National Coronial Information System: Epidemiology and the Coroner in Australia

Eva Saar, Lyndal Bugeja, David L. Ranson

ABSTRACT

The National Coronial Information System (NCIS) is the world's first national Internet-based database of coronial information. It was established in Australia following the recognition by coroners that their mandate for public health and safety could be improved if they could identify previous similar deaths. The NCIS is funded from state, territory, and commonwealth government agencies and overseen by the NCIS Board of Management. A team of ten staff manage the day-to-day operation of the system.

The NCIS enables the rapid identification of up-to-date information on deaths investigated by the coroners' jurisdictions in Australia (from July 2000) and New Zealand (from July 2007). It is accessible to death investigators (coroners; forensic, medical, and scientific staff; and police) to assist with death investigation and approved third parties (e.g., researchers). The NCIS contains demographic information about the deceased, contextual information about the circumstances in which the death occurred, the cause and manner of death, and four full text reports generated during the investigation.

The NCIS contains information on over 328 000 completed coroners' death investigations across Australia and New Zealand. Approximately 350 death investigators are registered to access the data for their ongoing death investigations, and 235 third party users are registered to utilize the data set in their research. In addition to the utility of the NCIS, this paper describes the rationale and governance structure of the NCIS, the information technology infrastructure, data set, quality assurance framework, and contribution to death and injury prevention. *Acad Forensic Pathol.* 2017 7(4): 582-590

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INFORMATION

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INTRODUCTION

Coroners in Australia and New Zealand agree that the most compelling justification for the coronial jurisdiction is its ability to contribute to the prevention of injury and death. Indeed, some of the included jurisdictions have “prevention of injury and death” described as a statutory duty of the coroner (1). The identification and quantification of risk factors amongst deaths is crucial information for coroners when discharging their discretion to make recommendations on public health and safety and the administration of justice. Recommendations have been made throughout the long history of coroners and have contributed to the development of policy and programs in areas such as product safety, transport, and workplace safety (2-4).

DISCUSSION

Rationale for the National Coronial Information System

Prior to 2000, the identification of trends in coroner-reported deaths relied on corporate knowledge. Coroner records were paper-based and stored in a numeric based filing system without indexes to identify clusters of similar cases. In addition, each of Australia's eight coronial jurisdictions had their own system of data collection and storage. To overcome these limitations, discussion commenced among Australian coroners for the development of a national database for coronial information.

In 1994, the Australian Coroners' Society (ACS) commissioned the National Injury Surveillance Unit of the Australian Institute of Health and Welfare to undertake a feasibility study on a national database for coronial information (5). This study was funded by the Australian Commonwealth Department of Health and Aged Care. It recommended the establishment of a national database and the recommendations were taken up by the ACS (5).

In September 1997, the ACS endorsed a business plan for development and management of the National Coronial Information System (NCIS), put forward by a consortium called the Monash University Nation-

al Centre for Coronial Information (MUNCCI). The consortium was made up of the Victorian Institute of Forensic Medicine (a statutory agency of the Victorian Department of Justice and Regulation, which also hosts the Department of Forensic Medicine at Monash University), Monash University's Department of Epidemiology and Preventive Medicine, and the Monash University Accident Research Centre.

National Coronial Information System Funding and Governance

The NCIS was launched in July 2000 and was managed by MUNCCI until 2004. The Victorian Institute of Forensic Medicine subsequently managed the NCIS from 2004-2012, with the parent government department of the Institute, the Victorian Department of Justice and Regulation, taking over responsibility for managing the NCIS from 2012 through its Service, Strategy, and Reform Division.

Core funding for the NCIS is provided annually from all Australian State/Territory Justice Departments and the Ministry of Justice in New Zealand. The Australian Federal Government provides annual funding to the NCIS through the Commonwealth Department of Health, the Department of Infrastructure and Regional Development, Safe Work Australia, the Australian Competition and Consumer Commission (ACCC), and the Australian Institute of Criminology (6). A small proportion of NCIS income is obtained from user fees for online subscriptions, and a data request service where one-off snapshots of de-identified data are provided to external agencies about certain topics of interest.

