

Mates in Construction Suicide Prevention Program: A Five Year Review

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Abstract

'Mates in Construction' (MATES) is a large-scale multi-component suicide prevention program for construction workers, initiated in Queensland in February 2008, and now disseminated to three additional Australian states. MATES uses on-site universal psychoeducation to encourage help-seeking and early intervention through 'Connectors' trained in suicide first aid and supported by outreach, case management, a 24-hour telephone response line, and online counseling. This review of the first five years in Queensland demonstrates broad program acceptability by workers, unions and construction companies. However, funding constraints and the size and geography of the State limited the overall reach to 35,761 workers from 476 building sites completing the first step in the program - General Awareness Training. Despite this, we compared suicide rates in Queensland male construction workers for the five years of the program (2008-2012) with the five years prior (2003-2007), in the context of general male suicide rates for Queensland and Australia for the two time periods.

Against a relatively stable male suicide rate for Australia as a whole, the overall male suicide rate (ages 15-64) for Queensland rose during the five years 2008-2012. In contrast, the age-adjusted male suicide rate in the Queensland Construction Industry decreased 7.9% for the years 2008-2012 compared with 2003-2007. Despite small numbers, we attempted statistical analysis using Negative Binomial Regression. The apparent reduction was not statistically significant (95% CI [-0.4, 15.6]), ($p=0.386$ NS). The decrease for lesser skilled workers (machine operators/labourers) was 22.5% (95% CI [-6.9, 43.8]), ($p=0.121$), relative risk 0.80 [CI 0.60, 1.08], again not statistically significant. For skilled trades, the relative risk was 1.04 [CI 0.81, 1.34, NS], a point increase in chance of suicide of 4.1% [CI -19.0, 33.7, NS]. The complexity of the program and our results are discussed.

Keywords: Suicide prevention; Construction industry; Male; Help-seeking; Longitudinal outcome study

Introduction

Suicide is a major public health problem. An estimated 804,000 suicide deaths occurred worldwide in 2012, with an annual global age-standardized suicide rate of 11.4 per 100,000 population (15.0 for males; 8.0 for females) [1]. This represents a promising reduction in numbers of 9% (2000-2012), with associated reductions in age-standardised rates for men (23%) and women (32%). The WHO suggests this may relate to improved global health but, in acknowledging emerging evidence for national strategies [2,3], they recommend a range of specific program strategies from which countries may choose. For the first time, they also acknowledge multi-component strategies as leading to positive outcomes [4-6].

Suicide among construction workers

Elevated rates of suicide among construction workers compared with the general working male population have been identified in many countries including Finland [7], the USA [8-12], Korea [13], Denmark [14], the UK [15,16], Canada [17], and Australia [18-20]. This may be because the construction workforce is largely male [21] and, in many countries, male rates of suicide are up to four times that of women [22]. Construction worker suicide is associated with

excessive alcohol consumption, relationship problems, and lack of help-seeking [19,23]. The health of workers is influenced by poor working conditions - including high demands, low job autonomy, job insecurity, and poor workplace support [24-26]. Construction work is cyclical, seasonal, and sporadic [27]. Workers are often forced to travel long distances to find work, and spend considerable time away from the family unit. The lowest skilled groups may be at most risk, especially during the job uncertainty of recession [26].

A Royal Commission into the Building and Construction industry in Australia suggested 41% of death claims made on behalf of Queensland construction workers over a four-month period could be attributed to suicide [28,29]. A commissioned study [30], estimated suicide rates for construction workers at 40.3 per 100,000, significantly above the then national rate for males (16.8 per 100,000). The rate for 15-24 year olds (58.6 per 100,000) represented a three-fold increased risk of suicide compared with male Australians of that age group generally, and in Queensland. Construction worker suicides aged 15-24 years were significantly more likely than non-construction counterparts to have evidence for untreated psychiatric conditions preceding death.

