

Using geographic information systems to study the impact of the built environment on social inclusion of people with physical disabilities: The case of Amman

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Abstract

This research explores the relationship between the built environment and social inclusion of adults with physical disabilities in the city of Amman, the capital of Jordan, using GIS (Geographic Information Systems). GIS is overlapped with the survey data to identify the built environment predictors (independent variables) and social inclusion indicators (dependent variables). The study hypothesized that the income level has a significant impact on all indicators of social inclusion. Multivariate Logistic Regression analysis is used to measure the influence of the built environment predictors including income level, residential density, land use mix, and variety of destinations on the three indicators of social inclusion: physical independence, occupation, and communal and social activities. The results of the study indicate that living conditions in neighborhoods with higher economic status, more land use mix, and more destinations are positively associated with social inclusion; while the high-compacted residential density has a negative impact on social inclusion. The results also indicate that there are other significant factors that negatively affect social inclusion such as attitudinal, physical, and transportation barriers. The findings of this research can be used as a basic material in the development of disability policies to improve social services and provide an entire social inclusion for people with physical disabilities.

Keywords

Built environment predictors, Geographic Information Systems, Jordan, Physical disabilities, Social inclusion indicators.

1. Introduction

According to the World Health Organization (WHO) and The World Bank (2011), there are over one billion, or around 15 %, of the world population living with a disability. Globally, disability prevalence is usually higher in developing countries. People with disabilities are more likely to have experience adverse socioeconomic outcomes such as less education, poorer health outcomes, lower levels of employment, and higher poverty rates (The World Bank, 2018). In the last decade, Interest has increased in the issue of inclusion of people with disabilities in societies, and many authorities around the world are promoting “inclusive cities’ strategies to meet their needs (UN, 2013).

In 1980, WHO used the terms Impairment and Handicap to refer to disability (WHO, 1980). It defined disability as any limitation or problem in body function or structure that prevent the performance of an activity in the time lapse considered normal for a human being (WHO, 2011). In 2011, WHO and the World Bank produced a broader definition of disability to cover impairments, activity limitations, and participation restrictions.

Similarly, the United Nations Convention on the Rights of Persons with Disabilities (CRPD) and Crabtree

(2013) defined disability as a result of the interaction between persons with impairments and environmental barriers that hinders their full participation in society on an equal level with others (UN, 2007).

Jordan was the first country in the Middle East to adopt national legislation for disability and signed the CRPD in 2008, which established a set of obligations at the international and national levels. Consequently, The Higher Council for the Rights of Persons with Disabilities (HCD) developed disability legislation to adapt CRPD’s articles and released a new law on the Rights of Persons with Disabilities in cooperation with different stakeholders in 2017. “The new legislation perceives those with disabilities in a new way by adopting a definition of disability that takes into account the physical barriers that hinder their ability to lead a normal life,” said Muhannad Azzeh, the secretary general of the Higher Council for People with Disabilities (Azzeh, 2017). Despite the strong legislative base in Jordan that focuses on social inclusion of people with disabilities in all life sectors, people with disabilities in Jordan are far less likely to be employed, educated and engaged in social activities. They are also more likely to live in poverty, be inactive and experience violence and bullying compared to people without disabilities

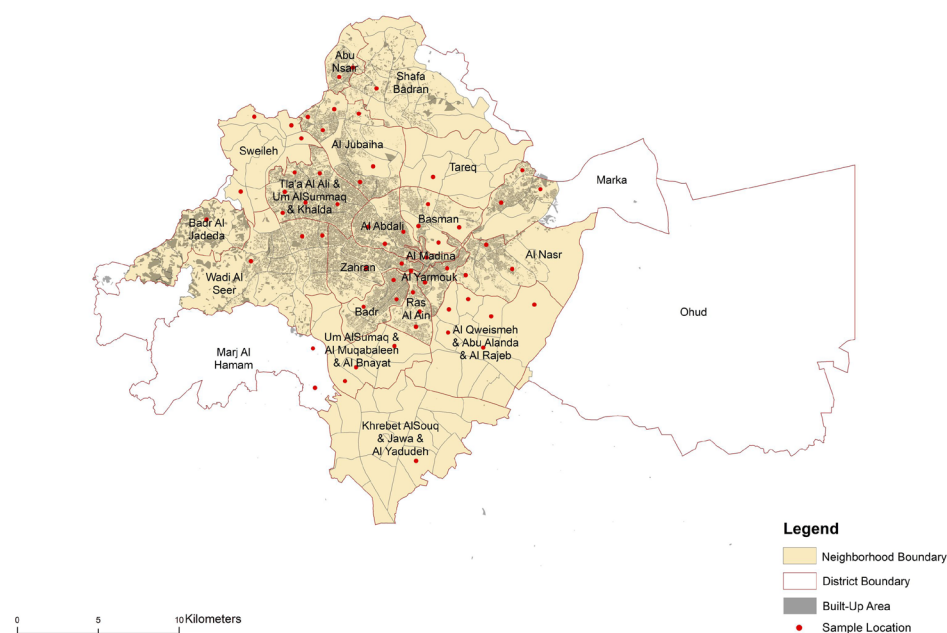


Figure 1. Neighborhoods of Amman showing study samples (Data acquired from GAM archive, 2018).

