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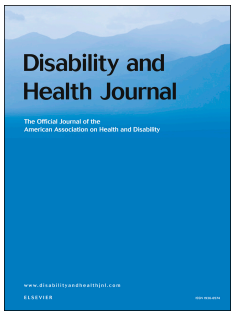

Disability, equity, and measurements of livability: a scoping review

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Title page

Disability, equity, and measurements of livability: a scoping review

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Disability, equity, and measurements of livability: A scoping review

ABSTRACT

Background: Livability is a concept commonly featured in health research to help shape public policy decisions and improve local place settings. Although widely used, it is a contested concept known for its ambiguity and inconsistency of measurements. Other criticisms include the lack of equity perspectives and the underrepresentation of people with disabilities and inhabitants of non-metropolitan places.

Objectives: This review sought to identify the extent to which people with disabilities and non-metropolitan places are included in measurements of livability and to critically review and summarize i) livability definitions and uses, ii) livability places and populations, and iii) livability measurements.

Methods: The scoping review followed Arksey and O'Malley's methodological framework and the PRISMA extension for scoping reviews. The data extraction used meta-aggregation techniques to evaluate findings. A standardized mixed methods appraisal tool was used, and a novel classification of measurements was created.

Results: Seventy-seven articles were included, and 1955 measurements were extracted. The overarching findings were: i) livability is inconsistently defined and assessed by measuring the performance of related and independent domains, ii) the population sample or the studies' participants are often not disclosed, non-metropolitan settings are overlooked, and equity is not generally applied or operationalized in measurements, and iii) there is an extensive lack of measurements considering people with disabilities and diversity within disabilities.

Conclusions: The assumptions of homogeneity in study populations in livability measurement literature overlook inequities experienced by people with disabilities and inhabitants of non-metropolitan settings. This review suggests recommendations for future research to assess livability from perspectives inclusive of human diversity.

KEYWORDS: Livability; disabilities, non-metropolitan; measurements; health equity.

INTRODUCTION

Livability is a concept used to shape public policy decisions toward improving places where humans live and interact. Although widely used internationally, it is a concept known for its ambiguity and the inconsistency of its measurements. The assessment of the concept is not the same across research, but overall it addresses specific aspects of a local place that affect individuals' quality of life and communities' wellbeing,[1] including housing, employment, education, services, transport, health, built environment, social cohesion, and security.[2] Given its holistic orientation, livability has become an important concept applied in decision-making for local planning[3] to evaluate the living arrangements necessary to address the *needs* and achieve the *wants* of local populations.[4] However, most approaches to operationalizing livability have failed to address inequities within diverse populations and locations.[5] Specifically, the concept has not been well theorized, measured, and applied to people with disabilities[5-7] and non-metropolitan settings.[8-11]

To assess livability, evaluation models and techniques often use quantitative methodologies such as analytical hierarchy process and entropy, fuzzy comprehensive evaluation, factor analysis and principal component analysis, spatial modeling, and, less frequently, a qualitative Delphi method.[12] These approaches encompass individual measurements to evaluate livability. As there is no consensus on how to measure the construct of livability, the selection and development of indicators are generally based on the personal or professional experience of scholars, policymakers, and planners rather than the adaptation of standardized measurements[13]. Despite the context-specific nature of livability, previous scoping reviews on livability measurements [12,13] have found that livability domains overlap internationally, highlighting their relevance and similarities across different contexts. Content validity is often assessed by expert validity and is highly reported, whereas reliability is less examined[13].

The results of livability measures are often presented in international rankings to compare cities worldwide, scoring factors based on peoples' perceptions and regional statistics. Recent criticisms highlight that these indices used to rank cities across livability factors are designed from a business perspective for promotional purposes and do not consider factors such as affordability, accessibility, sustainability, and opportunities.[14] Likewise, there are concerns about widening inequities within city populations,[2] a dependency on economic indicators and individualistic approaches, [13]gaps in information regarding social and spatial measures of housing affordability, local employment, and healthy food choices, as well as a disparity between public policies and the actual instruments used to measure advances.[15]

One of the most significant gaps in livability literature is the need for more clarity about the populations included in the construction of its measurements. Livability lenses have largely been built on the assumption that populations are primarily homogeneous and normative ideas pertaining to locations, ages, and abilities are routinely applied uncritically.[16] For instance, although livability is a concept that was first used in a social context to evaluate the viability of rural areas affected by migration to cities,[17] it was rapidly adopted to address the population pressures within cities that were struggling with planning urban scenarios for their increasing overcrowding dynamics.[17] Since then, livability has predominantly been applied to and within metropolitan settings, and recent literature gives insufficient attention to places other than capital cities.[10,11] Further, for whom livability is being assessed, or from whose perspectives, is also narrowly defined within livability research.

A point increasingly recognized within contemporary literature is that people with disabilities are often overlooked and underrepresented in livability studies, despite their rights to place and full participation protected in nations adhering to the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), and that they are a key population group representing 15% of the global population.[18] A systematic review of instruments of walkability and recreation[6] recognizes the gap in information relevant to people with mobility disabilities and the limited use of universal design. Similar conclusions were reached in a study[5] regarding the measurements used in studies of walkability that do not include people across the age and abilities spectrum, especially children and elderly with impairments. This was also consistent with findings from a qualitative study[16] that highlighted the lack of universal design in urban planning in non-metropolitan areas and the role of socially valued infrastructure, accessibility, and connectivity to achieve inclusive communities where ableist conceptions favoring the mobility of some bodies over others were questioned.

This scoping review seeks to identify the extent to which people with disabilities and non-metropolitan places are included and considered in measurements of livability and where gaps exist. The findings highlight the relevance of considering place and disabilities perspectives within public policies and regional planning initiatives for the construction of livability measurements that address rather than perpetuate inequities between people with disabilities and inhabitants of non-metropolitan places and their urban-located counterparts.

METHODS

Livability is not a consistently defined and measured concept, and its application to people with disabilities and non-metropolitan places is underdeveloped. A scoping review was considered the best approach to determine the extent of this broad topic, summarize the currently available research evidence, and identify gaps in the existing literature. The scoping review was conducted following Arksey and O'Malley's methodological framework[19]. The PRISMA extension for scoping reviews guideline was used to ensure that a comprehensive and inclusive approach was taken in the reporting of findings.[20] Protocol registration was done in Open Science Framework (https://osf.io/fths8/?view_only=dc13056a35e3462791f063f2a84480e2).

Search strategy and information sources

After testing appropriate terminology for inclusive results, the following nested search statement was used to construct the specific searches: Livability AND ((socioeconomic OR income OR employment OR housing OR education OR habitat) OR (equity OR equality) OR (wellbeing) OR (disability OR impairment)). The search statement was adapted to each database and synonyms previously tested for the relevance of the results used (see Appendix A). As limiters, academic peer-reviewed journals written in English were used. There was no time of publication limit, and all geographical scales were considered. A list of databases was created to determine potential information sources with a multidisciplinary approach (e.g., health, social science, urbanism, and design topics). After comparing relevant results, four databases were selected to conduct the study: Scopus, Web of Science, ProQuest, and EBSCOhost. The databases were first consulted on 4 March 2021, and a second search was done on 25 May 2023 to update the results. Alert notifications were activated for the posterior year to update relevant sources to include in the discussion section.

Eligibility criteria

The articles were screened by title and abstract using inclusion and exclusion criteria (see the complete list in Appendix B). The exclusion criteria were applied first to reject articles without measurements or focused only on elements from the natural environment or place setting without human populations. Articles that were only theoretical or those without sufficient relevant information were excluded at this stage. The remaining articles were included for a posterior quality check.

