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**Unpacking residential segregation:  
a spatial analysis of the effects of social policies**

A case study in an intermediate Colombian city

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## List of Acronyms

LMP	Land Management Plan
LAB	Local Administrative Boards
DANE	National Administrative Department for Statistics
MAUP	Modifiable Spatial Unit Problem
DAM	Mayor Administrative Division
MPI	Multidimensional Poverty Index
CTP	Conditional Transfer Programs
FeA	Familias en Acción
SRM	Social Risk Management
SPS	Social Promotion System
DPS	Department of Social Prosperity
JeA	Jovenes en Acción
MDP	Municipal Development Plan

## **Abstract**

As is well known, residential segregation is a long-standing phenomenon. However, its conceptualization has been approached from so many points, methodologies, and disciplines. At the same time, it is confusing to have an exact definition of what it is and its implications. For this reason, an analytical literature review is presented. Dividing the conceptions into four groups that account for its origin from the market and growth of industrial cities; the problematization of the strata; the instrumentalization in which segregation analyses often become; and the social problems with which it is generally associated. Recognizing the complexity and seeking to understand and contribute other edges to the analysis, an empirical exercise was carried out in Bucaramanga, an intermediate city in Colombia. The multidimensional poverty index was used as an approach to the condition of the population, and the relationship between segregation and social policies was analyzed, considering the non-direct implications of the largest social program in the country: Familias en Acción (Families in Action). As a result, it was found that the program does indeed reach the poorest of the poor (due to its targeting condition). However, its implementation deepens the differences between those who receive and those who do not and how to access such public benefits. This leaves many debates open, inviting future research to overcome data and conceptualization limitations.

## **Relevance to Development Studies**

The relevance of this work for development studies could be divided into two major themes: social policies and poverty, which, although related, are approached from different spheres. However, a common thing they follow is that their theorizations are oriented towards politics and technocracy, the product of following development agendas. Following orthodoxy, they emphasize the measurement of absolute measures, such as the Multidimensional Poverty Index that will be used in the analysis of the document. But at the same time, it will be questioned. The work rethinks and questions the statistical and institutional constructs of a specific social reality, such as Bucaramanga. It contributes to the theoretical discussion of segregation. Precisely, because the conceptions of poverty need an understanding of the evolution of the imperative social needs within the studies of development. Being aware that statistics and public policies are shaped by power relations and ideological ways of seeing the world that permeate their institutional origins. From the understanding of the non-direct implications of social policies the author seeks to contribute to the debate.

## **Keywords**

Residential Segregation, Social Policies, Urban poverty

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*This work is dedicated to God, who despite my smallness took notice of me and guided me through the comings and goings of this journey. And those who have always believed in me, and who have been committed to this master's voyage that has brought me to this point - my family, the one that I fortunately received from life, and the one that coincidences have been completing it. Especially to my grandparents, who with their joyful laughter encouraged every word of this Rp, I honour their life and their legacy.*

*To the province, to that "deep Colombia" that has much to say, analyze and contribute to the national debate. To Bucaramanga, city of parks and gente bonita that inspires to work for its people, because as the song says*

*Quien ha pisado tu suelo  
nunca te podrá olvidar  
en su corazón señora  
para ti tendrá un altar*

*Suspirando porque un día  
como canta el trovero  
pueda dormirse por siempre  
frente a tu parque Romero*

*And to all the poor and segregated who inspired this work, to the many faces that are still hidden behind numbers, still separated by visible and invisible barriers and still forgotten by many. For their recognition, for their silent struggles and the dignification of their lives, which go beyond the label of "poor". And for contributing to make other realities visible, so that privilege does not cloud our empathy.*

# Chapter 1

## Introduction

Based on the assumption that social policies help to resolve inequality, it would be worth asking whether or not they are actually helping to resolve the situation from the perspective of residential segregation. As a starting point, I would begin by defining social policy, which is often conceptualized in terms of social services such as education, health or social security, even though it encompasses other aspects such as protection and social justice. In this sense, the objectives of social policies are often instrumentalized by governments, turning them into flags for overcoming vicious circles of poverty, assuring human development, employment and economic growth. Thus, they can be understood as those policies that fight against "social" problems within the framework of the development of the Welfare State. Within the general conceptualizations, it is given the connotation of human creation, which must respond to spatiotemporal needs, conditioned to institutional means and manifestations. However the provision of social policies has not necessarily broken the cycles of poverty, and precisely in this research, the objective will be to analyze if in reality, social policies in their processes can segregate the poor in multidimensional terms, or what other effects they might have, since their implementation.

