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Review

Measurement of social capital in relation to health in low and middle income countries (LMIC): A systematic review

Thilini Chanchala Agampodi ^{a,*}, Suneth Buddhika Agampodi ^a, Nicholas Glozier ^b, Sisira Siribaddana ^c^a Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Saliyapura, Sri Lanka^b Brain and Mind Research Institute/CCS Sydney Medical School, University of Sydney, Australia^c Department of Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Saliyapura, Sri Lanka

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ABSTRACT

Social capital is a neglected determinant of health in low and middle income countries. To date, majority of evidence syntheses on social capital and health are based upon high income countries. We conducted this systematic review to identify the methods used to measure social capital in low and middle-income countries and to evaluate their relative strengths and weaknesses. An electronic search was conducted using Pubmed, Science citation index expanded, Social science citation index expanded, Web of knowledge, Cochrane, Trip, Google scholar and selected grey literature sources. We aimed to include all studies conducted in low and middle-income countries, published in English that have measured any aspect of social capital in relation to health in the study, from 1980 to January 2013. We extracted data using a data extraction form and performed narrative synthesis as the measures were heterogeneous. Of the 472 articles retrieved, 46 articles were selected for the review. The review included 32 studies from middle income countries and seven studies from low income countries. Seven were cross national studies. Most studies were descriptive cross sectional in design ($n = 39$). Only two randomized controlled trials were included. Among the studies conducted using primary data ($n = 32$), we identified 18 purposely built tools that measured various dimensions of social capital. Validity ($n = 11$) and reliability ($n = 8$) of the tools were assessed only in very few studies. Cognitive constructs of social capital, namely trust, social cohesion and sense of belonging had a positive association towards measured health outcome in majority of the studies. While most studies measured social capital at individual/micro level ($n = 32$), group level measurements were obtained by aggregation of individual measures. As many tools originate in high income contexts, cultural adaptation, validation and reliability assessment is mandatory in adapting the tool to the study setting. Evidence on causality and assessing predictive validity is a problem due to the scarcity of prospective study designs. We recommend Harpham et al. s' Adapted Social Capital Assessment Tool (A-SCAT), Hurtado et al. s' six item tool and Elgar et al. s' World Value Survey Social Capital Scale for assessment of social capital in low and middle income countries.

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1. Introduction

In 2005, the WHO Commission for Social Determinants of Health (CSDH) declared that new action strategies addressing social factors are required to improve health of populations, despite provision of equitable health systems (Commission for Social Determinants of Health, April 2007). "Social capital", was

identified as a key determinant of the commissions' framework emphasising its role in creating health equity and wellbeing of individuals and communities (WHO, 2010). This implicates that social capital act both as a structural and intermediary determinant of health. During the past two decades evidence on social capital and health has been frequently synthesized in the attempt to understand its relationship in a broader evidence base (Story, 2013; De Silva et al., 2005; Kawachi et al., 2007; Islam et al., 2006; Uphoff et al., 2013; Vyncke et al., 2013). However, the evidence suggest that the concept has not been a priority concern in Low and Middle Income Countries (LMICs) where inequalities in health are greater

* Corresponding author. Department of Community Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Saliyapura, Sri Lanka.
E-mail address: thilinchanchala@yahoo.com (T.C. Agampodi).

than many High Income Countries (HIC) (Story, 2013).

Although social capital is a widely used concept in many fields, there is lack of consensus upon its definition and dimensions. Experts of different fields have contributed to this notion with different viewpoints. In 1986, Pierre Bourdieu defined social capital as the “aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition” (Bourdieu, 1985). According to Portes this is the most theoretically refined definition for social capital in the sociological discourse (Portes, 1998). However in this discourse, Loury (Loury, 1977), Coleman (Coleman, 1990) and Putnam contributed to develop the distinctions of social capital while Putnam’s definition – “features of social organization, such as trust, norms and networks that can improve the efficiency of society by facilitating coordinated actions” (Putnam et al., 1993) – is one of the most widely used in literature. Recently the World Bank defined social capital as the “institutions, relationships and norms that shape up the quality and quantity of a society’s social interactions” (The World Bank Group, 2011).

Social capital consists of different dimensions, basically the “structural” and “cognitive” (The World Bank Group, 2011). Structural social capital refers to externally observable social interactions of people (Krishna, 2001; McKenzie et al., 2002; Harpham et al., 2002) whereas cognitive social capital consists of norms, values, and beliefs of people that affect their participation in a society (Islam et al., 2006). The most recent approach (Szreter and Woolcock, 2004) describes social capital in three distinct forms, namely “bonding”, “bridging” (horizontal) and “linking” (vertical) social capital. “Bonding” social capital (also called as localized social capital) refers to interactions between homogeneous members of a community such as family members and close friends and neighbours (De Silva and Harpham, 2007). “Bridging” social capital comprises relations of respect and mutuality between people who know that they are not alike in some socio-demographic sense, such as ethnic or occupational backgrounds (Krishna, 2001). “Linking” social capital, explains the relationships between people across power or authority gradients in a society.

