Ethos heat-health 65+ Qld Survey

Technical Report

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Ethos Survey 2022- Technical Report

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Contents

This document serves as a comprehensive guide tailored for researchers, academics, and policy makers. It offers a detailed exposition of the methodology employed during the survey tool's development process, aimed at facilitating the nuanced comprehension of the survey outcomes.

For information on demographics and sample representativeness please see Ethos Project: Policy Maker Report for the 2022 Heat Health and Digital Technology Survey (11-12).

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The survey described in this report was commissioned by Griffith University's Ethos Research Team. The survey was conducted by mainly Ethos core team members, Aaron Bach, Connor Forbes, Ella Jackman, Mehak Oberai, Sebastian Binnewies, Shannon Rutherford, Steven Baker, and Zhiwei Xu. Other members of the Ethos whole of team who provided valuable contributions to the content of the questionnaire included Sarah Cunningham, Dung Phung and Son Nghiem.

Graham Bradley and Louis Houston gave excellent expert feedback in their relevant areas. The team from Qualtrics played a vital role in survey build, recruiting participants from their panel, and implementing the survey. Their diligence and flexibility in performing these roles is very much appreciated.

"Appreciation is also extended to the 547 Respondents who completed the online and paper-based questionnaire".

Executive summary

The escalating impact of extreme and unprecedented heatwaves, attributed to global climate change, has resulted in adverse consequences, including increased mortality and morbidity across various regions worldwide. Notably, Spain, Portugal, and Europe have witnessed significant casualties due to recent heatwaves. Australia, experiencing a 1.5°C temperature rise since 1910, faces escalating challenges, particularly for older populations, contributing to heightened mortality rates during heatwaves.

The survey was a planned activity of the first year of the Ethos (Extreme Heat in Older Persons) project, a comprehensive initiative in Queensland. The project aims to identify vulnerability among older Queenslanders by developing an in-home solution to monitor heat exposure, assess risks, and support appropriate responses. The report centres on a sub-study conducted during the first year—a user survey targeting Queenslanders aged 65 and above.

Aligned with the theoretical framework proposed by Garcia and Fearnley, the Ethos project revolves around four key elements: risk knowledge, monitoring, communication, and response capability. To understand the perspectives of the target population, a state-wide survey was conducted, covering key areas such as knowledge and attitudes towards heat as a health problem, behaviour during heat events, and the attitude and use of personal and monitoring technologies.

The survey design and administration process are crucial components highlighted in this report. By addressing critical questions related to heat knowledge, coping strategies, and technology accessibility, the survey serves as a valuable tool to gather insights from older Queenslanders. The ultimate goal is to enhance preparedness and response capabilities, ensuring the well-being of vulnerable populations during extreme heat events.

This report offers a concise overview of the survey's purpose, emphasizing its relevance for researchers, stakeholders, and individuals interested in developing similar surveys or utilizing the survey tool employed by the Ethos project.

Acronyms and abbreviations

EWS	**Early Warning System**
Ethos	**Extreme heat and older persons**
ABS	**Australian Bureau of Statistics**
AIHW	**Australian Institute of Health and Welfare**
UCLA	**University of California, Los Angeles**
CAS	**Climate Action Survey**
STAM	**Senior Technology Acceptance model**
OEQs	**Open ended questions**
CEQs	**Close ended questions**
ATT	**Attitude towards usage of technology**
BNE	**Brisbane**
QLD	**Queensland**
CATI	**Computer assisted telephonic interviews**

Introduction

Extreme and unprecedented heatwaves leading to hot days, warm nights, and extended periods of elevated temperatures have been witnessed across different parts of the world, from Europe, Asia, North Africa to Middle East during the last few summers. This is a consequence of rising earth temperatures due to climate change[1,2]. These heatwaves have resulted in increased mortality and morbidities among our populations[3]. For instance, in Spain and Portugal, 1700 deaths have occurred solely due to the recent heatwaves of 2022[1,2] and over 70,000 excessive deaths occurred in whole of Europe for the 2022 summer[3].

