

Explaining the income and suicidality relationship: income rank is more strongly associated with suicidal thoughts and attempts than income

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Abstract

Purpose Low income is an established risk factor for suicidal thoughts and attempts. This study aims to explore income within a social rank perspective, proposing that the relationship between income and suicidality is accounted for by the rank of that income within comparison groups. **Methods** Participants ($N = 5779$) took part in the Adult Psychiatric Morbidity Survey across England. An income rank variable was created by ranking each individual's income within four comparison groups (sex by education, education by region, sex by region, and sex by education by region). Along with absolute income and demographic covariates, these variables were tested for associations with suicidal thoughts and attempts, both across the lifetime and in the past year.

Results Absolute income was associated with suicidal thoughts and attempts, both across the lifetime and in the past year. However, when income rank within the four comparison groups was regressed on lifetime suicidal thoughts and attempts, only income rank remained significant and therefore accounted for this relationship. A similar result was found for suicidal thoughts within the past year although the pattern was less clear for suicide attempts in the past year.

Conclusions Social position, rather than absolute income, may be more important in understanding suicidal thoughts

and attempts. This suggests that it may be psychosocial rather than material factors that explain the relationship between income and suicidal outcomes.

Keywords Suicide · Social rank theory · Income · Social comparisons · Defeat

Introduction

Suicide is a major public health issue; around the world it accounts for 800,000 deaths per annum [1] and in the UK almost 6000 people die by suicide each year [2]. In recent decades, it has become increasingly recognised that mental disorders are not sufficiently specific markers of suicidal ideation and behaviour [3–5]. As a consequence, there has been renewed attention on the wider social context of an individual's life, given that socioeconomic factors such as low income have been shown to be useful indicators of psychopathology [6, 7]. Indeed, international evidence has highlighted that low income is an important factor in understanding suicide across countries as diverse as Sweden, the USA, and China [8–11].

Although low income, a gross indicator of economic deprivation, is an important marker for negative health outcomes such as suicidality, the reasons why economically deprived groups exhibit higher suicide rates need to be better understood. Indeed, there has been considerable debate regarding the income–suicidality relationship. In brief, it is not yet clear whether material factors (i.e. having less ability to purchase goods and access services necessary for wellbeing) or psychosocial factors (i.e. being of a lower socioeconomic status causing distress) better account for this relationship. Increasingly, evidence suggests that a person's income *relative to others* may be

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more strongly associated with self-perceived health [12] and mental health disorders [13] than absolute income and that material factors do not adequately explain this relationship [14]. This suggests that both psychological and social factors play an important role in understanding how socioeconomic factors influence mental health outcomes. This study aims to directly compare the association between income rank (a potential psychosocial explanation involving social comparisons) versus absolute income (a material explanation), and suicidality.

Why do we make social comparisons?

Making comparisons with others is intrinsic to an individual's understanding of themselves and their place within the social context [15]. There have been a number of theoretical attempts to understand the reasons why we have this drive, and one such theory is Social Rank Theory (SRT) [16]. From an evolutionary perspective, SRT posits that the drive to be aware of one's position within social groups is important in understanding how we stand in the competition for resources. Such comparisons, when perceived as unequal, can lead to conflict between group members. To de-escalate this conflict, subordinate members may display submissive behaviours to a dominant other. It is also theorised that we possess an Involuntary Defeat Strategy (IDS) [17]—a hardwired response to defeat in the environment—which triggers these submissive behaviours. Previous research has argued that the misfiring of this adaptive behaviour contributes to the aetiology of some psychiatric illnesses, such as depression [18] and anxiety [19], and this has been supported by animal studies [20–22].

How are social comparisons related to suicidal outcomes?

In the ethological literature, the 'arrested flight' phenomenon, defined as when an animal desires to 'take flight' from a defeating situation but their escape is blocked (i.e. they are trapped), can result in a chronic stress reaction [23]. Extending this research, it has been suggested that a similar mechanism may be present in humans that may account for defeat responses to both internal and external stimuli [18]. This concept is the basis for Williams' Cry of Pain hypothesis of suicide [24] and the Integrated Motivational–Volitional Model of Suicidal Behaviour (IMV) [4]. Williams and O'Connor argue that an individual becomes distressed as a result of feeling defeated, with the defeat potentially triggered by perceiving oneself as being of low rank within their social group. Consequently, if an individual perceives no escape or rescue from the situation, suicidal ideation emerges. More recently, defeat and entrapment have been shown to be important factors in

understanding suicidal thoughts and actions [25] and self-harm [26] cross-sectionally and over time [27, 28].