Given social capital is a multifaceted concept (Dasgupta, 2000) underpinned by a long standing sociological discourse, measuring it is a complex procedure. In the first instance, what to measure is a problem. The theoretical views depict that one should measure the structurally observable relationships; cognitive aspects that affect these relationships; access to resources as well as the quality or depth of all these notions. Although numerous approaches have been used, there is no universally applicable gold standard tool to measure social capital. Secondly, operationalizing social capital variables is challenging (Krishna, 2001). Operationalization may vary according to context. The appropriate level at which social capital should be measured remains uncertain. It can be measured at individual (attitudinal and psychological), micro (social networks of individuals), meso (communities) and macro (nations, regions) levels. The current evidence base suggests that the differences in health are better predicted by individual level social capital variables rather than those measured at an ecological level (De Silva et al., 2005). Studies that measure social capital at ecological level lacks appropriate social capital measures which have been an impediment to synthesize evidence (Lochner et al., 1999). Islam et al. suggest that more appropriate statistical measures such as multi-level modelling should be used in understanding the relationship between social capital and health as it can account for the different impacts of individual and ecological level associations (Kawachi et al., 2007).

However, few studies from LMIC have been included in most of the reviews of social capital and health (Story, 2013; De Silva et al.,

2005; Kawachi et al., 2007; Islam et al., 2006; Uphoff et al., 2013; Vyncke et al., 2013). Although the concept is considered important as a means of health promotion in LMIC, syntheses of evidence focussing on these countries are scarce (Story, 2013). Furthermore as many of the measures originated in high-income countries (HICs) these may not identify how the concept of social capital is applied and measured in LMIC. Identifying relevant, reliable and valid measurement tools is paramount to understand the impact of social capital in relation to health and its association with health outcomes in developing contexts. As such we conducted a systematic review to identify the methods used to measure social capital in low and middle-income countries and to evaluate their relative strengths and weaknesses.

2. Methods

A study protocol for the systematic review was prepared according to the guidelines of the Cochrane collaboration (Higgins and SG, 2011).

2.1. Inclusion criteria

We aimed to include all studies conducted in LMIC that have measured any aspect of social capital in relation to health that are published in English. The definition of LMIC was the World Bank criteria (The World Bank Group, 2012). As the development of the concept of social capital and study of its implications to health in LMIC occurred after 1980s the date of search was restricted to the period from January 1980 to January 2013. Restrictions were not made in terms of study design and methodological quality as one aim of this search was to identify the most appropriate methods and deficiencies in measurements.

2.2. Search strategy

An electronic search was performed in selected wide range of databases and other web resources (Table 1). Both published articles and grey literature were encountered.

In the initial search, titles and abstracts were screened using following key terms and parentheses:

((“social capital” OR “social relationships” OR “social networks” OR “social cohesion” OR “Informal social control” OR “collective efficacy” OR “civil society” OR “neighbourhood cohesion”) AND (“developing countries” OR “low income countries” OR “poor countries” OR “middle income countries” OR “lower and middle income countries” OR “LMIC”)) AND health.

Both free text search and search using Medical Subject Headings (MeSH) were performed. A secondary search of cited references in

Table 1

Data bases and other web resources used in the systematic review.

Databases	Web resources (grey literature)
Pubmed	World Bank social capital document
Science citation index expanded	library
Social science citation index expanded	Social capital gateway
Web of knowledge	
Cochrane	
Trip	
Google scholar	
Selected regional bibliographic databases	
Social service abstracts	
Social care online	
Applied social science index and abstracts	

relevant papers was also carried out. Key experts in the field were contacted on relevance by the first author.

2.3. Selection of studies

A study was the unit of interest in the search. Multiple publications arising from a single study were linked. During the initial screening (Fig. 1), titles and abstracts were examined by two investigators (TCA and SBA) to exclude obviously irrelevant studies. In case of difficulties in deciding whether or not to include the paper based on the abstract, the full paper was retrieved and examined and a decision was taken by the consensus of the above two investigators. In case of disagreement the consensus was achieved by discussing with the two expert investigators: a subject expert on social capital and a methodological expert on systematic reviews.

After the initial screening, full texts of selected studies were examined by the other investigators for the suitability of inclusion in the study. Investigators of the studies were corresponded wherever it was necessary to clarify doubts regarding inclusion of the studies.

2.4. Data extraction

We conducted data extraction using a data extraction form, which was pilot tested prior to data extraction proper. Methodological characteristics of the selected studies were reviewed independently in detail by the investigators. Consensus was achieved through discussion.

2.5. Data analysis

Extracted data was synthesized using a narrative format. A meta-analysis was not performed, as the study did not aim to obtain a summary estimate of an association of a quantitative measure of social capital with related outcomes but to evaluate the measurement methods. Priority was given to studies using primary data in our analysis.

3. Results

We retrieved a total of 472 studies by searching the databases and grey literature sources (Table 2). Of these studies, 324 studies were excluded after screening and 46 articles were selected for the review (Fig. 1).