(Otoum et al., 2017).

This research focuses on physical barriers and explores the relationship between the built environment features of neighborhoods and social inclusion of adults with physical disabilities in Amman as the most populous city and the capital of Jordan. Amman is administered by the Greater Amman Municipality (GAM) and covers 22 districts with a total of 167 neighborhoods. It has a population of 3.3 million and an average density of 9,800 persons/km² (DoS, 2017). The built-up area of Amman has grown from 72 km² in 1983 to 144 km² in 1994 and 226 km² in 2005 and its area was doubled to 1,662 km² in 2007. Currently, GAM covered 800 km² (Ababsa, 2013). For the purpose of this research the neighborhoods of Amman were categorized into five groups based on area, population density, date of establishment, number of people with disabilities, and poverty. Samples were selected from all neighborhoods to reach accurate results and comparison (Figure 1).

This research gives an overview of the current situation of disability in Amman. The results of this research will be useful for public institutions such as The Higher Council for the Rights of Persons with Disabilities (HCD), Greater Amman Municipality (GAM), and Ministry of Public Works and Housing (MPWH) in developing disability inclusion strategies and disability codes in Jordan. It will also provide a foundation for researchers on the existing conditions related to the physical environment and social inclusion of people with disabilities in similar contexts.

The hypothesis of this research is that people with physical disabilities are living in Amman in neighborhoods of high residential density; low poverty rate; mixed land uses; many destinations are more likely to report optimal participation in society, and therefore higher social inclusion. The main objective of this research is to explore the relationship between the built environment predictors of neighborhoods and social inclusion indicators of people with physical disabilities. The sub objectives are to analyze the current situation of people with disabilities in Amman in different sectors of life to define

the reliable indicators of disability inclusion in Amman along with the built environment predictors. It also aims to develop basic recommendations to promote participation and social inclusion, and reduce the barriers, which oppress people with disabilities and exclude them from the society.

2. Theory and methodology

This section presents a thematic review of the literature that covers the social inclusion/exclusion. Inclusion as defined in the Oxford Dictionaries (2016) is “the action or state of including or of being included within a group or structure”. United Nations (UN) and the World Bank have almost given the same definition of social inclusion as the process of improving the terms of participation in society for people who are disadvantaged because of their disability, through enhancing opportunities, access to resources, and improving their abilities. Social exclusion emerged in the 1970s as a response to maintain social cohesion and stability in society after the massive economic restructuring associated with transitioning from an agrarian to an urban society. This concept was spread internationally with efforts to integrate excluded groups in normal life activities such as social, economic, political, and cultural activities. Social exclusion describes a state in which individuals or groups are unable or prevented from participating in economic, social, political and cultural activities to the fullest extent they desire (Labonte et al., 2011). Theatrically speaking, social inclusion is a multidimensional process (Tas, 2015; Thomas et al., 2015). It can happen in multiple areas, different magnitudes, and different directions (Tas, 2015). The main aim of social inclusion as multidimensional process is to enable full and active participation of all society members (Thomas et al., 2015), and to remove economic, social and cultural boundaries between those who are included and excluded (Lombe, 2007). However, inclusion of people with disabilities into everyday activities requires practices and policies designed to identify and remove all kinds of barriers in order to achieve equality in societies and making sure

everybody has the same opportunities to participate in every aspect of life to the best of their abilities and desires (Al Ju'beh, 2015).

Al Ju'beh (2015) defined disability as a relationship between a person's impairment and his/her environment. Disability occurs when a person with impairment live in a place full of environmental barriers, while inclusion achieved when a person with impairment live in accessible environment.

Labonte and others (2011) reviewed several social exclusion/inclusion frameworks in order to identify exclusion indicators and measures that could be used for purposes of monitoring, policy and program development, and evaluation. This review led to the identification of nine principle domains that capture processes of social exclusion/inclusion: Employment and work, Income and economic resources, Material resources, Education and skills, Health, Housing, Social resources, Community resources, Personal safety.

Individuals with disabilities are vulnerable to marginalization and exclusion from labor force due to their disability, despite legislation intended to prevent their marginalization in most countries, and the academic achievements, skills and training of many people with disabilities. Some employers avoid hiring people with disabilities because they think that it will reduce productivity, create more accidents in the workplace, and increase the cost of their accommodation (Leslie, R., Leslie, K. & Murphy, M., 2003).

People with disabilities face negative attitudes in Jordan such as signs of pity, fear or staring, especially among children that prevent their inclusion and negatively affect the person's participation in society (Jaber, 2012). They also imposed to a higher risk of being bullied, harassed and discriminated. Therefore, parents should play a more significant role in raising confidence and acceptance levels of their disable children. Schools should also increase the awareness of inclusion among students to avoid mistreatment of disable students.