Experiencing low rank within social groups may, therefore, be a risk factor for suicidal thoughts and attempts. Indeed, it has been suggested that income could act as an objective indicator of an individual's social rank within social areas such as the workplace [29]. In an attempt to better understand the mechanism that accounts for the relationship between income and wellbeing, Boyce and colleagues [30] ranked individuals' income within relevant social comparison groups. They found that the relationship between life satisfaction and income was fully accounted for by the income rank variable. This implies that two individuals could earn the same absolute income but if one lives in a region where people earned more, they may be more unhappy because they are of a lower social rank than the individual who lives in a less affluent area. This finding has received further support from Wood and colleagues [31] who found that the income rank variable wholly accounted for the relationship between income and mental distress. The psychosocial explanation of the effect of income upon health has also been strengthened by a recent study [32] where income rank explained the relationship between income/wealth and a number of health outcomes including physical functioning, obesity and long-standing illness. The study authors concluded that social position rather than material conditions may account for the impact of money on health [32].

Although previous research has shown that income rank accounts for the relationship between absolute income and life satisfaction/mental distress [30, 31], the relationship between income rank versus absolute income and suicidal thoughts or attempts has yet to be determined. The present study, therefore, contrasted the impact of income rank with a 'materialist' perspective (absolute income) on suicidal thoughts and attempts. Specifically, we hypothesised that lower ranked individuals would show a greater propensity towards suicidal thoughts and attempts than higher ranked individuals. In addition, when both absolute income and income rank within relevant comparison groups are evaluated simultaneously, we expected that social rank would explain the relationship between absolute income and the suicide outcomes.

Method

Participants and procedure

This study draws from the Adult Psychiatric Morbidity Survey (APMS 2007) [33]. This survey is a nationally representative sample drawn from the English population, whereby a random sample of private household residents

aged over 16 years old was recruited. The aim of the survey was to provide data on the prevalence of both treated and untreated psychiatric disorder (including suicidal thoughts and attempts) in the English adult population. Ethical approval for APMS 2007 was obtained from the Research Ethics Committee of the National Research Ethics Service as appropriate for nonclinical populations.

The survey adopted a multi-stage stratified probability sampling design [33], whereby the population was divided into strata based upon socioeconomic factors derived from census data and a random sample was taken from each stratum. In each designated household, one adult was selected for interview. A total of 57 % of those eligible agreed to take part in an interview and full interviews were carried out successfully with $n = 7403$ people. Fieldwork was carried out between October 2006 and December 2007.

Amongst the 7403 people who agreed to participate in the survey, $n = 5779$ completed the questions relating to suicidal thoughts and attempts, as well as the relevant socio-demographic items. The characteristics of this sample, along with the rates of suicidal outcomes, are reported in Table 1. Of the sample, 56.6 % ($n = 3272$) were female, 48.8 % ($n = 2799$) were married, and 93.0 % ($n = 5372$) were white.

To investigate whether there were any systematic differences between those who were included in this analysis and those who were not (i.e. 5779 included versus 1624 who were not), a series of Chi-squared and independent t tests were conducted. Some differences were found; including age ($t(2264) = 4280$, $p < 0.001$; those included were younger), education ($\chi^2(5, N = 7235) = 79.45$, $p < 0.001$; more of those included had a degree and a lower number had no qualifications), and ethnicity ($\chi^2(3, N = 7353) = 9.27$, $p = 0.026$; more of those included were white). In addition, those who were excluded because they did not complete the socio-demographic items reported fewer lifetime suicidal thoughts ($\chi^2(1, N = 7389) = 12.10$, $p = 0.001$) and attempts ($\chi^2(1, N = 7395) = 8.10$, $p = 0.004$) compared to those who did.

