**Intro:**

The project aims at demonstrating how different National Collaborative Research Infrastructure Strategy (NCRIS) facilities (i.e., Population Health Research Network, PHRN and Australian Urban Research Infrastructure Network, AURIN) can work with custodians to obtain SA1 level linked health data that would provide granularity to our study. With this data it is possible to generate health indicators at a finer spatial granularity, bringing insights that are beneficial to research communities and decision makers. From this perspective, this project is a pilot project for helping researchers in the future to follow the procedure we are going through (which will be documented and shared by the end of this project) and obtain data in their own research.

**Risks:**

This study will be carried out according to the ‘5 Safes framework’. As we will be applying all ‘5 Safes’ in combination, the overall risk of disclosure is very low:

1. Safe people: We have a highly experienced team of researchers covering various disciplines who are aware of issues of confidentiality, privacy, and the conditions of data usage through numerous similar studies that have addressed these issues. Investigators either have experience in working with linked data (Melanie) or person-level linked health data (David, Derrick), or will take course for linked health data in order to gain experience (e.g., Flavia, Hao).
2. Safe projects:. This project has been peer-reviewed and funded nationally by XXX and its benefits are discussed below. Findings will not be used for compliance or regulatory purposes.
3. Safe settings: Data will be stored on the secure computer network at SURE facility. Access to the datasets is restricted to research team members who are named in the ethics application and have signed a confidentiality document. Users also need to install a personal digital certificate on each computer from which they access SURE.
4. Safe data: Direct identifiers including names, addresses, full date of birth are not provided and researchers have no direct contact with participants.
5. Safe outputs: the output health data indicators will be aggregated and smoothed in order to reduce the risk of disclosure to a minimum. A risk assessment procedure will be conducted through the project advisory committee, which is independent from the project steering committee. All publications and presentations arising from this project will not contain any identifying information, and no individual, medical practice or hospital will be identified or identifiable in such material.

Specifically, since we are using SA1 level linked health data in this project, the reporting of the health indicator data consider two key issues in order to minimize identification risk: (i) data privacy and (ii) statistical stability. Data privacy relates to the responsibility to protect the identity of individuals in their data, and ensure that this is not compromised by the release of that data for reporting purposes. Statistical stability relates to the inherent random fluctuation of statistics based on small numbers of cases; the smaller the numbers, the more they fluctuate, potentially leading to incorrect interpretation. These issues are particularly relevant when considering geographical data. To address both these issues for geographical data, we will use a specific statistical method known as “spatial smoothing”. While standard methods typically only adjust for age and sex in each area, spatial smoothing recognises the geographical structure of the data and includes data from the neighbouring geographical areas when calculating the spatial estimates. This additional data provides greater stability to the estimates. In addition, because the spatial estimates are modelled, rather than observed, spatial smoothing reduces any risk of identifiability for specific individuals. Smoothed estimates are designed to reflect the real differences in the underlying rate or risk between areas. For this study, the spatial smoothing will be adjusted for age, sex and comorbidities (determined from the principal and secondary discharge diagnosis fields).

**Benefits:**

The AusUrb-HI pilot project is a joint effort between federally funded National Collaborative Research Infrastructure Strategy (NCRIS) facilities (ARDC, AURIN, PHRN) to facilitate access to SA1-level linked health data, which would otherwise be difficult for researchers to obtain. The data will be used to produce new, high value data assets (indicators) that will improve our understanding on heat vulnerability and liveability in urban and regional areas.

Climate change poses a significant threat to population health in urbanised areas, particularly through the urban heat island effect. Rapid urban growth and densification, as well as an increasing demand for new housing stock in Australian towns and cities are likely to exacerbate the effects of extreme heat and increase heat-related illnesses while adding pressure on health infrastructure systems. These elements underpin the need for climate sensitive urban planning and design decisions at local level to counter the effects of extreme heat on population health.

However, existing indicators for heat vulnerability do not include an adequate level of spatial granularity or detailed understanding of human health to generate adequate solutions.

More detailed research is needed to understand the complex set of underlying health conditions (and relationship between emergency department presentations, hospitalisations, deaths) exacerbated by heat, as well as the close relationship between human health and the characteristics of the built environment – the context in which they occur, in order to generate a comprehensive understanding of heat vulnerability at a local level.

The new indicator data assets developed through the AusUrb-HI project using linked health data will allow us to identify incidence patterns and other key risk factors across urban and regional population. We will integrate health, socio-economic, environmental, climate and built environment datasets to provide a holistic spatially-explicit understanding of urban population health. These indicators will allow health, urban and social infrastructure planners and policy makers to develop targeted policies and actions, and the outcomes will be shared with the research community.

The AusUrb-HI pilot project will provide outcomes at SA1 level, which will enable researchers, policy and decision makers to inform evidence-based action towards climate resilient cities, which is urgently needed to understand the drivers behind heat vulnerability and address issues at a local and urban (macro) scale.

The added value of this project contributes to better understanding of effects caused by heatwaves, which are Australia's deadliest natural hazard and the occurrence and severity of is predicted to increase and become more frequent through climate change, including effects such as extreme heat in densely built urban areas with low vegetation through the urban heat island effect in Australian cities and towns. It aligns with the federal government’s goal to reduce green-house emissions by 43% by 2030. The need to urgently address urban heat to avoid preventable deaths has been highlighted through several cities, including Melbourne, who have appointed Chief Health Officers to manage the risk of extreme heat to population living in cities. “In Melbourne, deaths begin to rise when the mean daily temperature reaches 28℃, with hospital admissions for heart attack increasing by 10.8 per cent when the mean daily temperature reaches 30℃. When the average temperature is higher than 27℃ for three consecutive days, hospital admissions increase by 37.7 per cent. This suggests that even a small reduction in temperature during a heatwave will reduce the numbers of deaths.” ([The Conversation, 2022](https://theconversation.com/melbourne-now-has-chief-heat-officers-heres-why-we-need-them-and-what-they-can-do-192248)) It’s also important to understand the importance of heatwaves regarding environmental population health considering all aspects that might play a role, so they can inform evidence-based policies and actions to .

The findings are expected to lead to improved understanding of urban planning and design options for positive public health outcomes, leading to improved urban planning and decision making. The research will also contribute assets to the research community that will help other researchers investigate similar phenomena in the built environment at every stage, from data integration and analysis methodologies. This project will provide us with a precision medicine approach to identify local areas of vulnerability to heat which could be used to mitigation interventions (e.g. local government planting more trees, or erecting shade cloths in areas with high heat vulnerability)”.