In this sense, to analyze the relationship between social policies and segregation, it is necessary to begin by understanding the theoretical and practical implications of the phenomenon. This is precisely one of the objectives of the research, starting with understanding the notion of "segregation" -even with its ambiguities- and how it has been changing to show a wide range of situations, being inscribed as such in academic and political agendas. It often operates as a conceptual tool to show the processes and practices of social groups in the urban environment and as a critical formulation, it is the antonym of "integration", which tends to be confused with inequality, a reason that this paper seeks to emphasize and differentiate in the development of the theoretical review of the concept of segregation. In these terms, more than a category, it is a notion that has been reformulated over time and in the heat of the debates in the different disciplinary fields, debates that will allow to understand it better, and to see its conceptualization and measurement, in order to take it to a particular context under the empirical application of the analytical results.

Taking into account the complexities of the phenomenon of segregation, and how it can be analyzed from different perspectives and methodologies. A 2-step analysis methodology will be followed, in the sense that the analysis will be divided into two main fronts. One will be the analysis of the data, which will have as a complement that quantitative and qualitative data will be taken for a better approach to what segregation means and how it is reflected in a particular reality, which in this case will be in the city of Bucaramanga. Thus, a literature review will be made with an analytical approach, in which the main objective is to assess the way other authors have defined or tried to measure or analyze segregation, and to examine potential problems, tensions, etc. Precisely, because the conceptual debate on residential segregation persists; therefore, any empirical inquiry on it should be aware of the diversity of readings it affects and followed by an analysis using spatial techniques to situate the problem in a spatial reality.

As a second step, an institutional analysis will be made, which will allow to understand whether or not the programs and policies formulated to be analyzed reflect the problems found in the data, or if the results of the spatial techniques can be explained from what is on paper, especially the Land Management Plans and the Municipal Development Plans, which at the local level, will be analyzed. These plans, which account for the planning of public management, make it possible to identify, order and articulate in a concrete manner the strategies that are being carried out to achieve the goals of the municipality (Ibarra 2007). Precisely because planning is a dynamic and not a static process, it is worthwhile to analyze the way in which policies are determined and, in this case, whether they influence in any way the spatial distribution or the situations of vulnerability that are exposed among the city's inhabitants.

## **1.1 What is this research about?**

### **1.1.2 Main question**

How do social policies influence trends in residential segregation, and to what extent are these particular policies part of the problem or part of the solution, bearing in mind that other types of issues could be involved?

### **1.1.3 Sub-questions**

-What is the nature of segregation in Bucaramanga and what are the other factors influencing segregation?

- From what point of view could social policies and their programs be understood in the spatial analysis of segregation?