Study selection process

The articles identified with the search strategy were downloaded into Endnote software, a reference management tool, and duplicates were deleted. The remaining sources were then uploaded into Rayyan QCRI software, an online research tool for scoping and systematic reviews. Articles were then screened by title and abstract in Rayyan, and undetected duplicates were deleted. Two researchers screened the articles using the exclusion/inclusion criteria using the interactive tools to accept/maybe/reject articles in Rayyan. These researchers did not meet or see each other's results until all decisions about the articles were made independently. Once this process was finalized, the two researchers met to resolve discrepancies between include/exclude decisions. The joint decision was based on a full-text screening when agreement could not be reached based on title/abstract information alone. Two additional researchers met to decide on the conflicts that could not be solved in the previous step. Finally, the lead researcher retrieved the full-text PDFs of the screened sources and, based on the abstract, methodology, and results, decided on the final included articles. At this stage, those articles without an explicit reference to the concept of livability were excluded.

Quality check

The articles were evaluated at the end of the study selection process to determine their scientific underpinning, quality, and coherence with the current study field. First, there was a peer-review second check of all the journals to exclude those not detected by the filters in the search strategy. Second, the reviewers considered whether the studies provided enough information regarding the theoretical or conceptual frameworks and whether they were internationally recognized or piloted in previous studies. Third, when the review was completed, McGill University's mixed method appraisal tool (MMAT)[21] was used to critically appraise the methodological quality of the papers. This tool has had validity[22] and reliability[23] checks and was used for its ability to assess qualitative, quantitative, and mixed method research. The papers were first assessed using the screening questions and later classified depending on the type of design. The corresponding criteria were used to evaluate the study quality. Results were discussed and rated (see Appendix C).

Data collection

The final included articles were tabulated in an Excel spreadsheet. Information regarding the literal definition of livability used in the text, the conceptual or theoretical framework, the scale of the study (i.e., neighborhood, city, regional, state, national), and the population and place that the study was based on was extracted verbatim from each source. The presence or absence of discussion about inequity/inequality was recorded, as well as whether people with

disabilities and non-metropolitan areas were mentioned. A further distinction was made between papers that mentioned disabilities or equity and those that implemented measurements to address both aspects (see Table 1). The categories/domains/principal factors used to assess livability and all the measurements/indicators/attributes to measure these across the articles were recorded in a separate sheet (see example of the measurements in Table 3 and Appendix D).

When the manuscript of the paper was completed, a second reviewer conducted a rigorous check of the data collection in three steps (see Appendix E). First, using a meta-aggregation technique,[24] the second reviewer read the verbatim extraction of data and determined whether the quotes were plausible to answer the inquiry. The review had three possible outcomes: the findings could be unequivocal – beyond a reasonable doubt, equivocal – open to challenge, or unsupported – findings not supported by the data. In the second part, the reviewer checked if the extractions of dichotomous variables measuring the presence or absence of people with disabilities, non-metropolitan areas, and equity were extracted correctly using a word search in each article, including relevant synonyms of the terms. In the third section, the second reviewer counted the number of domains and indicators in each article and corroborated the number reported by the first reviewer. Discrepancies between the authors and the external reviewer that led to unsupported results on the verbatim extractions (first step) or different answers in dichotomous variables (second step) are addressed in the limitation section. The numerical results in the measurements count (third step) did not have discrepancies once the measurements were corroborated.

Data analysis

Analysis occurred in three stages. To begin, three key questions guided the process: i) how livability was defined and in what context, ii) what places and populations were used in the studies and why, and iii) what measurements were taken to evaluate livability. Literal definitions and theoretical frameworks were extracted, as was how place was defined and the study's population identified; the concepts of (in)equity and justice were summarized, and disability was defined and described in each source. Relevant information was extracted verbatim and tabulated. These data were then analyzed to identify patterns of similarity or difference across each key question.

In the second stage, the measurements of livability used in each source were extracted, compared, and grouped into a novel classification of livability measurements with 15 domains

(Table 2) that articulated what aspects of livability were measured in each study. Domains were formed by aggregating similar terms and later were reviewed with other livability classifications. All the indicators of livability used within each source and in what context were cross-referenced with these domains. Indicators created specifically in or for non-metropolitan places and studies that considered people with disabilities were coded in this process. Similarities between indicators were then identified, and through this process, sub-domains were created to articulate the attributes of livability that sit within each domain.

Lastly, the measures of livability coded as specific to non-metropolitan places and people with disability were analyzed. These measures were compared to identify the attributes of livability most considered in non-metropolitan places and in reference to people with disabilities. Through this process, attention was given to what aspects of livability are and are not currently measured in studies conducted within non-metropolitan places and with people with disabilities.

RESULTS

A total of 9,947 articles were downloaded to Endnote from four different databases. After deleting duplicates, 4,746 articles remained to be screened by title and abstract in Rayyan QCRI. The title and abstract screening resulted in the selection of 266 papers. Finally, 77 articles (see Appendix F) were included after the full-text screening (see Figure 1). Table 1 presents a general summary of the data extraction. Extra information on livability definitions, participants of the studies, and disability assessment can be found in Appendix G.

How is livability defined?

The definitions of livability used in the included articles had four elements in common. First, a consensual acknowledgment that the definitions and measurements of livability are multiple, relative, and change over time, purpose, and place. Second, livability is a desirable concept that places should strive to achieve. Third, livability is considered in its relationship with the environment (natural and built), meaning with the surroundings where humans live and interact. Fourth, livability does not have a specific measurement itself, even when using composite indices. It is assessed by measuring the performance of related and independent factors (i.e., transportation, infrastructure, housing, security, and health). Furthermore, as established in the first element, the presence or absence of these factors in the studies depended on their alignment with current and relevant public policy, local planning, and related

conceptual frameworks. Over 40 conceptual frameworks related to livability were identified and grouped in Appendix H.

Half of the articles (52%) discussed in(equity) or justice issues. Some drew on related concepts, including health inequities, spatial justice, income equality, and disability-related inequalities. Although these concepts were frequently cited in the introduction and discussion sections, no context, measure, or explanation was provided in the studies' methodologies or findings. In some articles, equity, inequity or justice was described as an unfair distribution of resources in the space for disadvantaged groups. However, no detail was included on the populations that researchers identified as facing disadvantages. In addition, there were no explanations for how issues like spatial justice were considered in measurements. The studies established the place context in which the research was undertaken but rarely clarified the population/s from whom data pertaining to measurement was collected. More than half of the articles did not provide any information regarding the participants in their studies beyond the population size.

How is livability measured?

Livability is a concept assessed by measuring independent elements or domains, specifically in the articles reviewed here, 14 domains (see Table 2). Across these domains, the following standard evaluation criteria were used: availability, affordability, accessibility, connectivity, attractiveness, diversity, satisfaction, productivity, vitality, and enhancement (see Table 3 and Appendix D for examples of livability measurements). As indicated in the ranking column of Table 2, some domains drew more attention than others by having a larger proportion of measurements. The rationales used by the authors to choose one domain over another were not provided or explained. However, there were two broad approaches to their use: i) assessments of performance to improve local spaces to attract people, and ii) a planning inquiry to adapt local places to the needs of their populations.

