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RESEARCH

A Systems Thinking Approach for Community Health and Wellbeing

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Abstract
Under national or state-based legislation, local governments are commonly required to prepare municipal health and wellbeing plans. Yet, the issues these plans aim to address are often complex, and programmatic planning approaches traditionally used by practitioners struggle to engage with such complexity as they assume these issues can be 'solved' in isolation. Systems thinking is increasingly being used as an approach to deal with those struggles more effectively, yet little is known about whether local governments and other stakeholders think systems approaches are feasible and acceptable in practice. This study tested a systems thinking approach to gauge if it could better address complex place-based health and wellbeing issues, such as to reduce noncommunicable diseases. Guided by a systems change framework, the approach comprised a facilitated systemic inquiry and rich picture process involving diverse stakeholders in a remote municipality in the Australian state of Tasmania. Among the participants there was broad support for the systems approach tested and they thought it was effective for increasing systems thinking capacity, collaboratively revealing systemic issues, and identifying opportunities to address those issues. They valued the rich picture because it created shared understandings of local issues. The findings suggest more is needed from macro-level policy to support place-based stakeholders to undertake systems approaches in practice, which could result in more sustainable and effective systems change required to improve health and wellbeing outcomes. The findings have implications for theory, research, and practice across interdisciplinary fields concerned with placed-based systems change, especially in rural and remote municipalities.

Keywords Local government · Noncommunicable diseases (NCDs) · Place-based · Rich picture · Systemic inquiry · Systems thinking

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Introduction

Interest in systems thinking approaches (described hereinafter as systems approaches) to noncommunicable disease (NCD) prevention efforts by practitioners, policy makers, and researchers has grown over the past 20 years. This interest has been partly attributed to the limited success of programmatic planning approaches, whose advocates struggle to engage with the complex, dynamic, and interrelated factors that contribute to the prevalence of NCDs (Hassan 2014; Ison 2010; Riley et al. 2020). These struggles are compounded by 'practice divides', whereby understandings of inter-, cross- and transdisciplinary efforts are required, yet bridging knowledge and understandings has challenges (Lawrence 2021). The literature regarding systems approaches to NCD prevention is slowly shifting from theoretical arguments to practical applications (Carey et al. 2015; Chughtai and Blanchet 2017; Rusoja et al. 2017). However, there are few examples of place-based systems approaches that use systems methods pluralistically for NCD prevention, excepting a study by Riley et al. (2020), who, in this journal, shared their methodology and implementation experience and invited others to test it. While some studies reflect retrospectively on place-based systems approaches for NCD prevention (Bensberg et al. 2021; Joyce et al. 2018; Roussy et al. 2019), few have proactively aimed to test these approaches in practice and understand stakeholder perceptions about whether they are a suitable alternative to programmatic approaches. For example, local governments are place-based actors that commonly have a role developing such plans under national or state-based legislation (Beenstock et al. 2014; Browne et al. 2016), yet few studies have pre-emptively tested the acceptability and feasibility of undertaking a systems approach with them.

To respond to these research gaps, the aim of our study was to work collaboratively with local government and other place-based stakeholders to test a place-based systems approach for NCD prevention to (1) better understand the causes of health and wellbeing outcomes within a local government area and identify opportunities to improve those outcomes from a systems perspective (2) show whether and how a systems change framework (Davidson & Morgan, 2018) can be used at the local level and to get feedback from participants about its usefulness for building systems thinking capacity; and (3) gauge the acceptability and feasibility of the systems approach as an alternative to or could augment programmatic approaches among local government and other place-based stakeholders. Thus, we accept the invitation given by Riley et al. (2020) to test parts of their systems thinking methodology and hypotheses, and note their lessons. Specifically, within the constraints of our project resources, we adapted elements from their methodology to our systems approach (see Rich Picture and Local Advisory Group sections).

The work reported here rests on two arguments. First, if there was better understanding of how place-based systems approaches could replace or augment programmatic planning to address complex issues such as NCD prevention, then emerging insights might inform decision-makers at all tiers of government who shape policy conditions necessary for change. This understanding would be enhanced by learning from diverse perspectives held by stakeholders likely to be involved in implementing those new approaches. Second, if appropriately enabled, systems approaches could contribute to reduced prevalence of NCDs in the longer-term. In the process of prosecuting those arguments, this study makes important contributions to the literature where there are limited examples of place-based systems approaches using systems methods pluralistically for better health and wellbeing outcomes.

The next section of this paper provides an overview of the theoretical context and a brief literature review about how systems thinking has been used for place-based NCD prevention efforts. Then, the study design and methods are described, comprising the study setting, methods used in our systems approach, and for working with various collaborators in the study. The results of our study in response to our study aims are then detailed and followed by a discussion of the results where we examine and draw conclusions about the implications for research, policy, and practice.

Theoretical Context and Practical Applications of Systems Approaches

Systems thinking has evolved from a range of disciplines and is understood in many ways (Castellani and Gerrits 2021). Despite the diversity, most systems thinking theories, tools, and methods attend to interrelationships, boundaries, and perspectives to understand, address, and/or evaluate complex problems (Peters 2014). In this study, we use systems thinking as a conceptual lens positioned in the interdisciplinary fields of systems and complexity sciences (Patton 2015). With this lens, we view places, such as a community or local government area, as complex systems. As complex systems, places have many interacting parts, including people and the contextual factors they comprise, all of which are interrelated, dynamic, and evolving. Places are nested within larger systems, influenced by historical factors and broader societal forces, and like all complex systems are characterised by self-organisation, adaptation, nonlinearity, feedback, and emergence (Castellani et al. 2015; Newell et al. 2007).

