Causes of Death of Punjabi Hawkers and Farm Workers in Colonial Australia until 1901

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During the late nineteenth century a considerable number of young Punjabi men sought their fortunes in the Australian colonies, working as hawkers and farm labour. While there, they experienced marginalisation and high levels of racial vilification. Drawing on death certificates, archival sources and contemporary newspaper reports, this paper is the first to collate the data on all deaths of these men until 1901 when Australia's immigration policies terminated further recruitment.

This study is a first exploration of a hitherto unstudied topic and provides a unique insight into the causes of death of a marginalised group of people in Australia. Classified according to ICD-10, the major groups of mortality were infectious diseases such as tuberculosis, dysentery and typhoid with 33.9% of all fatalities, followed by violent deaths (suicides, murders and formal execution by the state, 11.8%) and respiratory diseases (9.1%). Not surprisingly, injuries (7.5%) and accidents (7.0%) also figure prominently.

The paper concludes with some observations on the provision of health care to that marginalised segment of Australia's colonial community.

Key words: Public Health; Communicable diseases; Suicides; Indian diaspora; Immigrant Communities; Social marginalisation

Introduction

Then as today, immigrant communities tend to be socially and culturally marginalised by the host community and consequently often do not have access to the same level of health care. There is a growing body of literature that looks at the socio-economic and cultural determinants of both the host and the immigrant communities ®.

A large number of Indians, primarily Punjabi, left the Indian subcontinent during the end of the nineteenth century and settled in other

British colonies, such as Australia, Canada, and New Zealand (McLeod 1989, 2001). Others, mainly from Bengal, migrated as indentured labour to places such as Natal and Fiji (Brennan, McDonald, and Shlomowitz 1998). Today, some of these form sizeable populations, embedded in the host communities, and sharing with them some, but not all public health issues.

While there are a number of studies that focus on public health aspects of Indian communities in the diaspora (Kolt et al. 2007; Jonnalagadda and Diwan 2002b, 2005; Grulich, Mccredie, and M. 1995; e.g. Diwan and Jonnalagadda 2002; Ramaiya et al. 1991; Jonnalagadda and Diwan 2002a; Patel et al. 2017), few studies have looked at the nature and rates of mortality (Swerdlow et al. 1995; Balarajan et al. 1984). All studies are focussed on the present, however, and none examine historic conditions and trajectories.

The history of public health in India has not concerned itself with the health of the Indians in the diaspora (e.g. Harrison 1994), while the literature on the public health of colonial Australia, Canada or New Zealand (e.g. de Looper 2015; Roberts 2014a, 2014b) has not addressed the health of the Punjabi immigrants. An exception is a discussion of suicides and mental health (Spennemann 2019a, 2020a), which followed an assessment of the deaths and subsequent cremations of Punjabi hawkers in the Southern Riverina and north-eastern Victoria of Australia (Spennemann 2017c). Such preliminary work identified the need for a broader enquiry into the causes of deaths of the Punjabi in south-eastern Australia to 1900.

This paper will compile all death records of Punjabi men in the Australian colonies until the end of 1901 when for all practical purposes the Punjabi immigration to the newly formed Australian state was effectively ceased due to the passage of the *Immigration Restriction Act* (Spennemann 2020c).

The Punjabi in Australia

During the late 1880s to mid 1890s a considerable number of Punjabi males emigrated to Australia. This is not the place to review the various drivers for the men to leave their home communities, suffice to say that they did so to avail themselves to the economic opportunities presented by the expanding colonial economy in order to acquire a modicum of

wealth and to further their family's status and prestige (*izzat)* at home (McLeod 1989, 2001).

Aged in their twenties to late thirties (Spennemann 2017a, 2020c), many of these Punjabi men found employment as unskilled rural labour (mainly in northern New South Wales and southern Queensland) or took to hawking. The latter occupation was particularly appealing as it required comparatively little capital, yet allowed for good returns, if the individual made an concerted effort (Gonzalez, Spennemann, and Allan 2017; Spennemann 2018). In rural areas of Australia, hawkers operated from rural service centres and, following loosely defined circuits, serviced the outlying farms by selling drapery, haberdashery, clothing, specialty goods and the like (see Spennemann 2018, and references therein).

Following the Federation of the British colonies in Australia on 1 January 1901, the new country passed the *Immigration Restriction Act* in 1901, which effectively closed the door on the unfettered immigration of British subjects from India. All subsequent passenger arrivals were those very few individuals who were allowed to immigrate, as well as those who had been resident in one of the Australian colonies prior to 1900 and had been granted departure and re-entry permits. One of the effects of this Act, which was given Royal assent on 23 December 1901, was an immediate and dramatic drop in arrivals of Punjabi men (Spennemann 2020c).[1]

Methodology

Death records

The data compiled in this study encompass all death records of Punjabi men in the Australian colonies until and including 1901. Given the passage of the *Immigration Restriction Act* of 1901 and the associated termination of large-scale Punjabi immigration, this year was a

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[1] . This paper forms part of a wider examination of the various manifestations of the presence of Punjabi hawkers in Australia, with special emphasis on the southern part of the Murray-Darling Basin in south–eastern Australia (Spennemann 2018, 2017c, 2017a, 2019b, 2017b, 2020a, 2019a, 2020b; Spennemann and Duffy 2021a, 2021b).

convenient, and logical time cut off. Therefore, 1901 was taken as a conceptually appropriate, albeit somewhat unconventional *end* point for the decades *(i.e.* 1882–1891, 1892–1901 etc.) (e.g. Table 1).