Australia has warmed by 1.5°C up since 1910 and the number, frequency, and intensity of heatwave days in the country is increasing[4]. Rising temperatures result in increased morbidity and mortality rates particularly in older people (especially among those with pre-existing health conditions and aged above 65yrs)[5]. Indeed, risk of mortality increased by 5% during heatwaves, putting increased pressure on healthcare services including emergency department visits, hospital admissions, and ambulance dispatches in Queensland between 2010 and 2019[6]. Understanding vulnerability is key to adequately preparing and responding to extreme events, including heat. Older populations are one group of our society who are particularly vulnerable to heat. This vulnerability is driven by a combination of physical, socio-economic, and physiological factors[5,7]. The Ethos (Extreme Heat in Older Persons) project aims to better identify vulnerability among older Queenslanders by developing an in-home solution to monitor heat exposure, identify risk, and support appropriate response to heat associated risks. This report focuses on a year 1 sub-study of the larger study - a user survey of older Queenslanders (65 and above), which sits under the umbrella of the larger project.

Core to the Ethos project is the theoretical concept proposed by an early warning systems framework by Garcia and Fearnley[8]. This tested framework commonly utilised at a population level to manage disaster and extreme weather risks, is framed around four key elements: risk knowledge, monitoring, communication, and response capability[8]. To achieve the Ethos project goals, it is critical to understand views and perspectives of our target population. To this end we undertook a state-wide survey of older people in Queensland to understand their heat and health risk knowledge, heat coping strategies, and accessibility to and use of digital technologies. The key areas addressed by this survey to fulfill this aim include:

- **Knowledge and attitude towards heat as a health problem**: this section focussed on knowledge, attitudes, perception, and experience of extreme heat conditions and the impact of the heatwaves on health of the respondents.
- **Behaviour when responding to heat stress and heat event messaging:** The survey questions in this section were formulated around: How do people currently respond to increased heat? What messaging are they currently receiving, and does it change their behaviour? How do older people in Queensland monitor and respond to heat as a health problem?
- **Attitude and use of personal and monitoring technologies:** The key research questions used to formulate survey questions in this section were: Do they have access to and use personal or monitoring technologies? and What are their perceptions of use (and barriers to use) of current and emerging personal and monitoring technologies?