Emergence occurs when multiple parts within a system of interest interact and produce an outcome that is greater than the sum of its parts—that is, the parts cannot be considered in isolation to change the outcome (Abson et al. 2017; Valentinov et al. 2016). For example, the high prevalence of NCDs is an example of an emergent outcome. Globally, the most common NCDs are heart diseases, cancers, chronic respiratory diseases, and diabetes, which are responsible for 41 million deaths each year, equivalent to 74% of all deaths (World Health Organization, 2022a). While some determinants of NCDs are non-modifiable, such as genetics and biology, others are modifiable and include individual risk factors related to smoking tobacco, physical inactivity, unhealthy diet, and harmful consumption of alcohol (Australian Institute of Health and Welfare 2019). These risk factors are influenced by broader interrelated ecological determinants of health at various scales, such as social circumstances and physical contexts such as where people are born, live, work, and die (Knai et al. 2018; Lang and Rayner 2012). Given many of these determinants are outside the health sector, it has long been recognised that intersectoral approaches to improving NCDs are necessary (Hancock 2017; Watkins et al. 2017). With a systems approach, the aims therefore are twofold. The first is to improve the whole system to get a better outcome by improving the relationships between the parts. The second is to get a better understanding of how all the factors are interrelated and accordingly affect an outcome, such as NCDs.

When a complex system produces an undesirable outcome, such as high prevalence of NCDs, that outcome can be perceived as a *complex* problem. Complex problems are characterised by having multiple, interacting parts with no clear definition, leadership, or solutions. A systems approach is suitable for addressing complex problems and is evident when a systems lens or perspective is combined with systems tools, methods, and practices by a

collaborative group, such as researchers, policy makers, practitioners, and community members (Newell et al. 2007). Systems approaches enable insights about how the system that produces a complex problem is working and fosters ideas about how the system might be changed so that it produces outcomes that are more desirable than those that exist. Systems approaches allow for testing, reflecting, learning, and adapting to respond to the emerging system dynamics until the change that is sought gets traction (Newell et al. 2007). In other words, a systems approach offers ways to understand and respond to complex problems to get better outcomes.

Complex problems are different from simple or complicated problems (Snowden and Boone 2007). A simple problem can be clearly defined, has a clear cause-and-effect, and steps to its solution can be articulated and repeated. When simple problems follow the same rules every time, they result in the same basic outcome—for example, following a recipe to bake a cake. Complicated problems need more analysis but, with experience, best practice approaches can be applied to achieve predicable outcomes—for example, building a car. Approaches to address simple and complicated problems can be described as programmatic, systematic (differing from systemic), reductionist, or business-as-usual, whereby the problem can be defined, isolated, and solutions identified, and the problem-solving process is linear and outcomes largely predicable.

Complex systems comprise simple, complicated, and complex problems, so a combination of programmatic and systems approaches is required. Yet, approaches to address complex problems such as reducing NCDs, which are sometimes referred to as 'wicked problems', are dominated by (ineffective) programmatic approaches and 'lifestyle drift' (Pescud et al. 2021; Rutter et al. 2017). Lifestyle drift occurs when policy interventions aimed to address upstream ecological determinants of health drift downstream to individual risk factors (Carey et al. 2017). However, systems approaches are increasingly being used to overcome these challenges.

Complex natural and constructed systems can be identified by their function or purpose, for example the nervous system, transport system, or healthcare system. A system's purpose is a judgement made on a set of dynamics that provides a way to bound a system of interest (Reynolds and Wilding 2017). This boundary helps determine what is in or out of an inquiry (of which the consequences of that boundary need to be attended to), and the boundary might shift and change as more is learned about the system. The prevention system aims to prevent (or reduce) the prevalence of NCDs, which may be scaled from community locales to larger geographic areas. Building on the World Health Organization's health system building blocks, Riley et al. (2020) identify and describe parts of the prevention system in local communities. These parts, which may otherwise be abstract or intangible, are adapted and summarised in Table 1.

Both the World Health Organization (2022b) and the UK Government Office for Science (2023) have recently published guidance on how to apply systems approaches for NCD prevention policy and use systems thinking for civil servants in other policy areas, respectively. Within these resources, are many examples of how the policy cycle can employ systems thinking tools and methods such as a systems lens, group model building, network analysis, rich picture, and system dynamics modelling. The World Health Organization (2022b) guidance includes examples of place-based systems approaches for NCD prevention, including that used for Healthy Together Victoria (Roussy et al. 2019), which is perhaps the most significant place-based systems approach implemented globally to date (Swinburn and

Table 1 Parts of place-based prevention systems. [adapted from Riley et al. (2020, p. 6)]

System parts / functions	Description
Policies, programs/ interventions, and regulations	'… 'regulate' the behaviour of people and organisations' within communities
Networks/relationships	People in the system provide a connecting infrastructure between each other and the system parts
Human capital	Includes workforce, volunteers, and community members
Environments/context	Physical, natural, urban, and virtual environments that support or impede efforts to reduce NCDs
Leadership and governance	The 'processes of decision-making and accountability within the prevention system'
Finance and resources	'The adequate funding of prevention'
Monitoring, evaluation, and feedback	'The production, analysis and use of information and evidence to monitor progress and assess performance'
Norms and beliefs	'System norms may be reflected in the attitudes and beliefs of key stakeholders that explain why the system looks and functions the way it does'

Wood 2013). Positively, the WHO's guidance emphasises the importance of participatory approaches for NCD prevention—an essential part of systems change efforts. Specifically, the intersectoral characteristics of the causes of NCDs requires engagement from systems actors from different sectors. While intersectoral action is necessary to achieve improved health outcomes, such actions can generate important co-benefits for sectors other than health (Greer et al. 2022; Swinburn et al. 2019). For example, creating more walkable communities can reduce traffic congestion and subsequently reduce traffic emissions, while also increasing physical activity levels that benefit health and wellbeing outcomes (Newell et al. 2018). The notion of co-benefits highlights the complex interrelationships between sectors and can help overcome problems with siloed working and identify and mitigate negative unintended consequences of actions. Also, engagement with intended beneficiaries of any system change efforts should inform all proposed changes. Such engagement provides a different perspective on a system of interest and can help ensure actions are context-specific, feasible, and relevant (Flavel et al. 2022; Foster-Fishman et al. 2007). While guidance from the WHO and UK Government are welcomed, more examples of systems approaches that use systems methods pluralistically, of systemic inquiry, or of systems frameworks for systems change for NCD prevention (Davidson et al. 2015; Pescud et al. 2021; Riley et al. 2020) would help advance understandings of systems approaches in practice.