The deaths analysed in this paper were identified by systematic searches of the births, deaths and marriages databases of New South Wales (NSW Justice 2017); Queensland (Queensland Government 2015); South Australia (Genealogy SA 2017); Tasmania (Tasmanian Government 2017); Victoria (Victoria Justice and Regulation 2017); and Western Australia (Department of Justice 2017), as well as New Zealand (Department of Internal Affairs 2017). The search terms used were the most common surnames of the Punjabi men, augmented by searches for some common given names.

Demographic information as well as details on causes of death were extracted from the actual death certificates themselves with the exception of Queensland, for which a file with causes of death (but no ages or professions) was supplied by the agency. These were augmented with inquest data, which, where available, were derived from the database of the Inquest Deposition Files of the Victorian Coroner's Office (Public Records Office Victoria 1853–1939), as well as NSW records as well as the NSW Registers of Coroner's Inquests (NSW Attorney General & Justice 1821-1937).

Newspaper searches

In order to expand on the death records, contemporary newspapers were systematically searched for reports of the death events. This drew on the online newspaper databases 'Trove' (National Library of Australia 2017) and 'Papers Past' (National Library of New Zealand 2017). The searchable data, however, are only as good as the quality of the input. This has two limitations. On the one hand, the relevant newspapers, and the years in question, have to be digitised and thus accessible for searching. Not all surviving newspapers have been digitised, with gaps in particular among small, and low circulation local and subregional papers. Secondly, the scan has to be of such a quality that the automated optical character recognition software can adequately perform the task. On occasion, the print quality of the original newspaper paper is weak, thus providing insufficient contrast, or the type used at the time was dirty. A common issue of the pre-Linotype era, for example, is that the counters of the letters

were often filled in with paper residue and ink grime. Consequently, the optical character recognition does either not work at all, thereby returning gibberish, or it returns erroneous, misinterpreted results (e.g. returning 'cl' for 'd' or 'd' for 'ri'). While much of this can be, and has been, manually corrected by the community of Trove users (Holley 2009), such rectification tends to hold true only for metropolitan papers (for which there is a higher demand).

The search terms used were the most common surnames of the Punjabi men: 'Baksh/Buksh/Box/Bux', 'Deen' 'Noor,' 'Khan,' 'Mull,' 'Gill/Ghill,' and ''Singh/Sing,' the same family names which had also been used for an assessment of age heaping (Spennemann 2017a). For this study, the search frame was extended to the family names 'Hassan' and 'Said'. Where the database interface allowed the author the opportunity to input a given name only, common given names were also searched. Further, given names such as Adul, Ali, Mohammed and Hassan, as well as their phonetic variations (e.g. 'Abdool,' 'Alee,' 'Mahomet'), were systematically checked (see Nicoll, Bassett, and Uluaszek 1986 for methodological limitations).

Data Cleaning and coding

A certain amount of data cleaning was required. For example, family name searches for 'Sing' (as a spelling variation of 'Singh') also returned large numbers of Chinese immigrants (e.g. 'Ah Sing'), while given names also returned European names starting with 'Mah*' and 'Moh*.' All of these were manually assessed and removed. Furthermore, as some data bases had been developed from a microfiche version, some online searches typically returned two entries for the same person, e.g. 'Bux, Mohamed' and 'Mohamed, Bux.' In the case of three-component names such as 'Mohamed Ben Ali', the searches returned three versions (*i.e.* 'Mohamed, Ben Ali,' 'Ben, Ali Mohamed' and Ali, Mohamed Ben'). All these duplicates had to be manually removed.

On occasion names are rendered in egregious Australian phonetics. For example, Faisal Deen was known as 'Big Fuzzle Deen' and is so reported in the newspapers.

As the searches for the given names had the potential of returning people of Syrian and Arabic descent, or people with Arabic given names, all entries were carefully checked. Excluded persons, for example, were

Mahomet Gamey Mahomet Tabis (WA 29/1901 born Kelang, Malaysia) and Mohamed Hosnain Bin Hussan (WA 80/1901 born Java, Indonesia).

The religious affiliation was coded based on the family names, with 'Deen,' 'Mull,' 'Gill/Ghill,' and 'Singh' attributed to Hindu and Sikh, while 'Baksh/Buksh/Box/Bux', 'Noor,' 'Deen' and 'Khan,' as well as the given names 'Adul,' 'Abdool', and 'Mahomet/Mohammed' were attributed to Muslim.

Ages

An inherent problem in the discussion of ages is the accuracy of age reporting. A precursor study that examined a much smaller data set of cremations and burials of hawkers in the Riverina area of southern NSW and north-eastern Victoria (Spennemann 2017c) noted that the reported ages at death were not evenly distributed between the terminal digits (there is no biological reason that people should die more frequently aged 30 than aged 29 or 31). Such age heaping can be observed in this data set as well (Table 9).