Studies about disability in Jordan began in the 1960s. It focused on rehabilitation services and providing insti-

tutional (residential) care for severely deaf and "mentally retarded" people (Turmusani, 1999). In the 1970s, governmental and voluntary organizations began to be more involved in the western-style institutional provision for people with mental disabilities. Public institutions and NGOs conduct most of the disability research in Jordan. Limited researches had discussed the inclusion of the disable people with in society. In addition, most of the researchers focus on rehabilitation, legislation, education, and other social aspects more than accessibility and social inclusion.

Most of books and research papers about the inclusion of people with disabilities in Jordan have been focused on inclusion in the educational sector. In general they did not address social inclusion in other fields such as employment or social activities. However, almost no research has been done on the association between the built environment characteristics and social inclusion of people with disabilities in Jordan.

Government-produced official statistics is the most obvious source of documentary data for research purposes. National census and various reports detailing demographic, social, economic, business, and political trends are forms of the official statistics (Henn, M., Weinstein, M., & Foard 2009). In Jordan, such a useful data are collected and produced by the Department of Statistics (DoS) which provides general data about the number of people with disabilities according to their type of disability, gender, and governorate. However, there are no specified analytical studies about the relationship between disability and the built environment produced in this regard, except the study about employment and unemployment of people with disabilities, which was published in 2010 in cooperation with the HCD. For example, the latest national census (2015) by DoS indicates that percentage of people with functional difficulties is about 11% of the total population above five year age. While the prevalence of severe disabilities only among the same age group is 2.7% and is higher than it was in 2004 and 1994 (1.2% for both). The percentage of people with disabilities in Jordan is relatively low compared to the international percentage, which is

Table 1. Number of people living in Amman aged (5 years and above) and facing difficulties in body functions by type of difficulty and severity (Source: DoS, 2015).

	Some difficulty (low)	Many difficulties (moderate)	Cannot do at all (severe)	Total	Percentage
Seeing	173,695	25,629	2,865	202,189	31%
Hearing	79,261	14,440	3,234	96,935	15%
Walking or climbing stairs	101,578	38,272	9,068	148,918	23%
Remembering or concentrating	67,778	14,809	5,064	87,651	13%
Personal care	43,005	12,546	8,058	63,609	10%
Communicating with others	37,032	10,711	6,212	53,955	8%
Total	502,349	116,407	34,501	653,257	100%

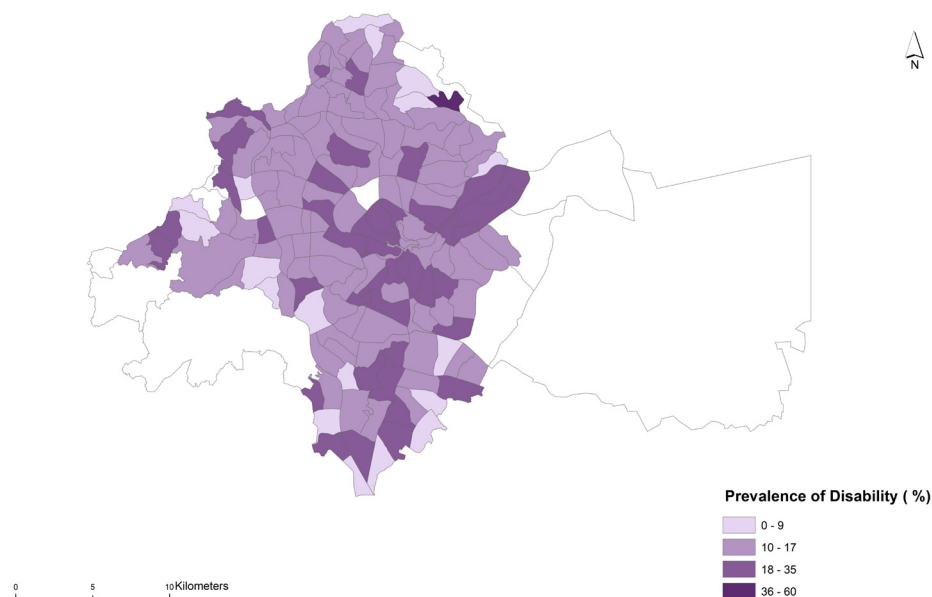


Figure 2. Prevalence of disability in the neighborhoods of Amman (Data acquired from DoS archive, 2015).

15%. Other census data indicates that illiterate people constitute 9.1% of Jordan population aged 13 years and above, while they constitute 22.4% of people with disabilities in the same age group. It was also reported that economically inactive people constitute 53% of Jordan population aged 15 years and more, while they constitute 82.2% of people with disabilities in the same age group (DoS, 2015). These numbers indicate that many people with disabilities have been excluded from mainstream education and work opportunities. They are also more likely to be inactive in comparison to people without disabilities.

The census categorized difficulties under six types, each type has three categories of difficulty based on its severity. Table 1 shows number of people living in Amman aged (5 years and above) and facing difficulties in body functions by type of difficulty and severity. Functional difficulties relating to the ability to walk or climb up stairs and the abil-

ity to see were the most prevalent difficulties with a percentage of 23% and 31%, respectively. While those relating to self-care and the ability to communicate with others were less so, with 10% and 8% respectively. It also shows people with moderate and severe physical difficulties constitute about 47,160 persons with a percentage of 1.31% of Amman Governorate's population aged five years and above.

