



## Miscellaneous

## Volunteering and mortality risk: a partner-controlled quasi-experimental design

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### Abstract

**Background:** The consensus that volunteering is associated with a lower mortality risk is derived from a body of observational studies and therefore vulnerable to uncontrolled or residual confounding. This potential limitation is likely to be particularly problematic for volunteers who, by definition, are self-selected and known to be significantly different from non-volunteers across a range of factors associated with better survival.

**Methods:** This is a census-based record-linkage study of 308 733 married couples aged 25 and over, including 100 571 volunteers, with mortality follow-up for 33 months. We used a standard Cox model to examine whether mortality risk in the partners of volunteers was influenced by partner volunteering status—something expected if the effects of volunteering on mortality risk were due to shared household or behavioural characteristics.

**Results:** Volunteers were general more affluent, better educated and more religious than their non-volunteering peers; they also had a lower mortality risk [hazard ratio (HR)<sub>adj</sub> = 0.78: 95% confidence interval (CI) = 0.71, 0.85 for males and HR<sub>adj</sub> = 0.77: 95% CI = 0.68, 0.88 for females]. However, amongst cohort members who were not volunteers, having a partner who was a volunteer was not associated with a mortality advantage (HR<sub>adj</sub> = 1.01: 95% CI = 0.92, 1.11 for men and HR<sub>adj</sub> = 1.00: 95% CI = 0.88, 1.13 women).

**Conclusions:** This study provides further evidence that the lower mortality associated with volunteering is unlikely to be due to health selection or to residual confounding arising from unmeasured selection effects within households. It therefore increases the plausibility of a direct causal effect.

**Key words:** volunteering, mortality risk, quasi-experimental study

### Key Messages

- Most of the information suggesting that volunteering benefits the volunteer as well as the wider society comes from observational studies and is therefore vulnerable to uncontrolled or residual confounding.
- This census-based study uses the known similarities between married co-habiting partners to provide better adjustment for unmeasured or poorly controlled potential confounders.
- It shows a clear mortality advantage for volunteers but not their non-volunteering partners, providing the strongest evidence yet for a direct causal effect of volunteering on the volunteer.

## Background

There is now a general consensus that volunteering carries social and health benefits, not just for recipients and the wider society, but also for the volunteers themselves. Many governments are now actively seeking ways of increasing the opportunities for volunteering as a mechanism for civic engagement, especially amongst older members of society. In a series of reviews and systematic reviews,<sup>1–6</sup> this consensus has recently been extended to include an associated reduced mortality risk. One recent meta-analysis of 14 studies by Okun *et al.*<sup>7</sup> showed that organizational or formal volunteering reduced the mortality risk of people aged 55 or more by 47% [95% confidence interval (CI) = 38–55%] and by 24% (16–31%) after adjustment for mediating factors, and concluded that ‘it is no longer a question of whether volunteering is predictive of reduced mortality: rather... that the volunteering-mortality association is reliable and that the magnitude of the relationship is sizable’. Others have qualified this—Anderson *et al.*,<sup>3</sup> in a narrative review, suggested that, whereas benefits (including reduced mortality) were evident at moderate levels of volunteering, these may be less apparent at high-intensity levels; and Jenkinson *et al.*<sup>4</sup> noted that most mortality-related studies have been US-based, where there is both a strong tradition of volunteering and wide disparities in health.

However, most studies reporting the salutogenic effects of volunteering, and all of the mortality studies,<sup>8–19</sup> are based on observational study designs and are therefore potentially subject to confounding due to factors that are unmeasured or difficult to adjust for using standard analytic approaches. Therefore, despite consensus about its benefits, there is still uncertainty as to whether the lower mortality risk associated with volunteering is a result of the activity of volunteering per se or a consequence of the characteristics of those who volunteer. This may be important for purported health benefits, as volunteers are, by definition, self-selected and it is recognized that volunteers differ from those who do not across a range of factors related to mortality risk: e.g. they have higher levels of social and material resources<sup>20,21</sup>; tend to be more affluent

and better educated; have better health (especially physical health); and better social integration and more religious involvement.<sup>22–24</sup>