Although the rationales behind choosing domains and measurements were not explicitly clarified in the reviewed articles, there was often an implicit prioritization exercise to select the domains that were considered in the study based on the perceived local circumstances. For instance, some studies prioritized transportation, while others public space. This decision is rarely explicitly justified but is generally attributed to the physical characteristics of a place and its needs (e.g., transportation if a village needs accessible roads or green public space if a city seeks to increase its low green area density). When the final domains are established, there is a second latent decision: how many measurements or indicators will be used to evaluate each

domain and how elaborate their content will be. If public records or government statistics were used, this number was given by the availability of data; if the study was empirical, it depended on the implicit priority of the domain (e.g., if transportation is considered more important to evaluate, it will have most of the measurements, or specific measurements created and adapted to assess the local circumstances).

How are non-metropolitan places assessed?

The selected articles mostly used metropolitan cities as a scale and unit of analysis. The city was the epicenter of livability assessments, and the reasons the researchers gave for choosing that scale were in terms of population magnitude and economic importance within the region. However, the most recent publications reflect a shift in interest towards a smaller scale within cities, such as neighborhoods, touristic centers, and local spaces. The national scale was often used for macroeconomic analysis but was less considered. The choice of location for each of the 25 articles that focused on non-metropolitan settings was based on the touristic value of the place, the importance allocated by local public policies, their strategic environmental role, or their significance for agricultural analysis. Overall, of the 1,955 measurements of livability, 474 (24.24%) were applied to non-metropolitan settings (see examples in Table 4). Table 2 lists the domains that received the most attention by the number of livability measurements.

According to the measurement ranking based on quantity, the top two domains were public space and neighborhood amenities, which were shared with non-metropolitan areas. However, health was ranked as the third most important factor, followed by economic development and cost of living. Some indicators sought to measure specific conditions in regional areas, such as farmers' income, shelter at bus stops, rural public transit, financial stress due to loans, and rural medical facilities. The importance of sub-domains did not change based on place. However, some attributes were not considered when measuring non-metropolitan areas, such as land use in transportation, private transportation, environmental impacts of transportation, housing connectivity, housing tenure, noise pollution, economic burden, and life expectancy and mortality.

How are people with disabilities considered through livability lenses?

From 1,955 measurements, 97 (4.96%) considered people with disabilities when constructing or applying livability measurements (see examples in Table 4). In these cases, public space and infrastructure, neighborhood amenities, transportation, and health and healthcare had the most

measures. These measurements focus on accessibility to facilities across the domains and distance from services.

Highlighted elements relevant to people with disabilities were walkability, availability of public toilets, shelter and seating, access to community centers, public transportation, distance to healthcare services, welfare, housing design, disability employment services, access to communication, and social inclusion and education for older people. The ecological (natural) environment, sanitation and public services, and safety and security domains were not included. Governance was only considered for the proportion of dwellings owned by the government, not in terms of participation. Although most indicators specific to people with disabilities considered facilities and services adapted to the needs of people with disabilities, there was no detail on what elements are considered when applying these measurements or how these are defined.

The presence or absence of footpaths/sidewalks/pavement was registered, although their quality or connectivity was less explored. Walkability was a concept often used, but its measurement was never explained or described. Another essential component was evaluating open spaces, including green spaces and parks. These measurements considered the spatial distribution of places and, in most cases, were used to compare differences in accessibility for local populations but were not specific to disability. Public space was measured by considering the accessibility and availability of facilities and core infrastructure. In contrast, housing was addressed from the perspective of houses that were accessible by roads or modes of transportation and only on one occasion about how accessible the housing was inside, given its design.

DISCUSSION

This review presents an extensive and systematically organized summary and novel classification of the current ways in which the concept of livability is understood and applied in international research across a range of place settings. There are common approaches to using livability to improve local places where humans live and interact. However, the measurements used to assess livability need to be better defined. They largely fail to consider the heterogeneous nature of human populations, including the specific needs and perspectives of people with disabilities[5,16,25] and the complexities and distinctions between different kinds of places.[26] Although livability is extensively assessed from a place perspective, the participants in studies or the human population sample used to evaluate livability domains are

underreported or missing.[27] From an inclusive livability perspective, the participation of people with disabilities in the literature was limited to access to and availability of public places and facilities. In non-metropolitan settings, the focus was confined to environmental impacts and agriculture.

Through a critical review of the literature, this evidence synthesis indicates that livability measurements are distributed across independent domains with an implicit priority sensitive to change when considering specific human populations. In our review, the sum of all included papers revealed the implicit priority or the areas where livability is focused on (Table 2). However, when analyzing only articles where the population was people with disabilities and inhabitants of non-metropolitan areas, the ranking changed, and health and healthcare became more relevant, whereas sanitation and public services, and safety and security fell to the bottom. It seems that when selecting the domains and number of measurements to assess livability, it does not solely rely on the physical characteristics of the place or availability of data but on the human population considered in the research. This could suggest that the ambiguity of livability measurements and embedded equity issues lie, to some extent, in the assumption that livability studies evaluate the performance of physical spaces regardless of their population. Nevertheless, the perceptions of the population considered are the ones shaping the decisions on what livability domains are worth being assessed and what measurements should be used. In addition, livability measurements contain benchmarks likely created based on a homogenous perception of the population and often targeted to metropolitan areas and an adult working population without impairments.

The findings of this review are consistent with other studies that highlight the lack of equity and justice perspectives within livability lenses.[2,14,15] Although mentioned in almost half of the articles, the concept of equity often needs to be operationalized and used when selecting study participants to ensure that diverse perspectives are included and reflected in research outcomes. For example, how the inclusion of indicators related to progressing a spatial justice agenda in health care for rural residents[28] could be achieved is currently missing from contemporary livability scholarship. This review also aligns with the conclusions of other studies that have found a consistent failure to include people with disabilities within livability studies.[16,27,29] This was especially evident in how some studies focused on the availability of services for people with disabilities without addressing, describing, or measuring the actual

properties of those services and how they can be adapted to the diversity within the disability spectrum.[25]

In future research, more precision is needed in defining and explaining the measurements used to assess livability. The lack of precision in reporting measurements is likely masking inequities experienced within diverse populations and geographies. For instance, an overlooked component of livability measurements is travel time in transportation, a measure helpful for assessing the equity conditions for people living in remote locations.[30] In non-metropolitan settings, the scores for green coverage could be high, but this does not mean that the areas are walkable for everyone.[31] People with disabilities were not considered in natural disaster metrics, although evidence indicates it is the population that could be the most affected in a natural emergency[32] as well as in other public health-related emergencies.[33] Furthermore, affordability and tenure were discussed in housing, but no clarity was given regarding how it was measured or if elements beyond availability, such as universal design and accessibility, were considered.[34]

The inequities experienced by people with disabilities within livability lenses should be made visible and explicitly addressed in future research. The importance of addressing these gaps lies in the potential of using livability as a social change tool regulated through public policy, which can transform metro and non-metropolitan place contexts. Accessibility in livability assessments could go beyond ramps to buildings and public transport, parking space, and public toilets to considering different elements within the diversity of abilities, ages, and geographies.[5] The assessment of footpaths/sidewalks/pavement could be constructed in terms of connectivity or suitability and measures of governance directed to social participation and the construction of inclusive communities for all.

LIMITATIONS

This scoping review excluded quality of life and wellbeing measurements that were not used in the context of livability, reducing the number of articles included and the depth of the analysis. Only articles with an explicit reference to the concept of livability were included. In addition, non-peer-reviewed literature and government publications were not included, which limited the scope of the review, especially in public policy applications. Furthermore, the total number of measurements of livability provided in a domain's classification could vary depending on their allocation. Although the information was grouped considering common factors and based on how the article classified the measurement, we recognize the interconnectivity of the measurements and how they might be related

to more than one domain. For instance, the domain "Neighborhood Amenities" could have been included as part of "Public Spaces and Infrastructure." However, we decided to separate these domains and include the subcategories of neighborhood amenities to highlight the difference in scales (neighborhood vs cities or districts). This aligns with the need for further research on the interaction between livability domains.