Figure 2 presents the prevalence of disability in Amman's neighborhoods. Number of people with disabilities is higher in low-income neighborhoods than in middle and high-income neighborhoods. About 93 neighborhoods in Amman (which constitute 56% of the total neighborhoods in Amman) have a higher disability percentage than the global rate, which is 15% (WHO, 2011).

Rehabilitation services for people with disabilities have been initiated in Jordan in the wake of war and conflict that increased the number of people

with conflict-related impairments in the country (Turmusani, 1999). Disability-related provision began in the 1960s and was led by foreign NGOs that provided institutional and residential care for people with disabilities. Jordan has become the focus of international attention and foreign aid after the displacement of refugees from other countries in the region (Turmusani, 1999), including Palestinians who fled to Jordan from conflict in the West Bank, especially in 1948 and 1976 and from the Gulf War in 1990 and 1991, and lately Syrians who fled to Jordan after the Syrian conflict in the past nine years. With the start of the Syrian crisis, Jordan witnessed an increase in the number of people with disabilities as about 30% of Syrian refugees in Jordan have physical or intellectual disability (Dupire, 2018)

2.1. Data collection methods

This research involves collecting, analyzing and integrating quantitative data (e.g., experiments, surveys) and qualitative data (e.g., focus groups, interviews). A mixed method approach is usually used for consequence-oriented and problem-centered research (Creswell, 2014), which makes it suitable for this research. An embedded sequential mixed methods design used in this study as a procedure for collecting, analyzing quantitative and qualitative data sequentially to understand the research problem. Qualitative data plays a secondary or supportive role to the quantitative data. Qualitative data supports and provides additional information to the quantitative data which plays a primary form in this research. The questionnaires were published online

on social media and disability-related websites. Online questionnaires are relatively cheap to administer, and they save time and effort and enable coverage of the whole area of Amman. In addition, online questionnaires have the advantage of ensuring a degree of privacy for people with disabilities because of avoiding direct personal contact. The questionnaire survey has a simple rating or (Yes/No) answers, with minimum open-ended questions. Closed questions are easily asked, easily understood, and easily answered and coded for analysis.

The interviews were conducted at two stages, the first was unstructured interviews that were conducted along with the literature review to highlight the disability situation in Amman and understand problems of disability and inclusion. The second was semi-structured interviews that contained questions that are more detailed. This study considers questions of inclusion of people with disabilities in the society, so some respondents might offer the 'socially acceptable' response – the answer that they believe the interviewer wants to know.

2.2. Target group and sampling method

The target group is people with severe physical disabilities (wheelchair users), and people with moderate physical disabilities who have limited walking abilities and use assistive devices such as walkers, prostheses, and crutches. According to the last census report by the DoS in 2015, people with moderate and severe physical difficulties constitute about 47,160 persons with a percentage 1.31% of Amman Governorate's aged five years

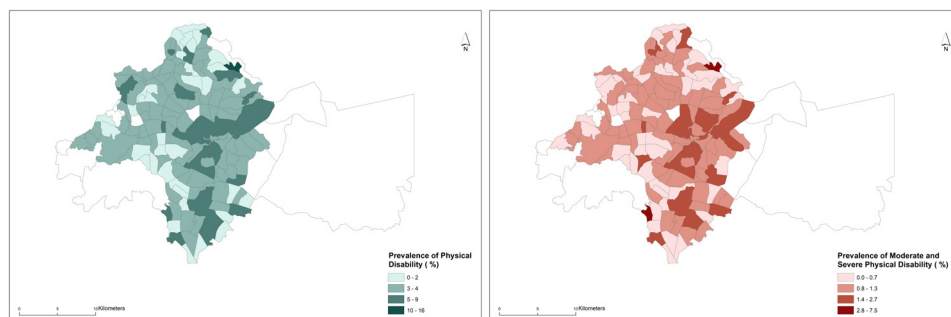


Figure 3. Prevalence of people with physical disability in the neighborhoods of Amman (A) Prevalence of people with all types of physical disability (B) Prevalence of people with moderate and severe physical disability.

and more. The variation between the international percentages of persons with disabilities and the national disability percentage is related to many reasons such as the societal perspective that drives people to hide the existence of disabilities in their families; the difference in the definition and the classification of disability in Jordan; and using traditional weak methods in surveys (HCAPD, 2010) (Figure 3).

Based on sample size equation (1), if we assume that confidence level is 90%, Margin of error is 5%, and the popu-

$$\text{sample size} = \frac{\frac{z^2 \cdot p(1-p)}{e^2}}{1 + \left(\frac{z^2 \cdot p(1-p)}{e^2 \cdot N} \right)} \quad (1)$$

lation is 40,523, then the sample size needed is approximately 250 persons.

