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INTERRELATIONSHIPS BETWEEN SUSTAINABILITY AND WELLBEING: THREE CASES FROM THE GLOBAL SOUTH

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Abstract

This paper seeks to advance the understanding and analysis of the role and impact of housing and neighbourhood characteristics on the wellbeing of communities in the informal settlements in the global south. It provides a holistic view on the relationship between household features, housing design and neighbourhood conditions to assess further their effects on wellbeing constructs in Nepal, South Africa, and Jordan. The COVID-19 pandemic has added to the prevailing challenges for population wellbeing in all cases. The study assessed the relationships between housing design, neighbourhood form, social inclusion, and mental and physical wellbeing through a detailed questionnaire. A comparative analysis allowed identifying the innovative changes and strategies in conjunction with local stakeholders to improve individual and public wellbeing. The study proves the significant relationships between the three dimensions of housing: house conditions and design, household characteristics and neighbourhood conditions, and individual and community wellbeing in informal settlements. The findings discuss multilevel (housing and neighbourhood) solutions and unique social groupings that support livelihood strategies and how these strategies impact the social, economic and environmental sustainability in informal settlements. The resultant importance of specific constructs and sub-constructs offers a toolkit for evaluating informal settlements and potential improvements. This work is also a demonstration of how an interdisciplinary methodology can help mediate societal challenges, particularly when it comes to the wellbeing of inhabitants in informal settlements.

INTRODUCTION

Improving the quality of life and living conditions of informal settlement dwellers in Global South are a pressing concern for both national and international agencies because of the significant consequences on sustainability of cities and citizens (Brown-Luthango et al., 2017). Informal settlements are characterised by poor housing that does not comply with building or planning regulations, a lack of sufficient basic services, inadequate healthcare and other public amenities, and housing that offers no tenure security for inhabitants (UN-Habitat, 2015). The wellbeing of individuals and communities in the informal settlements of metropolitan cities are compounded by their rapid unplanned growth (UN-Habitat, 2020). This paper assesses the relationship and impact of household characteristics, housing and

neighbourhood conditions on the wellbeing, and sustainability of individuals and communities in informal settlements across a section of neighbourhoods in Jordan, Nepal, and South Africa which are particularly affected by dense urban conditions. Case-studies were chosen to include a cross-section of countries representing Sub-Saharan Africa, the Middle East and Asia, and a variety of urban conditions, as well as environment and climate temperate, dry, and subtropical respectively. The three countries also represent the OECD Development Assistance Committee's 2021 classifications of official development assistance (ODA).¹ Accordingly, Nepal is categorised as a Least Developed Country, Jordan as a Lower Middle-Income Country, and South Africa an Upper Middle-Income Country. The research methodology was based on three objectives: First, to evaluate the living conditions of the informal settlements through household interviews and surveys. Second, to determine the impact and importance of various attributes on the wellbeing and sustainability of informal settlements and their dwellers using Structural Equation Modelling. Third, reflect on the main constructs and sub-constructs of sustainability and wellbeing in these informal settlements to develop a roadmap for evaluating the informal settlement conditions and potential improvement solutions through local stakeholders.

LITERATURE REVIEW

There is a growing body of literature on various dimensions of wellbeing in the context of the design of urban spaces and interior environments in dense cities. There is however a need to better understand factors such as how socioeconomic status of the dwellers affects their access to key urban amenities and the effect of this reality on physical safety, mental health and general wellbeing. The intersection of these themes is therefore a vital aspect of the methodology and research that underpins this paper. Within these dimensions, the existing studies have linked various urban trends to the impact on public health in particular focusing on slums and informal settlements, using systems analysis as main methodological tool for research. Themes of health, state of infrastructure, socio-economic realities, and access to food and water have been variously analysed to assess their inter-linkages and identify potential areas for intervention. A transdisciplinary and participatory approach is therefore necessary to understand their complexities (Bai et al., 2012).

Definitions, Interrelationships and Intersectionality

World Health Organisation defines wellbeing as “a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity” (WHO, 2019). This does not only concern one's physical health, but also the perception of urban surroundings, density, congestion, and resultant spatial experiences (Meng et al., 2020; Melis et al., 2015). The spatial dimensions of dwellings on a variety of scales, from house to neighbourhood are critical and taken into account within this definition. For instance, Weimann and Oni (2019) argued that physical, mental and social wellbeing of informal settlements communities are influenced by the physical housing structure, the psychosocial home environment and the features of the neighbourhood and community in the context of informal settlements. Furthermore, the concepts such as sustainability and resilience also need consideration which this research addresses within the context of wellbeing and urban density. Sustainability in

¹ <https://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/DAC-List-ODA-Recipients-for-reporting-2021-flows.pdf>

this instance refers to the triple bottom line of environmental, social, and economic considerations, while resilience refers to a system's ability to adapt, mitigate threat and impact and regulate itself after the challenging circumstances or disruptive events (Marchese et al., 2018).

