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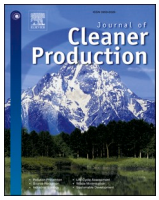

Sustainability indicators in public healthcare: A factor analysis approach

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ABSTRACT

Motivated by the increasing demand for integrated, value-based healthcare, this study proposes a valid measurement scale for sustainability in the healthcare sector. The model focuses on implementation strategies to foster social, environmental and broader economic value-based sustainability in healthcare. This unique holistic approach aligns with the UN SDGs agenda, focussing on environmental considerations and societal health and wellbeing through a multidimensional mix of leading economic, social and environmental performance indicators. Exploratory factor analysis revealed seven dimensions of the measurement scale for sustainability measured by 39 items. Confirmatory factor analysis has been used to confirm the factor structure of the study and the results indicate that the proposed measurement is valid. This measurement scale serves as the basis of a comprehensive benchmark, developed to assess sustainability-related performance in the healthcare industry. The study also explains the theoretical and practical implications of the findings, followed by the limitations and agenda for future research.

1. Introduction: problem identification

Sustainability in healthcare is understood as the harmonisation of three core elements: economic efficiency, social inclusion, and environmental protection (Borgonovi et al., 2018; Carnero, 2015; McKenzie, 2004). Economic efficiency has long been an issue in the healthcare sector, where the burgeoning cost of health services has increased individual and public spending (Abernethy and Chua, 1996; Llewellyn and Northcott, 2005; Lowe, 2000; Preston et al., 1992), even more recently being blamed for financial crises in some countries (Fragkiadakis et al. (2014). Accounting research primarily focuses on managing efficiency through budgetary performance and metrics linked to funding requirements (Lowe, 2000; Preston et al., 1992; Tabrizi, 2012). Over time, the notion of value has expanded from purely economic to include nonfinancial measures of healthcare system effectiveness, such as quality of service and patient satisfaction (Abernethy et al., 2006; Coskun and Bora Senyigit, 2010; Llewellyn and Northcott, 2005; Pflueger and Organizations, Society, 2016), which are presented in a balanced scorecard format (Kaplan and Norton, 1992) and used as part of management control (Northcott and Ma'amora Taulapapa, 2012).

Value-based healthcare extends the efficiency focus to one that prioritises patient needs and experiences over volume/cost and supply-driven demands (Koff and Lyons, 2020; Porter, 2010; Porter and Lee, 2013; Porter and Teisberg, 2006; Teisberg et al., 2020). Improving value is argued to benefit patients, payers, providers and suppliers while increasing the economic sustainability of the healthcare system (Porter, 2010). Value-based healthcare is underpinned by consistent measurement, guidelines and standards, but it is focused on Western evidence-based medicine (Koff and Lyons, 2020) and arguably pays less attention to the needs of the vulnerable (Duckett et al., 2015). Furthermore, value-based healthcare does not necessarily address issues of social inclusion in healthcare delivery, such as equity of access (McKenzie, 2004; Vallance et al., 2011), healthcare availability in developing countries, and the use of traditional and complementary medicine (Akter et al., 2010; Dave, 2011; Moscelli et al., 2018; UN, 2019).

Social inclusion is an essential element of healthcare delivery, and equity of access to key services (including health, education, transport, housing and recreation) is a major global public healthcare system policy objective (Acharya, 2018; Moscelli et al., 2018; Ruthledge and Wesley Jr, 2001; Thresia, 2018) and United Nations Sustainable Development Goal (SDG). The third of the seventeen interlinked SDGs aims to achieve good health and well-being of the global population and highlights the need for disease prevention, health promotion and wellness for individual patients and their communities (Hussain et al., 2018; Silvis, 2012). Academic discussions of UN SDG-3 have acknowledged

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the importance of traditional medicine in developing countries (Kasilo et al., 2019; Zhang, 2018) and called for research furthering an understanding of how organisations can assure social inclusion by addressing issues of polarisation, segregation, exclusion, inequality and vulnerability (Härenstam, 2017). The potential ecological benefits of traditional medicine have also been realised (Mthembu, 2020; Shankar and Patwardhan, 2017) in supporting action to mitigate the carbon footprint of healthcare service delivery, particularly the consumption of energy and water and the production of waste (Posada, 2017; Saviano et al., 2018), including toxic, infectious or radioactive biomedical waste (Carnero, 2015).

Current healthcare performance measurement and reporting regimes, which are primarily aligned with Western biomedicine are clearly inadequate when considering traditional medicine's contribution towards attaining the UN social and environmental SDGs, in particular universal access to healthcare (Akter et al., 2010; Dave, 2011; Duckett et al., 2015; Koff and Lyons, 2020; McKenzie, 2004; Moscelli et al., 2018;UN, 2019; Vallance et al., 2011). Chang et al. (2017) highlight the need for better models that can support performance measurement and corporate governance in healthcare institutions. Integrating sustainability with management and control may drive stakeholder participation and accountability across the value chain (Delai and Takahashi, 2011; Khan et al., 2018). Challenges associated with social inclusion and economic and environmental protection continue to impact the delivery of sustainable healthcare services around the world, particularly in developing countries. However, there is no established model or framework for measuring economic, environmental and social sustainability (including wellbeing) from a multidimensional perspective in the healthcare context.

The present work seeks to address these gaps by providing a measurement model that goes beyond the present efficiency focus by incorporating societal and environmental considerations. The aim is to propose a model that conforms to the holistic approach of the UN SDGs related to universal access and wellbeing. India is selected as the study context, as it provides a setting where a dual Western and traditional approach to care is part of the universal healthcare system. By examining how traditional medicine (Ayurveda) contributes to equality, inclusion and overall sustainability in India, this study offers the public-sector accounting and value-based healthcare literature a broader understanding of sustainability. The objectives of the study are as follows:

- To identify the critical sustainability dimensions that support *SDG goals.*
- *To develop and validate a measurement scale for sustainability in the healthcare sector.*

A Qualtrics questionnaire survey methodology was adopted to propose the measurement model aimed at assessing wellbeing and sustainability performance in the healthcare setting along with the patient-centric economic approach. Responses from practitioners employed at hospitals and clinics in India offering traditional (Ayurvedic) medicine were used to extract seven dimensions via principal component analysis and Varimax rotation with Kaiser normalization: performance reporting and budgeting (PRB); waiting time (WT); urban and rural disparities (URD); equal access (EA); social exclusion from healthcare based on caste and gender (EA-SECG); wellness over illness (WOI); and consideration of environmental sustainability in production and natural medicines (ES). Based on the results, a base model was proposed for the development of a comprehensive multidimensional measurement construct to assess sustainability-related performance in the healthcare industry.

