# SYSTEMATIC REVIEW





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# Abstract

**Purpose** This scoping review aims to understand the extent and attributes of literature evaluating differences between rural and urban populations' utilization of health services in upper-middle and high-income countries.

**Method** The review was conducted in line with established scoping review methodology guidelines. We used the "Participants, Concept and Context" framework to guide the inclusion criteria and determination of the review's scope. Studies published over a 15-year period (2008–2022) were identified using Embase, Medine, PubMed, and Scopus databases. Study attributes, areas of focus and findings were reviewed and extracted.

**Results** The search identified 179 studies. The number of studies published looking at rural–urban differences in health service utilization has increased over time. The focus of these studies is relatively evenly split between primary and secondary sectors. The majority of studies observed less service utilization by rural populations than urban—especially so in primary-sector services. When higher rural utilization of secondary services was observed this was frequently attributed to poor access to other services that would have had the potential to mitigate the secondary demand. Studies were not commonly grounded in principles of equity or fairness and rarely offered value judgements on observed differences in utilization. There were limited system-level studies – the vast majority being disease- or service-specific analyses. We consider this a notable gap in the literature.

**Conclusion** This scoping review identifies key parameters of studies on rural–urban variation in health service utilization. The finding that most studies observed rural populations utilized comparatively less services is concerning, in the context of general evidence about high levels of health need in rural communities. Future system-level research considering the combined variations in need and utilization appears a priority.

Keywords Scoping review, Rural, Equity, Health systems, Utilization

# Background

Rural population health outcomes are widely documented as being worse than those of urban populations [1-9]. Relatedly, equity theory suggests people with

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equivalent need should receive equivalent care (horizontal equity) [10], while those with greater need should receive greater care (vertical equity) [11]. Given evidence of poorer rural health outcomes, it would be consistent with this theory for rural populations to utilize proportionately greater amounts of health care services than urban—the increased levels being commensurate with the observed increased levels of need. Advancing understanding of the nature of literature looking at rural– urban service utilization contributes to one component of the need/use equity dyad.



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Connected to this theoretical base is the nature of health system design, and its impact on utilization. Health care utilization, is, among other factors, mediated and stimulated by health system design and degree of access [12]. These factors are modifiable, and therefore unjustified variation in utilization caused by system design fits the definition of an avoidable and therefore inequitable cause of variation [10]. The impact of access, as a component of service design, is emphasised within this review, given rural populations' frequent emphasis on access to services as a priority, and poor access as a barrier to care [13–16].

Despite the ample evidence looking at rural health outcomes and the structural limitations in access to services, there appears to be no published evidence synthesis of the literature looking at rural–urban variations in health service use. Given that many studies on rural– urban variation are disease or service-specific (without a system-wide view), a scoping review evidence synthesis allows consolidation of the extent and type of literature evaluating differences in health service utilization. This should support policy-makers and commissioners to consider how health systems are working for rural populations, beyond that offered by more "narrow" slices of evaluation.

The completion of this Scoping Review was prompted by research currently underway in New Zealand (and funded by the Health Research Council of New Zealand), looking at national-level differences in rural and urban populations' use of publicly funded services. This country-specific research is in response to recent studies showing rural New Zealanders experience poorer health outcomes [1, 7], and the desire to understand how utilization patterns may correspond or deviate from the patterns in mortality and morbidity (and indeed contribute to understanding the extent to which the health system is operating equitably). It is within this context that some of the decision-making around the design of the review (such as focussing on middle-high and high-income countries) is substantiated.

Consistent with the basis for undertaking scoping reviews [17, 18], the primary objectives of this review are to:

- Identify the extent of literature focussed on rural– urban variation in health care service utilization and understand what studies have already been completed.
- 2) Provide a descriptive analysis of the parameters of the literature pertaining to rural–urban variation in service utilization, including:

- inantly focussed on.b. Appraising studies for whether they were framed in concepts of "equity".
- c. Summarising the broad directions of findings from included studies.

Secondary objectives are to:

- 3) Assess the extent of research gaps in the existing literature; and
- Identify, if able, opportunities for future research that addresses any observed gaps across the included studies.

Throughout this review project, only one systematic review was identified related to our topic of rural–urban variation in utilization. This was a service-specific systematic review evaluating literature focussed on variations in use of cancer end-of-life care [19].

