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WORKING PAPER

Measuring unmet need for older adults in low-, middle- and high-income countries: theoretical and analytical model building

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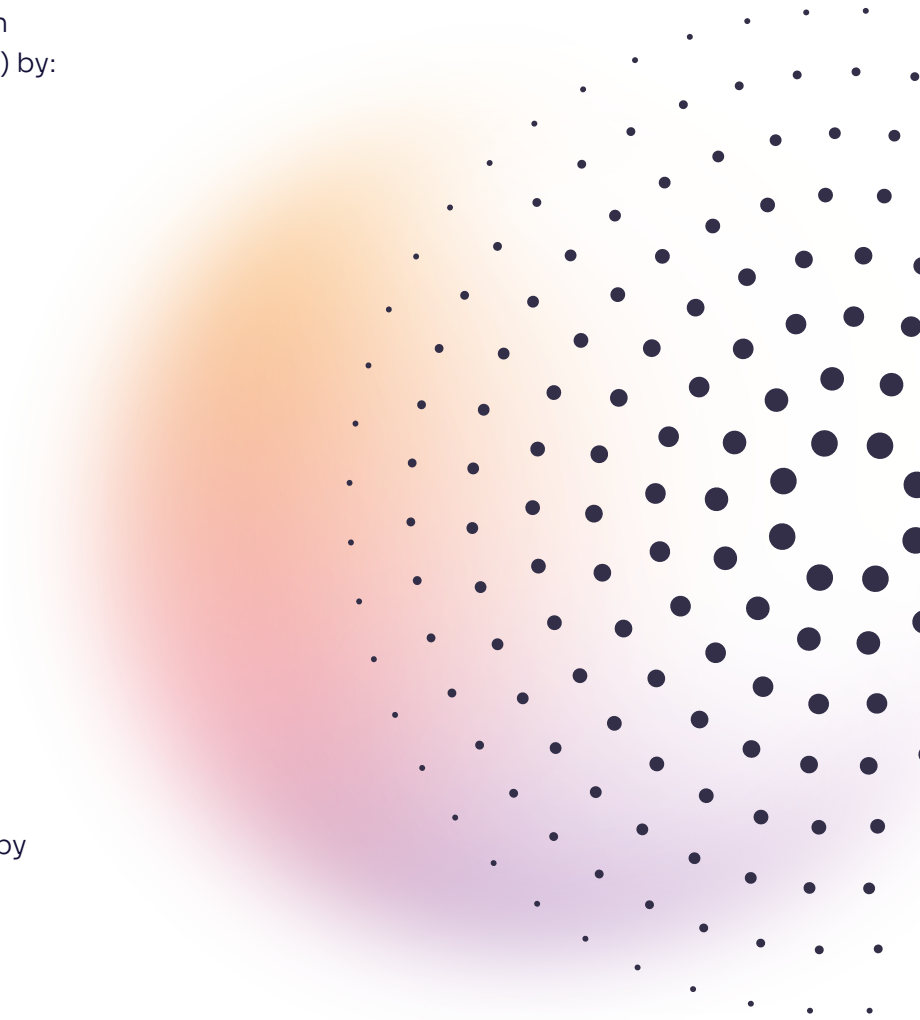

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Summary

- There is no agreed standard measure of unmet health care need
- Different factors appear to operate in defining unmet need in different countries and settings
- Self-reported unmet health need may be more highly localized than anticipated
- Proper indicators developed through formative mixed-method research would help to better define and measure unmet need

Background

Providing good quality health care that meets the health needs of a population is a key objective of national and sub-national health systems, and consistent with 2030 United Nations Sustainable Development Goal 3.8 and the World Health Organization's global impact framework[1,2]. (UN 2015; WHO 2019) As populations age, health needs shift, where the predominant disease burden tends to be from chronic diseases. Many of these chronic diseases and their risks are modifiable and their outcomes can be improved through accessing quality health and social care services. But in many countries, not all health needs of older people are being met. The gap represented by unmet need raises issues of equity in service coverage and universality of health care. However, current measures of universal health coverage (UHC) do not assess unmet need.