This study is the first to provide a model for measuring sustainability in the healthcare setting and thus offers several theoretical and practical implications. No specific model or multidimensional framework to measure sustainability or promote integration strategies to achieve value-based healthcare is available in the literature (Briggs et al., 2018; Porter and Teisberg, 2006). The proposed model focuses on implementation strategies for promoting social, environmental and broader economic value-based sustainability in healthcare. The proposed sustainability measurement model draws on the Indian healthcare setting to focus on the key strategies for supporting the achievement of value-based care alongside the UN SDGs. This model can be used as a guide for implementing health policies and efforts to achieve the UN SDGs in integrated healthcare service provision. Researchers, healthcare administrations and government policymakers can use the proposed model to measure and compare sustainability governance efforts in both public and private healthcare settings in different jurisdictions across the globe. By revealing the critical dimensions for measuring sustainability practices, the model also contributes to the literature on UN SDG-related sustainability accountability in healthcare. In doing so, the measurement model developed in this study provides a significant contribution not only to the sustainability literature but also to the sustainability-related and value-based healthcare literature.

The remainder of the paper is organised as follows. The conceptual framework is presented in Section 2, which also briefly reviews the dual Western and traditional healthcare approach followed in India and discusses the three core elements of sustainability, i.e., economic, environmental and social sustainability, in the context of healthcare and their harmonisation to the UN SDGs. The review of the literature also provides the seven dimensions that constitute the measurement model. Section 3 describes the methodology adopted to test the model, and Section 4 provides an overview of the results. This is followed by discussion in Section 5 before concluding the paper with limitations and areas for further research.

2. Literature review: conceptual framework and model development

2.1. The dual traditional (Ayurveda) and Western approaches to healthcare in India

The Indian context is selected as the basis for model development because of its dual traditional (Ayurveda) and Western approaches to healthcare, which are both supported by the Indian government. In India, public healthcare delivery is administered via national and state oversight over all essential healthcare services, including preventive and primary care, diagnostic services, and outpatient and inpatient hospital care. Ayurveda, the largest of the traditional medicine approaches, was managed through a separate Department of AYUSH (an acronym for Ayurveda, Yoga, Unani, Siddha and Homoeopathy) in terms of governance, education, regulation, development and growth (Naaz, 2019) until August 2014, when the Department of AYUSH was granted Ministry status and charged with developing education and research in traditional medicine (Sen and Chakraborty, 2017). Ayurveda has a 5000-year history and is a critical part of India's healthcare system. Ayurveda provides individualised healthcare delivery (Jaiswal and Williams, 2017; Sen and Chakraborty, 2017) and treats illness with an overall goal of promoting wellness (Binorkar, 2018; Deshpande et al., 2016; Mallick, 2016). Although there are philosophical differences between the traditional and Western biomedicine approaches, because of its widespread acceptance and low cost of delivery, Ayurveda is considered consistent with the Indian government's efforts to achieve UN SDG-3 (Kamineni, 2019).

To identify the critical dimensions of sustainability and develop a model for measuring sustainability in healthcare and enabling the UN SDGs, the three core elements of sustainability, i.e., economics, social inclusion and environmental protection, must be examined. Theoretical background on each of these elements is offered below, following by the identification of dimensions aligned with the 17 UN SDGs in Section 2.5.

2.2. Economic sustainability: A multidisciplinary value-based healthcare approach

Since the public sector reforms of the 1990s, many countries, including developing countries, have expanded the management control of their healthcare systems. New elements range from reporting measures of efficiency through budgetary control and monitoring activity-based funds and throughput mix volumes (Lowe, 2000) and ensuring broader accountability in the effectiveness of service delivery (Abernethy et al., 2006; Beazley et al., 2019; Tabrizi, 2012). In the public sector, the use of balanced scorecards is considered important for broader management accountability and control (Northcott and France, 2005; Northcott and Ma'amora Taulapapa, 2012). Multidimensional performance measurements now include performance in budgeted financial activity, quality of care indicators (readmissions, infections) and patient waiting times for emergency admission and elective care (Vesty and Brooks, 2016). Increasingly, healthcare service providers and those that take a patient-centric approach are incentivised to meet these indicators (Porter and Teisberg, 2006; Yuen and Ng, 2012). Waiting time is not only a concern for institutions seeking to meet healthcare delivery performance targets but can also impact a patient's health status (Hu et al., 2020; Koopmanschap et al., 2005; Landi et al., 2019; Shaikh et al., 2018). Delays in receiving treatment, including elective or non-urgent surgery can reduce a patient's quality of life (QoL), exacerbated further if waiting leads to further incapacitation or reduces the effectiveness when finally receiving treatment (Koff and Lyons, 2020).

Porter and Teisberg (2006) value-based healthcare approach is designed to overcome the issues associated with Western medicine's focus on throughput volumes and illness to the detriment of patient-centred value and wellness. Rather than using activity-based funding models to drive payment from a single service provider, value-based healthcare approaches foster solutions and expertise at the medical condition/disease level to support the shared health needs of patients. This concept relies on a balanced performance measurement approach to measure health outcomes and costs (Teisberg et al., 2020). Proponents argue for low-cost but high-quality care through the promotion of integrated approaches and improved patient access to services across the sector (Kodner and Spreeuwenberg, 2002; Leichsenring, 2004). Costs associated with wellness and health promotion, or preventative health, are an important and growing part of the new value-based healthcare agenda (Kodner and Spreeuwenberg, 2002; Koff and Lyons, 2020).

From a sustainability perspective, Porter and Teisberg (2006) value-based healthcare approach tends to focus more on the economic and the individual, than on the environmental and/or broader social dimensions defined by the UN SDGs. While social accountability is indirectly addressed through this approach with value defined in terms of meeting patient rather than service provider needs, it is silent on access to healthcare for important stakeholders such as the vulnerable and the minority groups (Duckett et al., 2015). Though many chronically ill patients live outside cities, driving calls for further investment in rural healthcare infrastructure (Putera, 2017), addressing urban/rural healthcare disparities seems not to be the priority because investors in both developed and developing countries are more interested in supporting health facilities in urban growth areas (Li et al., 2018; Wulandari and Laksono, 2019). In addition, developing countries rely on donor agencies for infrastructure investment, which requires greater transparency in value to demonstrate a broader return on investment (Millar and Hall, 2013). As Kim et al. (2013) state: "Assessing value comprehensively reveals the error of viewing investments in healthcare as a drain on the productive forces of an economy" (p.1068). Thus, further work is needed to evaluate value in the system from a broader stakeholder perspective (Duckett et al., 2015).

2.3. Social sustainability: universal healthcare

In this study, social sustainability is treated in terms of integrated approaches to healthcare and preventative health. Integrated care focuses on connecting the network of primary and tertiary health and social care, and is aimed at delivering value to patients with chronic conditions and complex needs (Sampalli et al., 2012). With the aim to keep these patients, out of the hospital, social sustainability includes meeting welfare requirements such as basic health and educational needs, conserving resources, creating a harmonious living environment through social interaction, the facilitation of daily life operations, and providing open spaces for enhancing social wellbeing (Chan and Lee, 2007; Msengi et al., 2019). The achievement of social sustainability is marked by a strong sense of social cohesion that enhances individual QoL (McKenzie, 2004; Sajjad and Shahbaz, 2020). This view is embodied in UN SDG-3, which is entitled 'Good health and wellbeing' and takes an overall population health and wellness approach to ensure healthy lives and promote wellbeing for everyone at all ages.

