

Study of poverty: A multidimensional approach: The case of the city of Agadir

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Abstract: Poverty is defined as a situation in which an individual or group of individuals lacks or has insufficient resources to meet their basic needs. The aim of this paper is to study poverty in the commune of Agadir, using a multidimensional approach. The results of the study reveal that Agadir's neighborhoods can be subdivided into five classes, each distinguished in terms of degree of vulnerability. The study confirms that there is a disparity in terms of income, standard of living, housing, education, safety, cleanliness and access to health and transport services in the commune of Agadir.

Keywords: Poverty ; Multidimensional approach; Principal Component Analysis; Morocco.

1. Introduction

Poverty is defined as a situation in which an individual or group of individuals lacks or has insufficient resources to satisfy their basic needs. It encompasses the economic aspect, which includes the general level of consumption, but also the non-financial aspect, which translates into the absence of minimum material conditions to ensure a rudimentary quality of life. Better poverty reduction planning depends on a good understanding of the socio-economic characteristics of the most vulnerable populations and their geographical targeting (DEZA, 2017).

In Morocco, the relative poverty rate¹ fell between 2001 and 2019, from 20.4% to 17.7%. It remains high, especially in rural areas, where it reached 36.8% in 2019. Over the same period, the incidence of relative poverty fell in urban areas, from 9% to 6.4%. Dealing with poverty is therefore an important issue. Its multiple facets were truly revealed through the health crisis that hit Morocco in March 2020.

¹ Selon la conception relative de la pauvreté, une personne est considérée comme pauvre lorsque son revenu disponible est inférieur au seuil de pauvreté relative qui a été défini.

According to the HCP, the incidence of poverty was multiplied by 7 during the confinement, reflecting the economic and social difficulties experienced by many Moroccan households (ONDH, 2021).

We can talk about vulnerability, which is considered in the literature to be a concept that refers to poverty. In fact, vulnerability groups together people whose economic resources are insufficient and/or people who are considered poor or close to the poverty line. Thus, it refers to people who are both poorly housed and poorly paid, and those who lack access to various sources of social protection and rights (Saunders, 2003).

As a result, this article aims to raise the determinants of vulnerability in the municipality of Agadir, and to take a multidimensional approach to poverty in the urban environment of Agadir. To this end, we will conduct documentary and empirical research.

This paper will be presented as follows: we will define the conceptual and theoretical framework of vulnerability and review the empirical literature. We will present the methodological process, which is in the form of a qualitative study. We will then present the results of the survey and the main recommendations.

1. Conceptual and theoretical framework

To be vulnerable is to be exposed to external threats, more or less predictable, which put to the test a number of resources held by individuals, groups and communities on territories. According to Chambers (1989): "A person's risk of harm (i.e. vulnerability) is the result of a set of distinct but related risks, namely: the risk of being exposed to a threat, the risk of a threat materializing, and the risk of lacking the protections necessary to cope with the threat" (Schröder-Butterfill & Marianti, 2006, cited by Martin, 2019).

This notion is used in the social sciences, in work on poverty and its treatment, and in labor market and employment analysis. In North American literature, the vulnerable are people whose economic resources are insufficient; people considered to be poor or close to the poverty level; people who are both poorly paid and poorly housed, but also lack access to various sources of protection and rights, such as social rights, which is also accompanied by a weakness of representation by a number of pressure and representation groups, such as trade unions (Saunders, 2003, cited by Martin, 2019).

1.1. Poverty definitions and vulnerability

In a given society, poverty refers to the fact of being in a situation of material inferiority in relation to the most privileged individuals; in particular, this translates into difficulties in providing for oneself and one's family. However, there is no universal definition of poverty. Poverty exists in a given society when a part of the population is unable to satisfy its basic needs

(Roach and Roach, 1972), or when its well-being (or standard of living) falls below a minimum set by the criteria of that society (Ravallion, 1996). Consequently, the definition of poverty and the poor is relative, since concepts of basic needs and well-being often vary from one area to another, and from one era to another. But whatever their diversity, all definitions of poverty can be grouped, according to Hagenaaers and De Vos, into three categories: "(i) poverty is having less than an objectively defined, absolute minimum, (ii) poverty is having less than others in society, (iii) poverty is feeling you don't have enough to get along". Based on the first definition, poverty is said to be absolute, based on the second definition, it is said to be relative, and based on the third definition, it is subjective. (Kobiane, 2006).