Mates in Construction (MATES) is a charity established in February 2008 by the Building Employees Redundancy Trust (BERT) to prevent suicide through implementing recommendations from earlier research [30]. MATES is a multi-component prevention and early intervention program, consistent with the Australian National Suicide Prevention

Strategy ('Living Is For Everyone' or 'LIFE') and Mrazek and Haggerty's (1994) spectrum of prevention and intervention including universal, selective, and indicated prevention, treatment and postvention [31]. MATES is an industry-based, workplace-focused program, with components delivered at construction sites or company offices. Significant commitment from building site management to the program has been crucial; both to communicate organisational investment in addressing the issue of suicide, and also allow training to be completed during work hours.

Design of the mates in construction suicide prevention strategy

General awareness training (GAT) is a 45 minute 'Universal Prevention' session provided first thing in the morning to all construction workers on a recruited site. GAT promotes awareness about mental health and illness as well as warning signs for suicidality. It aims to reduce associated stigma and encourage help-seeking, presents suicide as preventable, considering it as a workplace health and safety issue for the construction industry. It encourages workers to offer active support to co-workers displaying any warning signs. Workers completing GAT are provided with a white sticker to wear on their hard hat. For a site to be designated 'compliant', all workers on that worksite have to be exposed to GAT, with an 80% training level maintained despite staff turnover. GAT is a component of the Life Skills Toolbox, a training program specifically for apprentices.

Connector training [32] is a 'Selective Prevention' program. Connectors are recruited through an 'expression of interest' invitation on the GAT feedback form. They are volunteer gatekeepers who assist an at-risk worker to access help via an ASIST-trained worker (see below), MATES Field Officer or Case Manager. The four-hour training includes LivingWorks 'safeTALK'. Goals are to gain skills at identifying warning signs of suicidality, and strategies for engaging a co-worker. The MATES objective is to have 1 in 20 workers on every site trained as Connectors - ideally representing a diverse range of roles, ages and experience to increase the likelihood an at-risk worker will be noticed and supported. Connectors are supported by Field Officers through opportunities to debrief following an intervention and through regular Connector meetings. A Connector (visually identifiable by a green sticker on their hard hat) is defined as "a mate who can keep you safe while connecting you to help".

Suicide First Aid [33-34] is an 'Indicated Prevention' component of the program, in which ASIST trained workers provide suicide first aid interventions for at-risk workers identified by Connectors. All sites are encouraged to support interested workers to receive training in Suicide First Aid, through the 2-day 'Applied Suicide Intervention Skills Training' (ASIST). The component is mandatory for rural and remote construction sites where ASIST-trained MATES staff and other agencies may be less available. ASIST is funded by industry unions or employers, and is considered an important component for long-term sustainability. A recent review found strong support for effectiveness and acceptability of this training [35].

Field officers and case management

During the course of the present study, five Field Officers were employed in Queensland to increase awareness, recruit new construction sites, and provide ongoing support to MATES sites through fortnightly site visits. They establish and maintain relationships with workers on-site, and debrief Connectors. They also

have a role in reducing stigma associated with help-seeking. Field Officers are ASIST-trained and may intervene to provide direct support to suicidal workers. They ensure support provided is mindful of context and needs of the construction industry population. They maximize engagement, and encourage workers to access 24-hour telephone crisis support.

The role of a MATES Case Manager is the key to enhancing engagement of workers with external services, providing a 'safety net' between agencies to ensure continuity of care and follow-up, ensuring workers' needs are being met, and advocating for further assistance where necessary. The two Case Managers refer to counseling services, financial counselling, drug and alcohol intervention and the existing Employee Assistance Program (Converge International) contracted by BERT.

The MATES 24-hour Suicide Prevention Hotline is staffed by trained mental health professionals, and was established to provide emergency assistance to suicidal individuals, or those concerned about risk in another person.

The Postvention component provides consultation with building site management after a suicide, as well as providing written and verbal information about common grief reactions. MATES facilitates discussions amongst workers closest to the deceased person and organises counsellor support for the site. The Field Officer continues to provide support through visits and phone calls for up to several months following an incident, depending on circumstances.

The current study

We have previously reported on early progress for the MATES program, providing process and output statistics [23], later updating these in the context of help-seeking [36]. The current study aimed to provide a report of progress after 5 completed years of the program, extending our understanding of the program by asking the ultimate question of a suicide prevention program: "Does it prevent suicides?" To attempt this we sought retrospectively to compare rates of suicide in construction workers in Queensland from 2003-2007 (five years prior to the start of MATES) with the years 2008-2012 (five years from the start of the program).

