Planning healthy, liveable and sustainable cities: How can indicators inform policy?

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Abstract

Creating 'liveable' communities that are healthy and sustainable is an aspiration of policymakers in Australia and overseas. Indicators are being used at the national, state, and local level to compare the liveability of cities and regions. Yet, there are challenges in the adoption of such indicators. Planning scholars (e.g. Innes and Booher, 2000) see a challenge in creating indicators that measure something publicly valued, while public health researchers (e.g. Macintyre and Ellaway, 2003) are concerned about scant systemic research on relationships between policies, the built environment and health and wellbeing. This paper provides an overview of liveability indicators used to date in Australia and internationally. It then outlines the results of consultations with Melbourne-based academics and decision-makers, on how to increase their utility and support the creation of healthy, liveable and sustainable cities.

Keywords: liveability, social determinants of health, indicators, integrated planning, Melbourne

Introduction

There is a growing international recognition amongst policymakers and academics that urban environments are an important determinant of health behaviours and outcomes (Kent, Thompson, & Capon, 2012; Rydin et al., 2012; Lawrence and Fudge, 2009; Capon, 2007; Macintyre and Ellaway, 2003). In the Australian urban policy discourse, the role of the built environment in supporting health and wellbeing, as well as sustainability and productivity, is increasingly couched in terms of 'liveability' (e.g. Major Cities Unit, 2010). A series of documents from Australian national, state, and local governments recognise the need to create liveable built environments through integrated strategic planning (Victorian Government Department of Transport Planning and Local Infrastructure, 2014; COAG Reform Council, 2012; Australian Government Department of Infrastructure and Transport, 2011; Western Australian Planning Commission, 2007).

Internationally, a diverse range of indicators are being used to measure and compare liveability across cities and regions. Australia's major cities tend to fare well on international liveability rankings. This is partly because of relatively low crime rates, high proportions of public open space, good transport systems, and the availability of good educational opportunities, especially in inner city areas (e.g. OECD, 2014; Economist Intelligence Unit, 2012).

While many of these international liveability measures consider variations between cities, they do not measure disparities *within* cities, which are a growing concern globally (Macintyre and Ellaway, 2003). In Australia, a number of regions are experiencing significant problems, such as a lack of affordable housing, poor access to local employment, shops and essential infrastructure and services, and related car dependence,

resulting in low rates of walking, cycling and public transport use (Dodson and Sipe, 2008; Capon, 2007; Thompson and Gallico, 2005). These factors directly and indirectly contribute to chronic diseases and their risk factors, including physical inactivity, unhealthy diets, social isolation and poor air quality (Giles-Corti, Ryan and Foster, 2012; Healthy Built Environments Program, 2012; Cannuscio and Glanz, 2011; Ewing and Cervero, 2010; Saelens, Sallis and Frank, 2003; Frumkin, 2002). In the Australian context, the liveability of low-density single land use outer suburban growth areas is a key concern. Many of these areas are experiencing rapid population growth and the provision of local employment and essential infrastructure and services is often delayed or insufficient to meet growing demand (Victorian Government Outer Suburban/Interface Services and Development Committee, 2012).

Thus built environment features that contribute to the liveability of communities can be viewed as 'social determinants of health', which encompass the 'circumstances in which people are born, grow up, live, work and age' (World Health Organization, 2012). Numerous definitions of liveability exist, but most align with the concept of healthy urban environments, suggesting that the determinants of urban health and liveability are similar. For example, the 2011 *State of Australian Cities* report (Major Cities Unit, 2011, p. 139) defined liveability as:

> ...the degree to which a place supports quality of life, health and wellbeing. In broad terms, liveable cities are healthy, safe, harmonious, attractive and affordable. They have high amenity, provide good accessibility and are environmentally sustainable.

Before being dismantled in late 2013, the Australian federal government's Major Cities Unit produced annual *State of Australian Cities* reports, which provided a summary of urban growth and change and included indicators of liveability, productivity and sustainability.

The Major Cities Unit's definition indicates that liveability is partly dependent on the sustainability of the natural environment. Not only does environmental sustainability provide

the basis for health and liveability (by influencing factors such as water and air quality), but liveable and healthy communities can also support long-term environmental sustainability (Newman, 1999). For example, local factors that encourage people to use active modes of transport may result in improved air quality through reduced emissions from motor vehicles, with positive impacts on local and global natural environments. Unfortunately, out of 140 cities around the world, Australian cities rank amongst the worst in terms of ecological footprint: that is, the amount of productive land and water that a population requires to support the current level of consumption and waste production (Newton, 2012).