Several trends have emerged over the last few decades: the first defines poverty as a level of utility below a predefined standard. Economically, this utility would be approximated by a monetary variable, income or expenditure, the only one capable of accounting for individual satisfaction. For the proponents of the basic needs approach, assessing poverty on the basis of monetary resources alone obscures a part of human needs. For them, poverty is a multidimensional reality, expressed through a series of unsatisfied needs necessary for survival (Stewart, Streeten [1981]). The place of the monetary component in the basic needs approach is underestimated. Some authors have proposed integrating basic needs into a utility function expressed in terms of the costs required to acquire them. Thus, by constructing a monetary poverty line in basic needs costs. In the early 1980s, the capability approach (Sen [1981, 1985, 1992, 1999], Nussbaum [1995, 1999, 2002]) emerged as a reaction to social choice theory, to which Amartya Sen belongs, proposing an approach to well-being based neither on utility nor on basic needs. Drawing on the limitations of each of the previously proposed approaches, Sen offers a theoretical framework for the study of poverty, focusing on a new informational basis: capability. By placing the human being at the heart of the analysis, emphasizing the importance of his or her role as agent, focusing on freedom to be and to do, and moving beyond an assessment of poverty in terms of goods, Sen marks a renewal in the apprehension of development and poverty. Poverty will no longer be perceived as a lack of resources (monetary or in terms of goods and services), but as an inadequacy of the individual's capability as a whole, given his or her social environment and personal characteristics. (Bertin, 2007).

1.2. Poverty measurement and approaches

In order to measure poverty, which is characterized by its complex, multidimensional nature, three approaches have been adopted to capture the different facets of poverty.

- Monetary poverty, whose level is estimated in relation to household income or consumption expenditure. This concept of poverty is derived mainly from modern micro-economic theory (consumer theory), in which individuals maximize their well-being.

- Poverty of living conditions, the level of which assesses access to basic services such as education, health, drinking water, sanitation, etc. These goods are referred to as basic goods. These goods are called basic goods because their satisfaction is considered a prerequisite for the quality of human life. To this end, there are major differences of opinion concerning the nature and minimum quantities of these basic goods. The traditional approach to basic needs considered basic amenities to include: food, drinking water, sanitation, housing, health, basic education and access to public transport.
- Poverty of potential. This school of thought refers neither to utility nor to the satisfaction of basic needs, but to human capabilities. It is the most recent approach to poverty, whose main leader is Amartya Sen. It also involves diagnosing the household environment and living conditions, as well as people's perceptions and feelings (Moumami, 2009).

1.2.1. Monetary approach

The poverty rate is the proportion of households whose standard of living is below an amount called the poverty line. The poverty line can be determined either absolutely or relatively. An absolute poverty line is determined in relation to the satisfaction of certain needs. Its amount is re-evaluated according to price rises. A relative poverty line, applied in European countries, is determined in relation to the standard of living of the population as a whole. (Seys et al, 2002).

A common measure of extreme poverty is useful, as it enables international comparisons to be made. The World Bank introduced a "dollar-a-day" poverty line as a measure of absolute poverty in the world's poorest countries in 1990. A new poverty line of \$1.25 a day was introduced in 2005 (equivalent to \$1.00 a day in 1996). In 2020, this threshold reached \$1.90 per day, calculated on the basis of the national poverty lines of the 15 poorest countries in the world. It corresponds to the minimum resources a person needs for food, clothing and housing in these countries. The World Bank Group and the international community adopted this line in order to focus aid on the poorest as a matter of urgency, and to provide a stable measure for assessing progress in individual countries.

Other poverty lines recognized by the World Bank are \$3.20 per day for lower-middle-income countries and \$5.50 per day for upper-middle-income countries. The World Bank has also introduced a multidimensional measure of poverty, which takes into account access to education and basic services, and a societal poverty line, which is based on each country's representative level of consumption or income, and whose value increases as the country becomes wealthier (World Bank - a, 2020).

1.2.2. Wellness approaches

This is the non-axiomatic approach based on the aggregate well-being indicators provided by the World Bank. Examples include the Human Quality of Life Index (HQLI), which gives equal weight to illiteracy rates, infant mortality rates and life expectancy at birth. Among the most important indicators aggregated by the UNDP are the Human Development Index (HDI) and the Human Poverty Index (HPI). However, according to Ravallion and Chen, 1997, these indicators are rather vague and relatively weak in terms of choice of components, weighting, aggregation procedures and estimation rules. The axiomatic approach revolves around the analysis that poverty being a complex concept, its analysis can only be facilitated by the adoption of axioms for the measurement of poverty.

The work of Bourguignon and Chakravaty (1999), considered a reference in the field, is based on an axiomatic approach to the properties sought in the poverty index and on a composite poverty measure referring to a given poverty line for each indicator. (Lahrizi, 2018).

