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Transition to a first suicide attempt among young and middle-aged males with a history of suicidal thoughts: A two-year cohort study

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ABSTRACT

Introduction: Although many studies have examined the risk and protective factors associated with suicidal behavior, little is known about the probability of transition from suicidal thoughts to suicidal attempts and the factors that distinguish those who have suicidal thoughts from those who progress to a suicide attempt.
Objectives: To determine the probability and predictors of transition to a suicide attempt among young and middle-aged males with a history of suicidal thoughts but no prior history of attempting suicide.
Methods: We used data from the first two waves of the Australian Longitudinal Study on Male Health, approximately two years apart. We followed the cohort of males aged 18–55 years who, at wave 1, reported a lifetime history of suicidal ideation but no history of a prior suicide attempt. We report transition probabilities to a first suicide attempt at Wave 2 and used logistic regression models to examine baseline predictors of transition to a first suicide attempt over the two-year period among males aged 18 years and older.
Results: From the 1,564 males with suicidal thoughts at wave 1,140 participants (8.9%; 95% CI:7.6,10.5) reported to have had their first suicide attempt in the two-year period. In multivariate analyses, males aged 30–39 (OR=0.31; 95% CI: 0.16,0.60), 40–49 (OR=0.47; 95% CI:0.24,0.91) and 50–55 (OR=0.31; 95% CI: 0.13,0.73) all had lower odds of a first suicide attempt compared to males aged 18–29 years. The odds of a first suicide attempt were significantly higher for males who were: living in inner regional areas (ref: major cities) (OR=2.32; 95% CI: 1.33,4.04); homosexual or bisexual (OR=2.51; 95% CI: 1.17,5.36); working night shift as their main job (OR=1.75; 95% CI: 1.05,2.91); and, living with a disability (OR=1.99; 95% CI: 1.07,3.65). Clinical indicators such as symptoms of depression and illicit substance use were not significant predictors of transition to a first suicide attempt in multivariate models, nor were indicators of social connection.
Conclusion: We estimated that 8.9% of Australian males aged 15–55 years with a history of suicidal thoughts and no prior history of suicide attempts will progress to a first suicide attempt within two-years. Neither psychological distress, illicit substance use nor social connection indicators were correlated with transition to a first suicide attempt. Rather, it was socio-demographic indicators that were associated with transition to a first suicide attempt.

1. Background

Suicidal thoughts are common and a well-established risk factor for suicide attempts (Nock et al., 2008), yet most people who have thoughts of suicide do not progress to attempting suicide (ten Have et al., 2009). Many studies have examined the risk and protective factors associated with suicidal behavior (Hawton and van Heeringen, 2009), with most studies highlighting correlations between one measure of suicidality (i.e. either suicidal ideation or suicide attempt or suicide death) and the risk and protective factors of interest. However, the 'ideation to action' framework proposes that oft-cited risk factors for suicidality have failed to differentiate between those people who have thoughts of suicide and who do not attempt suicide and those people with suicidal thoughts who progress to a suicide attempt (Klonsky and May 2014). This distinction is fundamentally important as it is hard to prevent suicide if we don't know the modifiable factors that influence movement from suicidal ideation to a suicide attempt.

There has been a growth in studies seeking to apply the 'ideation to

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action' framework to their analyses but most have relied on cross-sectional study designs (May and Klonsky, 2016). Studies using this design are unable to provide estimates of the probability of transition from suicidal thoughts to suicide attempts, and risk factor analyses are impaired by a lack of clarity around the temporal direction of associations. Longitudinal studies adopting an ideation to action framework are scarce (Haregu et al., 2023; ten Have et al., 2009), with many typically using small sample sizes (i.e. <150) and focusing exclusively on clinical samples (Chan et al., 2014; Florez et al., 2022; Qiu et al., 2017).

In addition, prior 'ideation to action' studies have mostly focused on youth sub-populations (Hielscher et al., 2020; Mars et al., 2019). The risk of first onset of suicidal ideation increases rapidly between adolescence and young adulthood, and the risk of transition from ideation to planning or attempting suicide is thought to diminish with increasing time from first onset of ideation (Borges et al., 2012). However, we have far less data to inform our understanding of the risk of transition from suicidal ideation to attempts among adults in the general population.

