

National?

~~National Ambulance Surveillance System: A novel method using (coded) Australian ambulance clinical records to monitor self-harm and mental health-related morbidity~~  
--Manuscript Draft--

Manuscript Number: PONE-D-20-00466  
Article Type: Research Article  
Full Title: ( National Ambulance Surveillance System: A novel method using coded Australian ambulance clinical records to monitor self-harm and mental health-related morbidity )  
Short Title: Using <sup>NATIONAL</sup> coded ambulance clinical records to monitor self-harm and mental health outcomes

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Keywords: suicide; self-harm; mental health; surveillance system; public health; ambulance <sup>pre-hospital?</sup>

Abstract: Self-harm and mental health are inter-related issues that substantially contribute to global burden of disease. However, measurement of these issues at the population level is problematic. Statistics on suicide can be captured in coronial data however, there is a significant time-lag in availability, and coronial data do not include non-fatal incidents. Although survey, emergency department, and hospitalisation data present alternative information sources to measure self-harm, these data do not include the richness of information available at the point of incident. This paper describes the mental health and self-harm modules within the National Ambulance Surveillance System (NASS), a unique Australian system for monitoring and mapping mental health and self-harm. Data are sourced from paramedic electronic patient care records provided by Australian state and territory-based ambulance services. A team of specialised research assistants use a purpose-built system to manually scrutinise and code these records. Specific details of each incident are coded, including mental health symptoms and relevant risk indicators, as well as the type, intent, and method of self-harm. NASS provides almost 90 output variables related to self-harm (i.e., type of behaviour, self-injurious intent, and method) and mental health (e.g., mental health symptoms) in the 24 hours preceding each attendance, as well as demographics, temporal and geospatial characteristics, clinical outcomes, co-occurring substance use, and self-reported medical and psychiatric history. NASS provides internationally unique data on self-harm and mental health, with direct implications for translational research, public policy, and clinical practice. This methodology could be replicated in other countries with universal ambulance service provision to inform policy and health services. ✓ Good

- coronial data  
- AOD  
- unique internationally  
- wish there was some data!  
will be interesting to see how NASS data compares to "old" data  
↑ geo spatial mapping potential discussion

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#### Additional Information:

##### Question

##### Response

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This work was supported by funding from the federal Department of Health, Movember Foundation and Beyond Blue. Funders had no influence on this manuscript or the decision to publish.

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**Describe where the data may be found in full sentences. If you are copying our sample text, replace any instances of XXX with the appropriate details.**

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**Additional data availability information:**

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1 **National Ambulance Surveillance System: A novel method using coded Australian**  
2 **ambulance clinical records to monitor self-harm and mental health-related morbidity**

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## 23 Abstract

24 Self-harm and mental health are inter-related issues that substantially contribute to global  
 25 burden of disease. However, measurement of these issues at the population level is  
 26 problematic. Statistics on suicide can be captured in (coronial) data, however, there is a  
 27 significant time-lag in availability, and (coronial) data do not include non-fatal incidents.  
 28 Although survey, emergency department, and hospitalisation data present alternative  
 29 information sources to measure self-harm, these data do not include the richness of  
 30 information available at the point of incident. This paper describes the mental health and self-  
 31 harm modules within the National Ambulance Surveillance System (NASS), a unique  
 32 Australian system for monitoring and mapping mental health and self-harm. Data are sourced  
 33 from paramedic electronic patient care records provided by Australian state and territory-  
 34 based ambulance services. A team of specialised research assistants use a purpose-built  
 35 system to manually scrutinise and code these records. Specific details of each incident are  
 36 coded, including mental health symptoms and relevant risk indicators, as well as the type,  
 37 intent, and method of self-harm. NASS provides almost 90 output variables related to self-  
 38 harm (i.e., type of behaviour, self-injurious intent, and method) and mental health (e.g.,  
 39 mental health symptoms) in the 24 hours preceding each attendance, as well as  
 40 demographics, temporal and geospatial characteristics, clinical outcomes, co-occurring  
 41 substance use, and self-reported medical and psychiatric history. NASS provides  
 42 internationally unique data on self-harm and mental health, with direct implications for  
 43 translational research, public policy, and clinical practice. This methodology could be  
 44 replicated in other countries with universal ambulance service provision to inform policy and  
 45 health services.

46

47 **Key words:** suicide, self-harm, mental health, surveillance system, public health, ambulance

48

*Very good rationale in abstract.*

*"Coronial" is a term specific to Australia & NZ.*

*→ "coroners' statistics" may be less confusing to a non-local audience.*  
 % National



## 49 Introduction

50 Each year suicide claims the lives of more than 800,000 people globally, with numbers  
51 increasing each year (1). In Australia, suicide is the leading cause of death for those aged from  
52 15 to 44 years (2), costing the economy \$551 million annually (3). Despite the Australian  
53 government spending an additional \$47.2 million on suicide prevention in the decade to 2015-  
54 16 (4), suicide rates have not declined over that time (5). Critically, suicide deaths represent  
55 only the “tip of the iceberg”. For each suicide in Australia, there are 11 hospitalisations for  
56 intentional self-harm (6) (defined as deliberate self-injury *regardless* of the degree of suicidal  
57 intent (7)), and these presentations are also increasing (8-10). In response, the World Health  
58 Organisation (WHO) has identified that monitoring morbidity-related harms as an indicator  
59 of progress towards suicide prevention is imperative (11).