The independent review on data extraction highlighted some differences between authors in the analytical interpretation of the verbatim extractions. Some fragments of text were arguably considered conceptual frameworks or definitions of livability inferred by context more than a rigorous criterion to consider them as such. After the second data extraction review, eight articles suggested the presence of people with disabilities, non-metropolitan areas, or equity; however, they were not included in those specific sections when the mention did not have any implications in the methodology, measurements, or results, often consigned only in the background of the articles as an isolated term.

RECOMMENDATIONS

Based on the gaps identified through this scoping review, we suggest action be taken in three areas. First, livability measurements should be created and adapted to non-metropolitan areas. The livability factors considered should expand and cover all relevant dimensions beyond industry, forestation, and agriculture. Although it is important to evaluate the strategic role that non-metropolitan places play in the overall economy, it is equally important to evaluate the living condition of its habitants. For instance, although communications and technology is a neglected area in livability, this domain appears to be crucial for assessing the isolation in non-metropolitan contexts with indicators like "rural medical technology level" or "internet penetration rate." Consideration of travel time to main services as well as governance, inclusiveness, and diversity indicators, could also assist in assessing isolation. Further, research focused exclusively on non-metropolitan livability would be highly beneficial, as well as novel studies exploring factors based on the priorities of the local population.

Second, livability studies should be conducted from an equity perspective, and the human populations used to capture measurements reported. For instance, if street walkability and accessibility are assessed, the study should report if the measurement was calculated by tracking the pace of adult pedestrians without impairments or if a different sample or measurement not including human populations was used. Also, if there is any other sociodemographic characteristic that is relevant to the study and to the local equity context, these should be reported (e.g., gender, age, ethnicity, socioeconomic status, migration status). Livability studies focused on geographies of wealth or used exclusively for economic gain or

attraction of tourism could lead to the displacement of minorities and vulnerable populations. The distribution of resources across spaces and the assessment of small scales such as communities or neighborhoods could help to report the rationale behind studies.

Third, to capture the complexity of the lived experience of people with disabilities and their interactions with their surroundings, dynamic and interdependent livability indicators should be created and assessed across all livability domains. This includes assessing how individuals with various disabilities interact with public space and social infrastructure, identifying equity gaps in safety during natural disasters or access to communication and technology, and addressing housing quality and tenure, livability affordability, and geographies of opportunity for people with disabilities. To accurately evaluate the availability, affordability, accessibility, connectivity, attractiveness, diversity, satisfaction, vitality, and enhancement of livability factors, people with disabilities should be included as participants in all aspects of the study. We suggest that the first step in this direction is to improve the content validity of livability measurements by including people with disabilities and other marginalized groups as experts and co-designers of livability studies.

CONCLUSIONS

Livability is a key concept used in urban and health policy to guide decisions to enhance people's lives internationally. However, how it is defined, measured, and applied is highly varied. This review has highlighted the extent to which livability measurements overlook people with disabilities and non-metropolitan place settings. The review also highlights underreporting of study populations used to construct livability measurements, the lack of precision in defining the instruments used to measure the concept, and a lack of consideration given to place-specific dynamics. The assumptions of homogeneity in study populations in livability studies obscure and overlook inequities experienced by people with disabilities and inhabitants of non-metropolitan settings and could affect their quality of life, as previous research has shown.[35] Although there is recognition that equity is an important issue to consider when using livability lenses, there is limited application, operationalization, or interrogation within existing livability literature. The construction of livability measurements and deciding the use of one measurement over others affects populations. Future research should report precisely what population is included, which might be excluded, and the implications for populations that experience greater vulnerability. This review calls for livability research to be more inclusive of human diversity and coherent with equity claims.

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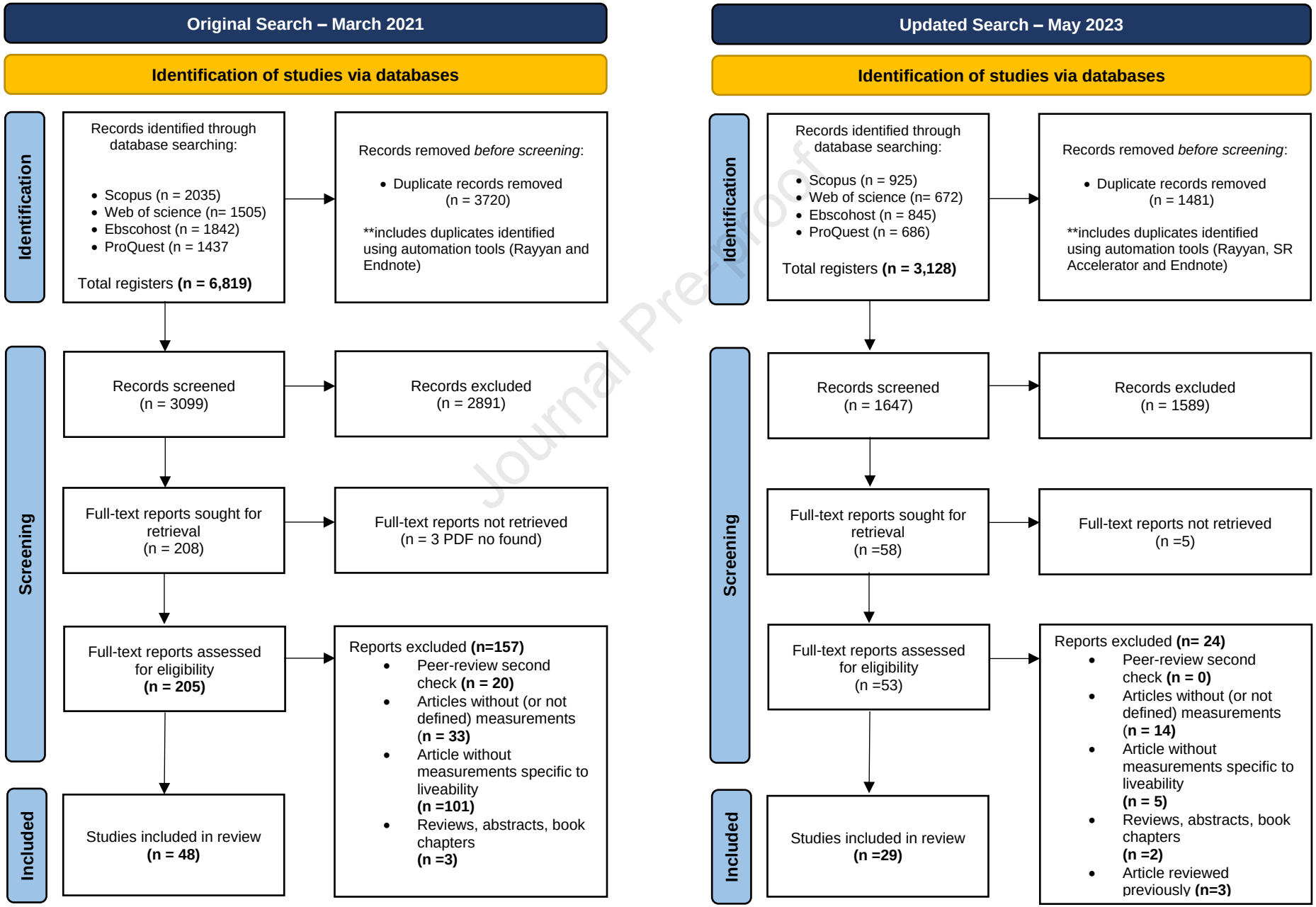
Insert tables 1-4 consecutively, immediately following the in-text reference to Tables 1–4 and Figure 1, if possible, during the production stages.