Where:

- z = z-score (the number of standard deviations a given proportion is away from the mean)
- p = Standard of deviation
- e = Margin of error (percentage in decimal form)
- N = Population size

The sample was selected from 70 neighborhoods of Amman, taking into consideration the diversity of the characteristics of the neighborhoods in terms of area, population density, date of establishment, the percentage of people with disabilities, and income level. About 50% of these neighborhoods have less than two kilometers of area, which means that walking distance from the neighborhood center to its edge does not exceed 800 m.

The sample was selected from neighborhoods with various population densities, with an average of 9,800 persons/km². Population density in Amman's central neighborhoods such as *Al-Hashmi Al-Shamali*, *Jabal Al-Nuzha* and *Al-Ashrafieh* is over 30,000 persons/km² with a maximum of 47,371 person/km², which is among the highest urban densities in the world. Most of the neighborhoods with low population densities are scattered at the edges of Amman such as *Al-Hummar* and *Al-Murouj* with a minimum of two persons/km².

The sample of the research was selected from different neighborhoods in terms of income level. The income

level was divided into four categories: poor, low, middle and high. The map clearly shows the line that divides East and West Amman. Amman suffer from high social segregation, highly populated neighborhoods where unemployment rates are high, and neighborhoods primarily located in the west, where employment is higher, education is better, and buildings and infrastructure are better and more developed. East Amman covers Amman's historical center and more than half of the city with its North and South expansions, while West Amman extends from Jabal Amman to *Dabouq*. Neighborhoods of high poverty rates include most of the informal houses that grew up after the arrival of Palestinian refugees in 1967 from the West Bank and Gaza Strip. Most of these houses were built on the fringes of the official refugee camps (Ababsa, 2013).

3. Measures of dependent and independent variables

3.1. Identifying the dependent variables: Social inclusion indicators

A systematic approach was adopted in the selection of social inclusion indicators. This involved a review of the literature and their theoretical review in developing the measuring approaches, and the selection of a most relevant and robustness indicators that can be applied in the Jordanian context and related to disability.

In addition to the literature review, interviews with people with disabilities explained what inclusion means to them. Asking them about the meaning of exclusion areas from their point of view helped in choosing the inclusion indicators. Most of the interviewees pointed out that the places of education and work are the most difficult places to integrate. They also have difficulties in accessing community services and participation in social activities.

Using the indicator evaluation criteria, suitable social inclusion indicators for people with disabilities had been developed. Defining inclusion indicators is one of the research objectives, first, an extensive list of indicators was created, and then a small number of core indicators was identified to be realistic in term of their

potential use, and compatible with the research content.

Following the review of the literature on social inclusion and interviews with people with disabilities, three main indicators are proposed to be adopted as the following:

1. Occupation: Which includes access to the formal labor market (Employment) and/or access to educational opportunities (Education).

2. Communal and social activities: Participation in communal activities and social relationships including community services, recreation and leisure, and family gathering.

3. Physical independence: Autonomy in mobility and daily activities.

3.2. Identifying the independent variables: Built environment predictors

Built environment predictors were created the same way as the inclusion indicators using a systematic approach. An extensive list of built environment predictors was created after reviewing the literature and choosing the most compatible predictors with the content of the research and the Jordanian built environment. Residential density, land use mix, and number and variety of destinations (Includes entertainment, landmarks, retail and religious

locations) were the most frequent variables in different research. Income level as a predictor was added by the author to be compatible with research requirements whereas disability is much related to poverty, especially in the developing countries.

4. Analyses and discussion

To test the relationship between the four-built environment predictors (independent variables) and the three inclusion indicators (dependent variables), two types of models could be used: Logit Model or Probit Model. Both methods lay under similar, though not identical, inferences. Logit Model (or Logistic Regression Model) is more popular in this type of research because coefficients can be interpreted in terms of odds ratios, and it was widely used in the past literature. In return, the Profit Model is used in more advanced econometric settings and hence are used in some contexts by economists and political scientists (Albright, 2015). For these reasons, Multivariate Logistic Regression analysis is implemented in this study using SAS software. Supportive data from interviews with experts and decision makers along with open-ended questions in the questionnaire were analyzed by descriptive data

Table 2. Results of independent variables showing main characteristics of built environment predictors of the 74 neighborhoods in Amman where the participants live, (Source: Researchers, 2019).

Independent variables	Frequency/N	Percentage	Mean	SD
Income level				
Poor	80	32.19	---	---
Low	87	34.93	---	---
Medium	77	30.82	---	---
High	6	2.5	---	---
Population density (inh/km²)	250	---	13121	12859
Low	112	44.5		
Medium	88	34.93		
High	50	20.55		
Land use mix (Percentage of non-residential land use)	250	---	13.6	11.3
Low	100	40		
Medium	91	36.3		
High	59	23.6		
Percentage of destinations	250	---	7.9	6.4
Low	105	41.6		
Medium	83	33.2		
High	62	24.8		

Table 3. Results of dependent variables showing main characteristics of social inclusion indicators for 250 participants of the study.