Prior longitudinal studies have also strongly favoured investigating clinical measures, such as psychiatric disorders, executive function and personality characteristics, as risk factors for suicide attempts among people with suicidal ideation (Haregu et al., review; Haregu et al., 2023; Hielscher et al., 2020; Mars et al., 2019). A recent systematic review of 18 longitudinal studies examining transitions from suicidal ideation to suicide attempt observed that few studies examined social and environmental correlates beyond basic demographics (Haregu et al., 2023). This is despite the growing evidence-base on the important role of social determinants, and associated phenomenon such as membership of minority populations, in experiences of suicidal behavior (Balakrishnan et al., 2022; Haregu et al., 2022; Machado et al., 2015; Stinchcombe and Hammond, 2021).

We aimed to extend the existing literature by using longitudinal data from a large general population-based sample of males, containing a broad suite of social, environmental and clinical correlates. The aim of this study was to determine the probability and correlates of transition to a suicide attempt among young and middle-aged males with a history of suicidal thoughts but no prior history of attempting suicide.

2. Methods

2.1. Data source

The study population is drawn from 12,218 males who participated in wave 1 and wave 2 (two-year follow-up) of The Australian Longitudinal Study on Male Health, a large-scale cohort study of Australian males aged 10 to 55 years at baseline. Full details of the study design and methods are available elsewhere (Currier et al., 2016). In brief, multi-stage stratified cluster sampling was used in wave 1 to recruit Australian boys and men from households in major cities, inner regional and outer regional areas; households in remote and very remote areas were not included in the sampling frame due to vast size of the country and associated resource constraints. Three different questionnaires were used for three different age groups (10–14 years; 15–17 years; 18 years and older). The questionnaires given to those aged under 18 differed substantially from those aged ≥18 years. Those aged 10–14 years were excluded from our study as they received different questions related to suicidality. We were able to include those aged 15–17 years when examining the probability of transition to a suicide attempt, but we had to exclude them from our multivariate regression analysis as they were given different questions related to our co-variates.

Questionnaires were self-administered and captured information about suicidal thoughts and attempts, physical and mental health, health-related behaviours, social and environmental determinants of health, health literacy, and health service use. The study received ethical approval from the University of Melbourne Human Sciences Human Ethics Sub-Committee (HREC 1237897 and 1237376).

2.2. Study design

We undertook a cohort study to determine the probability of transition from self-reported suicidal thoughts to attempts and to identify predictors of the transition over a two-year period. Our analyses focused on the study participants who reported a lifetime history of suicidal thoughts but no prior history of suicide attempts at baseline, and who provided follow-up data approximately two years later as part of wave 2 data collection.

2.3. Measures

2.3.1. Suicidality

Lifetime suicidal thoughts were measured by asking participants if they had ever seriously thought about killing themselves (yes/no). Lifetime suicide attempt was assessed by asking participants if they had ever tried to kill themselves (yes/no). Study participants with suicidal thoughts at wave 1 who answered "No" to lifetime suicidal attempt at wave 1 and "Yes" to lifetime suicidal attempt at wave 2 were considered to have progressed to making a first suicide attempt in the two-year period between study measurements.

2.3.2. Basic demographic indicators

Demographic variables included age, marital status (never married, currently married, separated/divorced/widowed), having children (yes/no) and remoteness of residence (urban, inner regional or outer regional), all taken from wave 1 surveys. Remoteness is classified by the Australian Bureau of Statistics using an index of relative geographic access to services (Australian Bureau of Statistics, 2023). *Inner* or *outer* regional are defined as those areas where geographic distance imposes *some* or *moderate*, respectively, restriction upon accessibility to the widest range of goods, services and opportunities for social interaction.

2.3.3. Health indicators

Depressive symptoms were measured using the PHQ-9 for adults, a nine-item screening tool based on criteria for depressive disorders in the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV). The PHQ-9 has well-established criterion, construct and external validity (Kroenke et al., 2001). We used the cut-off score of 10 or greater, which indicates moderate or worse depressive symptoms. Substance use was measured based on self-reports of any of the following behaviours: current tobacco smoking; harmful alcohol use as assessed using the Alcohol Use Disorders Identification Test (AUDIT) (Bohn et al., 1995); and, use of marijuana or cannabis; amphetamine; ecstasy or cocaine for non-medical purposes at least once in the past 12 months (yes/no). These indicators were all taken from wave 1 surveys.