MANUSCRIPT FIGURE

Figure 1. PRISMA diagram



MANUSCRIPT TABLES

Table 1. General summary

Country	Study places	Scale	Number of articles						
			Metropolitan	Non-metropolitan	People with disabilities		Equity		Total per country
					Mentions	Contains measurements	Mentions	Contains measurements	
China	Changshu	Regional / County	14	13	1	1	6	3	27
	100 cities Greater China Region	City							
	24 cities on the Loess Plateau	City / Region							
	31 provinces in China	Regional / Provinces							
	40 major cities	Country / City							
	40 major cities in China	City / Country							
	42 major cities of China	Community / City							
	Aksu	Prefecture / Region							
	Anhui province	City / Provincial							
	Beijing	City							
	Chongqing	City / Communities							
	Counties in Henan province	Regional							
	Fujian Province	Regional/Province/ City							
	Jianghan Plain	Region							
	Jiangsu Province	Province / Region							
	Jinchang, Oasis Area	Townships / Villages							
	Li Ming Community	Community/ Neighbourhood							
	Linyi	City / Community							
	Minjiang River	Rural settlements/ Region							
	Ningbo City	Provincial/ Community							
	Rural China	Country							
	Shanghai	City							
	Shanghai	Neighbourhood							
	Shenzhen	City							
	Wuhan	City							
	Xianju County	Regional							
	Xianning	City							
Australia	Australia's 21 largest cities	City	6	5	5	3	10	10	11
	Australia's 21 largest cities	City							
	Australia's 21 largest cities	City							
	Randwick, South-East, Sydney	City							
	Grater Bendigo City Council	Regional cities							

	Launceston, Tasmania and Victoria Melbourne Urban areas in Victoria Urban metropolitan Melbourne Victoria Victorian (Australian) region	Neighbourhood/ Regional cities City State City City / Neighbourhood Regional / City							
Multiple countries	21 cities around the world Eastern China and South Korea European cities Iran and Estonia	City / National Region City Country	4	0	0	0	3	0	4
Nigeria	Iwo Wushishi, Bosso and Tunga Minna Lekki, Lagos Niger State	City Neighbourhood City State / Region	2	2	1	1	1	0	4
United States	El Paso metropolitan area The city of Buffalo, New York United States Valley City and Dickinson, North Dakota	Regional City Metro areas / City Regional city / Rural town	2	2	1	1	2	1	4
India	Bhopal Pune Siliguri town, West Bengal	City City / Neighbourhood City / Town	3	0	1	0	2	2	3
Cyprus	Famagusta Salamis Road in Famagusta	City City / Street	2	0	0	0	2	0	2
Indonesia	Cirebon Metropolitan Region, Java. Kompleks Rumah Susun Sombo, Surabaya	City / Regional City / Neighbourhood	0	2	1	1	1	1	2
Iran	Tehran 31 Iranian cities	City City	2	0	0	0	1	1	2
Malaysia	Joho Titiwangsa Lake Gardens, Kuala Lumpur	City Sector of a city	2	0	2	2	2	1	2
Pakistan	Cities (districts) in Pakistan Eight major cities of Punjab, Pakistan	City / District / Country Region / City	2	0	0	0	1	1	2
Taiwan	Taipei City Taiwan	City City / District / Country	2	0	2	2	2	1	2
Thailand	Bangkok, Bangkok	City City	2	0	1	0	2	1	2
United Kingdom	n/a (university in London) Belfast	n/a City	1	1	1	1	1	1	2
Belgium	Ghent (midsized city)	City	1	0	0	0	1	0	1

Canada	Vancouver	City	1	0	0	0	0	0	1
Hong Kong	Hong Kong	City	1	0	0	0	0	0	1
Iraq	Baghdad	Neighbourhood	1	0	0	0	0	0	1
Russia	Russia	City / County	1	0	0	0	0	0	1
South Korea	Seoul	City	1	0	0	0	0	0	1
Spain	44 Spanish cities	City	1	0	0	0	1	0	1
United Arab Emirates	Sharjah's	City / Local districts	1	0	1	1	0	0	1
Total			**52**	**25**	**17**	**13**	**38**	**23**	**77**

MANUSCRIPT TABLES

Table 2. Livability domains, sub-domains per number of measurements.

DOMAIN	SUB-DOMAIN	Ranking	All articles		Ranking	Non-metropolitan settings		Ranking	For people with disabilities	
			N	%		N	%		N	%
Public space and infrastructure		**1**			**2**			**1**		
	Pedestrian Infrastructure and walkability		60	23,0%		9	18,4%		10	31,3%
	Open space and green coverage		78	29,9%		23	46,9%		3	9,4%
	Accessibility and availability of public space		23	8,8%		3	6,1%		7	21,9%
	Buildings		29	11,1%		2	4,1%		1	3,1%
	Landscape and aesthetics		23	8,8%		3	6,1%		1	3,1%
	Street furniture		23	8,8%		4	8,2%		4	12,5%
	Urbanisation		15	5,7%		4	8,2%		**0**	0,0%
	Other		10	3,8%		1	2,0%		6	18,8%
	Domain subtotal		**261**	100,0%		**49**	100,0%		**32**	100,0%
Transportation		**2**			**6**			**3**		
	Public transportation		82	33,9%		18	47,4%		7	50,0%
	Traffic		30	12,4%		2	5,3%		**0**	0,0%
	Road assessment		37	15,3%		11	28,9%		1	7,1%
	Transportation modes		11	4,5%		2	5,3%		1	7,1%
	Accessibility and availability of bicycle paths		19	7,9%		1	2,6%		**0**	0,0%
	Accessibility and availability of parking		12	5,0%		3	7,9%		3	21,4%
	Land use in transportation		7	2,9%		**0**	0,0%		**0**	0,0%
	Private transportation		12	5,0%		1	2,6%		**0**	0,0%
	Environmental impacts of transportation		4	1,7%		**0**	0,0%		**0**	0,0%
	Time travelled		4	1,7%		**0**	0,0%		1	7,1%
	Other		24	9,9%		0	0,0%		1	7,1%
	Domain subtotal		**242**	**100,0%**		**38**	100,0%		**14**	100,0%
Neighbourhood amenities		**3**			**1**			**2**		
	Stores and commercial services		39	16,1%		11	13,9%		**0**	0,0%
	Recreation, culture and entertainment venues		57	23,6%		19	24,1%		3	20,0%
	Food environment		44	18,2%		13	16,5%		2	13,3%
	Community centres and services		22	9,1%		8	10,1%		6	40,0%
	Sports facilities		29	12,0%		11	13,9%		1	6,7%
	Libraries		15	6,2%		7	8,9%		2	13,3%
	Worship places		5	2,1%		1	1,3%		1	6,7%
	Other		31	12,8%		9	11,4%		**0**	0,0%
	Domain subtotal:		**242**	100,0%		**79**	100,0%		**15**	100,0%