2. Data description and research methodology

2.1. Data description

In order to assess vulnerability in the commune of Agadir, we conducted a survey of residents, chosen by convenience. To this end, during the period December 2020 to June 2021, we sent a questionnaire (on Google form) to 355 residents belonging to 56 districts of the commune.

For the purposes of the survey, each neighborhood can be divided into 6 zones (low-cost apartments / medium and high-standard), villas (small / large), houses (developed / undeveloped subdivisions), according to their specific characteristics.

The interviewers administered the questionnaire and recorded the responses "face to face". Our sample of 355 Agadir residents was diverse in terms of gender, age and family status. The profile of respondents is strongly dominated by people aged between 20 and 40, with a contribution of 61%, followed by the 40-60 age group with a percentage of 28.60%. We note that the results of the study focus more on people aged between 20 and 60, which will enable us to achieve the objectives of the study, as this is the category that will offer the most significant elements of response in terms of vulnerability.

The questionnaire prepared on Google form is divided into 8 sections, each corresponding to the variables we determined on the basis of our literature review.

Table 1: Description of questionnaire Headings/variables

Variable	Objectives
Revenue	Evaluate the respondent's financial situation, while identifying his or her professional situation, sources of income and employment situation in the neighborhood.
Vulnerability	Quantify the respondent's economic situation, particularly during confinement.
Health	Evaluate the degree of access to health services received by the respondent, as well as their quality in the various study districts.
Education	Understand the level of education in each neighborhood.
Habitat/Housing	Distinguish between neighborhoods according to their level of vulnerability, based on the housing quality of the people surveyed.
Transport	Get to know the means of transport used and appreciate the benefits of public transport.
Safety, Cleanliness and living spaces	Assess the degree of security, the quality of waste management and the availability of living spaces.
Standard of living	Evaluate the respondent's financial situation and degree of access to leisure activities, including vacations, etc.

In order to capture the various multidimensional facets of poverty, particularly post Covid, we have broken down the above variables into several dimensions, resulting in 24 items.

Table 2: Study variables

Variable	Dimension	Abréviation
Revenue	Nature of work	CodV1_1
	Number of people working in the family	CodV1_2
	The family's sources of income	CodV1_3
	Neighborhood job profiles	CodV1_5
	Unemployment in the neighborhood	CodV1_6
Vulnerability	Income from confinement	CodV2
Health	Respondent's state of health	CodV3_1
	The situation of disabled people	CodV3_2
	Situation of the elderly	CodV3_4
	Health benefits	CodV3_5
Education	Children's level of schooling	CodV4_1
	Educational level of young people	CodV4_2
	Studying after the baccalaureate	CodV4_3
	Child Labour	CodV4_4
	Illiterate people	CodV4_5
Habitat/Housing	Respondent's housing situation	CodV5_1
	Housing condition in the neighborhood	CodV5_6
Transport	Means of transport used	CodV6_1
	Most common means of transport in the neighbourhood	CodV6_2
Safety, Cleanliness and living spaces	Safety in the neighborhood	CodV7_1
	Garbage disposal in the neighborhood	CodV7_2
	Social Spaces	CodV7_5
Standard of living	The respondent's financial situation	CodV8_1
	Late payment problems	CodV8_2

2.2. Research methodology

We have opted for a positivist methodology. In addition, we consulted the works that deal, closely or remotely, with key words via an overview of conceptual geneses and also literary ones, which enabled us to adopt our methodological positioning.

To map vulnerability in the city of Agadir, we analyzed the data as follows:

Step 1: Principal component analysis

To analyze this type of data, we recommend the use of principal component analysis (PCA), a very useful tool for spatial comparisons (Lardé, 2004). PCA reduces the number of initial variables by eliminating redundant information and focusing on the information retained for a reduced number of new variables called "factors or dimensions".

Step 2: Hierarchical ascending classification

Hierarchical clustering is an unsupervised classification technique that consists of searching for the proximity of observations in a multidimensional space. The closest neighborhoods are grouped into classes. The technique used is Hierarchical Ascending Classification (HAC), which uses an algorithmic partitioning approach to classify neighborhoods with similar vulnerability indicators.

Step 3: Discriminant factor analysis

Discriminant Factor Analysis (DFA) is a supervised classification technique designed to classify individuals characterized by a number of numerical variables. DFA has a descriptive power, since it identifies the most discriminating indicators for characterizing each class. In this way, discriminant factor analysis makes it possible to anticipate neighborhood membership on the basis of a probability constructed conditionally on the discriminant variables (Desbois, 2003).

3. Results and discussion

After administering our questionnaire, we carried out two types of analysis: principal component analysis and discriminant factor analysis. Our study yielded the following results.

