Evidence for Aboriginal and Torres Strait Islander architectural preferences in healthcare settings

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Abstract

Objective:
To examine Indigenous perceptions of healthcare settings and the effectiveness of a survey design in collecting data from inner regional and remote Indigenous populations.

Methods:
An area-based survey with a culturally-appropriate recruitment strategy was designed to collect data from Indigenous Australians in three Queensland locations. The survey included an online CAPI capability with customised images of four different health care settings to elicit data on preferences. Statistical analyses compared architectural preferences by location, gender and age.

Results:
Selected findings from 602 participants revealed preference for treatment at an Aboriginal or Islander medical clinic across all age groups; preference for hospital attendance by the (18-24) age group in Mt Isa, compared to other age groups; and, preference for a two-bed inpatient room, (Mt Isa 66%, Townsville 49%).

Conclusions:
The multidisciplinary approach to developing an online survey with images was effective in providing robust evidence for the design of culturally appropriate healthcare spaces for Indigenous users.

Implications for Public Health:
Health policy frameworks should acknowledge the significance of healthcare settings as an integral component of culturally safe service delivery, particularly for regional and remote Indigenous people.

Keywords:
Aboriginal and Torres Strait Islander health, healthcare architecture, survey design, cultural safety.
1.0 Introduction

The Aboriginal and Torres Strait Islander Health Performance Framework\(^1\) identifies the need for an appropriate, effective and responsive healthcare system that provides a continuous and accessible service to Aboriginal and Torres Strait Islander people. The Framework identifies cultural competency in healthcare service delivery, yet it ignores the physical setting in which the services are provided. Anecdotal evidence suggests that the architecture of hospitals and clinics may affect Indigenous people’s decisions about using health services, meeting appointment times, and experiences during treatment. In response to the deficit in cross-cultural research, this paper describes the design and implementation of a quantitative survey of 602 Aboriginal and Torres Strait Islander participants in three Queensland locations: Townsville, Mt Isa and Dajarra. Completed in 2017, the data collection techniques and the results from statistical analyses demonstrate the effectiveness of the survey and its limitations, as well as the potential of this type of research to inform the design of culturally appropriate spaces for the Indigenous users of healthcare buildings.

The survey is one component of a four-year interdisciplinary study that employs both quantitative and qualitative research methods to elicit data from Aboriginal and Torres Strait Islander people on their perceptions and experiences of healthcare buildings. This research project is based on the premise that cultural background can affect perceptions and experience of hospitals and clinics. Although recent healthcare buildings show signs of acknowledging Indigenous users,\(^2\) the generalised principles in the Australian Health Facility Guidelines\(^3\) give limited specific information about how cultural requirements might translate into architectural design.

The broader aim of the research is to provide evidence of preferred culturally appropriate settings for organisations that commission healthcare facilities and for the architectural profession providing these design services. This evidence will be based on the analysis and synthesis of data using the following four approaches:

1. Quantitative survey of Aboriginal and Torres Strait Islander people;
2. Selected qualitative interviews of Aboriginal and Torres Strait Islander people;
3. Qualitative interviews with hospital and health service workers;
4. Interviews with architects with experience in Australian healthcare design.

This paper reports on the effectiveness and validity of the quantitative survey of Indigenous people. We describe the research design and present selected results from analysis of the survey data that demonstrate the capacity of the methodological approach to answer broader questions about Indigenous preferences for healthcare services and settings by location, age and gender. The primary
research questions addressed are:

(i) How effective was the survey instrument and sampling design in gathering data from regional and remote Aboriginal and Torres Strait Islander people considered as a hard-to-reach population in social science research?

(ii) How do preferences for healthcare services and settings differ by location, age and gender?