Measures

Suicidal ideation and suicide attempts

All of the suicide items were derived from the ‘Suicidal Thoughts, Attempts and Self-harm’ section of the Clinical Interview Schedule-Revised (CIS-R) [34]. Suicidal thoughts were measured with a positive response to one of three dichotomous (yes/no) items from the CIS-R (“Have you ever felt that life was not worth living?”, “Have you

Table 1 Demographic characteristics and rates of suicidal thoughts and suicide attempts within the sample ($N = 5779$)

Age, M (SD)	51 years (17.6 years)
Gender, % (N)	
Male	43.4 (2507)
Female	56.6 (3272)
Marital status, % (N)	
Married	48.8 (2799)
Single	17.6 (1015)
Widowed	11.8 (683)
Divorced	9.8 (565)
Cohabiting	9.1 (528)
Separated	3.3 (189)
Ethnicity, % (N)	
White	93 (5372)
South Asian	2.6 (148)
Black	2.4 (136)
Mixed	2 (117)
Suicidal outcomes, % (N)	
Lifetime suicidal thoughts	24.1 (1391)
Lifetime suicide attempt	5.6 (325)
Past year suicidal thoughts	8.2 (476)
Past year suicide attempt	0.8 (44)

ever wished that you were dead?”, “Have you ever thought of taking your life, even if you would not really do it?”). The internal consistency of these three items scaled together was high ($\alpha = 0.88$). Suicide attempts were measured with one item (“Have you ever made an attempt to take your life, by taking tablets or in some other way?”). All of these items were followed by a question establishing whether the thought/attempt occurred ever or within the past year.

Income

Household income was established by presenting participants with a showcard on which banded incomes were presented. Initially participants were presented with 32 income bands, and if they chose the highest band they were presented with up to 60 income bands. Using the [35] equivalised scoring system, this variable was then adjusted to take account of the number of people living in the household. Each household member is given a score depending, for adults, on the number of adults cohabiting or not cohabiting, and for dependent children, on their age. This adjustment for household size helps to better represent each individual’s spending power. The total household income is divided by the sum of the McClements scores to provide the measure of *equivalised household income*. This

resulted in an income distribution with a large number of distinct data points (around 1444) that allowed an investigation of rank differences to be conducted. To ensure that the variables are comparable, equivalised household income was log-transformed using natural logarithm scaling prior to analysis. The natural logarithm of income is the transformation typically used in income and wellbeing studies, so it provides a useful benchmark against which to test income rank.

Income rank

Consistent with a methodology developed in previous research [29–31], income rank variables were created for each individual, based upon combinations of three variables measured in the APMS dataset. The income of each participant was ranked within their region, sex, and educational attainment level. These are domains that are deemed to be important in social comparison and similar to the comparison groups previously utilised by Boyce et al. [30] and Wood et al. [31]. As it is assumed that people base their social rank judgments on those in close proximity, a comparison group was based on the region of England in which an individual resides using the nine Government Office Regions (North East, North West, Yorkshire and Humber, East Midlands, West Midlands, East of England, London, South West, and South East). As it is also likely that people make comparisons to those with similar characteristics, sex (male and female) and the six categories of educational attainment (degree, teaching/Higher National Diploma (HND)/nursing, A level, General Certificate of Secondary Education (GCSE), foreign/other, no qualification) were also used. These categories were each combined to create four groups: Sex by education (12 comparison categories), sex by region (18 comparison categories), education by region (54 comparison categories), and sex by education by region (108 comparison categories). These groups were used to create each individual's income rank, variables representing the rank of their income within each of these comparison groups. Multiple rank variables were used to test whether a consistent association between income rank and each outcome was identified across comparison groups. A consistent link increases confidence in the robustness of the findings.

Once each person was ranked by income from highest to lowest within each of the comparison groups, an income rank variable was created using the method previously used by Wood et al. [31] and Boyce et al. [30]. The following equation was used to calculate the income rank variable for each individual:

$$R_i = \frac{i - 1}{n - 1}$$

For an individual's (i) relative rank (R_i), this equation calculates the number of people who have an income lower than the individual ($i - 1$) compared to the total number of people within that reference group ($n - 1$). This creates a ratio for the individual's rank within an individual's reference group, represented as a number normalised between 0 and 1.

Covariates

The following demographic factors are controlled for in all analyses: age, sex, household size and dummy variables identifying education and region (categories noted above). The distance from the mean of the reference group was controlled for in all income rank analyses.

