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Original article

Detecting determinants of suicidal ideation: South Australian surveillance system results

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Summary

Objective: To determine the self reported prevalence of suicidal ideation in South Australia and to examine the relationship of suicidal ideation with a range of risk, social and demographic factors and related health issues using data collected in a risk factor surveillance system.

Method: Data were collected using a monthly risk factor surveillance system where each month a representative random sample of South Australian is selected from the Electronic White Pages with interviews conducted using computer assisted telephone interviewing (CATI).

Results: In total, 4.7 % of South Australian, aged 16 years and over, were determined to have suicidal ideation. There was no change in the trend over the years when surveys between 1997 and 2005 were compared. A wide range of variables were significant with suicidal ideation at the univariate level. In the final multivariate model, marital status, money situation, psychosocial stress (K10), physical activity, fruit consumption, health service use and mental health service use proved to be best joint predictors of suicidal ideation.

Conclusions: Suicidal ideation in the community has not increased (or decreased) over time and questions assessing suicidal ideation can be used effectively in a surveillance system.

Keywords: Suicidal ideation – Surveillance system – Population – Risk factors – Methodological issues.

Suicidal ideation is an important public health issue. While much research has focused on completed suicides or suicide attempts, limited research has been conducted on the precursor to suicide attempts – the thoughts and preliminary actions that can pre-dispose the planning of a successful (or unsuccessful) suicide attempt. Specific studies on the suicidal ideation of in-patients (Palmer 2004; Tarrier et al. 2004), children and adolescents (Pfaff et al. 2001; McKelvey et al. 1998; Stewart et al. 2005; Goldney et al 1989; Allison et al. 2001), older populations (Bailey et al. 2005; Yip et al. 2003; Bartels et al. 2002), occupation-specific groups (Violanti 2004) and other groups (Charles et al. 2003; Turney et al. 2002) have been undertaken, but large random selected population-wide studies are less common (Stravynski et al. 2002; Carpenter et al. 2000; Goldney et al 2000; Goldney et al. 2003). Very few continuous population based surveillance systems routinely incorporate suicidal ideation in the system as a core module.

Suicidal ideation is an important risk factor for suicide attempts and suicide completion (Violanti et al. 2004; Kuo et al. 2001; Gili-Planas et al. 2001). Risk factors for suicidal ideation incorporate mental, physical, social and psychological aspects of life (Yip et al. 2003) and include depression (Gili-Planas et al. 2001; Wild et al. 2004), substance abuse or dependence (Turvey et al. 2002, Violanti 2004), poor social support (Stewart et al. 2005; Turvey et al. 2002; Stravynski et al. 2002) and recent stressful events (Bartels et al. 2002; Bailey et al. 2005).

This research uses a continuous risk factor surveillance system, in which questions on suicidal ideation are regularly included, to highlight trends in suicidal ideation and to clarify a broad range of demographic, social, health and physical characteristics associated with suicidal ideation. The questions asked to ascertain suicidal ideation were a four-item subscale of the 28 item General Health Questionnaire (GHQ-28) (Goldberg et al. 1979), which has previously demonstrated validity (Watson et al. 2001) and has been used extensively to assess suicidal ideation (Goldney et al 1989; Bailey et al. 2005, Gili-Planas et al. 2001; Hamilton et al. 2000). Based on a model of risk factors for suicide/suicide attempts used by the Australian