# Method and search strategy

A scoping review methodology was selected because of the absence of existing evidence detailing the scope and breadth of literature in this subject area, and the consequent intention of this review being to contribute to building this understanding [18]. Scoping reviews are described as an appropriate method of evidence synthesis when seeking to understand the extent and attributes of a body of literature, and for collating and describing parameters (including appraising evidence gaps) [20].

The scoping review was conducted in line with established scoping review methodology guidelines [17, 18, 21, 22]. Findings are described in accordance with the Preferred Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines [20]. The scoping review protocol was not registered.

### Inclusion criteria

The review used the "Participants, Concept and Context" (PCC) framework for scoping reviews to guide the inclusion criteria and determination of the review's scope [22].

The participants of interest were urban and rural populations and their associated health service use when domiciled in their respective urban and rural areas. Review criteria was agnostic as to the location of the service utilization (e.g., rural patients traveling to an urban service), provided the site was still within the same health administrative jurisdiction of residence. Administrative jurisdictions were deemed to be the country of study rather than attempting to ascertain any administrative sub-regions.

# Table 1 Concept screening criteria

Concept	Definition
Utilization:	Consumption of health services had to occur – i.e., utilization—rather than merely the presence of services. For example, studies focusing on "beds per capita" or "physicians by urban–rural catchments" were excluded.
Publicly funded health services:	The priority was for utilized services to be publicly financed. This meant the exclusion of studies that exclusively assessed utilization of private funded services—either those funded Out of Pocket, or via private insurance. An exception to this was made for mixed "concept" studies (largely in the American context) where public and privately funded insurance consumption were combined in the same study. We accepted these studies because of the presence of the public funding element.
Rural–urban comparison	Studies were required to have a rural-urban comparison in the reported results. Parameters were not put around defi- nitions of "rurality". Rather, the intent of the review was to scope international literature pertaining to broad rural-urban variations – even if definitions of rurality varied.

"Concept" refers to the phenomena of interest and outcomes of evaluation. Table 1 summarises the central concepts of utilization, of publicly funded health services, compared between urban and rural populations.

Context describes attributes of settings, or specific supplementary variables of interest that may affect inclusion. Table 2 summarises context screening criteria.

Literature for review was restricted to published academic studies. Searches were undertaken on Embase, Medine, PubMed, and Scopus. Searches of grey literature searches were not undertaken.

The process for developing the search term combinations was iterative and experimental, assessing combinations against two criteria – results returned (scope) and quality/relevance (specificity). The search structure sought to reach widely while also not creating an unworkable number of results due to introduction of key words being used in other contexts. Before commencing, advice was sought from library staff on development of the search strategy. Final searches were executed on 9 March 2023 on each of the named databases. The search resulted in 2,883 results. All identified citations were exported and uploaded into COVIDENCE [24]. Two reviewers (TL and GN) undertook blinded title and abstract screening. Full text screening was undertaken by TL, GN and TS. Any conflicts at both stages were resolved through discussion.

Data extraction took place for each study that advanced from the full-text screening phase. Extraction involved identifying study results and attributes. Extraction variables of interest spanned the PCC domains, and included year of publication; country of analysis; whether results were disaggregated by ethnicity and/or indigeneity; the number rurality classification tiers; area of health sector being analysed (primary vs secondary); whether or not studies were "disease" focussed or "service" focussed; unit of measurement; utilization classification; whether or not the concept of equity was used to frame or interpret results; direction of study results; and quantity of interpretations regarding the role of access as a cause of any results.

For health sector classification, studies were categorised as being "primary care" oriented if they focussed on community services, family physician or nursing activity, or non-hospital or non-specialist activities. Studies were deemed to be "secondary focussed" if they assessed the utilization of hospital or specialist services, including specialist outpatient services.

Studies were deemed to be "service focussed" if they measured select service types (e.g., CT scans; physician

Inclusion	Exclusion
Studies published in English, as research team is monolingual.	Studies which evaluated the efficacy of differ- ences in insurance coverage policies as a deter- minant of variations in urban–rural coverage.
Upper-middle and high-income countries, per World Bank classification [23], to support the rel- evance of the findings for developed health system research and policy.	Non-published studies.
Publication range between Jan 2008 to Dec 2022 (15 years), so that included study findings are more relevant to current system design.	Studies were excluded if they primarily assessed differences in clinical management practices or quality markers across urban and rural settings. This is because we considered such studies as less likely to be generalisable, and less focussed on utilization difference.