Operationally, unmet health care need can be defined as the differences between services that are necessary to deal appropriately and optimally with a defined health problem (or need) and the services that are actually accessed and provided[3]. However, the measurement of unmet need is theoretically complex, as needs may be partially met, met with difficulty or delay, or met sometimes and not other times. There may also be a qualitative element in the meeting of needs, as health care may be available, accessed and provided, but not necessarily in a way that is appropriate to the health care problem, or to the satisfaction of the patient. There is no standard agreed definition or measure of unmet health need.

Existing studies of unmet need have used different approaches, often based on self-report in surveys by asking a direct question about whether people perceive that there is a time when they needed health care and did not receive it (for example, "*The last time you needed health care, did you get health care?*"). However, on their own, these direct measures do not provide further differentiation of the reasons given for why health care could not be obtained, demand or supply side barriers, or how coverage could be improved.

The various dimensions of unmet need have been considered within latent models, using theoretical frameworks such as the Levesque or Anderson-Newman models[4-7]. These models posit that health care use is based not only on need, but also on the individual's personal factors (age, sex and education), enabling factors (social and financial support), and contextual factors (health care system and setting). Accordingly, we conceptualized met needs for health care in terms of the relationship between the needs and characteristics of the individual within their social and economic context.

Methods

We had previously generated prevalence estimates of unmet health need for adults aged 60 years and older from a range of existing health, social and economic studies, covering 83 countries (ranging from 0 to 67%)[8]. While the results provide useful estimates of unmet health need, the parameters used to define unmet need are inconsistent across available surveys and countries. Moreover, unmet need was self-reported and depended on a number of factors such as perception of need and propensity to seek care. To better estimate true prevalence and also operationalize unmet need for inclusion in UHC monitoring tools, we developed exploratory, confirmatory and convergent analytical models to identify latent measures of unmet need as might apply to our theoretical model. Our aim was to find dimensions and levels of unmet health care need, to better measure that unmet need among older people in low-, middle- and high-income countries in different world regions.

In total, data from six studies[a] covering 21 countries were used to develop the analytical models. These included studies from one low-income, four lower-middle, five upper-middle, and eleven high income countries.

Approach

Theoretical considerations were used to guide variable selection for data analysis. Our objectives were to identify a latent structure for unobserved 'unmet health need' and develop that further into a metric that could be used to define unmet health need. This, in turn, could be compared to characteristics of unmet health need derived from direct measures of unmet health need questions included in some surveys.

A modified Levesque model aligned with the Carroll synthesis model was used, working from the premise that in order to obtain care, a person must perceive the **need** for care, **seek care**, access care (**reach**), and get the care (**use**)[4,9]. The **consequences** of care then included experience of the service and outcomes. These consequences will in turn influence whether the person seeks care in the future. Based on this theoretical model, variables were grouped a priori within each domain (see **Figure 1**). For example, **need** factors included symptoms, conditions, disability and risk factors; education was included in **health seeking** expecting that those with higher education have higher health literacy and propensity to seek care, social support was included in **health care reaching** (with someone to help the person access the service); income and health insurance were included in **health care use** (as measures of ability to pay). Measures of perceived appropriateness, availability and acceptability were included under a domain of **health care consequence** reflecting the experience with the service. The accessed surveys did not include measures of health outcomes.

Variables were harmonized to the extent possible which included assessment of question wording, question sequencing/ordering and response categories. The team faced challenges with categorizing available variables and unequal representation of different model dimensions, especially the system level factors. The existing survey data did not allow us to build and apply multi-level analytical models – with few or no suitable supply-side variables available in the data sets to adequately examine systems level/supply side components.

Results

To assess if and how the different variables and/or domains affected unmet health need, different approaches were explored: principal component analysis, confirmatory factor analysis, and hierarchical logistic regression models. Not all the target variables mapped to the theoretical model domains were available for all the surveys.