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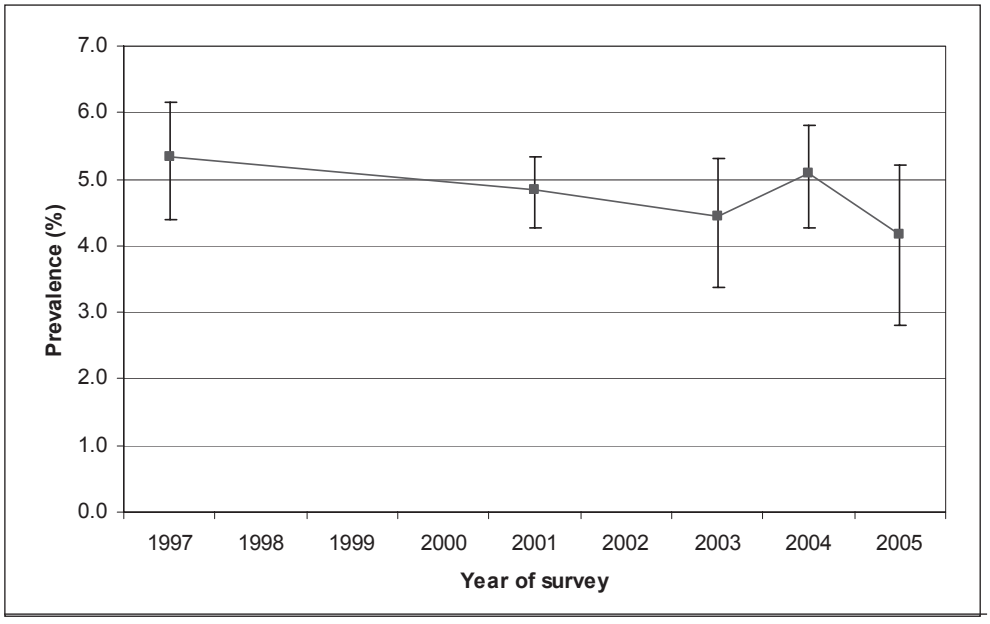

Figure 1 Proportion of people aged 18 years and over that have suicidal ideation by year

Note: 1997 data from Mental Health Survey, 2001 data from Gambling Survey, 2003 to 2005 data from SAMSS 18 years and over

Department of Health (Commonwealth Department of Health and Aged Care, 2000), all variables associated with genetic or biological factors, social and demographic factors, family characteristics and childhood experience, personality and beliefs, environmental factors and mental health problems were included in the analysis.

Methods

Survey design and sample section

The data for this study were collected using the South Australian Monitoring and Surveillance System (SAMSS) from July 2003 to March 2005. SAMSS is a telephone monitoring system designed to systematically monitor the trends of diseases, health related problem, risk factors and other health services issues for all ages over time for the South Australian (SA) health system (Department of Health, 2002). Interviews are conducted on a minimum of 600 randomly selected people (of all ages) each month. Surrogate interviews are conducted for respondents aged less than 16 years. All households in SA with a telephone connected and the telephone number listed in the Electronic White Pages (EWP) are eligible for selection in the sample.

A letter introducing the survey is sent to the selected household. At each selected household, the person with the last birthday is chosen for interview. There were no replacements for non-respondents. Up to ten call backs are made to the household to interview the selected persons. Interviews are conducted by trained health interviewers. SAMSS utilises a CATI (Computer Assisted Telephone Interviewing) system to conduct the interviews. The data were weighted by area (metropolitan/rural), age, gender and probability of selection in the household to the most recent SA population data so that the results were representative of the SA population (ABS 2004).

In the period July 2003 to March 2005 a total of 12200 interviews were conducted (69.0 % response rate). The suicidal ideation questions were included in SAMSS every second month and only asked respondents aged 16+ years. This analysis is therefore limited to the n = 5037 eligible respondents.

Data items

Suicidal ideation was based on four questions contained in the 28 item General Health Questionnaire (GHQ-28) (Goldberg et al. 1979). These were: over the past few weeks: "Have you felt that life isn't worth living?", "Have you thought of the possibility that you might do away with yourself?", "Have you found yourself wishing you were dead and away from it all?", and "Have you found that the idea of taking your own life kept coming into your mind?" The first and third question had the responses of "not at all", "no more than usual", "rather more than usual", or "much more than usual" and the second and fourth had the responses of "definitely not", "I don't think so", "has crossed my mind", or "definitely has". The suicidal questions were scored by applying the binary method to the four questions to produce a score ranging from 0 to 4 where a score of 1 or more indicated suicidal ideation (Goldney et

Table 1 Univariate analyses of selected socio-demographic variables by people with suicidal ideation compared with people without suicidal ideation for people aged 16 years and over in South Australia