## Chapter 2 Bucaramanga: socioeconomic and territorial context

Colombia is a nation of regions, and each of them is led by urban centers. In the case of northeastern Colombia, Bucaramanga is one of the cities that stand out for its size and competitiveness. In the territorial context, it is the capital of the department of Santander, the fourth economic region of Colombia (Rodríguez and Calderon 2015). Bucaramanga is a municipality with an area of 165 km<sup>2</sup> and is divided into 17 communes, which include 219 neighborhoods and 36 urban settlements. It also has a rural area composed of 29 *veredas*<sup>1</sup> and 15 rural settlements. As an aspect to take into account, it is very close to the seismic nest or swarms called Los Santos, one of the most active in the world, an issue that will be relevant in the zoning analysis, given the seismic threats, given the city's development and urban planning. Regarding the demographic composition of the municipality, it can be said that the total population projected for Bucaramanga in 2020 is 607,428 inhabitants, equivalent to 1.2% of the national total (DANE, 2018). Of these, 597,316 (98.33%) inhabit the urban area, while 10,112 (1.67%) are located in rural area. On the other hand, it should be noted that 52.47% (318,724 inhabitants) are female, and the remaining 47.53% (288,704 inhabitants) are male. For the development of this research, it is also important to highlight that communes 1 and 13 have the highest proportion of inhabitants (10.31% and 9.94% respectively), in contrast to commune 15, which has the lowest percentage (1.64%), as shown in the following table. On the other hand, communes 11 and 14 correspond to the areas most affected by erosion, landslides, and floods.

**Map 1. Communes of Bucaramanga**



Source: Author's elaboration, with data from DANE (2018).

<sup>1</sup> This is a term used in Colombia to define a type of territorial subdivision of the country's different municipalities. *Veredas* mainly comprise rural areas, although they may sometimes contain a micro-urban center (Linerós, Figueredo, and Figueredo 2021).

**Table 1. Demographic participation by communes in Bucaramanga**

Commune	Participation (%)	Population 2020
Commune 1 (North)	10,31%	61.583
Commune 2 (Northeastern)	6,66%	39.781
Commune 3 (San Francisco)	8,49%	50.712
Commune 4 (Western)	7,26%	43.365
Commune 5 (García Rovira)	8,01%	47.845
Commune 6 (La Concordia)	5,35%	31.956
Commune 7 (Ciudadela)	5,50%	32.852
Commune 8 (Southwesterdn)	3,50%	20.906
Commune 9 (La Pedregosa)	3,15%	18.815
Commune 10 (Provenza)	6,14%	36.675
Commune 11 (South)	5,41%	32.315
Commune 12 (Cabecera del Llano)	6,35%	37.930
Commune 13 (Eastern)	9,94%	59.373
Commune 14 (Morrórico)	4,36%	26.043
Commune 15 (Centre)	1,64%	9.796
Commune 16 (Lagos del Cacique)	2,85%	17.024
Commune 17 (Mutis)	5,08%	30.344
<b>Total</b>	<b>100%</b>	<b>597.316</b>

Source: Author's elaboration, using data from DANE (2018)

As can be seen in the maps<sup>2</sup>, it gives us an idea that the city is heterogeneous in terms of population density. Since one of its communes with the most significant number of inhabitants is commune 1, located in the north of the city, followed by commune 13, which is further to the east. Likewise, the risk of being affected by natural phenomena is higher in the south, reaching the city's north. That situation leaves an important point as a precedent in terms of policies, which cannot be focused only on one point of the city, having critical enclaves in the two extremes of the cardinal points. On the other hand, Bucaramanga is one of the cities with the more middle class in the country, which means the majority of the population is in the strata 3 and 4. By way of context, cities in Colombia are divided into strata, ranging from 1 -6, being 1, 2, and 3 the lowest and who receive subsidies in essential services such as water, gas, and electricity, and respectively the highest are 4, 5 and 6, who contribute to the subsidy of those who precede them. Although at the time (the 90s), the model was created under principles of solidarity, and with a critical reality of poverty

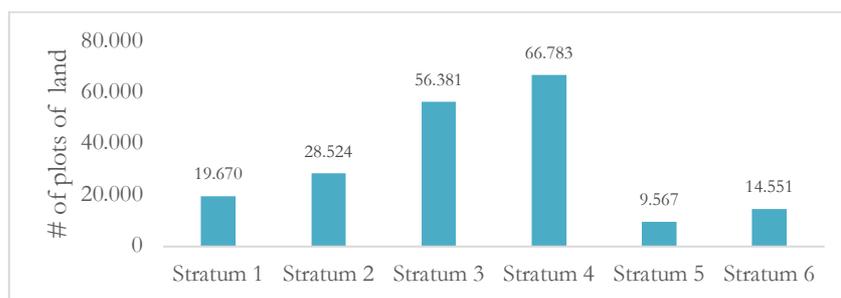
<sup>2</sup> more detailed maps in appendix 1.