#### Table 2 Context screening criteria

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appointments); or general service interactions (such as ED presentations or hospital admissions) where the service interaction was the orienting factor in the study design – e.g., "rural–urban variation in hospital-isations". In contrast, studies were classified as "disease focussed" if they measured activity specific to a disease group (e.g., diabetes) where the disease group was the orienting factor in the study design and activity selection – e.g., "rural–urban variation in hospitalisations for patients with diabetes". These examples illustrate the classification is somewhat arbitrary – both examples evaluate hospitalisations. However, the presence of a "disease-specific" interest in the second example signalled the classification under "disease-specific utilization".

Equity analysis involved appraising studies for their conceptual framing and results interpretation – specifically if the term "equity" (or derivations) was explicit. Table 3 details the three possible categories and the evaluation criteria.

Author interpretations regarding the role of access as a cause of any results were identified from study discussion sections. This involved appraising whether authors considered their observations of variation in demand as arising as direct result of access (or lack thereof) to the target service, or driven by access (or lack thereof) to any complementary service/s. Complementary services were defined as services identified by the authors where it was suggested better access may have mitigated the target service demand. Any postulations related to either area of the system (target or complementary) were categorised by the domains "access" and "effect", and the direction of influence of these domains (positive or negative). Definitions and examples are provided in Table 4.

Data extraction was undertaken using a template that was tested prior to commencing the review. Thematic interpretation was required for the equity focussed variable. TL led the extraction with support from GN and TS. Data analysis was quantitative and involved producing descriptive statistics for the results collated in the extraction phase.

# Results

A total of 2,883 studies were retrieved, and a final group of 179 studies were identified for analysis (Fig. 1). The full list of excluded studies and reasons for exclusion is provided in the supplementary materials.

# Study parameters and participants

Figure 2 shows the number of publications by year. The number of publications varied by year but increased in the latter half of the study period.

Publication count by country shows the majority of studies were in North America (USA and Canada) (65%, n=117) (Fig. 3). "Other" pertains to countries (n=17) where there were 2 or less studies identified per country.

# Ethnicity and indigeneity

"Other" pertains to countries (n = 17) where there were 2 or less studies identified per country.

Less than half of the studies (44%, n=79) considered ethnicity groups within assessed populations. Of the 132 studies in countries with colonial histories and indigenous populations, (USA, Canada, Australia, New Zealand, Brazil), only 21 (16%) considered indigeneity in study design, methods and results.

# Study approaches to measurement and assessment

One hundred forty-nine of one hundred seventynine studies were focussed specifically on rural–urban variation in service use. The remainder were focussed on alternative areas of variation, and rural–urban differences were a secondary variable of analysis.

The approach of classifying rural and urban areas varied across the studies with 65% (n=117) of studies using a dichotomous (2-tier) classification and 30% (n=54) of studies using an ordinal (3 tier or more) classification. The remaining 5% (n=8) of studies were unclear in their definition or used multiple methods to derive their conclusions.

There were two distinct approaches used to quantify service use: financially or measuring units of activity such as hospital admission or outpatient visit or procedure. Almost all studies assessed activity levels (94%, n=168); while only a very small number of studies assessed

Tab	le 3	Equity	categorisation a	and eva	luation criteria	
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Category	Evaluation criteria
Equity is explicitly focussed on	The term "equity" is used to frame the study, interpret the results, or shape the method.
An equity focus is apparent, but not in those terms	The term equity is not present in the study. However, different terms are used – disparity, justice, etc.
No explicit equity focus or synonymous terminology	No value-laden term such as equity are used in the manuscript. Paper approach is dominantly positivist or agnostic in nature taking an impartial look at differences between rural and urban populations without offering a value-based interpretation.