Variable	n	%	OR (95 % OR)	P value
Sex				
Male	126/2465	5.1	1.00	
Female	108/2573	4.2	0.82 (0.63–1.06)	0.13
Age Groups				
65 years and over	37/936	3.9	1.00	
45 to 64 years	89/1561	5.7	1.49 (1.00–2.20)	**0.047**
25 to 44 years	64/1803	3.6	0.91 (0.60–1.38)	0.66
16 to 24 years	44/738	6.0	1.57 (1.00–2.46)	**0.046**
Accessibility/remoteness of Australia				
Highly accessible	198/4149	4.8	1.00	
Accessible & moderately accessible	28/755	3.7	0.76 (0.51–1.15)	0.19
Remote & very remote	9/133	6.6	1.42 (0.71–2.86)	0.32
Number of people in household				
1	46/621	7.4	1.00	
2	92/1794	5.1	0.67 (0.47–0.97)	**0.03**
3 or more people	96/2622	3.7	0.47 (0.33–0.68)	**<0.001**
Children aged 15 years or less in household				
No	173/3392	5.1	1.00	
Yes	61/1646	3.7	0.72 (0.53–0.96)	**0.03**
Household composition				
Couple with or without children (incl. step families), or related adults	152/3969	3.8	1.00	
Single parent with children, share care parenting	26/276	9.4	2.61 (1.69–4.03)	**<0.001**
Adults (single, unrelated)	56/790	7.1	1.91 (1.39–2.62)	**<0.001**
Marital status				
Married, living with partner, widowed	121/3555	3.4	1.00	
Separated, divorced	34/351	9.7	3.05 (2.05–4.54)	**<0.001**
Never married	79/1131	7.0	2.12 (1.58–2.84)	**<0.001**
Highest educational attainment				
No schooling, secondary, trade, certificate, diploma	30/935	3.2	1.00	
Degree or higher	204/4093	5.0	1.60 (1.08–2.38)	**0.02**
Country of birth				
English speaking country	211/4577	4.6	1.00	
Non-English speaking country	23/459	5.1	1.11 (0.72–1.73)	0.63
Speak another language other than English at home				
Yes	22/528	4.3	1.00	
No	212/4509	4.7	1.11 (0.71–1.73)	0.21
Aboriginal or Torres Strait Islander				
No	229/4995	4.6	1.00	
Yes	5/40	13.3	3.16 (1.25–7.97)	**0.01**
Work status				
Full or part time employed	119/3063	3.9	1.00	
Unemployed or unable to work	42/263	16.0	4.73 (3.25 – 6.89)	**<0.001**
Home duties, student, retired, other	73/1711	4.3	1.10 (0.82 – 1.49)	0.51
Money situation				
Money left over each week – Can save a lot	117/3726	3.1	1.00	
Just have enough money to get through to	72/860	8.4	2.82 (2.08 – 3.82)	**<0.001**
Spending more money than getting	35/244	14.5	3.20 (3.51 – 7.85)	**<0.001**
Gross annual household income				
$60 000 or more	39/1698	2.3	1.00	
$20 001–$60 000	86/1768	4.8	2.17 (1.47–3.18)	**<0.001**
Up to $20 000	64/837	7.7	3.54 (2.35–5.32)	**<0.001**
Not stated	46/734	6.2	2.82 (1.82–4.37)	**<0.001**
Home ownership				
Owned or being purchased	169/4219	4.0	1.00	
Rented from the Housing Trust	23/195	11.8	3.20 (2.02–5.07)	**<0.001**
Rented privately	36/523	6.9	1.76 (1.22–2.56)	**0.002**
Other	6/101	5.8	1.48 (0.64–3.46)	0.36
Index of relative disadvantage (SEIFA)				
1st quintile (lowest)	50/823	6.1	1.00	
2nd quintile	51/951	5.3	0.87 (0.58–1.30)	0.49
3rd quintile	44/1067	4.1	0.67 (0.44–1.01)	0.06
4th quintile	41/1038	3.9	0.63 (0.41–0.96)	**0.03**
5th quintile (highest)	48/1145	4.2	0.67 (0.45–1.01)	0.06
Overall	234/5037	4.7		

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Table 2 Univariate analyses various chronic conditions by people with suicidal ideation compared with people without suicidal ideation for people aged 16 years and over in South Australia

