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Longitudinal investigation of the presence of different trajectories and associated health and socio-economic determinants, for participants who report suicidal ideation within a community-based public health survey

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ABSTRACT

Objective Given the paucity of evidence-based research investigating different suicidal ideation profiles and trajectories, this project sought to investigate health and socio-economic factors associated with the presence of suicidal ideation and changes in ideation over time.

Design Longitudinal cohort design, using logistic regression analysis.

Setting A public health survey was administered at two timepoints in a community setting across the North West of England. In the 2015/2016 survey, participants were recruited from high (n=20) and low (n=8) deprivation neighbourhoods. In the 2018 survey, only the 20 high-deprivation neighbourhoods were included.

Participants 4287 people were recruited in 2015/2016 and 3361 were recruited in 2018. The 2018 sample was subdivided into those who responded only in 2018 (n=2494: replication sample) and those who responded at both timepoints (n=867: longitudinal sample).

Primary outcome measures Suicide ideation was the dependent variable which was assessed using item 9 of the Patient Health Questionnaire instrument.

Results The prevalence of suicidal ideation was 11% (n=454/4319) at 2015/2016 and 16% (n=546/3361) at 2018.

Replication study results highlighted: persistent debilitation from physical ill health and/or medication side effects; demographic factors (ie, middle-aged, single or never married); and personal coping strategies (ie, smoking) as risk factors for suicidal ideation. A static/improved financial position and high levels of empathy were protective factors. Longitudinal study results confirmed three suicidal ideation trajectories: 'onset', 'remission' and 'persistence'. Similar findings to the replication study were evidenced for the onset and persistence trajectories. Persistent suicidal ideation was synonymous with higher levels of practical support which may correspond to the higher levels of debilitation and functional disability reported within this group. Remission was characterised by fewer debilitating factors and higher levels of self-agency.

Conclusion A greater appreciation of the heterogeneity of suicidal trajectories should lead to the implementation of broad clinical assessments and targeted interventions.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study drew from a large community-based population rather than the more traditional clinical samples.
⇒ This study examined a wide range of both risk and protective health and socio-economic factors.
⇒ A robust sampling strategy, accessing people in their own homes, was successful in identifying a large number who responded to the same interview questions at two timepoints.
⇒ Investigation was restricted to suicidal ideation change across dichotomous categories (ie, present/absent) for the replication study and suicidal ideation onset, remission and persistence compared with no suicidal ideation, given the small participant numbers in each category, thereby limiting investigation of more subtle changes in the degree of suicidal ideation intensity.

BACKGROUND

Suicidal ideation (ie, having self-destructive thoughts about dying[1]) is commonplace globally, with a reported 9% lifetime prevalence rate cross-nationally and little variation between low/middle income and high-income countries.[2] However, evidence from the community-based UK Adult Psychiatric Morbidity Survey suggests suicidal ideation prevalence within the UK to be more than double the cross-national rate, at between 19.5% and 21.7% for people aged between 16 and 74 years.[3] Moreover,

approximately 5% of surveyed participants reported experiencing suicidal ideation within the last 12 months, demonstrating a sustained increase from the original 3.8% reported in 2000.[3] Given the increasing high incidence and prevalence of suicidal ideation, refining epidemiology data and knowledge of predictive factors are both global and national priorities.[4 5]

A recent meta-analysis of risk factors for suicidal thoughts and behaviours noted that internalising psychopathy, including depression and anxiety, remains as the highest ranking risk factor category for suicidal thoughts and behaviours, since 1985.[6] This meta-analysis concluded: a restricted set of risk factors and limited protective factors differentiating between suicidal thoughts and suicide attempts; lengthy timepoints across measured risk factors which neither reflected nor captured the transient nature of suicidal thoughts and behaviours; and insufficient data to evaluate many suicide theories.[6] However, current suicidal ideation-to-action theories, such as the Integrated Motivational Volitional Model[7] and the Three Step Theory,[8] also purport discrete predictive profiles between individuals who experience suicidal ideation and those who plan and attempt suicide. Given that approximately 60% of individuals transition from suicidal ideation to action (ie, plan/attempt suicide) within the first year following suicidal ideation onset,[2] it is important to identify and differentiate between these states to enable successful clinical intervention.[9]

The transient nature of suicidal ideation has been noted, with psychiatric distress and/or physical health difficulties related to suicidal ideation onset and chronicity, while social connectedness, perceived social support and secure attachment style are associated with reduced suicidal ideation over time.[10] Whilst these results pertain to a military veteran population, studies conducted in non-military, community settings have concluded similar associations with suicidal ideation for psychiatric distress,[11 12] physical health difficulties[13 14] and social connectedness/support.[15–17] Indeed, a recent study investigating a military veteran population indicated complex heterogeneous pathways with four different suicidal ideation trajectories identified across 1-month, 3-month, 6-month and 12-month measurement timepoints, these being: low-stable; moderate-stable; high-stable and high-rapidly declining.[18] Perceived burdensomeness, thwarted belongingness, post-traumatic stress disorder symptoms and drug use were found to be higher in the high-stable suicidal ideation trajectory, while suicidal behaviour (ie, plan, attempts, completed suicide) was higher in both the high-stable and the moderate-stable trajectories.[18] Different suicidal ideation trajectories have also been found in non-military clinical populations. For example, Madsen *et al*[19] identified three suicidal ideation trajectories among a Danish population study with first-episode psychosis, from the first year of measurement across a 10-year timeframe, being: low-decreasing, frequent-stable and frequent-increasing.

This study aims to identify different suicidal ideation trajectories over time and their associated predictive profiles, utilising a large UK-based, non-clinical, community sample. This sample derived from participant responses to a National Institute for Health Research (NIHR) North West Coast (NWC) Household Health Survey (HHS) which was administered in 2015/2016 and re-administered in 2018, the methods for which have been reported by Geibel *et al*.[20] A predictive model for suicidal ideation was derived from the 2015/16 sample of this NIHR NWC HHS and the findings reported by Mulholland *et al*.[21] These findings suggested that depression and younger age represented the largest risk factors for suicidal ideation. Other risk factors included: identification with marginalised groups (eg, Black, Asian and minority ethnicity (BAME)); lower socio-economic status (eg, static financial position, unemployment, poor quality housing); debilitating physical health (eg, pain, cancer, hearing problems); and/or medication side effects. Lifestyle behaviours such as smoking and drinking alcohol were further additional suicidal ideation risk factors, as were higher perceptions of hopelessness and reduced ability to plan one's life course. Conversely, higher levels of empathy, self-esteem and social connectedness (ie, neighbourhood belonging) were found to be protective factors from suicidal ideation.[21] The re-administration of the NIHR NWC HHS in 2018 provided an opportunity to replicate these findings on a separate sample in the same locality and also to examine the relationship between these factors and change in suicidal ideation, especially with regard to the presence of different suicidal ideation trajectories over time. The objectives of this study therefore were to investigate the demographic, health and socio-economic factors in a non-clinical population which are associated with:

1. the presence of suicidal ideation as reported by HHS participants in 2018 (for comparison with HHS participant responses in 2015/2016, reported previously by Mulholland *et al*[21])
2. changes in HHS participants suicidal ideation across a 3-year timeframe, by comparing their response in 2015/2016 with their response in 2018, reflecting either suicidal: onset, remission or persistence.