Analysis by neighborhood: Principal component analysis

Principal Component Analysis (PCA) is a multivariate analysis method for representing and studying the dispersion of scatterplots of statistical units in a plane delimited by factors that faithfully summarize the information provided by the different variables. It enables us to select the most relevant dimensions for describing the data set, according to their proportional preponderance in the data (Saporta, 2006).

Correlation table for initial variables

By analyzing the correlation matrix, we can identify groups of variables that are correlated with each other. The more correlations are identified, the more the PCA will yield factorial axes that are representative of the observations, and therefore a strong representation of the information by the axes.

In this context, it is important to check the correlation between the variables in the study:

- Income (CodV1)
- Vulnerability (CodV2)
- Health (CodV3)
- Education (Cod4)
- Housing (CodV5)
- Transport (CodV6)
- Safety, cleanliness and living spaces (CodV7)
- Standard of living (CodV8)

Overall, the matrix below reveals the existence of a weak correlation between the different variables in the study. There is a negative correlation between the CodV1 and CodV2 variables; in other words, the study has shown that when people's income increases, their degree of vulnerability decreases, and vice versa. On the other hand, the CodV1 and CodV3 variables are positively correlated, proving that access to health benefits is strongly dependent on the income of the people surveyed.

The correlation matrix reveals a strong positive correlation between the variables CodV1 and CodV8, in other words, the standard of living of the survey population depends on the individual's sources of income.

In addition, Bartlett's test rejects the hypothesis is significant ($p < 0.0005$), proving that the correlation matrix is not an identity matrix and therefore confirming the correlation between the variables presented by the correlation matrix.

Table 3 : Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,754
Approx. Chi-Square		2646,284
Bartlett's Test of Sphericity	df	300
	Sig.	,000

Choice of principal components: Eigenvalue table and diagram

Running the eigenvalue query allows us to identify the components that contribute most to explaining the total variance of the initial variables. The SPSS analyses revealed 25 components, the first of which has a value of 17.07%, i.e., it explains 17.07% of the total variance of the initial values. If we refer to the cumulative variance, we see that over 80% of the total variance is explained by the first 13 axes.

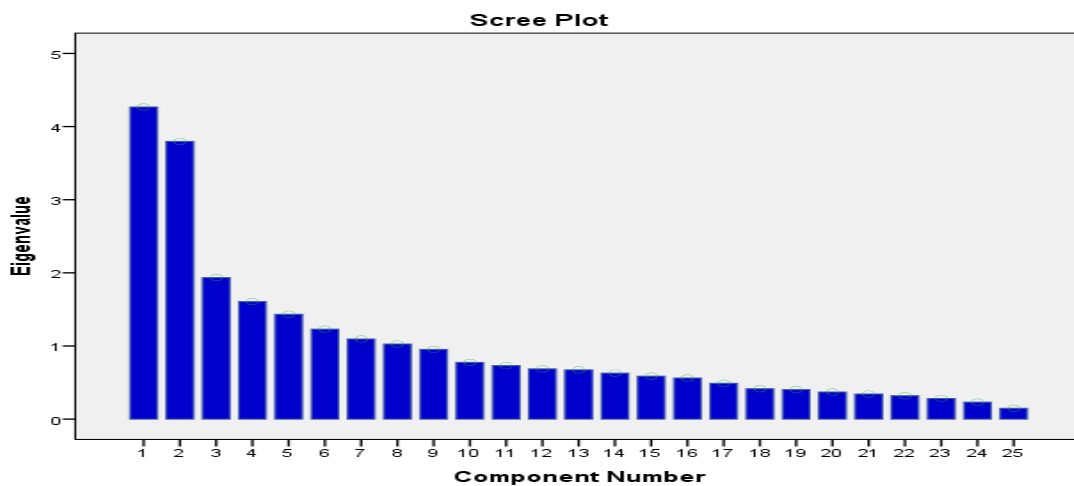
Table 4: Eigenvalues**Total Variance Explained**

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4,268	17,071	17,071	3,921	15,685	15,685
2	3,798	15,194	32,265	2,694	10,776	26,461
3	1,934	7,738	40,003	1,897	7,587	34,048
4	1,607	6,426	46,429	1,888	7,552	41,600
5	1,434	5,738	52,167	1,623	6,492	48,093
6	1,230	4,919	57,086	1,491	5,964	54,057
7	1,095	4,379	61,465	1,445	5,780	59,837
8	1,028	4,110	65,575	1,435	5,738	65,575
9	,953	3,812	69,387			
10	,776	3,103	72,490			
11	,731	2,924	75,414			
12	,687	2,748	78,162			
13	,673	2,693	80,856			
14	,630	2,519	83,375			
15	,588	2,353	85,727			
16	,561	2,246	87,973			
17	,491	1,962	89,936			
18	,415	1,661	91,597			
19	,403	1,611	93,208			
20	,371	1,482	94,690			
21	,344	1,377	96,067			
22	,320	1,279	97,346			
23	,283	1,131	98,478			
24	,232	,927	99,405			
25	,149	,595	100,000			

Extraction Method: Principal Component Analysis.