Variable	n	%	OR (95 % OR)	P value
Overall Health Status				
Excellent, very good, good	133/4233	3.2	1.00	
Fair, poor	101/804	12.5	4.40 (3.36–5.77)	**<0.001**
Diabetes				
No	218/4697	4.6	1.00	
Yes	17/341	4.8	1.05 (0.63–1.75)	0.86
Current asthma				
No	178/4303	4.1	1.00	
Yes	56/734	7.6	1.91 (1.40–2.60)	**<0.001**
Cardio vascular disease (heart attack, angina, heart disease, stroke)	207/4643	4.4	1.00	
Yes	28/394	7.0	1.62 (1.08–2.45)	**0.02**
Arthritis				
No	163/3992	4.1	1.00	
Yes	71/1046	6.8	1.71 (1.29–2.28)	**<0.001**
Osteoporosis				
No	222/4829	4.6	1.00	
Yes	13/208	6.0	1.34 (0.74–2.40)	0.33
Disability (limited in daily activities)				
No	105/3926	2.7	1.00	
Yes	129/1111	11.6	4.78 (3.66–6.25)	**<0.001**
Number of chronic conditions included diabetes, asthma, cardiovascular disease, arthritis and osteoporosis				
None	110/3063	3.6	1.00	
1	78/1392	5.6	1.59 (1.18–2.14)	**0.002**
2	33/439	7.4	2.14 (1.43–3.21)	**<0.001**
3 to 5	13/144	9.2	2.70 (1.49–4.91)	0.001
Overall				

al. 2000; Watson et al. 2001). The inclusion of suicidal ideation questions in a surveillance system initially highlighted some methodological issues with concerns expressed by interviewers and ethics consultants regarding the sensitive, and perhaps influencing, nature of the four questions. Specialist psychiatric advice was obtained which indicated little cause for concern. Notwithstanding, a toll-free number, providing mental health advice, was offered to all respondents.

Demographic variables included in the analyses were sex, age, area of residence, number of people aged 16 years and over in the household, any children living in the household (aged less than 16 years), country of birth, language other than English spoken at home, indigenous status, marital status, work status, highest educational attainment; money situation, dwelling status (e. g. own or rent), household composition, gross annual household income, and socio-economic disadvantage score. The index of relative social disadvantage (IRSD) developed by the Australian Bureau of Statistics was also calculated to identify those geographical areas, such as postcodes, of relatively disadvantaged (ABS, 2003). The IRSD is a composite measure based on selected census variables such as income, educational attainment and employment status. The IRSD scores were grouped into quintiles for analysis where the highest quintile comprises of postcodes with the highest IRSD scores (most advantaged areas).

To determine the general health, respondents were asked how they rated their general health on a scale from excellent to poor. Co-morbidity conditions included medically confirmed diabetes, current asthma, cardio-vascular disease (heart attack, angina, heart disease and/or stroke), arthritis and osteoporosis. These conditions were used to calculate the number of chronic conditions. An additional question assessed disability (respondent is limited in any activities because of any impairment or health problem).

Table 3 Univariate analyses of various mental health conditions by people with suicidal ideation compared with people without suicidal ideation for people aged 16 years and over in South Australia

Variable	n	%	OR (95 % OR)	P value
Diagnosed with a mental health condition in the last 12 months				
Anxiety	64/266	24.2	8.65 (6.28–11.91)	**<0.001**
Depression	85/360	23.6	9.38 (7.00–12.57)	**<0.001**
A stress related problem	65/289	22.6	7.90 (5.76–10.83)	**<0.001**
Any other mental health problem	17/45	37.3	13.03 (7.02–24.20)	**<0.001**
At least one of the above				
No	111/4375	2.5	1.00	
Yes	123/662	18.6	8.78 (6.69–11.52)	**<0.001**
Current mental health condition (diagnosed and/or receiving treatment)				
No	106/4327	2.4	1.00	
Yes	128/710	18.1	8.81 (6.71–11.55)	**<0.001**
Psychological distress				
Low	23/3395	0.7	1.00	
Moderate	62/1143	5.4	8.30 (5.12–13.43)	**<0.001**
High	77/356	21.6	40.07 (24.80–64.74)	**<0.001**
Very high	72/144	50.2	146.21 (86.70–246.58)	**<0.001**
No psychological distress (low/moderate)	85/4538	1.9	1.00	
Psychological distress (high/very high)	149/500	29.9	22.30 (16.73–29.73)	**<0.001**
	234/5037	40.7		
Overall				

The mental health related questions included being diagnosed by a doctor in the previous 12 months with anxiety, depression, a stress related problem or another mental health problem. Other respondents who, although not diagnosed with a mental health condition in the past 12 months, were currently receiving treatment for anxiety, depression, stress related problems or another mental health problems were determined to have a current self-reported mental health condition.