In the literature, age heaping has long been associated with a lack of numeracy and literacy skills (Baines 1908), which is then used as a proxy measure for human capital (A'Hearn, Baten, and Crayen 2009; Manzel, Baten, and Stolz 2012; Baten, Crayen, and Manzel 2008). A'Hearn, Delfino, and Nuvolari (2016) have shown that the linkage between age heaping and literacy is quite weak and that administrative actors play a major role. Indeed, an examination of the pronounced age heaping bias observed in the immigrants' source populations back home in the Punjab found no correlation between literacy and age heaping, but that the age heaping was exacerbated by the census collection practices that were prescribed by the authorities (Spennemann 2017a). Yet the fact remains that age heaping was also observed among Punjabi immigrants to the Australian colony of Victoria (both arriving and departing passengers) (Spennemann 2020c). It can be posited that an administrative rounding bias may be at work in the case of the deaths reported here, driven by a lack of specific community-provided age information and administrative expediency. For the Victorian sample, further work into the actual process of processing the arrivals is required.

Statistics

The statistical significance assessment of observed differences in the data used, as appropriate, student's T-test (MS Excel) or the Chi-squared test with n-1 correction of the MEDCALC comparison of proportions calculator (MedCalc Software 2018; Campbell 2007; Richardson 2011).

The Data

In total, 239 deaths have been identified (see the Supplementary data document, Tables S1–S3). Fifty-two of these can be attributed to Indian staff working on ships in the boiler rooms or as servants and stewards and who either died while their vessel was in port or died at sea with their deaths reported and registered upon arrival in the Australian port cities (Table S2). In addition, 24 death records, primarily in South Australia and Western Australia, belong to Afghan cameleers (Table S3). The latter two data sets are separated out where appropriate.

Not surprisingly, as the number of immigrants increased over time, especially during the 1890s (Spennemann 2020c), so did the number of deaths (Figure 1). The chronological pattern shows that for the period pre–1880 the majority of deaths were those of ship's crew, while thereafter it was primarily the general population of labourers and hawkers.

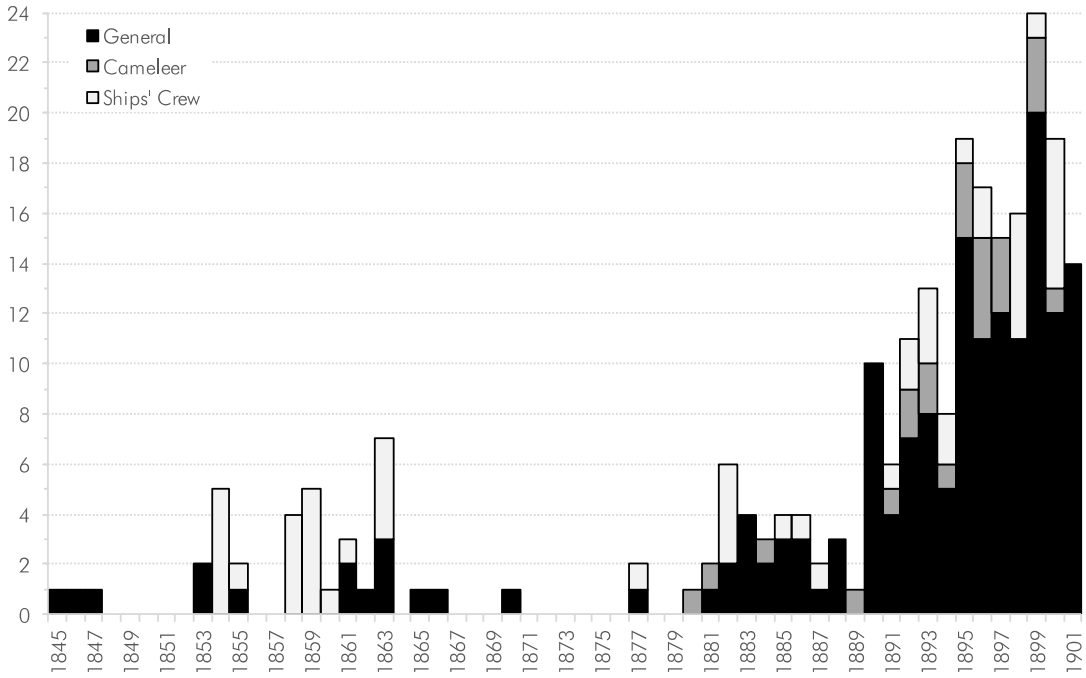

Figure 1. Annual frequency of deaths included in this study.

For standardisation, the causes of death as gleaned from the newspapers, coronial inquests and death certificates were classified based on the internationally recognised standard ICD-10 (2016). It should be acknowledged that original attributions of the causes of death in the death certificates contain a number of inaccuracies, caused by both the limitations of medical knowledge and causalities at the time, and the changing terminology (de Looper 2015, 113ff, 128ff; Roberts 2014b).

The level of detail in the descriptions of the causes of death ranges from generic comments such as 'suicide' or 'drowned' to complex descriptions, such as 'orchitic abscess purulent, cystitis strictera urethrae & exhaustion' (Table S1 nº 107). The level of detail in the descriptions has been analysed over time (Table 1) as well by colony (Table 2). Even though it could be expected that the level of detail of reporting would have

increased over time, this only holds true for the last decade, when a quarter of the descriptions of the causes of death contain more than one cause. Yet at the same time, the percentage of generic descriptions also increased. On a colony-by-colony basis, no clear pattern emerges (Table 2).