Materials and Methods

Data collection

Suicide rates were taken from the Australian National Coroners Information System (NCIS), utilised by coroners, government agencies, and researchers for identifying cases for death investigation, research, and to monitor external causes of death in Australia [37]. NCIS provides users with basic de-identified demographic information on deaths, including occupation and employment status at date of death. Suicide methods are classified according to the International Classification of Disease - 10th revision (ICD-10) within method specific codes X60-X84 [38]. Each NCIS case routinely includes police 'text' descriptions of circumstances and background of each extracted case, as well as coronial findings, and toxicology reports [39].

Data sources and coding

All cases studied were male, given the small number of female suicides (n=2). Employment type (casual, part-time, full-time) at date of death was based on Australian Standard Classification of

Occupations [40]. Occupational information was coded by two researchers according to Australian and New Zealand Standard Classification of Occupation (ANZSCO; up to 6-digit level). If more than one occupation was reported, researchers took the first listed as primary occupation, unless the second listed provided additional information not otherwise offered (e.g. construction/carpenter). Ambiguous occupational information was coded at the broadest level or marked as 'uncodeable'.

The construction industry was identified as building of homes, dwellings, buildings, or other structures and roads, as per Australian and New Zealand Standard Industrial Classification. We also included building work related to additions, alterations, reconstruction, maintenance, and repairs [41]. Occupations coded as being in construction were 'skilled trades' (ANZSCO level 3), 'machine operators' (ANZSCO 7) and 'labourers' (ANZSCO 8). ANZSCO 7/8 were aggregated to maximise cases available for analysis. Unless clearly designated as construction, cases in higher skilled occupations such as ANZSCO 1 (Managers) and ANZSCO 2 (Professionals) were excluded as they described generic non-construction related skills and included only a small number of relevant cases.

Construction Industry Suicide counts for Queensland were from the NCIS. Denominators for construction industry suicide counts were from the ABS Labour Force SuperTable E09 [42]. Age weights were based on the Standard Population (ABS 2001 Census). National suicide related figures are taken from the relevant year of Australian Bureau of Statistics, Causes of Death Data, years 2003-2012 (Catalogue Number 3303.0) [43]. All relevant demographic figures are taken from Australian Bureau of Statistics, Australian Demographic Statistics. (Catalogue Number 3101.0) [44].

Statistical analysis

Construction industry suicide rates (1) overall, (2) by age, and (3) by skill level were compared pre-MATES (2003-2007) to post-MATES (2008-2012). Drawing from Berry & Harrison [39], age standardised rates were calculated, and then negative binomial regressions, a form of Poisson regression adjusting variance independently from the mean, were used to compare the Rate Ratios (RRs) of suicide before and after introduction of MATES. All regressions were controlled for age. We also assessed differences in Skilled Trades versus Machine operators/Labourers pre (2003-2007) and post (2008-2012) the MATES program.

Results

MATES implementation and activity

Between February 2008 and December 2012, across Queensland (area 1.85 million square Kms; popn. 4.69 million) a total of 35,761 construction workers from 476 building sites received General Awareness Training. Of these, 2,393 later received Connector Training and 238 Suicide First Aid Training. More training was conducted in major cities (55.3%), with 39.4% conducted in regional areas and 5.3% in remote Queensland.

Between July 2008 and December 2012 there were 3,087 after-hours Crisis Hotline calls, excluding calls responded to by MATES staff during business hours. A total 1,474 workers, representing 4.1% of MATES participants, accessed Case Management from MATES, with numbers rising rapidly from 2009. Of these, 34.0% were self-referred (n=501). Referrals were also received through unions (13.0%, n=191), Connectors (10.2%, n=150), ACE (9.3%, 137), employers (8.9%,

n=131), GAT Training (7.1%, n=105), family (3.9%, n=58), other service providers (3.2%, n=47), OzHelp training (1.6%, n=23) and others (8.9%, n=131). Most were based in Brisbane (55.1%; n=812), but case management was also provided at the Gold Coast (19.9%; n=294), Sunshine Coast (4.7%; n=70), Central Queensland (3.3%; n=48), North Queensland (12.2%; n=180), Darling Downs (1.9%; n=28), Surat Basin (0.8%; n=12), Western Queensland (0.6%; n=9) and Bowen Basin (0.1%; n=1). A further 20 (1.4%) were based in other states.