The ideal solution—randomization—is impractical where mortality is the outcome and, whereas there have been some attempts to trial the effects of volunteering,<sup>25–28</sup> none has included mortality as an outcome. However, other methodologies such as propensity score<sup>29</sup> matching or the use of instrumental variables<sup>30</sup> are increasingly advocated to better adjust for other potential confounders and enhance causal inference from observational studies. Another approach is to undertake comparisons within a family, effective examples of which include studies of early-life factors where sibling exposures and outcomes<sup>31–34</sup> have been matched to detect and control for familial confounding, and they have produced greater clarity about the role of maternal smoking or body mass index and hyperactivity disorder in offspring<sup>35–37</sup> or use of psychotropic medication in later life,<sup>38</sup> and about the role of education and cardiovascular disease.<sup>39</sup>

The current study uses married partners rather than siblings as controls to provide the additional adjustment for the social, environmental and lifestyle covariates that may be associated with both volunteering and mortality risk. This study utilizes the fact that not only do married and co-habiting couples share to a great extent the same physical, social and socio-economic environment, but they are often similar across a range of other physical and behavioural attributes. This can arise from the combined effects of social homogamy or phenotypic assortative mating whereby people tend to marry people similar to themselves in terms of race, level of education, social class, behaviours, etc. or through cohabitation or social interaction effects, i.e. from a continued exposure to a largely shared physical and social environment. Collectively, this means that there is a well-recognized concordance between spouses in behaviours such as smoking, diabetes and obesity and other cardiovascular risk factors,<sup>40,41</sup> alcohol dependency and other health behaviours,<sup>42,43</sup> mental health<sup>44</sup> and work-related disability.<sup>45</sup> We hypothesize that, if the lower mortality risk associated with

volunteering is due to unadjusted or poorly controlled confounders present at the household level, then this lower mortality risk will be also be evident amongst the non-volunteering partners of these volunteers. If, on the other hand, volunteering has real protective effects, then the mortality advantage should not necessarily be evident for their partner.

## Methods

The Northern Ireland Mortality Study (NIMS) is a record-linkage study comprising the census returns for the whole enumerated population and subsequently registered deaths. The details of both NIMS and linkage processes are described elsewhere.<sup>46</sup> For this study, the population at risk were those enumerated in the Northern Ireland Census (March 2011), aged 25 and over, and not living in institutional care, with mortality follow-up from the census until December 2013 (a total of 33 months).

All personal characteristics were drawn from the census and selected on the basis of their known association with either volunteering or mortality risk: these include age (in 10-year bands to 75 and over), gender and marital status (married, never married and—as a single group—those widowed, separated or divorced). Religious affiliation was also included, as religiosity has been associated with both volunteering and the effects of volunteering, and previous analyses have suggested higher levels of religiosity amongst more conservative Christians: here, six religious groups, including no affiliation, were classified (see [Table 1](#)). In this context, the more conservative Christians included smaller Protestant denominations such as Pentecostal or Evangelical groups. Socio-economic status was assessed using (i) household car availability (two or more cars, one only, no access); (ii) educational attainment (third-level, intermediate, no qualifications); (iii) economic activity; and finally (iv) a combination of housing tenure and the rateable value of the property. Rateable value had been derived as part of an exercise by central government in 2005 to determine the level of local residential tax levels payable for each household, and these data were combined with housing tenure to produce an eight-fold classification of tenure/capital value: private renting; social renting; and, for owner-occupiers, five categories ranging from less than £75 000 to over £200 000 (see [Table 1](#)), with an additional category for homes as yet unvalued.

## Volunteer status

Although researchers and organizations use a wide array of definitions of volunteering (see [ref. 47](#) for an overview), most agree that it incorporates three essential

components—whereas the activity is voluntary, unpaid and benefits recipient individuals or communities, it excludes help to close family members (care-giving). Some researchers also differentiate between formal volunteering, which is structured through an organization, and informal volunteering, which happens outside the auspices of a formal organization. For this study, volunteer status was based on a single census question: ‘In the past year, have you helped with or carried out any voluntary work without pay?’, with responses ‘yes’ or ‘no’. No further detail was sought in terms of the hours spent volunteering or whether this was in a formal or informal capacity.