Statistical analysis

Initially a series of logistic regression analyses was conducted to determine if absolute income (log-transformed) was statistically associated with whether an individual had a lifetime experience of suicidal thoughts or attempts, or had experienced these within the past year. All analyses controlled for demographic factors. Next, the income rank variables for each of the comparison groups were added into separate logistic regressions, along with the reference group rank. To test robustness, we examined each relationship based on the income rank variables derived from how much an individual earns relative to those of the same sex by education, sex by region, education by region, and sex by education by region. These were used to test associations with lifetime suicidal thoughts and attempts, and those experienced in the past year. To maximise statistical power, as more individuals report lifetime suicidal thoughts and attempts than those in the past year, the former were selected as the primary outcomes.

Results

Household income

With regard to household income; the majority of the sample (68.4 %) earned less than £30,000 per annum, 22.5 % of the sample earned £30,000–£59,999 per annum, and 9.1 % earned over £60,000 per annum. The median income of the sample was £20,279.50, which fell within the 25th Income Band (£19,760 less than £20,799). Income was log-transformed using natural log scaling prior to

analysis (minimum = 4.98, maximum = 13.39, mean = 9.29, SD = 0.84).

Lifetime and past year suicidal thoughts

Rates of suicidal thoughts within the sample are reported in Table 1. Within the sample, almost a quarter (24.1 %) reported having experienced any thoughts relating to suicide in their lifetime, and 8.2 % had experienced suicidal thoughts in the past year.

Suicidal thoughts lifetime

Five logistic regression analyses were conducted with lifetime suicidal thoughts as the outcome variable. The results of these are displayed in Table 2, with the initial model showing that absolute income was associated with suicidal thoughts when controlling for demographic factors ($b = -0.322$, $SE = 0.041$, $OR = 0.725$, $p < 0.001$). This indicates that a one unit increase in absolute income was associated with a reduction in the odds of suicidal thoughts by 27.5 %.

Income rank within each of the social comparison groups was then added into the analysis. To ensure robustness, we tested each association using four reference group combinations (sex by education, sex by region, education by region, and sex by education by region). For the sex by education groups, moving from the bottom to the top of the income rank distribution was associated with a 57.7 % decreased odds of suicidal thoughts ($b = -0.861$, $SE = 0.278$, $OR = 0.423$, $p = 0.002$), whereas absolute income was no longer significant in the model ($b = -0.26$, $SE = 0.105$, $OR = 0.975$, $p = 0.807$). The robustness of this finding was supported by the further logistic

regressions conducted; as moving up the income ranking across all four reference comparison groups (sex by region, region by education, and sex by education by region) was significantly associated with reporting fewer suicidal thoughts across the lifespan, whereas absolute income was not (Table 2). This indicates that lower ranked individuals were at increased odds of lifetime suicidal thoughts compared to those of a higher rank.

Suicidal thoughts in the past year

Further regressions were conducted with suicidal thoughts in the past year as the outcome variable (Table 2). Absolute income was negatively associated with suicidal thoughts ($b = -0.531$, $SE = 0.060$, $OR = 0.588$, $p < 0.001$) indicating that as absolute income increases by one unit, the odds of suicidal thoughts decreased by 41.2 %.

Moving from the bottom to the top of the income rank distribution within two of the reference comparison groups (sex by education and education by region) was significantly associated with a 61.5–65 % decreased odds of suicidal thoughts in the past year (Table 2), whilst absolute income was no longer significant (e.g. absolute income in the region by education regression: $b = -0.229$, $SE = 0.136$, $OR = 0.795$, $p = 0.092$). In one of the comparison groups (sex by region), neither income rank nor absolute income was significantly associated with suicidal thoughts in the past year. In the final comparison group (sex by education by region), both income rank and absolute income were significantly associated with suicidal thoughts in the past year. Overall, it appeared that lower ranked individuals were at increased odds of experiencing suicidal thoughts in the past year.

Table 2 Logistic regression analyses investigating the associations between income, income rank, lifetime suicidal thoughts, and suicidal thoughts in the past year ($N = 5779$)

Model	Risk factor	Lifetime		Past year	
		Odds ratio	95 % CI	Odds ratio	95 % CI
1	Absolute income	0.725	0.668–0.786	0.588	0.523–0.661
2	Absolute income	0.975	0.793–1.198	0.817	0.621–1.075
	Income rank sex by education	0.423	0.245–0.729	0.350	0.163–0.753
3	Absolute income	1.006	0.799–1.266	0.752	0.560–1.010
	Income rank sex by region	0.349	0.176–0.693	0.421	0.166–1.071
4	Absolute income	0.943	0.773–1.151	0.795	0.609–1.038
	Income rank region by education	0.463	0.274–0.784	0.385	0.183–0.808
5	Absolute income	0.899	0.742–1.088	0.748	0.579–0.965
	Income rank sex by education by region	0.529	0.320–0.875	0.470	0.232–0.955

All analyses included demographic controls (age, sex, household size, education, and region) and rank analyses included a reference income variable. Absolute income transformed using natural logarithm scaling. 95 % CI's not covering one indicate significant results, also highlighted in bold

Lifetime and past year suicide attempts

Rates of suicide attempts within the sample are reported in Table 1. Within the sample, a total of 5.6 % reported having made a suicide attempt in their lifetime and only 0.8 % had made an attempt in the past year.

