

# Expressed demand for healthcare services in regional South Australia: a cross-sectional study

Matthew Leach (✉ [matthew.leach@unisa.edu.au](mailto:matthew.leach@unisa.edu.au))

University of South Australia <https://orcid.org/0000-0003-3133-1913>

Sandra Walsh

University of South Australia

Kuda Muyambi

University of South Australia

Marianne Gillam

University of South Australia

Martin Jones

University of South Australia

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## Research article

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# Abstract

Background Accessibility and availability of health care services/providers is an increasing concern for many regional communities, particularly regional South Australia. However, in order to ascertain the health service/workforce requirements of this community, it is important to understand the health care needs of the population. Assessing the level of health service/provider utilisation within the region (i.e. expressed demand) can be useful in determining both health care need, and health service/workforce demand. This can be helpful for informing future health workforce and health services planning. Methods The regional South Australia health (RESONATE) survey aimed to determine the expressed demand for health care services and the health workforce in a regional South Australian population. The study was open to adults living in regional South Australia and was promoted using a comprehensive multi-modal recruitment campaign. Data were collected between April 2017 and March 2018 using the consumer utilization, expectations and experiences of healthcare instrument, which was administered online and in print. Results 3,926 adults completed the questionnaire. Participants reported using 47 different health care providers in the previous 12 months. Whilst almost all (92.9%) participants had seen a general practitioner in the past 12 months, yoga instructors, chiropractors, pharmacists and physiotherapists were visited most frequently. Services/treatments most frequently received/recommended by a conventional health care provider were prescribed medication (71.9%) and dental procedures (50.4%); and by a complementary medicine provider, massage (26.1%) and vitamin/mineral supplementation (23.0%). Proportionally fewer participants in more remote locations received conventional services/treatments, though a significantly greater proportion of those in more remote locations had received complementary medicine services/treatments (relative to inner regional areas). Conclusions The findings of the RESONATE survey point to a high level of expressed demand for conventional and complementary health care services among study participants. Examining the extent to which the health needs of this and other regional populations are met should be the focus of further research to better inform future health workforce/services planning.

## Background

Rural, remote and regional populations (henceforth referred to as regional) face a plethora of health challenges and disparities relative to urban populaces. Higher rates of chronic disease (e.g. arthritis, cardiovascular disease, diabetes, obesity, and preventable cancers)<sup>1–6</sup> and unintentional injury<sup>7,8</sup>, greater exposure to behavioural risk factors (e.g. higher rates of smoking, greater consumption of alcohol, lower intakes of fruit and fibre, lower levels of physical activity)<sup>4,5,9,10</sup> and elevated levels of environmental and socioeconomic stress (e.g. lower incomes, greater rates of unemployment and poverty, heightened exposure to extreme weather events)<sup>7,11–14</sup> are among some of the issues impacting the health and wellbeing of regional populations across the globe. Access to timely and appropriate health care services, in suitable locations, may help to reduce some of the disease burden afflicting these communities.

Addressing the health care needs of regional communities first requires an understanding of what those needs are. Examining the prevalence of illness in a population, the level of exposure to risk factors<sup>15</sup>, quality of life and mortality<sup>16</sup> are some of the ways in which health care need may be determined. Another approach is to assess the level of demand for health care services within a region, which can be reported as either potential demand (i.e. a conveyed need to use a health service) or expressed demand (i.e. actual use of a health service)<sup>15,17</sup>. As expressed demand can be used to measure both health care need and health service utilization, it can be useful in informing health workforce and health services planning<sup>18</sup>.

Regional South Australia hosts some of the highest rates of chronic disease, psychological distress and co-morbidity of any State or Territory of Australia<sup>19</sup>. With a population of 390,645, it is also one of the least densely populated regions in the world<sup>20</sup>, where 23% of the state's population are dispersed across 99.7% of the state (representing a population density of 1 person per 2.52 square kilometres)<sup>21</sup>. Accordingly, regional South Australia serves as a suitable exemplar of a location where potential demand for health services is likely to be high, but accessibility and availability of health services may be problematic. In order to inform future health workforce and health services planning for regional South Australia, we carried out a survey of the population to better understand the expressed demand for health care services in the region.