Broader notions of sustainability, which incorporate the three pillars of social, economic and environmental sustainability, also overlap with the concepts of health and liveability, as they are all concerned with human wellbeing and the future of life and society (Bilj, 2011). However, in calling for constraints on human desires to ensure the wellbeing of future generations (de Chazal, 2010), sustainability has a longer-term and more global perspective, compared with the relatively localised and immediate concerns of liveability (van Dorst, 2000). Nevertheless, planning sustainable and liveable communities are complementary goals, with the potential to generate co-benefits across the urban planning, public health and environment sectors.

Creating coherent and consistent urban policy that promotes health, liveability and sustainability requires effective partnerships and collaboration between and within all three levels of government, and with the private and community sectors (Holden, 2012; Rayner and Howlett, 2009). In Australia, policies around land use, social services, healthcare, and transport planning are primarily the responsibility of state government, with local governments and the community sector focusing on service delivery. The federal government, through migration, taxation, major infrastructure funding and national health and education policies, also has a strong influence on urban policy and consequently, disparities within and

between cities (Williams and Maginn, 2012). Housing is primarily provided by the private sector, and housing policy is often disconnected from land use planning or transport policy (Tomlinson, 2012). Despite good intentions, both vertical integration between levels of government and horizontal integration across government departments have generally been lacking in Australia (Gleeson, Dodson and Spiller, 2010).

These difficulties are illustrated for example, by an evaluation of *Environments for Health*, the Victorian state-wide framework for local government public health planning. While the initiative had some success in the integration of health and council plans, the results were less impressive in integrating health and land use plans (Centre for Health through Action on Social Exclusion, 2006). Barriers to integrating public health plans with these other local government plans included a lack of collaboration across sectors, workforce capacity issues, and the complexity of council planning requirements (Centre for Health through Action on Social Exclusion, 2006).

Liveability indicators can be useful for monitoring progress towards achieving policy reform, engaging government in conversations with the private and community sectors, and enhancing the connection between urban planning and public health. They are a tool that can make explicit the links between employment, education, housing, and social service policies, and how access to these underlying determinants of health can be provided in an integrated and supportive manner. Liveability indicators have been incorporated into a range of Australian urban policies (e.g. Major Cities Unit, 2012). There is also a strong history in the state of Victoria of local government indicators influencing health and council plans (Davern et al., 2008).

However, as Innes and Booher (2000, p. 174) state, ‘millions of dollars and much time of many talented people has been wasted on preparing national, state and local indicator reports that remain on the shelf gathering dust’, at least in part because they ‘rely on a

simplistic model of how information drives policy'. Our research responds to this challenge of creating liveability indicators that are able to influence policy and practice. Conceptualising liveability through a social determinants of health lens, this paper reviews existing liveability indicators and considers how they are utilised. Based on the results of consultations with academics, policymakers from all levels of government, and community and private sector decision-makers in Melbourne, it then considers how indicators could be developed, reported and used to more strongly influence policy and support integrated planning for health, liveability and sustainability.

Methods

The research comprised two main phases: (1) a literature review of liveability indicators; and (2) a series of consultation workshops and feedback sessions with Melbourne-based academics, government policymakers, and community and private sector decision-makers. These steps are outlined more fully below, but first the research context is described.

Research context: Melbourne

This research was undertaken as part of the larger *Place, Health and Liveability Research Program*, which aims to measure the impacts of planning policy on health and liveability, and improve integrated planning in order to promote health and wellbeing. The research program began as a partnership between public health and urban planning researchers at the University of Melbourne, and policymakers and practitioners from the Victorian Department of Health, and the Regional Management Forum for Melbourne's North and West Metropolitan Region (McCaughey VicHealth Centre for Community Wellbeing, 2013). The Regional Management Forum is comprised of local government CEOs and state government departmental secretaries

and regional managers. Accordingly, this research focussed on the information needs of urban policymakers in Melbourne, and the Australian urban policy context informed the type of literature sourced. Nevertheless, the findings are relevant to all Australian cities and other developed countries facing similar challenges with regards to health, liveability and sustainability. Indeed, work has already commenced on developing national liveability indicators in Australia (Giles-Corti et al., in press).