2.3.4. Social indicators

Social indicators included educational qualification (high school or less; diploma or certificate; bachelor and above; others), current employment status (employed vs unemployed), working night shift for the main job (yes/no) and home ownership (yes/no). Financial stress (yes/no) was assessed by asking participants if they had experienced any of six negative consequences (for example, could not fill a prescription for medicine) because of a shortage of money. Disability status was assessed using questions from the Washington Group on Disability Statistics (Madans et al., 2011). Discrimination was broadly measured by asking participants if they had experienced discrimination in the preceding two years (Armstrong et al., 2021). Area-level disadvantage was assessed using the Socio-Economic Indexes for Areas (SEIFA) of the neighborhood in which the participant lived (Statistics, 2013) and converted to quartiles for analysis. Experience with intimate partner violence was assessed by asking participants if they had ever been hurt (yes/no) by an intimate partner. Sexual orientation was assessed by self-report and grouped into heterosexual, homo/bi-sexual, and unsure/others. We acknowledge homosexual and bisexual males are

different groups, but combined them to maximize statistical power. Social connectedness was measured by the Medical Outcomes Study (MOS) social support scale (Sherbourne and Stewart, 1991), being an active member of a club, and frequency of attending religious events (which may also have indicated religiosity). Personal wellbeing was measured using the Personal Wellbeing Index, which asks participants how satisfied they are (on a scale from 0 to 10) across eight different domains (e.g. standard of their life, how safe you feel, etc.) (The International Wellbeing Group, 2006). All indicators were taken from wave 1 responses.

2.4. Statistical analyses

Data analysis was undertaken using Stata version 17.0 and accounted for the complex multistage sampling design. We calculated the probability of transition from reporting suicidal thoughts in wave 1 to reporting a first suicide attempt by wave 2. We used logistic regression models to examine baseline correlates of transition to a first suicide attempt over the two-year period, reported as odds ratios. Variables associated with transition to suicide ($p<0.1$) in univariate analyses were included in the multivariate model.

3. Results

3.1. Characteristics of the study population

We identified 1564 males with history of lifetime suicidal thoughts but no reported history of suicide attempts at wave 1. Their characteristics are shown in Table 1. Just over half of the study sample were aged between 30 and 49 years, three out of five (60.8%) were married, and just over half (55.9%) lived in major cities. Indicators of social disadvantage were common in the sample. One-quarter had not completed high school, almost one-fifth (19.2%) were unemployed, almost half (45.8%) reported financial stress, almost one-third (29.9%) lived in lowest SEIFA quartile areas, one in ten reported living with a disability (11.7%), 5.7% were bi-or homosexual, 28.1% had a history of being hurt by their intimate partners, and one quarter (24.2%) had experienced discrimination in the preceding two years.

Transition to suicidal attempt: From the total 1564 participants, there were 140 males (8.9%; 95% CI:7.6,10.5) who reported having made a first suicide attempt at wave 2. This value varied by participant characteristics (see Table 1). The highest probability of transitioning to a first suicide attempt was observed among younger males aged 15–17 years (13.3%) and 18–29 years (15.3%), while the lowest probability among males aged 50–55 years (5.4%).

In adjusted analyses with males aged 18 years and older, participants aged 18–29 years were most likely to transition to a first suicide attempt by wave 2, with the odds of a suicide attempt lower for older age groups: 30–39 years (OR=0.31; 95% CI: 0.16,0.60), 40–49 years (OR=0.47; 95% CI: 0.24, 0.91) and 50–55 years (OR=0.31; 95% CI: 0.13,0.73). The odds of transitioning to a first suicide attempt were significantly higher for: males living in inner regional areas (ref: major cities) (OR=2. 32; 95% CI: 1.33,4.04); homosexual or bisexual males (OR=2.51; 95% CI: 1.17,5.36); males who worked night shift as their main job (OR=1.75; 95% CI: 1.05,2.91); and, males living with a disability (OR=1.98; 95% CI: 1.07,3.65). Clinical indicators such as symptoms of depression and illicit substance use were not significant correlates of transition to a first suicide attempt in multivariate models, nor were indicators of social connection.

4. Discussion

This cohort study examined the probability and correlates of transition to a first suicide attempt, among a general population cohort of 1564 young and middle-aged males with a history of suicidal thoughts but no prior history of attempting suicide. We observed that just under one in ten males in our cohort transitioned to a first suicide attempt, and the odds of transitioning to a first suicide attempt were highest among younger males, males with a disability, homosexual or bisexual males, males living in inner regional areas and males working night shift.