The level of psychological distress of respondents was determined using the Kessler Psychological Distress 10 item scale (K10) (Kessler et al. 1994). This scale is developed to measure anxiety and depressive disorders on a general population. The response categories of each of the 10 questions are converted to Likert scales and reverse scored. The 10 items in the scale are summed to give scores ranging from 10 (no distress) to 50 (high risk of anxiety or a depressive disorder). The scores were grouped in four categories: low (10–15), moderate (15–21), high (22–29), and very high (30–50).

Self-reported health risk factor data included current high blood pressure (HBP) and cholesterol, physical activity (derived on the amount of walking and moderate and vigorous activity in a one week period) (Gill & Taylor, 2004), body mass index (BMI) which was derived from self-reported weight and height and recoded into three categories (underweight, normal weight and overweight/obese) (Gill et al 2004; WHO, 2000), smoking status, household smoking environment, short term and long term alcohol risk (derived from the number of alcoholic drinks per day and the number of times per week alcohol was consumed) (NHMRC 2001), and inadequate daily consumption of vegetables (none to 1 serves) and fruit (none) (NHMRC 2003).

Health or health-related services used in the last four weeks were asked of respondents including the number of times they have used these services. Data on mental health services usage (psychologist, psychiatrist and other community mental health services) were also collected.

To compare the prevalence over time, data from two other point-in-time population surveys with similar sampling methodology were included (Taylor et al. 1997; Taylor et al. 2001). These comparisons were limited to adults aged 18 years and over.

Data analyses

Data were analysed using SPSS Version 13.0 and Stata Version 7.0. Significant changes in the prevalence of suicidal ideation over time for people aged 18 years and over were examined using the χ^2 for trend test. As there were no significant differences between the prevalence estimates from the surveillance system (2003 to 2005), the data were combined so that univariate analyses using χ^2 tests could be undertaken to assess suicidal ideation with the range of socio-demographic and

Table 4 Univariate analyses of various health-related risk factors by people with suicidal ideation compared with people without suicidal ideation for people aged 16 years and over in South Australia

Variable	n	%	OR (95 % OR)	P value
Current high blood pressure and/or on antihypertensive treatment				
No	189/4129	4.6	1.00	
Yes	46/908	5.0	1.11 (0.79–1.54)	0.55
Current high cholesterol and/or on medication				
No	192/4345	4.4	1.00	
Yes	42/692	6.1	1.40 (1.00–1.98)	**0.05**
Physical activity				
Yes (sufficient and/or not sufficient)	162/4075	4.0	1.00	
No	72/934	7.7	2.01 (1.51–2.68)	**<0.001**
Body mass index				
Normal (18.5 to less than 25)	83/1949	4.2	1.00	
Underweight (up to 18.5)	7/95	7.7	1.88 (0.86–4.14)	0.11
Overweight/Obese (25 to less than 30)	113/2515	4.5	1.06 (0.80–1.42)	0.68
Smoking status				
Non-smoker	61/2136	2.8	1.00	
Ex-smoker	85/1887	4.5	1.60 (1.15–2.24)	**0.005**
Smoker	89/1014	8.7	3.27 (2.33–4.57)	**<0.001**
Household smoking environment				
Smoke free home (incl. outside)	164/4356	3.8	1.00	
Smoking in home occasionally or frequently	70/681	10.3	2.91 (2.17–3.90)	**<0.001**
Risk of harm from alcohol in the short term				
Non-drinker, low risk	158/3564	4.4	1.00	
Risky, high-risk	75/1470	5.1	1.16 (0.87–1.54)	0.31
Risk of harm from alcohol in the long term				
Non-drinker, low risk	215/4815	4.5	1.00	
Risky, high-risk	18/220	8.1	1.88 (1.14–3.11)	**0.01**
Number serves of vegetables usually eaten each day				
2 to 5 serves	167/3864	4.3	1.00	
None or 1 serve	67/1174	5.7	1.35 (1.01–1.80)	**0.04**
Number serves of fruit usually eaten each day				
1 or more serves	201/4690	4.3	1.00	
None	34/347	9.7	2.42 (1.65–3.54)	**<0.001**
Number of risk factors				
0	47/1900	2.5	1.00	
1	70/1499	4.6	1.91 (1.31–2.78)	**0.001**
2	62/856	7.2	3.05 (2.07–4.50)	**<0.001**
3	22/319	6.8	2.86 (1.69–4.82)	**<0.001**
4 to 6	10/75	13.0	5.88 (2.83–12.24)	**<0.001**
Overall	234/5037	4.7		

health-related variables. All independent variables that were statistically significant at the 0.25 level in each of the univariate analysis were entered into a logistic regression analysis (Hosmer et al. 1989). Variables to be entered into the logistic regression were also refitted in STATA v7.0, in order to check for multi-collinearity.