(statistics of almost 40%), it has been perverted. Segregation has been accentuated to such a level where citizens are identified by the place they live, almost as if it were a caste system.

Going into detail on the classification of strata, the State is limited to evaluating the facade of the house, the materials, the conditions of the surrounding road, the sizes of houses, sidewalks, front yards, garages, and materials of facades and roofs. A myriad of elements that today say nothing about household income (ignoring that the analysis should go beyond the monetary element). Large sectors and popular areas in all cities have abused this obsolete classification and have maintained their low stratum to the detriment of those who truly need to be subsidized. To such an extent that, according to organizations such as UN-Habitat, Lippi, its spokesman, has expressed the situation that "stratification generates perversions that are one of the traps of poverty. Since the strata were created 30 years ago, the social dynamics changed, so it is difficult to think that the areas remain as homogeneous as they are located with the stratum" (2019, Took from an interview in El Tiempo, Traslated by the author). And it is precisely that, not in vain, these three decades under this system have created a collective imaginary that reaches levels of dispossessing citizens of any other attribute other than the place where they live. To the point that, in popular slang, social strata are imposed, transcending ideological and political understandings. Thus, the socio-spatial location has generated discrimination, both on the side of the rich and the poor.

Therefore, it is problematic to conceive a Colombian reality in which the houses of strata 1 and 2 are inhabited by the poor and those of strata 5 and 6 by the rich. On the contrary, the socioeconomic gap of what happens behind closed doors in a Colombian household is, on average, around 50 percent, according to an exercise carried out by UN-Habitat. This shows tremendous errors of inclusion and exclusion in state subsidies, in addition, re-asserting what Roberto Lippi has mentioned: "The stratum is a burden that prevents social mobility, causes frustration and inequality" (2019, took from an interview in El País, translated by the author).

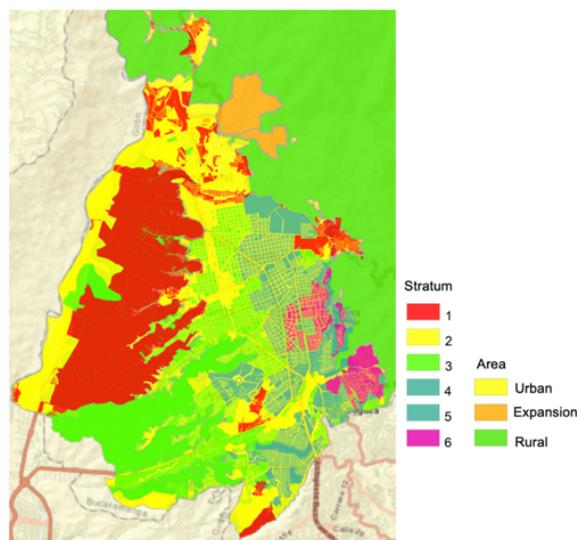
**Figure 1. Urban stratification in Bucaramanga**



Source: Author's elaboration, using data from DANE (2018)

In the case of Bucaramanga, as previously mentioned, the most significant number of properties is found between strata 3 and 4, which together have an average of 61,683 properties. Therefore, it could be thought of as a "positive" distribution. However, Bucaramanga faces social challenges related to the unequal distribution of income, the increase in the incidence of monetary poverty, and the percentage of people deprived of access to essential goods and services. Using traditional metrics, an optimistic picture could be shown and used as a symbol of relative supremacy in terms of welfare because relativizing percentages, the GINI of 0.432 is much lower than the 0.517 at the national level. However, since 2016 it has been presenting an increase (it has been approaching 1), which shows that income has been distributed more unequally in the city. Likewise, although Bucaramanga is one of the four cities with less monetary poverty in the country, as it presents an indicator of 14.5 and is below the national average, which is 27, the indicator has worsened, in the last four years, going from 8.4 to 14.5 (DANE, 2018).

