GOVERNMENT OF WESTERN AUSTRALIA

Sustainable Health Review

This submission is provided to the Sustainable Health Review by the Cooperative Research Centre for Spatial Information (CRCSI).

The information provided was prepared by the Health Program of the CRCSI and is endorsed by the organisation. For further information regarding any elements of the submission please contact the Director of the health Program, [redacted] Contact details are provided within the submission.

Sincerely,

Graeme Kernich

Acting CEO, CRCSI

GOVERNMENT OF WESTERN AUSTRALIA

Sustainable Health Review

Submission from the Health Program of the Cooperative Research Centre for Spatial Information (CRCSI)

Submission Purpose

The purpose of our submission is to highlight the potential **spatial information** has to enrich our understanding of health systems, drive strategies for greater effectiveness, efficiency, equity and overall performance and improve the health of the community through improved decision-making.

In addition, we propose a shift towards a **Precision Public Health** (PPH) paradigm which aims to harness data, from cells to cities, to provide innovative approaches that improve the health of populations. Underpinning the PPH paradigm is spatial information.

Both of these recommendations will help us realise our vision: By 2030 individuals and clinicians are empowered through data, analytics and technology to take more informed preventative health action and responsibility for health outcomes is shared.

These recommendations are embedded within the framework of the terms of reference (relevant to our submission) of this review.

Response to the Sustainable Health Review Terms of Reference

Ways to encourage and drive digital innovation, the use of new technology, research and data to support patient centred care and improved performance

a) **Increased uptake of spatial data and related technology**
The health and well-being of people critically depend on where they live, work and play. A person's location influences their health, education, access to social services, socio-economic status, environmental exposures and their interactions with other people. Location is the one common element which enables these factors to be considered under one common framework. We now have strong evidence that spatial information is valuable in the health domain:

i. Spatially Enabling the Health Sector[i], a paper by Tarun Weeramanthri and Peter Woodgate purports that greater utilization of spatial information and its related technology, as part of a broader redesign of the architecture of health information at local and national levels, could assist and speed up the process of health reform. In making this point, they describe the impetus for health sector reform, recent developments in spatial information and analytics, current Australasian spatial health research and highlight examples of uptake of spatial information by the health sector.

ii. Location Matters – the value of spatial information for people-centred policy[ii], a soon to be published paper by the Department of the Prime Minister and Cabinet, the Australian Institute for Health and Welfare the Western Australian Department of Health and the CRCSI provides an excellent overview and case studies demonstrating the value of spatial information.

iii. The APS200 Location Project[iii] endorsed the value of spatial information in assisting the running of government, including health to the Australian Government Secretaries Group.

iv. The Western Australian Department of Health are leaders in this field and are behind a national Roundtable series bringing senior executives together to discuss ways of increasing the uptake of spatial information for policy development.

Note: Further explanation of spatial information is offered in Appendix 1.

b) **Augmenting system data with individual level data**
With the emergence of new wearable and sensor technology we are seeing a deluge in personal data (wearable monitors, smartphones, electronic health record, genetics information, citizen science) and environmental data (environmental health surveillance system data, remote sensing, satellite imagery and weather data), however this data is not being harnessed in the public health domain. Additionally, with the deployment of the new My Health Record by the Australian Digital Heath Agency, individual primary health data will be accessible for research purposes. Augmenting this data with routinely collected system data will provide a wealth of opportunity to enable sophisticated predictive modelling for chronic disease management.

c) **Development of predictive algorithms for chronic disease modelling**
Advancement of Artificial Intelligence (AI) and machine learning provides timely opportunity to utilise these new data sources to predict adverse health events.

d) **Integration of big data and analytics on cloud based platforms**
An integration platform will be required to pull these data sources together with newly developed algorithms to enable real time streaming and accessibility.

e) **Development of clinical application to inform patients and clinicians**
R& D is needed to develop applications to communicate with individuals and clinicians which will assist in empowering consumers to take a greater level of responsibility for their health outcomes.

Opportunities to drive partnerships across sectors and all levels of government to reduce duplication and to deliver integrated and coordinated care

a) **The Cooperative Research Centre initiative**[iv] of the Commonwealth Department of Industry Innovation and Science provides an excellent framework for collaborative partnerships. The CRCSI have been in partnership with the WA Department of Health since 2010 and have jointly invested in projects that have delivered utilisable outcomes that have improved efficiency and health outcomes. The CRCSI have an extensive partnership network both domestically and that enable its partners to leverage research funding and share learnings.