Service	Service Definition	Access	Effect	Example
Target Service	The target service of the study	Access to target service (e.g., spe- cialist outpatient) Positive / Nega- tive	The effect access to the target service, had on that target service use Positive / Negative	"It is likely the long travel distance for rural communi- ties [negative access] limited utilization of the [target] outpatient service" [negative effect]
Complementary Service	Ancillary services that are considered to affect the demand of the target service (e.g., primary care offsetting hospitalisations)	Access to com- plementary services (e.g., primary care) Positive / Nega- tive	The effect access to complementary services had on target service use (e.g., hospitalisations) Positive / Negative	"Reduced access to primary care [complementary] in rural areas [negative access] may be driving increased hospitalisations [positive effect]" (hospitalisations being the target service)

Table 4 Postulated variables of influence, and associated effects



Fig. 1 Review PRISMA flow diagram

variation in financial terms (3%, n=5). 3% (n=6) used both approaches (financial and activity) in the same study.

Very few studies framed or interpreted results explicitly as an equity concern—using the term "equity" in introduction or discussion sections (8%, n=14). Close to half (47% n=84) used broadly synonymous terms such as "disparity" or "justice" to frame or interpret results. The remainder of the studies (45%, n=81) avoided valueladen terms and were dominantly positivist or agnostic in nature taking an impartial look at differences between rural and urban populations without offering a valuebased interpretation.

# Health system focus

Overall 32% of studies (n=57) were primary care focussed, 34% (n=60) were secondary care focussed, and 35% (n=62) assessed both primary and secondary system activity in the same paper. Across these areas, 49% (n=87) were service-focussed, while 51% (n=92) were disease-focussed. Table 5 shows the service and disease sub-categorisation. Acute care and community care were among the services most focussed upon in servicefocussed studies. In the disease-focussed studies, notable diseases and conditions of interest were chronic conditions, mental health & addictions, oncology and oral health.

# **Direction of study findings**

The findings of studies were classified by the direction of rural–urban variation in utilization:

- Service utilization was negatively associated with rurality (i.e., the rural populations appraised used fewer services than urban); or
- Service utilization was positively associated with rurality (i.e., the rural populations appraised used more services than urban).
- Mixed or opposing results within the same study
- No statistically significant difference

This classification was undertaken for both the Primary and Secondary domains of the health system considered in each manuscript. Findings are summarised in Table 6.



Fig. 2 Number of publications by year



# Interpretations of variations in service use

The volume of postulations regarding access to target services (and its impact) differed across primary and secondary focussed studies. Of studies finding rural populations use services less than urban populations, proportionately more secondary sector studies (52%, 29 of 56) than primary sector studies (40%, 30 of 75) postulated that poor access to the target service contributed to the observed differences.

Similarly, the level of postulation regarding access to complementary services (and its impact) also differed by sector focus. Of studies finding rural populations use more services than urban populations, proportionally more secondary sector studies (60%, 21 of 35) than primary sector studies (39%, 7 of 18) postulated that poor access to complementary services contributed to the higher use of the target service. Table 7 summarizes the directional findings and the level of postulation regarding the role of access.

# Discussion

This scoping review identified 179 studies comparing the levels of rural and urban population health service use. The studies spanned a variety of jurisdictions, service types and diseases of interest.

There were two primary objectives of this review. The first was to identify the extent of the literature focussed on rural-urban variation in health service use; and in doing so, understand what has already been accomplished. The second objective was to provide a descriptive analysis of the parameters of the literature including identifying the types of services that were investigated; appraising studies for whether they were framed in concepts of "equity"; and summarising the broad directions of findings from the studies. Secondary objectives of the review also included assessing the extent of research gaps in the existing literature; and to identify, if able, opportunities for future research that addresses any gaps across the body of included studies.

 Table 5
 Quantity of studies by utilization domain sub-group categories

Assessment Type	Assessment Group	Count of Title	%
Service-focussed studies	Multiple combined services or activity types	17	9%
	Other	15	8%
	Acute Care	14	8%
	Community Care	11	6%
	Hospitalisations	9	5%
	Maternity and Child Health	7	4%
	Surgical	6	3%
	Prescribing	4	2%
	Mental Health & Addictions	3	2%
	Cancer Services	1	1%
Subtotal		87	49%
Disease/condition-focussed studies	Chronic Conditions	33	18%
	Mental Health & Addictions	16	9%
	Oncology	13	7%
	Oral Health	11	6%
	Obstetric and Paediatric Conditions	7	4%
	Infectious Disease	6	3%
	Other	3	2%
	Acute Care	3	2%
Subtotal		92	51%
Grand Total		179	100%