## Methods

### ***Study design: Cross-sectional survey.***

*Aim & research questions:* The Regional South Australia Health (RESONATE) survey was designed to investigate the health care needs of the regional South Australian population, of which there were eight main objectives. For a detailed description of these objectives, see Leach et al<sup>22</sup>. This paper addresses the second objective of the survey: to determine the degree to which health services/treatments were used by adults residing in regional South Australia (i.e. expressed demand). Specifically, we set out to answer the following questions:

1. What types of health care providers and treatments/services have regional South Australians accessed in the previous twelve months?
2. How frequently have regional South Australians consulted health care providers in the previous twelve months?
3. What mix of health care providers have regional South Australians accessed in the previous twelve months?
4. What sociodemographic factors are associated with the type, frequency and mix of health care providers seen by regional South Australians?

*Participants:* RESONATE was open to all adults (aged  $\geq 18$  years) living in a private or non-private dwelling in regional, rural, remote or very remote South Australia, who had used any healthcare service or

health intervention in the past 12 months, and had either a fixed address (to which a print version of the questionnaire could be dispatched) or internet access (to support completion of the questionnaire online). Participants were also expected to be able to read and understand written English. People with severe visual or cognitive impairment, and those unable to provide informed consent, were not eligible to participate. Based on a target population of 290,290 adults<sup>23</sup> and a  $\pm 3\%$  margin of error at the 99% confidence level, we needed to survey at least 1,832 people.

*Questionnaire:* The tool used for the survey was the consumer utilisation, expectations and experiences of healthcare instrument (CONVERSATIONS)<sup>22</sup>. This 44-item self-administered, multidimensional tool captures information on five key areas: demographic characteristics (16 questions), health status and lifestyle (10 questions), use/attitude/experience/satisfaction of conventional/mainstream health services (8 questions), use/attitude/experience/satisfaction of complementary services and self-prescribed treatments (9 questions), and preferred mix of health services (1 question). The instrument has previously been shown to have good test–retest reliability, acceptable internal reliability, good content validity, and a high degree of acceptability. A detailed description of the development, structure and validation of CONVERSATIONS is reported elsewhere<sup>22</sup>.

*Outcomes:* The five outcomes of this research are defined below.

- Health care provider type: This referred to the types of health care providers accessed in the past 12 months. Participants were presented with 15 conventional/mainstream provider options (e.g. dentist, nurse, pharmacist), 16 complementary medicine provider options (e.g. acupuncturist, chiropractor, naturopath), and a free-text 'other' option.
- Frequency of health care utilization: This represented the number of times a participant consulted each conventional, complementary medicine and other health care provider in the past 12 months.
- Treatment/service type: This was defined as the types of treatments/services prescribed/received by a health care provider in the past 12 months. Participants were presented with 15 conventional/mainstream treatment/service options (e.g. prescribed medication, muscular/joint therapy, wound management), 19 complementary medicine treatment/service options (e.g. massage, spinal manipulation, vitamin/mineral supplement), and a free-text 'other' option.
- Health care provider mix: This referred to the number of distinct health care providers (by discipline) that a participant consulted in the past 12 months.
- Sociodemographic factors: This was defined as the range of social and demographic factors that characterized the sample, including age, sex, country of birth, marital status, highest qualification, employment status, and remoteness area (RA2–5, based on the Australian Standard Geographical Classification [ASGC]).

*Recruitment and data collection:* The study was conducted between April 2017 and March 2018. People were recruited using non-probability (self-selection) sampling, supported by an extensive, multi-modal recruitment campaign. A detailed description of the recruitment strategies utilized in the campaign are

reported elsewhere<sup>22</sup>; in brief, the campaign included the use of assorted online media (e.g. establishment of a project website, organizational email blasts), broadcast media (e.g. television classified advertisements, radio interviews), social media (e.g. Instagram and Twitter posts, Facebook advertisements), and print media (e.g. all-household letterbox drop across regional South Australia, newspaper articles). The campaign also included extensive community engagement (e.g. meetings with regional stakeholders, attendance at community events). All recruitment information directed people to either (i) access the project website to acquire additional information and to open the online version of the questionnaire (which was hosted on the SurveyMonkey™ platform, <https://www.surveymonkey.com>), or (ii) contact the research team to obtain a print version of the questionnaire (and a reply-paid envelope). Data from the completed printed surveys were directly entered into the online survey platform by the research team.