The NCIS is governed by a Board of Management, which endorse and monitor the NCIS budget and provide strategic direction. The NCIS Board of Management is comprised of representatives for each of the core funding agencies, a coronial representative, investigators, and researchers. It is chaired by the Secretary of the Victorian Department of Justice and Regulation. The NCIS team consists of ten staff members with a broad range of skills including information technology, health information management, forensic toxicology, and criminology.

The National Coronial Information System Information Technology Infrastructure

In the early days of the database, because many of the jurisdictions had not yet developed electronic case management systems, the NCIS (MUNCCI) developed and maintained a simple electronic tool that could be used in local Coroners' Courts and facilitated the electronic uploading of data to the national database. Today, with the establishment of effective electronic case management systems in the various jurisdictions, the NCIS operates through the medium of a secure Internet database accessible through a secure access area on the NCIS web site.

The server, which houses the database, is maintained by the information technology (IT) support team of the Victorian Institute of Forensic Medicine, and data is added via nightly or weekly automatic uploads from the local case management systems of all Australian and New Zealand coronial courts.

The National Coronial Information System Data Set

The NCIS stores a subset of material generated during a coronial investigation. For Australia, it stores information on deaths reported to coroners since July 2000 (January 2001 for Queensland), and for New Zealand since July 2007. Data entry is performed by staff employed at each coronial jurisdiction. Regular, secure data uploads from the court systems allow data to be added to the NCIS in a timely manner. Where possible, validation rules are incorporated into the local systems, which strengthen the validity of the data and limit manual errors at the point of data entry.

Data are entered as coded fields, structured free text, and four searchable full text documents are attached for each case: police report of death notification to the coroner, autopsy and toxicology reports, and coroners' findings. These data comprise information about the sociodemographic characteristics of the deceased; location, activity, and other contextual information about the circumstances of the death; cause and man-

ner of death; and other specific data provided by external organizations (**Table 1**).

A number of NCIS data items align to international mortality classification systems. The use of a standardized classification structure is a key component in ensuring that cases within the NCIS are cross jurisdictional comparable, enhancing the system's utility as a national research and analysis tool. The coding schemes utilized within the NCIS are derived from three sources: the National Health Data Dictionary (NHDD), the International Classification of External Causes of Injury (ICECI), and internally developed schemas. The majority of data items are based on the definitions outlined in the NHDD. This helps to ensure that fields such as date of birth, sex, indigenous origin, and marital status are consistent with other data collections. A classification based on the ICECI is used for the coding of data fields including: incident activity, intent, location of event, mechanism of injury, and object or substance producing injury.

In certain instances, it has been necessary to modify or enhance the ICECI to ensure the classification system is tailored to the Australian/New Zealand context and types of scenarios involved in coronial cases, such as the modification of location code from "sidewalk" to "footpath" or the inclusion of Mechanism of Injury code "bullying."

Other prominent classifications employed within the NCIS include the Australian and New Zealand Standard Classification of Occupations (ANZSCO), the Australian and New Zealand Standard Industrial Classification (ANZSIC), the Type of Occurrence Classification System (TOOCS), and the International Classification of Diseases, 10th Revision (ICD-10).

While the NCIS aims to make the four full text documents of interest available for all cases on the database, this can prove challenging due to inter-jurisdictional differences in the data provision and upload systems. Operational statistics for the NCIS, including case closure and document attachment rates, can be reviewed on the NCIS website (ncis.org.au).

The National Coronial Information System Quality Assurance Program

The utility of the NCIS is highly dependent upon the consistency and accuracy of data coding. The NCIS has developed a robust quality assurance process to ensure that the data complies with the standardized code sets and accurately reflects the facts of the death. The NCIS Quality Assurance Program has a number of quality objectives (see **Table 2**).