Lifetime suicide attempts

As with lifetime suicidal thoughts, five logistic regression analyses were conducted with lifetime suicidal attempts as the outcome, and the results are displayed in Table 3. The first regression showed that, as with lifetime suicidal thoughts, absolute income was negatively associated with suicide attempts ($b = -0.499$, $SE = 0.069$, $OR = 0.607$, $p < 0.001$). This indicates that as absolute income increases by one unit, the odds of a person having made a suicide attempt decreases by 39.3 %.

Next, the income rank variables for each of the comparison groups were included in the analysis. When both absolute income and income rank variables were entered into the regression model simultaneously, our analysis revealed that higher ranked individuals were at decreased risk of lifetime suicide attempts (e.g. sex by region: $b = -1.700$, $SE = 0.592$, $OR = 0.183$, $p = 0.004$). This was the case in three of the four reference group comparisons (sex by education, sex by region, and education by region), with the fourth comparison (sex by education by region) demonstrating a marginally significant association between income rank and suicide attempts ($b = -0.809$, $SE = 0.431$, $OR = 0.446$, $p = 0.061$). In summary, moving from the bottom to the top of the income rank distribution was associated with a 62.8–81.7 % decreased odds in lifetime suicide attempts (Table 3).

Suicide attempts in the past year

Further regression analyses were conducted with attempting suicide within the past year as the outcome variable (Table 3). We found that absolute income was associated with suicide attempts in the past year ($b = -0.798$, $SE = 0.151$, $OR = 0.450$, $p < 0.001$). This indicates that as absolute income increased by one unit the odds of having attempted suicide in the past year decreased by 55 %.

In the next set of logistic regressions, each of the income rank variables was added into the analysis to test associations with suicide attempts over the past year (Table 3). Within these groups, higher ranked individuals within one comparison group (sex by region) were at decreased risk of suicide attempts within the past year ($b = -2.688$, $SE = 1.372$, $OR = 0.068$, $p < 0.05$), although this was only marginally significant with the confidence interval crossing 1 (Table 3). Across all regression analyses with suicide attempts in the past year as the outcome, absolute income was no longer associated with suicide attempts in the past year (e.g. absolute income in the sex by region regression: $b = -0.188$, $SE = 0.394$, $OR = 0.828$, $p = 0.633$). These analyses therefore provide some limited support for the idea that income rank is linked to recent suicide attempts.

Discussion

In support of our main hypothesis, the findings indicate that the relationship between income and suicidality can be accounted for by a rank explanation. Specifically, having a lower rank of income within relevant social comparison

Table 3 Logistic regression analyses investigating the associations between income, income rank, lifetime suicide attempts, and suicide attempts in the past year ($N = 5779$)

Model	Risk factor	Lifetime		Past year	
		Odds ratio	95 % CI	Odd ratio	95 % CI
1	Absolute income	0.607	0.530–0.694	0.450	0.335–0.605
2	Absolute income	0.824	0.598–1.135	0.708	0.374–1.338
	Income rank sex by education	0.372	0.150–0.920	0.152	0.017–1.340
3	Absolute income	0.990	0.680–1.441	0.828	0.382–1.794
	Income rank sex by region	0.183	0.057–0.582	0.068 [†]	0.005–1.001
4	Absolute income	0.844	0.617–1.155	0.710	0.379–1.330
	Income rank region by education	0.340	0.140–0.825	0.142	0.017–1.225
5	Absolute income	0.781	0.579–1.054	0.656	0.360–1.196
	Income rank sex by education by region	0.446	0.192–1.036	0.201	0.260–1.566

All analyses included demographic controls (age, sex, household size, education, and region) and rank analyses included a reference income variable. Absolute income transformed using natural log scaling. 95 % CI's not covering one indicate significant results, also highlighted in bold