60 Although it is possible to establish surveillance systems through the use of surveys,  
61 methodologies that capture representative populations are expensive, and must be  
62 maintained over time to enable the capture of trends and patterns. As such, most surveillance  
63 systems use routinely collected administrative data (12). For example, data on Australian  
64 suicide deaths are obtained from coronial records (13). However, difficulties in determining  
65 suicidal intent, including a lack of guidance on such deliberations (14), contribute to lag times  
66 of up to four years and renders these data unsuitable for ‘real-time’ suicide monitoring (15).  
67 Hospitalisation data (patients admitted for treatment) are an alternative data source, but are  
68 likely to miss a substantial number of intentional self-harm events as only those with serious  
69 physical or mental health issues are admitted for further treatment. Emergency Department  
70 (ED) data are another source, and are often used as an “early warning system” (16) to monitor  
71 intentional self-harm related presentations (17-21). ED data are more inclusive than

72 hospitalisation data, as patients who present to ED but are not admitted as an inpatient will  
73 be included.

*very true*

74 WHO member states use the International Statistical Classification of Disease and Related  
75 Health Problems: 10<sup>th</sup> Revision (ICD-10) as an epidemiological tool to classify morbidity and  
76 mortality in health datasets. ICD-10 provides codes for injury and poisoning related harms in  
77 Chapters XIX Injury, Poisoning and Certain Other Consequences of External Causes and XX  
78 External Causes of Morbidity and Mortality (22). Although ICD was developed to monitor the  
79 prevalence of health problems in a consistent manner, for a number of reasons ICD-10 codes  
80 do not reliably capture, nor distinguish between different types of, intentional self-harm. This  
81 leads to an underestimation of self-harm in ED and hospitalisation data. First, ICD-10 codes  
82 cannot distinguish suicide attempt from self-injury without suicidal intent (23) meaning  
83 research based on ICD-10 can only report one catch-all 'intentional self-harm' variable.  
84 Further ICD-10 codes do not capture suicidal ideation at all. This is problematic as  
85 understanding the transition from suicidal ideation to suicide attempt informs effective  
86 suicide prediction and prevention activities (24). Second, an intentional self-harm injury must  
87 be clearly documented and medically treated while in ED or hospital (if admitted) in order for  
88 a code to be assigned. Therefore, if a patient either did not disclose the injury was self-  
89 inflicted or was not medically treated for the injury, then intentional self-harm ICD-10 codes  
90 may not be recorded (23). Third, some ED information systems only have capacity to record  
91 one code. Reliance on a single code means that the presence of a psychiatric disorder, suicide  
92 attempt, self-injury without suicidal intent or alcohol and other drug (AOD) intoxication, could  
93 be lost and only the physical injury that required treatment will be recorded (e.g., laceration  
94 or fracture). This is a major limitation of self-harm surveillance systems based on ICD-10  
95 codes, and particularly for systems reliant on ED data.

*yes*

*yes*

96 Enhanced surveillance programs for self-harm, predominantly using text mining techniques  
 97 to identify suicidal ideation, suicide attempt and self-injury without suicidal intent, can  
 98 augment information captured in ICD-10 codes (25). However, these typically require triage  
 99 or other clinical staff to complete additional training and coding. Time, resourcing, and other  
 100 constraints may lead to the under-estimation of cases and there may be significant lag time  
 101 for data availability (16). Natural Language Processing methodologies based on artificial  
 102 intelligence (AI), offer significant improvements on text mining (26, 27). However, success of  
 103 such AI methodologies are reliant on large and long-term datasets with reliably coded data to  
 104 give the AI computer algorithms sufficient information to precisely replicate human coding  
 105 capabilities. Also, given that only around one-third of Australians present to the ED following  
 106 an episode of self-harm, there are likely many more occurrences in the community that do  
 107 not result in ED presentation or hospitalisation, and are therefore not captured by either  
 108 enhanced self-harm or more generalised intentional self-harm surveillance systems (28).

*yes*

109 [ Routine clinical data from ambulance attendances offer a novel avenue for capturing  
 110 information related to self-harm.] Ambulance services are frequently the first, and sometimes  
 111 the only available, healthcare service to respond to both mental health and self-harm events  
 112 occurring in the community (29). Importantly, as paramedic clinical notes include  
 113 observations made on scene, ambulance data provide rich information regarding the  
 114 characteristics and patterns of self-harm, as well as co-occurrence with mental health  
 115 symptomatology and <sup>ok</sup> (AOD) use. This paper describes the self-harm and mental health  
 116 symptomatology modules of the National Ambulance Surveillance System (NASS), an  
 117 established and internationally unique multi-jurisdictional surveillance system using coded  
 118 ambulance clinical records.

*key point*

*bold statement = double underline*

## 119 **Materials and Methods**

### 120 **Project development and data coverage**

121 NASS is a surveillance system for self-harm, mental health, and AOD-related harms, created  
122 from an existing monitoring program. Project development, methodology and the AOD  
123 module of the project have been detailed previously (30-32). As the self-harm and mental  
124 health modules were added to the original AOD surveillance system (30), the system  
125 successfully leveraged existing partnerships with jurisdictional ambulance services from  
126 across Australia (ACT Ambulance Service, Ambulance Tasmania, Ambulance Victoria, NSW  
127 Ambulance, Queensland Ambulance Service, St Johns Ambulance Northern Territory, St Johns  
128 Ambulance Western Australia).