*Data analysis:* Data from SurveyMonkey™<sup>24</sup> were imported into IBM® SPSS® Statistics 25.0<sup>25</sup> for cleaning, coding and analysis. The deduplication procedure for online surveys, as described by Konstan et al<sup>26</sup>, was used to manage multiple responses from single participants. The online survey used forced-response questions, thus avoiding the need to handle missing data. However, for hard-copy surveys, missing data were simply reported as 'missing'. Categorical data were described using frequency distributions and percentages. Continuous data (which were non-normally distributed) were reported using medians and the interquartile range (IQR). Relationships between ASGC remoteness area and study outcomes were measured using Spearman correlations (for continuous variables) and  $\chi^2$  tests (for categorical variables). Correlation coefficients ranging between 0.00–0.29 were defined as a weak association, 0.30–0.69 as a moderate association, and 0.70–1.00 as a strong association<sup>27</sup>. Distribution of the survey sample was adjusted by applying weights to the age (i.e. by 5-year age group), sex and location distribution (i.e. at the statistical area 3 level) of the regional South Australian population; the purpose of which was to take into account the non-probability sampling strategy. These weights were derived from data obtained through the 2016 Australian population census<sup>28</sup>.

## Results

A total of 3,926 adults completed the questionnaire. After adjusting for age, sex and location distribution, the effective sample size was 3,743. As the actual number of people informed about the study could not be ascertained, it was not possible to determine the response rate for the survey.

*Demographic characteristics (weighted):* The majority of participants were born in Australia (84.2%), aged between 40 and 79 years (66.5%), married (56.1%), employed (51.9%) and living in outer regional South Australia (51.3%) (Table 1). Almost one-half (43.8%) of participants reported having no/primary/secondary school as their highest level of education, with 40.3% holding a Bachelor degree qualification or higher. A slightly higher proportion of the study sample were female (52.5%).

*Health care provider type:* Participants accessed 47 different types of health care providers in the 12 months preceding the survey. The 12-month prevalence of conventional/mainstream service use was

97.9% (3664/3743). Of the 22 distinct conventional/mainstream providers consulted, general practitioners (92.9%), pharmacists (70.5%) and dentists/dental professionals (59.9%) were among the most frequently seen in the preceding 12 months (Table 2). The conventional/mainstream providers that were least frequently consulted (i.e. by less than 1% of participants) were speech pathologists (0.6%).

The 12-month prevalence of complementary medicine service use was 47.3% (1770/3743). Among the 25 different complementary medicine providers consulted, the most frequently seen were massage therapists / myotherapists (28.8%) and chiropractors (21.2%) (Table 3). The least frequently consulted (by less than 1% of participants) complementary medicine providers were Shiatsu (0.3%) and Ayurvedic (0.6%) practitioners.

*Frequency of health care utilization:* Participants consulted conventional/mainstream health care providers, on average, 14 (median; IQR 7,26) times within the 12 months preceding the survey. Pharmacists (median 4 visits/year; IQR 2,10), physiotherapists (median 4 visits/year; IQR 2,6), general practitioners (median 4 visits/year; IQR 2,6) and other practitioners (median 4 visits/year; IQR 2,8) were visited more frequently than any other conventional/mainstream provider (Table 2). There was a moderate inverse association between ASGC remoteness area and visit frequency with speech therapists ( $r = -0.440$ ,  $p = 0.046$ ; i.e. the more remote the participant, the less frequent the provider visits), and a weak inverse association between ASGC remoteness area and visit frequency with physiotherapists ( $r = -0.136$ ,  $p < 0.001$ ), podiatrists ( $r = -0.090$ ,  $p = 0.012$ ), dentists ( $r = -0.055$ ,  $p = 0.009$ ), and medical specialists ( $r = -0.072$ ,  $p = 0.002$ ).