**Map 2. Socioeconomic strata in Bucaramanga**



Source: Author's elaboration, using data from DANE (2018)

The middle sectors cover more territory, and this is reflected in the map. This gives more information to begin making inferences about the geo-spatial location related to segregation and the geographic distribution of people living in the city. In this sense, an intense concentration of low strata is seen towards the north, with the south being a little more heterogeneous. However, these are preliminary analyses taking into account that, as mentioned above, this indicator omits more factors. One could begin by assuming that this model does not allow the same development in all areas, linking it to urbanism. This is because the residents of a neighborhood often refuse to have their roads improved, parks built, or new

public spaces created because this would increase the stratum. Thus, studies carried out by UN-Habitat state that: "The poor are disconnected from the benefits of urbanization, that is, from being more prosperous." This raises multiple questions that will be the object of development in the research since the measurement, the possible segregation in the city, and how this is expressed in public policies, which will be seen in terms of social policy, will be problematic.

In addition to the territorial and socioeconomic context of the city, an approach to what citizens feel and think in the context of the land-welfare situation it can be related to what some leaders expressed in the open meeting that took place during the construction of the LMP<sup>3</sup> (Land Management Plan). From which the marked intensity of problems in the north of the city is highlighted, in expressions as telling as that of the representative of the Kennedy neighborhood, who asked the local government to

"They should turn their eyes to the north of the city because it is there where social investment should be seen... They are worrying about the "big city," about the big buildings and constructions, but in the north, there is also a problem to solve" (2014, Extracted from the *cabildo abierto*<sup>4</sup>, translated by the author)

Sentiment supported by other leaders of the same sector, who assured that :

"In the neighbourhood we have more than 1,300 properties (7,000 inhabitants) and today the sector has become a sub-region within the city itself. The neighbourhood is becoming a marketplace. Anybody can set up a business wherever they want: liquor stores, drugstores, sauce shops... Besides, they build uncontrolled buildings, and the disorder is such that we are in a bad situation in terms of vehicles, because there is no space to move around and there are no speed bumps on the main road (Carrera 12)" (Daniel Gil, social leader in the *cabildo abierto*, translated by the author).

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<sup>3</sup> It is a technical instrument used by the country's municipalities to plan and organize their territory; this land-use planning seeks the efficiency of territorial structures through the deliberate and planned introduction of rationality, coherence, and efficiency in the processes of occupation and use of the territory (Hernández 2010, Cabeza 1998, and Ossa 2011). Based on Law 388 of 1997, "municipal land use planning" aimed at regulating the physical planning of cities and their rural environment.

<sup>4</sup> is an extraordinary way for city residents to come together to organize and listen to each other's voices.

Positions that account for the critical situation in these neighborhoods in the north of the city, which as a starting point for the research, show signs of chaos within the normality of these territories, which deserves to be seen in detail. As a summary, the points that leaders and councilors<sup>5</sup>, related to social policies, considered necessary to develop in the city, being these: Encourage research and entrepreneurship in schools, promote sexual and reproductive health, nutritional support for pregnant and lactating mothers, and the improvement of infrastructure and equipment in the health sector, include programs and projects of social innovation, include women as the central and fundamental axis of society, promote actions to guarantee the right to decent housing for the vulnerable population and victims of the armed conflict, and also include sports and cultural programs for the population victims of the armed conflict. However, these are ideas that, depending on the way they are implemented, could show whether there is indeed an influence of social policies and segregation in the city.

