Ambo-AODstats

Methods for
Victorian data maps

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INTRODUCTION

Turning Point is a specialist alcohol and other drug organisation that integrates treatment and support services with research, education and training. This unique service model ensures that research informs clinical practice and vice versa, resulting in a best practice environment.

This examination of drug-related events attended by ambulance in Victoria is a collaborative project between Turning Point's Population Health Research team and Ambulance Victoria, and is funded by the Victorian Department of Health and Human Services. The annual report for the Ambo Project: Alcohol and Drug-Related Ambulance Attendances was published online (Lloyd, Matthews, Gao, Heilbronn, & Beck, 2015).

Subsequent annual reporting for the Ambo Project will utilise a model similar to AODstats, which makes use of online platforms to provide interactive statistics and mapping webpages. As such, this methods document describes the data, source, and calculations that are presented in Ambo-AODstats. It is intended as a reference for users that require background information when interpreting and presenting data and graphs sourced from Ambo-AODstats.

METHODOLOGY

Setting

Ambulance Victoria (AV) is the Victorian Government enterprise charged with the state-wide role of ensuring that the people of Victoria receive the most appropriate response to personal and community medical emergencies, and medical transport. It is a critical link in Victoria's healthcare and emergency management systems. Ambulance Victoria operates across the state, with major administrative centres in Melbourne and Ballarat. It employs approximately 3,000 career paramedics supported by approximately 1,000 volunteers. Air ambulance services are provided by 4 fixed wing and 5 helicopter aircraft delivering fast access for rural communities to major specialist facilities in the metropolitan region. Ambulance Victoria also provides adult medical retrieval services staffed by medical personnel and utilise advanced tele-health systems. In servicing the community, Ambulance Victoria is supported by other organisations, including AV auxiliaries, the Emergency Services Telecommunications Authority (ESTA), Victoria Police, Country Fire Authority (CFA), Metropolitan Fire Brigade (MFB), and health care providers. Ambulance Victoria aims to improve the health of the community by delivering innovative, high-quality ambulance services. Research is integral to Ambulance Victoria achieving its vision for better health in the community.

Procedure

Data for Ambo-AODstats have been sourced from the Turning Point Ambo Project, which examines alcohol- and other drug-related events that are attended to by ambulance paramedics. Data is available from 1998 onwards for the Metropolitan Melbourne area (Dietze, Cvetkovski, Rumbold, & Miller, 2000). Data from regional Victorian areas has been coded from mid-2011. The results presented in this report are generated from an analysis of electronic data extracted from VACIS® records. This system is used by Ambulance Victoria paramedics to record the details of all emergency cases they attend, the endpoint being an ePCR. The project team have developed a method for parsing the received VACIS® electronic data to correctly identify relevant AOD-related cases and extract the required information. However, due to the structure of the data model in VACIS® (point

of care data collection), extracting AOD-related attendance information requires additional programming, manual data entry and clerical validation so as to accurately extract the specific drugs or substances involved in the cases attended by ambulance. As a consequence, a separate database was developed for the current project that integrates and standardises information extracted from VACIS® with the existing Turning Point project database. The database contains information on:

- Demographic details of patient (such as age and gender)
- Time of day, day of week of attendance
- Geographic location (e.g., Local Government Area)
- Type of location (e.g., indoors / outdoors; public building / private residence)
- Outcome of attendance (e.g., taken to hospital / not transported)
- Whether police co-attended at the scene
- Other relevant clinical data (e.g., cyanisation, pupil size, respiratory rate)

Data auditing and quality control

The data are internally validated when parsed for import and conversion from the VACIS® transfer files provided by Ambulance Victoria to Turning Point. Variables and coding used in the VACIS® data are compared to the Turning Point database model and any discrepancies are flagged for investigation by project staff. When the VACIS® data have been parsed, converted and appended to the Turning Point database, the ePCRs are collated for review by project staff in order to manually code the various project-specific data required for reporting, including correctly coding the drugs and substances involved in the event.

After the set of ePCRs is manually coded, the dataset is reviewed by senior project staff and extracted for cleaning prior to analysis. Multiple ePCRs for the same patient are aggregated and a random selection of cases is reviewed to ensure the manual coding was accurate and consistent. Data are then converted to a format suitable for analysis and are merged with the Turning Point master project dataset. Preliminary analyses are performed to identify any anomalous trends in the data. Any unusual or unexpected results are then re-reviewed to ensure that data accurately reflect the case details. Ongoing review and cleaning of historical data are undertaken to maintain the quality of the core dataset. Accordingly, numbers may vary slightly between Ambo-AODstats and previous publications.