Assistance from MATES was sought for a variety of issues, with many workers presenting multiple concerns. Issues included problems with family/relationships (27.3%; n=798); work and vocation related issues (14.6%; n=427); financial/legal problems (11.4%; n=333); drugs/alcohol/gambling (8.9%; n=261), personal injury or health problems (5.5%; n=162), diagnosed mental health disorders (4.2%; n=122); processing grief (3.3%; n=96). Active suicidal ideation was reported by 4.3% (n=125) with 23 requiring additional clinical intervention. Sixty-two sites received postvention support over the five years for accidental deaths or suicides.

Of 1474 workers accessing Case Management, data on referral are available for 1230 (83.4%). More than half (51.0%, n=687) were referred to mental health professionals (Alcohol and Drug Services, psychiatrist, psychologist, counsellor, social worker). A further 11.9% (n=160) were referred to human services organisations, 4.0% (n=54) to a general practitioner or other non-mental health medical person, 3.3% (n=45) to financial services, 1.8% (n=24) to their union, 1.2% (n=16) to a government department, 1.1% (n=15) to a lawyer or legal aid, 12.8% (n=173) to other services, only 12.8% (n=173) not requiring referral.

Suicide

Of the 426 suicides in the construction industry in Queensland for 2003-2012, two were female. We focused the current study on male suicide rates for Australia overall, Queensland overall, and the Queensland construction industry, comparing 2003-2007 (5 yrs) with 2008-2012 (5 yrs).

In line with overall Australia population growth, the numbers of working age Australian males (15-64 years) grew from 6.7 m (2003) to 7.6 m. Male suicides in this age group increased from 1493 per annum (2003) to 1593 per annum (2012), although the aggregated age-adjusted rate was relatively stable at 21.1 per 100,000 for the five years 2003-2007 and 20.9 per 100,000 for the five years 2008-2012.

In Queensland, the working age male population numbers increased from 1.3 m to 1.5 m. Male suicide rates have historically been higher in Queensland compared to the national rate. Suicide numbers increased from 329 per annum to 405 per annum (working age population, 15-64 years) with age-adjusted rates fluctuating within a band from 11.0-21.4 per 100,000 over the 10 years. In contrast to the Australian rate, the overall Queensland aggregated age-adjusted male suicide rate increased over the ten year period, from 21.7 per 100,000 for the five years 2003-2007 to 24.5 per 100,000 for the five years 2008-2012.

The Queensland construction industry employed personnel (skilled trades, machine operators and labourers - ANZSCO groups 3, 7 and 8) varied year by year, but grew overall from 104,159 (2003) to 149,718 (2012). Overall age-adjusted annual suicide rates for male construction workers varied widely within a band between 20.7 and 37.4 per 100,000, but reduced from 2003-2007 (aggregated age-adjusted rate 28.9 per 100,000) to 2008-2012 (aggregated age-adjusted rate 26.7 per 100,000).

Among the working age population (15-64 years) there were 424 male suicides in the Queensland Construction Industry over the period 2003-2012, with the proportion of suicides highest in the age group 25-34 years for both occupational groups. The age specific rate was highest for the 25-34 year age group among skilled trades (27.1 per 100,000), but highest for the 35-44 year age group among machine operators/labourers (44.2 per 100,000).

Overall, the age adjusted suicide rate was higher among machine operators/labourers (ANZSCO groups 7/8; 34.2 per 100,000) compared with skilled trades (ANZSCO group 3; 24.7 per 100,000). In fact, there were higher rates of suicide in each of the 10-year age groups for machine operators/labourers, except for the 55-64 year age group; rates of suicide among 25-44 year old were notably higher (Table 1).