We estimated that between 7.6% and 10.5% of Australian males aged 15–55 years with a history of suicidal thoughts and no prior history of suicide attempts will progress to a first suicide attempt within two-years. This probability of transitioning to a suicide attempt is comparable to international examples. One of the few longitudinal studies with a general adult population, undertaken in the Netherlands, estimated that 7.4% of people with suicidal ideation at baseline had made a suicide attempt by two-year follow-up (ten Have et al., 2009). In our study, the probability of transitioning to a suicide attempt was highest for those aged 15–17 years (13.3%) and 18–29 years (15.3%). This is slightly higher yet comparable to a study of a population birth cohort of youth aged 16 years in the UK, which reported that 12% of those with a prior history of suicidal thoughts had transitioned to a first suicide attempt by follow-up at 21 years of age (Mars et al., 2019). Our findings, along with this earlier research, highlight the importance of proactive supports for males experiencing suicidal thoughts, particularly young males, to reduce the risk of transitioning to a suicide attempt.

Without understating the high level of risk involved, it was encouraging that approximately 90% of our cohort of males with a history of suicidal thoughts had not transitioned to a first suicide attempt by two-year follow-up. In particular, the probability of transition to a first suicide attempt was substantially lower (5.4–7.2%) in males aged 30–55 years. In contrast to our finding, the suicide death rates in Australia are actually higher for males aged 25–54 years than they are for males aged 15–24 years, with rates peaking in mid-life (Australian Bureau of Statistics, 2021). However, attempting suicide and dying by suicide are related but different phenomena, and there can be several attempts for every death. This is particularly the case where less lethal suicide methods are being used, and it may be that middle-aged males have greater access to more lethal means of suicide than younger males. Regardless, the explanation for this difference in trends is unclear, but it's important to reflect that our sample only includes those with no prior suicide attempt, and that the risk of a suicide attempt for other groups of males in this age range (e.g. males aged 30–55 years with a prior history of suicide attempts) may be substantially higher.

Higher odds of transitioning to a suicide attempt were observed among males with a disability and homosexual or bisexual males, males working night shift and males living in inner regional areas. Prior research has identified these groups as being at high risk of suicidality (Australian Institute of Health and Welfare, 2019; Balakrishnan et al., 2022; Lutz and Fiske, 2018; Park et al., 2022). Our research extends this knowledge by documenting that these factors are also associated with a significantly higher risk of transitioning from suicidal thoughts to a first suicide attempt. Conversely, clinical indicators such as symptoms of depression and illicit substance use were only significant correlates of transition to a first suicide attempt in unadjusted analyses, and they lost statistical significance in multivariate models. This finding is somewhat surprising, given a recent systematic review documented that clinical psychiatric indicators and illicit substance use/dependence were frequently observed to be associated with transitioning to a suicide attempt among people experiencing suicidal ideation (Haregu et al., 2023). However, this review also identified that few studies had adjusted for a broad suite of social measures, which may in part explain the difference in findings. Furthermore, our findings to some extent support the assertions in a systematic review of cross-sectional "ideation to action" studies, that clinical psychiatric factors may be more correlated with suicidal ideation than they are with suicide attempts among people experiencing suicidal ideation (May and Klonsky, 2016). Our findings strongly suggest that future research in this area should endeavor to include a broader suite of health and social correlates when examining transitions from suicidal thoughts to attempts.

A surprising finding in our study was that social connection was not

Table 1
Probabilities and odds ratios of transition to suicide and associated factors.