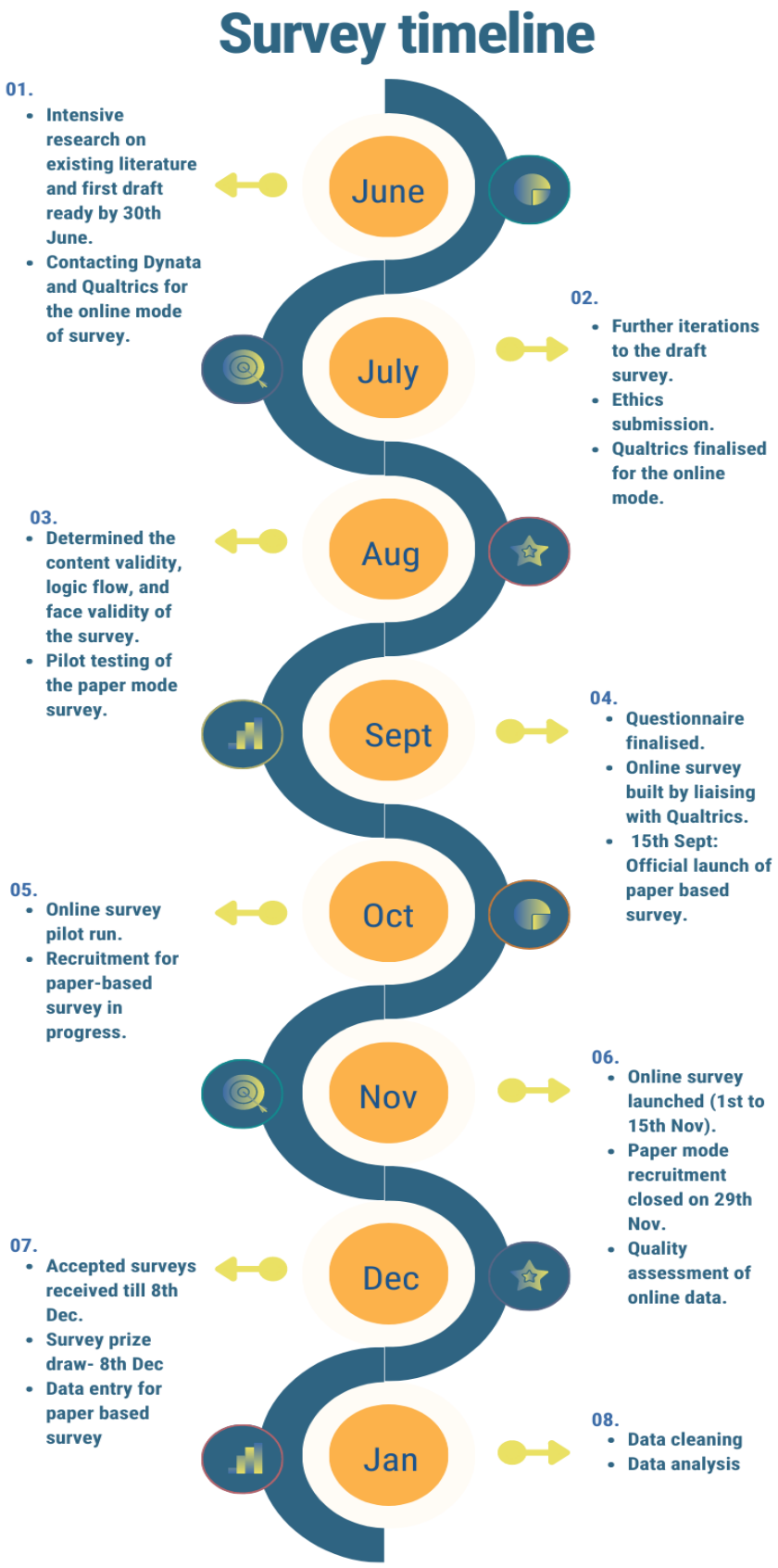

Figure 1. Timeline of survey processes

1. Sample size: target population

Sample size determination is an important aspect to consider for attaining accuracy with the data collected, as sample is an approximate microcosm of the population. According to Australian Bureau of Statistics (ABS), population in Queensland is around 5.2 million with older people accounting for 16-17% of this population[9]. Assuming the population of older Queenslanders to be approximately 850,000, a survey sample of at least 384 was required for the results to meet 95% confidence level with 5% margin error.

Queensland, the third largest state in Australia, has varied climate zones ranging from tropical to hot arid[9]. With different climatic conditions the impact of heatwaves can be felt differently, and people may be using different behavioural strategies to cope with heat. To capture these nuances in our survey we applied climate zone quota to our online sample. This was based on the proportion of population in each zone- 11% for climate zone 1, 81% for zone 2, 3% for zone 3, and 5% for zone 5[9].

No age or gender quotas were applied as it is very challenging to target respondents over the age of 65 or above in online panels. Applying these quotas would have had a negative impact on the feasibility and data collection times for the survey. Instead, only climate zone quotas were applied.

2. Survey design and development

As the primary goal of the Ethos project is to develop an individualised early warning system (EWS) for people aged 65 and above, collecting information from this age group was one way to improve our understanding of the potential user group, with regards to heat, health, and digital technology. Using this survey as a tool helped us gain an insight of the perspectives and views of older Queenslanders regarding the problem under study.

The survey was loosely structured on Garcia's and Fernley's[8] EWS framework (Figure 1). Early warning systems are used in disaster risk management to provide timely warnings to populations at risk. These warning systems are people centred with four key components: i) risk knowledge, ii) detection, monitoring, and forecasting, iii) building response capacity and preparedness, and iv) communication or dissemination of information. The Ethos survey was an omnibus survey designed with no specific hypothesis, but rather to collect data on the four key areas including demographics. The sections were designed with three key objectives to determine: i) knowledge and attitude towards heat as a health problem, ii) attitudes and use of personal and monitoring technologies, and iii) behaviours in responding to heat stress and messaging so as to inform the development of our designed system.