Informal settlements' inhabitants experience social and spatial marginalisation and thus are confronted with an increased risk to physical, mental and overall wellbeing (UN-Habitat, 2015). The need to address these deficits is underscored in the Sustainable Development Goals (SDGs) specifically through the global call to provide adequate dwellings and liveable environments in SDG 11 which seeks to 'Make cities inclusive, safe, resilient and sustainable' by ensuring, inter alia, access to adequate, safe and affordable housing for all. World Health Organization (WHO) Housing and Health Guidelines (WHO, 2018) highlight the influence that living environments play in shaping and determining health and wellbeing. While SDG 3 seeks to 'Ensure healthy lives and promote wellbeing for all at all ages', the interaction between SDG 3 and SDG 11 needs to be acknowledged, as inadequate living environments (SDG 11) will need to be addressed if health and wellbeing is to be achieved for all (SDG 3). While there is an international emphasis on improving poor living environments in order to address health and wellbeing, it is unclear how subnational and local built environment interventions specifically impact on health outcomes over time.

The urban system is comprised of a complex network or assemblage of interconnecting factors, both human and non-human, that act on and react with each other in response to changes and feedback loops. One component of the urban system is housing. The notion of urban assemblage is relevant to the concept of housing when a dwelling is considered as being more than just a built structure; it is also inhabited, and a place of urban belonging, as well as a structure that could have been built in line with political or civil society priorities, or in response to human need (McFarlane, 2011).

Housing is a product of an assemblage of urban human and non-human interconnections, and therefore should not only be considered as a physical, structural concept. Housing, and its complexities, is one of the many underlying factors within an urban system that are able to shape and determine human health, defined as complete physical, mental and social wellbeing (WHO 2020). This is the underpinning notion of the socio-ecological model of health, which highlights that community and individual wellbeing are greatly influenced and determined by a complex interaction of underlying factors (Berkeley and Springett, 2006). These factors, also referred to as social determinants of health, include those related to the quality of the surrounding living environment; stressors encountered through work; as well as behavioural and lifestyle choices that influence health in addition to underlying genetic influences. Combining the concepts of wellbeing/health and housing—examples of components within an urban system that interact with each other. The WHO suggests a holistic approach to exploring the housing component. Beyond just the house structure, it considers three overlapping and interrelated dimensions of housing that contribute to health and wellbeing: the physical housing structure (house design and conditions), the psychosocial and cultural home environment (household characteristics), the physical characteristics of the neighbourhood environment, the social environment and services within the community (neighbourhood conditions) (WHO, 2011).

Density, in a more technical sense may refer to the ratio of a dwelling unit or population per given area, though metrics often differ across cities and countries (Churchman, 1999). In the context of urban living, this definition becomes even more flexible and complex, incorporating many associated dimensions, including but not limited, a physical measure of people in each

area, to one's perception of a given place, to the various policy and economic issues, social aspects as well as access and state of infrastructural systems (Churchman, 1999). As a dimension of the urban environment, typological and design considerations are also critical factors that contribute to health and social and psychosocial stresses and may lead to issues regarding one's perception of safety in certain neighbourhoods (Churchman, 1999).

Dimensions of Health and Wellbeing

A recent systematic review of the relationship between health and buildings has identified that improvements to interior ventilation, refurbishment and water use were associated with positive effects on overall respiratory and mental health and overall quality of life (Ige et al., 2018). However, causal links were difficult to establish due to lack of quality data and methodological rigour in the studies used for the particular review. This is the crux of the issue. The lack of concrete evidence due to the complexity and constant flux of informal settlements presents challenges for researchers (Friesen et al., 2020). There has also been a general view of slums as unhealthy places with high rates of respiratory distress, infection and malnutrition. While this is due to a number of factors which include a lack of infrastructure and access to health providers, it is often a cause of low socioeconomic status as a result of falling into vicious circle of poverty, exacerbated by the illnesses (Ezeh et al., 2017). This is not to say that all people living in informal settlements experience ill health as a symptom of their immediate living conditions since not all homes in these settlements may fall within the category of slum dwellings. However, people living in these places do share certain environmental risks arising from lack of planning leading to the insufficient access to sanitation and urban amenities (Ezeh et al., 2017). This introduces the concept of neighbourhood effects, categorised by factors that affect health which are independent of household levels of poverty. According to Ezeh et. al. (2017) these factors include social interactions (UN-Habitat, 2013), geographic factors (Landrigan et al., 2015), institutional factors, and the physical environment in which people live. Understanding the complex dynamics of the domestic and environmental conditions of the settlements in question is therefore vital in assessing the wellbeing. From a spatial planning view (Shekhar et al., 2019), wellbeing constitutes subjective (individual) (Diener and Ryan, 2009) as well as collective (community) dimensions, including shared culture and economy (Lee and Kim, 2015). As an extension of this perspective, the aspects of participation and engagement, access, safety are all attributes which can be explored in and impacted by planning and policy practices, and their interdependencies mean that a change in one aspect can either contribute to or diminish one's overall sense of wellbeing (Shekhar et al., 2019). In this study, we used these concepts to underpin the methodology of our research, quantifying the various attributes that comprise these complex dimensions.