In addition to these formal quality control methods, throughout these processes, all project staff involved - the data entry personnel and the Research Fellows responsible for analysis - communicate to identify trends, anomalies or interesting patterns identified in the current dataset.

A case is determined to be AOD-related if the immediate or recent over or inappropriate use of a substance or medication is assessed as significant to the reason for paramedic attendance. Chronic use of a substance alone is not sufficient for inclusion in the analysis. Drug involvement in the attendance is ascertained from the paramedic clinical assessment, patient self-report, report from associates present or information available at the scene.

Definition of drug involvement/overdose used in reporting

The attribution of a drug or substance as being involved in the event is formed on the basis of ambulance paramedic *mention* of the involvement of these substances, established through paramedic clinical assessment, patient self-report or information provided by someone else at the

scene, such as family, friends or associates. Where involvement of a specific drug category is detailed in this report, an additional drug category or alcohol may have also been ingested (with the exception of *Alcohol Only* which is an exclusive category).

The core criterion project staff use in determining the involvement of a drug or substance is: "Is it reasonable to attribute the immediate or recent (not merely chronic) over- or inappropriate ingestion of the substance or medication as significantly contributing to the reason for the Ambulance Victoria attendance?"

Drug categories

The following drug categories are included in analysis here.

1. Alcohol Intoxication: Indicates case of alcohol intoxication, with or without other drug/substance involved in paramedic attendance.
2. Alcohol Only: Although other drugs cannot be absolutely ruled out in 'alcohol only' attendances, case data indicates that the attendance was caused by alcohol and, as far as could be determined, no other substances were involved in the presentation.
3. Any Illicit Drugs: Indicates case where an illicit drug was primarily involved in the event, including heroin, amphetamines, cannabis, synthetic cannabinoids, cocaine, ecstasy, GHB, ketamine, LSD, mushrooms, inhalants, emerging psychoactive substances or other illicit drugs. It cannot be ruled out that other substances were not present.
4. Amphetamines: Indicates case where any amphetamine was involved in attendance.
5. Crystal methamphetamine: Indicates case where crystal meth or ice was involved in attendance. This category is a subset of all amphetamine-related attendances.
6. Cannabis: Indicates case where cannabis or hashish was involved in attendance.
7. GHB (Gamma-hydroxybutyrate): Indicates case where GHB was involved in attendance.
8. Heroin: Indicates case where any heroin was involved in attendance.
9. Heroin Overdose: Indicates case where heroin was involved in attendance and a positive response to the administration of naloxone was recorded.
10. Heroin Other: Indicates case where heroin was involved in attendance but there was no positive response to the administration of naloxone, or naloxone was not administered.
11. Inhalants: Indicates case where any volatile substance, inhalant or solvent was involved in attendance, such as chrome or petrol.
12. Stimulants (excluding amphetamines): Indicates case where a stimulant was involved in attendance, including cocaine or ecstasy.
13. Hallucinogens: Indicates case where a hallucinogen was involved in attendance, including LSDs or mushrooms.
14. Any Pharmaceutical Drugs: indicates case where a prescription drug was primarily involved in the event, including anticonvulsants, antidepressants, antipsychotics, benzodiazepines, opioids, opioid pharmacotherapy, other analgesics, a pharmaceutical stimulant, or another medication (prescribed or non-prescribed) other than those explicitly mentioned. It cannot be ruled out that other substances were not present.
15. Antidepressants: Indicates cases where an antidepressant was involved in attendance, such as citalopram or sertraline.
16. Antipsychotics: Indicates cases where an antipsychotic was involved in attendance, such as amisulpride or quetiapine.

17. Benzodiazepines: Indicates case where a benzodiazepine was involved in attendance, such as alprazolam or diazepam.
18. Opioids: Indicates case where an opioid was involved in attendance, including opioid analgesics such as morphine or oxycodone.
19. Opioid Pharmacotherapy: Indicates case where opioid substitution therapy was involved in attendances, such as methadone or buprenorphine
20. Other Analgesics: Indicates case where pain relief medications were involved in attendance, such as aspirin or paracetamol.

DATA ANALYSIS

Software

STATA was utilised for data management and analysis. Stata is a general purpose statistical software program that is comprised of many capabilities, including data management, statistical analysis, graphics and custom programming.