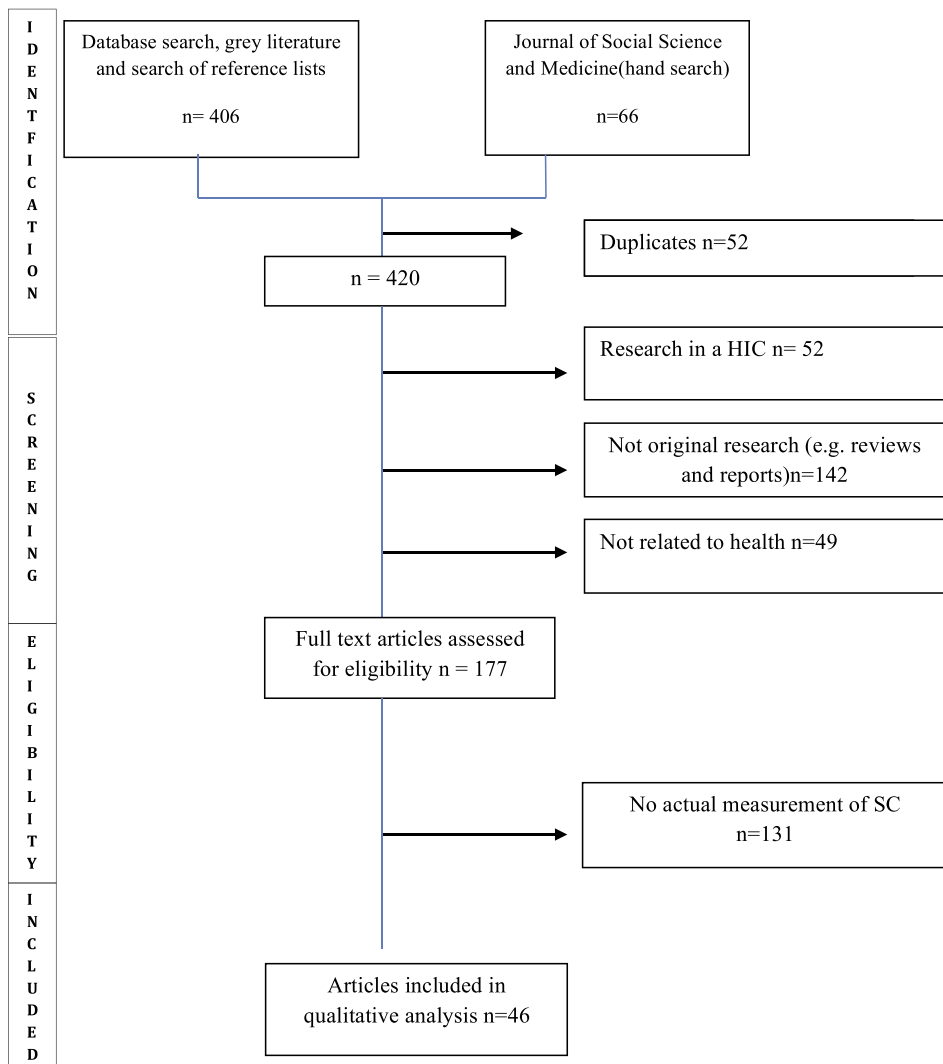


Fig. 1. PRISMA diagram of literature review.

Table 2
Literature search strategy and number of results for each database.

Databases/web resources searched	Search syntax	Number of results
Pubmed	(((((("social capital"[Title/Abstract]) OR "social cohesion"[Title/Abstract]) OR "social networks"[Title/Abstract]) OR "Informal social control"[Title/Abstract]) OR "collective efficacy"[Title/Abstract]) OR "neighborhood cohesion"[Title/Abstract]) OR "civil society"[Title/Abstract]) OR "social relationships"[Title/Abstract]) AND (((("developing countries"[Title/Abstract]) OR "poor countries"[Title/Abstract]) OR "low income countries"[Title/Abstract]) OR "low and middle income countries"[Title/Abstract]) OR "middle income countries"[Title/Abstract]) OR "LMIC"[Title/Abstract]) AND (health[Title/Abstract])	105
Web of knowledge including Science citation index expanded Social science citation index Conference proceedings citation indexes- science and social sciences and humanities	((TS=("Social capital" OR "Social relationship*" OR "Social Network*" OR "Social cohesion" OR "Informal social control" OR "Collective efficacy" OR "Civil societ*" OR "Neighborhood cohesion") AND PY = 2007–2012) AND Language = (English) AND (TS = ("developing countr*" OR "low income countr*" OR "Poor countr*" OR "middle income countr*" OR "lower and middle income countr*" OR LMIC) AND PY = 2007–2012) AND Language = (English)) AND (TS = health AND PY = 2007–2012) AND Language = (English)	121
Google scholar	["social capital" OR "social relationships" OR "social networks" OR "social cohesion" OR "Informal social control" OR "collective efficacy" OR "civil society" OR "neighborhood cohesion"] AND ["developing countries" OR "low income countries" OR "poor countries" OR "middle income countries" OR "lower and middle income countries" OR "LMIC"]	17 800 (title search-101)
Cochrane	"social capital": ti,ab,kw (Word variations have been searched) AND "developing countries"	19
Social care online, sociological abstracts, social capital gateway (hand search)		23
Social capital-world bank (hand search)		37
Journal of social science and medicine(hand search of titles of all available online)		66
Total		472

3.1. Characteristics of the studies selected

3.1.1. Income status

Of the 46 studies selected, 32 were conducted in middle income countries. These included 22 from upper middle income countries and 10 from lower middle income countries. Only seven studies

were conducted solely in low income countries. Of the seven cross-national studies, five included countries ranging from low income to upper middle income while 3 studies included countries ranging from low income to HICs.