Participant characteristics	Participant characteristicsN (%)	Probability of a suicide attempt[a]%(95% CI)	Unadjusted OR(95% CI)[b]	P value	Adjusted* OR[95% CI][b]	P value
Age categories						
15-17 years	102(6.6)	13.3(6.5,20)				
18-29 years (Ref)	347(22.5)	15.3(11.4,19.2)				
30 - 39 years	392(25.4)	6.0(3.6,8.4)	0.36(0.22,0.61)	0.000	0.31(0.16,0.60)	0.001
40 - 49 years	437(28.3)	7.2(4.7,9.6)	0.44(0.28,0.71)	0.001	0.47(0.24,0.91)	0.024
50 - 55 years	264(17.1)	5.4(2.6,8.1)	0.33(0.18,0.6)	0.000	0.31(0.13,0.73)	0.007
Marital status						
Never married (Ref)	426(29.7)	12.3(9.2,15.5)				
Divorced/widowed/separated	136(9.5)	11.1(5.8,16.4)	0.91(0.49,1.68)	0.766	1.27(0.53,3.03)	0.588
Married or living together	872(60.8)	6.2(4.6,7.8)	0.48(0.32,0.71)	0.000	0.95(0.52,1.72)	0.860
Have children[c]						
No (Ref)	517(36)	11.4(8.6,14.2)				
Yes	919(64)	6.7(5.1,8.4)	.57 (0.39,0.84)	0.004		
Remoteness						
Major cities (Ref)	804(55.9)	6.9(5.1,8.6)				
Inner regional	340(23.6)	12.5(9,16)	1.96(1.28,2.99)	0.002	2.32(1.33,4.04)	0.003
Outer regional	295(20.5)	8.1(4.9,11.3)	1.17(0.71,1.95)	0.535	1.54(0.81,2.92)	0.186
Depressive symptoms[d]						
PHQ9 <10 (Ref)	1002(69.6)	6.8(5.2,8.4)				
PHQ9 ≥10	438(30.4)	12.3(9.1,15.4)	1.05(1.02,1.08)	0.000	1.00(0.96,1.05)	0.864
Smoking						
No (Ref)	1061(73.7)	6.4(4.9,7.9)				
Yes	379(26.3)	14.2(10.6,17.7)	2.45(1.67,3.59)	0.000	1.58(0.95,2.61)	0.076
Alcohol use disorder						
Low risk (ref)	714(53.9)	6.7(4.9,8.6)				
Increasing risk	418(31.6)	9.6(6.7,12.4)	1.46(0.94,2.27)	0.094	1.19(0.72,1.99)	0.498
High risk	98(7.4)	12.4(5.8,18.9)	1.98(1.01,3.88)	0.046	1.27(0.58,2.81)	0.553
Possible dependence	94(7.1)	8.8(3,14.6)	1.32(0.60,2.89)	0.487	0.75(0.3,1.88)	0.535
Marijuana/cannabis use (past 12 months)						
No (Ref)	1080(75)	7.9(6.2,9.5)				
Yes	360(25)	10.2(7,13.4)	1.33 (0.89,2.01)	0.168		
Amphetamine use						
No (Ref)	1276(92.5)	7.9(6.4,9.4)				
Yes	104(7.5)	15.8(8.7,23)	2.16 (1.22,3.82)	0.008	1.47(0.73,2.95)	0.276
Ecstasy or cocaine						
No (Ref)	1326(95.5)	8(6.5,9.5)				
Yes	62(4.5)	18.6(8.7,28.6)	1.56(0.83,2.96)	0.166		
Highest Educational qualification						
High school or less (Ref)	374(27)	11(7.8,14.3)				
Diploma or certificate	649(46.8)	10(7.7,12.3)	0.91(0.60,1.38)	0.671	1.27(0.76,2.12)	0.370
Bachelor and above	327(23.6)	3.1(1.2,5)	0.26(0.12,0.53)	0.000	0.54(0.23,1.27)	0.158
Others	38(2.7)	2.6(-2.5,7.7)	0.22(0.03,1.68)	0.147	0.33(0.04,2.63)	0.295
Employment status						
Employed (Ref)	1159(80.8)	7.8(6.3,9.4)				
Unemployed	276(19.2)	10.8(7.1,14.5)	1.41 (0.91,2.19)	0.126		
Main job involves night shift						
No (Ref)	1158(80.4)	7.4(5.9,8.9)				
Yes	282(19.6)	12.7(8.8,16.7)	1.81(1.19,2.75)	0.001	1.75(1.05,2.91)	0.031
Home ownership						
No (Ref)	551(38.7)	11.5(8.8,14.2)				
Yes	872(61.3)	6.5(4.9,8.2)	0.55(0.38,0.81)	0.002	0.87(0.53,1.42)	0.570
Financial stress						
No (Ref)	781(54.2)	6.8(5.0,8.5)				
Yes	659(45.8)	10.5(8.1,12.8)	1.58 (1.08,2.31)	0.017	1.22(0.75,2.01)	0.421
Disability						
No (Ref)	1260(88.3)	7.4(5.9,8.8)				
Yes	167(11.7)	16.1(10.5,21.8)	2.37(1.48,3.79)	0.000	1.98(1.07,3.65)	0.030
Discrimination						
No (Ref)	1067(75.8)	7.4(5.9,9)				
Yes	341(24.2)	11.1(7.8,14.5)	1.54(1.02,2.33)	0.039	1.16(0.7,1.95)	0.560
SEIFA						
First quartile (Ref)	431(29.9)	10.4(7.5,13.3)				
Second quartile	372(25.8)	9.1(6.1,12)	0.86(0.53,1.38)	0.521	1.02(0.57,1.85)	0.935
Third quartile	375(26)	7.7(4.9,10.4)	0.71(0.43,1.16)	0.175	1.08(0.59,1.96)	0.813
Fourth quartile	262(18.2)	5.4(2.7,8.2)	0.50(0.27,0.93)	0.027	0.9(0.42,1.92)	0.776
Sexual orientation						
Heterosexual (Ref)	1313(92)	7.5(6.1,9)				
Homo/bisexual	81(5.7)	19.0(10.3,27.6)	2.84(1.56,5.17)	0.001	2.51(1.17,5.36)	0.018
Unsure/others	34(2.4)	15.6(3,28.2)	2.16(0.82,5.71)	0.120	2.09(0.55,7.96)	0.282
Hurt by sexual partners						
No (Ref)	1035(71.9)	7.4(5.8,9.0)				
Yes	405(28.1)	11.1(8,14.2)	1.56(1.05,2.31)	0.026	1.36(0.83,2.25)	0.223
Attending religious services						