## Health status

The health status of cohort members at baseline was also based on responses to a range of census questions: the first asked ‘how is your health in general’, with five responses ranging from very good to very bad; a second asked whether people had a health problem or disability that limited day-to-day activity ‘a little’ or ‘a lot’ (and had lasted, or was expected to last, at least 12 months). A further question asked about specific chronic conditions: ‘Do you have any of the following conditions which have lasted, or are expected to last, at least 12 months?’, from which we selected four that covered a wide range of physical and mental health problems: (i) ‘a mobility or dexterity difficulty (a condition that substantially limits one or more basic physical activities such as walking, climbing stairs lifting or carrying)’; (ii) ‘an emotional, psychological or mental health condition (such as depression or schizophrenia)’; (iii) ‘long-term pain or discomfort’; and finally (iv) ‘shortness of breath or difficulty breathing (such as asthma)’.

The outcome for analysis was risk of all-cause mortality during follow-up. The resulting linked data were anonymized, held in a safe setting by the Northern Ireland Statistics and Research Agency (NISRA) and made available to the research team for the purpose of this study. The use of the NIMS for research was approved by the Office for Research Ethics Committees Northern Ireland (ORECNI).

## Data manipulation and analysis strategy

Of the 1 123 205 people aged 25 and over at the census and not living in institutionalized care, we identified 308 733 married couples living in the same household with complete data on all variables examined. Descriptive statistics illustrated the distributions of: (i) individual-level socio-demographic and self-reported health characteristics, by gender and volunteer status; and (ii) household-level characteristics, by number of volunteers in the household.

**Table 1(a).** Comparison of individual characteristics of volunteers and non-volunteers in married households: data represent percentages within volunteer strata

	Male		Female	
	Non-volunteer N = 260 376	Volunteer N = 48 357	Non-volunteer N = 256 519	Volunteer N = 52 214
<b>Age(years)</b>				
25–34	10.1	8.3	13.9	11.1
35–44	21.4	21.2	22.4	24.5
45–54	23.7	28.1	23.7	28.5
55–64	20.7	22.5	19.9	21.1
65–74	15.5	14.6	14.1	12.1
75+	8.6	5.4	6.0	2.6
<b>Religion</b>				
Roman Catholic	38.6	34.7	41.2	34.7
Presbyterian	23.9	24.3	23.5	25.6
Church of Ireland	16.2	14.9	16.6	16.1
Methodist	3.6	3.8	3.8	4.1
Other Christian	6.6	12.6	6.8	12.0
Other religion	0.9	1.1	0.9	1.0
Not stated	10.2	8.7	7.1	6.5
<b>Educational attainment</b>				
Degree	27.7	51.2	31.3	52.6
Intermediate	39.8	38.0	37.7	38.0
No degree	32.4	10.8	31.0	9.3
<b>Economic activity</b>				
Employed full-time	57.9	66.7	29.3	33.5
Employed part-time	6.7	7.9	26.3	33.2
Unemployed	2.8	2.1	1.4	1.7
Retired	23.8	19.8	24.6	19.8
Homemaker/other	3.2	2.0	11.9	9.8
Permanently sick	5.5	1.5	6.4	1.9
<b>Limiting long-term illness</b>				
None	74.2	84.7	74.3	85.6
Limiting a little	10.9	10.3	11.0	9.9
Limiting a lot	14.9	5.1	14.7	4.5
<b>General health</b>				
Very good	34.8	45.3	35.8	46.6
Good	38.1	40.8	37.2	40.0
Fair	19.7	12.1	19.4	11.9
Bad	5.8	1.5	6.0	1.4
Very bad	1.5	0.2	1.5	0.2
<b>Chronic conditions</b>				
Mental ill-health	4.7	2.6	6.8	3.8
Mobility problems	15.2	6.9	15.7	7.3
Chronic pain	14.1	8.6	15.6	9.4
Breathing difficulty	9.5	6.3	9.3	6.0

Sex-specific Cox proportional hazards models were used to examine the all-cause mortality risk associated with volunteering and the mortality associated with spouses/partners.