Despite the potential problems of the causality of death recorded in the historic death certificates as identified by de Looper (2015), the bulk of the causes of death are either straightforward (e.g. [respiratory] tuberculosis, dysentery) or have been sufficiently broadly described (e.g. liver disease) that an attribution to one of the IDC-10 classes was readily possible. The various causes of deaths, as per IDC-10 classification have been summarised in Table S4.

Table 1. Level of detail in the descriptions of the causes of death. Breakdown by decade.

	1852–61	1862–71	1872–81	1882–91	1892-1901	Total
simple	1.2	1.4		11.5	14.8	13.9
1 cause stated	82.6	72.7	100.0	69.8	56.1	62.9
2 causes stated	4.3	9.1		11.6	26.5	20.3
3 causes stated					1.9	1.3
no cause stated	2.4	1.4			0.6	1.7
n	23	11	5	43	155	237

Table 2. Level of detail in the descriptions of the causes of death. Breakdown by colony.

	NSW	Qld	SA	Vic	WA	Australia
generic cause stated	14.5	14.3	28.6	12.9		13.9
1 cause stated	55.4	66.7	66.7	63.4	84.2	62.9
2 causes stated	26.5	19.0	0.0	21.5	10.5	20.3
3 causes stated			3.5	2.2		1.3
no cause stated	3.6				1.2	1.7
n	83	21	21	93	19	237

The influence of wrongful attributions is considered to be negligible as the majority of the following analysis will occur at a higher level of abstraction, utilising the major IDC-10 class groups, rather than a lower, more fine-grained and more specific level of classification.

Discussion

The three sample populations (general, cameleer and ships' crew) show differences in the major groups of causes of death (Figure 2). The cameleer population, for example, exhibited a very low percentage of tuberculosis and other respiratory diseases, whereas these are the highest among the general group (i.*e*. hawkers and rural workers). Ships' crew in particular, died from water-borne diseases such as dysentery and typhoid, as well of from trauma and drowning (which were the leading causes of death among cameleers). Among the violent deaths, the general group was more likely to commit suicide, while the cameleers were more likely to be victims of homicide.

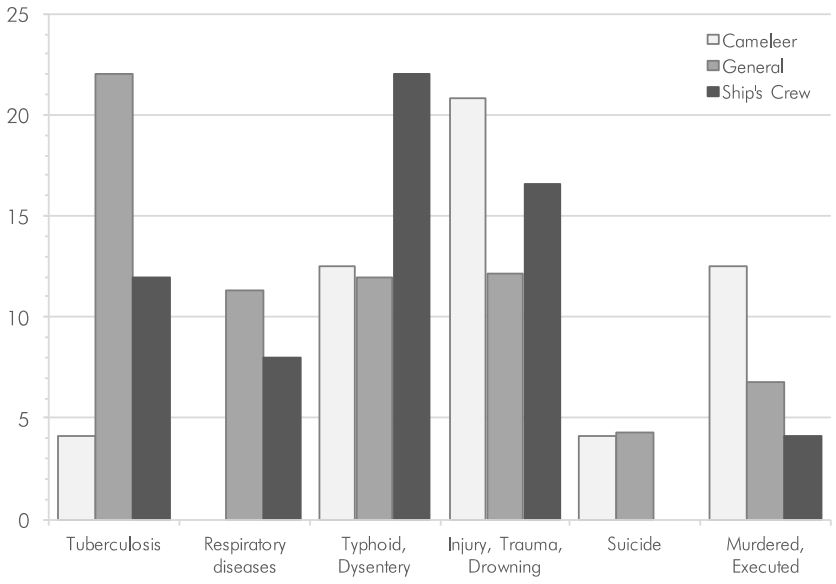

Figure 2. Proportions of major groups of causes of death by sample population

The men of the three sample populations were, on average, all in their thirties, with the ships' crews being statistically significantly younger than the cameleers. The general population of labourers and hawkers were on average the oldest (Table 3).

Table 3. Averages and statistical differences between the ages of the three sample populations

	Average Age	n		T-Test		
Cameleer	33.7±17.7	19		Cameleer	General	Ships' Crew
General	35.5±15.4	140	Cameleer	—	0.8723	*0.0324*
Ships' Crew	30.4±10.8	48	General		—	*0.0028*
Total	34.1±14.8	207	Ships' Crew			—

The remainder of this paper will focus on the true immigrants, excluding the ships' crews as incidental 'immigrants.' There is no significant age difference between the cameleers and the general population (Table 3), nor is there a significant difference between the members of the Hindu/Sikh and Muslim faiths among the Punjabi (and Afghani) (p= 0.3870, ships' crew excluded).

The Punjabi immigrant population as a whole was not evenly distributed across the five Australian colonies. Rather, the bulk resided and worked in New South Wales and Victoria, followed by Queensland, South Australia, and Western Australia. Not surprisingly, the relative frequency of deaths follows that trend. No deaths were recorded for Tasmania. Table 4 breaks down and sets out the major causes of mortality in % by the colonies. In percentage terms, Victoria stands out as different, while NSW is quite similar to the remainder of Australia.