According to the eigenvalue graph, two principal components can be retained. In fact, the difference in variance between the second and third components is very significant.

Figure 1: Eigenvalue diagram



Interpreting factorial axes: Matrix and digram of principal components

The component matrix, or component diagram, shows the correlations of the initial variables with the principal components. The first component is highly correlated with CodV4 (Education) and CodV1 (Income). The second component shows a strong positive correlation with the CodV6 variable (Transport), while the other representations are weak. On the other hand, the third component is strongly positively correlated with the variable relating to Safety, cleanliness and living spaces.

Table 5: Matrix of principal components

	Rotated Component Matrix ^a							
	Component							
	1	2	3	4	5	6	7	8
CodV4_5b	,839	,138	-,010	,012	,074	-,145	,066	,014
CodV4_5a	,811	-,215	,176	-,030	,090	,103	,092	,035
CodV4_5c	,731	,491	-,014	,048	-,027	-,124	,009	-,079
CodV4_5d	,689	,311	-,165	-,076	,122	,048	-,182	,067
CodV1_6b	,661	-,157	-,015	,034	,114	,050	,218	-,143
CodV1_6a	,643	-,245	,344	,046	,060	,191	,103	,009
CodV4_5e	,553	-,344	,033	-,030	-,527	,015	,055	,152
CodV6_2	,107	,806	,142	,145	,073	,110	,016	-,015
CodV6_1	-,005	,645	,186	,304	-,231	,133	,085	,136
CodV3_5c	,165	-,584	-,256	,066	,286	,124	,240	-,135
CodV8_1	,186	-,521	,231	-,483	,204	,152	,114	,150
CodV7_5	-,152	,092	,681	,082	-,344	-,140	-,042	-,109
CodV7_2	,263	,214	,634	,163	,196	-,037	-,037	,086
CodV1_3	,130	-,024	,120	,772	-,077	,017	,010	,188
CodV2_1b	,125	-,257	-,073	-,641	-,066	,136	,027	,179
CodV2_1a	,078	,397	,449	,551	,061	-,017	,115	-,066
CodV3_4	,176	-,252	,104	-,067	,652	,141	-,093	,286
CodV3_5a	-,310	,150	,239	-,002	-,595	,129	-,234	,169
CodV3_5b	-,021	,009	-,178	-,103	-,147	,718	-,379	-,048
CodV5_6	-,019	,003	-,048	-,137	,194	,691	,205	,074
CodV5_1	,111	,107	,405	,182	-,076	,477	-,017	,071
CodV7_1	-,143	,107	,242	-,086	,023	,118	-,770	,045
CodV8_2	,093	,107	,355	-,145	,058	,146	,628	,209
CodV1_1	-,129	,096	-,057	,220	-,204	,012	,077	,765
CodV1_2	,054	-,019	,054	-,191	,238	,051	,008	,688

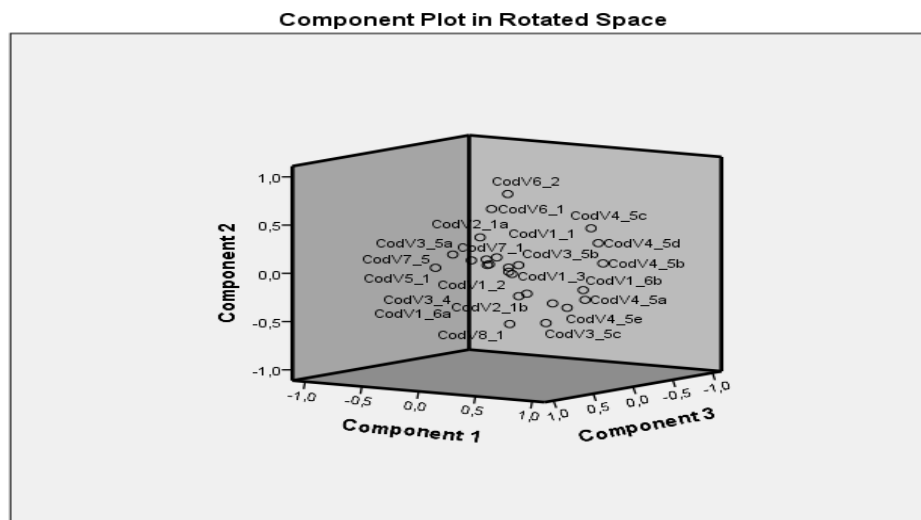
Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.^a

a. Rotation converged in 19 iterations.