Literature review

Between 2011 and 2012, the research team reviewed both academic and policy-related literature on liveability and associated topics, to identify the types of indicators used internationally to date. Initially, electronic databases and search engines were searched using appropriate combinations of the following key words: liveab*, livab*; index, indices, indicator; measure*, develop*. In addition, the reference lists of sourced documents were examined and the research team recommended other relevant literature that may have been missed in the initial search.

Relevant literature spanned qualitative and quantitative studies, peer-reviewed and grey literature, with no country or date exclusion criteria applied. Literature was only excluded if it was not in English language, the full text was unavailable, or liveability indicators were not discussed in detail. In total, 114 documents were reviewed, with 82 of these deemed eligible for inclusion in the literature review.

The next step was to identify and categorise indicators included in this literature. There is no single accepted definition of an indicator (Bracken, 1981). So as not to unduly narrow the scope of enquiry, a broad definition was adopted for this research: ‘an indicator is a measure or a set of measures that describes a complex social, economic or physical reality, and a measure is one data point that acts as a gauge to tell us how well or poorly we are doing with respect to an indicator’ (Balsas, 2004, p. 104). There was a particular emphasis on

neighbourhood-level indicators that were relevant to the Australian context. Specific details on the methods used to assess indicators and the results of this process are discussed elsewhere (Lowe et al., 2013; Badland et al., 2014).

Workshops with policymakers, researchers, and private sector decision-makers

The next stage involved a series of workshops and feedback sessions with urban policymakers, researchers, and private and community sector decision-makers. Non-government decision-makers were included, as some determinants of liveability, such as housing and community services, are strongly influenced by the private and community sectors, respectively. The purpose of these workshops was to ascertain decision-makers' experiences and perspectives of the use of indicators in policy and practice. The indicators literature review project was the starting point for discussion at these events. The first workshop involved approximately 80 state and local government policymakers and planners, at the North and West Metropolitan Regional Management Forum Integrated Planning Conference in October 2012, to introduce the liveability indicators literature review project. This was followed by feedback on preliminary findings of the literature review at the Thriving Neighbourhoods Conference in November 2012, with 50 planners, mostly from local government. In June 2013, a workshop was held on *Liveability Indicators: Where next for Melbourne?*, to launch and discuss the report on the literature review with approximately 40 participants, including academics from a variety of disciplines and policymakers from national, state and local government. Finally, a workshop titled *Retrofitting the middle suburbs to create a more liveable city: How do we make it happen?* was held in October 2013. This involved approximately 35 invited participants, including people working in state and local government, academia, and the private and community sectors.

While the focus of these engagement activities varied, participants at each of these events were asked how liveability indicators can inform and influence policy, and how best to

develop and report indicators in order to influence policy. Perspectives on these topics were discussed in groups of various sizes, from 6 to 50, led by one or more members of the research team. Notes on the general ideas and themes that emerged from these discussions were recorded by the researchers and then collated.

Results

Liveability indicators

The literature review identified a diverse range of indicators related to liveability. These were sourced from a variety of literature including: international rankings of the liveability of cities; national liveability indicator projects; city or community-based indicator projects; studies that focussed on particular aspects of liveability such as transport, or the health or sustainability of urban environments; and projects that focussed on specific population groups (such as children, youth, or older people).

The indicators reviewed included subjective and objective measures. Objective indicators used existing or routinely collected data that measured concrete facts (such as the number of doctors or amount of public open space per capita). Subjective indicators measured people's behaviours, beliefs and perceptions about their local environment (such as perceptions of safety or satisfaction with public open space), and thus are usually sourced from population surveys. Indicators were measured at three scales: individual-level measures (e.g. perceptions of safety collected through surveys) that can be aggregated to the local government area or other geographical scales as required; social or built environment-level measures (e.g. recorded crime rates or land use mix in a particular area); or policy-level measures, which are used to collect information on urban policies or plans.

The indicators identified tended to measure social and environmental *influences* on health and liveability (Macintyre, Ellaway and Cummins, 2002) such as the built environment

and living conditions, as well as *impacts* of these environmental influences, such as health behaviours and perceptions. These impacts in turn contribute to the *outcome* of healthy and liveable neighbourhoods and, ultimately, a healthier population (Lowe et al., 2013).