(*continued on next page*)

Table 1 (*continued*)

Participant characteristics	Participant characteristicsN (%)	Probability of a suicide attempt[a]%(95% CI)	Unadjusted OR(95% CI)[b]	P value	Adjusted* OR[95% CI][b]	P value
Never (Ref)	965(67.6)	9.4(7.6,11.3)				
Yes	462(32.4)	6.4(4.1,8.7)	0.66(0.42,1.02)	0.060	0.64(0.36,1.12)	0.119
Active member of a club						
No (Ref)	942(66.4)	9.0(7.1,10.8)				
Yes	477(33.6)	7.5(5.1,9.9)	0.81(0.54, 1.24)	0.343		
MOS social support scale**	62.4(27.9)		0.99 (0.99,1.00)	0.684		
Personal well-being (scale)**	61.2(18.4)		0.98(0.97,0.99)	0.002	0.99(0.98,1.01)	0.621

* Variables for the multivariate model were selected based on P<0.1 in bivariate analysis

** mean (Standard deviation) presented in column 2

[a] Probability of transitioning to a first suicide suicide attempt (n, %)

[b] From logistic regression model, adjusted for multi-stage sampling

[c] Not included in the adjusted model as it was correlated with marital status

[d] Used as continuous variable in the logistic regression models

associated with transition to a first suicide attempt. It is worth noting that social connection was measured by the Medical Outcomes Study (MOS) social support scale (Sherbourne and Stewart, 1991), and through active membership of a club and frequency of attending religious events (which may also have indicated religiosity). While useful, these measures enquire about access to positive social connections. For example, items in the MOS ask how often certain types of support (e.g. someone who shows you love and affection) are available to you if you need it. However, social exclusion and loneliness, and exposure to social distancing or discriminatory/exclusionary behaviours are different phenomena that are not simply the inverse of social connection. Our social connection measures also don't tell us much about belonging to, or exclusion from, groups that we strongly desire to connect with. Nor do they tell us the degree to which we feel like we're a burden on our social supports. Future research may include a broader suite of measures when seeking to examine the influence of social connections and social exclusion on transition to a suicide attempt. Additionally, our analyses only looked at baseline measurement of social connection, and it may be that a change over time in social connectedness (e.g. a profound reduction in access to social supports) may be more relevant as a predictor of transitioning to a suicide attempt in future studies.