On average, participants consulted complementary medicine providers 5 (median; IQR 2,12) times in the previous 12 months. The greatest number of visits were reported for yoga instructors (median 5 visits/year; IQR 1,12) and chiropractors (median 4 visits/year; IQR 2,10) (Table 3). There was a weak inverse association between ASGC remoteness area and visit frequency with chiropractors ( $r = -0.115$ ,  $p = 0.001$ ), massage therapists ( $r = -0.133$ ,  $p < 0.001$ ) and traditional Chinese medicine practitioners ( $r = -0.307$ ,  $p = 0.012$ ), and a weak positive association between ASGC remoteness area and visit frequency with naturopaths ( $r = 0.157$ ,  $p = 0.015$ ).

*Treatment/service type:* More than half of participants had received, or were recommended, prescribed medication (71.9%) or a dental procedure (50.4%) by a conventional/mainstream health care provider in the 12 months preceding the survey (Table 4). This was closely followed by prescription eyeglasses (48.3%) and vaccination (42.2%). There was a statistically significant association between ASGC remoteness area and some treatment-service types, with participants in more remote locations less likely to have received/been recommended counselling/psychotherapy ( $\chi^2(3) = 10.522$ ,  $p = 0.015$ ), a dental procedure ( $\chi^2(3) = 27.418$ ,  $p < 0.001$ ), pregnancy/birthing support ( $\chi^2(3) = 11.069$ ,  $p = 0.011$ ), prescribed exercise ( $\chi^2(3) = 9.629$ ,  $p = 0.022$ ), prescription eyeglasses ( $\chi^2(3) = 10.204$ ,  $p = 0.017$ ), prescribed medication ( $\chi^2(3) = 12.077$ ,  $p = 0.007$ ) or vaccination ( $\chi^2(3) = 8.680$ ,  $p = 0.034$ ).

Around 1 in 4 participants had received or were recommended massage (26.1%) or vitamin / mineral supplementation (23.0%) by a complementary medicine provider in the 12 months preceding the survey (Table 5). The services least frequently received/recommended by a complementary medicine provider were Tai Chi (1.7%) and pregnancy/birthing support (2.2%). A statistically significant association was found between ASGC remoteness area and treatment-service type, with proportionally fewer participants in more remote locations receiving/being recommended Chinese medicine ( $\chi^2(3) = 10.515$ ,  $p = 0.015$ ), herbal medicine ( $\chi^2(3) = 9.369$ ,  $p = 0.025$ ) or Bach flower treatment ( $\chi^2(3) = 9.829$ ,  $p = 0.020$ ), but a higher proportion receiving/being recommended yoga ( $\chi^2 = 8.401$ ,  $p = 0.038$ ). For some services, there was a clear split between regions, with proportionally fewer participants in ASGC remoteness area 2 (inner regional) receiving/being recommended aromatherapy ( $\chi^2(3) = 8.911$ ,  $p = 0.031$ ) and massage ( $\chi^2(3) = 17.103$ ,  $p = 0.001$ ) relative to participants in remoteness areas 3 (outer regional), 4 (remote) and 5 (very remote). A similar pattern applied to spinal manipulation ( $\chi^2(3) = 13.317$ ,  $p = 0.004$ ), although fewer participants in remoteness areas 2 and 5 had been recommended/received this service compared with participants in remoteness areas 3 and 4.

*Health care provider mix:* Participants consulted on average 5 (median; IQR 3,6) distinct (by discipline) conventional/mainstream health care providers in the 12 months preceding the survey. Participants also consulted on average, 2 (median; IQR 1,2) discrete (by discipline) complementary medicine providers in the previous 12 months. Overall, participants had seen 5 (median; IQR 4,7) different health care providers (by discipline) on average in the previous 12 months. There was a weak inverse association between ASGC remoteness area and conventional/mainstream health care provider mix ( $r = -0.044$ ,  $p = 0.007$ ), so as the level of remoteness increased, the number of different conventional/mainstream health care providers consulted declined. Conversely, ASGC remoteness area was found to be weakly associated with the number of distinct complementary medicine providers seen ( $r = 0.049$ ,  $p = 0.003$ ).

Approximately half of participants (50.7%, 1898/3743) had only consulted conventional/mainstream health care providers in the previous 12 months, with 47.2% (1767/3743) choosing to consult both conventional and complementary medicine providers. Few participants consulted complementary medicine providers only (0.05%, 2/3743), or no providers (2.0%, 76/3743). Proportionally fewer participants in remote and very remote areas (ASGC remoteness areas 4 and 5) versus inner and outer regional areas (ASGC remoteness areas 2 and 3) had consulted conventional/mainstream health care providers only ( $\chi^2(3) = 13.716$ ,  $p = 0.003$ ). Conversely, a greater proportion of participants in remote and very remote areas compared to inner and outer regional areas consulted both conventional/mainstream and complementary medicine providers ( $\chi^2(3) = 17.652$ ,  $p = 0.001$ ).