The research team grouped the identified indicators into 11 policy domains, based on state and local government policy sectors and common indicator categories: natural environment; crime and safety; education; employment and income; health and social services; housing; leisure and culture; food and other goods; public open space; transport; and social cohesion and local democracy. Table 1 lists the number of relevant papers, and the general types of indicators identified within each policy domain. A more detailed list of indicators and the relevant sources is available elsewhere (Lowe et al., 2013).

INSERT TABLE 1 HERE

Based on the indicators used to date, it is evident that a broad range of factors shape the liveability of a particular location. Crime and safety, transport, housing, and employment and income were the four most frequently mentioned indicators, and are all fundamental to health and wellbeing, as discussed in the next section. However, it is difficult to determine the relative contribution of each policy area to liveability based solely on the frequency with which indicators are mentioned. Some indicators may be more relevant to particular contexts. For example, water quality may be highly relevant when comparing cities or neighbourhoods in developing countries, but not so relevant when focussing on developed countries.

In addition, the development and selection of indicators has been shaped by the various purposes they are used for. Major international studies such as the Mercer Quality of Living Survey and the Economist Intelligent Unit's Liveability Index rank cities around the world on their current liveability, to guide business investment and the appropriate remuneration of expatriates. Therefore, these indexes focus on a limited set of factors that

impact on the economy and lifestyle of business expatriates, and are less useful for informing local policy development. Other indices are used to compare different neighbourhoods or sub-areas within a city or region, often with a more explicit focus on influencing policy. A further group of indicators are used as part of impact assessment tools. These policy-level indicators are used to determine the likely consequences of an existing or proposed policy or development on the liveability of an area, often in the form of a checklist.

The relationship between liveability, social determinants of health and sustainability

This literature review confirmed that the determinants of liveability, health and sustainability are closely related. All of the policy domains listed in Table 1 are well-established determinants of health and wellbeing (Badland et al., 2014). For example, causal relationships have been established between crime rates and fear of crime and a variety of health and wellbeing outcomes, including mental health (Stafford, Chandola and Marmot, 2007) and physical functioning (Ross and Mirowsky, 2011). Education is a strong predictor of mortality and morbidity across the life span (Marmot, 2011) and having a decent living-wage with opportunities for in-work development, flexibility and work-life balance is protective of health (Wilkinson and Marmot, 2003). Having access to good quality public open spaces promotes physical activity, mental health, and reduces blood pressure and stress levels (Frumkin, 2003). Transportation is necessary for accessing employment, education, food, health and social services, and active forms of transport (walking, cycling and public transport) promote health through increasing physical activity levels (Beaglehole et al., 2011). In recognition of the interdependence between healthy and liveable urban environments and the sustainability of the natural environment (Newman, 1999), many liveability indices include environmental sustainability indicators (such as indicators of green space, water and air quality and climate).

Based on analysis of the literature, the research team developed a composite definition

of a liveable and healthy neighbourhood: one that is safe, attractive, socially cohesive and inclusive, and environmentally sustainable; with affordable and diverse housing linked by convenient public transport, walking and cycling infrastructure to employment, education, public open space, local shops, health and community services, and leisure and cultural opportunities (Lowe et al., 2013).

Workshop results

Workshop participants expressed a variety of views on how liveability indicators can inform policy and therefore how they should be developed and reported. These are discussed in turn.

How can liveability indicators inform policy?

A commonly reported use of liveability indicators was for describing *what* the problem is and *why* the problem exists. In doing so, indicators were seen as useful for needs assessment and determining policy goals, priorities and benchmarks (Naidoo and Wills, 2009). Community Indicators Victoria was regarded by some local government workshop participants as a valuable tool for informing local government planning. Since 2006, this service has developed and provided access to community wellbeing indicators for Victorian Local Government Areas, building capacity to use them in policy and planning (Davern et al., 2011). Some participants also noted that, when shared with communities, indicators can empower communities to be involved in deliberative planning and prioritising processes. However, because Community Indicators Victoria tends to provide indicators at the relatively large scale of the local government area, they tend to obscure disparities between neighbourhoods.

The other main way that decision-makers use liveability indicators is to monitor progress on implementing a policy and assessing impacts and outcomes over time. To this

end, indicators were seen as useful for identifying the impact of policies and for gathering evidence that can facilitate the sharing of success stories and lessons learnt. It was also mentioned that indicators can be used to set common objectives across departments and agencies, whether at the local or state government level, thereby facilitating integrated planning. In that regard, tools such as Community Indicators Victoria could have greater potential use within metropolitan planning and stronger influence on integrated planning at the state government level.