UN SDG-3 recognises the importance of supporting developing countries over developed countries due to the multiplicity of outside governments and healthcare service providers managing differing community health philosophies, associated health expectations and ideals of value (DiSantostefano, 2013; Lopez-Valeiras et al., 2018; Naranjo-Gil et al., 2016). As part of their Hippocratic Oath healthcare providers aim to ensure that every person who seeks medical care is offered competent, sincere and equal treatment options. However, inequitable treatment and racial, gender and socio-economic biases still persists which erodes public trust (Härenstam, 2017; Ramirez et al., 2013; Røsstad et al., 2013; Ruthledge and Wesley Jr, 2001). Major gaps and inequalities in healthcare access continue in low- and middle-income countries (Munar et al., 2019), and access to public healthcare remains particularly challenging for patients in remote regions and those of lower socioeconomic status (Acharya, 2018; Angerer et al., 2019; Martin et al., 2020; Thresia, 2018).

In India, discrimination based on socioeconomic status is accompanied by that based on casteism. India's caste system is a 3000-year-old rigid social hierarchical division characterised by hereditary transmission of lifestyle, occupation and social status (Acharya, 2018; Angerer et al., 2019; Shaikh et al., 2018; Thresia, 2018). Despite considerable improvements in healthcare delivery mechanisms overall, divides remain between social groups. There is evidence of low health status among the poor, women, rural and tribal communities, scheduled castes (SC), and specific minority groups (Acharya, 2018; Angerer et al., 2019; Thresia, 2018). Even if healthcare facilities are intended to be available for everyone, these groups are often culturally denied access. For example, George (2015, p.3) reported that these social groups are asked to "stand in a separate queue, are asked to wait for many hours and doctors avoid touching them physically during medical check-up or treatment, further deteriorating their state of health and social wellbeing". Several community-based studies have indicated that women, tribe members, Dalits, the illiterate, the poor, and agricultural labourers are victims of discrimination with restricted access to healthcare (Thresia, 2018).

In addition to healthcare equity, as patients increasingly become active consumers, they are demanding alternatives to the pharmaceutical interventions offered by biomedicine (Weeks et al., 2017), with an emphasis on natural approaches that are gentle and caring and consider both emotional and physical wellbeing (Boehm and Kubzansky, 2012; ONJCWRC, 2020). The benefits of traditional medicine from a holistic wellness agenda might be perceived by the patient as equally or more valuable than biomedicine.

2.4. Environmental sustainability

The healthcare sector is more energy intensive than other commercial and service activities and is arguably not actively engaged in efforts to reduce emissions (Salas et al., 2020). Consequently, there have been calls for urgent action and better management of the carbon footprint, energy consumption and waste management practices in healthcare (Msengi et al., 2019). More robust measurement and reporting of healthcare-related environmental issues as well as their associated disease burden will help improve healthcare accountability and provide comparative insights between and within countries (Sherman et al., 2020). It is argued that environmentally responsible healthcare services and ethical practices can be achieved by empowering employees (Dunphy, 2014) through the addition of key objectives in employee performance evaluations (Shah, 2019) with attention to environmental sustainability practices and carbon emissions also needed in the manufacture of medicines (Shah, 2019). Marsh et al. (2016) reported that the US healthcare sector produced 546 MtCO2e in 2007, accounting for 8% of overall greenhouse gas emissions in the US that year. Thakur (2021) highlighted the need for governments and health officials worldwide to adopt policy and legal frameworks for healthcare waste management to mitigate critical negative economic, social and environmental consequences.

Traditional medicine arguably promotes environmental sustainability. In particular, Ayurveda counteracts negative externalities by making individuals responsible for maintaining the balance between their needs and the regeneration capacity of the ecosystem so that future generations can continue to satisfy their needs (Patwardhan, 2016). Posada (2017) observed that the prevention and treatment of diseases using natural herbs and plant-based medicines in Ayurveda contributes to environmental sustainability.

2.5. Development of sustainability dimensions in alignment with the UN SDGs

The three social, environmental and economic elements of sustainability are consolidated in this section, to identify dimensions in alignment with the 17 UN SDGs for model development. Based on the literature review, 7 dimensions relevant to sustainability measurement in the healthcare sector are identified. These dimensions were developed via content analysis of the extant literature on the development of sustainability indexes in other sectors, for example, AlJaberi et al. (2017) and Kumar and Anbanandam (2019). Few studies have estimated environmental sustainability indexes, social sustainability indexes, or other measurement scales for sustainability performance across the healthcare sector, particularly in the public sector context. We conducted keyword searches for different aspects of sustainability, such as "environmental sustainability", "social sustainability", "equal access", "waiting periods", "social inclusion", and "environmental protection", to identify dimensions and their statements.

The literature supports the suitability of the UN SDGs as a framework for exploring sustainability in healthcare more broadly based on the interconnectedness of the sustainability dimensions, particularly the link between economics and social values. Rockström and Sukhdev (2016) of the Stockholm Resilience Centre stated that each of the 17 UN SDGs is aligned with one of the three sustainability dimensions. They advocated a paradigm shift away from the sectoral approach to the three core elements towards the recognition that sustainable economic development enables society to exist in a safe operating space of the planet. Based on these interconnections, Boar et al. (2020) confirms the connections between the sustainability dimensions and the relevant SDGs.

While highlighting the need to address urban-rural disparities and inequalities, the extant healthcare literature also acknowledges the relevance of existing performance measurement and reporting regimes that focus on budgeted financial activity, quality of care indicators (readmissions, infections) and patient waiting times for emergency admission and elective care (Koopmanschap et al., 2005; Landi et al., 2019; Putera, 2017; Shaikh et al., 2018; Vesty and Brooks, 2016). Such metrics are related to 'UN SDG-8 - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all'; 'UN SDG-9 - Build resilient infrastructure, promote sustainable industrialization and foster innovation'; and 'UN SDG-10 - Reducing inequalities and ensuring no one is left behind'. Rajesh (2020) identified the resource use score, the environmental innovation score, and the corporate social responsibility strategy score as relevant in promoting the environmental, social, and governance performance of Indian firms. In addition to urban and rural disparities (URD), the present study examines the relevance of performance reporting and budgeting (PRB) and waiting time (WT) for developing a performance measurement model for the healthcare sector.

Although communicable diseases are typically in the news, it is non-communicable (chronic) diseases that pose the greatest threat globally. In its 2018 annual report, the Australian Institute of Health and Welfare (AIHW (2018) cited a 2017 WHO report stating that chronic conditions are responsible for approximately 70% of deaths worldwide. The AIHW report noted that those diagnosed with chronic conditions have complex health needs and poorer overall QoL and die prematurely. Many chronic conditions, such as physical inactivity, obesity, unhealthy diets and high blood pressure, are preventable with changes in lifestyle, highlighting "a complex interplay of individual, environmental and societal factors" (AIHW, 2018). The demand for equal access to public healthcare for everyone, regardless of caste, class, and gender, is increasingly expected to shift focus to wellness over illness as well as gender equality, healthy lives, promoting well-being, and making cities and human settlements inclusive, safe, resilient and sustainable (Chan and Lee, 2007; George, 2015; Martin et al., 2020; Msengi et al., 2019; Munar et al., 2019). Achieving these objectives will help realize 'UN SDG-3: Ensure healthy lives and promote well-being for all at all ages'; 'UN SDG-5: Achieve gender equality and empower all women and girls'; and 'UN SDG-11: Make cities inclusive, safe, resilient and sustainable'. Thus, in addition to SDG-3, the fourth dimension, equal access (EA), aligns with UN SDG-5 and SDG-11. This alignment justifies the inclusion of social exclusion from healthcare based on caste and gender (EA-SECG) and wellness over illness (WOI) as the fifth and sixth dimensions of the performance measurement model for the healthcare sector.