Two groups of causes of death make up almost half the total of fatalities. The major group of mortality were infectious diseases such as respiratory tuberculosis, dysentery and typhoid (A00-B99) with 47% of all fatalities in Victoria, 40% in South Australia and 19–28% of all fatalities in NSW and the other two colonies. Other respiratory diseases were the next most common cause of death (J00–J99), followed by violent deaths (suicides, murders and formal execution by the state, X60-Y36). Not surprisingly, injuries (S00–T98) and accidents (V01-X59) also figure prominently (Table 4).

Table 4. Major causes of mortality in % by colony/state (ships' crew excluded).

IDC-10	Major causes of mortality	NSW	Vic	Qld	SA	WA	Total
A00–B99	Certain infectious and parasitic diseases	28.3	47.6	19.0	40.5	23.5	33.9
C00–D48	Neoplasms	3.8	4.8		1.4		2.2
D50–D89	Diseases of the blood and blood-forming organs and disorders involving the immune mechanism					5.9	0.5
E00–E90	Endocrine, nutritional and metabolic diseases	3.8		19.0	2.7	17.6	5.9
G00–G99	Diseases of the nervous system				1.4	5.9	1.1
I00–I99	Diseases of the circulatory system	7.5	2.1		6.8	4.3	5.9
J00–J99	Diseases of the respiratory system	3.8	2.1	4.8	16.2	4.3	9.1
K00–K93	Diseases of the digestive system	5.7	4.2	9.5			3.8
M00–M99	Diseases of the musculoskeletal system and connective tissue					4.3	0.5
N00–N99	Diseases of the genitourinary system	5.7			5.4		3.8
R00–R99	Symptoms, signs and abnormal clinical and laboratory findings	9.4	6.3	4.8	4.1	4.3	7.0
S00–T98	Injury, poisoning and other consequences of external causes	9.4		14.3	8.1		7.5
V01-X59	Accidents	11.3	2.1	9.5	4.1	4.3	7.0
X60-X84	Intentional self-harm	3.8	4.2	9.5	2.7		4.3
X85-Y09	Assault	5.7		9.5	5.4	8.5	5.9
Y35-Y36	Legal intervention and operations of war	1.9			1.4	4.3	1.6
n		53	21	21	74	17	186

For the purposes of further analysis, all events were aggregated into decadal cohorts using 1901 as the terminal point (Table 5). The observed dramatic increase in Punjabi immigration after 1880 (Spennemann 2020c) and the resulting higher number of deaths is well reflected (Figure 1).

Table 5. Major causes of mortality by decadal intervals (ships' crew excluded). Raw numbers

ICD-10	Major causes of mortality	1841–52	1852–61	1862–71	1872–81	1882–91	1892-01	all years
A00–B99	Certain infectious and parasitic diseases		2	1	2	7	51	63
C00–D48	Neoplasms			1	1	1	1	4
D50–D89	Diseases of the blood and blood-forming organs, etc						1	1
E00–E90	Endocrine, nutritional and metabolic diseases		1			2	9	11
G00–G99	Diseases of the nervous system						2	2
I00–I99	Diseases of the circulatory system					2	9	11
J00–J99	Diseases of the respiratory system			1		7	11	17
K00–K93	Diseases of the digestive system					3	4	7
M00–M99	Diseases of the musculoskeletal system & connective tissue						1	1
N00–N99	Diseases of the genitourinary system			1		1	5	7
R00–R99	Symptoms, signs and abnormal clin. & labtry findings	1	1	1	1	2	4	12
S00–T98	Injury, poisoning & other consequences of external causes			1		3	10	14
V01-X59	Accidents		1			1	11	13
X60-X84	Intentional self-harm					2	6	8
X85-Y09	Assault	1				3	7	10
Y35-Y36	Legal intervention and operations of war			1		1	1	3
Total		2	5	7	4	35	133	184

Table 6. Major causes of mortality by 5-year intervals 1882–1901 (in % per demi-decade; ships' crew excluded).

ICD-10	Major causes of mortality	1882-86	1887-91	1892-96	1897-01	Total
A00–B99	Certain infectious and parasitic diseases	13.33	25.00	25.86	47.37	33.51
C00–D48	Neoplasms	6.67		1.72		2.13
D50–D89	Diseases of the blood and blood-forming organs, etc				1.32	0.53
E00–E90	Endocrine, nutritional and metabolic diseases	13.33		6.90	6.58	6.38
G00–G99	Diseases of the nervous system			1.72	1.32	1.06
I00–I99	Diseases of the circulatory system		10.00	12.07	2.63	5.85
J00–J99	Diseases of the respiratory system	26.67	15.00	13.79	3.95	10.11
K00–K93	Diseases of the digestive system	13.33	5.00	5.17	1.32	3.72
M00–M99	Diseases of the musculoskeletal system & connective tissue			1.72		0.53
N00–N99	Diseases of the genitourinary system		5.00	3.45	3.95	3.72
R00–R99	Symptoms, signs and abnormal clinical and laboratory findings	6.67	5.00	1.72	3.95	5.32
S00–T98	Injury, poisoning and other consequences of external causes	6.67	10.00	8.62	6.58	7.45
V01-X59	Accidents	6.67		3.45	11.84	6.91
X60-X84	Intentional self-harm		10.00	5.17	3.95	4.26
X85-Y09	Assault	6.67	10.00	8.62	2.63	5.85
Y35-Y36	Legal intervention and operations of war		5.00		1.32	1.60
Total		15	20	58	76	188