## Results

Of the 617 466 individuals identified in the study, 16.3% identified as volunteers, representing almost a quarter

(24.3%) of the 308 733 households. Overall, there were 48 357 male and 52 214 female volunteers (15.7% and 16.9% of their respective populations). Table 1(a) shows the socio-demographic characteristics associated with volunteering: most prevalent in middle age and more common amongst people from more conservative religious faiths; those better educated, employed and in better health (recording lower levels of both mental and physical chronic

**Table 1(b).** Characteristics of couple household according to number of volunteers

	No volunteers	One volunteer	Two volunteers
<b>Number of households</b>	N = 233 864	N = 49 167	N = 25 702
<b>Tenure/property value</b>			
Owner occupier: £200k	11.9	20.1	25.9
£150–199k	14.9	20.0	22.4
£100–149k	26.9	26.6	23.9
£75–99.9k	14.8	10.8	7.9
<£75k	9.1	5.4	3.7
Owner occupier: no rateable value	6.9	8.0	8.5
Private renting	1.2	1.1	1.8
Social renting	14.2	7.9	5.8
<b>Household car access</b>			
Two or more	57.5	71.4	77.9
One	36.5	26.1	20.8
None	6.0	2.5	1.3

**Table 2.** Mortality risk stratified by sex and own volunteering status according to risk on volunteering status of partner

		Adjusted age	+ religion	+ SES	+ health
<b>Males</b>	<b>Partner</b>				
Non-volunteer	Non-volunteer	1.00	1.00	1.00	1.00
(7434)	Volunteer	0.85 (0.78,0.93)	0.85 (0.78,0.93)	0.99 (0.91,1.09)	1.01 (0.92,1.11)
Volunteer	Non-volunteer	1.00	1.00	1.00	1.00
(560)	Volunteer	0.87 (0.73,1.02)	0.87 (0.74,1.03)	0.97 (0.82,1.15)	1.06 (0.89,1.26)
<b>Female</b>	<b>Partner</b>				
Non-volunteer	Non-volunteer	1.00	1.00	1.00	1.00
(4,035)	Volunteer	0.84 (0.75, 0.96)	0.85 (0.75,0.96)	1.00 (0.88,1.13)	1.00 (0.88,1.13)
Volunteer	Non-volunteer	1.00	1.00	1.00	1.00
(282)	Volunteer	0.81 (0.64,1.02)	0.82 (0.65,1.04)	0.90 (0.71,1.14)	0.92 (0.73,1.18)

Data represent the number of deaths in each category and the hazard ratios (and 95% confidence intervals) from separate Cox proportional hazard models.

ill-health). Male and female volunteers have similar demographic profiles except for age, where a higher proportion of older men than older women volunteer. **Table 1(b)** shows the distribution of volunteers in a household by indicators of relative affluence (housing tenure and car availability) and shows clear differences between those households with a volunteer present and those without, and also that those households with two volunteers are slightly more affluent than those with one only. Almost 30% of households with two or more cars and 37% of the most expensive houses had at least one volunteer.

In 34% of volunteer households, both partners were volunteers—53% of male and 49% of female volunteers also had a partner who was a volunteer. Even after adjusting for age, religion and socio-economic status, having a partner who was a volunteer increased the likelihood of being a volunteer by almost eight-fold (full models available on request). There was a reasonable correspondence in the individual characteristics of couples across a range of variables, with 83% sharing the same religious

affiliation, 59% the same level of educational attainment and 58% the same level of general health. In models adjusted for age, religious affiliation, volunteer status, educational attainment, car availability and housing tenure and value, having one partner with chronic poor mental health increased the risk of poor mental health in the other partner by four-fold [odds ratio (OR) = 4.17: 95% CIs = 3.99, 4.36 for men and OR = 4.18: 95% CIs = 4.00, 4.37 for women].

During the 33 months of follow-up, there were 12 260 deaths, 6.9% of which were to volunteers. In models adjusted for all the demographic and socio-economic variables listed in **Table 1**, the mortality risk associated with being a volunteer was hazard ratio (HR) = 0.65: 95% CI = 0.62, 0.69 for males and HR = 0.57: 95% CI = 0.53, 0.61 for females. With further adjustment for baseline health status, this mortality risk attenuated to HR = 0.79: 95% CI = 0.71, 0.85 for males and HR = 0.77: 95% CI = 0.68, 0.88 for females. **Table 2** shows the mortality variations for all four volunteer–non-volunteer

combinations for both sexes, although the first series of analyses in which the comparison is between those non-volunteer subjects who do and do not have a volunteering partner are the most germane to this paper. In models adjusted for age, non-volunteering men and women with partners who were volunteers are about 15% less likely to die during follow-up than their peers with non-volunteering partners. This does not change with adjustment for variations in religious affiliation but the difference disappears entirely with further adjustment for socio-economic status. Further adjustment for baseline health status produces little further change. In the fully adjusted models, there are no additional mortality benefits for volunteers in having a partner who is also a volunteer.