Dependent variables	Frequency	Percentage (%)
Occupation		
Yes	132	52.7
No	118	47.3
Physical independence		
Independent	55	22
Dependent	195	78
Communal and Social Activities		
Yes	94	37.7
No	156	62.3

analysis method.

Main characteristics of survey participants are:

1. The survey sample consisted of 250 persons.
2. Approximately 57% of respondents are male, while 43% are female.
3. The majority of respondents are Jordanian, amounting up to 92.5%.
4. Approximately 20.5% of respondents aged 15 years or older are educationally literate, at a less than secondary level education, and 71% are educationally literate at higher than secondary level education. About 5.4% are illiterate, while 4% can read and write.
5. Approximately 63.9% of respondents are employed, while 45.6% are unemployed and 17.5% economically inactive.
6. The percentage of employed male respondents is approximately 63% of total employed respondents, while their female counterparts stood at approximately 36%.
7. The percentage of unemployed male respondents is approximately 66% of total unemployed respondents, while their female counterparts stood at approximately 34%.

4.1. Impact of the built environment on social inclusion

4.1.1. Analyzing the built environment predictors (independent variables)

The independent variables include income level, population density, land use mix, and percentage of destinations. Data about land use and destinations was obtained from GAM as GIS maps, while population density was obtained from DoS. Recent data about poverty and income is not published yet by

DoS and the latest report was in 2010, so the income level was obtained from the Atlas of Jordan (2013). Table 2 summarizes the result of independent variables of the 74 neighborhoods.

4.1.2. Analyzing the social inclusion indicators (dependent variables)

Social inclusion indicators (dependent variables) were obtained from a structured questionnaire including occupation, physical independence, and communal and social activities. Questions about work and education are used as an indicator of occupation, while questions about the degree of independence in movement indicate whether a person is independent in movement or not. Indirect questions about the level of difficulty doing specific activities were asked to determine whether a person did most social activities without difficulty.

Table 3 summarizes the result of dependent variables for the 250 participants.

People with physical disabilities are less likely to participate in communal and social activities. Around 37% of the respondents do not face any problem or face mild problems in participating in most of the daily life activities, while 63% of them face moderate to severe problems. About 44% of the respondents face difficulty in participating in society due to people's negative attitudes.

4.1.3. Impact of built environment predictors on social inclusion

Multivariate Logistic Regression Method was used to test the relationships between the four built environment predictors and the three

Table 4. Odds ratio estimates showing the impact of the built environment predictors on social inclusion.

Predictors (Independent Variables)		indicators (Dependent Variables)		
		Odds Ratio Estimates		
		Physical Independence	Occupation	Communal and Social Activities
	Income level (4 vs 1)	1.328	4.117	2.443
	Population Density (3 vs 1)	0.753	0.876	0.725
	Number of destinations (3 vs 1)	1.597	0.194	3.144
	Land use mix (3 vs 1)	0.472	2.002	1.435

Table 5. Odds ratio estimates showing the impact of the built environment predictors on physical independence.

Odds Ratio Estimates					
Effect	Point Estimate	Wald Chi-Square	Pr > ChiSq	95% Wald Confidence Limits	
Income level 4 vs 1	1.328	0.0471	0.0282	1.180	6.781
Population Density 3 vs 1	0.753	0.1760	0.0449	0.200	0.831
No. of destinations 3 vs 1	1.597	0.3549	0.5514	0.342	7.447
Land use mix 3 vs 1	0.472	1.1866	0.2760	0.123	1.821

Table 6. Odds Ratio Estimates showing the impact of the built environment predictors on occupation.

Odds Ratio Estimates					
Effect	Point Estimate	Wald Chi-Square	Pr > ChiSq	95% Wald Confidence Limits	
Income level 4 vs 1	4.117	10.8484	0.0010	1.774	9.557
Population Density 3 vs 1	0.876	0.0640	0.0320	0.314	0.924
Number of destinations 3 vs 1	1.194	5.0268	0.0250	1.046	2.814
Land use mix 3 vs 1	2.002	1.4075	0.0255	1.636	6.302

inclusion domains separately at a neighborhood scale. The results are summarized and reported in Table 4.

Table 4 gives the coefficients as odds ratios. An odds ratio is the exponentiated coefficient and can be interpreted as the multiplicative change in the odds for a one unit change in the predictor variable. Odds ratio over 1.00 indicates a positive relationship between independent and dependent variables, while the odds ratio less than 1.00 indicates a negative relationship between them.

4.2. Impact of built environment predictors on physical independence

Table 5 shows the coefficients (Point Estimate), the Wald Chi-Square statistic, and associated p-values. The chi-square test statistics and associated P-values indicate that the coefficients for income level and population density are statistically significant at 95% confidence level, while the odd ratios of number of destinations and land use mix are not statistically

significant. The result of the impact of built environment predictors on physical independence indicates a positive association with income level and negative association with population density as the following:

1. For a one category increase in income level, the odds of being physically independent increase by a factor of 1.32. Therefore, for people with disabilities getting the highest income level, the odds of being physically independent is 1.32 times as large as the ones getting the lowest income level being physically independent.