129 Briefly, NASS covers more than 90% of the Australian population across seven of the eight  
130 Australian states and territories (Australian Capital Territory, New South Wales, Northern  
131 Territory (from 2016), Queensland, Tasmania, Western Australia (from 2020) and Victoria).  
132 Coded NASS self-harm and mental health data are available from the pilot phase, in which the  
133 proof of concept and system feasibility were established, and an additional three financial  
134 years. From this pilot phase, 12 months of coded data is available from the state of Victoria,  
135 and data snapshots of one month per quarter (March, June, September and December) are  
136 available for other jurisdictions, except Northern Territory and Western Australia. Self-harm  
137 and mental health data for males is also available for the 2013/2014, 2015/2016 and  
138 2016/2017 financial years, as a part of the *Beyond the Emergency* project led by Turning Point  
139 and Monash University, which investigated the scale and nature of ambulance attendances  
140 for men presenting with acute mental health issues and self-harm (33). NASS coding and  
141 reporting was approved through the Eastern Health Human Research Ethics Committee



## 166 **Case ascertainment**

167 Inclusion criteria were met if self-harm or mental health symptomatology contributed to the  
168 ambulance attendance, using the core inclusion criterion: 'Is it reasonable to attribute a  
169 recent (past 24-hours) incident of self-harm or symptom of mental health as contributing to  
170 the ambulance attendance?' This information was ascertained through manual scrutiny of  
171 each ePCR, considering paramedic clinical assessment, patient self-report, information from  
172 third parties and other evidence at the scene, such as written statements of intent (including  
173 social media, text messages and written notes), as recorded by paramedics in the ePCR. This  
174 evidence was also used to determine method of self-harm as well as presence of risk  
175 indicators.

## 176 **Case classification**

### 177 **Self-harm related ambulance attendances**

178 Self-harm related ambulance attendances were classified by the presence of self-harm  
179 preceding (past 24 hours) or during the ambulance attendance, with four categories of self-  
180 harm related ambulance attendances defined and coded as: (a) self-injury (known as non-  
181 suicidal self-injury in the USA): non-fatal intentional injury without suicidal intent (34); (b)  
182 suicidal ideation: thinking about killing oneself without acting on the thoughts (35); (c) suicide  
183 attempt: non-fatal intentional injury with suicidal intent, regardless of likelihood of lethality  
184 (35); (d) suicide: fatal intentional injury with suicidal intent (35). Suicide, suicide attempt and  
185 suicidal ideation were mutually exclusive, however, self-injury could be simultaneously coded  
186 with any other self-harm case category.

*good*

### 187 **Self-harm method and suicidal ideation preparation**

188 Common methods of self-harm were modified from the ICD-10 External Cause Codes (22) and  
189 multiple methods could be coded within one case. Thirteen methods of suicide, suicide  
190 attempt or suicidal ideation were defined and coded as: (a) intentional AOD poisoning  
191 (purposeful AOD consumption with suicidal intent); (b) carbon monoxide (CO) poisoning; (c)  
192 other poisoning (excluding intentional AOD poisoning and CO poisoning); (d) hanging; (e)  
193 asphyxia (excluding hanging); (f) laceration or penetrating wound; (g) firearm discharge; (h)  
194 drowning; (i) jumping from a height; (j) vehicular impact; (k) burn or corrosions; (l) other  
195 method; (m) unknown method. Seven methods of self-injury are defined and coded as: (a)  
196 laceration or penetrating wound; (b) bodily impact; (c) burn or corrosions; (d); ingestion of  
197 foreign object/s; (e) intentional AOD poisoning; (f) other method; (g) unknown method. Three  
198 categories of suicidal ideation preparation were defined and coded: (a) planned; (b)  
199 unplanned; (c) unknown if planned.

#### 200 **AOD poisoning: overdose threshold met**

201 To compliment the AOD module of the NASS (30), a supplementary category classifying the  
202 collective impact of substance use in AOD poisoning was defined and coded: AOD poisoning  
203 (overdose threshold met). This 'overdose threshold met' coding category applies to  
204 intentional AOD poisoning (defined in this paper), as well as two coding categories described  
205 in a previous paper ((a) unintentional AOD poisoning: purposeful AOD consumption without  
206 suicidal intent; (b) undetermined intent AOD poisoning: purposeful AOD consumption with  
207 unknown suicidal intent (where determination of intentional or unintentional AOD poisoning  
208 cannot be made from the ePCR)) (23). AOD poisoning (overdose threshold met) case inclusion  
209 criteria varies depending on the type of drug consumed, using proxy measures to identify  
210 cases with potential for medical harm. For alcohol and illicit substances, a potentially life-  
211 threatening event was identified by a clinical picture involving a Glasgow Coma Scale (GCS)

10  
*defensible, but  
still reasonable*

212 score of less than nine (36), low respiratory rate and/or paramedic concern for securing an  
213 airway. For pharmaceutical preparations, a concordant clinical picture to [alcohol or illicit drug]<sup>AOD?</sup>  
214 overdose, or the consumption of 10 or more times the typically prescribed dose was used to  
215 determine AOD poisoning. Case inclusion criteria for pharmaceutical drugs varies from that  
216 of (alcohol and illicit substances)<sup>AOD?</sup> due to the complexity of considering total drug effect for  
217 individual pharmaceutical preparations during the manual coding process (30).