As the majority of Punjabi immigration to the Australian colonies occurred during the last two decades of the nineteenth century (Spennemann 2020c), these were broken into demi-decades to achieve a more fine-grained analysis, while at the same time avoiding the influence of the annual fluctuations (Table 6). While these do not display coherent trends, some relationships are worth noting. Infectious and parasitic diseases increase continually throughout the period, with a significant increase to 47.37% of all deaths being in the last demi-decade (1892-96 vs. 1897-01, p=0.0114). In the same interval diseases of the circulatory system declined significantly (p=0.0329), as did diseases of the respiratory system (p=0.0425). Figure 3 shows the relative development of tuberculosis and respiratory diseases between 1882 and 1901, indicating that the two seem to be mutually exclusive (χ^2=50.670, df=3, p>0. 0001). As the instances of

tuberculosis rise, those of other respiratory diseases fall. The explanation for this is not straight forward. It is possible that in the early period some cases of pulmonary tuberculosis were misinterpreted as patients presenting with pneumonia or pleuro-pneumonia. These observations of a rising incidence of tuberculosis, however, runs counter to other studies which noted a decline in tuberculosis (de Looper 2015, 161f), certainly from 1880s onwards (Roberts 2014a). At least some this decline was explained as a classificatory artefact where many deaths would have previously been classified as caused by tuberculosis were transferred to other respiratory causes (e.g. Szreter 1988).

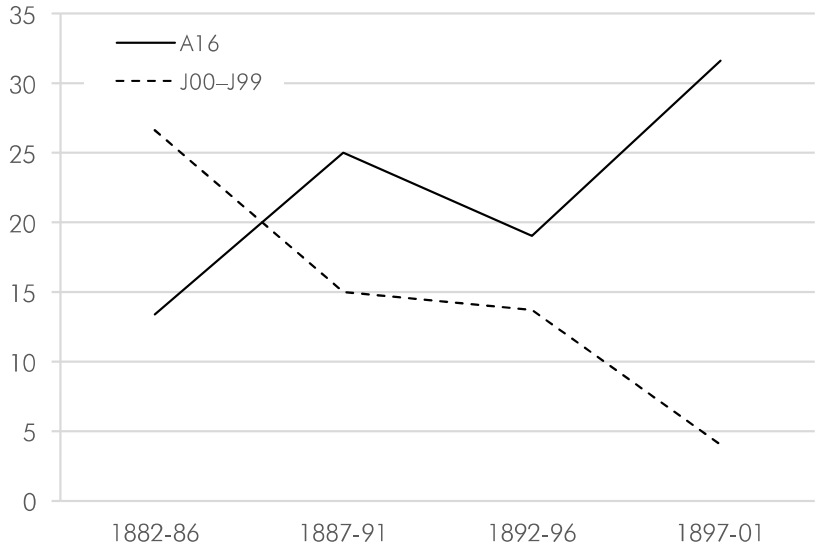

Figure 3. Relationship between tuberculosis (A16) and diseases of the respiratory system (J00–J99) by 5-year intervals 1882–1901 (ships' crew excluded).

Figure 4. Relationship between suicides (X60-X84) and homicides (incl. executions, X85–Y36) by 5-year intervals 1882–1901 (ships' crew excluded).

When considering violent deaths, both suicides and homicides (incl. state sanctioned homicide), we note a similarity in trends (Figure 4). While the difference between the two is statistically insignificant (χ^2=4.539, df=3, *p=0.2089*), the similarity is not statistically significant either (as a *p=0.995* would have been expected). The causalities for the two manifestations of violent deaths differ, with suicides beginning to level out during the last demi-decade (Spennemann 2019a), suggesting that the mental health situation of the Punjabi hawkers and farm workers did not improve to the same extent as their physical safety. The motives for the homicides primarily tend to be pecuniary gain, outright robbery and, as well as disagreements over business transactions. The motives for most suicides, however, could not be elucidated (Spennemann 2019a), while some seem to have cultural underpinnings (Spennemann 2020a).

Ages at death

The average age at death with respect to the various causes of death has been summarised in Table 7. Given the small population size, however, only those IDC-10 categories with 10 examples or more have been included here. People who died of diseases of the circulatory system (I00–

I99) were statistically significantly older than those who died of all other categories bar diseases of the respiratory system (J00–J99). None of the other differences were statistically significant) (for statistical data see Table 8).

