0.23–1.42)		
Varied	1.17 (0.52–2.61)			0.91 (0.42–1.96)		
Years volunteering		3.9(3)	0.27		75.52(23)	<0.001
≤4 (reference)						
5–9	1.56 (0.71–3.41)			1.44 (0.60–3.42)		
10–14	0.73 (0.25–2.11)			0.52 (0.15–1.77)		
≥15	1.64 (0.80–3.37)			1.21 (0.52–2.78)		
Type of volunteering		0.1(1)	0.74		65.1(21)	<0.001
Organization (reference)						
No organization	0.90(0.50–1.62)			0.74 (0.36–1.54)		

[a] Analyses were adjusted for age, gender, education, baseline physical health and mental health, activity level, and social ties.
HR = Hazard Ration; CI = Confidence Interval. Cox regression analyses were conducted with each of the aspects of volunteering separately.

(volunteering * employment status HR = 0.66, 95% CI: 0.28–1.55, volunteering * attendance at religious services HR = 0.74, 95% CI: 0.40–1.39, volunteering * regular exercise HR = 0.85, 95% CI: 0.46–1.55). There also was no interaction between volunteering and age (volunteering * age HR = 0.95, 95% CI: 0.63–1.44) or volunteering and gender (volunteering * gender HR = 0.90, 95% CI: 0.49–1.66).

In additional sensitivity analyses, I repeated the same analyses only for those who volunteered (Table 3). Within the group of volunteers, there was no significant difference in the risk for mortality between those who volunteered for five to nine hours, ten hours or more, or a non-fixed number of hours, relative to those who volunteered for less than an hour. There also was no significant difference between those who volunteered for four years or less relative to those who volunteered for five to nine years, ten to fourteen years or fifteen years. Lastly, there was no significant difference between those who volunteered for an organization relative to those who volunteered independently. Results remained the same when adjusted for all covariates.

Discussion

The present study is unique because it evaluates several aspects of volunteering in order to disentangle those particular aspects that make volunteering so beneficial to the individual. Findings support past research and suggest that volunteering is indeed associated with a variety of positive affects including lower mortality risk. Relative to non-volunteers, those individuals who volunteer not only are

more educated and of better mental and physical health, but also have a lower risk for death once all sociodemographic, baseline mental and physical health, social contacts, and activity variables are accounted for.

Unexpectedly, the number of hours of volunteering was not a significant predictor of all-cause mortality in the multivariate analysis. This finding is different from several studies that found a linear effect of volunteering frequency, so that those who volunteered for more hours had a reduced risk for mortality (Harris and Thoresen, 2005; Louh and Herzog, 2002; van Willigen, 2000). It also is different from Musick *et al.* (1999) who found a trend (though not significant) toward a curvilinear effect of volunteering. Instead, the present findings suggest that there is no dose effect for volunteering and that simply volunteering or not is more important than volunteering frequency.

Contrary to expectations, there was a curvilinear relationship between years of volunteering and mortality risk. In the fully adjusted model, those who volunteered for 10 to 14 years had a significantly lower risk for death, whereas those who volunteered for fewer or more years did not have a reduced mortality risk relative to non-volunteers. This finding provides only partial support for the continuity and role theories, by suggesting that those who have already established their social role as volunteers 10 to 14 years ago receive the greatest benefits from volunteering. However, contrary to expectations, those who volunteered for the greatest amount of time did not show such a beneficial effect for volunteering. One possible explanation is that those who have volunteered for the greatest amount of time were unable to maintain the same volunteering role they started with, because of both internal and external changes that are almost inevitable during such a long period of time. Thus, the continuity theory does not apply to these individuals who have been volunteers for such a long period of time and likely to have gone through changes in their volunteering role over the years. Further qualitative research might help to improve our understanding of the difference between those who volunteered for 10 to14 years and those who volunteered for more than 15 years.

Another unexpected finding of this study is that those who volunteered independently, not as part of an official organization, had a reduced mortality risk compared to non-volunteers, whereas those who volunteered in an organized fashion did not have a reduced mortality risk. It is possible that those who volunteer independently of an official organization work on their own initiative guided by the wish to help others, and are less guided by potential secondary gains associated with volunteering, such as role identity, other people's recognition of their good deeds, or social engagement and the opportunity to meet others. In support of this hypothesis, Herzog and House (1991) have argued that the discretionary nature of volunteering is what makes it particularly beneficial.