METHODS

Patient and public involvement

Two public advisors (PAs) from the National Institute for Health Research Applied Research Collaboration North West Coast (NIHR ARC NWC) remained as project team members, following publication of our initial study.[21] These PAs had an equal voice within the project team. The PAs utilised their personal interest/experience of suicidal behaviours to contribute to project team discussions and decisions to shape the research question, key objectives and study design, representing secondary analysis of the HHS. They were fully engaged in the project management and governance processes. They are co-authors of this manuscript and have reviewed and commented on its accuracy and ensured the wording is accessible to the

public. The PAs have also agreed to co-author a brief summary of this project for inclusion on the NIHR ARC NWC website, widening access beyond academic dissemination, to study participants and the general public.

Setting and sampling procedure

The NIHR NWC HHS was conducted at two timepoints (2015/2016 and 2018) in the North West of England as part of the NIHR ARC NWC. The sampling methodology and survey instruments were almost identical at both timepoints and have been described in detail elsewhere.[20] A brief summary is provided here.

In the 2015/2016 survey, 20 high-deprivation neighbourhoods and 8 relatively low-deprivation neighbourhoods in the North West of England were selected based on consultation with local authority representatives.[20] A random area probability sampling strategy was adopted in which random households within each identified neighbourhood were contacted. In the 2018 survey, only the 20 high-deprivation neighbourhoods were included. Every attempt was made to contact the same respondent in each household who completed the HHS in 2015/2016, but this was not always achieved. In these circumstances, a replacement individual or household was contacted. Written informed consent was obtained from all participants prior to the interview.

Participants

Overall, 4287 people were recruited between August 2015 and January 2016 and 3361 were recruited between August and December 2018. Those who responded in 2018 were subdivided into those who responded only in 2018 (n=2494: replication sample) and those who responded at both timepoints (n=867: longitudinal sample). Of those participants in the longitudinal sample, 16 participants (1.8%) reported suicidal ideation at only one of the timepoints and left their response 'blank' at the other timepoint. These participant responses were therefore excluded from the longitudinal analysis as missing data, leaving n=851 participants in this sample. A flowchart of participants within both the 2015/2016 and 2018 samples of the NIHR NWC HHS is provided in figure 1. Table 1 below reports the demographic and social characteristics of participants from both the replication and longitudinal samples according to the presence or absence of suicidal ideation alongside those from the 2015/2016 sample (Mulholland *et al*[21]) reported here for comparison purposes only. Those reporting suicidal ideation in the longitudinal sample have been further subdivided, according to suicidal ideation change status, by those who reported suicidal ideation onset (ie, suicidal ideation reported at 2018 only), remission (ie, suicidal ideation reported at 2015/2016 only) or persistence (ie, suicidal ideation reported at both timepoints).

There were somewhat higher proportions of participants who identified as black or minority ethnicity (BME) in the replication sample (23%) compared with the 2015/2016 sample (8%). However, no other substantial variations were noted across the groups.

Measures

As noted, the predictive factors associated with the development of suicidal ideation span personal, social and environmental factors, as depicted within the Integrated Motivational Volitional (IMV) model of suicide.[7] Therefore, a subset of the HHS questions which represented demographic, health and socio-economic variables were included in this analysis, based on their alignment with current suicide theories,[7 8] research evidence[6 22] and consultation with project team members which comprised: people with lived experience of suicidal ideation, clinicians and academics. All variables were derived from single or multiple items of validated instruments either

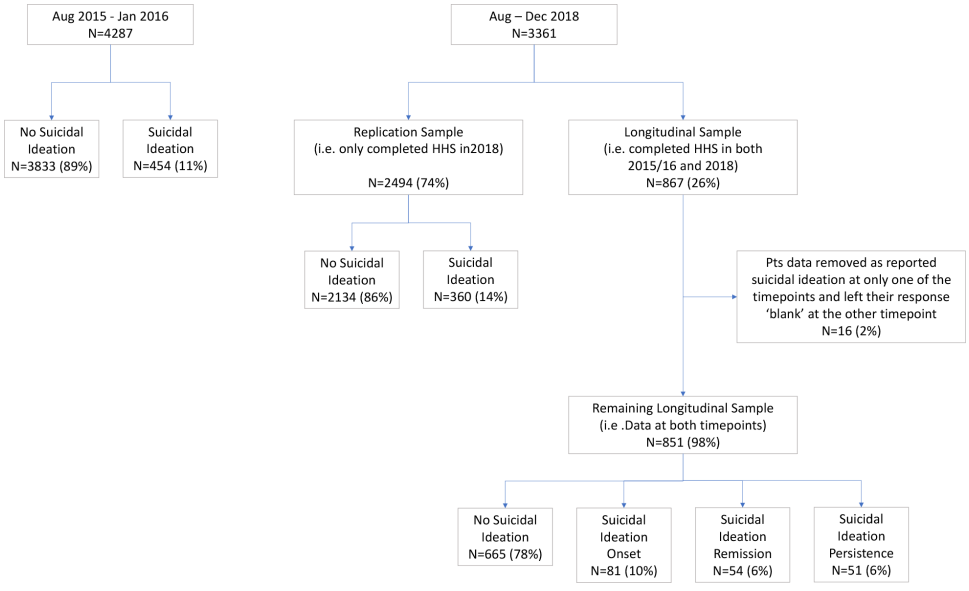

Figure 1 Flowchart of participants within the National Institute for Health Research (NIHR) North West Coast (NWC) Household Health Survey (HHS) administered in 2015/2016 and re-administered in 2018.

Table 1 Demographic and social characteristics of HHS participants at 2015/2016 (n=4287) compared with those participants who only responded at 2018 (ie, replication sample: n=2494) and those participants who responded at both 2015/2016 and 2018 (ie, comparison sample: n=851)

	Mulholland *et al*[21] (ie, only completed 2015/2016 HHS)		Replication sample (ie, only completed 2018 HHS)		Longitudinal sample (ie, completed both 2015/2016 and 2018 HHS)			
Variable	Suicidal ideation	No suicidal ideation	Suicidal ideation	No suicidal ideation	No Suicidal ideation	Suicidal ideation onset (ie, suicidal ideation at 2018 only)	Suicidal ideation remission (ie, suicidal ideation at 2015/2016 only)	Suicidal ideation persistence (ie, suicidal ideation at both 2015/2016 and 2018)
n (%)	454 (11)	3833 (89)	360 (14)	2134 (86)	665 (78)	81 (10)	54 (6)	51 (6)
Age, n (%)								
18–24	52 (11)	368 (10)	46 (13)	219 (12)	0	0	0	0
25–44	181 (40)	1247 (33)	123 (35)	708 (37)	226 (34)	32 (40)	22 (41)	20 (39)
45–64	160 (35)	1162 (30)	127 (37)	497 (26)	244 (37)	34 (42)	23 (43)	30 (59)
65+	60 (13)	1055 (28)	51 (15)	472 (25)	195 (29)	15 (19)	9 (17)	1 (2)
Gender, n (%)								
Female	249 (54)	2205 (58)	200 (56)	1146 (54)	419 (63)	57 (70)	35 (65)	26 (51)
Male	216 (46)	1628 (42)	160 (44)	988 (46)	246 (37)	24 (30)	19 (35)	25 (49)
Ethnicity, n (%)								
Black and ethnic minority (BAME)	38 (8)	414 (11)	83 (23)	235 (11)	80 (12)	5 (6)	9 (17)	4 (8)
White	415 (92)	3411 (89)	277 (77)	1874 (89)	585 (88)	76 (94)	45 (83)	47 (92)
Sexual orientation, n (%)								
Lesbian, Gay, Bisexual, Transgender, Queer or Questioning Heterosexual (LGBTQ)	15 (3)	50 (1)	11 (3)	37 (2)	14 (2)	0	3 (6)	0
Heterosexual	439 (97)	3783 (99)	348 (97)	2091 (98)	651 (98)	81 (100)	51 (94)	51 (100)
Relationship status, n (%)								
Not married/civil partnership	330 (73)	2209 (58)	277 (77)	1373 (64)	402 (60)	60 (74)	37 (69)	41 (80)
Married/civil partnership	123 (27)	1613 (42)	83 (23)	761 (36)	263 (40)	21 (26)	17 (31)	10 (20)
Education status, n (%)								
No qualifications	205 (45)	1498 (39)	173 (52)	815 (41)	312 (47)	38 (47)	28 (52)	19 (37)
Professional/vocational	192 (42)	1727 (45)	121 (36)	862 (43)	300 (45)	36 (44)	23 (43)	25 (49)
Degree or higher	57 (13)	599 (16)	41 (12)	315 (16)	53 (8)	7 (9)	3 (6)	7 (14)
Employment status, n (%)								
Employed	130 (29)	1608 (42)	102 (28)	942 (44)	342 (51)	36 (44)	25 (46)	21 (41)
Not employed	323 (71)	2233 (58)	258 (72)	1179 (56)	323 (49)	45 (56)	29 (54)	30 (59)
Financial position compared with previous 12 months, n (%)								
Better	37 (9)	471 (13)	34 (9)	229 (11)	74 (11)	8 (10)	5 (9)	4 (8)
Same	289 (64)	2781 (73)	221 (62)	1633 (77)	497 (75)	50 (62)	34 (63)	41 (80)
Worse	123 (27)	549 (13)	104 (29)	256 (12)	94 (14)	23 (28)	15 (27)	6 (12)