## Discussion

This study shows the following: it confirms the established characteristics associated with volunteering—when compared with non-volunteers, they are more affluent, better educated, from more conservative religious affiliations, and physically and mentally healthier. It also confirms that, even after adjustment for a range of socio-economic and baseline health factors, volunteers have an approximately 25% lower mortality risk than their non-volunteering peers and this is true for both men and women. However, the novel finding here is the clear demonstration that, amongst co-habiting married couples where one partner is a volunteer, the effects of volunteering are seen only in the volunteer and not in their non-volunteering partner: evidence that the known associations between volunteering and lower mortality risk are unlikely to be due to unmeasured or poorly adjusted-for confounders.

Although this study design allows a robust examination of the mortality risk associated with volunteering, its strength rests on the assumptions that (i) spousal controls provide a good adjustment for unmeasured potential confounders and (ii) the effects of volunteering are only likely to be experienced by the volunteer. Whereas it is evident that comparison between spouse pairs provides excellent adjustment for most household-level factors, including socio-economic status, it is possible that some aspects of wealth or income may not be equally distributed within a household. It is also likely that between-partner comparisons provide some adjustment for other potential social, behavioural or attitudinal confounders, though it is acknowledged that this is likely to be less successful than adjustment for shared factors such as physical environment and socio-economic status. A large body of existing evidence attests to the general concordance between spouses in lifestyles and behaviours and in levels of health

status,<sup>40–45</sup> and this study also demonstrates a reasonably high degree of similarity between spouses across an array of social and health factors, including religious affiliation, educational attainment, and general and mental health. It is therefore unlikely that the mortality advantage associated with volunteering is due to residual confounding, as this would be expected to present as a somewhat lower mortality risk amongst the non-volunteering partner of a volunteer. It is, however, acknowledged that this study design cannot adjust for other possibly important unshared factors or intrinsic attributes that might confound the relationship between volunteering and mortality, such as the personality trait of conscientiousness, which is known to be related to both the propensity to volunteer<sup>48</sup> and to mortality risk.<sup>49</sup>

The second assumption, that any benefits accruing from volunteering are predominantly experienced by the volunteer, is in keeping with the large body of research related to the health benefits associated with volunteering. Whereas we accept that there may be some minor advantage to the non-volunteering partner in terms of wider social interaction or better access to health and other information, it is evident that the suggested salutogenic mechanisms emphasize the primacy of the effects on the volunteer. Social integration and role theories, underpinned by putative biopsychological mechanisms,<sup>50</sup> suggest that volunteering leads to improvements in mental and physical health by providing a sense of meaning and purpose in life,<sup>51</sup> through facilitating social integration and interaction,<sup>52</sup> and by affecting personal self-control, promoting and bolstering self-esteem,<sup>53</sup> increased self-efficacy and competence,<sup>54</sup> and distraction from personal troubles.<sup>55</sup> Volunteering may also be associated with increased levels of physical activity.

This study has significant strengths and limitations. It is a large and representative study with volunteering defined at baseline and full ascertainment of mortality records through official registrations. The fact that the study was based on census returns avoids the recognized selection bias of volunteers into social surveys.<sup>56</sup> The census also provided adjustment for other socio-demographic, socio-economic and health factors known to be associated with both volunteering and mortality risk. The census, however, also presents some limitations, as it has to trade off a population-wide coverage for quality and extent of data capture. The responses to the census question on volunteering only allowed a dichotomous classification with no additional information available as to the type, duration or intensity of the activity, or whether this was in a formal or informal capacity. However, the prevalence of approximately 16% recorded here is in keeping with previously reported European and UK levels<sup>57,58</sup> and their



socio-demographic profile matches that of these and other studies worldwide. Furthermore, the lower mortality risk for those identified as volunteering in the current study is also very similar to that reported by Jenkinson *et al.*<sup>4</sup> and Okun *et al.*<sup>7</sup> in separate meta-analyses on the effects of volunteering.

In conclusion, while this study provides some evidence for an unconfounded beneficial health effect of volunteering, additional work is required to understand how these benefits relate to the type, quality and context of volunteering. As individual level confounding might still explain some of the effect we observe, it is also important to establish the relationship of volunteering with other pro-social activity and health benefiting individual characteristics before it can be recommended as a public health intervention.<sup>4,6</sup>

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