Results

The overall prevalence of suicidal ideation of people aged 16 years and over in SA, as determined by SAMSS, was 4.7 % (95 % CI 4.1-5.3, n = 234). For 18 years and over the prevalence was 4.5 % in 2003, 5.1 % in 2004 and 4.2 % in 2005 (overall =

Table 5 Univariate analyses of various health services used in the last four weeks by people with suicidal ideation compared with people without suicidal ideation for people aged 16 years and over in South Australia

Variable	n	%	OR (95 % OR)	P value
Health service used in last four weeks				
General Practitioner	117/1772	6.6	1.91 (1.47–2.48)	**<0.001**
Hospital – Accident & Emergency department	18/108	16.5	4.30 (2.54–7.28)	**<0.001**
Hospital Admission	17/113	15.0	3.82 (2.24–6.52)	**<0.001**
Hospital Clinic	30/301	10.1	2.51 (1.68–3.74)	**<0.001**
Specialist doctor (not in hospital)	43/470	9.2	2.32 (1.64–3.27)	**<0.001**
District nurse or other community nurse	14/81	16.7	4.29 (2.35–7.81)	**<0.001**
Optometrist	19/252	7.6	1.75 (1.08–2.85)	**0.02**
Physiotherapist	13/249	5.4	1.18 (0.67–2.07)	0.57
Chiropractor	18/325	5.5	1.20 (0.73–1.97)	0.48
Occupational therapist	4/17	22.2	5.93 (1.89–18.61)	**0.001**
Audiologist	3/33	10.2	2.34 (0.75–7.31)	0.13
Alternative therapists (naturopath, osteopath)	14/150	9.3	2.16 (1.23–3.82)	**0.006**
Number of times health service was used in last four weeks*				
None	80/2568	3.1	1.00	
1 to 2	82/1771	4.6	1.51 (1.10–2.07)	**0.01**
3 to 4	35/453	7.7	2.59 (1.72–3.91)	**<0.001**
5 or more	38/245	15.7	5.83 (3.87–8.79)	**<0.001**
Mental health service used in last four weeks				
Psychologist	16/50	32.6	10.61 (5.78–19.45)	**<0.001**
Psychiatrist	20/67	30.3	9.66 (5.64–16.54)	**<0.001**
Other community mental health services	10/27	36.7	12.35 (5.55–27.48)	**<0.001**
Number of times mental health services was used in last four weeks*				
None	193/4910	3.9	1.00	
1 to 6	41/128	32.1	11.53 (7.74–17.18)	**<0.001**
Overall	234/5037	4.7		

* For each services, the number of times the health services was used was recorded.

4.7 %). Figure 1 shows the proportion of people with suicidal ideation aged 18 years and over from 1997 to 2005. The trend did not vary over time (χ^2 trend = 1.28, p = 0.26).

Tables 1 to 6 detail the univariate analyses of various socio-demographic variables and health-related issues and the association with suicidal ideation. In total, nine of the sixteen demographic variables produced significant differences (Tab. 1) as did the majority of the health related variables (with osteoporosis and diabetes being the exception) (Tab. 2). All mental health related variables were significant (Tab. 3). In terms of health-related risk factors all variables were significant except for HBP, BMI and alcohol risk (in the short term) (Tab. 4). Table 5 highlights the significant differences in health service use. In the additional analysis undertaken on psychosocial events, a range of events were significantly different between people who had, and did not have, suicidal ideation (Tab. 6).

Table 7 shows the logistic regression analyses of the highest variables associated with suicidal ideation (χ^2 = 565.23, df = 19, p < 0.001). People with suicidal ideation were significantly more likely to be separated, divorced or never married; to have just enough money to get through to the next pay or spending more money than receiving; to have psychological distress (K10); to have done no physical activity in the previous week; to not eat fruit; to have used health or health related services five or more times during the last four weeks; and to have used a mental health-related service during the last four weeks.