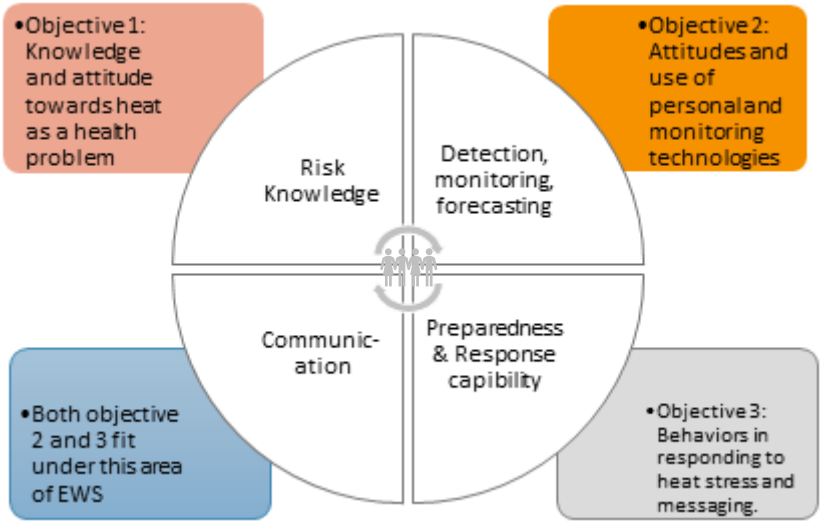

Figure 2. EWS framework linked to the survey objectives.

2.1 Section I – Demographics

This section included background information about the respondents incorporating social, economic, and physiological factors. It also included a subsection on individual health and co-morbidities so as to develop an increased understanding of our target population's health status. The questions in this section were based of standard questionnaires of ABS, Australian Institute of Health and Welfare (AIHW)[11], adapted from Griffith University's Climate Action Survey (CAS)[12], National Seniors Australia[13], and Queensland household energy surveys[14-15]. The UCLA loneliness[16] scale was also used to assess the level of social engagement in the respondents. Existing literature underscores the significance of all these factors as key determinants shaping individual responses during periods of very or extremely high temperatures.

2.2. Section II – Heat health risk knowledge and experiences

Section II of the survey was linked to the risk knowledge component of the EWS framework. The questions in this section were designed to access the level of knowledge that people have relating to extreme heat or very hot weather, to identify their perceptions about heat as a problem in general and heat as a problem to them personally (i.e., affecting their lives and living circumstances), and to gather information about their heat/extreme heat related experiences (targeted towards their health).

This section was mainly derived or adapted from surveys conducted by van Loenhout and Guha-Sapir[17], Nitschke et al [18-19], Soebarto et al[20], Hansen[21-22], Van Hoof et al[23], National Health Australia Survey (2020-21)[24], CAS survey[12], Sweltering Cities Summer Survey[25], ASHRAE SCALE (Bills et al[26]), and Kosatsky at al[27].