It also is interesting to note that, in the present study, volunteering that is not part of an organization shares many of its qualities with informal caregiving but differs in that services are not provided to family members. Whereas research has shown that caregiving to older adults is a risk for all-cause mortality (Schulz and Beach, 1999), the present study shows that helping children and older adults

that are not part of one's family has a protective value. It could be that the motivation behind informal caregiving is different from the motivation behind volunteering. The former might be guided by a sense of obligation, whereas that latter might be guided by one's self-initiative and inner motivation. The impact of past relationships with family members on current caregiving experience and the fact that informal caregiving is often associated with a change in roles within the family system could also explain the negative effects of informal caregiving. These factors probably have less of a presence in the case of assistance provided to non-family members. Additional research on the motivation behind volunteering is needed to better understand the implications of the present finding.

Our study, like that of Morrow-Howell *et al.* (2003), did not support past research showing that the beneficial effects of volunteering are particularly strong among those lacking social ties (Musick *et al.*, 1999) or among those who are engaged in a variety of activities (Shmotkin *et al.*, 2003). Given the contradictory results obtained in past research, the negative findings of the present study may suggest that past findings were simply due to multiple comparisons. Further research on the moderating effect of volunteering is needed for conclusions to be drawn.

Finally, this study is the first to evaluate the unique contribution of the various aspects of volunteering within the group of those who volunteer. In additional sensitivity analyses that focused only on volunteers, none of the various aspects of volunteering described above was associated with mortality risk. Hence, the present study suggests that whether or not one volunteers is a more important indicator of mortality than any of the other aspects of volunteering examined in this study. Whereas certain aspects of volunteering are associated with a reduced risk of death relative to non-volunteers, they do not distinguish between the volunteers.

The present study has several limitations. First, the study was conducted in Israel and although the sample is representative of the Israeli population (a similar volunteering rate was reported by another Israeli national study; Shmotkin *et al.*, 2003), the findings may not apply to other cultural groups. For example, the present rate of volunteering is significantly lower than the volunteering rate reported in the U.S.A. (Sundeen, 1992), suggesting that the Israeli population has a different attitude toward volunteering. Another limitation of the present study is that response options to the question about volunteering frequency were placed in categories that did not cover the entire spectrum of time. To account for this limitation, I conducted an additional sensitivity analysis (not reported here) that evaluated those who volunteered for fewer than 10 hours per week versus those who volunteered for 10 or more hours. Results remained similar, with no significant effect to hours of volunteering in the fully adjusted model. Another limitation of the study is the prediction of all-cause mortality rather than specific cause of death. However, given the fact that cause of death in older adults is often determined by multiple reasons, I decided not to evaluate the specific cause of death. In addition, I used level of education as a proxy of socioeconomic status, but did not have other measures, such as income or assets. I also did not evaluate medical severity, but only number of medical

conditions and functional impairment. Hence, it is possible that other variables, not accounted for in the present study, confounded the association between the various aspects of volunteering and mortality. Finally, to date, there has been only limited experimental research to study the beneficial effects of volunteering in old age. The few experimental studies conducted found that volunteering improved older adults' physical health (Tan *et al.*, 2006), strength, cognitive activity, and social networks (Fried *et al.*, 2004). Further experimental research is needed to verify the epidemiological findings obtained in the present study.

Nevertheless, the present study provides a unique contribution to the study of volunteering in old age. In support of past research, it demonstrates once again the beneficial effects associated with volunteering. Furthermore, this is the first study to evaluate the unique effect of length of time of volunteering. The findings suggest a curvilinear relationship, with those who volunteer between 10 to 14 years having the lowest mortality risk, relative to non-volunteers. The study also contributes by distinguishing between volunteering as part of an official organization and volunteering independently, not as part of an official organization, and by indicating that those who volunteer independently have a reduced risk for death, relative to non-volunteers.

Health care professionals should be aware of the beneficial effects associated with volunteering, yet keep in mind that not all aspects of volunteering have similar associations with all-cause mortality. Based on the present study, encouraging individuals to engage in volunteering activities should occur early on in life. Furthermore, it appears that independent volunteering activities should receive greater attention and encouragement than volunteering activities as part of an organization. However, in the analysis of volunteers only, the finding that none of the aspects of volunteering was associated with mortality re-emphasizes the importance of simply volunteering. Further research is needed in order to decipher more clearly those aspects of volunteering that make volunteering particularly beneficial to older adults. Using qualitative methodology, a particular focus should be placed on the motivational aspects of volunteering. Experimental research designs might also be beneficial in demonstrating a cause and effect relationship between the various aspects of volunteering and mortality.

Conflict of interest

None.

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