2. For a one level increase in population density, the odds of being physically independent decrease by a factor of 0.75. Therefore, for people with disabilities living in high-density neighborhoods, the odds of being physically independent is 0.75 times less than the ones living in low-density neighborhoods being physically independent.

Table 7. Odds Ratio Estimates showing the impact of the built environment predictors on communal and social activities.

Effect	Odds Ratio Estimates				
	Point Estimate	Wald Chi-Square	Pr > ChiSq	95% Confidence Limits	Wald
Income level 4 vs 1	2.443	3.5097	0.0410	0.960 6.218	
Population Density 3 vs 1	0.725	0.0189	0.0307	0.306 0.978	
Number of destinations 3 vs 1	3.144	2.6974	0.1005	0.801 12.334	
Land use mix 3 vs 1	1.435	1.8594	0.1727	0.132 2.439	

4.2.1. Impact of built environment predictors on occupation

Table 6 shows the coefficients (labeled Estimate), the Wald Chi-Square statistic, and associated P-values. The chi-square test statistics and associated P-values indicate that the coefficients for income level, population density, number of destinations, and land use mix are statistically significant at 95% confidence level. The result of the impact of built environment predictors on occupation indicates a positive association with income level, number of destinations, and land use mix, and negative association with population density as the following:

3. For a one category increase in income level, the odds of experience of full occupational activity increase by a factor of 4.12. Therefore, for people with disabilities getting the highest income level, the odds of experience of full occupational activity is 4.12 times as large as the ones getting the lowest income level.

4. For a one level increase in population density the odds of experience of full occupational activity decrease by a factor of 0.88. Therefore, for people with disabilities living in high density neighborhoods, the odds of experience of full occupational activity is 0.88 times less than the ones living in low density neighborhoods.

5. For a one category increase in number and variety of destinations, the odds of experience of full occupational activity increase by a factor of 1.19. Therefore, for people with disabilities living in neighborhoods with high number and variety of destinations, the odds of experience of full occupational activity is 1.19 times as large as the ones living in neighborhoods with low number and variety of destinations.

6. For a one category increase in land use mix, the odds of experience of full occupational activity increase by a fac-

tor of 2.00. Therefore, for people with disabilities living in neighborhoods with high land use mix, the odds of experience of full occupational activity is 2.00 times as large as the ones living in neighborhoods with low land use mix.

4.2.2. Impact of built environment predictors on communal and social activities

Table 7 shows the coefficients (labeled Estimate), the Wald Chi-Square statistic, and associated P-values. The chi-square test statistics and associated P-values indicate that the coefficients for income level and population density are statistically significant at 95% confidence level, while the odd ratios of number of destinations and land use mix are not statistically significant. The result of the impact of built environment predictors on communal and social activities indicates a positive association with income level and number of destinations, and a negative association with population density and land use mix as the following:

7. For a one category increase in income level, the odds of experience of full communal and social activities increase by a factor of 2.443. Therefore, for people with disabilities getting the highest income level, the odds of experience of full communal and social activities is 2.443 times as large as the ones getting the lowest income level.

8. For a one category increase in population density the odds of experience of full communal and social activities decrease by a factor of 0.73. Therefore, for people with disabilities living in high density neighborhoods, the odds of experience of full communal and social activities is 0.73 times less than the ones living in low density neighborhoods.

9. For a one category increase in number and variety of destinations, the odds of experience of full communal and social activities increase by a factor of 3.14.

Therefore, for people with disabilities living in neighborhoods with high number and variety of destinations, the odds of experience of full communal and social activities is 3.14 times as large as the ones living in neighborhoods with low number and variety of destinations.

10. For a one category increase in land use mix, the odds of experience of full communal and social activities increase by a factor of 1.44. Therefore, for people with disabilities living in neighborhoods with high land use mix, the odds of experience of full communal and social activities is 1.44 times as large as the ones living in neighborhoods with low land use mix.

5. Discussion, conclusion and recommendations

5.1. Income level and social inclusion

The findings of this study indicate that income level of neighborhoods has the greatest impact on social inclusion. It is significantly associated with the odds of social inclusion indicators at 95% confidence level. The results of the impact of income level on social inclusion indicate a positive association with all indicators of social inclusion. For a one category increase in income level, the odds of being physically independent increase by a factor of 1.33. Moreover, the increase factor applies to occupation (4.12) and communal and social activities (2.44).

People with physical disabilities who live in neighborhoods with high economic status such as *Khalda* and *Dabouq* are more likely to be included in society than who live in neighborhoods with low economic status such as *Al-Manara* and *Jabal Al-Nadeef*. The positive relationship between income level and inclusion is consistent with all literature reporting the relationship between poverty and disability inclusion.

Disability in Amman is both a cause and consequence of poverty. People with disabilities and their families are much more likely to experience financial hardships than people without disabilities at the same income level. Disability can lead to job loss, limited access to education and training, reduced earnings, and additional expenses on health care. This can make people with disabilities excluded from economic and social life in

many ways leading to poverty. Disability is also a consequence of poverty because poverty can limit access to health and preventive services and increase the likelihood that a person lives and works in an environment that may negatively affect health. In addition to this, they cannot afford to buy modern supportive devices that help them in commuting such as electric wheelchairs.