Ecological (natural) environment		**4**			**5**			**12**	
	Air and atmospheric environment		57	38,8%		9	23,1%		**0**
	Climate		25	17,0%		4	10,3%		1
	Forestation and agroforestry		18	12,2%		14	35,9%		**0**
	Water		18	12,2%		5	12,8%		**0**
	Noise pollution		11	7,5%		**0**	0,0%		**0**
	Others		18	12,2%		7	17,9%		0
	Domain subtotal		**147**	100,0%		**39**	100,0%		**1**
Economic development and cost of living		**5**			**4**			**5**	
	Industry and GDP		36	26,3%		14	31,8%		**0**
	Business and investments		16	11,7%		3	6,8%		**0**
	Living standards and cost of living		16	11,7%		8	18,2%		2
	Insurance and welfare		12	8,8%		7	15,9%		3
	Tourism		13	9,5%		2	4,5%		**0**
	Revenue		7	5,1%		3	6,8%		**0**
	Economic burden and vulnerability		22	16,1%		2	4,5%		**0**
	Other		15	10,9%		5	11,4%		0
	Domain subtotal		**137**	100,0%		**44**	100,0%		**5**
Housing		**6**			**8**			**8**	
	Living space and house amenities		49	36,3%		22	62,9%		**0**
	Connectivity (distance to facilities)		15	11,1%		**0**	0,0%		**0**
	Affordability		26	19,3%		7	20,0%		1
	Residential density		17	12,6%		3	8,6%		1
	Accessibility		6	4,4%		1	2,9%		1
	Housing tenure		7	5,2%		**0**	0,0%		**0**
	Other		15	11,1%		2	5,7%		**0**
	Domain subtotal		**135**	100,0%		**35**	100,0%		**3**
Sanitation and public services		**7**			**9**			**14**	
	Potable drinking water		28	20,9%		7	21,2%		**0**
	Waste		32	23,9%		9	27,3%		**0**
	Drainage and sewage		19	14,2%		6	18,2%		**0**
	Energy and electricity		22	16,4%		3	9,1%		**0**
	Gas		9	6,7%		3	9,1%		**0**
	Environmental hygiene (cleanliness)		15	11,2%		1	3,0%		**0**
	Other		9	6,7%		4	12,1%		**0**
	Domain subtotal		**134**	100,0%		**33**	100,0%		**0**
Safety and security		**8**			**11**			**11**	
	Natural disasters and response		36	27,3%		9	47,4%		**0**
	Crime		29	22,0%		2	10,5%		1
	Traffic accidents		19	14,4%		1	5,3%		**0**
	Sense of safety		12	9,1%		2	10,5%		**0**

	Police presence and services		13	9,8%		2	10,5%		**0**	
	Shelters		6	4,5%		1	5,3%		**0**	
	Others		17	12,9%		2	10,5%		0	
	Domain subtotal		**132**	100,0%		**19**	100,0%		**1**	
Health and healthcare		**9**			**3**			**4**		
	Accessibility to services and facilities		43	35,5%		30	66,7%		11	84,6%
	Availability of services and facilities		23	19,0%		5	11,1%		1	7,7%
	Life expectancy and mortality		10	8,3%		**0**	0,0%		**0**	0,0%
	Affordability		7	5,8%		2	4,4%		**0**	0,0%
	Hospital beds		11	9,1%		2	4,4%		**0**	0,0%
	Medical staff		8	6,6%		2	4,4%		**0**	0,0%
	Others		19	15,7%		4	8,9%		1	7,7%
	Domain subtotal		**121**	100,0%		**45**	100,0%		**13**	100,0%
Employment and income		**10**			**7**			**9**		
	Income, salary or wages		35	32,1%		15	40,5%		**0**	
	Employment availability		21	19,3%		4	10,8%		1	
	Employment accessibility		17	15,6%		3	8,1%		**0**	
	Unemployment		13	11,9%		3	8,1%		**0**	
	Others		23	21,1%		12	32,4%		2	
	Domain subtotal		**109**	100,0%		**37**	100,0%		**3**	
Education		**11**			**10**			**6**		
	School attendance		19	19,2%		3	11,1%		**0**	
	Access to educational facilities		26	26,3%		12	44,4%		**0**	
	Availability of educational facilities		24	24,2%		7	25,9%		1	
	Teachers' ratio		10	10,1%		3	11,1%		**0**	
	Others		20	20,2%		2	7,4%		3	
	Domain subtotal		**99**	100,0%		**27**	100,0%		**4**	
Social cohesion		**12**			**12**			**10**		
	Inclusiveness, diversity and identity		30	35,3%		1	9,1%		**0**	
	Social relationships		25	29,4%		3	27,3%		**0**	
	Social and cultural activities		16	18,8%		4	36,4%		**0**	
	Others		14	16,5%		3	27,3%		2	
	Domain subtotal		**85**	100,0%		**11**	100,0%		**2**	
Governance		**13**	**45**		**14**	**6**		**13**	**1**	
Communications and information		**14**	**28**		**13**	**7**		**7**	**3**	
Others			**38**			**5**			**1**	
TOTAL			**1955**	**100,0%**		**474**	**100,0%**		**98**	**100,0%**

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Table 3. Livability measurements examples.

DOMAIN	SUB-DOMAIN	Measurement example
Transportation	Public transportation	Number of public transportation vehicles per 10,000 population
	Traffic	Probability of traffic congestion
	Road assessment	Per capita road length and area
	Transportation modes	Integration of different transportation modes
	Accessibility and availability of bicycle paths	Bike lane completeness index
	Accessibility and availability of parking	Availability of paid parking space
	Land use in transportation	Land Use and Public Transport Accessibility Index (LUPTAI)
	Private transportation	Mean number of cars owned per household
	Environmental impacts of transportation	Energy Use in transportation
	Time travelled	Time taken to travel to work (in minutes)
	Other	Health Impact of transportation
Public space and infrastructure	Pedestrian Infrastructure and walkability	Safe and orderly pedestrian sidewalks and overpasses
	Open space and green coverage	Spatial distribution of parks and green spaces in the districts
	Accessibility and availability of public space	Visibility of public spaces
	Buildings	Proportion of building height to street width
	Landscape and aesthetics	Accessibility of landscape
	Street furniture	Proportion of illuminated parts of streets, driveways and embankments
	Urbanisation	Population urbanization rate
	Other	The sense of hierarchy between public and private spaces
Housing	Living space and house amenities	Satisfaction with housing conditions
	Connectivity (distance to facilities)	Home nearness to commercial/industrial zone
	Affordability	Access to low cost and quality public housing
	Residential density	Per capita usable space of houses in urban areas (m2)
	Accessibility	Housing Unit Accessible by Road
	Housing tenure	Access to property rights
	Other	Share of dilapidated housing
Neighbourhood amenities	Stores and commercial services	Number of shops within 0.5-km buffer zone
	Recreation, culture and entertainment venues	Spatial distribution of leisure time centres in the districts
	Food environment	Number of Restaurant within 300m walking distance
	Community centres and services	Distribution of community organizations and public utilities
	Sports facilities	Areas for passive recreation and physical activity
	Libraries	Number of libraries per 1,000 residents
	Worship places	Distribution of religious sites and cultural heritage
	Other	Dissatisfaction with the current neighbourhood
Ecological (natural) environment	Air and atmospheric environment	Accumulated ozone concentration exceeding 70 microgram/m3
	Climate	Duration of thermal comfort