Table 7. Average ages at death by major causes of death (ships' crew excluded)

ICD-10	Causes	Average	n
A00–B99	Infectious and parasitic diseases	35.1±9.4	59
I00–I99	Diseases of the circulatory system	46.1±15.0	11
J00–J99	Diseases of the respiratory system	37.5±16.0	17
S00–T98	Injury, poisoning etc.	28.0±10.7	10
V01-X59	Accidents	33.7±13.4	11
All causes		35.3±15.6	159

Table 8. Statistical comparison (t-test) of ages at death by selected major causes of death (ships' crew excluded)

	A00–B99	I00–I99	J00–J99	S00–T98	V01-X59
A00–B99	—	***0.0018***	0.4054	0.2179	0.6475
I00–I99		—	0.1667	***0.0108***	***0.0352***
J00–J99			—	0.2446	0.4638
S00–T98				—	0.5636
V01-X59					—

An inherent problem in the discussion of ages is the accuracy of age reporting. A precursor study that examined a much smaller data set of cremations and burials of hawkers in the Riverina area of southern NSW

and north-eastern Victoria (Spennemann 2017c) noted that the reported ages at death were not evenly distributed between the terminal digits (there is no biological reason that people should die more frequently aged 30 than aged 29 or 31). Such age heaping can also be observed in this data set (see supplementary file).

Seasonality

Overall, on a month-by-month basis, there is no clear evidence of seasonality among all the deaths (Figure 5). The monthly pattern of morbidity due to tuberculosis shows a gradual, but statistically not significant increase during the (southern) spring and summer (Figure 6). The pattern does not change if we restrict the data to south-eastern Australia (NSW and Victoria), suggesting that climatological and seasonal factors are of no consequence. As can be expected, the monthly mortality due to respiratory diseases is higher in the winter months, but not statistically so. Given the small sample size, deaths were recoded into formal seasons, using the monthly climatic classification (Bureau of Meteorology 2019) rather than the astronomical definitions (Table 9). The differences are statistically insignificant with the exception of instances of mortality die to respiratory diseases, which are less likely in summer than in autumn (χ^2=4.765, p=0.0290) and accidents which are more likely to occur in spring than in autumn (χ^2=4.623, p=0.0315).

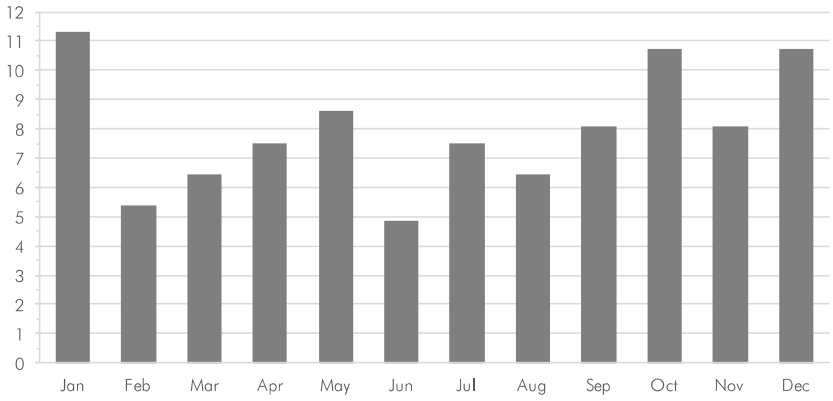

Figure 5. Monthly frequency of mortality (in %) (ships' crew excluded).

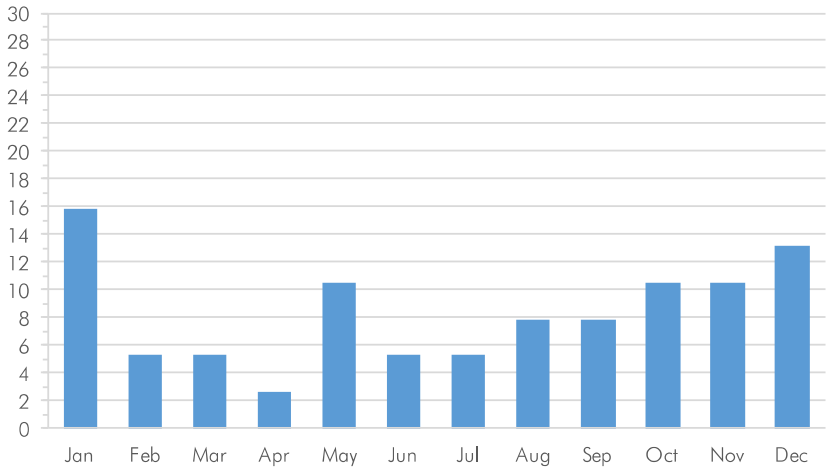

Figure 6. Monthly frequency of mortality (in %). Tuberculosis only (n=38) (ships' crew excluded).

In this, the pattern of deaths of Punjabi hawkers and farm workers does not follow the general Australian pattern which saw summer peaks in mortality, primarily caused by the increased incidence of diarrhoea, dysentery and other enteric diseases (de Looper 2015, 108).