2.0 Background

2.1 Evidence-based design of culturally appropriate spaces

Although relatively recent, recognition of a need for culturally appropriate spaces in hospitals is consistent with the rationale behind the growing network of Indigenous-specific healthcare services and general efforts to improve cultural safety in healthcare delivery. The influence of culture on the use of domestic space and the adverse effects of inappropriate design on user health and welfare is well established in the Australian research literature on Indigenous housing. Relatedly, changes to courthouse and prison design, to reduce the stress of incarceration and risk of suicide, were recommendations of the 1991 Report by the Royal Commission into Aboriginal Deaths in Custody.

North American researchers have published a relatively large body of literature on the evidence-based design of healthcare buildings. Relevant studies have examined the significance of setting on patient satisfaction and rates of recovery, exploring the effects of views, art and physical variables such as noise and daylight. This type of research influences the design of healthcare buildings, yet the field currently provides negligible evidence on cross-cultural perceptions or experiences of conventional modern hospitals and clinics.

2.2 Survey methods for hard-to-reach populations

Traditional survey and sampling methods used for health research have often failed to reach and represent ethnic minorities or Indigenous Australians. Although population coverage from telephone-based sampling methods has recently improved with the introduction of dual sampling frames that utilise both landline and mobile telephone numbers, there is still considerable risk of excluding the hardest-to-reach sections of the population due to access, language and cultural barriers.

Sociological and health research with the Indigenous population of Australia require familiarity with the area, its colonial history as well as, effective communication and collaboration with the local
Indigenous community. Face-to-face surveys delivered by peer interviewers improve participation in surveys and disclosure of relevant information.\textsuperscript{22-24} Although resource intensive, this approach is critical for maximising coverage of the population.\textsuperscript{22,24} More successful sampling strategies have included time-space sampling, time-location sampling and respondent driven sampling.\textsuperscript{25}

Recent national surveys of Indigenous populations have utilised location-based sampling and face-to-face peer interviews with computer-assisted personal interviewer (CAPI) technology. These surveys include the comprehensive 2012 National Aboriginal and Torres Strait Islander Health survey (NATSIHS)\textsuperscript{26} on risk factors and selected health conditions, and the Longitudinal Study of Indigenous Children (LSIC): a survey of two cohorts of Indigenous children which has collected data every two years since 2008 from children residing in eleven geographical sites.\textsuperscript{27} The 2012 NATSIHS achieved enhanced coverage of the Indigenous population compared to previous surveys, with the use of two sampling frames: a community frame (persons residing in discrete Aboriginal and Torres Strait Islander communities in remote areas); and, a non-community frame (remainder of in-scope population). Two face-to-face interviewers for each household were accompanied by Indigenous facilitators.\textsuperscript{26}

3.0 Survey methods

The multidisciplinary research team relied on combined expertise to develop the survey instrument over a relatively long development phase during 2016-2017. The team included field anthropologists, a social statistician, a demographer, an on-line survey communication expert and architectural researchers. The anthropologists brought a range of options for recruiting and adapting Indigenous data-collection protocols in the three survey sites while others contributed their extensive social research knowledge to survey design and data collection technology.

Ethics approval for this research was granted by the University of Queensland Human Research Ethics Committee (Approval numbers 2016001618, 2017000329).