	Forestation and agroforestry	Area of nature reserves as percentage of the region
	Water	Protection of natural waterways
	Noise pollution	Mean value of regional environmental noise
	Others	Satisfaction with quality of natural environment
Sanitation and public services	Potable drinking water	Access to potable drinking water
	Waste	Collected solid waste—tonnes per inhabitant and year
	Drainage and sewage	Industrial sewage treatment rate
	Energy and electricity	Total electricity consumption
	Gas	Evaluation of residents to gas supply
	Environmental hygiene (cleanliness)	Cleanliness of city
	Other	Willingness to pay for equipment to get healthy air
Economic development and cost of living	Industry and GDP	Proportion of tertiary industry in GDP/%
	Business and investments	Business licensing for new enterprise
	Living standards and cost of living	Urban household Engel's coefficient
	Insurance and welfare	Percentage of the population covered by basic pension insurance
	Tourism	Number of foreign tourists arrivals per capita
	Revenue	Tax revenue as a percentage of public budgetary revenue
	Economic burden and vulnerability	Deprivation index
	Other	Satisfaction with economic development
Safety and security	Natural disasters and response	Availability of geo-hazard map to citizens
	Crime	Ratio of crime solution to total crimes committed
	Traffic accidents	Number of fatal accidents involving pedestrians
	Sense of safety	Safe walking at night in your area
	Police presence and services	Satisfaction with police services (survey)
	Shelters	Emergency shelter condition
	Others	Distribution industrial outlets with potential safety problems such as gas stations
Employment and income	Income, salary or wages	Growth rate of per capita income
	Employment availability	Population employment mix index
	Employment accessibility	Mode access to employment (active travel)
	Unemployment	Registered unemployment rate in urban area/%
	Others	Spatial distribution of the employed population
Social cohesion	Inclusiveness, diversity and identity	Respect of traditions among diverse cultures
	Social relationships	Being member of any of the association
	Social and cultural activities	Joint activities opportunities
	Others	Community resilience
Health and healthcare	Accessibility to services and facilities	Driving distance to the nearest hospital
	Availability of services and facilities	Number of urban medical/health centres
	Life expectancy and mortality	Number of deaths from chronic diseases
	Affordability	Average cost of hospital room per day
	Hospital beds	Available hospital beds in cities
	Medical staff	Ratio of medical officer per 1,000 population
	Others	Satisfaction with healthcare facilities

Education	School attendance	Percent of high school dropout
	Access to educational facilities	Spatial distribution of educational centres in the districts
	Availability of educational facilities	Number of primary and secondary schools per 10,000 population
	Teachers' ratio	Teacher student ratio in primary schools
	Others	Quality of education system (index)
Governance		Access to government records
		Citizen participation in government policy making process
		National laws and local ordinances properly implemented
Communications and information		Information Development Index (IDI)
		Access/coverage of internet/broadband
		The negative situation reported by media
Others		High-quality citizens
		Personal space
		Territorial functioning

MANUSCRIPT TABLES

Table 4. Overlap of measurements for non-metropolitan settings and people with disabilities.

		NM	PWD
1.	**Transportation**		
1.1	Access to a public transport stop within 400 m with a regular service every 30 min (7 am–7 pm)	✓	✓
1.2	Access to public transport with disability standards for accessible public transport	✓	✓
1.3	Bus stops with seats/shelters	✓	✓
1.4	Community transport measure	✓	✓
1.5	Public transport availability (% dwellings)	✓	✓
1.6	Daily commute (options)	✓	✓
1.7	Disabled car parking access	✓	✓
1.8	Parking (availability)	✓	✓
1.9	Transportation and parking (accessibility)	✓	✓
1.10	Availability of public transportation facilities	✓	
1.11	Daily transport cost	✓	
1.12	Proximity to transit facilities	✓	
1.13	Public transport accessibility	✓	
1.14	Rural public transit	✓	
1.15	Road traffic facilities	✓	
1.16	Highway density (Km)	✓	
1.17	Rural per capita road area	✓	
1.18	Rural road condition	✓	
1.19	City transportation (modes)	✓	
1.20	Index of personal travel impact (IPTI)		✓
1.21	Quality of the transportation for disadvantaged group		✓
2.	**Public Space and Infrastructure**		
2.1	Intersections serviced with pedestrian crossings	✓	✓
2.2	Pedestrian Infrastructure	✓	✓
2.3	Walkability (index)	✓	✓
2.4	Walkability for transport (with and without footpaths)	✓	✓
2.5	Access to public open space within 400 m	✓	✓
2.6	Public open space (% dwellings)	✓	✓
2.7	Public parks (availability)	✓	✓

2.8	Availability of facilities for disabled people (in public space)	✓	✓
2.9	Shelter (in public sapce)	✓	✓
2.10	Accessible buildings	✓	✓
2.11	Access and use of toilets	✓	✓
2.12	Access to public seating	✓	✓
2.13	Access to public toilets (with and without accessibility features)	✓	✓
2.14	Green coverage rate	✓	
2.15	Green open spaces in the public area	✓	
2.16	Proximity to parks and recreation	✓	
2.17	Existence of public spaces	✓	
2.18	Natural landscape	✓	
2.19	Surrounding landscape	✓	
2.20	Street light condition	✓	
2.21	Percentage of urbanization	✓	
2.22	Proportion of urban population in the region	✓	
2.23	Urbanization rate (%)	✓	
2.24	Accessibility of disabled person to establishments		✓
2.25	Universal design (in public space)		✓
2.26	Presence of ramps & wheelchair friendly facilities		✓
2.27	Stairs with railing support		✓
2.28	Minimal level differences on ground surface		✓
2.29	Absence of loud noises		✓
2.30	Absence of unpleasant smells		✓
2.31	Absence of unpleasant sights		✓
2.32	Absence of unpleasant physical surfaces		✓
2.33	Adequate provision of signage, visual cues and/or within the park location map		✓
2.34	Seamless transition between various parts of the location		✓
2.35	Ease in seeing and discerning all areas surrounding the park		✓
2.36	No structures to obstruct view of surroundings		✓
2.37	Reasonably good elevation with minimal fluctuations (slightly undulating)		✓
3.	**Housing**		
3.1	Affordable housing	✓	✓
3.2	Housing diversity according to eight different housing types	✓	✓

3.3	Living space (Bedroom size, dining area size, kitchen size, toilet/bath size living area size)	✓	
3.4	Air Circulation	✓	
3.5	Condition In Shelter Units	✓	
3.6	House ventilation	✓	
3.7	Housing quality	✓	
3.8	Housing space	✓	
3.9	Housing style	✓	
3.10	Housing with garden spaces	✓	
3.11	Number of bathrooms	✓	
3.12	Space Adequacy (housing)	✓	
3.13	Affordability (housing)	✓	
3.14	Effects of loan/rent on total income	✓	
3.15	Rating on housing affordability	✓	
3.16	Per capita housing construction area	✓	
3.17	Healthy housing	✓	
3.18	Housing unit suitability for the disable/old person		✓
4.	**Neighbourhood Amenities**		
4.1	Access to local cafés measured by distance	✓	✓
4.2	Cultural institutions	✓	✓
4.3	Recreational services catered to older people e.g., a YMCA	✓	✓
4.4	Access to neighbourhood houses/community centres	✓	✓
4.5	Access to services for older people	✓	✓
4.6	Access to social clubs/senior citizens clubs	✓	✓
4.7	Activity centre (meters)	✓	✓
4.8	Places of social connection	✓	✓
4.9	Physical activity and recreation (meters)	✓	✓
4.10	Access to libraries	✓	✓
4.11	Library (meters)	✓	✓
4.12	Healthier food proportion (%)	✓	✓
4.13	Number of healthier food options (count)	✓	✓
4.14	Access to places of worship	✓	✓
4.15	Access to trade And service facilities	✓	
4.16	Shopping centres	✓	
4.17	Shopping convenience	✓	