Finally, it is important to measure and monitor carbon emissions reductions in the healthcare sector (Posada, 2017; Shah, 2019) and the sector's impact on public health (Sherman et al., 2020). An important aspect of environmental sustainability in India is the positive contributions Ayurveda can make on the healthcare sector and achieving the UN SDGs (Kamineni, 2019; Posada, 2017). Insights from Ayurveda can also contribute to medicine manufacturing techniques that promote environmentally friendly production and sustainable healthcare service delivery (Posada, 2017). This focus on environmentally sustainable practices links with 'UN SDG-13: Take urgent action to combat climate change and its impacts' and is discussed in this study as the seventh dimension, consideration of environmental sustainability in production and natural medicines (ES). Fig. 1 illustrates the interdependence of the three core elements of sustainability and their harmonisation to achieve the SDGs.

Table 1 presents the seven dimensions of the measurement model developed from the literature along with relevant references and key sustainability core elements and UN SDGs.

Sustainability elements: economic growth, social inclusion and environmental protection.

3. Research methodology

The study aims to propose a valid measurement scale for sustainability in the healthcare sector that conforms to the holistic approach of the UN SDGs related to universal access and wellbeing. Towards this, a

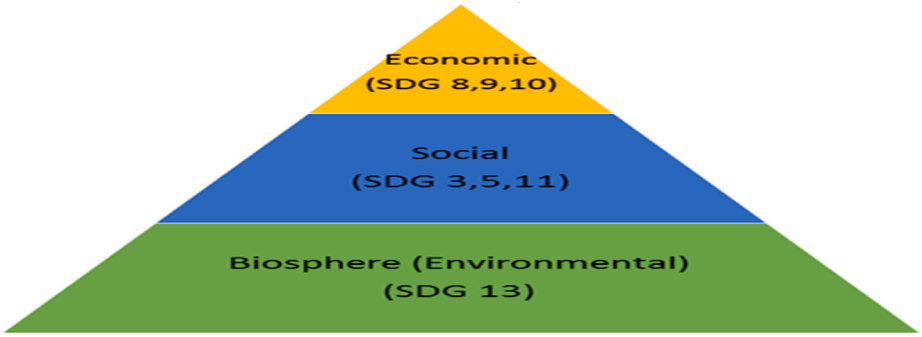

Fig. 1. Harmonisation of the three interdependent core elements of sustainability in the SDGs. Adapted from Rockström and Sukhdev (2016).

Table 1
Key sustainability index dimensions.

Identified Dimension	Sustainability Core Element	SDG (s)	References
Performance reporting and budgeting **(PRB)**	Economic growth	SDG-8, SDG-9	Naveh and Stern (2005); Yuen and Ng (2012); Beazley et al. (2019); Munar et al. (2019); Preston et al. (1992); Lowe (2000); Tabrizi (2012); Abernethy et al., 2015; Pflueger and Organizations, Society, 2016
Waiting time **(WT)**	Economic growth	SDG-10	Koopmanschap et al. (2005); Vesty and Brooks (2016); Shaikh et al. (2018); Landi et al. (2019); Martin et al. (2020); Koff and Lyons (2020)
Urban and rural disparities **(URD)**	Economic growth	SDG-8	Putera (2017); Li et al. (2018); Wulandari and Laksono (2019)
Equal access **(EA)**	Social inclusion	SDG-3	McKenzie, 2004; Moscelli et al. (2018); Thresia (2018); Burger and Christian (2020); Angerer et al. (2019)
Social exclusion from healthcare based on caste and gender **(EA-SECG)**	Social inclusion	SDG–3, SDG-5	George (2015); Acharya (2018); Shaikh et al. (2018); Thresia (2018); Angerer et al. (2019)
Wellness over illness **(WOI)**	Social inclusion	SDG-3, SDG-11	Silvis (2012); Sen and Chakraborty (2017); McColl-Kennedy et al. (2017); Hussain et al. (2018); Masciadri et al. (2019); Teisberg et al., 2020
Consideration of environmental sustainability in production and natural medicines **(ES)**	Environmental protection	SDG-13	Dunphy (2014); Carnero (2015); Posada (2017); Saviano et al. (2018); Shah (2019); Msengi et al. (2019); Salas et al. (2020)

five-step process is adopted, i.e. develop a measurement index based on the review of the literature and SDG goals in the first step. This is articulated in the section on literature review. The second step is the collection of data, this is discussed in this section on research methodology. The third step is to assess the appropriateness of the data for exploratory factor analysis (EFA). The fourth step confirms the previously hypothesised relationships among the variables in the measurement model through confirmatory factor analysis (CFA) using AMOS 18.0. The fifth step examines whether the mean of the population is statistically different from a specific value by conducting the one sample test. The results of the third, fourth and fifth steps are analysed in the section on "result: Data analysis". Similar research methodologies have been used by Cabral and Dhar (2019); Fatma et al. (2016); Larimian et al. (2020); Shah (2019) and Tang et al. (2018) to develop and validate measurement scales for their respective studies.

The second step i.e. data collection starts with the development of a survey instrument as a quantitative measurement tool, that was adopted in this study. Specifically, an online Qualtrics survey was developed in which participants were invited to answer questions on Ayurvedic healthcare in India. Participants were provided details of the project along with instructions and a URL link to the survey in an email invitation.

The survey instrument comprised specific statements based on the different dimensions in Table 1 and was built from the current literature. The questionnaire was written in English, which is the second most widely spoken second language in India and was further improved based on feedback received during pilot testing. The final questionnaire comprised 39 statements and was distributed to approximately 600 employees of Ayurvedic hospitals and clinics providing routine and preventive medical care in the North Indian States. These states constitute more than 30% of the 1.21 billion Indian population according to the 2011 census, supporting the representativeness of the sample (Censusindia, 2011). In India, patients visit local dispensaries and outpatient departments (OPDs, i.e., walk-in patients) for routine and preventive medical care. A total of 177 responses were received, corresponding to a response rate of 30%, which compares favourably to the response rate of 20% and 146 responses in Rao et al. (2013). This sample size is also suitable for conducting EFA and CFA, for which Boomsma (1985) and Gorsuch (1983) recommended a minimum sample size of 100 observations. Table 2 details the profile of the respondents:

To extract the distinct factors, principal component analysis (PCA) was performed on the 39 statements by using Varimax rotation, a form

Table 2
Socio-demographic characteristics of the sample (N = 177).