Frameworks for systems change are sometimes used to support the implementation of systems approaches to address place-based complex social and health problems. Some frameworks explicitly draw on systems and complexity theories. For example, the ABLe Change framework by Foster-Fishman and Watson (2012), which has been adapted retrospectively for NCD prevention by Pescud et al. (2021). Other noteworthy frameworks include the framework for system-based solutions for childhood obesity by Garcia et al. (2021), and the collaborative conceptual modelling framework by Newell and Proust (2012), which has been used to explore the interrelationships between the built environ-

ment and health outcomes. Some place-based frameworks that aim for systems change may not necessarily be underpinned by theories that conceptualise places as complex systems, such as the Collective Impact framework (Kania and Kramer 2011) or others identified by Christens and Inzeo (2015). Regardless of the underpinning theory, frameworks for systems change often share aligning principles, such as the need to collaborate. Our study used a systems change framework by Davidson and Morgan (2018). Explicitly positioned in systems and complexity theories, this framework is intended to help people become more familiar with systems thinking concepts and practices and take a systems approach to work towards creating systems change. However, to our knowledge, there is limited empirical evidence of the framework's application, hence we seek to show how it can be used by place-based stakeholders and invited feedback about its usefulness for building systems thinking capacity among participants in our study.

The evidence and understanding regarding systems approaches for NCD prevention continues to grow. However, there is a need to continue to test, seek feedback on, and adapt systems approaches to build greater understanding about how such approaches can be implemented in diverse settings, and if they can support the systems change pursued in the longer-term.

Study Design and Methods

This study was conducted as part of a larger research project concerning systems approaches to improve community health and wellbeing and to consider local governments' roles in such efforts. Ethics approval was obtained from the Human Research Ethics Committee of University of Tasmania, Ethics No. 20203. The study design and methods comprise three main parts: an overview of the study setting in the West Coast local government area in Tasmania; the methods used in our systems approach; and our approach to collaboration for the study.

Study Setting

Tasmania is one of Australia's eight subnational jurisdictions and has a population of 558,000 (ABS, 2022). It is governed by one state government and 29 local governments—known as councils—which are responsible for their municipalities or local government areas (Fig. 1). While 83% of the state's population live in the urban municipalities of Greater Hobart, Launceston, Devonport, and Burnie, the remainder live in rural and remote areas (ABS, 2021). This study was conducted between February and July 2022 in the West Coast local government area, one of Tasmania's most remote and least populous areas (Fig. 1).

The West Coast is 9,583.5 km^2 in areal extent and has a population of 4,263, most of whom reside in the four towns of Rosebery, Strahan, Queenstown, and Zeehan. The West Coast is characterised by rugged wilderness and isolation and, since colonisation, mining and tourism. The socio-economic indexes for areas (SEIFA) is a measure for geographic areas in Australia that indicates average socio-economic advantage and disadvantage in terms of 'people's access to material and social resources, and their ability to participate in society' (ABS, 2018). According to SEIFA, the West Coast is in the most disadvantaged

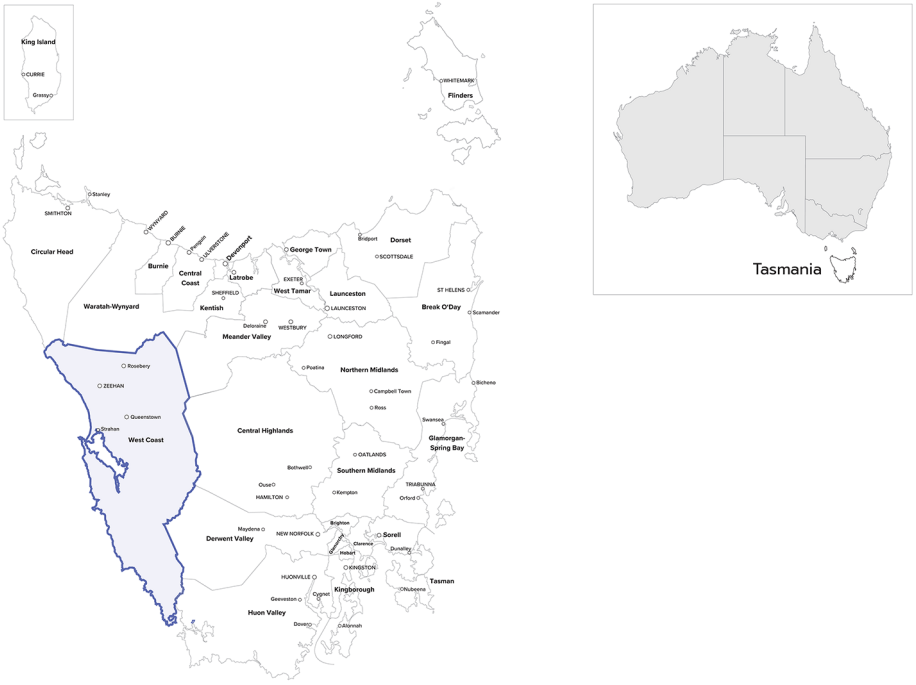

Fig. 1 Tasmania's 29 local government areas, with West Coast highlighted
Adapted from: MapSVG (n.d.) and TASMAP (n.d.)

quintile, compared with the state's capital local government area, Hobart, which is in the most advantaged quintile (ABS, 2018).