Ways to drive improvements in safety and quality for patients, value and financial sustainability, including cost drivers, allocative and technical efficiencies

a) **Increase uptake of spatial information**

A number of case studies have demonstrated efficiency gains resulting from the use of spatial information and related technology. Benefits are measured in terms of return on investment, increased productivity, internal efficiency and time saving. A report produced by ACIL Tasmania outlines the economic benefits[v].

The key enablers of new efficiencies and change, including, research, productivity, teaching and training, culture, leadership development, procurement and improved performance monitoring

a) **Consider a Public Health Innovation Model**
The Public Health Innovation Model (PHIM) is proposed in a Frontiers in Public Health article[vi] as a tool for public health leaders who wish to integrate innovation into public health practice. This model merges traditional public health program planning models with innovation principles adapted from the private sector, including design thinking, seeking funding from private sector entities, and more strongly emphasizing program outcomes. The paper also discuss principles that leaders should consider adopting when transitioning to the PHIM, including cross-collaboration, community buy-in, human-centered assessment, autonomy and creativity, rapid experimentation and prototyping, and accountability to outcomes.

Any further opportunities concerning patient centred service delivery and the sustainability of the WA health system

a) **The Precision Public Health Agenda**
The CRCSI together with the Western Australian Department of Health Public Health Division are driving the Precision Public Health (PPH) agenda. At the heart of the PPH paradigm is the need for integration of new and existing technologies, which more precisely describe and analyse individuals and their environment over the life course, in order to tailor preventive interventions for at-risk groups and improve the overall health of the population[vii].

i. The CRCSI have determined a number of research priorities in order to enable research to assist in delivering the required elements of a PPH system. This research can be leveraged by the WA Department of Health to drive change. An envisioning paper by the CRCSI Health Program provides a snapshot of the elements of the PPH and the requirements to commence laying the foundations for such a system[viii].
Note: An overview of the CRCSI is offered in Appendix 2.

ii. An Australia/Asia PPH Summit is being planned for October 2018 here stakeholders will come together to determine what can be done as a nation to drive this agenda.

iii. The Office of Science and Innovation Australia is currently considering a Precision Public Health Moonshot as part of their 2030 National Science and Innovation Agenda[ix].

Appendix 1: Overview of Spatial Information

What do we mean by Spatial Information?

Spatial information is the digital connection between location, people and activities. This information can graphically illustrate what is happening (where, how and why) to show the insight and impact of the past, the present and the (likely) future. Traditionally spatial data have been uniquely characterized as geographic (e.g., longitude and latitude) or map-based coordinates.

Spatial data therefore is data that has an x,y, and z coordinate as an attribute and will increasingly in the future be time stamped. These characteristics are required for the data to be 'spatially enabled'.

Spatial information includes data, the data products (maps and other ways of visualising data, etc.) that utilise these data, the resultant insights (summaries, statistical analyses, interpretations), and the decisions, outcomes and impacts that are based on these data, products and insights.

How is Spatial Information used in health?

Spatial tools have been used for many years to explore environmental determinants of cancer, describe risk factors for chronic disease, investigate disease transmission, and plan for and respond to natural disasters, including in low-resource settings, where application to infectious disease surveillance and outbreak response predominates[x]. Indeed, modern public health, in the English-speaking world, was founded in the work of John Snow and his carefully drawn cholera maps in the London of the 1850s[xi].

In the last two decades, the possibilities for mapping and for spatial analysis of disease patterns have changed dramatically, as computer power has increased and Geographic Information Systems (GIS) have emerged as individually accessible software, allowing for more widespread, complex and comprehensive analyses than previously. Such advances have made it possible for medical geographers, and others, to seek answers to questions that were previously overly complex and unfeasible. Through GIS analysis it is possible to understand why things are located where they are and, in combination with health and other sciences, how they are related. Obtaining disease and health data has been made easier by low-cost global positioning system (GPS) units and the improvement of the quality of Remote Sensing (RS)[xii].

Key insights can be discovered when we overlay health data with other seemingly disparate data sets such as transport, location of types of food supply, socioeconomic status and environmental data.