3.1 Survey Instrument

The survey instrument contained three components consisting of 1) questions in the form of items with an exhaustive list of options, 2) open-ended questions for more detailed comments, and 3) digital images displaying a health service setting for pairwise comparison and ranking. The open-ended questions were included to obtain more detailed explanations for the response selected. To reduce the incidence of incomplete responses, the number of survey questions was minimised to achieve an estimated completion time of 20 minutes.
The survey included questions on demographics, culture, wellbeing, healthcare behaviour and attitudes, health conditions, doctor consultations and hospital visits. Where possible, questions that had been validated with an Indigenous population were sourced from the existing LSIC and NATSIHS surveys. New questions were derived to measure experiences and attitudes related to healthcare settings. To elicit cultural information about the participants, three survey questions asked about knowledge of Indigenous cultural background, knowledge of non-Indigenous institutions, and one question asked about language/tribal group affiliation. These questions were adapted from questions that were asked in LSIC (Wave 3). To measure subjective wellbeing in a way that may be relevant to participants of all ages, we asked “How happy are you with your life in general?” with the three response options of very happy, okay and not happy. Questions on healthcare behaviour and attitudes align with those included in the 2012 NATSIHS. To distinguish use and attitudes towards types of healthcare settings, we asked participants “where would you most like to go when you are sick?”, “which of these have you ever used for your own health?” and “which of these have you used most?” with the response options of: Aboriginal or Islander medical service/clinic; a non-Indigenous medical clinic; hospital; traditional healer; home visit from a doctor; family or friend. Participants were also asked when they had last used the service they “used most”. The online CAPI tool enabled the questionnaire to be tailored to this response, prompting a series of questions about the healthcare service a participant had selected as using the most (as this service would appear in the related question throughout the survey). This included a rating of the service and different spaces (outdoor area, foyer/reception, type of seating, shade, nature-based areas, private space, space for family and friends) with response options: excellent, good enough, not good enough.

High Indigenous rates of potentially preventable hospitalisations informed a question about reasons for a failure to attend medical appointments, if identified in the last 12 months. Similarly, there was a direct question about discharge against medical advice and reasons for premature discharge from hospital. To indicate need for health services, participants were also asked to rate their own health (measured on a Likert scale with options excellent, very good, good, fair, poor), identify long term health problems (yes/no) and type of problem that could be selected from a list of health condition groups. Demographic information was requested on the region in which “you mostly lived these days”, “where do you come from?”, highest level of education completed, completion of a trade certificate, job status, marital status and living situation.

Finally, the survey used images to elicit preferences for varied architectural treatments of four settings: hospital façades; generic waiting rooms, an outdoor courtyard, and inpatient rooms. The proposed completion time limited the number of settings with an emphasis on public spaces and the patient room, excluding specialist treatment units. The images were constructed from Computer
Aided Design (CAD) drawings and the final sets of images were informed by qualitative interviews that used a repertory grid technique\(^9,30-32\) to elicit design-related constructs from an independently sampled pilot survey of 29 participants. Research questions about Indigenous patients’ and visitors’ use and experience of these settings, informed by anecdotal evidence, also contributed to the selection of settings and choice of treatments. For example, the relatively high use of outdoor areas by Indigenous people at the entrances of regional hospitals and clinics has been noted in reports (Memmott 1997).\(^33\) The survey instrument was delivered using CAPI technology with data stored electronically on a tablet device with an interviewer available for face-to-face support and assistance if required.

### 3.2 Sampling Design

At the time of survey development, 2.8% of the Australian population identified as Indigenous.\(^34\) In Queensland, 3.6% of the population was Indigenous of which: 30% lived in major cities, 20% lived in inner regional areas, 30% lived in outer regional areas and 20% resided in remote or very remote areas.\(^34\) As the population followed an approximate uniform distribution across location, an area-based design was used to sample the adult Indigenous population of three Queensland towns, classified as either a remote (Dajarra), outer regional (Mt Isa) or inner regional (Townsville) location. At the time of survey, the 2016 Census showed that 7% (13,040) of the Townsville population, 17% (3,151) of the Mt Isa population, and 62% (117) of the Dajarra population was Indigenous.\(^35\)

A power analysis was used to compute the minimum required sample size to achieve a reasonable level of accuracy in statistical estimates of use and preferences for hospitals and clinics, and tests of differences between locations. Adjusted age-standardised hospitalisation rates for the Aboriginal and Torres Strait Islander population differed by more than 30% between inner and outer regional areas but there were no marked differences between regions for other Australians.\(^36\) We used this as a benchmark effect size for computing sample size. A minimum sample size of 180 in each of two groups was required to detect a proportional difference of 0.15 (or 15% of the population) with a 95% level of confidence and a statistical power of 0.8. A total sample size of 600 was considered practically feasible and enabled detection of an effect size of at least 0.15 when comparing measures between inner and outer regions. A minimum sample of 360 people from Townsville, 180 from Mt Isa and 60 from Dajarra, ensured at least sufficient power to detect reasonable differences in proportional measures of preferences for clinics/hospitals between Townsville and Mt Isa.