Case study Areas

This study is based on learning and sharing the situations of three informal settlements: Manohara located in Kathmandu Valley, Nepal (NP); Al Baqa'a refugee camp in Jordan (JR); and QQ Section in Khayelitsha township located in the periphery of Cape Town, South Africa (SA). To identify the three research case studies in a consistent, reliable, uniform and objective manner the following inclusion and exclusion criteria are considered:

- An informal settlement located in one of the metropolitan area of countries study Jordan, Nepal and South Africa

- Medium to the large size of informal settlements
- Highly dense informal settlement
- Well established informal settlement (more than ten years)
- Migrant informal settlements due to either political or economic issues

Manohara informal settlement, Kathmandu, Nepal

Manohara is a squatter settlement which lies on the banks of Manohara River within the Kathmandu Valley inside Madhyapur Thimi Municipality. The inhabitants of the community lack legal entitlement to the land they inhabit making them illegal squatters. Before the settlers started inhabiting the land, it was mostly used for agricultural purposes. The settlement saw in-migration mostly between 2005-2007 during and in the aftermath of the Maoist insurgency in the country. The Manohara River is a highly polluted river which places the community at a higher risk of pollution and water borne diseases. As is the case of other informal settlements in Kathmandu valley, Manohara lacks the basic infrastructure and services subsequently affecting the living quality of the residents. Road infrastructure, sanitation and water supply are either missing or are in desperate need of reform. Lack of financial security, long-term employment and affordable health and education services are also key factors affecting the quality of life in Manohara. Nepal lacks clear stance public housing policies. Hence, the households in Manohara and other similar settlements live under constant threat of evacuation from the authorities. There are several generations of families who continue to call Manohara their home and have successfully built a sense of community.

Al Baqa'a refugee camp, Jordan

Established in 1968, Al Baqa'a is the largest official Palestinian refugee camp in Jordan. Located 20 km north of Amman, it accommodates around 120,000 people, accounting for nearly one-third of Palestinian refugees officially registered. The population density is estimated as 72,243 person per square kilometre. The camp is run by the UNRWA. At the beginning the camp hosted 26,000 refugees living in 5,000 tents. Over the time, it grown over four times its initial size. Throughout the years, the area has changed from a camp to neighbourhood, to an informal city establishing its unique aspects of social cohesion, culture, socio-political influences and socio-economic trends. It has also transitioned structurally from tents to brick houses to multi-story buildings, portraying the ever changing community needs and transformed urbanized spaces that give the camp its specific character. Refugees however continue to suffer from inadequate housing conditions that do not meet the requisite buildings guidelines and planning regulations. It is an overcrowded space with majority of houses featuring poor appearance, severe defects, cracked rooftops with no waterproofing or insulation, inadequate sanitation system and persistence of health related issues such as, Asthma, especially amongst children besides generally declining emotional and mental health.

QQ Section informal settlement, Khayelitsha township, South Africa

QQ Section is an informal settlement in the Khayelitsha township located in the periphery of the city of Cape Town (35km from the CBD). QQ Section was founded in 1989 and currently accommodates about 1000 families. It is occupied mainly by migrants and backyard-dwellers from the old, overcrowded sections of Khayelitsha township. The settlement is well known as one of the most under-served and neglected communities in Cape Town. Time and again, it has experienced severe floods and massive shack fires. The shacks that people live in are

mostly made of corrugated zinc sheets and are densely packed together on a long thin strip of land between the brick houses of Q Section and the road. Road infrastructure, water supply and sanitation remain major concerns besides lack of healthcare facilities.

THEORETICAL FRAMEWORK

Due to the complex interaction between wellbeing and factors of the built environment, there is a need for a research utilising a systems approach to generate evidence that investigates the interlinked factors that longitudinally influence health and wellbeing in the context of informal settlement in rapidly growing cities in Global South. Therefore, this study adopted the principal of holistic approach suggested by WHO above to develop a theoretical framework of the relationship between the household characteristics, houses and neighbourhood conditions based on sustainability principles of social, economic and environmental wellbeing, shown in Figure 1.

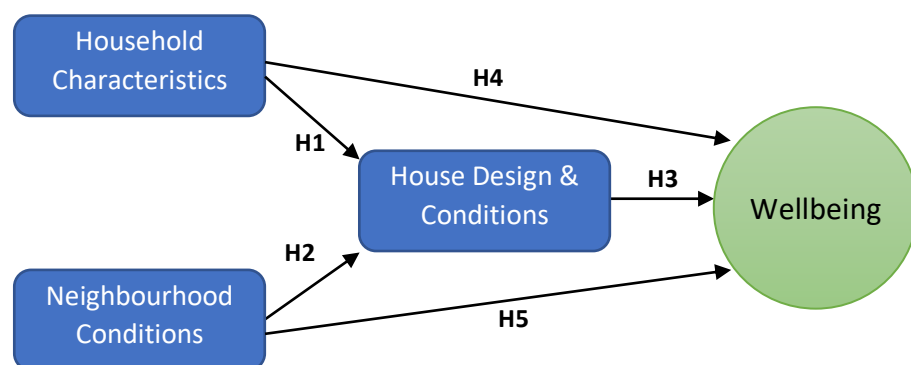


Figure 1. Research theoretical framework

The framework shows the direct impact of household characteristics, neighbourhood conditions and houses conditions on the wellbeing. Moreover, the indirect influence of household characteristics and neighbourhood on the wellbeing of individuals and communities through house conditions are illustrated in the theoretical framework of the study. The theories that the research is designed to test are:

H1: There is a significant relationship between the household characteristics and house design and conditions.

H2: There is a significant relationship between the neighbourhood conditions and house design and conditions.

H3: There is a significant relationship between the house conditions and design and wellbeing.