Discussion

This study has detailed the prevalence of suicidal ideation in the SA community with nearly 5 % of the adult population having had thoughts of suicide in the past few weeks. The prevalence of suicidal ideation among adults aged 18 years and over has not varied significantly over time between 1997 and 2005. The study has also highlighted that there is a wide range of variables that are associated with people who are in the pre-planning stage of a suicide attempt.

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Table 6 Univariate analyses of various psychosocial events experience in the last 12 months by people with suicidal ideation compared with people without suicidal ideation for people aged 16 years and over in South Australia

Variable	n	%	OR (95 % OR)	P value
Affected by events in the last 12 months				
Unplanned loss of job	13/162	8.2	2.03 (1.13–3.64)	**0.02**
New job	19/428	4.4	1.01 (0.62–1.65)	0.98
Family or domestic violence	11/78	14.6	3.94 (2.06–7.53)	**<0.001**
Death of somebody close	44/743	6.0	1.53 (1.07–2.18)	**0.02**
Discrimination	20/131	15.0	4.24 (2.55–7.05)	**<0.001**
Moved house	20/302	6.6	1.62 (1.00–2.63)	**0.05**
Robbed or home burgled	9/132	6.8	1.62 (0.81–3.26)	0.17
Marriage/relationship breakdown	31/199	15.8	4.83 (3.17–7.35)	**<0.001**
Serious injury	14/133	10.7	2.77 (1.56–4.92)	**<0.001**
Serious illness	32/261	12.1	3.48 (2.31–5.26)	**<0.001**
Illness in family member/friend	36/681	5.3	1.30 (0.89–1.90)	0.18
Birth/pregnancy	6/211	3.0	0.66 (0.30–1.48)	0.31
Financial stress	47/471	9.9	2.97 (2.08–4.24)	**<0.001**
Family issues/problem	53/479	11.0	3.53 (2.50–4.99)	**<0.001**
Mental illness/severe mental disturbance – family member	24/211	11.5	3.16 (2.00–4.98)	**<0.001**
Surgical operation	17/247	6.8	1.65 (0.98–2.79)	0.06
Any other major events	20/229	8.7	2.21 (1.35–3.62)	**0.001**
Number of events				
None to 1	55/2307	2.4	1.00	
2 to 3	50/935	5.3	2.29 (1.55–3.39)	**<0.001**
4 or more	54/375	14.4	6.84 (4.62–10.13)	**<0.001**
Overall	159/3617	4.4		

Note: Since 2005 data asked every three months (Jan, Apr, Jul, Oct) which means for some months data would be not collected at the same time as when data collected on suicidal ideation

The strength of this study lies in the large sample size and the large number of variables that were assessed. SAMSS is a continuous surveillance system that is linked to key national, state and regional indicators. As a surveillance system is not research *per se*, the 15 min on average each participant spends on the telephone is limited to key broad questions rather than an in-depth investigation of one particular area of research interest. Thus, for this kind of analysis, a broader range of known and unknown variables could be assessed.

The limitations of the study are the exclusion of some important groups including the homeless, those living in sheltered accommodation or those without a telephone connection. People in these circumstances might be expected to exhibit suicidal ideation and as a result the prevalence estimates produced in this study should be seen as an underestimation.

Other limitations to the study include the lack of details on known suicidal risk factors including family hardships, substance abuse and prior suicide attempts. The establishment of telephone-based risk factor surveillance systems is always a cost-benefit exercise with time on the telephone limited by both responder burden and interviewing and telephone costs. As a result decisions are made regarding what is, and is not, included in the system. It is a limitation of this study that the important psychosocial and social capital related questions were not always asked in the same months as the suicidal ideation questions as that multivariate associations could be explored.

The univariate analysis results indicated that the youngest age groups and the 45 to 64 year old age groups are at greatest risk of suicidal ideation and certainly there is a high rate of suicide among younger age groups (Pelkonen et al. 2003). In the middle age groups there may be a greater likelihood of stressful life events, job loss, and marital break down which impact on thoughts of suicide.