In relation to health, 12% of West Coasters have three or more NCDs, similar to the Tasmanian average (ABS, 2020). However, only 56% of West Coasters rate their health as excellent or very good compared with 78% for the Tasmanian average (Tasmanian Department of Health, 2020). West Coasters have rates of smoking significantly higher than the state average (39% compared with 12%), and higher rates of alcohol consumption, and lower rates of fruit and vegetable consumption, and physical activity levels, compared with the state average (Primary Health Tasmania, 2021, 2022).

While the West Coast is unique in its physical and human geographies, it shares some characteristics with other rural and remote municipalities in Tasmania (and elsewhere), among them SEIFA results, remoteness, low population densities, and health outcomes. On that basis, we gauged that findings on systems change processes from a study on the West Coast could be generalisable to (but clearly not representative of) those other areas and, indeed, to other local government areas in Australia and comparable jurisdictions.

Methods

Underpinned by interdisciplinary work in systems and complexity sciences, and embracing methodological pluralism (Midgley 2011; Patton 2015), mixed methods were used for this

study, which we describe collectively as a systems approach. Following, we describe each method and their interrelationships to each other.

Participatory Systemic Inquiry

Participatory systemic inquiry is 'an approach to learning and deliberation which involves multiple stakeholders in generating deep insights into the dynamics of the systems that they are trying to change' (Burns 2012, p. 88; see also Foster et al. 2016). While participatory systemic inquiries can be embedded into longer term action research processes (Burns 2012), our inquiry was a standalone process dictated by the time and resources available to the team for one project in a three year program of research. The main component of our inquiry process was conducted in a community-based workshop, held over two half-days on 6 and 7 July 2022 in Queenstown, Tasmania.

The workshop process was designed specifically to respond to the overall study aims (see Introduction section). To design the process, we were guided by a systems change framework (see Systems Change Framework section), a design considerations resource by Davidson (2021), and consultation with a systems expert and local advisory group (see supplementary material 1 and 2). The process included development of a rich picture (see Rich Picture section), a variety of social learning activities adapted from other systems-based processes and resources, and a paper-based evaluation survey (see Evaluation Survey section). The lead author, who had group facilitation experience, facilitated the workshop.

Systems Change Framework

The systems change framework by Davidson and Morgan (2018) includes two key components. The first is a systemic inquiry process that guides users through stages to gain deeper understandings of a system of interest and identify and act on opportunities to create systems change (centre component of Fig. 2). The four stages of the inquiry process are: define situation, gain clarity, find leverage, and act strategically. The inquiry process is meant to be iterative such that insights generated during the process inform the next stage of inquiry, which may occur in a non-linear way. The inquiry process can be scaled, depending on an inquiry's resources and context. The second component of the framework comprises principle-based actions to support the inquiry process (the three outer circles of Fig. 2). This component outlines practices to make sense of complex problems from a systems perspective, identifies the need to purposefully engage diverse perspectives, and encourages ongoing processes of reflection, learning, and adaptation.

Rich Picture

A rich picture is a type of visual methodology whereby graphics are used to help understand and/or communicate complex ideas among and/or to diverse audiences (Conte and Davidson 2020). While pictures have been used throughout history as a communication tool, in the academic field of systems thinking, the rich picture concept was conceived by Peter Checkland (2000) as part of his soft system methodology. In soft system methodology, rich pictures are used as an entry point for understanding complex systems. There are various ways rich pictures can be generated and used. In this journal, a special edition explores

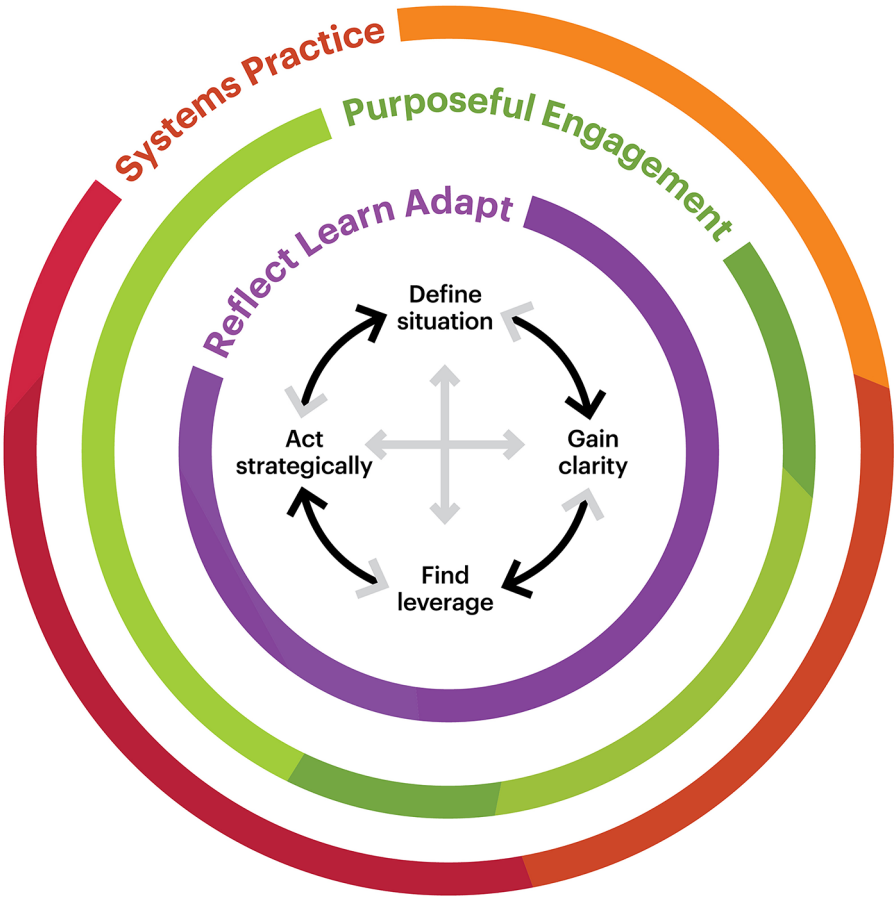

Fig. 2 Systems Change Framework. Source: Davidson and Morgan (2018)

diverse ways pictures can be used across many aspects of education 'as educational devices, as specific forms of expression, as assessable artefacts, as means to conjure data and as explicable and analysable stories' (Bell 2013, p. 316). Other examples demonstrate how rich pictures can be used as a way for researchers to communicate research findings to different audiences, for recording conversations in pictures in real-time, and to aid data synthesis processes (Conte and Davidson 2020; Kotiadis 2017; Riley et al. 2020).