H4: There is a significant relationship between the household characteristics and wellbeing.

H5: There is a significant relationship between the neighbourhood conditions and wellbeing.

Method of Research

Semi-structured household interviews and surveys were undertaken in the three areas to find out the household characteristics, housing conditions, neighbourhood situations and wellbeing of residents and communities. The research adopted the three constructs and their relevant variables from WHO suggested holistic approach to exploring the housing component. The study constructs, variables, used in measuring the wellbeing constructs and its corresponding measurement scale are shown in Table 1.

Table 1. Variables used in measuring the study constructs

Constructs	Variables (sub-constructs)	Measurement Scale
Household and head of household Characteristics	Income	Open ended
	House ownership	
	Size of family	
	Duration of living in the neighbourhood	
	Age	
	Gender	
	Education	
Houses Conditions	Job	Respondents were asked to evaluate the condition of their houses based on identified variables on a scale of 0 to 3.
	House has enough space to accommodate all members of the family	
	House provides the level of privacy that all members of the family require.	
	House connected to clean water supply.	
	House has a good sanitation system.	
	House has a safe and secure toilet.	
	House has a safe and secure bathroom.	
	House has a separate kitchen or cooking area.	
	House has a safe and secure open area	
	House provides adequately natural light during the day.	
	House provides adequately natural ventilation and fresh air	
	House has access to legal and secure electricity.	
	House has access to legal and stable internet connection.	
House protects residents against disasters such as flood and fire.		
Neighbourhood Conditions	Access to safe public transport in the neighbourhood that links to other parts of the city	Respondents were asked to evaluate the condition of their neighbourhood based on identified variables on a scale of 0 to 3.
	Access to sufficient healthcare facilities in the neighbourhood	
	Access to schools and childcare facilities in your neighbourhood	
	Access to shops and other commercial amenities in your neighbourhood	
	Access to open communal/public spaces in your neighbourhood	
	Neighbourhood is safe	
	Neighbourhood is walkable	
	Neighbourhood is a youth-friendly environment	
	Neighbourhood is a female-friendly environment	
	Neighbourhood is an elderly and disable-friendly environment	
Neighbourhood supports the local business and economy.		
Neighbourhood protects community against disasters		
Wellbeing	Your family living conditions are safe	Respondents were asked to evaluate their wellbeing based on identified variables on a scale of 0 to 3.
	You live in a neighbourhood with a strong sense of community	
	Help and support with care for yourself and others are easily accessed.	
	You and your family often participate in social gatherings with friends and neighbours in the area	
	You and your family well connected to your neighbourhood	
	Your family socially sustainable	
	Your family financially sustainable	
	Your family emotionally/mentally healthy	
Your family physically healthy		

The study population consisted of all households in the three selected case studies. A total of 12000 households were identified in QQ section, Manohara informal settlement and Al Baqa'a refugee camp respectively, which formed the target population for the study. Out of the total 12000 households that were identified, 5% of the target population, 611 household interviews were conducted as the sample size for the study. This followed the

recommendations of Rahi et al., (2019) for a large population. The data collected were analysed using descriptive and inferential statistical techniques. Confirmatory factors analysis and path analysis were conducted to assess the validity of the constructs and sub-constructs. At the same time, Structural Equation Modelling (SEM) was used in validating the relationship between the constructs, based on the maximum likelihood estimate.

STRUCTURAL EQUATION MODELLING OF SUSTAINABILITY AND WELLBEING

Analysis of the measurement model

The constructs and sub-constructs were assessed for discriminant validity, reliability, internal consistency, convergent validity, and divergent validity. Convergent validity represents the extent of agreement between two or more variables of the same construct, and it was tested using the average variance explained. Convergent validity is established if the average variance explained is higher than 0.50. It indicates that the variables in the constructs explain at least half the variance of the constructs. Discriminant validity is established if there is a correlation between the constructs or sub-constructs.

Table 2. Consistency and reliability of the constructs and sub-constructs

Construct	Numbers of sub-constructs	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted
Household characteristics	2	0.892	0.930	0.948	0.901
House Conditions	13	0.886	0.893	0.905	0.528
Neighbourhood Conditions	12	0.843	0.853	0.876	0.577
Wellbeing	9	0.744	0.753	0.810	0.525

The results of the consistency and reliability test, Cronbach's alpha coefficient, and the average variance show that the factor loading is above 0.50, which is acceptable; the Cronbach's alpha values for the constructs are more significant than 0.70, which indicates reliability. The average variance explained for the constructs is more significant than 0.50, which indicates convergent validity as presented in Table 2. These results indicate that the constructs and sub-constructs have acceptable validity and internal consistency. Five research hypotheses were tested using T-Statistics. P-Values of hypotheses test are less than 0.05, therefore all five research hypotheses are statistically significant as presented in Table 3.