using summed scale score or recoded where necessary to between 2 and 5 response categories for analysis.

Dependent variable

Suicidal ideation was derived from responses to item Patient Health Questionnaire (PHQ-9)[23] which elicits the frequency of 'thoughts that you would be better off dead or of hurting yourself' in the 2 weeks preceding completion, reported on a four-point scale according to frequency. However, it is acknowledged that this item reflects a composition of suicide and self-harm ideation, and this limitation is therefore noted accordingly. For the replication sample, responses were reduced to two categories: 'several days' or higher frequency was coded as '1' (n=360, 14%) and 'not at all' as '0' (n=2134, 86%; see table 1, replication sample). For the longitudinal sample, suicidal ideation was also reduced to these two dichotomous categories and then further coded into four independent groups to examine change: no suicidal ideation at either timepoint (n=665, 78%); suicidal ideation: onset (n=81, 10%), remission (n=54, 6%) and persistence (n=51, 6%).

Independent variables

Socio-demographic variables and caring responsibilities were categorised according to the UK Office for National Statistics national census categories[24] and dichotomised (apart from age and caring responsibilities with four categories). These variables were: age, sex, ethnicity, sexuality, employment, partnership status, education and caring responsibilities (hours per week).

Other variables were selected items derived from existing validated measures as follows:

Housing quality: English Housing Survey,[25] three items; Financial situation: Wealth and Assets Survey,[26] one item; Social capital (practical support and social contact): Community Life Survey, two items; Neighbourhood belonging: Community Life Survey,[27] one item; Physical health status: EQ-5D,[28] five items; Physical health conditions: Adult Psychiatric Morbidity Study,[29] 23 conditions (sum of all 23 conditions for the longitudinal analysis only); Medication side effects: Health Survey for England,[30] two items; Alcohol consumption and Smoking: Merseyside Lifestyle Survey,[31] one item each; Depression: PHQ-9,[23] eight items as item 9 (suicidal ideation) was used as the dependent variable (DV); Anxiety: Generalised Anxiety Disorder Questionnaire (GAD7),[32] sum of seven items; Paranoia: Five-item Persecution and Deservedness Scale (PaDS-5),[33] sum of five items; Well-being: Warwick-Edinburgh Mental Well-being Scale (WEMWBS),[34] sum of seven items, abbreviated; Self-esteem: Self-Esteem Scale,[35] one item; Empathy: Interpersonal Reactivity Index (IRI),[36] sum of five items, abbreviated; Locus of control: Levenson Locus of Control Scale,[37] three subscales (Chance, Self, Powerful Others), sum of three items on each, abbreviated; Hopelessness: Brief-H-Pos,[38] sum of two items.

Data analysis strategy

For both the replication and longitudinal analyses, data were analysed using Stata V.12.[39]

Replication study

The DV had two categories in the replication analysis (suicidal ideation present or absent). The independent variable (IV) responses for the replication analysis were reported in a similar manner to those in the original analysis.[21] Summary statistics stratified by group were tabulated. To replicate the original analysis all variables, with the exception of mental health variables, associated with the DV were then entered into a multivariate analysis using logistic regression regardless of their statistical significance. In our original analysis, all mental health variables were shown to increase the risk of suicidal ideation, in particular depression, which demonstrated a sevenfold increase in the odds (CI: 5.22 to 10.07) of reporting suicidal ideation. Mental health variables therefore overshadowed the influence of all other included variables, the predictive ability of which was elucidated when mental health variables were controlled for in the subsequent analyses.[21] Given these findings—which replicate the wider literature confirming the strong association between mental ill health and suicidal ideation—the decision was taken to replicate the initial study, excluding mental health variables, as their inclusion would not add to this extant literature.

Longitudinal study

In the longitudinal analysis, the DV had four categories, with no suicidal ideation compared separately against suicidal ideation change: onset, remission or persistence. The IVs were measured at time 1 (ie, 2015/2016) and related to subsequent change over time in the DV (suicidal ideation) between time 1 and time 2 (ie, 2018). Due to the small number of observations, some of the categorical responses had to be collapsed into dichotomous variables. Univariate analysis was conducted for each IV separately using χ^2 tests and t-tests. Statistically significant IVs were then entered into multivariate analysis using logistic regression.

RESULTS

The prevalence of suicidal ideation was 11% (n=454/4319) at 2015/2016 and 16% at 2018 (ie, suicidal ideation reported within both the replication study (n=360) and the longitudinal study (n=186) as a percentage of the total 2018 sample (n=3361)).

Replication study

The replication study represented an examination of the associations between suicidal ideation and the health and socio-economic variables for participants who completed the HHS only at 2018. Multivariate analysis using logistic regression (see table 2) revealed that suffering the effects from 'liver' conditions demonstrated the highest

Table 2 Replication study results showing the statistically significant associations between independent variables and the presence of suicidal ideation for participant responses at time 2 only, identified via multivariate analysis, using logistic regression

Variable	Regression coefficient	Odds ratio (95% CI)	Significance
Age, years			
18–24	1.85	6.38 (3.62, 11.27)	p<0.001
25–44	1.24	3.44 (2.13, 5.54)	p<0.001
45–64	1.49	4.44 (2.89, 7.30)	p<0.001
65+	Reference	1	
Financial status compared with 12 months ago			
Worse	Reference	1	
Same	−0.86	0.42 (0.30, 0.61)	p<0.001
Better	−0.84	0.43 (0.24, 0.77)	p=0.005
Liver problems			
No	Reference	1	
Yes	2.49	12.06 (3.82, 38.08)	p<0.001
Epilepsy			
No	Reference	1	
Yes	0.93	2.54 (1.11, 5.85)	p=0.03
Migraine			
No	Reference	1	
Yes	0.79	2.11 (1.28, 3.81)	p=0.004
Medication side effects			
No/never	Reference	1	
Bothers little	0.71	2.03 (0.61, 6.81)	p=0.25
Bothers somewhat	1.11	3.02 (1.66, 5.51)	p<0.001
Bothers lot	0.95	2.59 (1.31, 5.17)	p=0.007
Smoking status			
Never	Reference	1	
Past occasional	0.83	2.29 (1.17, 4.48)	p=0.02
Past daily	0.08	1.08 (0.67, 1.75)	p=0.74
Current occasional	0.35	1.42 (0.56, 3.59)	p=0.46
Current daily	0.66	1.95 (1.37, 2.79)	p<0.001
Locus of control (internal)	0.18	1.20 (1.13, 1.27)	p<0.001
Empathy	−0.06	0.94 (0.91, 0.97)	p=0.001