4.18	Cultural and recreational facilities	✓	
4.19	Rural fitness place index	✓	
4.20	Per capita volume of books in libraries	✓	
4.21	Average delivery times per week in rural areas	✓	
4.22	Multi-purpose sport courts		✓
4.23	Spaces and facilities use open for interpretation by users		✓
5.	**Ecological (natural) environment**		
5.1	Air quality index	✓	
5.2	City air quality	✓	
5.3	Days of air compliance (%)	✓	
5.4	City climate	✓	
5.5	Climate comfort	✓	
5.6	Density of fertilizer application	✓	
5.7	Density of pesticide use	✓	
5.8	Density of plastic film for farm use	✓	
5.9	Forest coverage rate (%)	✓	
5.10	Per capita sown area	✓	
5.11	Percentage of forest cover	✓	
5.12	Proportion of biogas output of agricultural waste to total biogas + output	✓	
5.13	Total area of afforestation (Mu)	✓	
5.14	Total grain output (Tons)	✓	
5.15	Total mechanical power per unit of cultivated land (W/mu)	✓	
5.16	Healthy waterways	✓	
5.17	Water-saving irrigation rate	✓	
5.18	Well maintained river	✓	
5.19	Geological stability	✓	
5.20	Fertilizer application intensity (Tons)	✓	
6.	**Sanitation and Public Services**		
6.1	Per capita possession of fresh water resources	✓	
6.2	Popularizing rate of water supply	✓	
6.3	Running water supply facilities	✓	
6.4	Safe drinking water	✓	
6.5	Sufficient water availability	✓	
6.6	Water quality	✓	

6.7	Garbage collection	✓	
6.8	Garbage treatment rate	✓	
6.9	Household waste disposal	✓	
6.10	Household sewage disposal	✓	
6.11	River and pond pollution disposal	✓	
6.12	Water and sanitation infrastructure/ waste water treatment	✓	
6.13	Energy supply facilities	✓	
6.14	Gas connection	✓	
6.15	Popularizing rate of gas	✓	
6.16	Environmental Cleanliness	✓	
6.17	Percentage of sanitary	✓	
6.18	Popularization of sanitary toilets	✓	
6.19	Popularizing rate of sanitary toilet	✓	
7.	**Economic development and cost of living**		
7.1	Overall cost of living	✓	✓
7.2	Proportion of households in the bottom 40% of incomes spending more than 30% of income on housing costs	✓	✓
7.3	Access to Commonwealth Support Home Packages (funding supporting ageing in the home if available)	✓	✓
7.4	Centrelink (meters)	✓	✓
7.5	Agriculture, forestry and water affairs expenditure	✓	
7.6	Per capita agricultural machinery power	✓	
7.7	Per capita GDP	✓	
7.8	Per capita tertiary industry gross domestic products	✓	
7.9	Proportion of income from special industries (%)	✓	
7.10	The per capita gross output value	✓	
7.11	Third industry accounted for GDP	✓	
7.12	Value-added of secondary industry	✓	
7.13	Completed investment in fixed assets of rural households	✓	
7.14	Per capita investment in fixed assets	✓	
7.15	Per capita savings deposit of rural and urban residents	✓	
7.16	Rate of decline of the number of rural residents with minimum living security (%)	✓	
7.17	Standard of living	✓	
7.18	Number of rural pension institutions per 10,000 households	✓	
7.19	Percentage of persons participated in basic pension insurance	✓	

7.20	Rural endowment insurance	✓	
7.21	Social insurance condition	✓	
7.22	Per capita financial revenue	✓	
7.23	Per capita retail sales of consumer goods	✓	
7.24	Per capita retail sales of social consumer goods	✓	
8.	**Safety and Security**		
8.1	Low crime	✓	✓
8.2	Drought prevention	✓	
8.3	Fire Protection	✓	
8.4	Flood protection	✓	
8.5	Crime safety	✓	
8.6	Accident safety	✓	
8.7	Property safety	✓	
8.8	Safety of life and property	✓	
8.9	Availability of security services	✓	
8.10	Public security	✓	
8.11	Security	✓	
9.	**Employment and Income**		
9.1	Available jobs	✓	✓
9.2	Disability employment service (meters)	✓	✓
9.3	Proportion of population working beyond official retirement age	✓	✓
9.4	Annual financial income per capita	✓	
9.5	Monthly income	✓	
9.6	Per capita disposable income of urban residents	✓	
9.7	Per capita net income of urban residents	✓	
9.8	Per-capita net income of farmers	✓	
9.9	Employment (availability)	✓	
9.10	Percentage of employed population	✓	
9.11	Accessibility of the workplace	✓	
9.12	Employment-population ratio	✓	
10	**Health and Healthcare**		
10.1	Access to General Practitioners	✓	✓
10.1	Access to Geriatricians	✓	✓
10.2	Access to residential aged care accommodation	✓	✓

10.3	Adult mental health (meters)	✓	✓
10.4	Dentist (meters)	✓	✓
10.5	Family counselling (meters)	✓	✓
10.6	General practitioner (meters)	✓	✓
10.7	Generalist counselling (meters)	✓	✓
10.8	Hospital (meters)	✓	✓
10.9	Pharmacy (meters)	✓	✓
10.10	Psychology (meters)	✓	✓
10.11	Quality healthcare	✓	✓
10.12	Access to health service	✓	
10.13	Health care (availability of services and facilities)	✓	
10.14	Public Health (programs)	✓	
10.15	Rural medical facility index	✓	
10.16	Percentage of persons participated in the new rural cooperative medical (insurance)	✓	
10.17	Rural medical insurance	✓	
10.18	Number of beds in medical and health institutions	✓	
10.19	Number of rural medical staff per 1000 inhabitants	✓	
10.20	Medical convenience	✓	
10.21	Healthy human settlement	✓	
10.22	Rural medical technology level	✓	
11.	**Education**		
11.1	Access to Universities of the 3rd Age	✓	✓
11.2	Quality public schools	✓	✓
11.3	Average number of students per teacher in rural nine-year compulsory education	✓	
11.4	Percentage of junior enrolment consolidated	✓	
11.5	Access To Educational Facilities	✓	
11.6	Education convenience	✓	
11.7	Children education services	✓	
11.8	Number of high school teachers (per 1,000 students)	✓	
12.	**Social cohesion**		
12.1	Membership of Clubs like Probus and Rotary	✓	✓
12.2	Proportion of population aged 60+ years regularly volunteering	✓	✓
12.3	Percentage of external population		✓
12.4	Interaction / Social Relations		✓

12.5	Mutual Cooperation Between Neighbours		✓
12.6	Neighbourhood relationship		✓
12.7	Amateur cultural organization index		✓
12.8	Interesting Cultural Activities		✓
12.9	Ongoing Social Activities		✓
12.10	Places of historical figures and cultural heritage points		✓
13.	**Governance**		
13.1	Proportion of government owned dwellings	✓	✓
13.2	Democratic management	✓	
13.3	Village management index	✓	
13.4	The responsibility of the villiage clerk and directo		
14.	**Communications and information**		
14.1	Access to ABC or national broadcaster radio	✓	✓
14.2	Proportion of households with access to the internet	✓	✓
14.3	Proportion of households with mobile phone reception	✓	✓
14.4	E-commerce service site	✓	
14.5	Postal and communication facilities	✓	
14.6	Rural broadband penetration	✓	