Access to the National Coronial Information System

Two types of users are permitted to access the NCIS: death investigators and third parties. A “death investigator” is a coroner, forensic pathologist, toxicologist, police assistant, or other medical, scientific, or legal professional who is tasked with assisting a coroner (or magistrate acting as a coroner). Access to the data stored on the NCIS is available to all Australian and New Zealand death investigators to assist with their

Table 1: National Coronial Information System Core Dataset

Case demographics	Name Age and age units Sex Marital status Indigenous status Place of birth
Case type	Natural cause External cause Unknown cause
Intent	Unintentional Intentional self-harm Assault Legal intervention Operations of war Complications of medical and surgical care Undetermined intent
Cause of death	Medical cause of death
Event circumstances	Time and location - usual residence Time and location - incident/death/body found/last seen alive
Causative or contributing external factors	Mechanism Object
Procedural information	Inquest held Coroners' recommendations Death notification date Death investigation closure date
Externally provided codes	ICD-10/ICD-10-AM cause of death codes
Full text reports	Police summary of circumstances Autopsy report Toxicology report Coroners' finding

Table 2: National Coronial Information System (NCIS) Quality Objectives

Maintain systematic quality analysis and monitoring
Provide coder training
Review and update NCIS reference documents – Data Dictionary, Coding Manual, and User Guide
Provide Help-desk coding assistance
Review coding classification and ensure the code sets reflect current international standards and concepts
Establish and maintain relevant coding and quality contacts within jurisdictions
Examine and remedy inconsistent practices across jurisdictions

death investigation work. There is no applicable cost. Upon request, the NCIS Unit will obtain signed approval from the respective State or Chief Coroner in the home jurisdiction for NCIS access, with each applicant required to sign an individual confidentiality agreement. Standard levels of access usually comprise of all cases (open and closed) from the home jurisdiction, with closed case access only for other jurisdictions. Cases are classified as “open” until the coroner has completed the investigation and the case details are entered into the NCIS. If a staff member requires a higher level of access, the State or Chief Coroner of each particular jurisdiction is required to provide written authorization.

A “third party” for the purposes of NCIS access is a government, research, or nonprofit organization with a bona fide interest or specific focus on public health and safety. Third parties are eligible to apply for direct access to the NCIS. Media or private organizations are not eligible to obtain direct access to the NCIS, but may contact the NCIS unit to request de-identified statistical information. There are two levels of access applicants may request:

Level 1: Access to all data (including identifying information) related to closed cases (including case reports where available) and non-identifying data for open cases.

Level 2: Access to non-identifying data for all open and closed cases (does not include case reports).

All third party applications for access to the NCIS must be considered by the NCIS Research Committee (NRC) and Victorian Department of Justice and Regulation Human Research Ethics Committee. If the applying organization has an in-house ethics or research committee, the researchers must first obtain approval from them before submitting an application to the NCIS. If an applicant is seeking Level 1 access to Western Australian data, an additional application must be considered by the Western Australian Coronial Ethics Committee (WACEC).

Approved third parties are required to enter into an access agreement that governs the use of NCIS data, compliance with the NCIS Privacy Protocols, and notification of any identified Issues of Concern to Public Health or Safety. Once approved, there are different manners through which third party users can access data from the NCIS including direct system access (online using username and password) or data extract service (required data fields are provided in an Excel or .csv format by the NCIS Unit). These protections ensure that all research conducted must serve the public interest in order to support the use of information from deceased persons, who are unable to provide informed consent.

Utility of the National Coronial Information System

As of July 2016, the NCIS database holds information about more than 328 000 completed coroners’ death investigations across Australia and New Zealand. Furthermore, there are 38 500 records with more restrictive access permissions that relate to “open cases” where the death investigation is still ongoing with the coroner or data entry is yet to be completed.