Neighborhoods with a low-income level in Amman are associated with other predictors such as residential instability and poor street conditions (Ababseh, 2013). This give an initial conclusion that people with disabilities who live in neighborhoods with high residential instability and poor infrastructure are less likely to be included in the society.

5.2. Mixed land use and social inclusion

Mixed land use represents the diversity of land uses in the neighborhood such as residential, commercial, recreational, mixed-use and public services. The results of the study indicate that land use mix is significantly associated with the odds of occupation ($P=0.025$), while it is not significantly associated with physical independence and participation in communal and social activities.

Land use mix has a positive impact on occupation and participation in communal and social activities. People with disabilities live in neighborhoods with a high percentage of land use mix such as *Shmisani* and *Jabal Al-Weibdeh* are more likely to participate in communal and social activities and have more working and education opportunities than people who live in neighborhoods with a low percentage of land use mix such as *Al-Bnayyat* and *Al-Msherefeh*. People with disabilities prefer living in neighborhoods that provide work and education opportunities within the neighborhood boundary, so they do not have to travel long daily distances.

The availability of land use mix is not significantly associated with physical independence and participation in communal and social activities. This is because of people's negative attitudes towards persons with disabilities or the lack of infrastructure and limited accessibility in these uses.

5.3. Number and variety of destinations and social inclusion

Number and variety of destinations of neighborhoods is significantly associated with occupation ($P = 0.025$), while it is not significantly associated with physical independence and participation in communal and social activities.

People with physical disability may be more likely to limit their participation in communal and social activities if they live in a neighborhood with no nearby access to shops and public services, than if they live in a neighborhood with many nearby shops and easy access to different destinations. Although variety and number of destinations have a positive impact on social inclusion, the interviews showed that many people with disabilities face other barriers that impede their participation such as attitudinal barriers, and poor financial conditions.

Variety of destinations has insignificant impact on physical independence because most of these destinations are inaccessible, hindering the independence of movement among people with physical disabilities. GAM is not responsible for the construction of sidewalks of private buildings whether they are residential or commercial (K. Qeque, personal communication, 2017). Therefore, there is no connectivity along sidewalks, which make the movement of people with disabilities almost impossible without getting other's assistance.

5.4. Population density and social inclusion

Population density has a negative impact on all social inclusion indicators. The associations between residential density and social inclusion observed in this analysis deviate from prior research suggesting that more density in the local community increases physical and social participation. Neighborhoods with high population density (over 22,000 ppl/km²) such as *Jabal Al-Akhdar* and *Jabal Al-Nadeef* have low economic status, poor infrastructure, lack of public services, and limited varieties of destination (Ababseh, 2013) which in return negatively affect the inclusion of

people with disabilities unlike previous studies in other cities around the world.

Lack of accessibility in Amman explain why the study results do not correspond to all previous studies as hypothesized. When asking people with disabilities if they prefer living in neighborhoods with high densities, high mixed-use area, and high number and variety of destinations, most of them prefer the accessible neighborhood with a high number of destinations and high mixed-use area. According to them, if the built environment is accessible without any barriers, they can move independently, be easily engaged in communal and social life activities, and would get better work and education opportunities.

Participants remark that local government and institutions concerned with people with disabilities affairs should find realistic solutions to reduce inclusion limitations, and insure full accessibility for them in order to be fully socially included in the society. As a result, urban environment, infrastructure and facilities can impede or enable inclusion of people with disabilities in the society.

6. Conclusion

The results of this research indicate that income level has a significant impact on all indicators of social inclusion. People live in neighborhoods with high economic status are more likely to be included than who live in neighborhoods with low economic status. They can get a better education and thus better job opportunities; also, they can afford to buy vehicles and assistive modern devices that help them in movement and participation in social and communal activities. Unlike previous studies, the results indicate that population density has a negative association with all indicators of social inclusion. It has been noted that neighborhoods with high population density have low economic status, poor infrastructure, lack of public services, and limited varieties of destination, which in return negatively affect the inclusion of people with disabilities.

The results also indicate that mixed use and number and variety of destinations have a significant impact on

occupation but insignificant impact on physical independence and participation in communal and social activities. Neighborhoods with high mixed-use facilities offer more jobs and education opportunities than neighborhoods with low land mixed. Land use and destinations have insignificant impact on physical independence and participation in activities because most of the are inaccessible.

Analysis of the status of people with disabilities in housing, education, education, and work sectors show that accessibility of the built environment has a significant impact on social inclusion. Lack of accessibility is one of the main reasons of social exclusion, which restricts the movement of people in access to places of education, employment and participation in various activities. Coordination and cooperation between all governmental agencies should be better applied to ensure environmental facilitation and inclusion in all sectors. Community awareness towards the issue of disability should also be achieved to reduce attitudinal barriers.

The findings of this research can be used as a basic material in the development of disability policies and social services, which lead to the full social inclusion for people with disabilities in Jordan.

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