



## Short communication

# What types of social interactions reduce the risk of psychological distress? Fixed effects longitudinal analysis of a cohort of 30,271 middle-to-older aged Australians

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## ABSTRACT

**Background:** Research on the impact of social interactions on psychological distress tends to be limited to particular forms of support, cross-sectional designs and by the spectre of omitted variables bias.

**Method:** A baseline sample with  $3.4 \pm 0.95$  years follow-up time was extracted from the 45 and Up Study. Change in the risk of psychological distress (Kessler Psychological Distress Scale) was assessed using fixed effects logistic regressions in relation to the number of times in the past week a participant: i) spent time with friends or family they did not live with; ii) talked to friends, relatives or others on the telephone; iii) attended meetings at social clubs or religious groups; and the count of people outside their home, but within one hour travel-time, participants felt close to. Separate models were fitted for men and women, adjusting for age, income, economic and couple status.

**Results:** An increase in the number of social interactions was associated with a reduction in the risk of psychological distress, with some gender differences. Interactions with friends or family were important for women (adjusted OR 0.85, 95%CI 0.74, 0.98,  $p=0.024$ ), whereas telephone calls were effective among men (adjusted OR 0.83, 95%CI 0.72, 0.96,  $p=0.011$ ). Strong effects for the number of people that can be relied on were observed for men and women, but attendance at clubs and groups was not. No age-specific effects were observed.

**Limitations:** No indicator of positive mental health.

**Conclusions:** Policies targeting greater social interactions in middle-to-older age may help protect mental health.

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## 1. Introduction

Social isolation is increasingly appreciated as a risk factor for morbidity and mortality (Cacioppo and Cacioppo, 2014; Cacioppo et al., 2015; Holt-Lunstad et al., 2015). Variation by gender and age, as well different types of social interactions has been noted (Litwin and Stoeckel, 2013; Litwin et al., 2015). Establishing causal relationships between social ties and mental health with observational data is, however, beset with significant challenges (Kawachi and Berkman, 2001). While the limitations of cross-sectional studies are well-known, causal inference remains difficult in longitudinal studies due to the potential for omitted variables bias.

Unmeasured phenomena may influence both engagement in social networks and mental health, such as introversion, negative affect or other personality traits. If such traits are consistent through time, any ensuing biases could be potentially accounted for in a longitudinal analysis using an unobserved effects model (Gunasekara et al., 2013) (often referred to as ‘fixed effects’ models (Allison, 2005)). By fitting a fixed intercept for every individual participant, all between-person variation is eliminated with each participant serving as their own control. The ‘fixed effects’ approach therefore affords an opportunity to mimic an intervention focusing on within-person variation only. The main purpose of this study was to investigate if an increase in particular types of social interactions in middle-to-older age decrease the risk of experiencing psychological distress. Furthermore, we also set out to determine whether any results were contingent upon gender and age of the participants.

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## 2. Methods

### 2.1. Data

Baseline data from 2006 to 2008 was extracted from the Sax Institute's 45 and Up Study (45 and Up Study Collaborators, 2008). Participants were randomly sampled from the Medicare Australia database (the national provider of universal health care in Australia). A self-complete questionnaire achieved a baseline response of 18% (45 and Up Study Collaborators, 2008). The first 100,000 baseline were followed up in 2010 as part of the Social Economic and Environmental Factors (SEEF) Study, replicating many of the questions asked at baseline. A total of 28,057 men and 32,347 women completed the SEEF follow-up (overall response rate of 60.4%,  $3.4 \pm 0.95$  years follow-up time). Ethical approval for the 45 and Up Study was granted by the University of New South Wales Human Research Ethics Committee (HREC 05035/HREC 10186) and the SEEF Study by the University of Sydney Human Research Ethics Committee (ref no. 10-2009/12187).

### 2.2. Outcome variable

All 10 items for constructing the Kessler Psychological Distress Scale ('K10') (Kessler et al., 2002) were asked at baseline and follow-up. The K10 measures symptoms of psychological distress experienced across 4 weeks prior to a participant's completion of the questionnaire. These questions included whether a participant had felt tired for no reason, nervous, hopeless, restless, depressed, sad or worthless. The K10 ranges from scores of 10–50, with higher scores denoting poorer mental health. In line with previous work (Byles et al., 2012; Feng and Astell-Burt, 2013; Feng et al., 2013; Phongsavan et al., 2013), a binary variable was constructed with scores of 22 and over identifying participants at high risk of psychological distress. This cut-point has been widely validated (Australian Bureau of Statistics, 2003; Furukawa et al., 2003; Kessler et al., 2002).