3.1.2. Geographical distribution

When cross national studies were excluded, nineteen studies came from Asian countries, ten studies appeared from Latin American region and ten studies belonged to Africa.

3.1.3. Study designs

The majority of studies (n = 39) were descriptive and cross sectional in design. There were two Randomized Controlled Trials (RCTs) (de Souza and Grundy, 2007; Pronyk et al., 2008a), one pre-post intervention study (Brune and Bossert, 2009), a single case study (Mattoo et al., 2008) and three qualitative studies (Murray et al., 2012; De Silva et al., 2007a; Pronyk et al., 2008b).

3.1.4. Data types and sources used to measure social capital

Of the 46 studies, 32 consisted of primary data while 14 measured social capital using secondary data (Affifi et al., 2010; d'Hombres et al., 2010; Idrovo et al., 2010; Leone et al., 2008; Mansyur et al., 2008; Moxley et al., 2011; Rose, 2000; Sirven, 2006; Cramm and Nieboer, 2011; Habibov and Afandi, 2011; Pattussi et al., 2006; Calvo et al., 2012; Chiao et al., 2012; Elgar et al., 2011). All cross national (Leone et al., 2008; Mansyur et al., 2008; Calvo et al., 2012; Elgar et al., 2011; D'Hombres et al., 2006) studies except the studies conducted by De Silva et al. (De Silva and Harpham, 2007; De Silva et al., 2007b) used secondary data from routine population surveys such as World Values Survey (WVS), Gallop world poll, Demographic and Health Survey (DHS) and others (Table 4). Three studies that included secondary data did not mention an origin of the data used (Cramm and Nieboer, 2011; Habibov and Afandi, 2011; Pattussi et al., 2006). Of the quantitative studies that used primary data 22/29 used a specific tool/s to obtain a measure of social capital (De Silva and Harpham, 2007; de Souza and Grundy, 2007; Pronyk et al., 2008a; Brune and Bossert, 2009; Mattoo et al., 2008; De Silva et al., 2007b; Thuy and Berry, 2013; Friche et al., 2012; Ashrafi et al., 2012; Hurtado et al., 2011; Borges et al., 2010; Wang et al., 2009; Mitchell and Bossert, 2007; Moscardino et al., 2010; Springer et al., 2006; Pronyk et al., 2008c; Modie-Moroka, 2009; Looman and Farrag, 2009; De Silva et al., 2006; Harpham et al., 2006, 2004; Inclan et al., 2005) (Table 3) while the other seven studies utilized questions on selected social capital constructs but did not mention an origin of these items (Yip et al., 2007; Yiengprugsawan et al., 2011; Gregson et al., 2011; Nilsson et al., 2006; Cramm et al., 2012; Lau and Li, 2011; Gayen and Raeside, 2007).

3.1.5. Level at which social capital was measured

Of the 46 studies, 32 measured social capital at individual/micro level, seven studies at meso level (Friche et al., 2012; De Silva et al., 2006; Harpham et al., 2006; Inclan et al., 2005; Yip et al., 2007; Gregson et al., 2011; Nilsson et al., 2006) and another seven studies at macro level (Idrovo et al., 2010; Leone et al., 2008; Mansyur et al., 2008; Calvo et al., 2012; Chiao et al., 2012; Elgar et al., 2011; De Silva et al., 2007b). In macro level studies the aggregated individual level social capital was used to obtain a collective measurement.

3.2. Study tools used to measure social capital

Among the studies that used primary data we were able to identify 18 purpose built study instruments/tools to measure social capital. Some studies used a combination of tools to capture

Table 3
Tools utilizing primary data used to measure SC, their content, validation and reliability check.