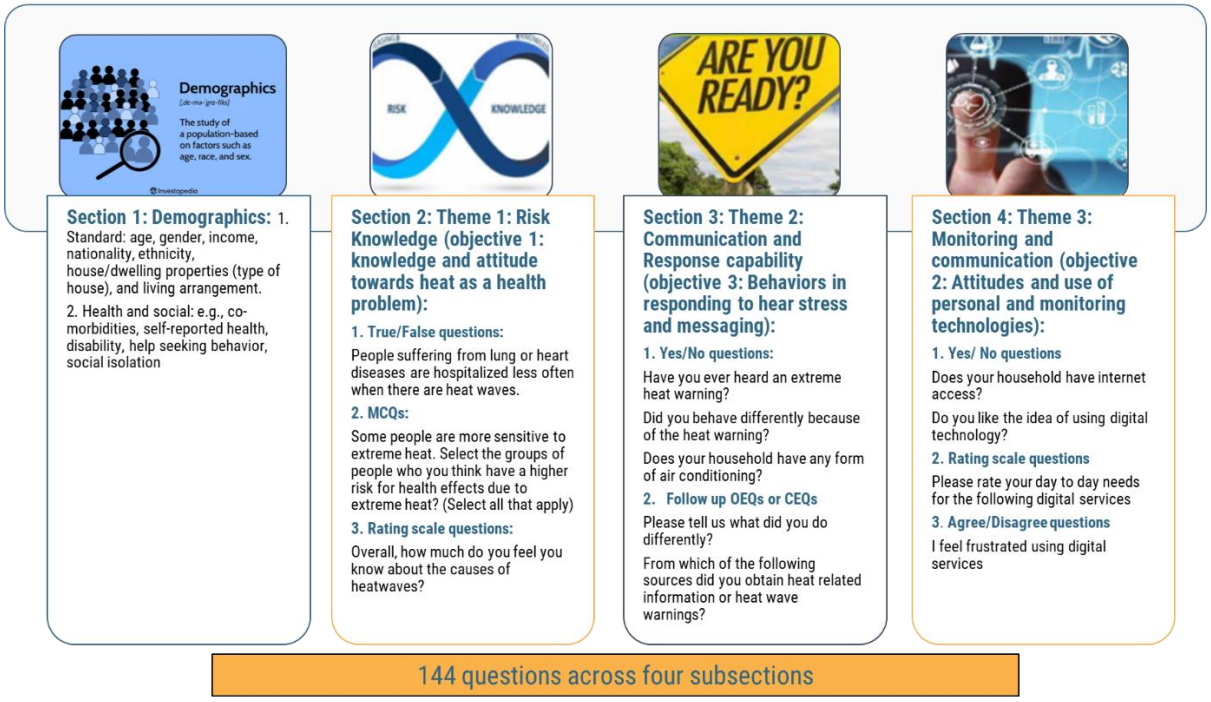

Figure 3. Overview of the four key sections of the survey linked to objectives and EWS framework.

2.3. Section III – Communication and cooling behaviours

Section III was based on the response capability, warning, and communication component of the EWS framework. The section gathered information about the respondent's knowledge of the existing systems of heatwave warnings and their preferences regarding sources for disseminating heatwave warnings and heat preparedness information.

It also includes a subsection aimed at identifying information about behaviour and response to heat and heat warnings. These questions aimed to collect information about help seeking behaviour, who they contacted during their time of need, heat adaptive modifications that they have installed or would like to install, and any factors or issues that prevented them from making changes to their home. These sections were based on the research of Soebarto et al[20], Sweltering Cities summer survey[25], Van Hoof et al[23], Sheridan (2007)[28], Nitschke et al[18-19], Madrigano et al[29], Erens et al[30], Howe et al[31], Khare et al[32], Lefevre et al[33], Loughnan et al[34-35], Lane et al[36], Lee & Shaman[37], and adapted from the CAS survey[12].

The final subsection focussed on air conditioning use. This section is important as air conditioner usage is a common solution to deal with extreme heat but has negative effects on the environment as it requires a high amount of energy and contributes to greenhouse gas emissions. Further it is expensive to run. The questions in this section focussed on various aspects of air-conditioning use- what time of day, at what temperature, and if they did not have, or did not using air-conditioning, exploring the reasons for this (Lee and Sharman[37], Richard et al[38]).

2.4 Section IV – Digital technology usage and acceptance

A key part of the Ethos system is an in-home device that issues alerts. Section IV of the survey was based on the monitoring, and communication component of the EWS framework. The aim of the questions in the section was to understand experiences and interest of the target group around technologies. It drew on the Senior Technology Acceptance model (STAM)[39] to gather data about frequency, trends, ability,

barriers, comfort, and confidence of older people in using digital technology and services. Table 1 describes the linkage of each question in section IV to STAM theory (Li 2016[40], ACMA 2018[41], Anderson 2017[42], National Senior Australia[43], Thomas et al[44], He et al 2013[45], Vaportzis et al[46], Sun et al[47], Heponiemi et al[48], Chen et al[49]).