 Table 6
 Summary of rural utilization levels relative to urban, by health sector area

Soctor Focus	Pural I Itilization Loval	Netudios	0/2
	Kurai Otilization Level	in studies	70
Primary health services	Positive (higher than urban)	18	15%
	Negative (less than urban)	75	63%
	Mixed results	8	7%
	No difference	18	15%
	Total	119	100%
Secondary health services	Positive (higher than urban)	35	29%
	Negative (less than urban)	56	46%
	Mixed results	13	11%
	No difference	18	15%
	Total	122	100%

Paper counts exceed the 179 studies because many had a dual focus (primary & secondary sectors in the same study)

### **Extent of literature**

Firstly, and positively, it appears the volume of publications pertaining to rural–urban differences in health utilization is growing over time. This suggests an increase in policy and research priority. However, while this review is naturally already skewed by the restriction to Englishlanguage publications, we can see among the studies that most literature is North American. This may suggest a need for increased attention on rural–urban variation in utilization in other countries and regions.

The review identified a balanced sector focus and limited skew in the literature towards either primary or secondary sector service utilization. Within these studies, the major areas of activity investigated were acute care and community care. Pronounced diseases of interest included chronic conditions, mental health & addictions, cancer services and oral health. Notably there appeared to be comparatively limited assessment of surgical Studies predominantly considered specific diseases or types of activity. It was rare that the studies were systemlevel and evaluated the use of all available services by the rural and urban communities of interest. This may be due to limitations in data collection preventing such analyses, or analyses being led mainly by subject matter experts (such as research teams with a specific disease or activity interest). Regardless, this observation suggests the presence of a gap in evaluation and understanding about how rural populations utilize services relative to urban peers, at the health system-level.

Strikingly, for studies evaluating differences between populations, research framing and result interpretation was rarely explicitly positioned as an 'equity' concern. It appears that there is an opportunity for researchers to be more explicit in acknowledging social values and consequences of variation – such as by framing or interpreting results through equity theory, theories of social justice and distributional fairness, or theories of social policy.

Finally, it is also notable that minimal number of studies appraised health service use in financial terms. Use of financial values effectively standardises the unit of assessment, allowing comparison between different models of care and distributional equity at a more aggregate level. Use of differing models of care between rural and urban areas may contribute to the variations observed (e.g., an augmented rural primary care model reducing secondary Emergency Department use), but without considering these models and the relative cost, we have limited ability to undertake meaningful comparisons in total resource use and distributional equity within societies.

### Rural-urban differences in service use

Studies more frequently identified rural population used fewer services than the inverse. This observation held in both primary and secondary sector sectors, and poor direct service access was frequently speculated to be a

Sector Focus	<b>Rural Utilization Level</b>	N studies	Postulated cause		
			Negative access to target service	Negative access to complementary service	
Primary	Positive (higher)	18	-	7	
	Negative (less)	75	30	-	
	Mixed or no difference	24	-	-	
Secondary	Positive (higher)	35	-	21	
	Negative (less)	56	29	-	
	Mixed or no difference	31	-	-	

#### Table 7 Speculated effects of system access on observed outcomes

cause of this variation (although more often in secondary service-oriented studies).

Authors frequently suggested different utilization rates arose due to challenges in access to complementary services. For example, of the studies that found higher levels of service use by rural populations, the majority were secondary service oriented and almost two thirds of these studies speculated a cause of this variation was reduced access to different complementary services that may have mitigated the secondary demand.

Notably however, of the (lesser number) primary care studies that found utilization was higher for rural populations, only a third speculated this was due to limitations in access to different services. Differential levels of focus on access to different complementary services as explaining primary and secondary service use, may suggest that access challenges produce different utilization outcomes for different parts of the health system.

Caution must be applied however in interpreting and generalising from these directional results. Firstly, unlike in a systematic review, the lack of critical method appraisal means that there was a variety of methods, populations and approaches behind each study, as well as variance in paper quality within the included manuscript list. Relatedly, there was wide variation in rurality classification methods used. Evidence of how rurality classification can skew results has been demonstrated [25, 26]. It may be that although the balance of the literature was towards negative utilization for rural communities, these findings may not be generalisable.