We used the method to create an initial systems map of the West Coast local government area as it related to community health and wellbeing at a point in time, and as an engagement tool to foster among participants a deeper and shared understandings of the system and approaches to systems thinking in practice. The research team led the development of the rich picture, with input from a local advisory group and a professional graphic designer (Fig. 3; see supplementary material 3 and 4).

With input from local advisory group members, we identified and collated data to be used in the rich picture and were also guided by the determinants of health framework outlined by Schulz and Northridge (2004) and by the community profile and prevention system parts

Fig. 3 West Coast rich picture. Source: Morgan and Walpole (2022)

described by Riley et al. (2020). We included both routinely collected community-level data and perspectives gleaned from local advisory group members in order to privilege diverse knowledge sources and create an integrated view of local context (Riley et al. 2022). We identified two key issues regarding access to and use of routinely collected data. First, data sources were from disparate sources and not all data were 'ready to use' at the local government area level. Collating and preparing these data required knowledge and analytical skills from the research team that may not be readily available in everyday practice among local communities. Second, in remote local government areas such as the West Coast some data samples were too small for data to be reported, resulting in no data or less nuanced data given the need for aggregation.

Evaluation Survey

Based on reflection-*on*-action and reflection-*for*-action models of reflective practice (Schon, 1983, and Killion and Todnem, 1991 cited in Hampe 2013), we developed and used an evaluation survey to give workshop participants opportunities to critically reflect on their experiences of the systems approach and on whether the approach could, in their estimation, be acceptable and feasibly applied beyond the study (see supplementary material 5). The survey had 19 questions, which included both open and closed questions.

Methods for Working with Collaborators in the Study

The research team led the design, implementation, and evaluation of the study with contributions from collaborators recruited using self-selection, purposive, and snowball sampling techniques (Mason 2018). In addition to the Tasmanian Department of Health's Public Health Services, which contributed financial and professional resources accessible because of the lead author's embedded research and policy position, other collaborators included West Coast Council, the local advisory group, a graphic designer, and workshop participants. Following, we describe how each collaborator joined the study and explain their roles in the study.

West Coast Council

West Coast Council was invited to partner with the research team to conduct the study for two key reasons. First, in 2020 we had conducted a desktop review to ascertain what health and wellbeing initiatives were underway in local government areas across Tasmania. We discovered few preventive health initiatives underway on the West Coast and thought our study might benefit that community and the research team in terms of building joint professional capacity, generating insights, and fostering research outputs. It was important to us that the study provided benefits in the community, did not duplicate existing efforts, and was not a burden to participants.

Second, the general manager of West Coast Council had participated in both a large survey and interviews as part of the larger research project described earlier. The general manager expressed interest in being involved in the part of the research with which this paper is concerned. Given general managers' leadership roles and responsibilities in local government, we welcomed his interest in supporting community-based efforts for improved health and wellbeing outcomes (Baldwin et al. 2021), and his willingness for the council to be a single case study site for this stage of the research.

The partnership between West Coast Council and the research team was informal, with contributions from each party discussed during Zoom video meetings and agreed to over email. West Coast Council assisted the research team by recruiting members for a local advisory group and the community workshop, participating in meetings and the community workshop, and providing council chambers as a venue to conduct the community workshop.

Local Advisory Group

The local advisory group, indebted as an idea to Riley et al. (2020), included a member from the research team, two council staff, one staff member from a local health service, and one staff member from another community-based organisation. All group members were provided with a participant information sheet and completed a study consent form. Over a three-month period, members met online on Zoom five times prior to, and once after the community workshop, each time for one hour. Group members helped to inform the design, implementation, and evaluation of the community workshop. That work included, for example, helping determine the issue to be explored in the inquiry process, identifying and recruiting workshop participants, providing input into the creation of the rich picture, piloting an evaluation survey, and participating in a workshop debrief.

The group decided that the issue to be explored in the inquiry process should concern 'community health and wellbeing' broadly rather than NCDs or one or more NCD risk factors. The basis of that decision was that a broader scope would likely engage more and diverse participants and that a more comprehensive picture of health would be useful for the community as an initial exploration process. The group settled on a cross-section of individuals and organisations with roles in community health and wellbeing to invite to the community workshop (see Workshop Participants section). Based on existing relationships, each group member invited potential participants to the community workshop.

Fieldnotes were recorded for group meetings, and meetings were audio recorded and transcribed verbatim. These data were used to document decision points throughout the inquiry process and supplement evaluation data analysis.

Graphic Designer

A member of the local advisory group recommended a local professional graphic designer, who was commissioned by the research team to create the rich picture (Fig. 3). A benefit of commissioning her was that the design was locally informed. For example, the West Coast has an established open source brand that is widely accepted by the community (West Coast Council, 2022). With such local knowledge, familiar or resonant branding, imagery, and colour palette were used in our rich picture. It was created electronically and prepared at two sizes: A0, which was professionally printed on paper to use in the workshop, and A3 to enable in-house printing.