Adjusted suicide rates for skilled trades and machine operators/labourers by year show the consistent difference in suicide between lowest and highest skill level groups (Table 2).

| | N | % | ASR | N | % | ASR |
|----------|------------|---------------|-------------|------------|---------------|-------------|
| 15-24 | 32 | 18.1% | 29.5 | 43 | 17.4% | 25.8 |
| 25-34 | 54 | 30.5% | 41.3 | 68 | 27.5% | 27.1 |
| 35-44 | 52 | 29.4% | 44.2 | 64 | 25.9% | 25.7 |
| 45-54 | 30 | 16.9% | 31.8 | 53 | 21.5% | 25.6 |
| 55-64 | 9 | 5.1% | 17.1 | 19 | 7.7% | 16.1 |
| All Ages | 177 | 100.0% | 35.1 | 247 | 100.0% | 24.3 |

ASR: Age Specific Rate

Table 1: Age profile of suicide among male Queensland Construction Workers over the period 2003 to 2012.

| Age Groups | Machine operators/ Labourers | | Skilled Trades | |
|------------|---------------------------------|--|----------------|--|
|------------|---------------------------------|--|----------------|--|

| | All Workers | | | | Skilled Trades | | | | Machine operators/Labourers | | | |
|------------------|-------------|------|------|------|----------------|------|------|------|-----------------------------|------|------|------|
| | N | ASR | LCI | UCI | N | ASR | LCI | UCI | N | ASR | LCI | UCI |
| 2003 | 35 | 34.0 | 22.6 | 45.4 | 21 | 33.8 | 19.2 | 48.3 | 14 | 34.4 | 16.2 | 52.5 |
| 2004 | 51 | 37.4 | 27.1 | 47.7 | 29 | 31.1 | 19.7 | 42.5 | 22 | 50.3 | 29.2 | 71.5 |
| 2005 | 41 | 28.1 | 19.5 | 36.8 | 19 | 18.3 | 10.0 | 26.6 | 22 | 50.8 | 29.5 | 72.1 |
| 2006 | 30 | 20.7 | 13.3 | 28.2 | 20 | 20.8 | 11.6 | 29.9 | 10 | 20.6 | 7.8 | 33.4 |
| 2007 | 47 | 26.9 | 19.2 | 34.6 | 23 | 20.7 | 12.2 | 29.3 | 24 | 37.7 | 22.6 | 52.8 |
| 2008 | 44 | 25.7 | 18.1 | 33.3 | 22 | 19.3 | 11.2 | 27.3 | 22 | 36.0 | 20.9 | 51.2 |
| 2009 | 43 | 24.8 | 17.4 | 32.3 | 25 | 22.2 | 13.4 | 31.0 | 18 | 29.9 | 15.9 | 43.8 |
| 2010 | 44 | 27.1 | 19.0 | 35.1 | 29 | 27.2 | 17.2 | 37.1 | 15 | 26.6 | 13.0 | 40.3 |
| 2011 | 53 | 31.7 | 23.1 | 40.2 | 35 | 31.4 | 20.8 | 42.0 | 18 | 35.1 | 18.7 | 51.6 |
| 2012 | 36 | 24.1 | 16.2 | 32.0 | 24 | 24.7 | 14.6 | 34.7 | 12 | 25.7 | 11.0 | 40.3 |
| 2003-2007 | 204 | 28.9 | 24.9 | 32.9 | 112 | 24.0 | 19.6 | 28.5 | 92 | 38.3 | 30.5 | 46.2 |
| 2008-2012 | 220 | 26.7 | 23.2 | 30.3 | 135 | 25.0 | 20.8 | 29.3 | 85 | 30.8 | 24.2 | 37.4 |
| All Years | 424 | 27.8 | 25.2 | 30.5 | 247 | 24.7 | 21.6 | 27.8 | 177 | 34.2 | 29.1 | 39.3 |

ASR: Age standardised rates; LCI: Lower confidence limit; UCI: Upper confidence limit

Table 2: Age standardised rates per year for Skilled Trades versus Machine Operators/Labourers (direct standardisation, age groups 15-24; 25-34; 35-44; 45-54; 55-64).

For most of the years 2003-2012, suicide rates among construction workers were higher than those of the general Queensland male population, and higher than the overall Australian male rate (Figure 1).