[†] Although the CI covers 1, significant at $p = 0.05$ level

groups (region, sex, and educational attainment) was linked with higher lifetime suicidal thoughts and attempts. A similar, although less consistent pattern was also found for suicidal thoughts in the past year. The inclusion of income rank largely eliminated the relationship between absolute income and suicidality in the statistical models, indicating that it is income rank rather than income per se that accounts for the income–suicidality relationship. This is consistent with previous findings showing that the income rank variable within similar social comparison groups accounts for the associations between absolute income and life satisfaction [30], distress [31], and health [32]. Taken together, these findings suggest that the relationship between income and wellbeing (including suicidality) may be explained through psychosocial rather than material mechanisms.

There has been a growing research focus on the relationship between socioeconomic factors (including low income) and psychopathology generally [6], as well as with suicide more specifically [10, 11]. Such research has explored how different theories account for the relationship between low income and psychiatric illness. For example, Social Causation Theory [36] proposes that the stress associated with being a member of a disadvantaged group causes mental health problems, whereas Social Selection Theory [37] suggests that those with mental ill-health are predisposed to disadvantage due to factors such as genetics [38]. By contrast, the present study contextualises the association of socioeconomic factors such as income with mental wellbeing, and suicidality, more specifically within a Social Rank Theory [16] of behaviour. The latter proposes that income acts as a marker of social rank, with a comparatively low income indicating that an individual is of lower social rank. It has been suggested that perceiving oneself to be of low rank relative to others may activate the Involuntary Defeat Strategy (IDS), and if the individual cannot escape from or accept the defeat, the response to this will be prolonged and can manifest as depression [17]. According to Gilbert and colleagues [39], this involuntary subordination and resulting negative affect could potentially lead to suicidal thoughts and actions. Such an explanation is consistent with the Integrated Motivational–Volitional (IMV) Model of suicidal behaviour which maps out the process from defeat and entrapment to suicidal thoughts and behaviours [4, 27].

It has been suggested that there are individual differences in sensitivity to social rank cues in the environment, such that more insecure individuals will have a greater focus upon social comparisons and will, therefore, perceive more opportunities for feeling defeated and inferior [40]. Indeed, previous research has found that individuals who score higher on measures of competitive insecure striving (i.e. the desire to avoid inferiority) are more likely to self-

harm [41], and individuals with heightened self-criticism, particularly when self-persecuting, are also at increased risk of self-harm [39]. This is also consistent with the Cry of Pain and the IMV Model of Suicidal Behaviour model that argue that individuals who are more sensitive to what others expect of them are at increased risk of suicidal behaviour [4, 24, 42]. Within the social rank literature, it is suggested that Western society is a particularly competitive environment, with the media creating ideals that are difficult to live up to [41]. Where income and signals of income are salient, these ideals may lead to the dysregulation of the evolutionary processes relating to social rank, leading to the display of submissive behaviours when they are not necessary [31].

A limitation of the present study was the cross-sectional nature of the study design, thereby precluding the possibility of determining the temporal relationship between the risk factors (income and income rank) and the outcome variables (suicidal thoughts/attempts). Although income rank was most consistently linked with *lifetime* suicidal thoughts and attempts, these could have occurred many years before the data collection. Therefore, we cannot be certain of the proximity of the relationship with a participant's current income levels. However, the findings that income rank is associated with suicidal thoughts, and to a lesser extent attempts, within the past year in a similar manner strengthens our central conclusion. Due to the modest number of suicidal 'cases', the sub-group analyses of suicidal thoughts and attempts in the past year had limited statistical power, yet these analyses, taken together, still indicated that income rank partially accounted for the relationship between income and suicidality in the past year.

It is also important to highlight that suicidal thoughts and attempts were measured via self-report. Consequently, participants may have been reluctant to disclose sensitive information and therefore under-reported these phenomena. Nonetheless, previous research has established self-report as an important method of measuring suicidal thoughts and attempts, and the rates of suicidality reported in the APMS sample (i.e. in this study) compare favourably with other large-scale studies [44]. Moreover, even if there is under-reporting within the sample, there is no reason to assume that there would be differential under-reporting across the income and social comparison groups. Consequently, we do not believe that any potential under-reporting affects the overall study conclusions though we suggest that this is an issue worthy of investigation in future research.