Variable	Category	N	%
Gender	Male	124	70.0
	Female	53	29.9
Age (Years)	21–35	27	15.2
	36–50	113	63.8
	51–65	37	20.9
Experience in Service	1–10	48	27.1
	10–20	96	54.2
	20–40	33	18.6
Occupation	Doctor & Clinicians	117	66.1
	Administration & Support Staff	60	33.8
Location of Service	Urban	128	72.3
	Rural	49	27.6
Patients on daily basis	0–50	24	13.5
	51–100	35	19.7
	101–200	79	44.6
	201–300	39	22.0

of orthogonal rotation. An initial analysis was conducted to obtain the eigenvalues for each component in the data set. The statements with factor loadings of less than 0.5 were suppressed, resulting in the extraction of 7 dimensions. Furthermore, to measure the suitability of the data for conducting factor analysis, the commonalities generalized from the exploratory factor analysis were reviewed.

4. Results: data analysis

Before extracting factors, the appropriateness of the data for exploratory factor analysis was assessed. Two tests were conducted. First, the Kaiser-Meyer-Olkin (KMO) test was applied to evaluate the adequacy of the sample. A KMO value of 0.769 was obtained; values greater than 0.60 are considered adequate. Second, Bartlett's test of sphericity was performed. This test provides the statistical probability that there are significant correlations among at least some of the variables in the correlation matrix, thus supporting the data's suitability for framework development. The correlation matrix was significant, that is, less than 0.05, and the values of commonalities were greater than 0.5, suggesting that the data set was adequate for PCA.

The seven dimensions were extracted after performing PCA on the 39 statements by using Varimax rotation, a form of orthogonal rotation. As shown in Table 3, the seven dimensions all had eigenvalues greater than Kaiser's criterion of 1 and together explained 69.180 per cent of the total variance. The seven dimensions were labelled URD, PRB, ES, EA, WT, WOI, and EA-SECG in numerical order. Seven statements loaded in the second and third dimensions, six statements in the first dimension, five statements in the fourth, fifth and sixth dimensions, and four statements in the seventh dimension. The item factor loadings are presented in Table 3, and the explored items and their respective values are presented in Table 4.

Table 3 depicts the rotated component matrix, which suggests the linear combinations associated with each of the statements. As indicated in Table 4, the first dimension (URD) is the linear combination of six statements indicating urban and rural disparities in terms of funding, infrastructure and medical supplies. The second dimension (PRB) is the linear combination of seven statements detailing the costs involved in providing government healthcare and performance measures for ensuring the efficiency of service provision. The third dimension (ES) is the linear combination of seven statements taking into account the value offering of Ayurvedic medicine and associated waste and energy minimisation. The fourth dimension (EA) is the linear combination of the five statements related to equal access to Ayurvedic medical facilities/centres. The fifth dimension (WT) is the linear combination of five

Table 3
Rotated component matrix.

	Component						
	1	2	3	4	5	6	7
URD6	.900						
URD3	.878						
URD4	.867						
URD1	.866						
URD2	.837						
URD5	.821						
PRB2		.828					
PRB3		.822					
PRB7		.817					
PRB1		.786					
PRB4		.785					
PRB5		.760					
PRB6		.717					
ES7			.811				
ES5			.810				
ES3			.771				
ES6			.769				
ES4			.751				
ES2			.716				
ES1			.684				
EA4				.872			
EA5				.870			
EA2				.864			
EA3				.845			
EA1				.821			
WT2					.898		
WT3					.864		
WT4					.801		
WT1					.723		
WT5					.720		
WOI4						.815	
WOI2						.770	
WOI5						.752	
WOI3						.744	
WOI1						.688	
SECG1							.794
SECG4							.789
SECG3							.787
SECG2							.786
Eigenvalue	4.821	4.659	4.239	3.953	3.508	3.125	2.675
% of Variance	12.326	11.947	10.869	10.136	8.994	8.014	6.858
Cronbach's Alpha	.944	.906	.886	.923	.864	.832	.818

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

Table 4
Sustainability Dimensions and their statements.

Dimensions	Statements
URD	1R. Government funding issues mean that urban and rural patients are served differently in Ayurvedic healthcare. 2R. Rural patients do not get equal access compared with urban patients (Infrastructure). 3R. Rural patients do not get equal access compared with urban patients (Pharmacy). 4R. Rural patients do not get equal access compared with urban patients (Facilities/equipment). 5R. Ayurvedic hospital services are only available in urban cities. 6R. Rural Ayurvedic clinics are not able to provide all Ayurvedic medical services.
PRB	1. Ayurvedic healthcare is monitored by governments through performance measurement systems that measure quantitative measures, such as budget performance. 2. Performance reporting is strictly managed and analysed by governments to increase efficiency and effectiveness. 3. The costs involved in providing regular health check and yoga camps and other social events are budgeted according to the government funding provided. 4. All health camps and social events conducted by Ayurvedic Healthcare are fully funded by the government. 5R. Trade-offs need to be made, as some Ayurvedic health treatments, such as yoga camps and social events, might need to be cancelled or not provided due to funding constraints. 6R. There is a high cost involved in treating chronic/acute illness in Ayurveda (Quality of care trade-off). 7R. The allocation of the government budget for Ayurvedic treatments results in trade-offs between treatments (i.e., less use of gold and precious metals in the treatments).
ES	1. Sustainability (recycling and waste management) is considered important in Ayurvedic healthcare management. 2. Changes in Ayurvedic medicine manufacturing techniques support the environment. 3R. Waste and disposal of Ayurvedic medicine is bad for environmental sustainability. 4. Ayurvedic medicines are only valuable if they are 100% natural. 5. It is essential that Ayurvedic medicines are treated with additives to increase their shelf life. 6. Ayurvedic medicine recognises that there are different levels of purity in herbs and plants to maintain health and help prevent diseases. 7. Ayurvedic medicine is of higher quality in rural areas where there is less air pollution.
EA	1. All patients in India have equal access to Ayurvedic medical facilities/centres. 2. The age of the patient determines (young/older) access to the facility. 3. The gender (male/female) of the patient determines access to the facility. 4. Ayurvedic healthcare provides equal services to all community demographics, including the poor. 5. Ayurvedic facilities are equally available in both urban and rural areas.
WT	1. There are reasonable waiting times in Ayurvedic hospitals/ dispensaries (i.e., less than 2 h before being seen by a practitioner). 2. Patients are prioritised according to the condition of the patient and the seriousness of the sickness/disease (waiting time). 3. Elderly people have priority in the waiting queue. 4. Women and women with children have priority in the waiting queue. 5. There is no waiting list for treatment in Ayurvedic hospitals.
WOI	1. Doctors spend most of the consultation time to better understand the patient's personal lifestyle factors (i.e., recreational activities; family support; community involvement) rather than the illness/ disease the patient has presented with. 2. Doctors also attend community welfare programs for informal meetings with patients to get connected with them. 3. Doctors spend time investigating the patient's inter-generational (family members) conditions to determine appropriate treatments. 4. Doctors routinely follow up with patients about their prescribed treatments. 5. Ayurvedic medicines treat acute/chronic diseases efficiently (i.e., low cost).
EA-SECG	1R. Patients from backward or scheduled castes do not receive any subsidies for the purchase of over-the-counter medicines. 2R. Dalit women cannot get equal access to all Ayurvedic treatments. 3R. Upper-caste patients are prioritised in Ayurvedic treatment. 4R. Ayurvedic treatment offerings are differentiated based on caste and gender.

statements involving waiting time for service provision. The sixth dimension (WOI) is the linear combination of five statements related to approaches to wellness based on the doctor's understanding of and engagement with a patient's family, community and lifestyle factors concerning the patient's illness/disease. The seventh dimension (EA-SECG) is the linear combination of four statements further extending the understanding of equal access for patients from backward or scheduled castes and for women who do not receive any subsidies or access to all Ayurvedic treatments. In these situations, upper-caste patients are prioritised.