Table 1. Linkage of each question in section IV to STAM theory

Questions	Factors of STAM accessed
K1, K3, K18A	Attitude towards using technology (ATT)
K2, K4, K5, K14, K16	Usage of technology
K6, K8	Frequency of usage
K7	Perceived usefulness, attitude towards technology usage
K9, K15	Gereontechnology self-efficacy
K10, K11	Confidence and perceived ease of use
K12, K18B, K18F	Perceived usefulness
K13	Facilitating conditions
K17, K19	For our designing component
K18C, K18D	Perceived ease of use
K18E, K18G	Facilitating conditions
K20, 21	Economics component
K22	OEQ

2.5 Validity: construct validity and survey piloting.

The survey was piloted with the user group (6 respondents for paper-based survey and 30 people from the panel of Qualtrics for the online mode). The survey was estimated to take approximately 25 minutes to complete online and 35-40 minutes when done on paper. During the piloting phase, the survey questionnaire was developed and shared with the stakeholders/experts across the fields of public health, heat-health epidemiology, sociology physiology, and digital technology to determine the content of the survey. This process contributed to the confidence in the content and face validity of the survey. Additionally, the survey was developed based upon already existing surveys[11-23] and adapted to the Queensland context, with the addition of further questions specific to this context developed in collaboration with major stakeholders.

Construct validity was determined by arranging a few questions in descending and ascending order scales. This according to literature is useful in reducing the response bias, especially in Likert scale questions[53]. All this process resulted in the development of a 144 questions long survey tool with 141 closed ended questions (CEQ) and 3 key open-ended questions (OEQ).

3. Survey Conduct (Administration method)

The Ethos Heat-health survey of older Queenslanders was administered through two modes:

1. **Online via panel (conducted in Early November 2022):** A survey company was contracted to implement the online survey using its panel method. The company was chosen because of the quality processes it offers around data collection with bot screening in place along with its commitment to provide the desired sample size using climate zone quotas. First, to test and refine the survey questionnaire to be used for the main study, a pilot study was conducted on 43 Older Queenslanders selected randomly from the professional survey provider's volunteer panel. The results helped us refine the final questionnaire before continuing the main study. A sample of 412 Queenslanders aged 65 and above completed the online questionnaire modified after the pilot testing. These people were randomly selected from the company's volunteer panel.
2. **Paper-based (Mid-September till Early- December 2022):** The aim was to recruit a sample size of around 120 Queenslanders aged 75 and above to complete the same paper-based version of the online questionnaire following pilot testing of 5 people in the target population, then refinement. The main sample was recruited through formal networks with project partners (by advertising using flyers [see Appendix 1] with requests to contact the project team to facilitate the posting of questionnaires to a mailing or email address) and informal networks. This sample was also recruited through newspaper advertisements as highlighted in the next section. This mode and age focus was chosen:
    - to reduce bias around digital technology use, as this was a key component of the survey, and
    - digital technology and the internet usage is less prominent in Australians over the age of 75, compared to Australians aged 65-74[50].

Table 2. Survey administration overview

TARGET POPULATION	Queenslanders aged 65 and above.
FINAL SAMPLE SIZE	412 (online) & 135 (paper-based)
ADMINISTRATION	Self-Administration through online and paper-based modes
SURVEY LENGTH	25 minutes (approximately)
SURVEY TIMING	Sept- Nov ,2022

3.1 Survey (paper-mode) Recruitment Methods

On the 15th of September, the paper-based survey was officially launched at the 2022 Brisbane Care Expo. Following the Expo, the survey was promoted to personal networks of the whole Ethos team, which included family, friends, colleagues, and the network of our reference group member.

Griffith University networks were also utilised, promoting the survey through the Griffith staff newsletter and the Griffith volunteers' page. Survey flyers were distributed and displayed on campus notice boards, Griffith Health Clinics, and Griffith Dental Clinics. Care was taken to meet all ethical guidelines while promoting the survey.

A variety of media channels were used to promote the survey and increase awareness of heat as a health issue for older Queenslanders. These included printed media such as newspapers, magazines, and local newsletters, as well as online news and social media outlets and radio interviews reaching all areas across Far- North to Western parts of Queensland. The most successful recruitment channels (media outlets) used were the Senior, Your Time, Ipswich Local news, and 50 & Better magazines (refer to Table 3). For a complete list of news outlets, see appendix C. Survey was also promoted on social media channels mainly, LinkedIn and Facebook. This resulted in 202 surveys sent out and 138 surveys received.