Workshop Participants

In its work with us, the local advisory group considered four stakeholder groups for the workshop: community members who experience poor health and wellbeing outcomes; service providers; staff from advocacy organisations; and decision makers (Foster-Fishman and Watson 2012). Invited participants were mostly based on the West Coast. People from organisations with statewide mandates were also invited, including those from the Department of Health, the Local Government Association of Tasmania, and the University of Tasmania but such invitations were purposefully limited. The local advisory group knew that imposing this limit would exclude representation from organisations in the broader system that affects community health and wellbeing on the West Coast. However, group members agreed that prioritising local perspectives in an initial inquiry process was important to ensure that insights and actions generated as part of the process were locally relevant and owned (Burns 2014). While the group knew it would be useful for others in the West Coast community to participate, there were no established mechanisms to engage with them, such as through community or consumer reference groups or committees.

Participants had to be at least 18 years of age. When invited to participate in the workshop, they were given a participant information sheet and asked to complete an online consent form when they registered to attend the workshop. Those who were interested but unable to attend were invited to contribute to an email activity. The facilitator integrated email contributions at relevant points throughout the workshop.

In addition to fieldnotes recorded by the research team, crowdsourced data from the community workshop were documented by participants in writing on paper then photo-

graphed by the facilitator who then typed and organised it into a report. Where necessary, feedback and clarifications were later sought from participants via email. The report was then distributed to participants and other interested stakeholders within two weeks. Contact corresponding author for report.

Methods Summary

Overall, 19 people participated in the whole systems approach, which includes members of the local advisory group and workshop participants and excludes the lead author who facilitated the study and the graphic designer. Participants were predominately West Coast residents and included employees from both senior and officer levels from local and state governments; local, regional, state, and national health services, a regional collaborative; a medical union; and a self-employed retailer. Ten people who participated in both workshop days completed a paper-based evaluation survey during the time allocated to do so at the end of the second day. Other participants were emailed the survey by the research team, but none were completed—likely because of heavy workloads as reported during the workshop. Data from completed surveys were manually entered into an excel spreadsheet and analysed in excel, first descriptively and then thematically.

Results

To respond to the study aims, we reviewed all data from field notes, the workshop outcomes report, and evaluation survey and present the results as follows: First, we briefly describe the outcomes of the systemic inquiry process which aimed to better understand the causes of health and wellbeing outcomes within the West Coast local government area and opportunities to improve those outcomes from a systems perspective. Second, we used the reflection-*on*-action and reflection-*for*-action evaluation model (Hampe 2013) to consider the usefulness of the systems change framework for building systems thinking capacity and to gauge the acceptability and feasibility of the systems approach and report these results in two parts: the participants' experiences of the workshop, then their perspectives about the acceptability and feasibility of applying the approach beyond the study.

Outcomes of the Systemic Inquiry Process

The process enabled participants to build a more comprehensive and deeper understanding of the prevention system on the West Coast. Participants identified many interrelated factors that affect people's health and wellbeing on the West Coast. Collectively, a systemic problem identified was that health care service provision on the West Coast reflects a perpetual cycle of disadvantage. The 'story' told by participants was that the fragmentation of health care services, combined with community attitudes and behaviours, leads to health care services not meeting the needs of the community, which results in poorer community health outcomes, declining population, and wasted resources that then reinforces the fragmentation of health care services. Participants recognised they want to work together on their own solutions, and identified the need for better resource allocation, funding, and communication among stakeholders. Many opportunities to improve the system to achieve better health

and wellbeing outcomes were identified during the process, which included communication and advocacy, partnership and network development, and strategic planning activities with various local and statewide stakeholders.

Participants' Experiences of the Workshop

Participants described the systems approach as engaging and 'a great learning experience' (#7), that 'challenged traditional thinking' (#4) and 'produced rich and surprising results' (#2). Participants said the approach enabled them to come together, build relationships, work collaboratively, and hear different perspectives, thereby gaining a deeper, collective understanding of the local system and of how to take steps together towards a common goal to improve quality of life and health outcomes for consumers and communities.

Participants were asked if any part of the workshop was uncomfortable for them, based on an assumption by the research team that such a process was likely to be different from programmatic approaches participants were more likely to be familiar with. While most said no, one participant said it was 'challenging, not uncomfortable' (#2) and another said what was uncomfortable was that it unsettled 'how [and] why you think' (#3). Another participant said, 'At times I witnessed overwhelm as people uncovered some of the barriers to achieving sustainable improvements in HWB [health and wellbeing] and wondered if there was enough focus on "achievable insights". [There was] also, some discomfort when see[ing] self in the system and potential to cause harm' (#9).

When asked about what new, surprising, or powerful insights were gained from the workshop participants said that 'most people are working towards the same goals' (#5), that 'service providers are experiencing similar frustrations' (#10) in the pursuit of improving community health and wellbeing outcomes, and that the issues are 'deeper than you think' (#6). Some said there needs to be 'more community-based collaboration' (#4) and suggested the community has a role in creating the 'community change' (#8) to improve health and wellbeing outcomes. Others said they gained a deeper understanding of the local context: history, strengths, and current challenges, which included lack of services and service fragmentation. Some reported that the process helped them see how their work contributed to larger contexts and that the workshop helped mediate local conflict and misunderstandings. Specifically, the rich picture offered an integrated understanding of the community context in an accessible and engaging format and helped create deeper collective understanding.

Participants shared what they would do differently because of what they learned from the workshop. They described wanting to approach their work differently by being more open-minded, taking a systems approach to some degree in their work, feeling more confident in their approach because of an improved understanding of the community, taking a more collaborative approach to problem solving, and taking time to gain deeper understanding of problems rather than 'jumping to solutions' (#4). One said the process had made them realise how important it was for community members to be more actively involved and that they would put 'more effort on community change' (#8). Another said they would 'think about how to apply the methodology in a sustainable way outside the research environment' (#9).

All participants agreed the systems change framework helped them become more familiar with systems thinking and systems change and provided a useful structure, process, and set of practices to engage with systems thinking. All said they increased understanding

of systems thinking, systems change, causes of poor health, and opportunities to address causes of poor health in the West Coast from a systems perspective. From the research team's perspective, that outcome was evident from the workshop processes and participants' reflections in group discussions and evaluation survey.