Eligible participants were those who identified as Aboriginal and/or Torres Strait Islander and were aged 18 years or older. Quotas were used to ensure that the age and gender distribution of the sample reflected the distribution of the Indigenous population in each location. The quotas were determined
using area-level data from the 2011 ABS Census for Townsville and from the 2016 Census for Mt Isa and Dajarra, for which the latter became available after Townsville was surveyed.

The Indigenous population of Townsville 18 years and over in 2011 was estimated to be 5,833. For Mt Isa, the Indigenous population older than 18 years in 2016 was estimated to be 1,745. The proportion of the population by age group was computed separately for men and women, and these were used to estimate the target sample size for each category to achieve a total sample of 360 in Townsville and 180 in Mt Isa (Table 1).

Table 1: ¹Townsville and ²Mt Isa survey quotas by age and gender.

<table>
<thead>
<tr>
<th>Age</th>
<th>Indigenous Men</th>
<th>Indigenous Women</th>
<th>Total Indigenous Population N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Population % of total N</td>
<td>Survey Quota</td>
<td>Population % of total N</td>
</tr>
<tr>
<td></td>
<td>Region: Townsville</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>718 12.3</td>
<td>44</td>
<td>695 11.9</td>
</tr>
<tr>
<td>25-49</td>
<td>1574 27.0</td>
<td>97</td>
<td>1685 28.9</td>
</tr>
<tr>
<td>50+</td>
<td>510 8.7</td>
<td>31</td>
<td>651 11.2</td>
</tr>
<tr>
<td>Total</td>
<td>2802 48.0</td>
<td>173</td>
<td>3031 52.0</td>
</tr>
<tr>
<td></td>
<td>Region: Mt Isa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>160 9.2</td>
<td>17</td>
<td>198 11.3</td>
</tr>
<tr>
<td>25-49</td>
<td>414 23.7</td>
<td>43</td>
<td>517 29.6</td>
</tr>
<tr>
<td>50+</td>
<td>193 11.1</td>
<td>20</td>
<td>263 15.1</td>
</tr>
<tr>
<td>Total</td>
<td>767 44.0</td>
<td>80</td>
<td>978 56.0</td>
</tr>
</tbody>
</table>

¹Townsville survey quota was derived from data for ‘Enumerated Persons, Place of Usual Residence’ from ABS Census 2011 for Townsville SA3 region.
²Mt Isa survey quota derived from data for ‘Enumerated Persons, Place of Usual Residence’ from ABS Census 2016 for Mt Isa Indigenous Area.

The Indigenous population of Dajarra 18 years and older in 2016 was estimated to be 117 using the 2016 ABS Census. Due to small numbers in the gender by age group classifications, the cells in the ABS tables have been randomly adjusted to avoid the release of confidential data. Our quota of 60 for Dajarra divided equally into males and females and distributed across the three age groups.
3.3 Implementation and recruitment

Following a pilot survey (n=29) of Aboriginal and Torres Strait Islander people in an inner Brisbane suburb, the survey was conducted in Townsville, Mt Isa and Dajarra during three short periods from June to September in 2017. In an attempt to reach a broad cross-section of the local Indigenous population, the team developed a flexible strategy for recruitment based on a diverse range of community engagement in each location. The approach included partnering with local Aboriginal and Islander agencies, employing local Indigenous research assistants (RAs), and, choosing a range of interview locations including community centres, public places where the Indigenous community were known to attend in numbers, special events and private homes. Each participant received a gift voucher ($20.00) as an honorarium payment for participation in the survey.