OR with suicidal ideation, reflecting a 12-fold increase in odds. However, this finding should be treated with caution due to the small number reporting liver problems. In addition, demographic factors (ie, younger age (ie, ≤65 years), and in particular those aged 18–24 years), together with other physical health issues (ie, epilepsy; migraine) and medication side effects increased the risk of suicidal ideation. However, caution is also noted for the results pertaining to the 18–24 age category, which also represented smaller participant numbers. Higher perceptions of personal agency over one's life course (ie, internal locus of control) and lifestyle behaviours (ie, current or previous smoking) were also more prevalent in people who reported suicidal ideation. Both a static or improved financial position compared with the previous 12 months and higher levels of empathy were protective against suicidal ideation.

Table 2 reports only the variables with a statistically significant association with suicidal ideation in the multivariate analysis. The full set of model variables from the replication study are now reported for completeness in an additional supplemental table (see online supplemental table 1) regardless of their statistical significance in either analysis.

Longitudinal study

While 186 (22%) reported suicidal ideation at either one or both timepoints, 665 (78%) remained non-suicidal

across both timepoints and this group was used as the comparison group in all subsequent analyses.

Of the total 851 participants within the longitudinal sample, 81 (10%) reported the onset of suicidal ideation, 54 (6%) reported remission from suicidal ideation and 51 (6%) reported persistent suicidal ideation across both timepoints.

Table 3 reports the statistically significant associations between the IVs and the three separate suicide ideation trajectories (ie, onset, remission and persistence), identified via multivariate analysis, using logistic regression. Both the statistically significant and non-significant associations for all the IVs and the three aforementioned suicide ideation trajectories are reported in online supplemental table 2.

Suicidal ideation onset

For those participants who reported the onset of suicidal ideation, being middle aged (ie, aged 45–54 years) was the greatest risk factor. Again, demographic (ie, single or never married status); socio-economic status (ie, better financial position than the previous year; caring responsibilities (ie, 1–49 hours per week)); physical health issues (ie, pain, problems undertaking usual activities); and experiencing medication side effects were also risk factors for suicidal ideation onset, as were lifestyle behaviours (ie, being an ex-smoker or current smoker). Higher empathy was also shown to be a risk factor for suicidal ideation onset.

Suicidal ideation remission

Remission from suicidal ideation was more likely in those who were: aged 25–34 or 45–54 years; in a better financial position than the previous year; reported self-care problems and/or medication side effects; and higher levels of practical support and/or socialising. While remission from suicidal ideation was more likely for those who reported high self-agency over ones' life course (ie, internal locus of control), increased agency of powerful others over one's life course (ie, power locus of control) reduced the likelihood of remission from suicidal ideation. Similarly, higher levels of hopelessness reduced the likelihood of remission from suicidal ideation.

Persistent suicidal ideation

For participants who reported persistent suicidal ideation, younger age (ie, ≤65 years), in particular being aged 45–54 years, was found to be the greatest risk factor. Similarly, demographic (ie, single or never married status), socio-economic status (ie, problems with housing), physical health issues (ie, pain, problems with self-care, usual activities and mobility; one or more mental and physical health comorbidities) and medication side effects also increased the risk of persistent suicidal ideation. Such individuals were also more likely to engage in health-harming lifestyle behaviours (ie, smoking), have access to practical support, engage in socialising and have a stronger sense of neighbourhood belonging. However, higher hopelessness reduced the likelihood of suicidal ideation persistence.

DISCUSSION

The objectives of this study were twofold. First, to examine associations between suicidal ideation and the health and socio-economic variables (excluding mental health variables), as previously investigated by Mulholland *et al*,[21] to establish the robustness of the model across these different samples. Second, the study was designed to conduct a novel longitudinal investigation of the presence of heterogeneous suicidal ideation trajectories as identified by other researchers,[18 40 41] together with predictive profiles of each trajectory.

Findings from the replication study corroborate many of those reported by Mulholland *et al*[21] and thus provide additional support of the emerging evidence-based model for suicidal ideation prediction in non-clinical community populations. In particular, persistent debilitation from physical ill health and/or medication side effects is emerging as important in the development of suicidal ideation and supports current theories of suicide,[7 8] which highlight the sense of inescapability as a key contributing factor in the development of suicidal ideation and behaviours. Lifestyle behaviours, such as smoking, remained more likely for such individuals, and these may represent personal coping strategies to manage distress[42] related to suicidal ideation as previously reported by Gonzalez *et al*.[43] A sense of high personal agency over one's life course was also a risk factor for suicidal ideation within the replication study, which is counterintuitive and contrary to previous findings.[44 45] However, Ross[46] suggests that a 'locus of control shift' (p311) represents a transition towards self-blame and/or responsibility which once entrenched can serve as a defence mechanism to counteract perceptions of entrapment and hence underscore suicidal ideation. Conversely, being in the same or better financial position than over the previous 12 months and reporting high levels of empathy were found to be protective factors from suicidal ideation. Indeed, high empathy as a protective factor from suicidal ideation was a novel finding in our initial study[21] and may represent strengthened social deterrents to suicidal ideation.[47]

The longitudinal study compared no suicidal ideation separately against change scores for three nominated suicidal ideation trajectories, being: onset, remission or persistence. Statistically significant predictive factors identified via univariate analysis were then entered into multivariate analysis using logistic regression. It is worth noting first that suicidal ideation was very stable overall during the 2-year period separating the two timepoints. A large majority of respondents (82%) either reported no suicidal ideation at either timepoint or reported some suicidal ideation at both timepoints so that less than a fifth of people changed over this extensive time period.

While different associations between each suicidal ideation trajectory and the health and socio-economic

Table 3 Statistically significant associations between independent variables and the onset, remission and persistence of suicidal ideation