218 **Mental health-related ambulance attendances**

219 Mental health-related ambulance attendances were classified by the presence of a mental  
220 health symptom preceding or during the ambulance attendance and, importantly, did not  
221 equate to a diagnosis. Four categories of mental health-related ambulance attendances were  
222 defined and categorised as: (a) anxiety: overwhelming and intrusive worry, and/or panic  
223 attack symptom profile; (b) depression: symptom profile consistent with depression, such as  
224 low mood, feelings of hopelessness, despair, worthlessness, anhedonia, change in sleep  
225 and/or appetite; (c) psychosis: presence of hallucinations or delusions; (d) other mental  
226 health symptom: mental health symptoms not otherwise unspecified. Importantly, cases  
227 where presenting mental health symptoms were likely to have a medical cause (e.g., hypoxia,  
228 head injury, delirium, diabetes and dementia), rather than a mental health cause, were  
229 excluded.

230 **Mental health and other risk indicators**

231 For cases ascertained to meet inclusion criteria for mental health-, self-harm- or AOD-related  
232 ambulance attendances, 41 risk indicators are also coded as 'recorded' or 'not recorded'. Risk  
233 indicators were defined and coded into four broad categories, with individual risk factors  
234 presented in Table 1: (a) history of self-harm; (b) history of mental health symptoms or



235 diagnosis; (c) concurrent risk indicator: experiencing the risk indicator at the time of ambulance  
 236 attendance (d) lifetime risk indicator: have experienced the risk indicator during their lifetime.

## 237 Output variables

238 The self-harm and mental health modules of NASS capture more than 80 output variables, in  
 239 addition to the demographic and scene information that was consistent across all modules,  
 240 including patient details, scene details, and the physical condition of the patient. The self-  
 241 harm module had 35 variables that categorise the type of self-harm, intent, and method. The  
 242 mental health module had 46 variables; five that described mental health symptoms at the  
 243 time of the ambulance attendance, and 31 that described risk indicators. Output variables  
 244 related to these modules are summarised in Table 1.

245

246 **Table 1. Self-harm and mental health variables available in the NASS dataset**

<b>Patient and case details</b>			
<b>Case details</b>	<b>Patient details</b>	<b>Scene details</b>	<b>Physical condition</b>
<i>Case number</i>	Gender	<i>Public / private</i>	Fatal event
<i>Case date and time</i>	Age	<i>Indoor / outdoor</i>	<i>Pulse rate</i>
Transport to hospital	<i>Residential postcode</i>	<i>Event postcode and coordinates</i>	<i>Respiratory rate</i>
<i>Non-transport reason</i>		Police co-attendance	<i>GCS</i>
		Others on scene	<i>Naloxone administered</i>
		Minors on scene	Naloxone responsive
<b>Case classification during ambulance attendance</b>			
<b>Mental health</b>	<b>Self-harm</b>		
	<b>Self-harm and other AOD poisoning</b>	<b>Suicidal intent or planning*</b>	<b>Self-harm method**</b>
Anxiety	Suicide	Not applicable	Intentional AOD poisoning Hanging
Depression	Suicide attempt	Evidence of intent Evidence of intent, but denied	Vehicular impact Laceration/penetrating wound Jumping from height CO poisoning Other poisoning
Psychosis	Suicidal ideation	Suicide plan No suicide plan Unknown if plan exists	Firearm Drowning Burning Asphyxia Other

Other/unspecified	Self-injury	Evidence of intent Evidence of intent, but denied	Intentional AOD poisoning Laceration/penetrating wound Burning Asphyxia Bodily impact Ingestion of foreign body# Other
	Unintentional AOD poisoning	n/a	
	Undetermined intent AOD poisoning	n/a	

#### Relevant history and risk indicators

Self-harm history	Mental health history	Current risk indicators	Lifetime risk indicators
Suicide attempt	Anxiety	Agitation	Culturally/linguistically diverse
Suicidal ideation	Post-traumatic stressor disorder	Poor social support	Military service history
Self-injury	Obsessive compulsive disorder	Emergency MH team	Foster care/state guardianship
AOD poisoning: unintentional/undetermined intent	Bipolar disorder	Link to health services	Post prison release
	Depression	Housing problem	Refugee background
	Schizophrenia	Unemployment	Suicidal exposure
	Other/unspecified psychosis	Bereavement	Intellectual impairment
	Borderline personality disorder	Family problem	Acquired brain injury
	Other personality disorder	Chronic pain	Dementia
	AOD misuse	Sleeping problems	Developmental disorder
	Eating disorder	Financial problems	
	Other / unspecified indicator	Gambling problems	
		In custody	
		Bullying	
		Other / unspecified indicator	

247 \* Intent relates to suicidal attempt and self-injury; planning relates to suicidal ideation

248 \*\*For suicide, suicide attempt and suicidal ideation, the method pertains to the self-harm method that was undertaken by the patient. For suicidal ideation, the method pertains to the self-harm method that was planned by the patient

250 #Excludes AOD or other poisons

251 Variables that are used directly from ambulance service data provision, and do not undergo additional coding within the NASS, are shown in italics

252

253

254

## 257 **Ethics approval**

258 This project is approved through the Eastern Health Human Research Ethics Committee  
259 (HREC), with additional HREC approval for jurisdictional data provision, and requirements for  
260 informed consent were waived by these HRECs. Strict protocols are in place for data de-  
261 identification, confidentiality, storage, access and reporting. Patient identifiers are provided  
262 by some ambulance jurisdictions for the purposes of data linkage. On data receipt, these  
263 identifiers are stripped from the dataset and a unique statistical linkage key created.  
264 Identifiers are held in a password protected, secure, separate database that is accessible only  
265 to database managers. All data is de-identified prior to coding.