## Discussion

This study has generated important insights into the expressed demand for health care services and the health workforce in one of the least densely populated regions in the world—regional South Australia<sup>20</sup>. There was diversity in the type of health care providers accessed and health services received, with

almost half of participants choosing to use a combination of both complementary medicine and conventional/mainstream health care providers to address their health care needs. Geographic remoteness appeared to have some bearing on the types of services that participants accessed, with utilization of several complementary medicine providers/treatments shown to be proportionally higher in remote areas versus inner regional locations, whereas the utilization of conventional/mainstream providers/treatments tended to be proportionally lower in remote regions versus inner regional areas.

Overall, there was considerable demand for conventional health care providers among participants, particularly for general practitioners, pharmacists, dentists and opticians/optometrists. The proportion of participants that visited these providers was generally higher than that reported in the general South Australian population (i.e. 93% vs. 88% for general practitioners, and 60% vs. 50% for dentists, respectively)<sup>29,30</sup>. While these distinctions may be partly attributed to differences in the sampling methods of each study, it also might suggest that a proportion of the regional South Australian population have high levels of health care need. Indeed, prevalence rates for conditions such as asthma, cardiovascular disease, arthritis, diabetes, mental illness and osteoporosis have been shown to be much higher in regional South Australia than urban South Australia<sup>19</sup>. A relatively greater prevalence of cataract and dental disease is also reported in regional populations more generally<sup>5,6,31–33</sup>. Similarly, regional South Australians (and regional populations in general) are more likely to be exposed to risk factors associated with these diseases, including higher rates of physical inactivity, smoking, alcohol intake and sugar consumption, and lower intakes of fruit and fibre<sup>4,5,9,10,19,34</sup>.

Other factors that may possibly explain the high level of expressed demand for healthcare services among participants are provider over-servicing (i.e. unnecessary healthcare utilization driven by supplier-induced demand) and oversupply (i.e. increased service utilization driven by surplus availability of healthcare resources)<sup>35,36</sup>. There was little indication that the healthcare providers in this sample were over-servicing. In fact, participants generally reported fewer visits to healthcare providers in the preceding twelve months than that reported nationally, including visits to general practitioners (i.e. 4 visits [regional SA] vs. 6.1 visits [Australia])<sup>29</sup>, dentists (i.e. 2 visits vs. 2.4 visits)<sup>37</sup> and pharmacists (i.e. 4 visits vs. 14 visits)<sup>38</sup>.

The oversupply of healthcare providers was also unlikely to be a driver of the expressed demand for healthcare services in the region, with workforce supply found to be disproportionate to workforce demand in many cases. For instance, nursing, the largest health workforce (which has a provider-population ratio of 86/10,000 in regional South Australia) did not rank in the top five health providers visited by participants<sup>19</sup>. By contrast, one of the smallest health disciplines (opticians/optometrists, which has a provider-population ratio of 0.7/10,000 in regional South Australia), was among the top four most frequently visited health providers in the region<sup>19</sup>. If provider over-servicing and oversupply are unlikely to represent possible explanations for these high healthcare utilization rates, it is probable that the expressed demand for conventional healthcare services in regional South Australia may be driven by healthcare need.



The findings of this study also point to a moderate level of expressed demand for complementary medicine services among participants. While the types of complementary medicine providers that participants most frequently consulted in the region (i.e. massage therapists and chiropractors) were similar to those most frequented nationally<sup>39–41</sup>, the 12-month prevalence rate of complementary medicine service use (i.e. 47%) exceeded that reported in most Australian studies to date (i.e. 27–44%)<sup>39–41</sup>. Evidence from previous Australian studies indicates that the higher rates of complementary medicine service use in regional areas (compared to urban areas) may be driven by greater levels of healthcare need, a desire to improve quality of life, dissatisfaction with the outcomes of conventional medical care, and poorer access to conventional healthcare services (including lengthy waiting times)<sup>42–44</sup>. Unfortunately, the results of our analysis are unable to substantiate these explanations.