	Onset of suicidal ideation		Remission from suicidal ideation		Persistence of suicidal ideation	
Predictor	**OR**	**P value (95 CI)**	**OR**	**P value (95 CI)**	**OR**	**P value (95 CI)**
Demographics						
Age (65+)	Reference		Reference		Reference	
25–34	1.93	0.07 (0.95, 3.94)	2.54	0.033 (1.08, 5.98)	18.28	0.006 (2.35, 142.31)
35–44	1.72	0.17 (0.79, 3.77)	1.55	0.40 (0.56, 4.28)	15.92	0.01 (1.96, 129.08)
45–54	2.77	0.0039 (1.39, 5.53)	3.01	0.012 (1.07, 7.11)	36.11	0.0005 (4.78, 272.78)
55–64	1.05	0.90 (0.47, 2.36)	1.27	0.63 (0.48, 3.39)	14.34	0.012 (1.81, 113.32)
Married/partnership	Reference		Reference		Reference	
Single/never married or civil partnership	1.87	0.019 (1.11, 3.15)	1.43	0.24 (0.79, 2.58)	2.68	0.006 (1.32, 5.45)
Socioeconomic status						
Problems with housing						
No problems	Reference		Reference		Reference	
One or more problems	1.11	0.89 (0.25, 4.87)	0.34	0.058 (0.11, 1.04)	0.17	0.002 (0.07, 0.44)
Financial position vs previous 12 months						
Same	Reference		Reference		Reference	
Worse	1.07	0.97 (0.49, 2.35)	0.98	0.97 (0.37, 2.60)	1.25	0.62 (0.51, 3.10)
Better	2.42	0.001 (1.41, 4.16)	2.32	0.01 (1.22, 4.43)	1.97	0.06 (0.98, 3.97)
Caring responsibility						
None	Reference		Reference		Reference	
1–49 hours week	2.19	0.024 (1.11, 4.35)	2.1	0.07 (0.93, 4.70)	1.69	0.25 (0.68, 4.17)
50+ hours week	1.06	0.91 (0.44, 2.56)	0.5	0.35 (0.12, 2.14)	1.08	0.89 (0.37, 3.14)
Health problems (EQ-5D)						
Pain						
None	Reference		Reference		Reference	
Some pain	1.74	0.02 (1.09, 2.76)	1.32	0.33 (0.76, 2.30)	2.38	0.004 (1.33, 4.26)
Self-care						
No problems	Reference		Reference		Reference	
Some problems	1.61	0.16 (0.83, 3.12)	2.36	0.018 (1.16, 4.80)	3.16	0.0001 (1.60, 6.23)
Usual activity						
No problems	Reference		Reference		Reference	
Some problems	2.01	0.005 (1.24, 3.25)	1.76	0.06 (0.98, 3.16)	3.12	0.005 (1.75, 5.54)
Mobility						
No problems	Reference		Reference		Reference	
Some problems	1.28	0.33 (0.78, 2.09)	1.28	0.42 (0.71, 2.30)	1.94	0.026 (1.08, 3.45)
Mental and physical ill health comorbidity						
No co-morbidity	Reference		Reference		Reference	
Yes ≥1 comorbidity	1.35	0.25 (0.81, 2.27)	0.93	0.81 (0.52, 1.66)	3.17	0.005 (1.41, 7.15)
Medication side effects						
No side effects	Reference		Reference		Reference	
Some side effects	2.08	0.043 (1.02, 4.22)	2.36	0.048 (1.01, 5.55)	3.68	0.0003 (1.81, 7.49)
Smoking status						
Never	Reference		Reference		Reference	
Ex-smoker	1.96	0.03 (1.05, 3.65)	0.98	0.96 (0.45, 2.15)	2.14	0.076 (0.92, 4.96)
Current	2.42	0.002 (1.38, 4.22)	1.77	0.07 (0.95, 3.29)	3.76	0.0003 (1.83, 7.71)
Psychological factors						
Empathy	1.07	0.038 (1.00, 1.13)	0.98	0.59 (0.91, 1.05)	1.00	0.97 (0.93, 1.07)

Continued

Table 3 Continued

Predictor	Onset of suicidal ideation		Remission from suicidal ideation		Persistence of suicidal ideation	
	OR	P value (95 CI)	OR	P value (95 CI)	OR	P value (95 CI)
Hopelessness	1.01	0.92 (0.90, 1.13)	0.84	0.006 (0.74, 0.95)	0.83	0.005 (0.73, 0.95)
Locus of control: power	0.98	0.72 (0.89, 1.09)	0.87	0.015 (0.78, 0.97)	1.03	0.68 (0.90, 1.09)
Chance	1.08	0.08 (0.99, 1.17)	1.08	0.11 (0.98, 1.20)	1.04	0.40 (0.95, 1.15)
Internal	1.07	0.17 (0.97, 1.19)	1.13	0.051 (1.00, 1.27)	1.05	0.42 (0.93, 1.19)
Social capital						
Practical support						
No	Reference		Reference		Reference	
Yes	1.76	0.27 (0.65, 4.74)	3.34	0.01 (1.30, 8.56)	3.56	0.008 (1.38, 9.16)
Socialise						
No	Reference		Reference		Reference	
Yes	1.92	0.20 (0.75, 5.23)	5.84	<0.001 (2.54, 13.44)	3.18	0.026 (1.15, 8.78)
Neighbourhood belonging						
No	Reference		Reference		Reference	
Yes	1.09	0.81 (0.58, 1.99)	1.05	0.89 (0.91, 0.99)	2.15	0.019 (1.14, 4.06)

variables were evidenced, consistent patterns of findings across these trajectories were also noted. For example, the onset of suicidal ideation was underscored by risk factors that represent persistent debilitation (ie, pain, problems with usual activities, medication side effects) and/or entrapment (ie, higher levels of caring responsibilities), which are key factors identified within current ideation-to-action theories of suicide.[7 8] These 'onset' individuals were also more likely to be middle aged (ie, 45–54 years), single or never married and engaging in personal coping strategies (ie, smoking), which again reflect existing evidence in the development[2] and management[42] of suicidal ideation. These findings also corroborate those from a systematic review which identified strong associations between functional disability and suicidal ideation in middle-aged and older adults.[14]

Suicidal ideation onset was also more likely for people who reported being in a better financial position than the previous 12 months. This finding is counterintuitive and in opposition to a body of evidence that suggests a higher socio-economic status to be protective of suicidal ideation. However, given that many respondents lived in areas categorised as being highly deprived, these results may represent low-paid employment over unemployment with the potential for associated loss of benefits and negative impacts on quality of life for individuals. However, this explanation remains conjectural without additional enquiry to investigate the underlying reasons why an improved financial position might increase the likelihood of suicidal ideation.

Similarly, higher levels of empathy increased the risk of suicidal ideation onset which is contrary to findings within our initial investigation.[21] Zhang and colleagues[47] suggested that higher empathy levels may strengthen social deterrents to suicidal ideation and behaviour. However, if one perceives oneself to be burdensome to others, then higher levels of empathy could underscore a perception that suicide may relieve such a burden. Indeed, perceived burdensomeness is an established risk factor identified in current theories of suicide[7 8] and such circumstances could provide some tentative insight into the reasons for this unexpected finding. Indeed, Harter *et al*[48] suggested that the prediction of suicidal ideation following judgements of both personal incompetence and limited social support in domains important to oneself and significant others was mediated by a depression composite score, comprising self-worth, affect and hopelessness. Therefore, if individuals perceived significant others to negatively judge them this may in turn negatively impact their perceptions of self-worth, leading to the development of suicidal ideation. Indeed, 'empathy' is emerging as a complex and important factor in relation to the development of suicidal ideation and these contrasting findings underscore the need for further investigation to elucidate this impact.