Nonetheless, this finding that social connection was not associated with transition to a suicide attempt is highly relevant for suicide research, given contemporary theoretical models place great emphasis on phenomena like thwarted belongingness and perceived burdensomeness (Chu et al., 2020), suggesting that social connections are a critically important factor in the processes that influence suicidality. The benefit of taking an ideation-to-action approach is that we can start to unpack where in the process a factor like social connection intervenes. Our findings Are consistent with contemporary theories around suicidal behavior (Klonsky et al., 2021), which emphasize that a lack of connectedness is associated with the transition to active suicidal desire, but not with the transition to acting on suicidal thoughts. Frameworks such as the The Three Step Theory (3ST) of suicide posit that the transition to a suicide attempt occurs when the desire for suicide is matched by a capability to make a suicide attempt. There are no comprehensive, validated measures of suicide capability, although three studies using a brief suicide capacity scale have observed an elevation of suicide capability among people with histories of suicide attempts compared to those with histories of suicidal ideation but not attempts (Klonsky et al., 2021).

There are several strengths and limitations associated with this study. Most of the 'ideation to attempt' research has been undertaken on cross-sectional data, and the few longitudinal studies that have been done have prioritized clinical correlates. We were able to undertake longitudinal analyses on a large general population-based sample of males, containing a broad suite of social, environmental and clinical correlates. Our data also included a broad age range of young and middle-aged males, improving our knowledge base of transitions from ideation to attempt across the life course. Nonetheless, there are several limitations. Firstly, our key variables are based on self-report of suicidality over a lifetime, and there can be measurement error when relying on lifetime recall as participants can provide inconsistent responses to questions regarding lifetime suicidal behavior after months or years have elapsed since the event (Klimes-Dougan et al., 2022, 2007). Klimes-Dougan et al. examined data from 19 longitudinal samples and estimated a prevalence of 39% for inconsistent reporting of suicidal ideation and behavior across timepoints (Klimes-Dougan et al., 2022). Inconsistency in reporting was also evident in our data, although to a more modest degree than this estimate provided by Klimes-Dougan et al. In our data we identified that 24.1% (193) of the 802 males who reported a lifetime suicide attempt at wave 1 did not report a lifetime suicide attempt at wave 2. This issue clearly isn't isolated to our data, and it represents a significant challenge for longitudinal research on suicidal ideation and behaviours. An impact of this phenomenon on our study is that for a moderate proportion of participants, our assumption that they are reporting a first suicide attempt is likely to be incorrect. Secondly, there can also be stigma associated with reporting suicidality, and responses to these questions may have been impacted by social desirability bias. Thirdly, we have no data to inform us if a participant died by suicide between baseline and follow-up measurement, so we may have missed some instances of fatal suicide attempts in our analyses. We also don't have access to other related data, such as hospital presentations for self-harm. Relatedly, there were 2024 participants who reported lifetime suicidal ideation and no lifetime suicide attempt at wave 1, among whom 460 (22.7%) did not participate in wave 2. We would hypothesize that the group who dropped out of wave 2 data collection would be at even greater risk of progressing to a suicide attempt; if true, this would mean the estimates we present in this paper are likely conservative. Fourthly, there are some important clinical measures that would have been highly relevant to include, for example, assessments for: anxiety disorders, conduct disorders, impulsiveness and personality measures. Many of these measures may have been better candidates than depression symptoms for predicting suicide attempts among people experiencing suicidal thoughts. Finally, our analyses crudely combined (for purposes of statistical power) males who reported a sexual orientation of homosexuality or bisexuality, even though prior research has highlighted the risk of suicidality varies across these categories (Balakrishnan et al., 2022).

5. Conclusion

We estimated that just under one in ten males aged 15–55 years with a history of suicidal thoughts and no prior history of suicide attempts will progress to a first suicide attempt within two-years. The probability of transitioning to a first suicide attempt was highest among younger males, males with a disability, homosexual or bisexual males, males living in inner regional areas and males working night shift. Neither

psychological distress, illicit substance use nor social connection indicators were correlated with transition to a first suicide attempt. There is a need for more longitudinal studies with a broad suite of clinical and socio-environmental measures to further estimate the risk of transition to a suicide attempt among people experiencing suicidal ideation.

CRediT authorship contribution statement

G. Armstrong: Funding acquisition, Conceptualization, Investigation, Methodology, Writing – original draft, Supervision. **T. Haregu:** Formal analysis, Writing – review & editing. **E. Cho:** Formal analysis, Writing – original draft, Investigation. **A.F. Jorm:** Conceptualization, Methodology, Writing – review & editing. **P. Batterham:** Methodology, Investigation, Writing – review & editing. **M.J. Spittal:** Methodology, Investigation, Writing – original draft.

Declaration of Competing Interest

The authors have no competing interests to declare.

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