Table 3: Hypotheses testing results

Hypothesis	Path Coefficient	T Statistics	P Values	Confidence Intervals		Decision
				2.5%	97.5%	
H1: Household characteristics -> House Design & Conditions	0.195	5.12	0.000	0.115	0.266	Significant
H2: Neighbourhood Conditions -> House Design & Conditions	0.631	19.97	0.000	0.564	0.685	Significant
H3: House Design & Conditions -> Wellbeing	0.212	3.245	0.001	0.09	0.346	Significant
H4: Household characteristics -> Wellbeing	0.129	3.133	0.002	0.045	0.205	Significant
H5: Neighbourhood Conditions -> Wellbeing	0.472	7.551	0.000	0.329	0.582	Significant

Analysis of the structural model

Since all the research hypotheses are statistically significant, the path analysis for the theoretical framework of study using four main constructs and 36 sub-constructs with loading factor greater 0.5 (satisfactory relationships of variables in measurement of construct) were

developed, as illustrated in Figure 2. As illustrated in the path diagram model the both R-square of House design and conditions and Wellbeing are above 0.5 which means there are moderate correlation and significance in the developed model. Furthermore, the fit indices for the estimated model shows that the fit indices are within the recommended values (SRMR = 0.071, NFI=0.901, d ULS & d G<95% & 99% value) therefore the model fits the data and the results validate the developed theoretical framework. As shown in path diagram to a great extent the individual and community wellbeing affected by the neighbourhood conditions (0.470), moreover the neighbourhood conditions significantly impact the houses conditions and consequently impact (indirect relationship) on wellbeing. This clearly proved the crucial role of the neighbourhood condition (directly and indirectly) on the wellbeing of individuals and community, this finding is aligned with a study by Montoya et al. (2020).

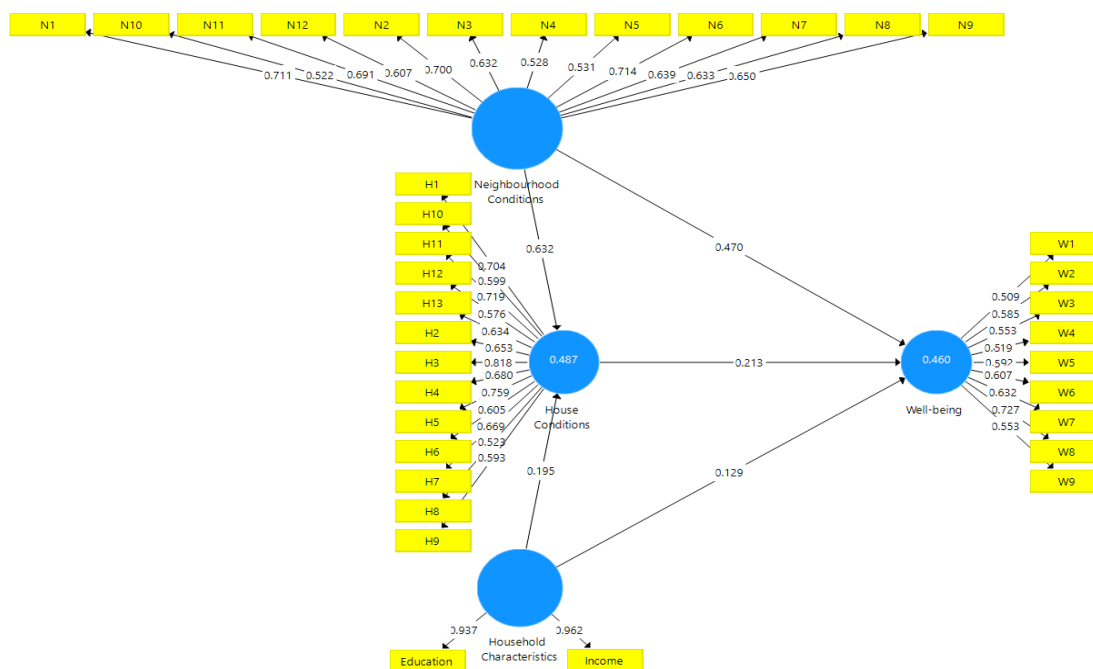


Figure 2: Path diagram for the structural equation model

Finally, the outer weights of each sub-constructs are estimated, and the results ranked according to the relative importance in Figure 5. Outer weights are the results of a multiple regression of a construct on its set of indicators which assess each indicator's relative importance in formative measurement models.

As shown in Figure 3 the Outer weights of variables of each dependent construct (households, house, neighbourhood) are very close (~0.5 for household variables and ~0.1 for house and neighbourhood variables), which indicate the importance and almost equal impact of all these variables on wellbeing. However, W8 (emotional/mental health), W9 (physical health) and W1 (safe living condition) are three wellbeing (independent) variables that are slightly more important or affected by dependent variables than the other wellbeing variables.