A total of 602 participants comprising 295 men and 307 women aged 18 years and older took part in the survey. In Townsville, the quota was achieved for all gender by age group categories except for 25-49 year old women which was under achieved by just two people. The youngest age group was over sampled by 19 men and 16 women. In Mt Isa the quota was slightly under achieved for women (by 2 for the 25-49 age group and by 3 for the over 50 age group). However, these marginal under achievements will have minimal consequence on the analytic comparison of measures between Townsville and Mt Isa. The Dajarra quota was underachieved by 31 individuals and with the small sample size of 29, this group was removed from the majority of analyses.

3.4 Analytic Plan

Bivariate analyses were used to test for associations between each of healthcare service type preferences and use, and frequency of use with gender and age. These analyses were performed separately for the survey locations of Townsville and Mt Isa. To examine the preferences for different aspects of healthcare settings, multiple logistic regression models were used to estimate odds ratios for preference or not, including explanatory variables of interest while controlling for age, gender, highest level of education and existence of a long-term health problem.

4.0 Results

Table 2 shows the frequencies and percentages of responses for categories of demographic and selected variables of interest by location for the 602 participants. While the age and gender distributions reflected the population distribution through the use of sampling quotas, the distribution of the sample participants by highest level of education varied considerably between Townsville and Mt Isa. Of all Townsville participants, 53% had completed Year 12 or graduated with a university
degree compared to 26% of participants from Mt Isa and 24% from Dajarra.

Healthcare preferences

The survey asked individuals where they preferred to go when they were sick. The six options provided were Aboriginal or Islander medical service/clinic, non-Indigenous medical clinic, hospital, traditional Aboriginal or Islander healer, home visit from a doctor, and family or friend. For the purposes of analysis, the last three categories were combined into one to form an “Other” category. For participants from both Townsville and Mt Isa, 51% prefer to go to an Aboriginal or Islander medical/service clinic when they are sick. Other participants prefer to go to the hospital (20% in Townsville and 35% in Mt Isa) or non-Indigenous medical clinics (21% in Townsville and 10% in Mt Isa). Results showed a clear preference for treatment at an Aboriginal or Islander medical clinic by both men and women.

Health conditions and healthcare use

When asked about their own health in the last week, 21% of participants in Townsville rated their health as excellent and 14% rated their health as fair or poor. Only 12% of participants in Mt Isa rated their health as excellent and 23% rated their health as fair or poor. Mt Isa participants tended to rate their health lower than participants in Townsville ($\chi^2(4) = 15.0, p = 0.005$). In these two locations 41% of participants reported that they had health problems that had lasted, or were likely to last, for more than six months and those aged more than 50 years were almost three times as likely than not, to experience long-term health problems.

Regarding type of health services most often used, participants in Townsville (43%) were less likely than participants in Mt Isa (51%) to have used an Aboriginal or Islander medical/service clinic when they were sick, even though the preference for use of this type of health service in Townsville was higher (51%). Instead, remaining participants have gone to the hospital (23% in Townsville and 35% in Mt Isa) or non-Indigenous medical clinics (28% in Townsville and 9% in Mt Isa).

Approximately 85% of participants from Townsville and Mt Isa, visited their “mostly used” service in the previous 12 months. More than 68% of participants from each location used the service in the previous six months, and more than a third used the service in the previous month (34% in Townsville and 43% in Mt Isa). This indicates a high demand for health services within a short time period up to six months.