This pattern of findings for suicidal ideation onset was often consistent with that for those who reported persistent suicidal ideation, although the risk factors were broader for persistent debilitation (ie, pain; problems with self-care, usual activities, mobility; mental and physical health comorbidity; medication side effects) and different for factors representing entrapment (ie, problems with housing). While evidence of associations between functional abilities and suicidal ideation have already been noted,[14] limitations in usual activities and pain have both been shown to have a greater impact on the development of suicidal ideation in older adults than other risk factors including chronic illness and depression.[49] Indeed, while all those aged ≤65 years were more vulnerable to persistent suicidal ideation, being middle aged represented a 36-fold increase in the risk of persistent suicidal ideation. Individuals reporting persistent suicidal

ideation were again more likely to be single or never married and to engage in personal coping strategies (ie, smoking) which corroborates existing literature.[2 42] They were also more likely to have access to higher levels of practical support, which may correspond to the higher levels of debilitation and functional disability reported within this group. While higher levels of socialising represented a risk factor for persistent suicidal ideation, higher levels of hopelessness were protective against persistent suicidal ideation. These findings, while counterintuitive and contrary to current suicide theories,[7 8] may represent an acceptance and accommodation of persistent suicidal ideation by individuals. It is important to note that suicidal persistence within this cohort is across a 2-year to 3-year timeframe. Although it is estimated that approximately 60% of individuals transition from suicidal ideation to action (ie, plan/attempt suicide) within the first year following suicidal ideation onset,[2] the limitations of these data restrict the ability to investigate the development from suicidal ideation to behaviour within this cohort.

Suicidal ideation remission is an important trajectory as it indicates improvement over time which may or may not have been achieved 'spontaneously' and independently of any clinical intervention. Remission was characterised by fewer debilitating physical health factors (ie, problems with self-care; medication side effects) than either the suicidal ideation onset or persistent trajectories and no risk factors representing 'entrapment'. These individuals were also more likely to be younger (ie, 25–34 years) or middle aged (ie, 45–54 years). Higher perceptions (ie, internal locus of control) and expressions (ie, reporting a better financial position than the previous year, higher levels of practical support and/or socialising) of self-agency also increased the likelihood of remission from suicidal ideation. Chang *et al*[50] suggest that economic circumstances have a greater influence on suicide behaviours in young and middle-aged individuals and these findings support this assertion. Conversely, increased agency of powerful others over one's life course (ie, power locus of control) reduced the likelihood of remission from suicidal ideation, as did higher levels of hopelessness. These findings mirror the risk and protective factors highlighted in current theories of suicide.[7 8]

Much research in this area relies on relatively small samples of special populations who often have moved on to clinical contact with mental health services. This study drew instead from a large community-based population enabling examination of a wide range of sociodemographic factors which can be considered by frontline and primary care providers engaged in suicide prevention. It used a robust sampling strategy accessing people in their own homes and was successful in identifying a large number who responded to the same interview questions at two timepoints. It thus provides significant new insights into dynamic suicide risk in a 'real-world' setting. However, there are several limitations to this study. While retrospective self-report questionnaires are routinely used in studies of suicidal ideation, when compared with real-time assessment (eg, using ecological momentary assessment) there is evidence that responses to questionnaires are liable to under-represent the extent of the ideation.[51] Inevitably, social desirability factors will have influenced how participants responded to the interview especially when discussing sensitive topics of which suicidal ideation is among the most sensitive of all. Interviewers had little time to establish rapport with participants and the interview schedule was very extensive so participant fatigue may have also affected willingness to consider questions carefully especially towards the end of the interview. Further, item 9 of the PHQ-9 instrument was used as the DV reflecting suicidal ideation in this study. Although this item assesses suicidal ideation or self-harm and the response options do not account for occasional suicidal/self-harm thoughts, this item and instrument have been shown to be predictive of suicidal ideation.[52] With regard to analyses, investigation was restricted to change across dichotomous categories (ie, present/absent) and more subtle changes in the degree of suicidal ideation intensity could not be conducted because of the small numbers in each category. Further, the decision to exclude mental health variables was based on the extant literature and our own initial investigations,[21] demonstrating the strong association between depression/anxiety and suicidal ideation, thereby overshadowing the predictive ability of other health and socio-economic variables. However, it must be acknowledged that this introduces a potential for confounding and significantly limits the strength of deductions that can be made from the analysis presented here. For example, the association observed between medication side effects and persistent suicidal ideation may be due to higher levels of depression and therefore medication use among people with persistent suicidal ideation and there may be no independent association between medication side effects and suicidal ideation. For this reason, all conclusions made here about casual pathways must be considered quite tentative and suggestive of connections which are candidates for further empirical testing rather than confirmed findings.

CONCLUSION

Our findings suggest that three different suicidal ideation trajectories in a non-clinical community population have some consistent and some unique predictive factors. Psychiatric distress and/or physical health difficulties have been identified as risk factors for suicidal ideation onset and chronicity, while social connectedness, perceived social support and secure attachment style are noted as protective against suicidal ideation over time.[11–18] The findings from both the replication and the longitudinal investigations presented here largely concur with these findings, in that enduring physical issues and medication side effects, together with onerous caring responsibilities and poor housing quality may engender perceptions of debilitation and entrapment, thereby increasing the risk of suicidal ideation onset and persistence. Indeed, the

compounding effects of multiple, simultaneous factors underscore suicidal ideation persistence over onset. However, increased self-agency and social capital provide a level of protection against suicidal ideation. These factors also reflect those presented within current 'ideation to action' suicide theories.[7 8] Some of the unexpected findings reported here, for example, those relating to the role of empathy, highlight the limitations of current knowledge regarding the onset of and remission from suicidal ideation. These incongruencies may reflect the dynamically changing profiles of socio-emotional factors related to mental distress, personal idiosyncrasies between empathy as a social deterrent to suicidal ideation and/or enhancing perceptions of burdensomeness on others, which require further in-depth qualitative investigation.

Clinical implications

It has long been recognised that the assessment of suicidal ideation is a routine part of risk assessments in mental health service settings. Conventionally, special attention is given to whether the thoughts are 'active' (ie, thoughts, including a plan, to die) or 'passive' (ie, thoughts to die without a plan).[53] While this approach focuses on a cross-sectional analysis of the nature of the ideas, it imagines that the ideation is relatively fixed over time. However, more recently empirical research has demonstrated suicidal ideation changes in nature over time. Furthermore, heterogeneity of suicidal ideation trajectories has been demonstrated[18] and different trajectories may be associated with different liabilities for the translation of ideation into action.[7 8]

Analyses of this community sample over more traditional clinical populations provide new insights into dynamic suicide risk in a 'real-world' setting, notwithstanding the aforementioned limitation caveats. A more nuanced understanding of predictive profiles for different patterns of suicidal ideation over time, as provided here, has relevance to clinical practice. If, as the current emerging evidence suggests, chronicity of suicidal ideation is associated with a greater likelihood of action, then knowing the factors that predict chronicity can inform approaches to risk assessment in clinical practice. One has to be cautious, though, about using these factors to make predictive judgements in individual cases. Due to the high prevalence of such factors in clinical groups and the low frequency of suicide, the predictive value of these factors is so low as to make them of very limited practical use.[54] Nonetheless, an assessment which acknowledges the potential transience of suicidal ideation and which takes fuller account of nuances in risk and protective factors and underlying processes across different suicide ideation trajectories should lead to greater insight into the patients' experience which is associated with improved outcomes.[55] Indeed, given that suicidality is impacted by both societal and individual factors,[8 9] the importance of protective factors, such as social capital, as identified within our original study[21] and the replication and longitudinal data presented here, would aide such insight and outcomes. Furthermore, a greater appreciation of the heterogeneity of suicidal trajectories should lead to the development of more targeted interventions.

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Supplementary Table 1: The full set of model variables from the replication study regardless of their statistical significance in either analysis.

Supplementary Table 1. The full set of model variables from the replication study regardless of their statistical significance in either analysis.