### 2.3. Exposure variables

Four questions from the shortened version of the Duke Social Support Index (Koenig et al., 1993) were asked at baseline and follow-up. Three of the questions assessed the number of times in the past week a participant: i) spent time with friends or family they did not live with; ii) talked to someone (friends, relatives or others) on the telephone; iii) attended meetings at social clubs or religious groups. The final question asked participants how many people outside their home, but within one hour travel-time, did they feel close to or could rely on. All four indicators of social interactions were examined separately.

### 2.4. Time-varying confounder variables

As the 'fixed effects' approach eliminates time-invariant sources of confounding (in so far as those have consistent effects through time), only time-varying confounders needed to be controlled. Risk of psychological distress is well-known to vary by age, couple status and socioeconomic circumstances (Byles et al., 2012; Feng and Astell-Burt, 2013; Phongsavan et al., 2013). Age (years) was included as a continuous indicator. Transitions in annual household income, economic status (e.g. employed, retired, unemployed) and couple status (in a couple versus not) were fitted as categorical variables.

### 2.5. Sample and missing data

A total of 14,529 (51.8%) men and 15,742 (48.7%) women reported valid outcome and exposure data. Participants missing data

were omitted. The age variable had no missing data. Separate categories were included for time-varying confounding variables with missing data.

### 2.6. Statistical analysis

The odds of experiencing psychological distress were modelled using binary logit regression fitted with the K10 variable equal/above ('1') or below a score of 22 ('0') for each participant. Separate models were fitted for men and women. A fixed effects strategy was implemented immediately to avoid making any inferences biased by time-invariant confounding. Each indicator of social interactions was fitted separately in age-adjusted models, followed by adjustment for economic status, annual household income and couple status. In fully adjusted models, statistical interaction terms were added as a final step to investigate for age-related effect measure modification in any association between social interaction indicators and risk of psychological distress. Fixed effect parameters were exponentiated to odds ratios (OR) and 95% confidence intervals (95% CIs). All analyses were conducted in Stata v.12 (StataCorp, College Station, TX).

## 3. Results

The prevalence of psychological distress in the sample increased among men and women between baseline and follow-up (Table 1). Average numbers of social interactions decreased across the same period. Annual household income distributions increased over time, as did the percentage of the sample identified as fully retired. The prevalence in each couple status category remained reasonably consistent between baseline and follow-up. Of 14,529 men and 15,742 women, 3.3% and 3.6% developed psychological distress at follow-up, 2.3% and 3.0% had psychological distress at baseline but not follow-up, and 2.2% and 2.4% experienced psychological distress at baseline and follow-up.

Of the participants missing data on psychological distress and/or social support indicators, those more likely to be omitted were male (OR 1.13, 95%CI 1.10, 1.17), have low annual household incomes (e.g. OR  $\geq$  \$70 K vs.  $<$  20 K 0.85, 95%CI: 0.81, 0.90), unemployed (OR 1.25, 95%CI 1.08, 1.45), single, divorced or widowed (OR 1.18, 95%CI: 1.13, 1.22), or aged  $\geq$  65y (OR 1.35, 95%CI 1.31, 1.39).

An increase in the number of social interactions was associated with a reduction in the risk of experiencing psychological distress in age-adjusted and fully-adjusted models (Table 2). There were some gender differences in the level of statistical significance of the odds ratios by type of social interaction. An increase in the number of interactions with friends or family was associated with a reduced risk (adjusted OR 0.85, 95%CI 0.74, 0.98,  $p=0.024$ ) for women but evidence was weaker for men ( $p=0.065$ ). Conversely, an increase in the number of times a man spoke on the telephone with friends, relatives or made other calls of a personal nature was associated with a drop in the risk of experiencing psychological distress (adjusted OR 0.83, 95%CI 0.72, 0.96,  $p=0.011$ ). An increase in the number of telephone calls was not associated with a reduction in psychological distress risk among women ( $p=0.462$ ).

Some similarities between men and women were also observed. No statistically significant associations were detected for increases in the number of times men or women attended social clubs, religious groups or other groups to which participants belonged. In contrast, an increase in the number of people that participants felt they could depend on, living outside their home but within one hour of travel, was associated with a significant reduction in the risk of psychological distress among men (adjusted OR 0.768, 95%CI 0.643, 0.918,  $p=0.004$ ) and women (adjusted OR 0.569, 95%CI 0.477, 0.679,  $p<0.001$ ). Two-way

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