The reach of MATES began small in 2008 and increased each year through to 2012. The overall age-adjusted suicide rate decreased in this five-year period after MATES was implemented (from 28.9 per 100,000

between 2003-2007 to 26.7 per 100,000 between 2008-2012). The difference is accounted for by the decreased suicide rate of machine operators/labourers (38.3 per 100,000 between 2003-2007 vs. 30.8 per 100,000 between 2008-2012), compared with skilled trades, where the suicide rate increased marginally over the same time period (24.0 per 100,000 between 2003-2007 vs. 25.0 per 100,000 between 2008-2012).

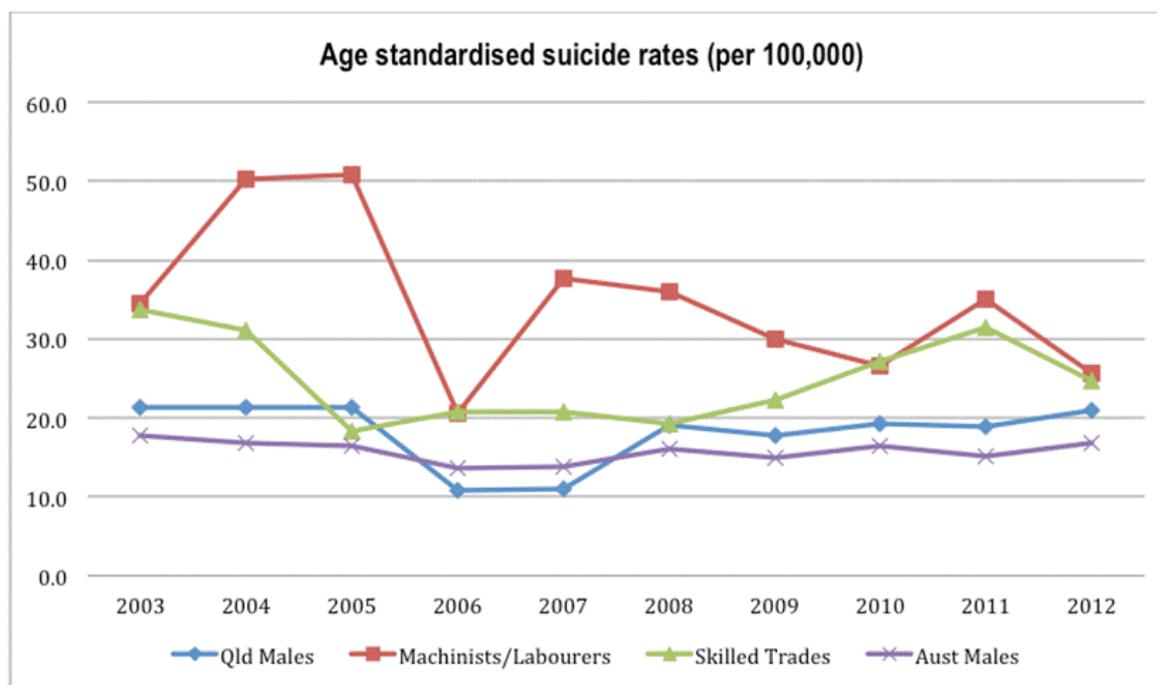


Figure 1: Age standardised suicide rates among Queensland males employed in the construction industry, plotted against the general Queensland and Australian male population rates (per 100,000).

Negative binomial regressions [39], were run to compare suicide rates before and after introduction of MATES. All regressions were controlled for age. Results show an overall 7.9% decrease in the suicide rate from before to after MATES (95% CI [-0.4, 15.6]), this difference did not reach statistical significance ($p=0.386$). For Skilled Trades there was no statistical difference in suicide rates from before to after MATES. However, for Machine operators/Labourers, the decrease in suicide rates from before to after the introduction of MATES was 22.5% (95% CI [-6.9, 43.8]). The difference did not reach statistical significance ($p=0.121$).