Variable	No suicidal ideation	Some suicidal ideation	Significance
N	2134	360	
Gender n(%)			P = 0.53[1]
Female	1146 (54%)	200 (56%)	
Male	988 (46%)	160 (44%)	
Age n(%)			
18 - 24	219 (12%)	46 (13%)	
25 - 44	708 (37%)	123 (35%)	
45 - 64	497 (26%)	127 (37%)	
65+	472 (25%)	51 (15%)	
Employment n(%)			P < 0.001[1]
No	1179 (56%)	258 (72%)	
Paid employment	942 (44%)	102 (28%)	
Ethnicity n(%)			P < 0.001[1]
White	1874 (89%)	277 (77%)	
BAME	235 (11%)	83 (23%)	
Partnership n(%)			P < 0.001[1]
Married	1373 (64%)	277 (77%)	
Other	761 (36%)	83 (23%)	
Education n(%)			
None	815 (41%)	173 (52%)	
Professional	862 (43%)	121 (36%)	
Degree	315 (16%)	41 (12%)	
Support n(%)			
No	1905 (89%)	308 (86%)	
1 – 19	88 (4%)	19 (5%)	
20 – 49	48 (2%)	11 (3%)	
50+	93 (4%)	22 (6%)	
Orientation n(%)			P = 0.10[1]
Heterosexual	2091 (98%)	348 (97%)	
Other	37 (2%)	11 (3%)	
Financial n(%)			
Better	229 (11%)	34 (9%)	
Same	1633 (77%)	221 (62%)	
Worse	256 (12%)	104 (29%)	
Cancer n(%)			P = 0.06[1]
No	2078 (97%)	344 (96%)	
Yes	56 (3%)	16 (4%)	
Diabetes n(%)			P = 0.06[1]
No	1988 (93%)	325 (90%)	
Yes	146 (7%)	35 (10%)	
Epilepsy n(%)			P = 0.002[1]
No	2102 (99%)	345 (96%)	
Yes	32 (1%)	15 (4%)	

Supplementary Table 1: The full set of model variables from the replication study regardless of their statistical significance in either analysis.

Migraine n(%)			P < 0.001[1]
No	2029 (95%)	316 (88%)	
Yes	105 (5%)	44 (12%)	
Dementia n(%)			P = 0.29[1]
No	2121 (99%)	356 (99%)	
Yes	13 (1%)	4 (1%)	
Mental health n(%)			P < 0.001[1]
No	1914 (90%)	183 (51%)	
Yes	220 (10%)	177 (49%)	
Eye n(%)			P = 0.80[1]
No	2017 (95%)	339 (94%)	
Yes	117 (5%)	21 (6%)	
Ear n(%)			P = 0.04[1]
No	2061 (97%)	339 (94%)	
Yes	73 (3%)	21 (6%)	
Stroke n(%)			P = 0.68[1]
No	2094 (98%)	352 (98%)	
Yes	40 (2%)	8 (2%)	
Heart attack n(%)			P = 0.31[1]
No	2025 (95%)	337 (94%)	
Yes	109 (5%)	23 (6%)	
High BP n(%)			P = 0.03[1]
No	1790 (84%)	301 (84%)	
Yes	244 (16%)	59 (16%)	
Bronchitis n(%)			P = 0.03[1]
No	2086 (98%)	344 (96%)	
Yes	48 (2%)	16 (4%)	
Asthma n(%)			P = 0.003[1]
No	1958 (92%)	312 (87%)	
Yes	176 (8%)	48 (13%)	
Allergies n(%)			P = 0.001[1]
No	2075 (97%)	337 (94%)	
Yes	59 (3%)	23 (6%)	
Ulcer n(%)			P < 0.001[1]
No	2062 (97%)	318 (88%)	
Yes	72 (3%)	42 (12%)	
Liver n(%)			P < 0.001[1]
No	2119 (99%)	341 (95%)	
Yes	15 (1%)	19 (5%)	
Bowel n(%)			P < 0.001[1]
No	2077 (97%)	335 (93%)	
Yes	57 (3%)	25 (7%)	
Bladder n(%)			P = 0.001[1]
No	2097 (98%)	343 (95%)	
Yes	37 (2%)	17 (5%)	
Arthritis n(%)			P < 0.001[1]
No	1821 (85%)	281 (78%)	

Supplementary Table 1: The full set of model variables from the replication study regardless of their statistical significance in either analysis.

Yes	313 (15%)	79 (22%)	
Bone n(%) No Yes	 1807 (85%) 327 (15%)	 272 (76%) 88 (24%)	P < 0.001[1]
Gout n(%) No Yes	 2112 (99%) 22 (1%)	 356 (99%) 4 (1%)	P = 0.78[1]
Skin n(%) No Yes	 2060 (97%) 74 (3%)	 333 (93%) 27 (7%)	P = 0.001[1]
Mobility n(%) None Some Severe	 1686 (79%) 436 (20%) 10 (1%)	 231 (64%) 124 34%) 5 (2%)	
Self care n(%) None Some Severe	 1934 (91%) 181 (8%) 17 (1%)	 279 (78%) 73 (20%) 7 (2%)	
Usual care n(%) None Some Severe	 1727 (81%) 361 (17%) 44 (2%)	 217 (60%) 121 (34%) 22 (6%)	
Pain n(%) None Some Severe	 1491 (70%) 495 (23%) 144 (7%)	 161 (45%) 125 (35%) 73 (20%)	
Side-effects n(%) No Yes	 834 (86%) 135 (14%)	 170 (71%) 71 (29%)	P < 0.001[1]
Cigarettes n(%) Never Past occasionally Past Daily Current occasionally Current daily	 969 (45%) 105 (5%) 392 (18%) 62 (3%) 603 (28%)	 101 (28%) 24 (7%) 62 (17%) 14 (4%) 159 (44%)	
Hopelessness Mean (st. dev.)	 7.13 (1.95)	 6.40 (2.08)	P < 0.001[2]
LOC1 total Mean (st. dev.)	 8.08 (2.22)	 8.97 (2.21)	P < 0.001[2]
LOC2 total Mean (st. dev.)	 11.17 (1.98)	 10.23 (2.52)	P < 0.001[2]
LOC3 total Mean (st. dev.)	 8.26 (2.59)	 9.65 (2.69)	P < 0.001[2]
PHQ total Mean (st. dev.)	 11.41 (4.5)	 20.43 (6.55)	P < 0.001[2]
GAD total Mean (st. dev.)	 9.66 (4.15)	 17.25 (6.73)	P < 0.001[2]

Supplementary Table 1: The full set of model variables from the replication study regardless of their statistical significance in either analysis.

Empathy total Mean (st. dev.)	 16.28 (4.75)	 14.77 (5.02)	P < 0.001[2]
Housing quality n(%) None One Two Three	 155 (7%) 1423 (67%) 333 (16%) 223 (10%)	 31 (9%) 216 (60%) 64 (18%) 49 (14%)	
Neighbourhood n(%) Not Belonging	 565 (27%) 1539 (73%)	 134 (38%) 222 (62%)	P < 0.001[1]
Paranoia n(%) Strongly disagree Disagree Neither Agree Strongly agree	 1674 (79%) 396 (19%) 27 (1%) 20 (1%) 11 (1%)	 173 (49%) 98 (28%) 36 (10%) 31 (9%) 17 (5%)	
Well being Mean (st. dev.)	 26.51 (5.19)	 20.82 (6.44)	P < 0.001[2]
Social capital Mean (st. dev.)	 7.09 (2.22)	 6.59 (6.64)	P < 0.001[2]

1 Chi-squared test

2 Independent sample t-test

Supplementary Table 2: Associations between the independent variables and the three separate suicide ideation trajectories (i.e. onset, remission and persistence), identified via multivariate analysis, using logistic regression, regardless of statistical significance.