Overall, participants found the workshop enjoyable, worthwhile, insightful, and valuable for informing their work. The approach was effective at building relationships among participants, increasing systems thinking capacity, collaboratively surfacing systemic issues, and identifying opportunities to address those issues. The rich picture was valuable for creating a shared understanding of local issues among diverse stakeholders. However, one participant expressed concern about whether and how insights gained could be acted upon beyond the workshop given people and organisations are under-resourced and had little or no capacity to lead system change efforts. Another participant leading a federally funded project said they may be able to respond to some of the actions identified and that the workshop offered valuable insights to initiate that collaborative work.

Acceptability and Feasibility of Applying the Systems Approach Beyond the Study

West Coast Council's general manager acknowledged that not all council business is complex and does not require a systems approach. However, with other participants, he agreed that the systems approach we tested could address complex issues that require intersectoral collaboration or in situations where systems change is sought. Examples of complex community issues identified by participants included health improvement, disadvantage, literacy, education, and aging in place—all of which have unique challenges in remote areas.

The general manager noted that Council's decision to take a systems approach would depend on the issues to be addressed, the outcomes sought, and on the availability of internal or external leadership capacity. He said that local governments in Tasmania typically develop strategic plans by working with external consultants, who use accredited processes that vary from business development to community development approaches such as co-design, placemaking, and community dialogue—the latter have characteristics akin to systems approaches. The general manager also thought a systems approach was more accessible than other approaches because it was more open-ended and could be done within existing resources. Whereas in other approaches, such as co-design, there is an expectation on councils to contribute resources to match those of partnering organisations, which councils may not have. In his experience, business strategy approaches have not been effective at creating systems or community change, because of the transactional, consultative rather than participatory nature of such approaches. Participants recognised that systems approaches are collaborative and need to involve various and diverse actors within the system as each has a role in contributing to systems change.

Participants reported that the systems approach tested was an acceptable way to explore complex community issues because it enabled collective understanding of an issue's larger context and—in this instance—revealed or reiterated the interrelated causes of poor health outcomes on the West Coast; helped identify priorities and actions to improve community health and wellbeing in the West Coast local government area; encouraged collaboration among stakeholders; and provided an alternative to typical planning approaches. If the process were extended, the general manager thought the systems approach could result in a collaborative strategy that could define a shared system goal and help coordinate commu-

nity-based actions for systems change leading to health improvements. He thought it would be important to explore multiple priority issues and their interrelationships simultaneously to achieve a more comprehensive strategy.

There was less confidence that the approach could be used at regional or state levels; that is among the eight 'Cradle Coast councils' of which the West Coast is a part, or among the full 29 local governments in Tasmania. Nonetheless, at a municipal level, participants thought the approach could provide an 'opportunity to collaborate and share knowledge/lived experience' (#4) from 'many perspectives' (#5) and could include 'community engagement and solutions' (#8). Some said the approach effectively surfaced new insights and deeper understandings of the local context and issues, and leverage points. Even at regional and state levels, some participants thought the approach might 'harness [attention from] more diverse stakeholders' (#4) and could reveal regional and statewide issues and responses that may not have occurred with other approaches. However, participants reported significant differences across Tasmania's three regions—the others being the northern and southern regional groups—and between urban and rural municipalities. One participant recommended using this approach among a collective of rural municipalities rather than regionally as rural municipalities had similar characteristics and faced similar issues (#8). Another thought that the approach would be 'too broad and politically influenced' at a statewide level and would take away from the fact that many issues are 'place-based' and require approaches that attend to such granularity (#4).

Participants said that for their organisations and stakeholders to adopt an ongoing systems approach for community health and wellbeing, they would need a lot of support, including leadership capacity. In addition, they would require time to participate in an ongoing process, improved communication mechanisms, information resources for various stakeholders such as a 'primer for others to understand it better' (#1), 'Illustration of the value of applying relevant local case studies that demonstrate the impact' (#9), and a sense of how systems thinking relates to other methods such as design thinking and continual learning opportunities. All were interested in learning more about using systems thinking in their work and many said they wanted to learn via occasional emails, an online community of practice, a face-to-face short course, and an online short course.

Beyond the workshop, council staff said the rich picture has been a valuable resource they have been able to share with other stakeholders to create a collective understanding of local context. Council has and will continue to use the rich picture for various purposes including advocacy, planning, grant applications, and stakeholder engagement. Another participant is adopting the method to create rich pictures for numerous other local government areas they work with across Tasmania after experiencing its effectiveness as a community engagement tool in the workshop.

With an extension to the process tested, participants said the systems approach was acceptable for addressing complex place-based community health and wellbeing issues and could potentially be used at regional and statewide levels. In addition, the rich picture provided an immediate and beneficial resource to community stakeholders in the sense that it can help facilitate a shared understanding of a complex system. However, for the overall systems approach to be feasible in practice, local governments and other community-based organisations need to be supported to implement such an approach, which would include access to an appropriately skilled facilitator, capacity and relationship building opportunities, and improved access to community-level data.

Discussion and Conclusion

In this study, we tested a systems approach for NCD prevention in the West Coast local government area in Tasmania to gauge its acceptability and feasibility as an alternative to programmatic approaches. In addition, we aimed to show how the systems change framework can be applied and sought feedback about its usefulness for building systems thinking capacity among participants. Our findings show that there was broad support for the systems approach tested among participants and that the approach was effective at increasing systems thinking capacity, collaboratively surfacing systemic issues, and identifying opportunities to address those issues. Furthermore, the rich picture was valuable for creating a shared understanding of the local context among diverse stakeholders. However, for the systems approach tested to be feasible in practice, particularly in reference to the challenges faced by remote municipalities, there is a need for the broader prevention system to be strengthened to support local level efforts. With a multi-scaled systems approach, it might be possible to foster more effective and positive systems change and improvements to health and wellbeing outcomes.