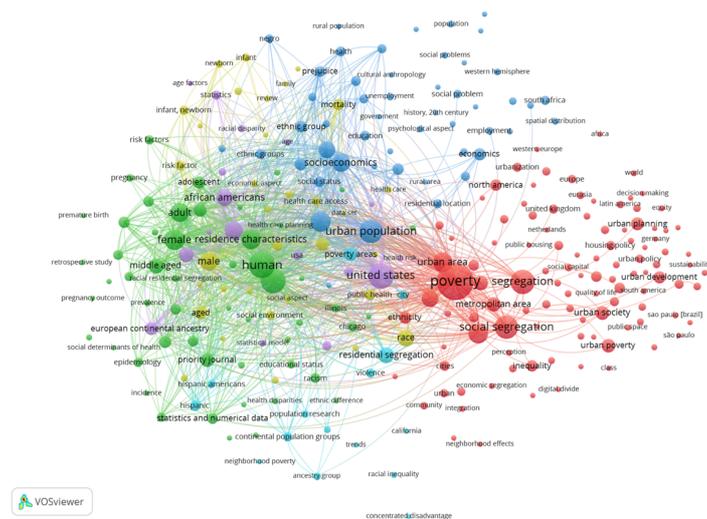
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<sup>5</sup> They are the members of the LAB (Local Administrative Boards), elected by popular vote, in charge of representing their community.

## Chapter 3 Literature Review: Encounters and misunderstandings in the segregation debates

Residential segregation can be understood from different perspectives, and like other social phenomena, its measurements and conceptualizations can be intertwined and even confused with other issues that concern urban research. However, one objective of this literature review is to understand the meaning of segregation from the viewpoint of other authors. So that, while for some, segregation is a natural phenomenon, to contrast it with the fact that for others, it may be a structurally determined problem, to mention some debates. Thus, to problematize the conceptual approaches that exist to see the problems themselves in the debates.

**Figure 2. Bibliometric network of the conceptualization of segregation and poverty in articles in Scopus-indexed journals.**



Source: Author's elaboration, using data from Scopus-Aug 2021

When scanning through multiple research articles, the complexity and implications of segregation are evident. As seen in the bibliographic network, many concepts are related to the term, either by causality or consequence. In particular, it is worth mentioning the constant presence of poverty in the nodes of the bibliographic network as almost a constant in empirical and theoretical research on the phenomenon in cities. Precisely because the term segregation is often equated with poverty, but at the same time with other concepts such as social inequalities, social exclusion, and even marginality. To such a degree, that in many cases, it is the urban academics' way of referring to urban poverty. However, just like poverty, it is evident in the literature that there is a tendency to confuse the reflection of social

inequalities in urban living standards or housing standards with a more complex relationship between social inequalities and residential segregation. Thus, it is problematic to understand segregation among so many intertwined concepts, and before looking at its relationship with other phenomena, it is crucial to understand its meaning.

For this reason, once the literature review was carried out, it was decided to systematize the understandings and concepts into four groups or categories, which were considered valuable because they encompass different ways of understanding segregation, and at the same time, offer future research an alternative for the conceptual study of segregation. Thus, overcoming traditional dichotomies and mixing theoretical and methodological debates from urban sociology and economics. The four categories are: residential segregation as a result of modern cities evolution, social classes and the reductionism to social strata, the operationalization of segregation and the social problems related with this phenomenon.

### **3.1 Residential segregation as a result of modern cities evolution**

Although there is no specific origin of the separations in urban spaces, it is as old as the same spaces that make up the city, according to many authors. For this reason, authors such as Ruiz-Tagle (2016:6) point out that the origin of residential segregation is mainly linked to the consolidation of industrial capitalism. And agree with what is agreed by many concerning the conception of the pre-modern city, whose formation was governed by social segregation and the link with non-specialized land use (Davis 1965). However, from that pre-modern city consensus, we move on to complex cities, where stratification systems, high housing density, inequalities (of different types), poverty, among other phenomena, abound (Flanagan 1999: 433) make it more difficult to explain. However, what was found in the literature, is the limitation of having industrialization as a cause and how these growing cities end up in segregating cities, where the less fortunate are isolated from the "advantages of economic growth."