266

## 267 **Results and Discussion**

268 NASS provides unique and timely monitoring of acute self-harm and mental health morbidity,  
269 and covers more than 90% of Australia's population. NASS also captures a greater proportion  
270 of the community experiencing self-harm and mental ill health than surveillance systems that  
271 use ED, hospital admission or coronial data. These highly relevant and valuable data are not  
272 captured by other means, and strengthen our understanding of the context and burden of  
273 self-harm and mental health conditions on individuals, the community, health services, and  
274 particularly ambulance responses to acute crises. Further, as mental health symptomatology  
275 and suicidal intent fluctuate in both duration and intensity, paramedics' ability to assess these  
276 outcomes as close in time as possible to the time of the event are a valuable context for  
277 improved public health policy recommendations.

278 NASS data have already underpinned and evaluated a major mental health and wellbeing  
279 initiative, *Beyond the Emergency*, a program improving the well-being of men by linking

280 ambulance patients to low-cost mental health interventions and providing mental health  
281 training to Australian paramedics (33). Furthermore, these data have monitored spatial and  
282 temporal trends in self-harm and mental health-related harms (37), and underpinned a range  
283 of research to guide public policy, such as self-harm and mental health related harms in pre-  
284 adolescents (38), self-harm and mental health related harms that co-occurs with inhalant  
285 misuse (39), the prevalence of a history of self-harm and/or mental health in attendances  
286 relating to pregabalin misuse (40), the co-occurrence of psychosis symptoms in ambulance  
287 attendances related to methamphetamine use (41), and the role of sleep and co-morbid  
288 mental health and AOD-factors in suicide ideation and attempt related ambulance  
289 attendances (42).

290 System aptitude to delineate types of self-harm and mental health symptomatology, along  
291 with method of self-harm and risk indicators, sets it apart from other population level data  
292 sources. For example,  Fig 2 shows self-harm related ambulance attendances from the three  
293 largest jurisdictions (New South Wales, Queensland and Victoria). This highlights NASS's  
294 capacity to identify types of behaviours across the spectrum of self-harm, including self-injury,  
295 suicidal ideation and suicide attempt. Demarcation of self-harm type facilitates targeted  
296 intervention points and strategies, enhances evaluation of prevention programs, and  
297 provides much needed evidence to further clarify the contentious issue of predictive value of  
298 previous self-harm on subsequent suicide attempts and fatal suicide (43). There is a  
299 noticeable difference in the rates of specific types of self-harm across the jurisdictions, such  
300 as higher rates in Queensland. There are many contributing factors to this, such as treatment  
301 access and provision across jurisdictions (e.g., lower access to 24-hour health centres in states  
302 such as Queensland that have a higher regional and remote population, and greater  
303 geographic spread).





356 *Limitations and Future Directions*

357 Data are collected for operational rather than research purposes with paramedics only  
358 recording information that they observe, or is provided to them by the patient or bystanders,  
359 and which they deem clinically relevant to patient care. It is possible that relevant information  
360 with respect to self-harm or mental health variables is not recorded, or similar events may  
361 not be recorded consistently by different paramedics over time. Close partnerships with  
362 jurisdictional ambulance services ensures ongoing, and changing, paramedic and data  
363 warehouse operations are clearly understood by the research team. Intra- and inter-rater  
364 reliability of the data is maintained by comprehensive training and reliability audits, as  
365 outlined in previous publications (30). *good*

366 NASS data only includes those cases serious enough to require ambulance attendance.  
367 Inherently, this dataset is primarily a morbidity dataset as fatal suicide is under-represented  
368 as ambulances do not attend all deaths, and when they do attend there may be insufficient  
369 information to determine suicidal intent at the scene. However, paramedic clinical records  
370 are rich sources of information that complement existing population health metrics (e.g.,  
371 hospital and ED presentations). Analysis of these records allow for the identification of  
372 numerous risk factors and associated drivers of suicide and self-harm that have potential for  
373 intervention either as preventive strategies or treatment options. Importantly, the data are *true*  
374 collected in a manner that is not intrusive or demanding on those affected by suicide and self-  
375 harm, and does not rely on additional data collection by, or interactions with, already *good*  
376 burdened health services.

377 Transformation of these data into a publicly available, online surveillance resource could be  
378 modelled on the ambulance component of *AODstats.org.au*, the online dissemination  
379 platform for the research team's previous AOD surveillance program (30). This would enhance

380 self-harm and mental health policy formulation and evaluation at a local, state and national  
381 level. The timely nature of the system means data could be available to stakeholders within  
382 three to six months of an ambulance attendance, with data uploaded online shortly  
383 thereafter. This is significantly more timely than other surveillance systems, including those  
384 using coronial data and enhanced self-harm surveillance systems, with significant time lags  
385 (15) (16).