The figure below shows the factor coordinates of the variables on the factor plane delimited by the three principal components. It also shows the rotated component matrix, which assesses the quality of representation of the variables on the axes and gives them meaning.

Figure 2: Principal components factorial design



3.1. Hierarchical ascending classification

Hierarchical ascending classification is used to partition observations into homogeneous groups based on the principal components previously identified. The use of Ward's method, based on the decomposition of the variable, enables the creation of groups characterized by both low intra-class variance and high inter-class variance (Tenenhaus, 2007).

3.1.1. Dendrogramme of communes

Based on the principal components we have identified, and using Ward's aggregation method, the result of the hierarchical ascending classification is visualized using the dendrogram.

3.1.2. Neighborhood groups obtained

The dendrogram obtained through hierarchical ascending classification shows the organization of Agadir's neighborhoods into 5 homogeneous classes.

Table 6: Hierarchical ascending classification of neighborhoods

Class 1	Class 2	Class 3	Class 4	Class 5
Les Amicales	Ihchach	Founty	Douar Amzil	Bicha Jet Sakan
Lakhyam 2	Al Hajeb	Najah	Ait Al Mouden	Ennahda
Azaytoun & Biranzarane	Al Qods	Ville Nouvelle	Ighil Nouderdour	Hassanya
Lakhyam 1	Boutchakat	Illigh	Imounssiss	Lagouira
Adrar	Sidi Youssef	Al Wifaq	Ahlaka	Riad Essalam
Bensergao	Al Massira	Charaf	Ait Taoukt	Salam
Tilila	Abatoir	Cité Suisse	Al Jihadya Filahya	Tildi
Hay Al Farah	Al Wafa		Ahlaka	Quartier Administratif
Assaka	Dakhla		Al Farabi	
Bouargane	Sidi Mohamed		Taoukit	
Al Houda	Anza			
Talborjt	El Ghazoua			
Quartier Industriel	Extension Dakhla			
Hay Mohammadi	Taddart			
Aghroud				
Ammesirrate				
Laazib Moulay Rachid				

It is imperative to note that the present classification cannot be used to map poverty in the city of Agadir without a discriminant factor analysis.

3.2. Discriminant factor analysis

Discriminant factor analysis is used to explain the oppositions between groups of neighborhoods in the city of Agadir, a priori constituted by hierarchical ascending analysis, through the descriptive statistics of neighborhood classes and the combination of discriminant variables that differentiate between them. This allows us to construct a synthetic score that determines group membership according to an assignment rule. In addition, discriminant factor analysis enables us to anticipate neighborhood membership on the basis of a probability built conditionally on the discriminant variables (Desbois, 2003).

3.3. Determining discriminant variables

Discriminating variables are identified firstly by reference to tests of equality of group means, and secondly through the structure matrix. To optimize the choice of discriminating variables, we performed a stepwise factorial analysis.

3.3.1. Tests for equality of means

Exploration of the tests for equality of group means (Table 7) shows that the majority of variables have a Wilks' lambda of less than 0.9. In fact, the equality of variable means is not confirmed. Wilks' Lambda is the ratio of intra-class variance to total variance. The most discriminating indicators have the lowest Wilks' Lambda values.

Table 7: Test of equality of group means

Tests of Equality of Group Means					
	Wilks' Lambda	F	df1	df2	Sig.
CodV1_1	,963	2,946	4	309	,021
CodV1_2	,925	6,262	4	309	,000
CodV1_3	,813	17,787	4	309	,000
CodV1_6a	,710	31,625	4	309	,000
CodV1_6b	,762	24,118	4	309	,000
CodV2_1a	,604	50,698	4	309	,000
CodV2_1b	,764	23,823	4	309	,000
CodV3_4	,670	38,023	4	309	,000
CodV3_5a	,844	14,331	4	309	,000
CodV3_5b	,837	14,998	4	309	,000
CodV3_5c	,784	21,315	4	309	,000
CodV4_5a	,300	180,444	4	309	,000
CodV4_5b	,336	152,375	4	309	,000
CodV4_5c	,437	99,462	4	309	,000
CodV4_5d	,619	47,629	4	309	,000
CodV4_5e	,580	55,980	4	309	,000
CodV5_1	,953	3,776	4	309	,005
CodV5_6	,873	11,264	4	309	,000
CodV6_1	,642	43,039	4	309	,000
CodV6_2	,616	48,146	4	309	,000
CodV7_1	,939	4,985	4	309	,001
CodV7_2	,389	121,261	4	309	,000
CodV7_5	,766	23,647	4	309	,000
CodV8_1	,519	71,730	4	309	,000
CodV8_2	,991	,716	4	309	,581

3.3.2. Structure matrix

The structure matrix presents the coefficients of the factor structure, which expresses the degree of intra-class correlation between discriminant variables and discriminant functions. The latter are the linear combination of factors that distinguish between groups of communes.