For Townsville participants, there is a significant association between frequency of use and age ($\chi^2(6) = 19.0, p = 0.004$) with a higher percentage of use of a health service within one month prior to the survey for those people older than 50 years (51%), compared to those aged 25-49 years (36%) and 18-24 years (22%). Most recent use of a health service in the previous 1-6 months, occurs mostly for the youngest age group (42%) followed by the 25-49 age group (34%) and the older age group (26%).
<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Townsville</th>
<th>Mt Isa</th>
<th>Dajarra</th>
<th>Total Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample</strong></td>
<td>398 66%</td>
<td>175 29%</td>
<td>29 5%</td>
<td>602</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>201 51%</td>
<td>93 53%</td>
<td>13 55%</td>
<td>307</td>
</tr>
<tr>
<td>Men</td>
<td>197 49%</td>
<td>82 47%</td>
<td>16 45%</td>
<td>295</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>121 30%</td>
<td>38 22%</td>
<td>5 17%</td>
<td>164</td>
</tr>
<tr>
<td>25-49</td>
<td>195 49%</td>
<td>94 54%</td>
<td>13 45%</td>
<td>302</td>
</tr>
<tr>
<td>50+</td>
<td>82 21%</td>
<td>43 25%</td>
<td>11 38%</td>
<td>136</td>
</tr>
<tr>
<td><strong>Highest Level of Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>59 15%</td>
<td>15 9%</td>
<td>1 3%</td>
<td>75</td>
</tr>
<tr>
<td>Year 12</td>
<td>153 38%</td>
<td>31 18%</td>
<td>6 21%</td>
<td>190</td>
</tr>
<tr>
<td>Year 10</td>
<td>116 29%</td>
<td>85 49%</td>
<td>6 21%</td>
<td>207</td>
</tr>
<tr>
<td>Did not complete Year 10</td>
<td>36 9%</td>
<td>33 19%</td>
<td>14 48%</td>
<td>83</td>
</tr>
<tr>
<td>Missing</td>
<td>34 9%</td>
<td>11 6%</td>
<td>2 7%</td>
<td>47</td>
</tr>
<tr>
<td><strong>Long-term health problem</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>162 41%</td>
<td>69 39%</td>
<td>16 55%</td>
<td>247</td>
</tr>
<tr>
<td>No</td>
<td>226 57%</td>
<td>105 60%</td>
<td>13 45%</td>
<td>344</td>
</tr>
<tr>
<td>Missing</td>
<td>10 2%</td>
<td>1 1%</td>
<td>0 0%</td>
<td>11</td>
</tr>
<tr>
<td><strong>Preferred health clinic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboriginal or Islander medical clinic</td>
<td>203 51%</td>
<td>89 51%</td>
<td>6 21%</td>
<td>298</td>
</tr>
<tr>
<td>Non-Indigenous medical clinic</td>
<td>85 21%</td>
<td>18 10%</td>
<td>8 28%</td>
<td>111</td>
</tr>
<tr>
<td>Hospital</td>
<td>78 20%</td>
<td>62 35%</td>
<td>14 48%</td>
<td>154</td>
</tr>
<tr>
<td>Other</td>
<td>32 8%</td>
<td>6 3%</td>
<td>1 3%</td>
<td>39</td>
</tr>
<tr>
<td><strong>Most recent use of health service</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In last month</td>
<td>136 34%</td>
<td>76 43%</td>
<td>18 62%</td>
<td>230</td>
</tr>
<tr>
<td>1-6 months ago</td>
<td>136 34%</td>
<td>56 32%</td>
<td>6 21%</td>
<td>198</td>
</tr>
<tr>
<td>6-12 months ago</td>
<td>64 16%</td>
<td>20 11%</td>
<td>2 7%</td>
<td>86</td>
</tr>
<tr>
<td>More than 12 months ago</td>
<td>54 14%</td>
<td>20 11%</td>
<td>3 10%</td>
<td>77</td>
</tr>
<tr>
<td>Missing</td>
<td>8 2%</td>
<td>3 2%</td>
<td>0 0%</td>
<td>11</td>
</tr>
</tbody>
</table>
By contrast, for Mt Isa participants, there is a significant association between frequency of health service use and gender ($\chi^2(3) = 15.5, p = 0.001$) with 20% more women than men using a health service within one month prior to the survey.