At the time of writing, there are more than 100 ethically approved research or monitoring projects using the NCIS as an ongoing data source. Some 235 third party users are registered to utilize the dataset in their research and around 352 Australian and New Zealand death investigation users are registered to access the data.

Data can be identified and extracted from the NCIS via coded or free text searches. Searches can be conducted across coded and non-coded variables as well as the full text documents using particular codes, keywords, or expressions. The comprehensive data allows users to search and review not only the death event but also the involvement of risk factors and the contribution of additional factors, such as the consumption of substances, and other diseases. The NCIS makes user guides available to all new users to facilitate optimal use of the database.

Contribution of the National Coronial Information System to Prevention

The information held on the NCIS, consisting of medical histories; social factors; circumstances of the death; investigatory evidence; and forensic, medical, and toxicological analysis, among other data, serves as a rich data source for injury and death prevention. From 2011-2017, over 215 publications have been produced utilizing the NCIS as a source of data.

Information has been provided to coroners, ministers, government agencies, researchers, nonprofit safety organisations, media, and private companies. These data have helped inform manufacturing changes, regulatory changes, awareness campaigns, suicide prevention initiatives, and coronial recommendations, all performed with the key objective of reducing death and injury in the community (7).

The NCIS provides a research consultancy service, free of charge, for coroners and their staff, which involves the preparation of statistical data reports that can be tabled in court, and also provides assistance in case identification. These activities assist coroners and death investigators to uncover mortality trends and identify similar cases in order to formulate effective recommendations. In a recent New Zealand government report regarding suicide data and prevention, it was suggested the NCIS will allow New Zealand Coroners to identify opportunities for suicide prevention (8).

The NCIS has been a key data source for a number of Regulation Impact Statements (formal documents analyzing the potential effects of proposed regulatory policy). These include reviews relating to motorized mobility scooters, infant pacifiers, infant cots, domestic ladder falls, and illegal weapon fatalities, among others (9-11).

The NCIS also assists the development and maintenance of purpose-built data collections that inform research and policy. Notable examples include the Australian Institute of Criminology National Homicide Monitoring Program, the National Fatal Drown-

ing Database of the Royal Life Saving Society, the Department of Infrastructure and Regional Development Australian Road Deaths Database, in addition to various state and territory mortality review committees.

The use of NCIS has helped to support the introduction of initiatives designed to prevent deaths in the community. Some examples are described below.

Quad Bike/All Terrain Vehicle (ATV) Safety

The NCIS is accessed by the Australian Centre for Agricultural Health and Safety (ACAHS) as a primary data source to monitor issues associated with quad bike fatalities. The NCIS Unit has also produced a number of reports for coroners in relation to the frequency and type of quad bike fatalities, which have shown that 140 people died across Australia in quad bike-related incidents from 2003 to 2014 (12).

Supported by these data, a combination of coronial recommendations and lobbying from the ACAS has resulted in several initiatives over the past decade in relation to quad bike safety (12). These have included: a requirement to wear a helmet if riding a quad-bike on a public road; the development of accredited technical and further education (TAFE) training programs around Australia for farmers to increase awareness and safety associated with quad-bike use; and the introduction of a number of state funded subsidy programs to help farmers buy roll over protection devices for quad bikes (12).

Blind or Curtain Cords

In 2003, a request was made to the Flinders University by the Commonwealth Department of Health to supply information regarding deaths of infants and young children due to strangulation by blind or curtain cords. Flinders University was able to use the NCIS to identify fatalities that had occurred since the NCIS national data collection began in July 2000. The number of cases found prompted the lodging of an "Issue of Concern to Public Health and Safety" to the NCIS, which was subsequently passed along to all State and

Chief Coroners around Australia (13). In 2004, the Blind Makers Association of Australia contacted the NCIS and requested case information concerning the nature of these fatalities to present to their members at the association's annual conference. In 2016, tie-downs and tension devices to secure blinds are part of a mandatory standard for installation and are present in all new installations (14).