386

### 387 **Conclusions**

388 NASS data provides a population based, cost-efficient resource that can be used to inform the  
389 development of prevention initiatives, and also serve to evaluate policies and practice over  
390 time, specific geographic regions and population groups. NASS is dynamic and changes can  
391 be made in response to emerging or changing mental health harms or priorities. In order to  
392 improve the utility of NASS, future work will focus on data linkage and the use of artificial  
393 intelligence to assist in screening and coding the data, thereby increasing the timeliness and  
394 completeness of the data.

395

396

397



398 **Acknowledgements**

399 We acknowledge the RA team in Population Health at Turning Point, Mr. Mark Hoffman the  
400 database manager, and our partner ambulance services and paramedics. We also  
401 acknowledge Isabelle Hum, who created Figure 3.

402

*consistency?*

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Figure 1

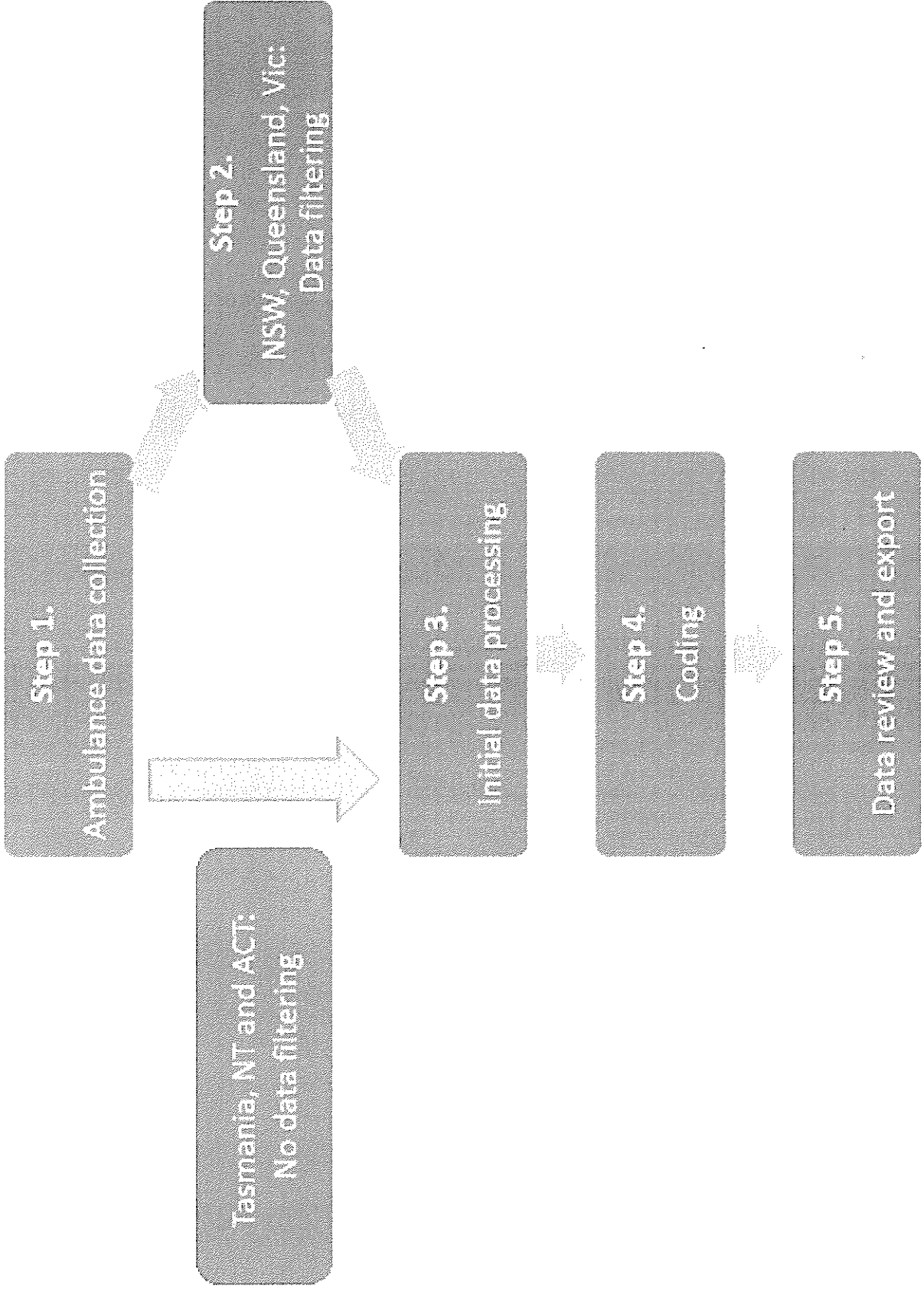
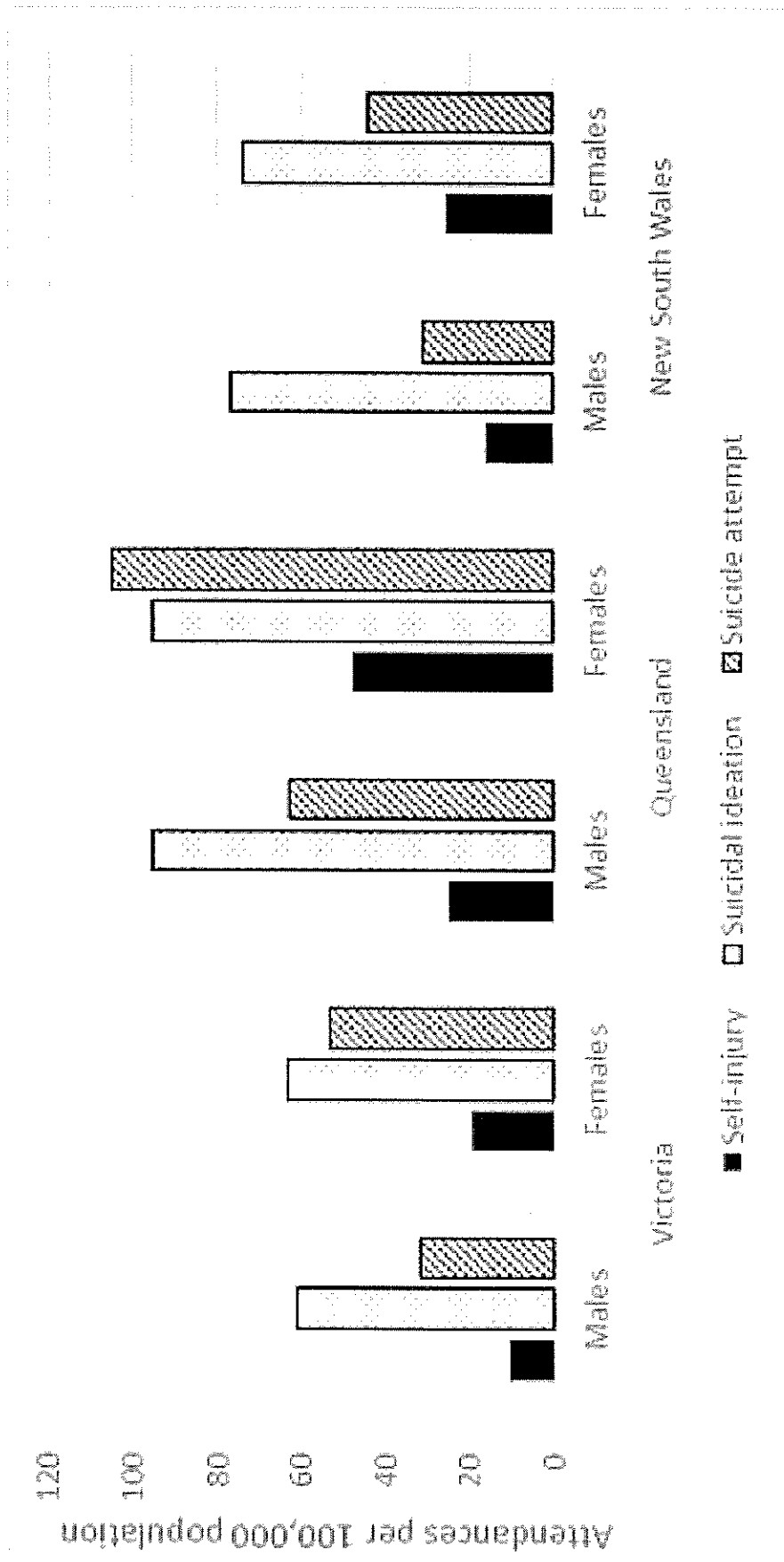
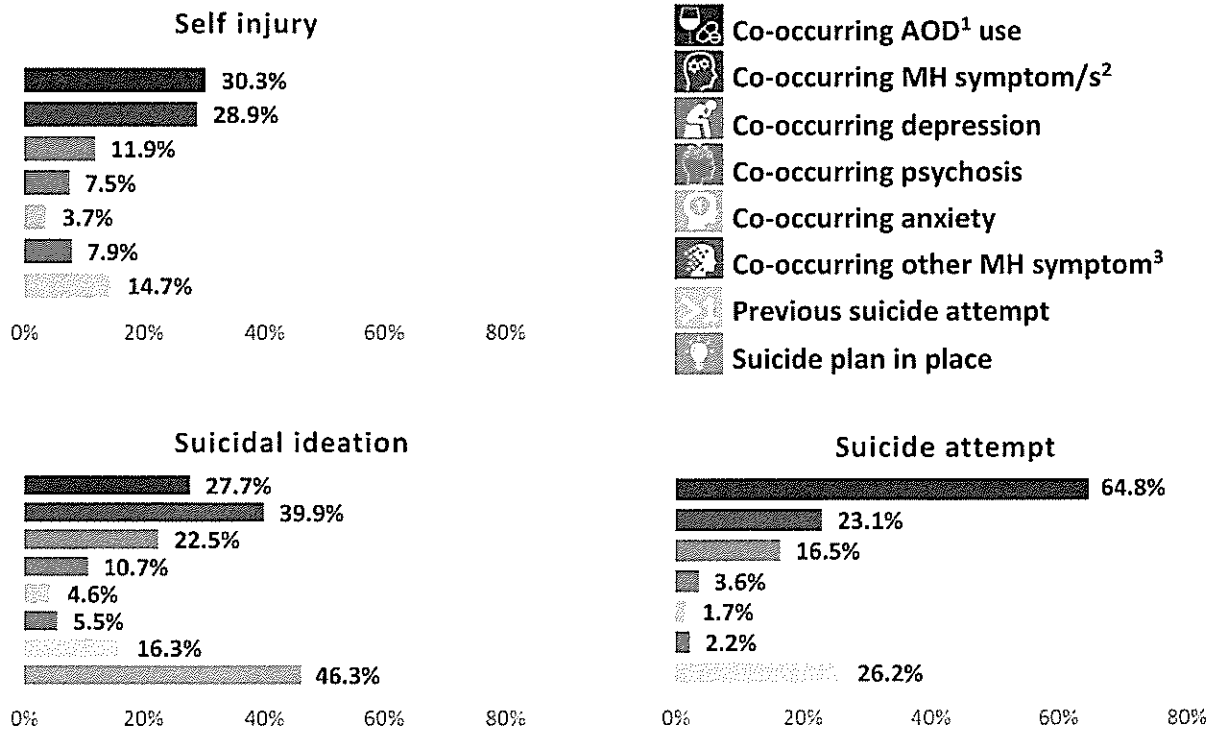