Tool name/origin	Study (reference)	Country	Main dimensions of SC	Level	Tool content (item number/SC constructs/scales of measurement)	Tests of validity used	Tests of reliability used
Australian community participation questionnaire (ACPQ)	Thuy and Berry (2013)	Vietnam	Structural and cognitive	Individual	<i>Social participation</i> : ACPQ- 30 items, <i>Participation perception</i> : seven types measured in a 7 point likert scale	Nil	Nil
Organizational trust inventory	Thuy and Berry (2013)	Vietnam	Cognitive	Individual	<i>Social trust</i> 12 items measured in a seven point likert scale	Nil	Nil
Neighborhood scale	Friche et al., 2012	Brazil	Structural and cognitive	Individual and meso level	Two scales assessing SC; <i>Neighborhood participation</i> (11 items) <i>social cohesion</i> (6 items)	Translation validity Convergent validity CFA	IC 0.51-0.86
Six item scale- prepared in Iran	Ashrafi et al., 2012, Hurtado et al., 2011	Iran	Structural, cognitive, bonding, bridging	Individual	6 items; <i>Volunteering, participation, social trust, sense of community reciprocity, social networks</i>	Nil	Nil
Six item scale prepared from a previous review	Hurtado et al., 2011	Colombia	Structural and cognitive	Individual	6 items; <i>Interpersonal trust, Reciprocity, Membership in groups, current volunteering activities, Non electoral political participation, Participation in public civic activities</i> Measured as binary variables	PCA	IC 0.76-0.84
Integrated questionnaire on social capital (SCIQ)	Borges et al., 2010	Brazil	Structural, cognitive, bridging and bonding	Individual	14 selected items from SCIQ; <i>Groups and network, Trust, Solidarity, Collective action and cooperation, Information and communication, Social cohesion and inclusion, Empowerment and political action.</i>	Nil	Nil
	Wang et al., 2009	China	Cognitive	Individual and meso level	<i>Trust</i> part of SCIQ; 10 statements in a 5 point likert scale	PCA	
	Mitchell and Bossert, 2007	Nicaragua	Structural and cognitive	Individual	Items selected from SCIQ; <i>Structural formal networks</i> 30 items, <i>Informal networks</i> 5 items, <i>Trust, Reciprocity and Solidarity</i> measured sing 15 likert scale + binary items	EFA	
Multidimensional scale of perceived social support (MSPSS)	Moscardino et al., 2010	Russia	Cognitive	Individual	<i>Social support</i> 12 items	Validated method not mentioned	IC-0.71-0.86
	Springer et al., 2006	El Salvador	Cognitive	Individual	<i>Perceived parental social support</i> 7-item scale; <i>perceived social cohesion at school</i> 6-item scale	Validated method not mentioned	IC-0.71
Sense of community index	Moscardino et al., 2010	Russia	Cognitive	individual	<i>Psychological sense of community</i> additional 10 statements to evaluate adolescents' sense of safety and security	Validated method not mentioned	IC-0.76
Individualism/collectivism scale (INDCOL)	Moscardino et al., 2010	Russia	Cognitive	individual	<i>collectivistic versus individualistic ideologies</i> 16 items rated on a 5 point likert scale	Previously validated method not mentioned	IC-0.76
Social capital assessment tool(SCAT)	Inclan et al., 2005	Mexico	Structural and cognitive	Individual and meso level	<i>Collective action</i> 3 items, <i>Receprocity</i> 2 items, <i>Perception of physical environment and safety</i> 4 items	EFA	Nil
	Brune and Bossert, 2009, Pronyk et al., 2008a	Nicaragua	Structural and cognitive	Individual	<i>Participation in community groups, Meeting load, Trust and solidarity, Sociability and social harmony</i>	Nil	Nil
	Pronyk et al., 2008a, de Souza and Grundy, 2007, Pronyk et al., 2008b, De Silva et al., 2007a	South Africa	Structural and cognitive	Individual	Group membership and the level or intensity of membership; Cognitive social capital measured by a composite indicator made up of answers to 9 questions on <i>Perceived Reciprocity and Community support, Perceived solidarity in crisis, Community action</i>	NIL	IC 0.3-0.7
Project of human development in chicao neighbourhoods (PHDCN) community survey	Pronyk et al., 2008c	Mexico	Structural and cognitive	Individual		EFA	
Perceived social capital scale	Modie-Moroka, 2009, Borges et al., 2010	Botswana	Cognitive	Individual	<i>Perception of community integration, trust, strength of civic associations, and personal involvement in the community</i> 37 items with Likert scales		IC-0.81
Social capital scale	Looman and Farrag, 2009	Egypt	Structural and cognitive	Individual	<i>Engagement for common good, Sense of belonging, system connection, Family role in community</i> 14 declarative statements responded in a Likert scale	EFA CFA(both not satisfactory) Hypothesis testing	IC-0.66-0.79
Social support questionnaire	Mattoo et al., 2008, Brune and Bossert, 2009	India		Individual	<i>Social support</i> measured by 18 items in a 4 point likert scale	Convergent validity	

(continued on next page)

Table 3 (continued)

Tool name/origin	Study (reference)	Country	Main dimensions of SC	Level	Tool content (item number/SC constructs/scales of measurement)	Tests of validity used	Tests of reliability used
American social general social survey	de Souza and Grundy, 2007, Harpham et al., 2002	Brazil	Structural and cognitive	Individual	Trust 4 items, Reciprocity 2 and Family relationships 3 items		Test re-test reliability-0.56
Health survey for England	de Souza and Grundy, 2007, The World Bank Group, 2012	Brazil	Cognitive	Individual			
Short version of adapted social capital assessment tool (SASCAT)	De Silva et al. (2007a,b), De Silva et al. (2006), Murray et al. (2012)	Peru, Ethiopia, Vietnam, India	Structural and cognitive	Individual and ecological	Structural social capital 5 items; Group membership, Support from groups, Support from individuals, Citizenship activities and 4 cognitive items	Cognitive validation PCA	
Adapted social capital assessment tool (ASCAT)	Harpham et al. (2006) Harpham et al. (2004)	Vietnam Colombia	Structural, cognitive, bridging and bonding	Individual	Group participation, Trust(<i>general, thick and thin</i>), social cohesion, informal social control, social support(<i>informational, instrumental and emotional</i>), Civic participation. 20 items Except for group participation, all others measured in a 5 point scale	PCA	IC (values not mentioned)

*PCA- Principle component analysis *EFA- Exploratory Factor Analysis *IC-Internal consistency.