These results support previous findings from a large-scale prospective study that reported that a decrease in income over time was associated with an increased risk of mental disorders [43]. Our study may provide a potential

mechanistic explanation for this relationship. Future studies could benefit from using a sample with higher rates of suicidal thoughts and attempts and utilising data from a longitudinal design. It must also be noted that some systematic differences were found with those who were included in the analysis and those who were not, most notably that those with a suicidal history were significantly over-represented. This suggests that the sample included was not representative of the original sample; although this is unlikely to change the pattern of results, it is worth acknowledging that this over-representation could overestimate the relationship between suicide and income rank.

Conclusion

In summary, this study empirically investigated whether a psychosocial (income rank) or material (absolute income) explanation best explained the relationship between income and suicidal outcomes, yielding strong support for a psychosocial explanation. The present findings from a large scale, nationally representative survey suggest that socioeconomic factors such as absolute income are not directly related to suicidality, but rather may act as a proxy for an individual's social rank compared to others.

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Conflict of interest The authors have no conflict of interest.

Ethical standard All studies have been approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

References

- World Health Organization (2014). http://www.who.int/mental_health/prevention/en/
- Office of National Statistics (2014). <http://www.ons.gov.uk/ons/taxonomy/index.html?nscl=Suicides+and+Intentional+Self-harm>
- Baumeister RF (1990) Suicide as escape from self. *Psychol Rev* 97:90–113
- O'Connor RC (2011) Towards an Integrated Motivational-Volitional of Suicidal Behaviour. In: O'Connor RC, Platt S, Gordon J (eds) *International handbook of suicide prevention: research, policy and practice*. Wiley Blackwell, New York, pp 181–198
- O'Connor RC, Nock MK (2014) The psychology of suicidal behaviour. *Lancet Psychiatry* 1:73–85
- Lynch JW, Smith GD, Kaplan GA, House JS (2000) Income inequality and mortality: importance to health of individual income, psychosocial environment, or material conditions. *Br Med J* 320:1200–1204
- Wilkinson RG, Pickett KE (2006) Income inequality and population health: a review and explanation of the evidence. *Soc Sci Med* 62:1768–1784
- Sher L (2006) Per capita income is related to suicide rates in men but not in women. *J Men's Health Sex* 3(1):39–42
- Ferrada-Noli M (1997) Social psychological variables in populations contrasted by income and suicide rate: Durkheim revisited. *Psychol Rep* 81(1):307–316
- McMillan KA, Enns MW, Asmundson GG, Sareen J (2010) The association between income and distress, mental disorders, and suicidal ideation and attempts: findings from the collaborative psychiatric epidemiology surveys. *J Clin Psychiatry* 71(9):1168–1175
- Chung C, Pai L, Kao S, Lee M, Yang T, Chien W (2013) The interaction effect between low income and severe illness on the risk of death by suicide after self-harm. *Crisis* 34(6):398–405
- Kondo N, Kawachi I, Subramanian SV, Takeda Y, Yamagata Z (2008) Do social comparisons explain the association between income inequality and health?: relative deprivation and perceived health among male and female Japanese individuals. *Soc Sci Med* 67:982–987
- Eibner C, Sturm R, Gresenz CR (2004) Does relative deprivation predict the need for mental health services. *J Mental Health Policy Econ* 7:167–175
- Marmot M, Wilkinson RG et al (2001) Psychosocial and material pathways in the relation between income and health: a response to Lynch et al. *Br Med J* 322:1233–1236
- Festinger L (1954) A theory of social comparison processes. *Hum Relat* 7(2):117–140
- Price JS (1972) Genetic and phylogenetic aspects of mood variations. *Int J Mental Health* 1:124–144
- Sloman L (2000) How the involuntary defeat strategy relates to depression. In: Sloman L, Gilbert P (eds) *Subordination and defeat: an evolutionary approach to mood disorders and their therapy*. Erlbaum, Mahwah, pp 47–67
- Gilbert P, Allan S (1998) The role of defeat and entrapment (arrested flight) in depression: an exploration of an evolutionary view. *Psychol Med* 28:585–598
- Gilbert P, Allan S, Brough S, Melley S, Miles J (2002) Relationship of anhedonia and anxiety to social rank, defeat and entrapment. *J Affect Disord* 71(1–3):141–151
- Von Holst D (1986) Vegetative and somatic components of tree shrews' behaviour. *J Auton Nervous Syst (Suppl.)*:657–670
- Shively CA, Laber-Laird K, Anton RF (1997) Behavior and physiology of social stress and depression in female cynomolgus monkeys. *Biol Psychiatry* 41:871–882
- Taylor PJ, Gooding P, Wood AM, Tarrier N (2011) The role of defeat and entrapment in depression, anxiety, and suicide. *Psychol Bull* 137:391–420
- Dixon AK, Fisch HU, Huber C, Walser A (1989) Ethological studies in animals and man: their use of psychiatry. *Pharmacopsychiatry* 22:44–50
- Williams JMG (1997) Cry of pain: understanding suicide and selfharm. Penguin, Harmondsworth
- O'Connor RC (2003) Suicidal behavior as a cry of pain: test of a psychological model. *Arch Suicide Res* 7:297–308
- Rasmussen S, Fraser L, Gotz M, MacHale S, Mackie R, Masterton G, McConachie S, O'Connor RC (2010) Elaborating the cry of pain model of suicidality: testing a psychological model in a sample of first-time and repeat self-harm patients. *Br J Clin Psychol* 49:15–30
- O'Connor RC, Smyth R, Ferguson E, Ryan C, Williams JMG (2013) Psychological processes and repeat suicidal behavior: a four year prospective study. *J Consult Clin Psychol* 81:1137–1143
- Taylor PJ, Wood AM, Gooding P, Tarrier N (2011) Prospective predictors of suicidality: defeat and entrapment lead to changes in