An inverse relationship between remoteness and visit frequency was evident for some conventional and complementary medicine providers, including chiropractors, massage therapists, physiotherapists, speech therapists and traditional Chinese medicine practitioners, and to a lesser extent, dentists, podiatrists and medical specialists. These differences in visit frequency may be explained to some extent by the lower provider-population ratios for some of these disciplines (e.g. dentistry, massage therapy, physiotherapy, podiatry, speech therapy)<sup>19</sup>. For other disciplines, such as chiropractic, there was an inverse relationship between provider-population ratios and visit frequency with increasing remoteness (at least between remoteness area two and remoteness area four)<sup>19</sup>. In this instance, accessibility may be constrained not by provider numbers, but by socioeconomic factors. This is because in Australia, only a limited number of chiropractic services are covered by Medicare (Australia's public health insurance scheme), and only if an individual's general practitioner has endorsed this through a chronic disease management plan or team care arrangement<sup>45</sup>. In other words, if the chiropractic service is not supported by a general practitioner, or the individual requires more than the maximum five visits per annum, the individual would have to pay for the service out-of-pocket (or via private health insurance), which may be cost-prohibitive for many people living in regional areas.

Access to other complementary medicine services, such as naturopathy, also may be constrained by cost. This is because unlike chiropractic, naturopathy services are not funded by Medicare; instead, these services are paid for out-of-pocket, or until recently, were covered by private health insurance rebates<sup>46</sup>. Accordingly, access to naturopathy services is likely to be limited to individuals with high incomes and private health insurance<sup>47</sup>. Notwithstanding, our study findings revealed that the frequency of naturopath visits (unlike other health providers) reported by participants increased as their level of remoteness rose. While this finding could be explained by increased physical access to naturopathic services, this claim cannot be substantiated given the paucity of data on the naturopath workforce in South Australia<sup>48</sup>. However, findings from a New South Wales study reveal that naturopaths comprise one of the largest groups of complementary medicine providers in rural regions, and in some cases, outnumber the supply of general practitioners<sup>49</sup>.

Treatments/services provided or recommended by health care providers closely reflected the professions most frequently consulted by participants, and thus, most likely reflect the treatments/services that were more readily accessible to participants. For example, prescribed medication, dental procedures and prescription eyeglasses were most likely to have been recommended/provided by a general practitioner/pharmacist, dentist and optician/optometrist, respectively. Similarly, massage therapists and chiropractors were most likely to have recommended/provided massage and spinal manipulation, respectively. Nevertheless, it is not clear as to which complementary medicine providers recommended vitamin/nutrition supplements (the second most frequently recommended complementary medicine treatment), as these are not typically prescribed by massage therapists, chiropractors or yoga instructors in Australia. It is possible that complementary medicine providers working in regional locations may have a broader scope of practice relative to their urban counterparts, not dissimilar to that observed among conventional clinicians working in regional settings<sup>50,51</sup>. Although this represents a reasonable explanation for this situation, it does warrant further investigation.

The RESONATE study represents one of the largest and most comprehensive health surveys ever conducted in regional South Australia. The use of a valid, reliable, acceptable and theoretically-informed questionnaire (i.e. CONVERSATIONS)<sup>22</sup> was an added strength of this research. Notwithstanding, there are some limitations that should be taken into consideration when interpreting the findings of this research. The use of non-probability sampling suggests the study could be susceptible to self-selection bias. Whilst this risk cannot be eliminated, we did institute several strategies to mitigate this risk, as well as the potential risk of undercoverage bias, recruitment bias and measurement error (e.g. implementation of an extensive multimodal recruitment campaign, widespread community engagement and diverse survey administration methods). These strategies are explained in more detail elsewhere<sup>22</sup>.