On this basis, we provide two key conclusions. First, the systems approach tested could be a suitable alternative to programmatic approaches to better understand the causes of NCDs within a local government area and identify opportunities to improve those outcomes, and that the systems change framework was useful for guiding such an approach. This approach could be enhanced with an extension to the process that was tested with the West Coast community. However, the approach would likely only be feasible in practice with dedicated support from the broader prevention system, such as from the state and federal governments which are well-placed to provide strategic leadership, coordination, and resource support. Second, the systems methods we used, namely participatory systemic inquiry and rich picture within a social learning context, are valuable for identifying systemic issues in the prevention system and for creating a shared understanding of the complex and interrelated nature of health and wellbeing.

Bensberg et al. (2021) describes the prevention system, comprising parts consistent with those described in Table 1, at micro- and macro-levels. The micro-level is where people at the community-level aim to tackle public health challenges *in* the prevention system, and ideally apply systems practices. At the macro-level, people 'are working *on* the [prevention] system, to develop a structure to coordinate effective whole-of-prevention system strategies', which comprise the following system parts and their interactions: interventions, leadership, knowledge and data, relationships, resources (funding), and workforce (Bensberg et al. 2021, p. 1). Articulating the macro-level system in this way is helpful because it can identify where the system needs to be strengthened to support place-based (micro-level) approaches.

Drawing on the Healthy Together Victoria initiative, Bensberg et al. (2021, p. 13) argues that for place-based systems approaches for NCD prevention to be effective, whole-of-prevention-system oversight at the macro level is needed to redress 'poorly functioning parts or absent connections'. From our study, strengthening the workforce part of the prevention system (and the interrelationships with resources and relationship system parts) for the West Coast was perhaps the most significant area of need. In addition to a limited workforce that are already working at or beyond their capacity, attracting people to work in remote locations is difficult, and the declining population there reduces volunteer capacity too. Other

studies on the West Coast are exploring the employment challenges (Johnson et al. 2022). Within this context then, testing ways to harness existing resources for health and wellbeing more efficiently through building relationships and systems thinking capacity are likely to be beneficial, which would be enabled by timely macro-level system support.

Relationship building and systems thinking capacity are increasingly recognised as essential strategies for responding to complex problems more effectively, including to improve health and wellbeing outcomes and within the local government sector (Bensberg et al. 2021; Kavanagh et al. 2020; Stansfield et al. 2020; Walker et al. 2022). Such strategies could include for example creating and facilitating spaces with diverse place-based stakeholders, including mechanisms to involve community members, to build relationships and systems thinking capacity, to enable more coordinated and locally informed responses to common challenges. In addition, strengthening relationships between local governments with similar characteristics, such as remoteness and health outcomes, to share information and learnings is likely to be valuable (Morgan et al. 2022). Ensuring the macro-level system actors support and prioritise the development of this 'soft infrastructure' is needed. Kavanagh et al. (2020, p. 7) propose that 'funders would be wise to provide salaries for constant 'on-the-ground' workers whose job it is to … attend to the building and management of soft infrastructure and the coaching and reporting on system change'—this resource would also strengthen the monitoring, evaluation, and feedback part of the prevention system. Given recruitment challenges in remote communities, macro-level system actors need to work with communities to identify and test ways to recruit to and support such positions.

The participatory systemic inquiry and rich picture methods used in our study were valuable in many ways. First, and analogous to community action research (Senge and Scharmer 2006), the participatory nature and social learning focus of the entire inquiry process helped to foster relationships among diverse study participants and the research team, for participants to see their role in the system and the system from different perspectives, and produce locally-informed practical knowledge. Developing and using the rich picture was an important part of the process: it provided an avenue to privilege diverse knowledge sources, engaging a local graphic designer ensured the picture was connected to the locality, and using a visual tool early in the workshop helped establish a level playing field for participants to work together—people have a level of confidence to comment on images that they may not have with words and tables of data. Further, the rich picture has been a useful resource beyond the workshops which has helped create a common understanding of the local context with stakeholders beyond our study.

However, the process of identifying and using routinely collected data for the rich picture highlighted challenges in undertaking such a task in Tasmania. Improving access to community level data is important for the monitoring, evaluation, and feedback part of the prevention system. With appropriate support strategies in place, improved access to community data could help communities better understand health and wellbeing issues within their communities, how their communities compare with other areas at different scales and over time, the factors that cause health outcomes in their communities, and support efforts for monitoring systems changes over time (Davern et al. 2017).

While our study found the systems approach we tested to be an acceptable alternative to programmatic approaches to address complex place-based issues among participants, there are two key limitations of our study. First, due to the time and resource constraints of the project, the research team were unable to test the full extent of the systems change frame-

work in practice, namely, to 'act strategically' and test experimental actions identified in the community process in practice. Second, our results are not representative but are likely to offer useful insights for others working across interdisciplinary fields concerned with placed-based systems change, especially in rural and remote municipalities. Future research that tests the systems approach over a longer period and in more diverse contexts to address these limitations would help advance understandings and impact of systems approaches in practice. This study makes an important contribution to the literature where there are few examples of place-based systems approaches that use systems methods pluralistically for NCD prevention and capture the stakeholder perceptions of such an approach.

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Author Contribution The study was devised by MM, ES, SH, and SR. MM coordinated and implemented all activities and analysed data in consultation with ES and SH. MM drafted the manuscript and supplementary material and ES, SH, and SR contributed to the writing via review and editing. All authors reviewed the manuscript.

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Data Availability Participants of this study did not agree for their data to be shared publicly, so data generated is not available. The materials generated and used for this study are available in the supplementary material.

Declarations

Compliance with Ethical Standards This work has received ethics clearance from the Human Research Ethics Committee of University of Tasmania, Ethics No. 20203. Informed consent was obtained from all participants involved in the study.

Competing interests None declared.

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