Table 4

Sources of secondary data used in SC assessment tools.

Tool name	Study
New Russia barometry survey	Rose, 2000
Gallup world poll	Calvo et al., 2012
World values survey	Elgar et al., 2011
	Moxley et al., 2011
	Idrovo et al., 2010
	Mansyur et al., 2008
	D'Hombres et al., 2006
Transparency international web page	Moxley et al., 2011
	Idrovo et al., 2010
DHS	Chiao et al 2012
	Leone et al., 2008
2003 urban health study	Affi et al., 2010
Network of rural observatories (NRO) through the agency of the national institute of statistics (NIS) of Madagascar.	Sirven, 2006

different dimensions of social capital (Table 3). According to the measurement they possess, the purposely-built tools were basically of two different types. The first type used individual questions or statements to resemble selected dimensions of social capital, such as the SCIQ (Borges et al., 2010; Wang et al., 2009; Mitchell and Bossert, 2007). The second type were composite tools which measured each dimension of social capital using several questions or statements such as A-SCAT (Harpham et al., 2004). Only 11/22 studies, using 8 different instruments mentioned any validation of the instrument used. Testing construct validity was the mostly widely used technique for psychometric validation: In 9/22 studies Principle Component Analysis (PCA) was the method used to assess construct validity. Only 2/22 studies used Confirmatory Factor Analysis. Internal reliability was assessed using Chronbachs' alpha to detect the internal consistency in 7/22 studies. Only a single study mentioned test re-test reliability.

The Social Capital Assessment Tool (SCAT) developed under the World Banks social capital initiative and its adapted and shortened versions was the most widely used composite tool to measure

social capital related to health in LMIC (De Silva and Harpham, 2007; Pronyk et al., 2008a; Brune and Bossert, 2009; De Silva et al., 2007b; Pronyk et al., 2008c; De Silva et al., 2006; Inclan et al., 2005). However the original SCAT tool was hardly used in health surveys. We observed that different researchers have selected different items from the original tool to utilize in their studies. The Adapted Social Capital Assessment Tool (A-SCAT) used by Harpham et al. (Harpham et al., 2004) consists of eleven constructs resembling structural and cognitive dimensions of social capital. This tool is a result of a three-year effort of the research team and possesses face validity, content validity and construct validity (using PCA). However its reliability is not mentioned in literature. De Silva et al. have used the Shortened version of A-SCAT (SASCAT) in cross-national studies (De Silva and Harpham, 2007; De Silva et al., 2007b). The investigators have used cognitive validation in addition to psychometric validation (De Silva et al., 2006).

We examined the nationwide studies that measured social capital based on secondary data. All studies except Elgar et al. 's study used few questions selected from large population surveys. Trust and group membership were included in most of these studies. Other measures included proxy variables of social capital. Elgar et al. has measured social capital using a 17-item scale (Elgar et al., 2011). This tool is constructed using selected questions from the World Value Survey. The psychometric validation of the tool is conducted using stepwise EFA-CFA approach. This is the only tool that was validated among the tools that used secondary data to measure social capital. The investigators were able to extract four social capital constructs; Trust, Group, Civic and Linking social capital that are grounded on bridging, bonding and linking social capital.

Only 17/42 studies done in LMIC at least mentioned about cultural adaptation of the instrument. Very few studies clearly describe the procedures conducted to culturally adapt their questionnaires. Translation and back translation (Springer et al., 2006; Looman and Farrag, 2009), pilot testing (Pronyk et al., 2008a; Thuy and Berry, 2013; Pronyk et al., 2008c; Inclan et al., 2005), focus group discussions or in-depth interviews (De Silva and Harpham, 2007; Pronyk et al., 2008a; De Silva et al., 2007a; De Silva et al., 2007b; Pronyk et al., 2008c; Lau and Li, 2011) with community members were the methods used by the investigators in this process.

3.3. Main dimensions of social capital measured using tools

Twenty nine studies included measures of both structural and cognitive dimensions, only 2 studies mentioned bridging and bonding SC (Borges et al., 2010; Harpham et al., 2004) while only a single study mentioned all three of bridging, bonding and linking SC. Six studies had only structural measures while 9 studies had only cognitive measures. In two studies the measures were proxies indicating either cognitive or structural SC.

3.4. Social capital constructs and association with health outcomes

Twelve different constructs were used to represent major dimensions of social capital and tested for an association with health outcomes in 18 studies (Fig. 2). The commonest health outcomes measured were those that required “subjective” assessments: mental health conditions (6 studies) and self-rated health (5 studies). Objective health outcomes were measured less commonly and included, child nutrition (2), vaccination (1), risk behaviours(1), HIV risk(1), road traffic accidents(1), and medicinal use(1). Social trust, social cohesion and sense of belonging had positive association with health outcomes in most of the studies.