StatPlanet is a software program that is created to produce user-friendly interactive maps and visualisations using your own data and meta-data. It allows the user to use tools to better explore and analyse the data according to their needs. StatPlanet can be used to visualise location-based statistical data and there is the option of including interactive graphs and charts to create feature-rich interactive infographics.

Data management

Ambo-AODstats contains data for each of the drug categories for ten consecutive financial years, from 2005/06 to 2014/15. Data for Alcohol Intoxication is only presented from 2007/08 however, as this began to be collected in October 2006. Data for synthetic cannabinoids is only included from 2014/15, as this began to be collected in January 2014. Data for emerging psychoactive substances is only included from 2015/16, as this began to be collected in January 2015. There are several months of missing data in the 2014/15 financial year, due to industrial action by Ambulance Victoria paramedics. This missing data was managed by imputing numbers for the missing months based on the same months in the year prior and after, taking the average of the two.

Mapping of alcohol- and drug-related ambulance attendances

The ability to map AOD-related ambulance attendances provides unparalleled opportunities to explore clustering of harms in local areas for populations and sub-populations of interest. For each of the drug categories included in Ambo-AODstats, maps of ambulance attendances are provided by three levels: State, Metropolitan Melbourne/Regional Victoria, and by Local Government Area (LGA). It is important to remember that regional Victorian data was included from 2011/12 financial year.

Analyses

Basic descriptive statistical analyses are used to explore AOD-related ambulance attendances. Analyses include frequencies (i.e., number of attendances), proportions, and crude population rates per 100,000 population (accompanied by confidence intervals). Statistics based on numbers less than five are not reported. Numbers have been shortened to two decimal places.

Proportions

Proportions are based on non-missing information. Proportions for each drug category were calculated using the following formula:

$$\frac{\textbf{Number of ambulance attendances}}{\textbf{Number of cases for the financial year}} \times \mathbf{100}$$

Proportions for indicators (e.g., gender) within each drug category were calculated using the following formula:

$$\frac{\textbf{Indicator number, such as number of males}}{\textbf{Total known cases for indicator category, such as total valid gender cases}} \times \mathbf{100}$$

Rates per 100,000 population

The Australian Bureau of Statistics Estimated Resident Population (ERP) data was utilised to calculate population rates, thereby correcting for variation in population size between areas. ERP data is estimated at June 30 each year. For the 2005/06 financial year, ERP data from 2005 was used as the denominator. Population rates were calculated for the Ambo Project dataset using the following calculation:

Crude rate = number of ambulance attendances x 100,000 population (State, Region, LGA)

Rates were calculated for the total population, by gender and also according to five age categories (0 to 14 years, 15 to 24 years, 25 to 39 years, 40 to 64 years, and 65 years and over). A number of included LGAs were comprised of a small number of cases, therefore to protect individual confidentiality, data is not reported where an area has fewer than five cases. Furthermore, rates based on small numbers can produce unstable results. For instance, small numbers and small populations can produce larger than expected results. Where rates appear unduly high, low or show rapid change, please consider the actual raw number as it may be small and distort interpretation.

Please note that rates reported in Ambo-AODstats are crude rates. Crude rates allow for adjustment of population size across different areas; however they do not adjust for certain demographic attributes, such as age and gender. From a public health perspective there are advantages to standardising for age and/or sex as it allows comparisons across areas to be made more accurately. However, from a policy perspective knowing what is impacting the rates is equally important. Given that age and gender are key contributors to alcohol harms and use, if an area has more men and younger people this information is important and policy and services need to be aware.

Confidence intervals (95% CI)

Confidence intervals for rates were calculated using the exact method based on the Poisson distribution (Dobson, Kuulasmaa, Eberle, & Scherer, 1991; Buchan, 2004). Where confidence intervals do not overlap, this can be broadly interpreted as indicating a statistically significant difference. Throughout Ambo-AODstats these differences are termed significant.

Exact Poisson confidence intervals for:

$$LL = \frac{\left(\chi^2_{\frac{\alpha}{2},2d} \right)}{2e}$$

$$UL = \frac{\left(\chi^2_{1-\frac{\alpha}{2},2(d+1)} \right)}{2e}$$

Where:
d = number of events (e.g., ambulance attendances)
e = exposure (e.g., population size)
α = 1-confidence interval (e.g., α = 0.05 for a 95% confidence interval)

X^2 α,ν is the $(100*\alpha)^{th}$ chi-square centile with ν degrees of freedom

LL = lower limit
UL = upper limit

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