Supplementary Table 2. Longitudinal Study Results showing the associations between independent variables and the onset, remission and persistence of suicidal ideation, identified via multivariate analysis, using logistic regression.

Predictor	Onset of Suicidal Ideation			Remission from Suicidal Ideation			Persistence of Suicidal Ideation		
	odds ratio	95 Confidence Interval	P value	odds ratio	95 Confidence Interval	P value	odds ratio	95 Confidence Interval	P value
Demographics									
Age (65+)	Reference			Reference			Reference		
25 - 34	1.93	(0.95, 3.94)	0.07	2.54	(1.08, 5.98)	0.033	18.28	(2.35, 142.31)	0.006
35 – 44	1.72	(0.79, 3.77)	0.17	1.55	(0.56, 4.28)	0.40	15.92	(1.96, 129.08)	0.01
45 – 54	2.77	(1.39, 5.53)	0.0039	3.01	(1.07, 7.11)	0.012	36.11	(4.78, 272.78)	0.0005
55 - 64	1.05	(0.47, 2.36)	0.90	1.27	(0.48, 3.39)	0.63	14.34	(1.81, 113.32)	0.012
Female	Reference			Reference			Reference		
Male	0.72	(0.43, 1.19)	0.20	0.92	(0.52, 1.65)	0.79	1.64	(0.93, 2.90)	0.09
White	Reference			Reference			Reference		
Black + ethic minority	0.48	(0.19, 1.22)	0.12	1.46	(0.69, 3.10)	0.32	0.62	(0.22, 1.77)	0.37
Heterosexual	Reference			Reference			Reference		
LGBTQ				2.73	(0.76, 9.83)	0.12			
Married/partnership	Reference			Reference			Reference		
Single/never married or civil partnership	1.87	(1.11, 3.15)	0.019	1.43	(0.79, 2.58)	0.24	2.68	(1.32, 5.45)	0.006
Socioeconomic status									
Education									
(no qualifications)	Reference			Reference			Reference		
Professional, vocational or work certificate	0.98	(0.61, 1.59)	0.94	0.85	(0.48, 1.51)	0.85	1.36	(0.74, 2.53)	0.32
Degree or higher	1.08	(0.46, 2.55)	0.86	0.63	(0.18, 2.14)	0.63	2.16	(0.87, 5.39)	0.98
Employed	Reference			Reference			Reference		
Non-employment	1.32	(0.83, 2.10)	0.24	1.23	(0.70, 2.14)	0.47	1.51	(0.85, 2.70)	0.16
Problems with housing									
No problems	Reference			Reference			Reference		
One or more problems	1.11	(0.25, 4.87)	0.89	0.34	(0.11, 1.04)	0.058	0.17	(0.07, 0.44)	0.002

Supplementary Table 2: Associations between the independent variables and the three separate suicide ideation trajectories (i.e. onset, remission and persistence), identified via multivariate analysis, using logistic regression, regardless of statistical significance.

Financial position compared with previous 12 months									
Worse	1.07	(0.49, 2.35)	0.97	0.98	(0.37, 2.60)	0.97	1.25	(0.51 3.10)	0.62
Same	Reference			Reference			Reference		
Better	2.42	(1.41, 4.16)	0.001	2.32	(1.22, 4.43)	0.01	1.97	(0.98, 3.97)	0.06
Caring responsibility									
None	Reference			Reference			Reference		
1 – 49 hours week	2.19	(1.11, 4.35)	0.024	2.10	(0.93, 4.70)	0.07	1.69	(0.68, 4.17)	0.25
50+ hours week	1.06	(0.44, 2.56)	0.91	0.50	(0.12, 2.14)	0.35	1.08	(0.37, 3.14)	0.89
Health problems (EQ-5D)									
Pain									
None	Reference			Reference			Reference		
Some pain	1.74	(1.09, 2.76)	0.02	1.32	0.76, 2.30)	0.33	2.38	(1.33, 4.26)	0.004
Self-care									
No problems	Reference			Reference			Reference		
Some problems	1.61	(0.83, 3.12)	0.16	2.36	(1.16, 4.80)	0.018	3.16	(1.60, 6.23)	0.0001
Usual activity									
No problems	Reference			Reference			Reference		
Some problems	2.01	(1.24, 3.25)	0.005	1.76	(0.98, 3.16)	0.06	3.12	(1.75, 5.54)	0.005
Mobility									
No problems	Reference			Reference			Reference		
Some problems	1.28	(0.78, 2.09)	0.33	1.28	(0.71, 2.30)	0.42	1.94	(1.08, 3.45)	0.026
Mental and physical ill-health comorbidity									
No co-morbidity	Reference			Reference			Reference		
Yes - one or more comorbidities	1.35	(0.81, 2.27)	0.25	0.93	(0.52, 1.66)	0.81	3.17	(1.41, 7.15	0.005
Medication Side effects									
No side effects	Reference			Reference			Reference		
Some side effects	2.08	(1.02, 4.22)	0.043	2.36	(1.01, 5.55)	0.048	3.68	(1.81, 7.49)	0.0003

Supplementary Table 2: Associations between the independent variables and the three separate suicide ideation trajectories (i.e. onset, remission and persistence), identified via multivariate analysis, using logistic regression, regardless of statistical significance.

Alcohol consumption									
None (0 units)	Reference			Reference			Reference		
Moderate/Heavy (1 - 28 units)	0.69	(0.30, 1.62)	0.40	0.41	(0.13, 1.25)	0.12	0.48	(0.18, 1.24)	0.13
Very heavy (> 28 units)	0.41	(0.11, 1.60)	0.20	1.03	(0.30, 3.57)	0.96	0.93	(0.30, 2.85)	0.90
Smoking status									
Never	Reference			Reference			Reference		
Ex - smoker	1.96	(1.05, 3.65)	0.03	0.98	(0.45, 2.15)	0.96	2.14	(0.92, 4.96)	0.076
Current	2.42	(1.38, 4.22)	0.002	1.77	(0.95, 3.29!	0.07	3.76	(1.83, 7.71)	0.0003
Psychological factors									
Empathy	1.07	(1.00, 1.13)	0.038	0.98	(0.91, 1.05))	0.59	1.00	(0.93, 1.07)	0.97
Hopelessness	1.01	(0.90, 1.13)	0.92	0.84	(0.74, 0.95)	0.006	0.83	(0.73, 0.95)	0.005
Locus of control:									
- power	0.98	(0.89, 1.09)	0.72	0.87	(0.78, 0.97)	0.015	1.03	(0.90, 1.09)	0.68
- chance	1..08	(0.99, 1.17)	0.08	1.08	(0.98, 1.20)	0.11	1.04	(0.95, 1.15)	0.40
- internal	1.07	(0.97, 1.19)	0.17	1.13	(1.00, 1.27)	0.051	1.05	(0.93, 1.19)	0.42
Social capital									
Practical support									
No	Reference			Reference			Reference		
Yes	1.76	(0.65, 4.74)	0.27	3.34	(1.30, 8.56)	0.01	3.56	(1.38, 9.16)	0.008
Socialise									
No	Reference			Reference			Reference		
Yes	1.92	(0.75, 5.23	0.20	5.84	(2.54, 13.44)	<0.001	3.18	(1.15, 8.78)	0.026
Neighbourhood belonging									
No	Reference			Reference			Reference		
Yes	1.09	(0.58, 1.99)	0.81	1.05	(0.91, 0.99)	0.89	2.15	(1.14, 4.06)	0.019