4. Discussion

This review identifies the variety of measurement used to assess social capital in LMIC and their strengths and weaknesses. We identified that social capital has been measured using both primary and secondary data that are collected through composite and non-composite tools. It is argued in literature that composite measures are better in measuring the concept due to its' multifaceted nature (Lochner et al., 1999). However the variable nature of the associations with health outcomes may mean some of the items and

constructs are redundant.

The social capital dimensions measured by each tool as well as the number of items used was heterogeneous. This is similar to the findings of other systematic reviews that include majority of studies from HICs (De Silva et al., 2005; Kawachi et al., 2007; Islam et al., 2006; Uphoff et al., 2013; Vyncke et al., 2013) Due to this heterogeneity, it is difficult to detect as to which type of tool (composite/not) or which type of scale (binary/likert) is more suitable in measuring social capital. The cognitive dimensions such as trust, sense of community and social cohesion were frequently included in tools and tend to be more associated with health (Fig. 2). However it is important to note that heterogeneity that existed even in measuring each construct could interfere with the validity of above summarization. For example different types of trust were assessed in different studies and their association changed at different cultural settings (Harpham et al., 2004). We observed that in majority of studies (44/46) the objective was to assess the direct relationship between social capital or selected component/s of social capital and health while in two studies (Idrovo et al., 2010; Sirven, 2006) the authors investigated the mediating role of social capital in the pathway of income inequality and health. The comprehensiveness of the measure used to assess social capital did not vary with the objective of the study.

Considering the different entities of social capital that has evolved through long standing debates, “access to resources” – at least ones that are relevant to the health outcome measured – should have been measured to obtain a comprehensive analysis of the concept. Access to resources as well as social influence would have considerable role in determining the pathways of association between social capital and health especially in LMICs. Surprisingly, none of the tools (in studies using primary data) in this review measured these aspects. We suggest incorporating either incorporating above items (Webber and Huxley, 2007) or at least

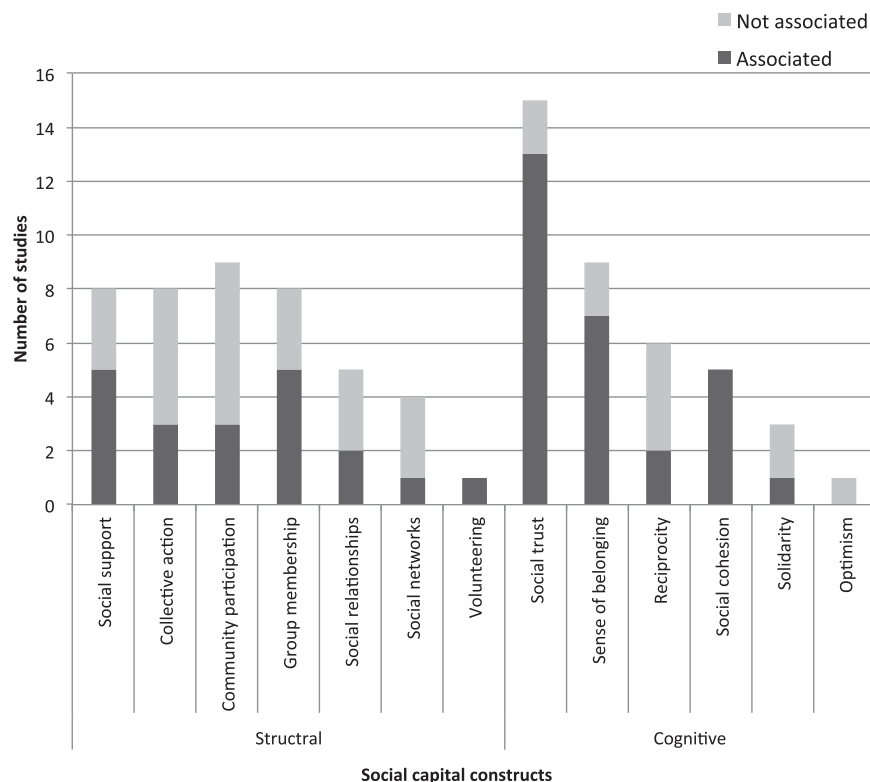


Fig. 2. Social capital constructs that were used to represent major dimensions of social capital and their association to health.

considering them at analytical stage when measuring social capital in LMIC, if one is specially concerned about pathways of association.

Most of the tools used to measure social capital in LMIC were originally developed in HICs. Cultural adaptation of the tool is an important procedure especially when the original tool is from a different cultural setting. Although 17 studies mentioned about cultural adaptation, very few have clearly explained the techniques used. We find this as a major drawback in measuring social capital in these regions. By conducting cross cultural studies using the same tool (SASCAT), De Silva et al. explains how important cultural adaptation is to identify the relevant social capital constructs and ways and means of including them in tools for different cultural settings (De Silva and Harpham, 2007; De Silva et al., 2007b). We recommend to use qualitative techniques to identify social capital in the context studied prior to its quantitative measurement of social capital in LMIC. An initial qualitative assessment as will help to identify the social capital constructs relevant to the community under study (De Silva et al., 2007a). It will also help in identifying intermediate and proximal variables that stand along the pathways of social capital and health (Murray et al., 2012); Thus it will facilitate measuring pathways (Social Epidemiology: Oxfo, 2000) of how social capital affects health.