To further our understanding of the changes, and despite the lack of statistical difference in suicide rates from before to after MATES, Relative Risk calculations were used to translate the apparent decrease in suicides into 'possible saved cases'. Combining skilled trades and Machine operators/labourers, the relative risk of suicide from before to after MATES was 0.92 [95% CI .76, 1.12]. This translated to a point change in risk of suicide at -7.6% [CI -23.6, 11.8] and 14.8 'possible cases saved' [CI -18, 48; 3.0 per year]. Examining skilled trades alone, the relative risk was 1.04 [CI .81, 1.34], which translated to a point change in risk of suicide of 4.1% [CI -19.0, 33.7] and 5.7 'possible cases lost' [CI -31, 19; -1.1 per year]. Conversely, for machine operators/labourers, the relative risk was 0.80 [CI 0.60, 1.08], translating to a point change in risk of suicide of -19.7% [CI -40.2, 7.8] and 20.3 'possible cases saved' [CI -1, 43; 4.1 per year]. Further output and analysis data from the MATES program is available by emailing the corresponding author.

Discussion

Australia has had suicide prevention strategies in place since the mid 1990s, initially focused on youth. From 2000 the 'Living is for Everyone' (LiFE) National Suicide Prevention Strategy adopted a 'whole of life span' approach. A thorough recent national evaluation of 49 projects funded under the program [45] reported: "Based on the current literature on suicide prevention, a strong evidence base does not exist for many of the interventions that are currently funded under the NSPP" and "it is not possible to evaluate the extent to which the projects reduced the incidence of suicide or suicidal behaviour... data on the incidence of suicide and suicidal behaviour before or after the interventions was not collected." Although this situation is replicated across the world, there have been exceptions. Knox and colleagues [46], reported early impressive reductions in the suicide rate for USAF personnel. The work was criticised because of its multi-component nature, and the need for us to know more precisely which elements of a program prevent suicide [47]. However, subsequent reports continue to demonstrate effectiveness of the USAF program in preventing suicide and other mental health problems [5,48]. While and colleagues [6] have reported a ten year follow-up study in the United Kingdom, where suicide rates in those with mental illness were significantly reduced in clinical services adopting nine clear recommendations, compared to services that did not. Both studies report progress over 10 years or more. What may be gleaned is that large-scale comprehensive studies over a lengthy timeframe may assist us to overcome the statistical problem of the small base rate for suicide. The While study was based on all UK mental health units, comparing suicides in those units adopting the whole program with those that did not. Perhaps more important than large scale is that the Knox suicide prevention

training reached all USAF personnel. If all personnel are reached in a service, then comparisons from before to after intervention with even small numbers are much more likely to succeed, as demonstrated by Mishara and Martin's study of a Canadian police force intervention [49].

This current review of the Mates in Construction (MATES) program relies on only five years of active prevention, based in one Australian state, with only 35,761 (of nearly 150,000) workers completing General Awareness Training, 3,087 after-hours Crisis consultations, and 1,474 accessing case management. The possibility that the MATES program may be capable of reducing the suicide rate in construction workers is intriguing but currently, despite an apparent overall reduction in relative risk, statistically we cannot have confidence in our results.

MATES began as a charity with limited mixed funding. However, following a Senate Community Affairs References Committee Inquiry into Suicide in Australia [50], the Australian Government provided additional funding under the Taking Action to Tackle Suicide program [51]. In the last three years, MATES has now begun operations in three more states (Western Australia (October 2011), South Australia (December 2012) and New South Wales (January 2013). Currently there have been over 100,000 GAT completions nationally in these four states of Australia. As the program continues, statistical analysis of much larger base numbers of construction workers may help to clarify whether we can have confidence in the program as preventing suicide. The current plan is to further research the outcomes for the program when it has reached either more than 100,000 General Awareness Trainings or 50% of the available workforce in Queensland.

Mates in Construction has been the recipient of five annual national LiFE awards for excellence in suicide prevention, and two national safety awards, and these acknowledge the comprehensive professional nature of the program, and its ongoing engagement with the industry. They also take into account the assiduous manner in which data has been collected about each component, the openness with which information is shared (<http://www.matesinconstruction.org.au/Home>), and the level of accountability. MATES set out from the beginning to gain as clear an understanding as possible of outcomes from the program.

The low base rate of suicide has always made it difficult to analyse programs designed to reduce suicide, due to low statistical power. We believed that accumulating five years of data, and comparing with the five years before the program was created, might go some way to addressing this. However, while the numbers of construction workers trained is impressive in terms of the use of limited available resources, our negative binomial regressions suffered from a lack of power due to small sample size.