Self-Extinguishing Cigarette Manufacturing Standard

Data about the number of fatalities caused by unintentional cigarette-related fires (an average of 11 each year) was sourced from the NCIS and provided to the New South Wales Fire Brigades during October 2006. This information helped lead to an endorsement by State and Federal Emergency Services Ministers for a national mandatory standard for the manufacture of Reduced Fire Risk (self-extinguishing) cigarettes (15). This standard has since been legislated by Government, and came into effect in March 2010 (16). Any cigarettes manufactured in Australia must now be actively smoked to continue burning, making them less likely to cause fires if dropped or left unattended.

Working Safely Under Vehicles

Data from the NCIS were able to confirm to the Australian Competition and Consumer Commission (ACCC) in 2005 that incorrectly working under vehicles in a domestic setting was causing a number of preventable fatalities. A joint national safety campaign by the ACCC and the Australian Department of Health and Ageing (now "Commonwealth Department of Health") was subsequently launched, and a safety alert brochure was published (17). Updated figures in 2008 showed there had been 29 deaths between July 2000 and June 2007 in which a decedent was crushed after incorrectly jacking up a vehicle (17). These data helped support the update of mandatory standards for vehicle jacks, which came into effect in February 2010. The updated standard includes improved warning messages to be placed on vehicle jacks.

Run Over Deaths of Children

In 2007, the Queensland Parliamentary Travelsafe Committee (QPTC) used data from the NCIS when investigating slow vehicle run overs of children. The data showed that an average of nine children (up to the age of five years) each year were killed in driveway run overs in Australia. The QPTC accordingly made a number of recommendations to attempt to reduce the number of such deaths, such as new home builders in Queensland should be encouraged to install child-resistant fencing and self-closing gates/doors near driveways. The Queensland Parliament endorsed the recommendations, and also reported they would lobby federal authorities to have reversing sensors installed in all new cars (18).

In 2012, the NCIS Unit provided data to help inform a report produced by the Federal Department of Infrastructure titled *Child pedestrian safety: 'driveway deaths' and 'low speed vehicle run-overs', Australia, 2001-10*, which noted that 66 pedestrians aged 0-14 years were killed by a four-wheeled motor vehicle around a home in Australia between Jan 2001 and December 2010 (19). In 2014, the Australian Department of Infrastructure and Regional Development released a report that summarized public feedback to developed "*Driveway Safety Design Guidelines*" (20). By 2016, most states and the federal government had developed safety campaigns/materials to warn about the dangers of children and driveways, with steps to take to reduce the risks.

CONCLUSION

At the launch of the NCIS, the Honourable Rob Hulls, Attorney-General of Victoria, stated:

The NCIS represents a world first in providing an Internet-accessible database of coronial information across Australia. Coronial data is a rich source of information about the causes of preventable deaths in this country. [The NCIS] will provide a means of accessing data in a timely way and will increase the potential for coronial information to contribute to a reduction in

preventable death and injury in Australia and in doing so, it will reduce both the emotional and financial burden of lost life in our community. The NCIS will revolutionise the way we investigate and respond to preventable deaths in Australia (21).

Since the establishment of the database, there has been considerable interest in its operations from a number of jurisdictions around the world. There appears to be a recognized need for such data and given the international dimension of community and environmental hazards, we may expect to see data links developed between a number of national coronial databases in the future. With the coroner's responsibility for the identification of deceased persons and the current tensions in relation to disasters involving mass loss of life, such databases may prove to be of considerable value.

The work of the NCIS would not be possible without the support of coroners in Australia and New Zealand – for their commitment to death and injury prevention through the collection and sharing of coronial data and the allocation of court resources to facilitate this process. The NCIS recognizes the importance of this work and is proud to assist in creating safer communities.

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