The Value of Spatial Information in Health

Spatial information answers the key question 'Does my location affect my health'?

A pertinent example of this is the landmark Atlas of Cancer in Queensland report released by the Cancer Council Queensland in February 2011[xiii]. The Atlas provided small-area survival outcomes for the first time in Australia, as well as patterns in small-area cancer incidence (diagnoses) using novel spatio-temporal analysis. The study found that incidence patterns varied by cancer type, with higher incidence for certain cancers in more urban areas (e.g. breast, prostate, thyroid cancers) and higher incidence in more remote areas for some cancers (e.g. lung cancer). It also found that people living in rural and remote areas have poorer survival for many types of cancer than people living in urban areas and lower survival was observed among many socioeconomically disadvantaged areas. The report played a major role in the development of public policy reforms, including a landmark increase of Queensland's Patient Travel Subsidy Scheme in 2013. The findings of the Atlas report have been widely utilised to inform the work of government agencies, health policy makers, and non-government organisations. A National Digital Atlas is now being developed by the research team in partnership with the CRCSI and the Australian Institute of Health & Welfare.

In another example, spatially enabled health data collected from the Western Australian Health and Wellbeing Surveillance System was analysed to determine whether individual-level childhood excess body weight is related to residential availability of fast food and healthy food outlets[xiv]. The local food environment around children's homes was shown to have an independent effect on child weight status. An increasing number of healthy food outlets within 800 m of a child's home was associated with a significantly reduced risk of being overweight/obese in all models tested. After controlling for age, physical activity, time spent sedentary, weekly takeaway consumption, area disadvantage, and count of fast food outlets, each additional healthy food outlet within 800 m was associated with a 20% decrease in the likelihood of a child being overweight or obese.

Other case studies that demonstrate the value of spatial information in the health sector include mapping and matching of needs and services, and evaluation of outcomes (including adverse events and medical errors), depending on location of residence or work[xv]. For example, a recent study looked at the variation in common hospital procedures (such as arthroscopies, caesarean sections, and cardiac procedures) across regions in Australia and found that much of the variation was unwarranted, unrelated to demonstrable need, and hence not a good use of scarce resources[xvi].

Less frequently explored is how geocoded social determinants can be used to improve patient care at the community health centre level. CRCSI funded research has identified the spatial clustering of older patients with poorly controlled diabetes within a large Australian general practice using individual-level data[xvii]. Such analyses promote new preventive strategies, and stimulate better targeted approaches to patient management at a community level.

For more information and case studies see, Location Matters – the value of spatial information for people-centred policy[ii].

Appendix 2: The Cooperative Research Centre for Spatial Information (CRCSI)

The Cooperative Research Centre for Spatial Information (CRCSI), represents a collaboration between universities, government and industry partners that collectively engage with a range of sectors including the health sector.

The CRCSI builds on 15 years of user led collaborative research, leading to new and exciting commercial and applied results delivering impacts estimated at $730M. Since 2003 the CRCSI has generated an impact of $2.50 for every $1 of investment in collaborative projects calculated through a well-developed Commonwealth Government Cooperative Research Centre impact assessment tool and guiding framework.

Our Role

- To **formulate** and **deliver** innovative solutions for the social, economic and environmental challenges present in an increasingly complex and interconnected world, especially those that involve nation building.
- To **enable** national infrastructure and industry capacity to meet future challenges and demands.
- To **connect** our partners with the most capable people and organisations to undertake user led research in location technologies, data exploration and analysis, that deliver solutions and enhance business opportunities.
- To **guide** the private sector and government through the innovation, research and development process, navigating our partners to the best outcome.

Health R&D Program

Since 2010, the CRCSI has had a dedicated ***health program*** managed by a national program manager and supported by a program board (representing industry, government and universities) which is chaired by Professor Tarun Weeramanthri, Assistant Director General of Public Health at the WA Department of Health. The Program is also guided by an Australian and international science director as well as state-wide business development managers. The program is focused on the interdisciplinary field of spatial health research, translation and commercialisation of enabling technologies to improve people's health and well-being.

Health Program Vision

By 2030 individuals and clinicians are empowered through data, analytics and technology to take more informed preventative health action and responsibility for health outcomes is shared.

Related link

www.crcsi.com.au

References

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