Each of these dimensions is described in Table 4, along with the associated statements that meet each of the seven dimensions. The "R" denotation is a reminder that the statements are reverse scored on a Likert scale of 1–5 to measure the degree of variation in response.

Note. URD: Urban and rural disparities; PRB: Performance reporting and budgeting; ES: Environmental sustainability; EA: Equal access; WT: Waiting time; WOI: Wellness over illness; EA-SECG: Social equality: Social exclusion from healthcare based on caste and gender. Likert scale 1–5 to measure the degree of variation in responses. R = Reverse (Likert scale 5–1 to measure the degree of variation in responses).

4.1. Confirmatory factor analysis

To confirm the previously hypothesised relationships among the variables in the measurement model, confirmatory factor analysis (CFA) was performed (Netemeyer et al., 2003) using AMOS 18.0. Before establishing the validity of the measurement model, the goodness of fit of the model was confirmed. An acceptable model fit index was obtained as indicated in Table 5.

The measurement model (Fig. 2) was assessed by measuring its discriminant and convergent validity. Convergent validity determines the degree to which each measurement correlates with other measures of the same latent factor and whether the scale statements converge on a single factor during measurement (Steenkamp and Van Trijp, 1991). Convergent validity was assessed with the procedure prescribed by Hair et al. (2010), which suggests that composite reliability (CR) should be greater than the average variance extracted (AVE) and that the AVE should be greater than or equal to 0.5.

Table 5
Goodness- and badness-of-fit indices of first-order CFA.

Goodness-of-fit Indices	Model Values
Absolute Goodness-of-fit Index	
Chi-Square (CMIN)	1088.879
Degree of Freedom (DF)	679
Probability Level	.000
Normed Chi-Square (CMIN/DF)	1.604
Goodness of Fit Index (GFI)	.777
Absolute Badness-of-fit Index	
Root Mean Square Residual (RMSR)	.054
Root Mean Square Error of Approximation (RMSEA)	.059
Incremental Fit Measure	
Adjusted GFI	.743
Comparative Fit Index (CFI)	.908
Parsimony Fit Measurement	
Parsimony GFI	.676
Parsimony CFI	.832
Parsimony Normed Fit Index"	.725

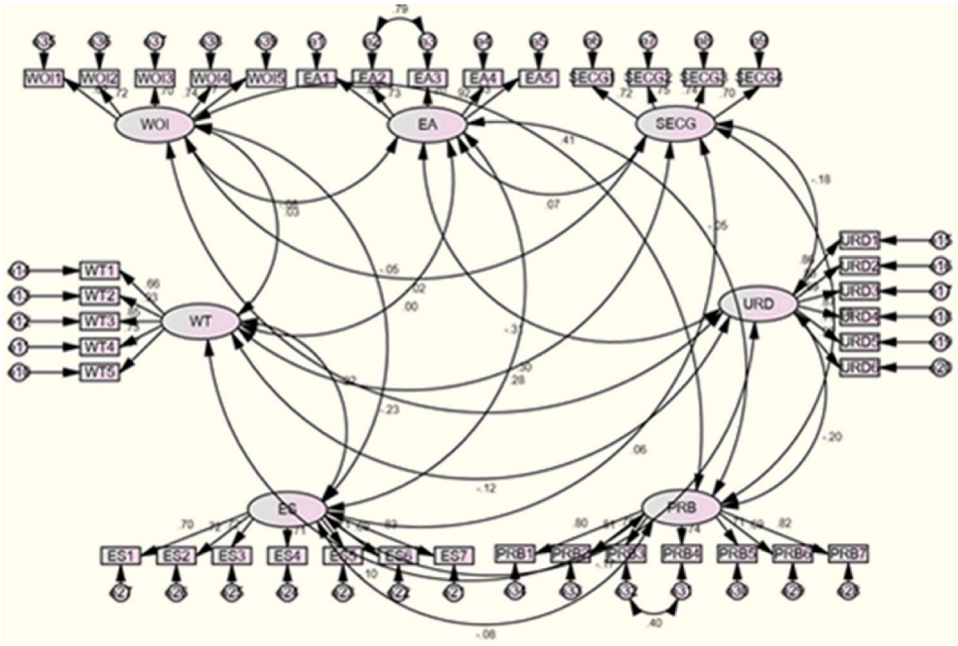

Fig. 2. Measurement model.

Discriminant validity implies that there is no correlation between different constructs and that each construct is unique and distinguishable, capturing phenomena that the other constructs do not (Hair et al., 2010). Discriminant validity was assessed by the procedure prescribed by Hair et al. (2010), which suggests that the maximum shared variance (MSV) should be less than the AVE. As shown in Table 6, the MSV is less than the AVE for each construct. Furthermore, the square root of each construct's AVE (bold off-diagonal) is greater than the inter-construct correlation values. These results from EFA and CFA provide significant evidence of the discriminant validity of the measurement model. The findings of the study confirm empirical validation of the seven distinct dimensions of healthcare sustainability. Validity of the scale is further confirmed through testing the relationship between sustainability and the theoretically related factors. Our findings suggest that healthcare providers should pay attention to all issues rather than one dimension in particular.

4.1.1. One-sample test

To confirm the consensus reached by the respondents from the north Indian healthcare facilities to the proposed validated measurement model one sample *t*-test is conducted. For this purpose, the population mean was fixed at an appropriate level of 3 and the rating scale adopted considered higher ratings 4 and 5 to be important and very important factors (Ogunbiyi et al., 2014). Based on the five-point Likert scale, a factor was considered important if it had a mean of 3 or above. The significance level was also set at 95 per cent as per the risk levels. Using one sample test, we test the following hypotheses.

Table 7
One-sample statistics.

	Mean	Std. Deviation	t-value	p-value
Equal Access	3.6859	1.04961	8.694***	0
Waiting Time	4.026	0.72801	18.750***	0
Urban and Rural	2.4303	1.02979	−7.360***	0
Environment Sustainability	4.209	0.54035	29.768***	0
Social exclusion based on caste and gender	4.3503	0.48578	36.981***	0
Performance reporting and budgeting	3.9911	0.71787	18.368***	0
Wellness Over Illness	4.2418	0.58993	28.005***	0

H1. Ayurveda adds value to healthcare by focussing on wellness over the illness.

H2. Ayurvedic Healthcare system provides equal access to all patients

H3. In the Ayurvedic Healthcare system there are reasonable waiting periods were accepted

H4. There is social exclusion based on caste and gender in Ayurvedic healthcare

H5. Ayurvedic Healthcare offers similar access at both urban and rural hospitals

Table 6
Validity of the measurement model.