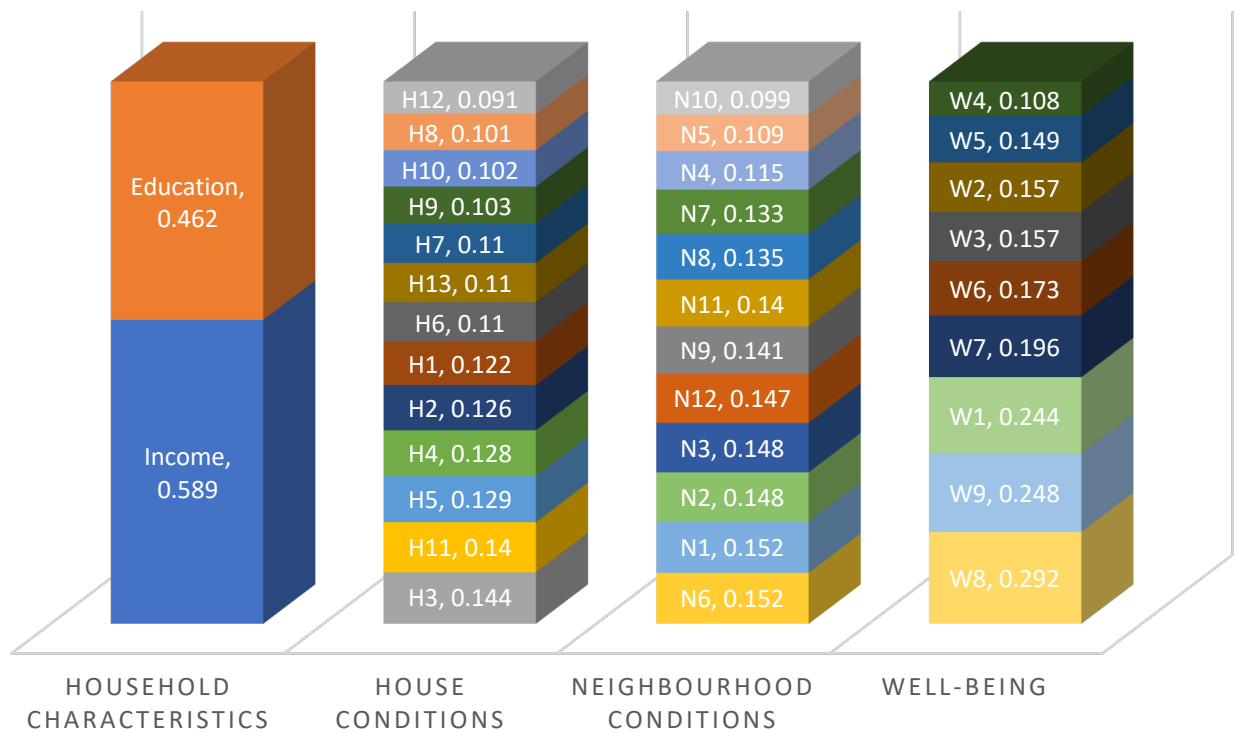


Figure 3: Weights of sub-constructs

RESULTS AND DISCUSSION OF FINDINGS

This section presents and discusses the analysis of 611 households' interviews conducted across the three selected case studies.

Households and head of household's information

The general information of interviewed households and demographic information of households' heads are summarised in Figure 4 and 5 respectively. More than half of the houses in these neighbourhoods/townships owned by the head of households and the majority of households are classified under low and lower-middle income groups with average size of 2 to 5 family members as shown in Figure 4. However, the average living years are varied across the three cases from 1 to 5 years in QQ section, SA, 10 to 20 years in the Al Baqa'a refugee camp, JR and more than 20 years in Manohara, NP.

The average age of head of households in QQ section is 25, while in Manohara informal settlement and Al Baqa'a refugee camp are 34 and 39 respectively. The predominant head of households in Nepal and Jordan are male while the 60% of households' head in South Africa are female. The majority of households' head in South Africa and Nepal are unemployed with average education in secondary/high school (74%) and never attended any school (68%) respectively. On the other hand, 72% of the household heads in Jordan are employed holding a university degree as listed in Figure 5.