The first approach used was **principal component analysis (PCA)**, to reduce the number of variables and to learn more about the underlying structure of the data. The PCA was considered here to check if and how measured variables clustered together in different theoretical model component(s), and if so, to give a meaning to the component(s) intended to measure unmet health need. A separate PCA was conducted in each study/country. All variables were dichotomized, tetrachoric correlation coefficients were estimated and saved into a matrix. PCA was run on this matrix using pcamat STATA command. An orthogonal varimax rotation of loading matrix was applied, where only components with eigenvalue >1 were kept. In the 21 countries, the PCA resulted in four to nine components, with great variability in item loading across the different components (see a stylized set of results in **Figure 1**, that provide an example from four studies and countries). From retained components, new variables with the component scores were created and subsequently divided into quintiles. These quintiles were then cross-tabulated with the self-reported unmet health need variable (from survey questions) to assess if a direction/gradient was present in each component within its quintiles. The variable recording sex was not considered in the PCA. Instead, quintiles were compared for men and women, to assess differences by gender.

The second approach used was **confirmatory factor analysis (CFA)**, implemented using **Structural Equation Modelling (SEM)** to assess how well one or more latent variables are measured by multiple observed variables in three countries (Brazil, Ghana and India). Latent variables were represented by the five domains of the theoretical model (need, seek, reach, use, and consequence), and for each domain, the observed variables were those listed in **Figure 1**. Each domain was analyzed separately, so five different SEM models were implemented. Before running the models, all observed variables were dichotomized to allow harmonization of response categories across the data sets. Due to this dichotomous nature of the variables, **Generalized Structural Equation Modeling (GSEM)** using a logit link function was applied. Although GSEM has multiple advantages, it does not provide goodness-of-fit indicators (in STATA SE 17.0), so only Akaike and Bayesian Information Criteria can be reported (**Table 1**). The major problem encountered in applying GSEM was that some of the domains did not converge, even after some variable modifications and/or constrains introduction.

A third approach, **hierarchical logistic regression**, was used to assess the effect that each variable had on the self-reported direct measure of unmet health need in six countries (Brazil, Germany, Ghana, India, Mongolia, and Tunisia). In this model, variables were grouped into domains based on the theoretical model and separate logistic models were fitted for all variables pertaining to each domain and applying backward elimination until all variables had a p-value <0.15. Nested models were built by adding the variables for each domain sequentially, starting with the need variables. A subsequent model was fitted adjusting for age and sex. The final model included only those variables with p-value <0.15. The only consistent predictors of unmet health need were limitations in activities of daily living (ADL) and poor self-reported memory, which remained in the final model in four out of six countries. It should be noted that, due to data limitations, the number of predictors included in the model varied across studies (**Table 1**).

Each of the models provided some signal on country-specific structures for unmet health need, but the models did not sufficiently converge to develop a universal structure for unmet health need. Unmet health need has the potential to lead to poor health outcomes from delayed or foregone care. In some countries, older people and poorer populations may have higher prevalence of unmet need than younger and wealthier populations [10]. For these individuals, when or if care is eventually accessed, more intensive and costly health care services may be required due to worsened health conditions. Keeping adult populations independent and active

into older ages may not always require health care services, and instead good health outcomes could be achieved with social care services [11]. In the global context, the concept of 'need' is not explicitly defined, yet the paths to UHC and realizing the right to health care are based on the ability to fulfil needs and maintain autonomy.

This work attempted to create working models of unmet health need in older adult populations using available data; however, data from formative mixed-methods research would be needed to populate the theoretical model domains and thereby allow the analytical models to run properly. Also, it is possible that unmet need is not measurement invariant, with some factors having little impact under some health systems but being of fundamental importance in others. Defining unmet need is crucial to measuring it and considerations should be made to incorporate this element into monitoring progress towards universal health coverage.

Conclusions

The dimensions and determinants of unmet need are contextual and therefore, proper indicators developed through formative mixed-method research are needed to measure and define unmet need. Despite harmonization of available variables across different studies and countries, indicators of certain dimensions of unmet needs are lacking or not comparable.