Another limitation relating to the use of non-probability sampling is the representativeness of the sample. Although the sex, age and country of birth of participants closely approximated that of the regional South Australian population (based on 2016 Australian population census data)<sup>28</sup>, the sample had less representation from inner regional areas (33.1% vs. 48.3%) and greater representation from outer regional areas (51.3% vs. 39.0%) relative to that reported in the 2016 Australian population census<sup>21</sup>. Our sample also overrepresented those with an education level higher than a Bachelor degree (22.3% [RESONATE sample] vs. 3.3% [Census sample]), earning \$90,000 or more per annum (26.2% vs. 7.5%), and those who were married (56.1% vs. 45.6%) and unemployed (10.2% vs. 3.4%)<sup>28</sup>. It is possible that the overrepresentation of these groups could impact the conclusions of this study. However, given that these factors are likely to have opposing effects on expressed demand (i.e. higher income and education are generally correlated with greater health care utilization, whereas increasing remoteness and unemployment are typically associated with reduced health care use)<sup>52–54</sup>, the extent of this impact remains uncertain.

## Conclusions

The RESONATE study has revealed a high level of expressed demand for conventional health care services, and a moderate level of expressed demand for complementary medicine services, among participants living in regional South Australia. This level of demand was considerably higher than that reported in the general South Australian / National population. The implication of this finding is that regional South Australians may have a high level of health care need. The extent to which the health needs of participants have been adequately met however was beyond the scope of this study, and should be the subject of further enquiry to help inform future health workforce and health services planning. Parallel to this work, is a need to further explore the drivers of complementary medicine service utilization in more remote areas, to understand if and how these services may be addressing the health care needs of regional communities. The findings of this work may help pave the way for the development of more appropriate health service delivery models for regional populations.

## Declarations

*Ethics approval and consent to participate:* The University of South Australia Human Research Ethics Committee reviewed and approved the study protocol (Protocol ID: 0000034611). Each participant was provided with a detailed information sheet, and informed consent was required prior to completing the survey. Participants were advised that completion of the survey was voluntary, and that their data would not be identifiable.

*Consent for publication:* Not applicable.

*Availability of data and materials:* The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

*Competing interests:* The authors declare that they have no competing interests.

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*Author contributions:* ML conceptualized the project. ML drafted the introduction, methods and results. ML, SW and KM drafted the discussion. ML, MG, KM, SW and MJ interpreted the findings, reviewed and edited the manuscript, and read and approved the final manuscript.

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## Tables

Table 1. Demographic characteristics of the study sample (weighted; effective sample size n=3,743).

Characteristic	Category	n (%)
Age	Under 20 years	65 (1.7)
	20-39 years	939 (25.1)
	40-59 years	1332 (35.6)
	60-79 years	1155 (30.9)
	80 years or older	252 (6.7)
Sex	Female	1966 (52.5)
	Male	1777 (47.5)
Highest level of education	Postgraduate degree ( <i>AQF levels 9-10</i> )	212 (5.7)
	Graduate Certificate / Diploma ( <i>AQF level 8</i> )	621 (16.6)
	Bachelor degree ( <i>AQF level 7</i> )	673 (18.0)
	Certificate / Diploma ( <i>AQF levels 1-6</i> )	596 (16.0)
	Secondary school	1596 (42.6)
	Primary school / no school	45 (1.2)
Relationship status	Married	2099 (56.1)
	Single, never married	599 (16.0)
	Divorced / separated	416 (11.1)
	Domestic partnership	384 (10.3)
	Widowed	245 (6.6)
Country of birth	Australia	3153 (84.2)
	United Kingdom	355 (9.5)
	Other	235 (6.3)
Employment status	Employed	1943 (51.9)
	Unemployed	381 (10.2)
	Retired	1067 (28.5)
	Other	352 (9.4)
ASGC remoteness area classification	RA2 ( <i>inner regional</i> )	1239 (33.1)
	RA3 ( <i>outer regional</i> )	1922 (51.3)
	RA4 ( <i>remote</i> )	494 (13.2)
	RA5 ( <i>very remote</i> )	88 (2.4)

AQF - Australian Qualification Framework; ASGC - Australian Standard Geographical Classification.