Four general understandings were found that show different ways of understanding segregation under this assumption. First, segregation can be understood as a cause housing location, derived from the evolution in forms of production. Thus, authors such as Engels (2015:58) highlight how capitalism influenced households, from the separation between production and reproduction and the assignment at the time of gender roles within the

household (respectively), leaving marginal locations as a major consequence the environment of workers' housing. As a second explanation, segregation would originate from the commodification of urban land (Ruiz-Tagle 2016:7). This product of urban densification has resulted in real estate markets, which reflect a gulf between poor and rich, governed by hierarchical patterns (Gottdiener, Hohle, and King 2019). Third, social and cultural factors, as well as capitalism and cities, have evolved. There are differentiations between trades and laborers, causing many to seek particular lifestyles in their places of residence (Durkheim 2014). And fourth, a widely studied cause in the field of segregation has been racism, which, based on superiorities and discrimination, has been one of the most perverse, and therefore the most intense, especially in the cities of the United States (Cazenave and Maddern 1999). Although in the first decades of industrialization and modernism, the modes of production defined the transformations in the cities. It is omitted in the literature that at some point, spatial structures, which were socially created, may also have begun to influence the city's production and reproduction. This hypothesis is corroborated by what Lefebvre (Cited on Chiodelli 2013) and Soja (1989) called the socio-spatial dialectic<sup>6</sup>.

Nonetheless, from critical reading, the explanation of simultaneity between strong inequalities and the social segregation of space is a bit simplistic. Even though it is empirically valid following the "mirror theory"<sup>7</sup>, widely used by urban planners and geographers, who generally simply seek to read the city's social structure in thematic maps (Roca 2012), although this theory has been widely used, it has multiple criticisms that derive from the Chicago school, which in addition to being one of the precursors of segregation studies, related urban sociology to social Darwinism, giving a connotation of urban ecology to the development of cities (Burgess et al. 2008). The city has no particular control, nor has it been designed for specific purposes, which is why segregation turns out to be a natural phenomenon amid this "metabolic process" (Park 1915). Thus, both inequalities and segregation are spontaneous in the process of city functioning. Going further, authors such as Burgess, Parks, and McKenzie (1925) understood segregation as de-fining places and roles within the organization of urban life. However, by not recognizing the origins of inequalities, one would be

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<sup>6</sup> Implies that spatial and social structures are mutually determining factors. For a while, space is socially constructed. However, it also has a certain degree of influence on the social relations it hosts.

<sup>7</sup> Some comparative studies have debated and questioned the relationship between the interpretation of the social and spatial, an example is the one carried out between Brazil and the United States, showing that inequalities are more prevalent in the former and segregation in the latter (Sabatini and Brain 2008).

omitting a large part of the social problem and, in a way, justifying the naturalness of significant percentages of segregated people. In addition, as a somewhat epistemological criticism, it also results in its deterministic and normative character, which is limited to moral judgments without providing an analytical explanation of segregation as a natural process (Gottdiener and Hurtchison 2019 and Saunders 2003). Not to mention that political economy is lagging, and although they address divisive issues such as social classes and race, they do not transcend what lies behind capitalist ideology or the role of relevant institutions in urban development (Flanagan 1999; Edelman 2003). And in the evolution of segregation as a process of city growth as a condition of modernization and urban experience.

Contrary to "mirror theory," and as explained in previous paragraphs, another way inequalities and segregation have been understood was found in the literature. In which emphasis has been given to the analysis of social processes. In this sense, they seek to understand the role of spatial segregation in forming groups and their identities. For example, White, Massey, and Phua (1996) suggest differentiating between residential segregation as a spatial phenomenon and inequalities as a social phenomenon. There would be two spectrums of geographic and sociological segregation, which transcend in processes such as social mobility. Thus, here the threat is seen in how classes or strata ascend socially and can coerce collective identities. It can be understood that the impoverishment of the communities and its implications in the welfare puts at risk the survival of certain groups as differentiated strata of the social body (Katzman 2002:4). This being so, many groups prefer spatial segregation to maintain their identities, either rooted or in the process of formation, which is at risk.