Figure 2

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<sup>1</sup> Alcohol and other drugs

<sup>2</sup> Any current mental health symptom

<sup>3</sup> Other current mental health symptom/s, excluding anxiety, depression and/or psychosis



Figure 4 (a) Drug categories involved in Victorian suicidal ideation and suicide attempt-related ambulance attendance, 2012 to 2018

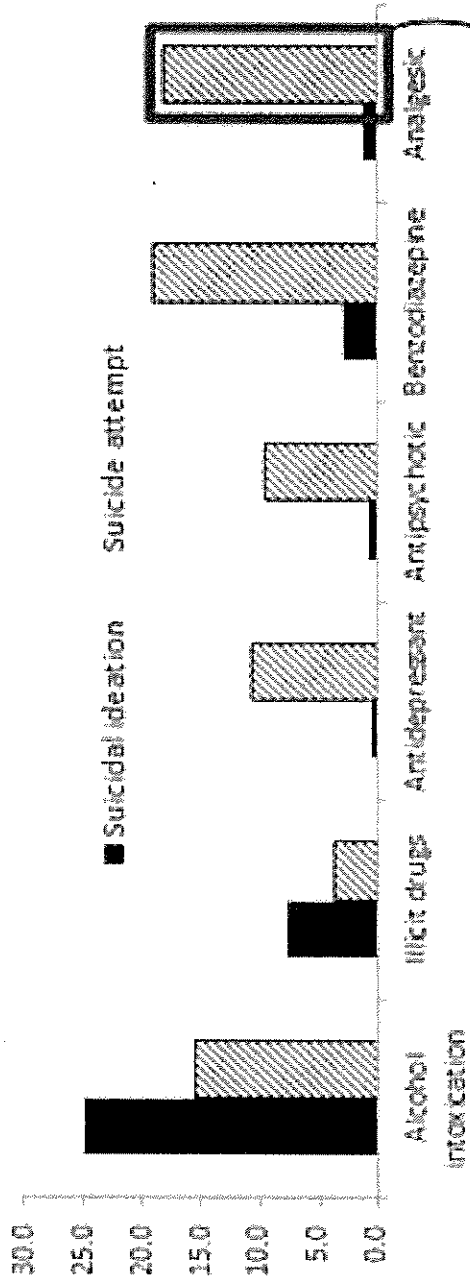
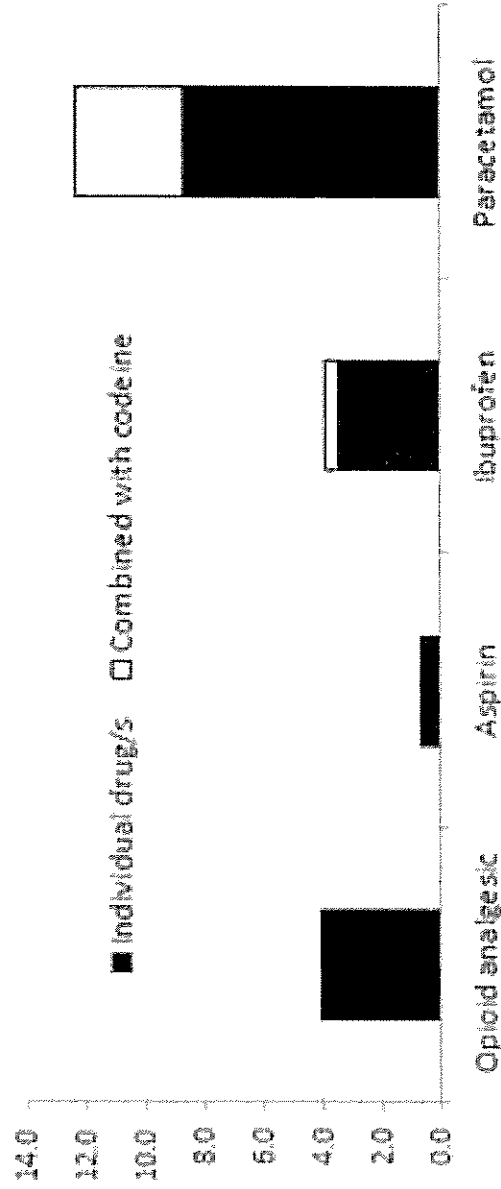


Figure 4 (b) Individual analgesic drugs involved in Victorian suicide attempt-related ambulance attendances, 2012 to 2018



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