While the definition and measurement of social capital is still at the developmental stage, valid and reliable measurement instruments are required to shed light on the nature of the relationship between social capital and health (Harpham et al., 2002). However, very few studies have used multiple methods for validation. Among them, testing construct validity using PCA was common. Only 2 studies (Elgar et al., 2011; Looman and Farrag, 2009) in this review have used the step-wise approach of EFA-CFA. It is difficult to suggest the most suitable method for testing construct validity. But due to divers variables used in measuring social capital an initial EFA would be important in data reduction. Following CFA would decide whether the tool differentiates between different dimensions of social capital. It is not possible to assess concurrent validity of the instruments, as there is no gold standard measure for social capital. Due to the scarcity of studies with prospective designs, predictive validity (ability to predict a future event) was not tested in any of the instruments used in LMIC, although could have been in those that did have a longitudinal component (de Souza and Grundy, 2007; Pronyk et al., 2008b). Therefore testing predictive validity of instruments through cohort studies would be an important step forward towards developing a valid tool to measure social capital. Cognitive validation seems to be beneficial as the measurements depend on individual perceptions and the variety of available social networks (De Silva and Harpham, 2007; De Silva et al., 2007b; De Silva et al., 2006).

Test re-test reliability was assessed in only one study (Mattoo et al., 2008) a major limitation in the field. It was interesting to note that the tools with high reliability consisted mostly of cognitive constructs of social capital (Hurtado et al., 2011; Moscardino et al., 2010; Modie-Moroka, 2009).

In this review 12/46 studies (six studies using primary data) measured social capital at micro, meso or macro levels. The group level measure was obtained by aggregation of individual social capital measures. Compared to the common finding of individual social capital being related to health rather than community level aggregates, multi-level modelling shows that in some contexts, ecological social capital is independently associated with health (Habibov and Afandi, 2011; Elgar et al., 2011). Whether to assess social capital at individual or group level may depend upon ones objective. It is useful to have group level measures if the researcher is interested in contextual outcomes or context based interventions. However one should be careful when interpreting aggregated social capital at group level. One problem is that it

depends on the type of individual who is selected for the study. For example, in studies where only the female caregiver is selected, aggregation of individual social capital measures would not resemble the social capital of the whole community (Lochner et al., 1999). Further group level measures of cognitive constructs may lack reliability due to variability in individual perceptions (Friche et al., 2012). No studies done in LMIC used a community/contextual level indicators of social capital (Lochner et al., 1999) which was independent of aggregation of individual measures. However prior qualitative assessment of social capital may help in identifying such indicators appropriate to the community under study; De Silva et al. in her study of social capital in Peru states that some Mothers' Groups practice skill training on their own for fund raising while others receive funds from religious, political or charitable groups (De Silva et al., 2007a). Hence the number of Mothers' Groups per community serving above functions could be used as community level indicators of "social cohesion" and "linking social capital" respectively.

Selecting an ideal tool to measure social capital is a challenge when going through the results of this review. We observed that although the same tool was used (SCAT), different researchers intend to select different items from this tool, which inculcate further heterogeneity among the social capital measures, which has undermined its validity. For example in SASCAT, the psychometric analysis does not show much discriminant validity (De Silva et al., 2006). Reliability of this tool is only published in one country – South Africa (Pronyk et al., 2008a, 2008c). Therefore developing a gold standard measure through frequent refinement of a specific tool has become a missed opportunity in LMIC. Compared to other measures A-SCAT comprehensively captures the concept, including eleven different constructs of social capital. It exerts psychometric validity distinguishing between structural and cognitive dimensions as well as eight factors representing different social capital constructs (Harpham et al., 2004). However literature does not mention its reliability and it does not address linking social capital. Looking at the simplicity, different dimensions and constructs of SC measured and validity/reliability assessment, the six item composite scale developed by Hurtado et al. (Elgar et al., 2011) based on a review would be an ideal tool for large health studies to measure SC as only one variable among many others. In measuring social capital using secondary data from surveys, Elga et al. s' WVS social capital tool is exemplary exerting content and construct validity.

This review may have limitations on incomplete retrieval of studies. In press articles were not included due to inconvenience in access. However we searched more than 10 databases/search engines as well as grey literature sources relevant to the theme under study. In assessing measurement properties of tools, it would have been better if we used the COSMIN (COnsensus-based Standards for the selection of health status Measurement INstruments) checklist (Mokkink et al., 2010). But we have actually included most of the components in this checklist and combined some of them for simplicity.

5. Conclusions

We observed that there are many gaps in the measurements of SC in LMICs. Cultural adaptation, validation and assessment of reliability of the tool in the study setting are important in measurement of social capital. Prospective studies are needed to determine the causal relationships between health and social capital as well as to assess predictive validity of the available tools. Of the tools we recommend ASCAT and the six-item scale used by Hurtado et al. to be used in measurement of social capital in these regions in primary studies. Current strategies for health promotion

in LMIC such as building community support groups, positive deviance and peer education are based on social capital of individuals and communities. Therefore it would be a propitious effort to improve measurement of social capital in LMIC, emphasizing cognitive dimensions and using adequate adaptation and psychometric validation of instruments.

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