Table 8: Structure matrix

	Structure Matrix			
	Function			
	1	2	3	4
CodV4_5a	,546*	,110	-,050	,107
CodV4_5b	,454*	,297	,159	-,078
CodV1_6a	,212*	,036	-,164	,125
CodV1_6b	,195*	,039	,097	,044
CodV7_1	-,088*	,001	,012	,066
CodV7_2	-,115	,506*	-,292	,466
CodV4_5c	,244	,404*	,299	-,158
CodV2_1a	-,116	,333*	,102	-,254
CodV1_3	-,024	,221*	,082	-,114
CodV2_1b	,081	-,220*	-,087	,193
CodV3_5c	,141	-,144*	-,087	,144
CodV8_2	,010	-,040*	-,019	-,034
CodV6_2	-,128	,249	,395*	-,055
CodV4_5d	,213	,122	,361*	,081
CodV7_5	-,117	,128	-,283*	-,092
CodV3_5b	-,010	-,139	,261*	,084
CodV5_6	,028	-,132	,168*	,135
CodV3_4	,105	-,090	,143	,501*
CodV8_1	,163	-,328	-,287	,344*
CodV6_1	-,149	,227	,167	-,315*
CodV4_5e	,252	-,030	-,281	-,289*
CodV3_5a	-,121	,018	-,072	-,219*
CodV1_2	,036	-,081	,070	,165*
CodV5_1	-,038	-,010	,020	-,164*
CodV1_1	-,043	-,027	-,017	-,123*

*. La plus grande corrélation absolue entre chaque variable et toute fonction discriminante.

The structure matrix table above shows the discriminant variables with the most significant correlations with the discriminant functions resulting from the step-by-step AFD analysis.

3.4. Class interpretation

Examination of the descriptive statistics enables us to define the multidimensional poverty profile in terms of deprivations relating to the living environment and conditions, as well as education and social

services, for each class of communes. To do this, we will rely on an inter-class and intra-class analysis of the means and standard deviations of the discriminant variables in each class of communes.

The analyses presented in the table of descriptive statistics for the discriminant variables show that class 3 is considered to be the best-performing class, particularly in terms of the income of citizens living in the neighborhoods included in this class. It groups together neighborhoods with a low vulnerability indicator and good housing and habitat indicators. Class 1 is made up of middle-income neighborhoods with a good level of education. On the other hand, the neighborhoods that make up this class present dysfunctions in terms of health provision, so the class groups together neighborhoods with an average standard of living. The 2nd class groups together a large number of neighborhoods with somewhat similar characteristics. It is characterized by an adaptable level of income and a representative level of education. However, there is a lack of transport services.

Class 4 is the most vulnerable class compared to the other classes in the study. The table of descriptive statistics shows that the population of these neighborhoods suffers from inadequate cleanliness and transport services, as well as inadequate living standards, particularly in terms of leisure activities.

Finally, class 5 is considered to be a middle-income class with a good level of education. It is characterized by an acceptable standard of living, particularly in terms of transportation and housing. By examining the descriptive statistics, we can define the multidimensional poverty profile in terms of deprivations relating to the living environment and conditions, as well as education and social services, for each class of commune. To do this, we will rely on an inter-class and intra-class analysis of the means and standard deviations of the discriminant variables in each class of communes.

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3.5. Vulnerability mapping

The vulnerability map for Agadir's neighborhoods, presented in figure 3, reflects the results of the analysis carried out:

- The majority of neighborhoods in class 3 have good indicators, particularly in terms of income, housing type and standard of living. The analyses carried out revealed that the population living in the neighborhoods making up this class are characterized primarily by substantial financial resources, as the majority of residents hold professional positions that enable them to enjoy a good level of income. The analyses revealed that the level of education in these neighborhoods is high, as the "Education" variable showed us significant performance, while proving the non-existence of Child Labour in these neighborhoods, with the highest rate in terms of school enrolment for children and young people. Class 3 also boasts a very good "Housing" score, as the survey revealed that this class is characterized by a large number of dwellings, notably villas and high and medium-rise apartments. The survey results confirmed that residents in these neighborhoods have the highest standard of living, particularly in terms of their financial situation and leisure activities. As far as means of transport are concerned, residents of these neighborhoods often use private cars. What's more, residents of these neighborhoods enjoy the best services in terms of garbage disposal and security.
- Class 4 neighborhoods are considered to be the most marginalized, while at the same time displaying a high degree of vulnerability compared to the other classes, especially in terms of the quality of cleanliness and transport services, as well as living standards. The results of the survey revealed that the inhabitants of these neighborhoods suffer from inadequate incomes, especially as this class is mainly made up of workers in the informal sector, which does not provide them with sufficient financial resources. This class is characterized by a high level of unemployment among young people, which worsens their financial situation and prevents their social integration.