- suicidal ideation over time. *Suicide Life Threat Behav* 41:297–306
29. Brown GDA, Gardner J, Oswald AJ, Qian J (2008) Does wage rank affect employees' well-being? *Ind Relat* 47:355–389
 30. Boyce CJ, Brown GDA, Moore S (2010) Money and happiness: rank of income, not income, affects life satisfaction. *Psychol Sci* 21:471–475
 31. Wood AM, Boyce CJ, Moore SC, Brown GD (2012) An evolutionary based social rank explanation of why low income predicts mental distress: a 17 year cohort study of 30,000 people. *J Affect Disord* 136(3):882–888
 32. Daly M, Boyce C, Wood A (2015) A social rank explanation of how money influences health. *Health Psychol* 34:222–230
 33. McManus S, Meltzer H, Brugha T, Bebbington P, Jenkins R (2009) Adult psychiatric morbidity in England, 2007: results of a household survey. National Centre for Social Research, London
 34. Lewis G, Pelosi AJ, Araya R, Dunn G (1992) Measuring psychiatric disorder in the community: a standardized assessment for use by lay interviewers. *Psychol Med* 22:465–486
 35. McClements LD (1977) Equivalence scales for children. *J Public Econ* 8:191–210
 36. Hollingshead AB, Redlich FC (1958) Social class and mental illness: a community study. Wiley, New York
 37. Brown GW, Harris T (1978) Social origins of depression. Free Press, New York
 38. Dohrenwend B, Levav I, Shrout P, Schwartz S, Naveh G, Link B, Stueve A (1992) Socioeconomic status and psychiatric disorders: the causation-selection issue. *Science (New York, N.Y.)* 255(5047):946–952
 39. Gilbert P, McEwan K, Irons C, Bhundia R, Christie R, Broomhead C, Rockliff H (2010) Self-harm in a mixed clinical population: the roles of self-criticism, shame, and social rank. *Br J Clin Psychol* 49(Pt 4):563–576
 40. Gilbert P, Broomhead C, Irons C, McEwan K, Bellew R, Mills A, Gale C, Knibb R (2007) Development of a striving to avoid inferiority scale. *Br J Soc Psychol* 46:633–648
 41. Williams K, Gilbert P, McEwan K (2009) Striving and competing and its relationship to self-harm in young adults. *Int J Cogn Ther* 2(3):282–291
 42. O'Connor RC (2007) The relations between perfectionism and suicidality: a systematic review. *Suicide Life-Threat Behav* 37(6):698–714
 43. Sareen J, Afifi TO, McMillan KA, Asmundson GG (2011) Relationship between household income and mental disorders: findings from a population-based longitudinal study. *Arch Gen Psychiatry* 68(4):419–426
 44. Nock MK, Borges G, Bromet EJ, Alonso J, Angermeyer M, Beautrais A, Williams D (2008) Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *Br J Psychiatry* 192:98–105