Table 2. Conventional/mainstream providers consulted in the previous 12 months (weighted; effective sample size n=3,743)



Provider	Consulted at least once in the past 12 months <i>n (%)</i>	Number of times consulted in the past 12 months* <i>median (IQR)</i>
General practitioner	3479 (92.9)	4 (2,6)
Pharmacist	2637 (70.5)	4 (2,10)
Dentist / Dental professional	2243 (59.9)	2 (1,2)
Optician / Optometrist	2070 (55.3)	1 (1,1)
Medical specialist	1814 (48.5)	2 (1,3)
Nurse / Nurse practitioner	1202 (32.1)	2 (1,3)
Physiotherapist	1146 (30.6)	4 (2,6)
Podiatrist	787 (21.0)	2 (1,5)
Counsellor / Psychologist	633 (16.9)	3 (1,6)
Dietician / Nutritionist	356 (9.5)	1 (1,2)
Exercise physiologist	216 (5.8)	1 (1,3)
Social Worker	171 (4.6)	2 (1,4)
Occupational therapist	112 (3.0)	2 (1,3)
Midwife	98 (2.6)	4 (2,7)
Speech pathologist	21 (0.6)	2 (1,3)
Other ( <i>not further defined</i> )	337 (9.0)	4 (2,8)

\*For participants that accessed this provider

Table 3. Complementary medicine providers consulted in the previous 12 months (weighted; effective sample size n=3,743)

Provider	Consulted at least once in the past 12 months <i>n (%)</i>	Number of times consulted in the past 12 months* <i>median (IQR)</i>
Massage therapist / myotherapist	1079 (28.8)	3 (1,5)
Chiropractor	794 (21.2)	4 (2,10)
Yoga instructor	291 (7.8)	5 (1,12)
Acupuncturist	254 (6.8)	2 (1,5)
Naturopath	242 (6.5)	2 (1,3)
Reiki practitioner	129 (3.5)	1 (1,3)
Herbalist	101 (2.7)	2 (1,3)
Aromatherapist	80 (2.1)	1 (1,3)
Homeopath	77 (2.1)	3 (1,5)
Kinesiologist	70 (1.9)	1 (1,3)
Traditional Chinese medicine practitioner	69 (1.8)	3 (1,6)
Reflexologist	66 (1.8)	1 (1,4)
Tai Chi instructor	57 (1.5)	3 (1,12)
Osteopath	56 (1.5)	3 (1,5)
Ayurvedic practitioner	22 (0.6)	1 (1,2)
Shiatsu practitioner	11 (0.3)	2 (1,7)
Other ( <i>not further defined</i> )	134 (3.6)	2 (1,6)

\*For participants that accessed this provider

**Table 4. Treatments/services received or recommended by a conventional/mainstream health care provider in the previous 12 months (weighted; effective sample size n=3,743)**

Treatment/service	Received / recommended in the past 12 months
	<i>n (%)</i>
Prescribed medication	2690 (71.9)
Dental procedure	1885 (50.4)
Prescription eyeglasses	1807 (48.3)
Vaccination	1581 (42.2)
Surgical procedure / operation	957 (25.6)
Muscular / joint therapy	881 (23.5)
Counselling / psychotherapy	573 (15.3)
Wound management	517 (13.8)
Dietary advice	474 (12.7)
Prescribed exercise	461 (12.3)
Pregnancy / birthing support	123 (3.3)
Transfusion of blood / blood products	120 (3.2)
Radiotherapy	76 (2.0)
Other treatment / service	73 (1.9)
Chemotherapy	45 (1.2)
Diagnostic procedure	46 (1.2)
Hemodialysis / peritoneal dialysis	15 (0.4)

Table 5. Treatments/services received or recommended by a complementary medicine provider in the previous 12 months (weighted; effective sample size n=3,743)

Treatment/service	Received / recommended in the past 12 months
	<i>n (%)</i>
Massage	975 (26.1)
Vitamin / mineral supplementation	862 (23.0)
Exercise advice	704 (18.8)
Spinal manipulation	484 (12.9)
Dietary advice	482 (12.9)
Meditation	346 (9.2)
Aromatherapy	322 (8.6)
Acupuncture / acupressure	301 (8.0)
Yoga	261 (7.0)
Herbal medicine	242 (6.5)
Relaxation therapy	182 (4.9)
Reiki / therapeutic touch	146 (3.9)
Homeopathic medicine	133 (3.6)
Other treatment / service	92 (2.5)
Tissue salt therapy	90 (2.4)
Bach flower treatment	86 (2.3)
Pregnancy / birthing support	82 (2.2)
Tai Chi	64 (1.7)