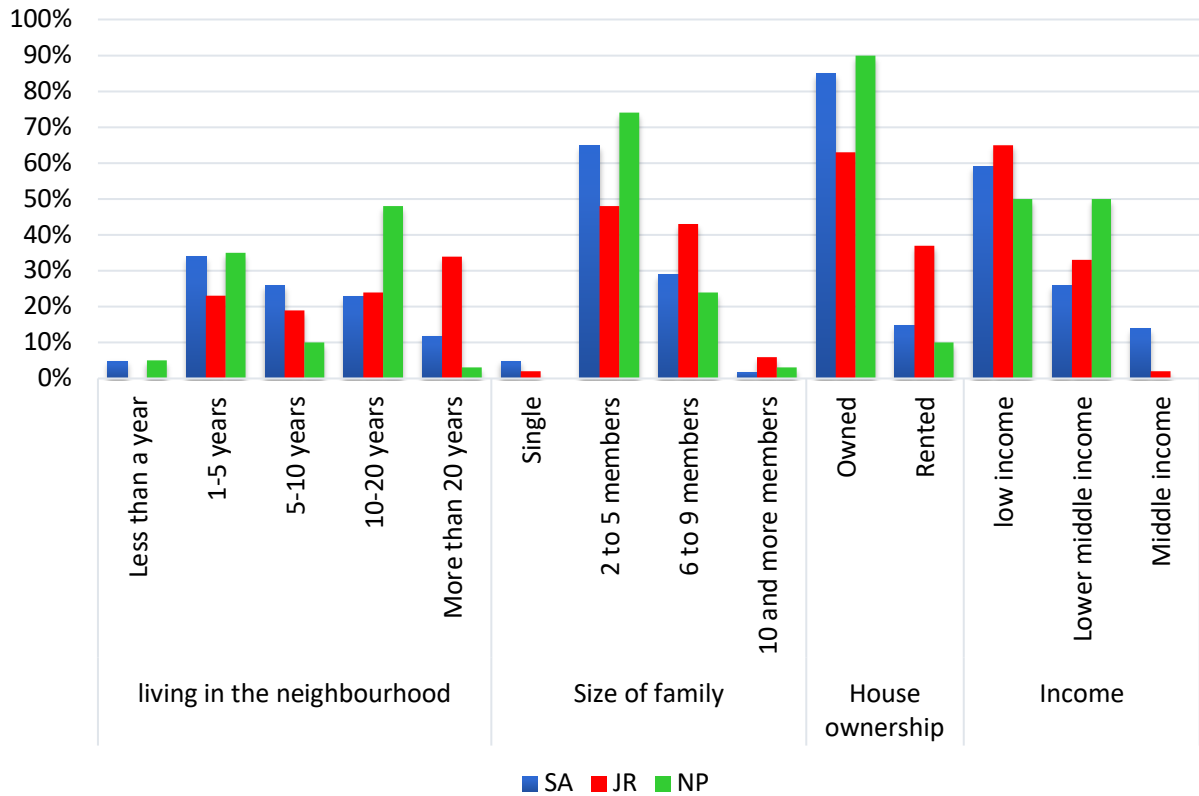


Figure 4. General information of interviewed households

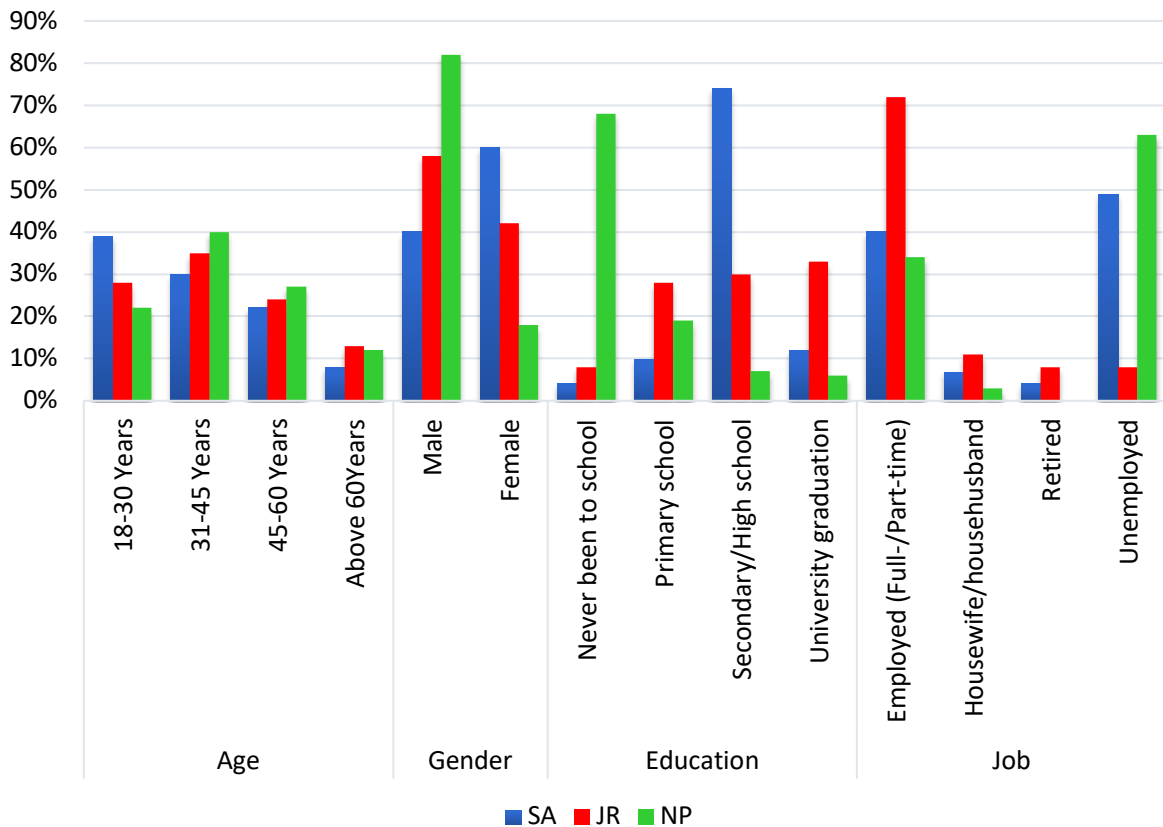


Figure 5. Demographic information of interviewed households' head

Housing conditions

The overall condition of housing in three case studies are very poor, since the majority of houses do not provide basic services to their residents. As listed in Table 4, most of the houses in Manohara do not cover essential needs of the residents, and only in two categories more than 50% of houses have a safe and secure toilet and access to legal and secure electricity. The most critical issues of houses in this neighbourhood are the vulnerability of the residents to the disasters, poor design and orientation, and connectedness to decent water and sanitation systems. Similar to Manohara, houses in QQ section do not protect their residents against the disasters nor address social needs such as open spaces, family space, privacy). On the other hand, the houses in Al Baqa'a refugee camp do cater for the essential needs of residents except for environmental aspects such as adequate natural light and fresh air mainly due to the lack of good design and absence of planning.