Secondly, and more broadly, without understanding comparative levels of need or different models of care, we cannot determine whether differences in relative service utilization are appropriate (or indeed, inequitable). A rural utilization rate that differs from urban may be entirely appropriate given underlying health needs or different decisions in health service investment. Similarly, limited studies were system-level considering the entirety of the health system. It may be that despite this review identifying a greater quantity of studies observing reduced rural service use, these reflect limited snapshots of interest, rather than what may be visible when taking a broader system-level view.

### **Scoping review limitations**

This scoping review is not without limitations. Firstly, the method was constrained in that it did not pursue secondary references from included study reference lists or seek grey literature—doing so may have added to the number of included studies.

Omitted terminology in the search strategy may have had implications for the identification of studies looking at surgical interventions and procedures. The included terminology focussed on utilization rather than "rates" or "intervention" – terms that in hindsight, may have augmented the results with surgical-related activity.

The decision to exclude studies published in languages other than English also naturally means this review will only present a partial picture of available evidence on rural-urban variations in health resource utilization. This is despite the similarities that may exist across health systems, even if the languages of assessment differ. Similarly, the decision to exclude low-middle- and low-income country health systems, and weight of included literature towards North American health systems may mean that nuances in other health systems are not observable in the current dataset. Finally, differences in definitions of rurality and likely lack of comparability across contexts, combined with absence of methodological appraisal, means that the headline directional findings of this review should be interpreted and applied with care. The differences in definition of rural across the studies may affect the conclusions formed.

### Research gaps and future research opportunities

This review identifies several gaps in the research. Firstly, most studies were either activity or disease-specific in their evaluation and focus. Findings of variations in these areas may not be generalisable across health systems or populations. Comprehensive health system-level studies would aid understanding of how health systems as a whole function for rural and urban populations respectively.

Similarly, studies looking at the financial value of resources utilized would add to understanding regarding rural-urban variations in utilization. By considering costs of service use, more meaningful comparisons in total resource utilization would be possible.

The relative paucity of surgical intervention rate comparison appears to be a gap. However, it is also important to acknowledge this finding may be due to the search strategy limitations mentioned above. Future research may seek to understand differences in surgical service utilization between rural and urban populations.

Future systematic reviews of explanatory studies would also aid understanding of the different variables that may drive differences in use between rural and urban communities. Country-specific systematic reviews could hold more parameters equal, such as urban-rural taxonomies, health system funding approaches, and standards of access, allowing richer understanding of the factors that drive rural and urban utilization respectively.

Lastly, and in the context that this review was ultimately driven by an aspiration to advance equity for rural populations, the findings unfortunately show most studies found rural populations use fewer health services than their urban equivalent. Added to this, of those studiesthat did find higher rural rates, this was often suggested to be the consequence of poor access to different services.

These findings are stark alongside the varied and ample evidence illustrating worse health outcomes for rural communities [1-9]. While it would be unwise to directly link these separate observations and claim the presence of structural inequities (high health need with low service use), it does appear that structural inequity may be a realistic possibility. The findings of this review suggest a need for targeted research in this particular area – understanding specifically if inequities exist when considering need and service utilization together.

# Conclusion

This scoping review provides an overview of the literature relating to rural-urban variation in health service utilization. The review provides a headline finding as to the volume of directional results from the included studies – namely that proportionately more studies identified rural population use fewer health resources than urban populations, and where higher rural utilization was observed, this was frequently attributed to poor access to different services. Given the wider context regarding higher burdens of disease and mortality in rural populations, there appears to be a pressing need for further research to understand the appropriateness of rural-urban systemlevel differences in the utilization of health services.

### Supplementary Information

The online version contains supplementary material available at https://doi. org/10.1186/s12939-024-02261-w.

Supplementary Material 1.

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## Disclosures

N/A.

#### Authors' contributions

Garry Nixon, Tim Stokes and Talis Liepins conceptualised the design and search strategy. Garry Nixon, Tim Stokes and Talis Liepins undertook screening activities. Talis Liepins led data extraction and analysis. Talis Liepins was lead author for drafting the manuscript. Garry Nixon, Tim Stokes and Talis Liepins authors read and approved the final manuscript.

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#### Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

#### Data availability

Data is provided within the manuscript or supplementary information files.

### Declarations

Ethics approval and consent to participate N/A.

#### **Consent for publication**

### **Competing interests**

The authors declare no competing interests.

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