	CR	AVE	MSV	PRB	EA	SECG	WT	URD	ES	WOI
PRB	0.905	0.578	0.165	**0.760**						
EA	0.914	0.682	0.094	0.045	**0.826**					
SECG	0.818	0.529	0.076	0.082	0.069	**0.727**				
WT	0.881	0.601	0.076	−0.103	0.002	0.276	**0.775**			
URD	0.945	0.743	0.094	0.200	0.307	0.176	−0.125	**0.862**		
ES	0.888	0.531	0.092	−0.082	0.304	0.063	0.215	0.175	**0.729**	
WOI	0.837	0.507	0.165	0.406	0.029	−0.015	−0.080	0.226	−0.053	**0.712**

H6. Ayurveda supports environmental sustainability was accepted

H7. Ayurveda healthcare requires improved performance measurement tools

The results of one sample *t*-test show that the mean value of construct "Wellness over Illness" significantly varies from its test value of 3 as the p-value is less than 0.05. It means that there is a significant difference in the mean value of the constructs and the population mean value. The mean value for the construct "Wellness over Illness" is 4.2418, which shows that majority of the respondents agreed that Ayurveda adds value to the healthcare system with its focus on wellness. Hence, "H1: Ayurveda adds value to healthcare by focussing on wellness over illness", was accepted. This result supports the viewpoints of (Binorkar, 2018; Deshpande et al., 2016) that Ayurveda's main objective is to "facilitate optimal health and well-being through a comprehensive approach that addresses mind, body, behaviour, and environment", thus treating illness with an overall goal of promoting wellness with a focus on healthy lifestyles and herbal medicines for preventative care.

Results of the one sample *t*-test for the H2 show that the mean value of construct "Equal Access" significantly varies from its test value of 3 as the p-value is less than 0.05. It means that there is a significant difference in the mean value of the constructs and the population mean value. The mean value for the construct "Equal access" is 3.6859, which indicates that the majority of the respondents agreed that the Ayurvedic healthcare system provides equal access to all patients. Hence, "H2: Ayurvedic Healthcare system provides equal access to all patients", was accepted. Similarly, the results of one sample *t*-test for the H3 show that the mean value of construct "waiting period" significantly varies from its test value of 3 as the p-value is less than 0.05. It means that there is a significant difference in the mean value of the constructs and the population mean value. The mean value for the construct "waiting period" is 4.0260, which indicates that the majority of the respondents agreed that in the Ayurvedic healthcare system, there appeared to be minimum waiting periods. Hence, "H3: In the Ayurvedic Healthcare system there are reasonable waiting periods", was accepted. It implies that the patients are prioritised according to the condition of the patient and the seriousness of the sickness/disease which helps to avoid the negative impacts associated with long waiting times (Landi et al., 2019).

The results of one sample *t*-test show that the mean value of the construct "Social exclusion to healthcare based on caste and gender" significantly varied from its test value of 3 as the p-value is less than 0.05, meaning that there is a significant difference in the mean value of the constructs and the population mean value. The mean value for the construct "Social exclusion based on caste and gender" is 4.3503, which shows that majority of the respondents showed agreement that there is social exclusion based on caste and gender. Hence H4: There is social exclusion based on caste and gender in Ayurvedic healthcare was accepted. It is mentioned by several studies that India has a prolonged caste system with inequality and access issues and continues to play an important role in the dynamic of social and political interactions (George, 2015; Acharya, 2018; Thresia, 2018). This issue raises a major concern for the Indian policy makers in healthcare sector to promote equitable access for all patients to improve the wellbeing of different disadvantages groups due to their economic or social classes (Acharya, 2018).

Further, the results of one sample *t*-test for the H5 show that the mean value of construct "Urban and Rural Disparities" significantly vary from its test value of 3 as the p-value is less than 0.05. It means that there is a significant difference in the mean value of the constructs and the population mean value. The mean value for the construct "Urban Rural Disparities" is 2.4303, which neither shows any agreement nor disagreement with the statement that the Ayurvedic healthcare system offers similar access between urban and rural hospitals. Hence, "H5: Ayurvedic Healthcare offers similar access at both urban and rural hospitals", was rejected. Nevertheless, the finding of this present study is in line with Wulandari and Laksono (2019) who found the lack of infrastructure in urban/rural healthcare settings makes rural people underutilize health care in comparison to their urban counterparts (Li et al., 2018). Results indicate that rural patients cannot get equal access to medicines, infrastructure and medical equipment/facilities as compared to urban patients which is serious concern and major hurdle for healthcare in achieving SDG-3. Health policy makers should consider providing equal access and similar healthcare facilities geographically.

The results of one sample *t*-test for the H6 show that the mean value of construct "Env. Sustainability" significantly vary from its test value of 3 as the p-value is less than 0.05. It means that there is a significant difference in the mean value of the constructs and the population mean value. Hence, "H6: Ayurveda supports environmental sustainability", was accepted. The mean value for the construct "Environmental Sustainability" is 4.2090, which shows that majority of the respondents agreed that Ayurveda supports Environmental Sustainability.

Finally, the results of one sample *t*-test show that the mean value of construct "Performance reporting and budgeting" significantly vary from its test value of 3 as the p-value is less than 0.05. It means that there is a significant difference in the mean value of the constructs and the population mean value. Hence, "H7: Ayurveda healthcare requires improved performance measurement tools", was accepted. The mean value for the construct "Performance reporting and budgeting" is 3.9911, which shows that majority of the respondents agreed that the Ayurveda healthcare performance measurement system needs to be improved. The literature also suggests adoption of more advanced performance measures (Xu et al., 2022; Koff and Lyons, 2020) to enhance the effectiveness and efficiency of healthcare services for achieving better population health.

5. Discussion

The key objective of this study is to consider social and environmental sustainability within a patient-centric approach to measuring economic value in the healthcare system. Definition of value-based care supports the design of patient-centric measures, which can be extended with the UN SDGs upholding universal healthcare (UN, 2019). The present study is the first to offer a systematic procedure for obtaining a further conceptual and empirical understanding of value-based mechanisms in the public healthcare sector. A multidimensional measurement

Table 8
One-sample test.

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Equal Access	8.694	176	0	0.68588	0.5302	0.8416
Waiting Time	18.75	176	0	1.02599	0.918	1.134
Urban and Rural	−7.36	176	0	−0.56968	−0.7224	−0.4169
Environment Sustainability	29.768	176	0	1.20904	1.1289	1.2892
Social exclusion based on caste and gender	36.981	176	0	1.35028	1.2782	1.4223
Performance reporting and budgeting	18.368	176	0	0.99112	0.8846	1.0976
Wellness Over Illness	28.005	176	0	1.24181	1.1543	1.3293

construct composed of seven dimensions, URD, PRB, ES, EA, WT, WOI and EA-SECG, is developed to determine the level of sustainability offered by healthcare services. This study proposes that the measurement model can be used to assess wellbeing and sustainability perspectives in the healthcare setting and the patient-centric economic approach (Porter and Teisberg, 2006).