The univariate analysis supports the evidence of relationships with various other demographic and health related variables. These include adults who are single, whether that is never having been married or separated or divorced and includes single parents who could be more likely to have suicidal ideation. Adults living with other people, either adults or with children in the household are less likely to have thoughts of suicide. Evidence does suggest that those adults who do live alone are more likely to commit suicide due to loneliness, loss of contact with others and perceived worthlessness (Stravynski et al. 2001). Children in the household may provide reasons not to think of suicide and the relationships with others in the household assist a person's self worth and self esteem, limiting negative thoughts (Hopes et al. 1999). Respondents

Table 7 Logistic regression analysis of the likelihood of having a suicidal ideation compared not having suicidal ideation for people aged 16 years and over in South Australia

Variable	n	%	OR (95 % OR)	P value
Marital status				
Married, living with partner, widowed	121/3555	3.4	1.00	
Separated, divorced	34/351	9.7	1.64 (1.02–2.62)	**0.04**
Never married	79/1131	7.0	2.14 (1.51–3.02)	**<0.001**
Money situation				
Money left over each week – Can save a lot	117/3726	3.1	1.00	
Just have enough money to get through to the next pay	72/860	8.4	1.5 (1.06–2.13)	**0.02**
Spending more money than getting	35/244	14.5	2.24 (1.4–3.6)	**0.001**
Psychological distress				
No psychological distress (low/moderate)	85/4538	1.9	1.00	
Psychological distress (high/very high)	149/500	29.9	14.23 (10.39–19.49)	**<0.001**
Physical activity				
Yes (sufficient and/or not sufficient)	162/4075	4.0	1.00	
No	72/934	7.7	1.55 (1.11–2.18)	**0.01**
Number serves of fruit usually eaten each day				
1 or more serves	201/4690	4.3	1.00	
None	34/347	9.7	2.11 (1.34–3.33)	**0.001**
Number of times health service was used in last four weeks*				
None	80/2568	3.1	1.00	
1 to 2	82/1771	4.6	1.15 (0.81–1.64)	0.43
3 to 4	35/453	7.7	1.39 (0.85–2.26)	0.19
5 or more	38/245	15.7	1.95 (1.19–3.19)	**0.008**
Number of times mental health services was used in last four weeks*				
None	193/4910	3.9	1.00	
1 to 6	41/128	32.1	3.04 (1.87–4.94)	**<0.001**

with a higher level of education also have a greater risk of suicidal ideation. Often these people are high achievers and perhaps as a result of stressful life events, they may feel they have failed and thoughts of suicide are seen as a way of dealing with this failure.

Indicators of lower socioeconomic status such as lower income, lack of home ownership, or just having enough money to get through or spending more money than they get are also indicators of a greater risk of suicidal ideation. These respondents may feel hopeless within their situation and think of suicide as the only option (Steward et al. 2005; Turvey et al. 2002).

Univariate analysis also indicates that respondents who report their health as fair or poor, with chronic conditions or a disability, are more likely to have suicidal ideation. These chronic conditions impact on quality of life, and there may be limitations as a result of the condition placed on activities or daily living or pain, often over the long term. Respondents with these conditions may consider suicide as a solution to ending their suffering and poor quality of life.

It is not surprising that respondents reporting a mental health condition also were more likely to have suicidal ideation as suicidal behaviours are strongly associated with mental disorders. Risk factors such as lack of activity, smoking, high levels of alcohol use, lack of fruit and vegetables in the diet all are indicators of lower levels of health, lower quality of life and a greater likelihood of thoughts of suicide.

Higher levels of suicidal ideation were also associated with higher levels of health care use. Higher service use may indicate lower health levels thus a decreased quality of life and more suicidal thoughts but also offer a pathway to intervention.

The logistic regression analysis describes the factors most commonly associated with suicidal ideation. While marital status (separated, divorced, or never married) has been shown in other studies (Goldney et al. 2003; Goodwin et al. 2003; Stravynski et al. 2001), the relationship of typical health risk factors such as lack of fruit consumption are less documented especially when the multivariate analysis has taken into account the lack of money. The inclusion of

K10, as a measure of psychological distress, and the high use of health services (including mental health services) indicate help seeking behaviours and acknowledgment of the problem.

This study has shown the benefit of a surveillance system to obtain data so as to assist policy, planning and health promoting experts. The results support the use of the questions from the GHQ-28 in a surveillance system as a measure of suicidal ideation and provide further evidence for the association between various factors and suicidal ideation.

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