There may be other problems in the data. The Australian Bureau of Statistics acknowledges possible error in classifying suicides, and maintains a delay period in which corrections can be made. The National Coronial Information System has been the subject of recurrent scrutiny to ensure the best available data, but we have to accept the limitation that misclassifications may have occurred. Similarly, although we have been extremely cautious in classification of industry roles, we acknowledge the possible limitation that misclassifications of undifferentiated skill levels or roles may confound variables in our analysis.

There are conceptual problems in suggesting that MATES has directly influenced a reduction in rates of suicide. Suicide is the end

point of a complex set of bio-psycho-social circumstances, and there are other wider influences to be considered. Growth in the construction industry in Queensland may have provided a level of optimism within the industry that could counteract depressive and suicidal feelings. However, similar growth occurred elsewhere in Australia during the same time period, for instance in New South Wales where, in the absence of a suicide prevention program, suicide rates amongst construction workers continued to rise [52]. An argument could also be mounted regarding the impact of politics. From 2007-2013, there was socialist national government in Australia, and a stable socialist state government in Queensland throughout 2003-2012. Evidence exists to suggest that socialist governments may lower suicide rates [53,54].

If we were to accept the apparently lowered rate of suicide for construction workers over the five-year period 2008-2012, and the speculation that Mates may have contributed to this, then a further issue for discussion relates to exactly what, within the overall Mates program, may have made such a contribution. An apparent result of the program is the number of men of all education and skill levels actively seeking help. We believe this does not happen in the absence of a General Awareness Training for all workers, and is unlikely to have happened if we had only provided written materials or had simply encouraged access to online information. Increased help-seeking may have resulted from the open discussion of serious personal issues in a public forum, and possibly a small increase in knowledge, but may also relate to an increased trust that can be placed in 'your mates'. We would argue this does not occur unless those mates can prove themselves, and can provide relevant and prompt access to appropriate assistance. These mates ('connectors') will always require specific and ongoing training, and subsequent active support of their own work – not just from field officers, but explicitly from unions and managers and company owners in the construction industry. We believe the wide range of problems presented for assistance is important to the overall program. If you can sort out a personal, financial or relationship problem through this system, you may be more confident that a serious emotional problem (including suicidality) can also be solved by seeking help through a connector. You know they understand your context, and are appropriately trained and supported.

Conclusion

In conclusion, the combined suicide rate for less skilled construction workers appears from the current research to have declined from 2008-2012 in Queensland by comparison with the combined suicide rate for 2003-2007, although this did not reach statistical significance. Our statistical approach was robust, and appropriate to the sample analysed. We believe the overall small proportion of the construction population, from only one state of Australia, contributed to low statistical power.

Despite broad advertising of the program, and widely expressed enthusiasm and acclaim from unions, management, superannuation funds, and workers on the ground, Mates in Construction had humble beginnings in 2008, and was initially confined to city construction sites. It took five years to gain the 9.2% overall penetration for construction workers state wide across Queensland.

Our results should be considered against a background of an increasing rate of suicide for men generally in Queensland throughout 2003-2012, despite the apparently stable rate overall for Australian men. The construction industry grew during the time frame of our

study, with an increase in numbers of construction workers; it is possible that a sense of optimism from this permeated the industry and perhaps influenced mental health. Results from the current study are intriguing. However, at this time it remains problematic to claim that Mates in Construction has been causal in reducing the suicide rate in workers. Time, and a further planned study at 10 years, may confirm how much of an ongoing contribution the program has made to Suicide Prevention as an outcome.

Author Contributions

GM conceptualised this study, supervised SS, and edited the final paper in consultation. JG oversaw development of MATES and the data collection, and also contributed to the conceptualisation of the paper. SS analysed national and state level data for the paper consulting with AM. AM retrieved data from the National Coronial Information System (NCIS) and, in consultation, analysed this and other relevant national data. All authors contributed to early drafts and commented on final drafts of the paper.

Conflicts of Interest

JG is employed fulltime by Mates In Construction and is the national CEO of the company. GM has been, and AM currently is, an academic board member of Mates In Construction. There was no grant support directly for this study. None of the authors received any inducement or remuneration outside of their full time salaries.

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