How should liveability indicators be developed and reported, so as to influence policy?

A range of suggestions were made about how liveability indicators should be developed and reported. The geographic scale of measurement was thought to be important. Some participants advocated for neighbourhood-level measures as they can assist with place-based planning. However, these measures need to be consistent across neighbourhoods, and some data is difficult to find at the neighbourhood level. For example, data on cycling paths in Victoria is managed by two separate state government departments and 79 local governments, making it difficult to collate. Some participants also cautioned that 'low scores' can be seized upon by media to further stigmatize some disadvantaged neighbourhoods. In addition, workshop participants recognised the value of having indicators that distinguish, not just between different geographic areas, but also between different sub-populations. When aiming to identify and address the needs of disadvantaged populations, policymakers sometimes require indicators to be broken down by sex, age or socioeconomic status. For instance, young people aged 15-24 years who are out of school and out of work might be a particular focus. Furthermore, it was noted that indicators of both the social aspects of a community (e.g., social cohesion and volunteering rates) and the built environment (e.g., access to public transport and public open space) are required for integrated planning. The literature review showed that both of these aspects are reflected in

the liveability indicators developed to date.

To assist with needs assessment, priority setting and policy evaluation, workshop participants recognised the value of having measures of policy inputs (e.g., access to good primary education), as well as the intermediary impacts (e.g., high school leaving rates) and long-term health and wellbeing outcomes of policies. As the literature review found, these different types of indicators exist. However, the quality of these indicators varies widely. Transport indicators (e.g., modal share or the proportion of the population that regularly walks or cycles) are commonly and relatively uniformly used, easily obtainable, and clearly linked to health and wellbeing outcomes. In contrast, indicators of access to, and use of, public open spaces reflect no such uniformity, and the literature linking these specific indicators to health and wellbeing outcomes (e.g., cardiovascular health or depression) is not as well established. The general consensus from workshop participants was that evidence-based benchmarks need to be established for indicators, and that developing economic measures of policy impacts and outcomes should also be a priority.

Workshop participants reiterated that indicators must be credible and difficult to disregard. To this end, they held the view that indicators must be developed through rigorous research, and proven to be valid and reliable. The researchers, organisations or agencies that develop and report indicators also need to be influential and respected. It was suggested that it is best for independent organisations outside of government to develop and manage indicators, to ensure transparency and government accountability with regards to policy goals and benchmarks.

Almost all workshop participants agreed that liveability indicators should be incorporated into policy documents. Thus, indicators must be applicable and directly related to policy goals and existing portfolio responsibilities. This requires indicators to be developed in consultation and partnership with policymakers and community organisations

who use the indicators.

Finally, it was suggested that indicators must be reported in an appropriate format if they are to influence policy and planning. The presentation style should be tailored to the particular audience and intended users of the indicators. There was a strong preference amongst workshop participants for data to be presented simply and in visual formats. Indicators should be easy to interpret and incorporate into planning processes and documents, and need to be accompanied by information about their rigour, validity and reliability.

Discussion and Conclusions

Planning healthy, liveable and sustainable communities epitomises the crucial nexus between public health, urban planning and the environment with potential co-benefits across all sectors. Indicators are important because they provide benchmarks against which to monitor progress towards policy reform; and to make comparisons between and within cities.

This research revealed that the liveability indicators generated to date cross many policy domains governed by Australian state and local government, with varying involvement of the federal government. They also cover policy domains such as housing, which are dominated by the private sector, and community services, which are strongly influenced by the non-profit sector. However, current liveability indicators are often not tied to achieving policy outcomes, and there is no general consensus amongst decision-makers or researchers on which indicators are most useful for guiding urban policy development and implementation.

More effective and consistent use of liveability indicators is required to promote the creation of healthy, liveable and sustainable cities, achieved through integrated planning across and between different levels of government, as well as the private and community sectors. However, this requires a new approach to developing and reporting indicators. As shown internationally, it is possible to create a set of indicators that influence local, metropolitan,

state, and federal planning policies. In the US context for instance, since the early 1990s the Seattle Indicators of Sustainable Community have influenced policymakers at all levels of government, as well as the community and private sectors (Holden, 2006). Likewise, more recently, Greater Portland Pulse in Portland, Oregon has assisted in prioritising infrastructure improvements and encouraged partnerships between government, the private sector and civil society at the metropolitan scale (Martin and Morehead, 2013).