Among the seven dimensions of this construct, URD considers the disparities that exist from a geographical perspective. Equal distribution of value across a region is a demonstration of value-based healthcare. Nevertheless, researchers have found that healthcare facilities differ between urban and rural areas and that rural residents underutilize healthcare facilities compared with urban residents (Li et al., 2018; Wulandari and Laksono, 2019). These findings highlight the need for greater connectivity across urban and rural healthcare settings to support rural residents. Investment in rural infrastructure is also essential for reducing disparities between urban and rural healthcare facilities. Testing for this dimension provides a deeper understanding of the status of facilities provided to and accessed by rural residents (Wulandari and Laksono, 2019) and disparities compared with urban facilities (Li et al., 2018). The present study argues that, as part of value-based healthcare, service providers should focus on policies that facilitate infrastructure connectivity across the healthcare network.

The PRB dimension indicates that performance reporting and budgeting allocation systems need to be strengthened to support healthcare services provider accountability (Munar et al., 2019). Healthcare organisations have expanded performance reporting to include both quantitative and qualitative measures, and this can be further extended to include UN SDG-related measures that draw attention to trade-offs in healthcare treatment, patient access or community programmes/social events due to funding constraints. Low-value care negatively impacts individual expectations (Porter and Teisberg, 2006). Xu et al. (2022) recommended greater adoption of QoL measures in the healthcare sector to better manage the patient-centric approach. These can also be included in performance reporting and budgeting to better measure the effectiveness and efficiency of healthcare services (Koff and Lyons, 2020) across the entire healthcare network, thus ensuring a greater focus on integrated healthcare service delivery for overall population health.

ES encompasses the environmental sustainability practices adopted by the healthcare sector in support of the UN SDGs. The measurement of environmental sustainability reflects healthcare accountability towards the ecosystem and natural resources (Sherman et al., 2020). ES can be measured by the carbon emissions of healthcare facilities or by focussing on the manufacturing techniques associated with the production of medicines, including associated carbon emissions and biomedical waste (Rajan et al., 2019; Shah, 2019). The impact of associated waste and disposal on the environment is similarly important and requires performance measurements of recycling and biomedical waste management to protect environmental sustainability (Dunphy, 2014).

The EA value indicates equal access to healthcare services. McKenzie (2004) stated that socially sustainable communities are equitable, diverse, connected and democratic and provide good QoL. Despite government policies promoting equal access, deep concerns about inequality and access to care remain in India (Acharya, 2018; Burger and Christian, 2020). These challenges need to be resolved to achieve social sustainability, which can be accomplished by measuring and managing healthcare practices at the local level to confirm equality in healthcare delivery regardless of patient demographic factors such as gender, class, age and location.

The EA-SECG value highlights the exclusion of a particular group/people from healthcare services based on their caste and/or gender (Acharya, 2018; Thresia, 2018). Researchers have found that social class, gender and race are the main drivers of social exclusion globally, with social exclusion based on the caste system more specific to India (Popay, 2010; Sidhu and West, 2014). In a US-based study, Hay et al. (2019) argued that "restrictive gender norms manifest in the health system reflect and reinforce gender inequalities, compromising the health and wellbeing of patients and providers" (p. 2543). Mahapatro (2020) claimed that inequality of access in Indian healthcare based on caste is ongoing in economically weaker regions, resulting in the deterioration of the health of excluded individuals. Promoting equitable access while ensuring that healthcare facilities can further improve the wellbeing of different groups/classes of individuals is still a major challenge in moving towards UN SDG-3 (Acharya, 2018). Further research is needed to help break down these important barriers to care.

For all of the dimensions proposed in this model, specific questions can be tailored to suit jurisdictional differences. For example, social class differences can be explored as an alternative to the caste system in India; performance reporting and budgeting associated with Ayurveda can be tailored to alternative service deliveries across the network; and environmental measures can be aligned to the impacts of Western or traditional medicine, which can be unique to the setting.

6. Conclusion

The study proposes a model for assessing wellbeing and sustainability performance in the healthcare setting and takes a patient-centric economic approach. In addition to using routinely applied measures of purely economic efficiency, the model integrates measures of the social inclusion and environmental protection elements of sustainability. The inclusion of these measures of performance reflects the increasing realisation by the investing community and society at large of the importance of business performance on sustainability parameters for ensuring consistent long-term returns for various stakeholders (McKenzie, 2004; Vallance et al., 2011). In line with this recognition, the UN has proposed 17 interlinked SDGs to be achieved by 2030 to provide a better and sustainable future for the global population (Hussain et al., 2018; Kasilo et al., 2019; Silvis, 2012; UN, 2019; Zhang, 2018). These goals call for efforts by all UN member states to address global population needs, with a focus on health, education, employment, poverty, and societal inequality, while protecting the planet for future generations (UN, 2019). This holistic approach involving a multidimensional mix of leading economic, social and environmental performance indicators encourages a focus on environmental considerations and the wellness agenda promoted by the UN SDGs. The resulting model offers a systematic procedure for improving the conceptual and empirical comprehension of sustainability-related value in healthcare and can be used as a guide for health policy implementation and efforts toward achieving UN SDGs in healthcare service provision. This study also supports the move to value-based healthcare which recognises the need to understand the shared health needs of patients and solutions to improve health outcomes (Teisberg et al., 2020). The study draws attention to important dimensions that help to achieve this goal. It not only provides theoretical contributions to this emerging field of literature in healthcare sustainability and value-based healthcare but provides practical solutions for practitioners wishing to measure value in universal healthcare delivery more holistically. The study can be seen as a step towards enabling future research and theorising measurement of the performance on sustainability. The review of the literature and the proposed model focuses on implementation strategies to foster social, environmental and broader economic value-based sustainability in healthcare. This unique holistic approach aligns with the UN SDGs agenda, focussing on environmental considerations and societal health and wellbeing through a multidimensional mix of leading economic, social and environmental performance indicators.

This study carries the common limitations of survey-based research, although all necessary measures were taken to minimise potential limiting factors. For example, the respondents could not ask for clarification of the statements in the survey, which according to Helfaya et al. (2018) increases the possibility of misinterpretation. In addition, the measurement model was developed and tested in a traditional Indian, public healthcare context. While the finding provides a sufficient

understanding of sustainability in a non-Western setting, further research is required to determine if these dimensions also hold in different settings, the Indian private sector, or traditional healthcare in other jurisdictions. Additional work is also required to ascertain whether the proposed model can be adapted for both public and private healthcare settings around the world. Other important dimensions (independent dimensions) or adjustments may be needed to better measure sustainability in healthcare in multijurisdictional contexts. Future researchers could expand the present model by including more dimensions depending upon the nature and structure of healthcare in the jurisdiction of interest or to meet the policy requirements of specific locations.

CRediT authorship contribution statement

Tarunpreet Kaur Rattan: Conceptualization, Data curation, Investigation, Methodology, Formal analysis, Writing – original draft, Project administration. **Mahesh Joshi:** Formal analysis, Supervision, Writing – review & editing. **Gillian Vesty:** Supervision, Writing – review & editing. **Sharad Sharma:** Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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