Table 9. Major causes of death by seasons (ships' crew excluded)

	Spring	Summer	Autumn	Winter	n
Tuberculosis	28.9	34.2	18.4	18.4	38
Respiratory	26.3	10.5	42.1	21.1	19
Suicide	37.5	25.0	12.5	25.0	8
Accidents	38.1	33.3	9.5	19.0	21
Total	30	28	24	17	99

Professions

A breakdown of the causes of death by profession (Table 10) shows no universal trends. Looking at the three better represented professions of hawker, camel driver, and farm worker, differences could be expected because of the specifics of their professional activities and associated

exposure to hazards as well as their differing travel and residence patterns. Some of these seem to be represented as trends in the data. For example, twice as many cameleers or farm workers die from accidents or injuries than hawkers (Table 10). Twice as many hawkers, who for much of the year lived on the open road sleeping in their wagons, were likely to die from respiratory diseases than the other professions. Likewise, hawkers or cameleers were twice as likely to die from assault than farm workers, which can possibly be explained by their solitary and work practices. Yet, there are only three statically significant differences: camel drivers are more likely to die of infectious and parasitic diseases than hawkers (χ^2=8.618, p=0.0033) or farmworkers (χ^2=6.174, p=0. 0130), and also more likely to die of endocrine, nutritional and metabolic diseases than hawkers (χ^2=8.131, p=0. 0044). The latter may be a reflection of their itinerant lifestyle in outback and remote Australia.

Table 10. Major causes of death by selected professions (ships' crew excluded)

IDC-10	Major causes of mortality	hawker	camel driver	farm worker	miner	cook	store keeper
A00–B99	Certain infectious and parasitic diseases	25	3	10	1		
C00–D48	Neoplasms	1				1	
D50–D89	Diseases of the blood and blood-forming organs and disorders involving the immune mechanism		1				
E00–E90	Endocrine, nutritional and metabolic diseases	1	5	2			
G00–G99	Diseases of the nervous system	1					
I00–I99	Diseases of the circulatory system	2		2	2	3	
J00–J99	Diseases of the respiratory system	5		1	1	2	1
K00–K93	Diseases of the digestive system	3	1				
M00–M99	Diseases of the musculoskeletal system and connective tissue		1				
N00–N99	Diseases of the genitourinary system	1		1			2
R00–R99	Symptoms, signs and abnormal clinical and laboratory findings		2		1		1
S00–T98	Injury, poisoning and other consequences of external causes	3	3	1			
V01-X59	Accidents	3	3	3			
X60-X84	Intentional self-harm	2	1				1
X85-Y09	Assault	4	2	1			
Y35-Y36	Legal intervention and operations of war		1				
n		51	23	21	5	6	5

Indian medicine

While considerable work has been carried out on the general nature of health care in regional and rural settler communities of colonial Australia and New Zealand®, and while some work has been conducted on the real and perceived health of Chinese immigrants (Manderson 1994) ®,the provision of healthcare to the Punjabi men remains a major unexplored area. Clearly, the causes of mortality investigated in this paper are only indicative of the range and frequency of diseases and infections afflicting the Punjabi population. In the majority, these would have been treated or managed.

Given that a number of Punjabi men accessed local hospitals, but often only the final stages of illness and as a consequence of accidents (Spennemann 2017c), indicates that they could avail themselves to the same health system as the rest of the colonial population. However, there is evidence that much of the health care of the colonial settler communities, at least in the first instance, relied heavily on domestic self-help (Bishop 2014; Coleborne and Godtschalk 2013; Pearn 2012; Raftery 1999).

While some work has been conducted on the Indian-Australian nexus of plant introductions (Beattie 2012) the emphasis was placed on the Australian contribution to India. At present, little research has been carried out that examines the role of Indian herbal medicine and that of Indian herbalists in treating their fellow countrymen. Judging from other colonial locales, such as Natal (Flint 2006; Wright 2006), the Anglo-Celtic colonial settler community was derogatory of their skills. Yet we can surmise that Indian herbal medicinal compounds would have been sold in Australia at least to the Indian community and most likely also to the wider rural community. It can be further surmised that much of the health care of hawkers would have relied on a combination of self-help and support by Indian health practitioners and herbal medicine sellers.

Future Directions

As a first exploration of a hitherto unstudied topic, this paper provides an insight into the causes of death of Punjabi hawkers and farm workers of a marginalised group of people in colonial Australia. The major group of mortality were infectious diseases such as tuberculosis, dysentery and typhoid, followed by violent deaths and respiratory diseases. Some

changes over time could be identified, such as the increase of deaths from tuberculosis, as well as some differences in the professions.

Given the differences in travel and residence patterns it would be fruitful to examine the general health status of Punjabi farm workers and compare them with Punjabi hawkers, who for much of the year lived on the open road sleeping in their wagons. We know that both groups accessed local hospitals, but often only the final stages of illness and as a consequence of accidents. While farm workers would have been serviced by medical professionals associated with their employers (compare the situation in Natal: Brain and Brain 1982), it can be surmised that much of the health care of hawkers, would have relied on a combination of self-help and support by Indian health practitioners and herbal medicine sellers. No work has been carried out as to what extent they serviced the Punjabi as well as the wider community in rural colonial Australia. A systematic survey of the few surviving admission registers of regional hospitals promises a fruitful line of investigation.

Finally, given the significant contribution travelling hawkers made to the economic functioning of rural communities (Spennemann 2018), another valuable line of future inquiry would be to explore the nature of Indian herbal medicinal compounds sold in Australia and their role in health provision of the rural and remote areas of Australia.

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Ethical clearance

As the study is a review of death certificates of persons deceased over 100 years ago, a clearance from the Ethics in Human Research Committee is not required.

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Conflict of interest

There is no conflict of interest to report.

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