Table 3: Most successful media outlets for recruitment

Gold Coast's Over Fifties' Magazine	Your Local Newsletters | Read Online
Griffith Staff Newsletter	Older participants needed for survey into the effects of extreme heat (sharepoint.com)
Your Time Magazine (Sunshine Coast and BNE)	Your Time Magazine | November 2022
The Senior Newspaper (QLD)	The Senior | Read Online

Figure 4. Ethos survey recruitment i) article in Your Time (left), and iv) article in Over 50's magazine (right)

4. Data collection, cleaning, and consolidation

Data collection and entry are vital steps in the survey process that impact the quality, reliability, and usability of the survey results. By ensuring accuracy, validity, and ethical considerations, researchers can leverage survey data to derive valuable insights and make informed decisions. Steps taken to ensure data quality included:

- For paper-based questionnaire, data was entered using the data codes set for the online questionnaire. This maintained uniformity and assisted the merging process of online and paper data.
- Data entry was conducted by numerous members of the research team- 10% of data was double checked.
- Quality checks were conducted via a Python program to find any outliers or records that did not meet match the quality check criteria.
- The online data collected by Qualtrics were subjected to bot checks and validity checks as per company explanatory notes and the research team also ran quality checks to find outliers or responses that did not meet the desired criteria.

Following these steps, the online and paper-based data was merged for data analysis. This merging was considered appropriate because the survey questionnaire was identical for both modes of survey administration and data collection. Moreover, few questions (K2 and K4) from the digital section were utilised to find if there were key differences in characteristics of paper and online respondents before merging the datasets.

5. Lessons learnt

Various lessons were learnt through the Ethos survey process (timeline in Figure 1) from design to data cleaning. The key lessons learnt are highlighted below:

Survey design & development

- There was a lack of validated survey tools to measure heat health risk knowledge and perception.
- Questions and survey scales required adaption based on older Australians.
- Surveys need to be designed in a way that is clear to understand of an appropriate length considering the target population.
- Providing an "*other*" as option helped to capture some nuanced responses in the population.
- Piloting with experts and target sample was key to the development of an easy-to-understand survey which captures the required information.

Recruitment and Reach

- Partnering with a trusted panel company for an online mode of the survey was important. They had appropriate quality checks and bot checks in place, which ensured high quality in data collected.
- While paper-based surveys allowed us to reduce bias, the strategy required significant investment in communication team resources and required more time to ensure that target numbers are met.
- Radio interviews were not deemed as a successful way to recruit participants for the survey, instead newspaper articles were major channels that helped with recruiting participants for the paper-based survey.
- Fear of scamming was an issue for our population due to the data collection phase coinciding with a carrier data leakage problem.
- Timeliness is key: Have a recruitment plan and connect with media sources in timely manner. Know deadlines for publications as timelines for most media channels are pre-determined. Additionally, it is good to start connecting with the right people before recruitment. Start reaching out approximately 2 months in advance from the date you want your article to be published. This is important in the case of time-based studies where surveys or research is open for a limited time period.

- Communication is key: Be clear and adaptable: Adapting your communication depending on the target population and their knowledge. For instance, we had to be mindful in using terms such as “climate change” as this led to disinterest in some with comments like: *“love the heat”, “it has always been hot”*.

Hard to reach parts of Queensland

- It was hard to reach the local newspapers in regional areas, specially in climate zone 3.
- Because of the lack of support from media channels to publish about our research, the survey and the general disregard of heat as an issue (for example, *“not issue, as they can turn on their air conditioner”, or “heat is not something they were concerned of” or “they don’t need digital devices”*) it was very difficult to recruit people from climate zone 1, 3, and 5.

Heat not being considered as an issue- Need to increase heat-health risk awareness and perception.

- Cool summers over the past 2-3 years led to more concern about the cold, floods or Covid 19.
- Lack of awareness regarding heat being a health issue.

This is likely to change since 2023-24 summer has been hot and humid as evident from 15 BOM heatwave alerts being issued this summer.

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