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Geographic distribution of burn in an Australian setting

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ABSTRACT

Objective: To investigate the geographic distribution and temporal trends of burn admissions in an Australian setting.

Methods: Health administrative data of all persons hospitalised for a first burn in Western Australia for the period 2000–2012 were used. Crude and standardised incident rates were generated for each region. Maps of crude rates were generated for state regions and postcode-suburbs of Perth, the capital city. Standardised incidence rates were generated for Western Australia, total and regions, and for sub-cohorts defined by age (<20 years; ≥20 years), TBSA burn severity and major causes of burns (fire, scalds and contact). Negative binomial regression was used to examine temporal changes and generate incidence rate ratios (IRR) with 95% confidence intervals (CI).

Results: Perth had the lowest burn admission rate per population; clusters of suburbs of lower social advantage and higher immigrant settlement were identified as being at high risk. While the highest observed admission rates were found in Kimberley and Goldfields (remote) regions, after adjustment for the regional demographic structures, the Wheatbelt and Mid-West (rural) regions were found to have the highest adjusted rates of burn admissions. Significant annual declines in admission rates were found for the Kimberley, Pilbara and Goldfields (remote regions); however, stable admission rates were identified for all other regions.

Conclusions: The Mid-West and Wheatbelt rural regions were found to have the highest risk of burn admissions raising concerns about farming-related injury. Safety awareness and burn prevention strategies need to be continued, with specific attention to these high risk areas, to reduce burn admissions in Western Australia.

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1. Introduction

Burn is a leading cause of death and disability worldwide [1]. It is a preventable health condition and remains a

public health concern. In Western Australia, burns account for approximately 2.2% of hospitalizations due to community injuries; however, they are responsible for the highest length of stay of all injuries [2]. Previous research has identified significant declines in burn admissions over the

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past decades in developed countries including Australia [3–5]. In Western Australia, these findings are most likely the result of burn prevention strategies in combination with changing patterns of outpatient and inpatient models of care over time [6–8]. Despite improvements in burn admission rates, some groups remain at high risk of burns: children younger than 5 years, males aged between 15 and 29 years, adults older than 65 years [5] and minority and indigenous populations [1,5]. Burn admission rates for indigenous Western Australians have however declined over the past three decades at a greater rate than that for non-indigenous people [5]. Recent population-based research has demonstrated worse long-term mortality after burns [9–12] and excess morbidity across a range of health conditions when compared with uninjured people [13–17]. These findings together with the trauma associated with the acute burn, provide impetus to generate information to inform burn prevention.

Western Australia is the largest state of Australia with a total land area of approximately 2.5 million square kilometres of diverse geography. However, the state is sparsely populated. Approximately 10% (~2.2 million) of Australia's population resided in the state, with 72% of the state's population living in the capital city, Perth, 22% living in regional areas and 7% in remote and very remote areas [18]. Western Australia's economy is largely driven by the extraction and processing of natural resources, contributing significantly to Australia's mineral and energy exports [19]. Agricultural production in Western Australia is also a major contributor to the state and national economies [20].

Hospital and other health services are provided by the Western Australian Government Department of Health. In total there are 85 hospitals and health service centres located across the state, including 70 country sites, with specialist burns units (paediatric and adult) located in Perth. The 'Burn Injury Model of Care' for Western Australia, developed in 2008, outlines burn management including pre-hospital and immediate care and criteria for transport and transfer to burns specialist units [21]. The Burns Service of Western Australia is involved in delivering a number of education programs such as the Burns Management Program targeting participants from regional hospitals, General Practitioners, Aboriginal Medical Services, the Royal Flying Doctor Service, occupational health and safety, and ambulance services. The Emergency Management of Severe Burns education program, facilitated by Australia and New Zealand Burns Association, is also delivered state-wide on a regular basis to medical and nursing staff involved in the treatment of burn patients.

Western Australia represents an interesting microcosm of Australia with respect to lifestyle, work and access to services in urban, rural and remote regions. In terms of key socio-demographics and health economic indicators, Western Australia is representative of other Australian states and Territories [22]. In this study, we used state-wide health administrative data for the period 2000–2012 to firstly, map the distribution of burn undergoing hospitalization by geographic region; and, secondly, to quantify temporal trends in burn admissions in Western Australia.

2. Methods

This study used linked de-identified hospital and death data of all persons hospitalised with a first burn (principal or additional diagnosis) in Western Australia during the period 2000–2012. The methods of cohort selection have been previously published [23]. Population-based data were provided by staff of the Western Australian Data Linkage System (WADLS), Western Australian Department of Health [24]. Study approvals were granted by the human research ethics committees of the University of Western Australia and the Western Australian Department of Health.

Study variables included: age at time of burn admission, gender, indigenous status, admission and discharge dates, and burn characteristics (depth, site, and total body surface area percent (TBSA%); cause, place of injury), social disadvantage index (Socio-economic Index for Areas [25]), postcode and local government area of usual place of residence, hospital region of admission and year of admission. International Classification of Diseases coding categorises TBSA in groups of 10% (e.g. 0–9, 10–19 etc.); for this study TBSA severity was classified <20% (minor) and ≥20% (severe).

Refer to Fig. 1 for a map of regions in Western Australia. Population, land area, industry and hospital service characteristics of each geographic region are presented in Appendix A. To address mapping issues with respect to low population densities in regions outside of the capital city of Perth, geographic regions were constructed using postcodes and local government areas to represent the Western Australian Government and Department of Health service regions. Postcodes of place of residence of burn patients in non-metropolitan regions were classified into the following regions: South West [26]; Great Southern [27]; Wheatbelt [28]; Mid-West [29]; Goldfields [30]; Pilbara [31]; and, Kimberley [32]. Given the high population density in the metropolitan area of Perth, suburban postcodes were used to create maps of observed burn incidence to identify hot spots of high incidence.

2.1. Analyses

Chi square tests for differences comparing categorical variables (region vs. place of occurrence of burn; region vs. mechanisms of burn) were performed. Annual crude (observed) burn admission incidence rates were generated and graphed for Western Australia (total and regions) and Perth, using Western Australia population estimates from 2000 to 2012, and summed to derive a total for the study period 2000–2012.

Annual standardised incidence rates were estimated using Western Australia population estimates from 2000 to 2012 and standardised by age, gender and indigenous status for the total Western Australian burn cohort and for admission in each geographic region for each year using the direct method [33], with the Western Australian population at 2006 as the reference population. The annual standardised rates were summed to derive a total for the study period 2000–2012 (WA total, region). Annual standardised admission rates (per

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