The lack of standardized data from available studies to measure different dimensions of unmet needs among older people hampers the effort to measure the level of unmet health care needs and account for this in monitoring progress towards universal health coverage.

Creating a harmonized definition of unmet need in older adults that applies globally may not be possible.

Table 1: Representative results from two analytical models

Confirmatory Factor Analysis						
Domain	**ELSI – Brazil[a]**		**SAGE – Ghana**		**SAGE – India**	
Need	AIC: 110922.00; BIC: 111089.60		AIC: 110922.00; BIC: 111089.60		AIC: 84107.33; BIC: 84309.61	
Seek[§]	N/A		N/A		N/A	
Reach	AIC: 15413.88; BIC: 15441.81		AIC: 7997.384; BIC: 8022.816		Not converged	
Use	Not converged		AIC: 16642.57; BIC: 16680.72		AIC: 16818.90; BIC: 16859.36	
Consequence	AIC: 29889.53; BIC: 29945.39		Not converged		Not converged	
Hierarchical Logistic Regression						
Domain and variables	**ELSI – Brazil**	**CMWF – Germany**	**SAGE – Ghana**	**SAGE – India**	**Mini SAGE – Mongolia**	**THES – Tunisia**
Need						
self-rated health	0.53***					
ADL	0.47***		0.29	0.71***	0.83***	
NCDs	0.33***	0.65				
depression	0.42***					
pain			0.51***	0.40*		0.29*
breathless-ness			0.92***	0.43**		
vision deficits	0.31***					
hearing deficits	0.12		0.88***			0.61*
smoke			0.50**		-0.88**	0.36

Hierarchical Logistic Regression						
Domain and variables	ELSI – Brazil	CMWF – Germany	SAGE – Ghana	SAGE – India	Mini SAGE – Mongolia	THES – Tunisia
hypertension			-0.52***			
obesity			-0.17			
alcohol consumption	-0.29***					
poverty		0.69*	0.64*		0.31	
loneliness	0.29***	0.79*				
memory	0.18*		0.52*	0.56**	0.73*	
*Seek^*						
education		0.98*				
Reach						
employment						
social support	0.29**					
family size						
Use						
insurance			0.29**			
income	0.29**					
area of residence					0.29**	

Hierarchical Logistic Regression						
Domain and variables	ELSI - Brazil	CMWF - Germany	SAGE - Ghana	SAGE - India	Mini SAGE - Mongolia	THES - Tunisia
*Seek^*						
appropriate	0.23***	0.98***				
affordability						
availability	0.37***					0.53**
acceptibility	0.42***			0.50**		
gender						
age				0.02**		
constant	-1.93***	-3.89***	-2.50***	-3.20***	-1.92***	-1.28***

Ethics clearance

No ethical approval was required for this research, as we compiled results from secondary data sources using de-identified data sets.

Availability of data and materials

The data that support the findings of this study are available from each study on application/ request. Additional information will be available through https://extranet.who.int/kobe_centre/en/project-details/unmet_needs.

Funding

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Abbreviations

ADL Activities of daily living
CFA Confirmatory Factor Analysis
CMWF Commonwealth Fund International Health Policy Survey of Adults
ELSI Brazilian Longitudinal Study of Aging (ELSI-Brazil)
GSEM Generalized Structural Equation Modeling
HIS Integrated Household Survey
PCA Principal component analysis
SAGE Study of global AGEing and adult health
SDG Sustainable Development Goals
SEM Structural Equation Modelling
THES Tunisian Health Examination Survey
UHC Universal health coverage
UN United Nations
WHO World Health Organization

References

[1] United Nations. 2030 UN Sustainable Development Goal 3.8 Target 3.8: Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all. 2015. (https://unstats.un.org/sdgs/metadata/?Text=&Goal=3&Target=3.8)