Table 4. Houses conditions of case studies

Code	Description	SA	JR	NP
H1	House has enough space to accommodate all members of the family	38%	63%	35%
H2	House provides the level of privacy that all members of the family require	38%	51%	33%
H3	House connected to clean water supply.	60%	98%	30%
H4	House has a good sanitation system.	51%	84%	23%
H5	House has a safe and secure toilet.	46%	N/A	80%
H6	House has a safe and secure bathroom.	33%	N/A	38%
H7	House has a separate kitchen or cooking area.	56%	N/A	40%
H8	House has a safe and secure open area	28%	46%	20%
H9	House provides adequately natural light during the day.	75%	34%	17%
H10	House provides adequately natural ventilation and fresh air.	66%	34%	48%
H11	House has access to legal and secure electricity.	64%	98%	91%
H12	House has access to legal and stable internet connection.	44%	49%	24%
H13	House protects residents against disasters such as flood and fire.	30%	N/A	4%
Overall condition of houses scores out of 100		48	62	37

Neighbourhood conditions

Table 5. Neighbourhood conditions of case studies

Code	Descripting	SA	JR	NP
N1	Access to safe public transport in the neighbourhood	72%	84%	39%
N2	Access to sufficient healthcare facilities in the neighbourhood	65%	89%	10%
N3	Access to schools and childcare facilities in your neighbourhood	76%	89%	41%
N4	Access to shops and other commercial amenities in your neighbourhood	69%	83%	92%
N5	Access to open communal/public spaces in your neighbourhood	52%	37%	N/A
N6	Neighbourhood is safe	15%	27%	8%
N7	Neighbourhood is walkable	62%	N/A	18%
N8	Neighbourhood is a youth-friendly environment	52%	27%	63%
N9	Neighbourhood is a female-friendly environment	47%	31%	88%
N10	Neighbourhood is an elderly and disable-friendly environment	43%	N/A	41%
N11	Neighbourhood supports the local business and economy	77%	14%	60%
N12	Neighbourhood protects community against disasters	33%	N/A	28%
Overall neighbourhoods' conditions score out of 100		54	52	45

The conditions of neighbourhoods in selected case studies are diverse. However, safety and security remains a common critical denominator across the three case studies. The inclusivity of the QQ section. Lack of support for local businesses and the economy is the main concern in Al Baqa'a refugee camp in Jordan. On the other hand, lack of healthcare facilities is the second most paucity in the Manohara neighbourhood. Table 5 underlines the most critical issues of three case studies. Overall, the neighbourhood conditions of QQ section and Al Baqa'a refugee camp are better than in Manohara.

Wellbeing conditions

Similar to housing design and conditions and neighbourhood situations the overall wellbeing of Manohara community is lower than the two other communities as shown in Table 6. The wellbeing issue in Nepal case study is very critical because of the high rate of unemployment and low level of income as presented in the section 1.1. The unsustainability of economic activity is a common wellbeing issue in the low, lower-middle income communities across the three case studies. Furthermore, unsafe living conditions is another critical problem of wellbeing in South Africa and Nepal.

Table 6. Wellbeing's condition of the case studies

Code	Description	SA	JR	NP
W1	Your family living conditions are safe	37%	N/A	30%
W2	You live in a neighbourhood with a strong sense of community	70%	73%	86%
W3	Help and support with care for yourself and others are easily accessed	60%	N/A	19%
W4	You and your family often participate in social gatherings with friends and neighbours in the area	77%	61%	61%
W5	You and your family well connected to your neighbourhood	77%	63%	88%
W6	Your family socially sustainable	66%	72%	90%
W7	Your family financially sustainable	27%	40%	9%
W8	Your family emotionally/mentally healthy	70%	61%	65%
W9	Your family physically healthy	73%	82%	50%
Overall wellbeing's conditions score out of 100		62	65	55

CONCLUSION

This study has provided a holistic view on the relationship between the household characteristics, housing conditions, neighbourhood situations and public wellbeing for socioeconomic and environmental sustainability of the informal settlements in global south. Three different informal settlements were selected, one each from a Least Developed Country (Nepal), a Lower Middle-Income Country (Jordan) and an Upper Middle-Income Country (South Africa). The analysis of the current condition of families, houses, neighbourhoods and wellbeing in the informal settlements across the three specific case studies and modelling their relationships allowed for a novel approach to be used to assess the importance and impact of the dependent constructs and sub-constructs on wellbeing and sustainability of individual and community as well as the relationships between these clusters of concepts.

The findings of the study support the arguments made in the literature about the important role of neighbourhood conditions, housing conditions and household characteristics respectively on the wellbeing of the individuals and communities in informal settlements. They offer the possibility of multilevel solutions (neighbourhood and housing) to the

challenges faced in informal settlements as well as the intricate social networks which exist within these informal settlements to support a range of livelihood strategies. These strategies consequently impact the social, economic and environmental sustainability of the urban dwellers at large. Another point that has emerged from the literature and confirmed by the findings of this study is that a one-size-fits-all approach to informal settlement upgrading is not viable (Aburamadan, 2017). This is because of the uniqueness of each informal settlement context. The findings of this study and the resultant importance of constructs and sub-constructs can be used as a toolkit and roadmap on evaluating the informal settlement conditions and potential improvement solutions by local stakeholders in Global South. However, this is also worth acknowledging that the toolkit in its current form and scope does not fully accommodate the importance of local cultures, norms and traditions in analysing the housing and neighbourhood conditions and collective wellbeing. This is an aspect worth exploring further in the future research.

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