The inhabitants have a high illiteracy rate and a low level of schooling. This is mainly due to a number of reasons, including the scarcity of local schools, colleges and lycées, and the financial situation of families, which pushes young people to leave education in order to find

work. The inhabitants of these neighborhoods live in insalubrious, informally-built housing, which does not allow them to live with dignity.

We can confirm that class 4 neighborhoods are considered to be the most marginalized, with a high degree of vulnerability, particularly in terms of income, health services, transport, safety and social amenities. As a result, local authorities have to respond to the social demands of these citizens in order to preserve a dignified standard of living.

- Class 2 comprises the majority of neighborhoods characterized by an average level of vulnerability, while at the same time presenting an inadequacy in terms of transport services. Inhabitants of these neighborhoods, who make greater use of public transport, particularly buses, to meet their travel needs, suffer from the quality of public transport in terms of punctuality and cleanliness. In addition, residents in these neighborhoods have a higher income level than those in class 4. The results also revealed that class 2 residents enjoy good garbage disposal services, with a higher level of security. This class is characterized by a good level of schooling for children and young people, with a low rate of illiteracy. Health services are fairly well developed. Class 2 inhabitants benefit from the availability of health centers, hospitals, dispensaries and private clinics, enabling them to meet their health needs and preserve their health.
- Class 1 is characterized by a representative level of education with average incomes, while it presents dysfunctions in terms of health provision. The results of the study revealed that the inhabitants belonging to this class benefit from good educational services, with good school enrolment indicators for children and young people, as these neighborhoods are characterized by the availability of schools, colleges and high schools, and are close to university establishments. The inhabitants of these neighborhoods have sufficient income to meet their daily needs. This class benefits from good waste disposal and more living space. However, the population suffers from the lack of local dispensaries to receive care, without having to turn to private clinics.
- Class 5 comprises fewer neighborhoods than the other classes. It is very similar to class 1 in terms of income and standard of living. Inhabitants of this class are distinguished by an average level of financial income, enabling them to meet their daily needs and have access to transport and health services. They also enjoy a high level of security. These neighborhoods also score well in terms of education, with a sufficient number of schools and universities.

4. Conclusion

In this study, we mapped vulnerability in the city of Agadir. We defined the conceptual framework and reviewed the empirical literature. We then presented the methodological process, using principal component analysis, hierarchical ascending classification and discriminant factor analysis as the methodological process to be followed. Finally, we presented the main findings and implications of the study.

This derogation revealed that the neighborhoods of the Agadir commune can be subdivided into five classes that are distinguished in terms of their degree of vulnerability. Class 1, which groups together average neighborhoods, is characterized by a representative level of education and average incomes, while showing some dysfunctions in terms of health services. Class 2 is made up of neighborhoods with an average level of vulnerability, but with inadequate transport services. Class 3: affluent neighborhoods with good indicators, notably in terms of income, housing type and standard of living. Class 4 is made up of the most marginalized neighborhoods, with a high degree of vulnerability compared to the other classes, especially in terms of the quality of cleanliness and transport services, as well as living standards. Finally, class 5, which includes a smaller number of neighborhoods than the other classes, is very close to class 1 in terms of income and standard of living. Based on the results of our study, we can confirm that in the commune of Agadir, there is a disparity in terms of income, standard of living, housing, education, safety, cleanliness and access to health and transport services. This calls for collaboration between the various local players, notably the local authority, associations and civil society, in order to combat vulnerability and ensure effective social inclusion for all Agadir's inhabitants.

According to our analysis, we recommend stepping up efforts to promote the economic inclusion of young people and women, especially in class 4 neighborhoods, while offering financing programs that encourage entrepreneurship, in order to improve the population's financial situation. In this context, local authorities, through the INDH, can propose specific economic and social inclusion programs for the inhabitants of these neighborhoods in order to eliminate social inequalities. Local authorities and managers also need to improve services in the areas of waste management, security and education, while proposing new social development programs aimed specifically at these neighborhoods.

Collaboration between local authorities and associations working in the field of social inclusion should be strengthened to help combat the population's vulnerability. Associations should be involved in setting up programs to support the vulnerable population and combat precariousness.

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