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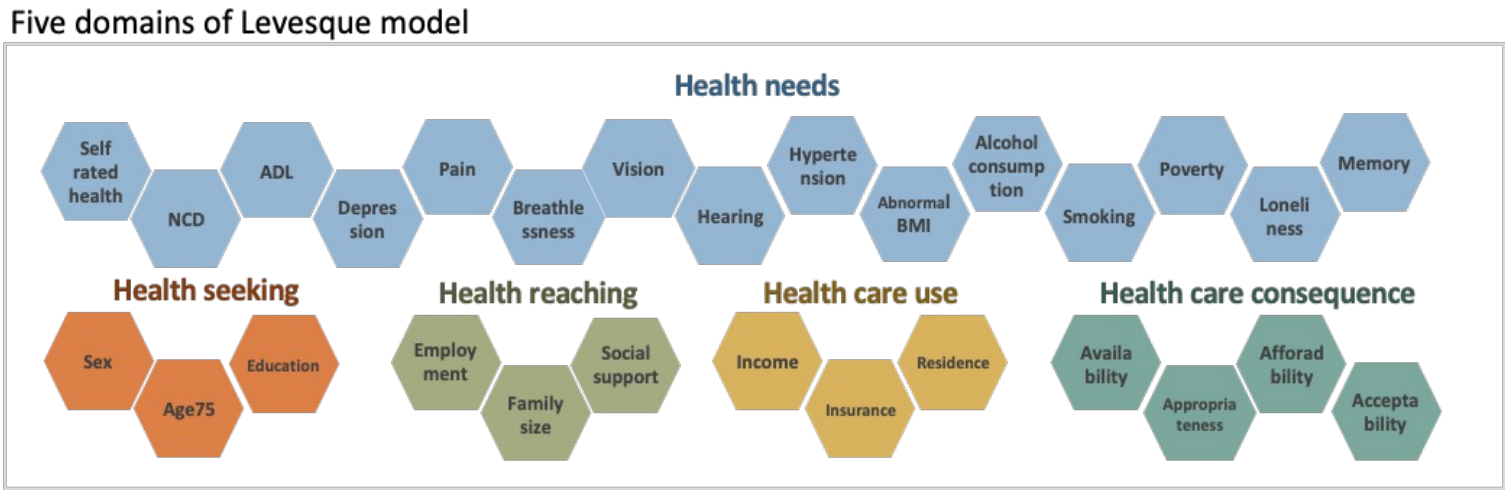
Footnote

[a] 2015 Brazilian Longitudinal Study of Aging (ELSI-Brazil); 2017 Commonwealth Fund International Health Policy Survey of Adults (Australia, Canada, France, Germany, Netherlands, New Zealand, Norway, Sweden, Switzerland, United Kingdom and Northern Ireland, United States of America); 2015/16 Gambia Integrated Household Survey (IHS); 2007/10 Study of global AGEing and adult health, Wave-1 (China, Ghana, India, Mexico, Russia, South Africa); 2017 Mongolia Mini SAGE (Mongolia); 2016 Tunisian Health Examination Survey (THES, Tunisia). We used different number of studies/countries for each analysis: PCA: 11 countries (CMWF), 6 countries (SAGE), Gambia (IHS), Brazil (ELSI-Brazil). CFA: Brazil (ELSI-Brazil), India and Ghana (SAGE). Hierarchical model: Brazil (ELSI-Brazil), India and Ghana (SAGE), Germany (CMWF), Mongolia (miniSAGE), Tunisia (THES).

Figure 1. Results of principal component analysis in selected countries

Country	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6	Component 7
Brazil (ELSI-Brazil)	10.5%	9.5%	8.6%	8.0%	7.9%	6.7%	5.4%
Gambia (IHS)	17.5%	16.1%	15.9%	13.3%	12.6%		
India (SAGE)	11.7%	11.5%	8.7%	8.6%	7.4%	6.6%	6.4%
Switzerland (CMWF)	15.1%	13.7%	11.5%	11.2%	10.1%		



Notes: PCA was conducted in Brazil (ELSI-Brazil), Ghana, South Africa, India, China, Mexico, Russia (SAGE), Australia, Canada, France, Germany, Netherlands, New Zealand, Norway, Sweden, Switzerland, United Kingdom and Northern Ireland, United States of America (CMWF), and Gambia (IHS).