Selection of preferred images

Approximately one-quarter of Townsville survey participants and one-third of Mt Isa survey participants have used the hospital most of the time for their health requirements. The survey asked participants about preferred hospital architecture for specific spaces. To ensure that participants were responding to the same images and selection was based on the change in just one feature, the survey showed pairs of images and asked participants to select the preferred image from the pair. In this paper, we discuss preferences relating to the hospital inpatient room only. Survey participants were asked to choose between images of a one-bed and a two-bed inpatient room, each based on the Guidelines.3 Sixty-six percent of participants from Mt Isa selected the image with two beds compared to 49% of participants from Townsville. The preference for the images of a two-bed room did not differ significantly by gender in bivariate analyses, however, there was some association with age group and long-term health problems.

Table 3 shows the estimated odds ratios from logistic regression models for the preference of two beds in a hospital room, with explanatory variables included for gender, age group and long-term health problem (Model 1), for participants from Townsville and Mt Isa, respectively. As the distribution of highest level of education differs between Townsville and Mt Isa, and is highly associated with age group, a second model is estimated (Model 2) that also includes this variable. For Townsville, Table 3 shows that the odds for the preference of a two-bed room was 1.9 times higher for people who were 50 years or older, relative to the youngest age group (OR = 1.9, p = 0.041). When highest education level was added to the model, age group was no longer significant due to confounding with education level. Relative to individuals with a university degree or postgraduate qualification, the odds for the preference of a two-bed room was significantly higher for those who had completed Year 10 only (OR = 3.8, p <0.001) followed by those who had completed Year 12 (OR = 2.7, p = 0.005).

A similar model for Mt Isa participants showed that the preference for the two-bed room was not significantly associated with age. However, from Model 1 (Table 3) the odds for the preference for a two-bed room was 2.8 times higher for people who did not have a long-term health problem, relative to those with a long-term health problem (OR = 2.8, p = 0.003). The inclusion of highest level of education (Model 2) did not significantly alter the results which is not surprising given that a much higher proportion of participants (74%) completed Year 10 only or lower in Mt Isa compared to Townsville (48%).
The next pair of images showed a patient room with a single bed only, however, one image contained a window and the other image showed the same room with entrance to a balcony from a glass sliding door. For both Townsville and Mt Isa, 90% of participants selected the image with a balcony rather than a window only. Of all participants, 68% prefer the park view from the window, while 32% prefer the urban view. This pattern was similar across locations, however, a bivariate analysis showed that the youngest age group was significantly more likely to prefer the urban view (41%) than the older participants: 30% of those aged 30-49 years and 26% of those aged 50 years or more ($\chi^2(2) = 7.6, p=0.023$). Of all participants, 89% prefer additional furniture in the room, including a day-bed and a comfortable chair in addition to the bed. This pattern was similar across locations.

Table 3: Estimated odds ratios and 95% confidence intervals from logistic regression of preference for two beds in an in-patient hospital room

<table>
<thead>
<tr>
<th>Image preference for 2-bed inpatient hospital room</th>
<th>Townsville Odds Ratio (95% CI)</th>
<th>Mt Isa Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>Age Group [18-24]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-49</td>
<td>1.09 (0.68-1.75)</td>
<td>1.08 (0.64-1.81)</td>
</tr>
<tr>
<td>50+</td>
<td>1.90 (1.03-3.52)</td>
<td>1.75 (0.86-3.54)</td>
</tr>
<tr>
<td>Gender [Male]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.83 (0.55-1.24)</td>
<td>1.01 (0.65-1.55)</td>
</tr>
<tr>
<td>Long-term health problem [Yes]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.41 (0.91-2.17)</td>
<td>1.26 (0.79-1.99)</td>
</tr>
<tr>
<td>Highest Education [University Graduate.]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 12</td>
<td>2.70 (1.34-5.46)</td>
<td></td>
</tr>
<tr>
<td>Year 10</td>
<td>3.76 (1.88-7.52)</td>
<td></td>
</tr>
<tr>
<td>Did not complete Y10</td>
<td>4.16 (1.69-10.23)</td>
<td></td>
</tr>
</tbody>
</table>
5.0 Discussion