Consultations with Victorian decision-makers indicated that, when appropriate liveability indicators are available, they can assist with developing policies, assessing the effect of policies on health and liveability and monitoring progress towards integrated planning. The challenge is to routinely incorporate valid and reliable indicators into policy documents and decision-making processes. For example, the new metropolitan planning strategy for Melbourne, *Plan Melbourne*, has a clear focus on liveability and the need for liveability indicators, although as yet it does not include specific indicators or benchmarks to monitor the impact of this policy (Victorian Government Department of Transport Planning and Local Infrastructure, 2014).

The perspectives expressed by workshop participants on how indicators should be developed and reported are mirrored by the literature on indicators. The literature suggests that indicators should be clearly associated with a policy or set of possible actions (Innes and Booher, 2000). To achieve this, indicators should be designed to highlight issues of concern, provide measures of policy progress, and stimulate discussion for future actions. They must also be measurable and quantifiable using valid data sources, defined explicitly, have a clear conceptual basis and be sensitive to changes in public policy (Greenwood, 2008; Balsas, 2004; Bracken, 1981).

This research highlights some key considerations for those developing indicators. Clearly, indicators must be reliable and valid, but they also need to be policy-relevant so

that they can accurately measure the effects of policies over time. Further research is required to establish clear links between environmental influences, intermediary impacts, and long-term health and wellbeing outcomes. However, developing high-quality indicators based on the best available evidence and data must be balanced with making indicators useable and easy to incorporate into policy. This study reinforces that policymakers should be involved in developing indicators, to ensure that they are applicable to policy and practice and that they are 'owned' by decision-makers (Innes and Booher, 2000). Gahin and Patterson (2001), summarising lessons learned from the history of indicators, suggest that effective indicators require a strong set of shared values underlying the indicators. Hence, researchers and others involved in developing indicators need to consider, not just what is measured and how to measure it, but also how indicators will be used and how to present and communicate indicators in ways that meet the particular needs of end users. Greater commitment to using liveability indicators to measure the impacts and outcomes of policies and monitor progress towards reform, might assist policymakers to achieve their policy goals of creating healthy, liveable and sustainable cities, and enhance the nexus between urban planning and public health. Building on these findings, the next step in this research is to develop a set of liveability indicators that are robust, evidence-based and linked to urban planning policies.

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Policy areas	**Number of papers that mention relevant indicators**	**Types of indicators identified**
Crime and safety	43	Perceptions of safety; and rates of crimes against property and the person.
Transport	38	Rates of engagement in active and public transport modes; the accessibility, quality, and layout of infrastructure; travel times and distances; perceptions of car parking; car dependency and ownership; speed and affordability of freight transport; motor vehicle mileage; traffic speeds; car and freight commute times; modal share; transport affordability; connectivity across the transport network; transport safety; and traffic noise.
Housing	35	Quality and affordability of housing; housing density; land use mix; residential population; housing stock and tenure; and housing adaptability.
Employment and income	32	Income; income distribution; rates of (un)employment; employment growth over time; the location of employment; and the number and types of jobs available locally.
Social cohesion and local democracy	31	Opportunities to contribute to important issues; membership of community organisations; feeling part of the community; access to social support; community volunteering; parent involvement in schools; community acceptance of diversity; opportunities for community input in planning and governance; community pride and attachment; and social and community connectedness.
Public open space	30	Access and quantity of public open space; available public open space; variety and quality; and frequency of use.
Leisure and culture	30	Access to and presence of appropriate cultural and leisure activities measured both objectively and subjectively.
Health and social services	26	The distance to and number of General Practices for a given population; access to various services for older adults; provision of aged-care facilities; the number of hospital beds available; and access to: public amenities, child and youth services, and emergency centres.
Natural environment	25	Water and air quality; greenhouse gas emissions; water quantity and conservation; precipitation; climate; biodiversity; and energy consumption.
Education	24	Access to education (i.e., distance); availability of formal educational opportunities; rates of secondary-school student retention; and internet access.
Food and other local goods	22	Access to different types of food and shops; food prices; food security; and local retail activity.

Table 1: The number of papers that mention relevant indicators and the types of indicators in each policy domain