The effectiveness of the survey instrument can be attributed to the methodological approach including the rigorous development of questions and images as well as the sampling, recruitment and survey administration. In contrast to specific patient surveys (for example, Bureau of Health Information 2016), the research project sampled the broader Aboriginal and Torres Strait Islander community. Through a robust sampling process, we were able to reach a broad cross-section of the Indigenous population, often identified as a hard-to-reach population. Our approach involved access to Indigenous social networks through repeated contact with Indigenous bodies and other agencies (health, housing, academic and administrative) and an on-ground presence. The local research assistants were a critical factor in the participant recruitment strategy. As Indigenous people with their own social networks within the wider Indigenous community they collectively reached a broad range of men and women across all age groups in a wide geographical area of the field locations.

The positive response to the digital interface and images by the participants contributed to a high level of survey completion: interviewers observed close engagement with image selection and positive anecdotal feedback on the screen–based images. Most importantly, the method allowed focus on architectural features and spatial variation in different healthcare settings.

The survey locations were selected to examine potential social and cultural differences between Indigenous people residing in different sized population centres, from the larger provincial city to the more remote town. Preferences for different types of medical care showed little variation between places, with 50% of both the Townsville and Mt Isa sample nominating the Aboriginal or Islander medical service/clinic as first preference, and neither gender nor age significantly affected this preference. Differences in the preferences for hospitals between Mt Isa and Townsville may be partly explained by the far greater choice of private medical clinics in Townsville and convenience, however more information is needed to explain the differences.

The survey findings about inpatient rooms suggested that architectural features including the room size, layout and window placement were significant to the participants. Consistent with the literature, there was a strong preference for large windows with views of nature (68%), that was most prominent in the older age groups. It was significant that preferences for images of one and two-bed rooms did not align with current Australian hospital planning and practice which has moved toward single-bed rooms. An awareness of these potential differences could help alleviate stress and promote recovery.
Limitations

The survey was piloted in Brisbane with only 29 participants. Results from larger pilot survey on location would have improved the questionnaire design through to fewer open-ended questions and anomalous responses. These questions, which yielded little valid data and slowed completion time, could have been replaced by further image choices that explored setting preferences in more detail.

The inherent difficulty of eliciting spatial preferences from two-dimensional images of architectural settings requires further exploration. In a similar length survey, a focus on one or two settings, rather than four, with different treatments testing for the same variable (for example room size), could be designed to reduce possible ambiguity about spatial preferences.

Local survey research assistants provided an invaluable connection into the local Indigenous communities but lacked professional experience as interviewers. Their involvement with a more extensive pilot survey would have complemented their brief, intensive training.

Conclusion

Few research surveys of Indigenous health have examined the architectural qualities of hospitals or clinics and the Indigenous perceptions of the health care environment. This paper, and the broader research project, adds to the literature on evidence-based design from an Australian and cross-cultural perspective. Policy frameworks that aim to close the health gap between the Indigenous and non-Indigenous populations highlight the significance of culturally appropriate service delivery, but the architectural qualities of the healthcare setting have been ignored in this framework.

A collaborative multidisciplinary approach was influential in the survey design, and a reliance on Aboriginal and Torres Strait Islander social networks in the study locations was integral to meeting quotas. The effectiveness of the survey was evident in the attentiveness to the images in the survey. The use of images to elicit data on physical environments used by Indigenous or different ethnic groups is worthy of further exploration. In the next stage of the project, comparative analysis of the survey results with data from qualitative interviews (more than 40 participants) will add to the quality of the evidence, while interviews with hospital staff will provide additional perspectives on health service-setting. As a combined body of data, sourced by different disciplines and methods, the project results will establish a more robust framework for further research on other specialist settings and place-based studies.

The discrepancies in services between urban, regional and remote areas are well known. Current
policies on Indigenous health care have set directions and targets for improving outcomes including through better access to effective and appropriate health service. A focus on individual perceptions of health care services leads towards better understandings of the combined significance of service design and setting and can inform more transformative policy for the Aboriginal and Torres Strait Islander population.

**Acknowledgements**

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