However, this raises the question of how to explain social inequalities accompanied by segregation in urban spaces, which is very marked in the particular case of Latin America. Generally, the areas where the elites are concentrated have a social diversity related to low segregation. But, on the other hand, contrary to this, the so-called "informal" poverty strata are concentrated and characterized by their social homogeneity, which translates into high segregation (Katzman 2002: 4)—precisely, emphasizing the particular case of Latin America and the identities in the societies of the region's countries. A way of highlighting what the elites and the State have done by using spatial segregation and justifying it with economic growth has been the identity of "developed country-cities," inspired by cities of the northern hemisphere, such as Paris or some cities of the United States (Rematoso and Katzman 2005). Following the urban models of that time in order to exclude groups that do not fall within

the exclusive and "progress" zones that are linked to the social structure of developed capitalism, thus resulting in the region in those commonly called "marginal" or "informal." In addition to being spatially distant, they are related to poverty and, under these canons, have a weak social identity on the sovereignty of this multi-class identity of "developed country-city."

### **3.2 Social classes and the reductionism to social strata**

As was seen in the contextualization of Bucaramanga, it is generally zoned by strata, and social classes are lost among these other forms of socioeconomic division that leave aside deeper theories of class implications, which often end up determining behaviors and ways of life of the communities. For this reason, it is worth looking at how some schools, such as the structuralist one, gave greater weight to classes, and not from the stratum. Precisely, whose authors, based on Marx, put the urban political economy into the debate, reconsidering the city and seeking to redefine it from the perspective of class domination (Castells 1978). It is worthwhile to situate the debate in the particular context of the moment, which took place in the 1960s when the northern hemisphere was experiencing the insurgencies in Europe (1968) and the riots in the ghettos of the United States. This environment made them think about the reconfiguration of the state and social classes (Zukin 1980). Thus, Lefebvre understood the urban as the reproduction of capitalist social relations, Castells as the intersection of collective consumption units (Castells 1977), and Harvey as the environment created by capitalist industry. This meant that a large part of the problem was due to the imposition of neoliberal urbanism, succinct in that: Although all serious researchers admit the seriousness of the ghetto problem, few of them question the forces that truly govern our economic system. Thus, they analyzed everything except the essential characteristics of a capitalist market economy (Harvey, 1977: 150). This is precisely why it differs from the Chicago school.

On the contrary, it is worth highlighting the potential they have seen in the lower strata as active actors in favor of improvements in the quality of life in the city. Specifically, Harvey (2012) has seen them as engines of urban transformation, and in line with the Marxist theory that supports them, seek control over the surplus of production. However, in the main criticisms of the school, there is little value placed on the potential of spatial transformations, focusing its attention on the non-spatial, which could sometimes imply very abstract changes. Digging a little deeper, the extreme concern for social classes and the concentration of power

means that urban issues are left aside in their theoretical contributions. This is a little inconsistent since their obviation goes in the opposite direction to their principal analysis of social problems, which could now be interpreted as urban problems.

In a homogeneity of low socioeconomic level, territorial stigmas are an amplified version of social stigma. Even living in a poor neighborhood hinders specific ways of life for individuals and erodes social cohesion in the territory (Sabatini and Wormald, 2013). Therefore, according to this view, public policy should move towards more heterogeneous levels of socioeconomic proximity as these segregated popular neighborhoods have various social problems (school dropouts, delinquency, etcetera.) (Sabatini and Brain, 2008). Even though they allude to an insufficient range of determinants, attempts to account for residential segregation basically in terms of the urbanization of poverty and the increase in urban density (Massey, 1996). Are useful to underline the importance and historical uniqueness of the concentration of the poor in cities as a necessary condition for the activation of mechanisms that would lead to their social isolation. An additional contribution is providing a simple explanation for the formation of subcultures that are apart from the "mainstream" of society. According to Fisher's theory in 1975 (Bridgeland 1977), the subculture would naturally emerge from the spatial concentration of population categories that share similar characteristics. The simple fact of greater intragroup accessibility would favor the formation of normative patterns that reflect these common traits.

### **3.3 Operationalization of segregation: reducing segregation to maths and statistics**

Although the literature related to segregation has allowed us to find certain theoretical debates, they suffer more from the intervention of urban sociology in this subject. In terms of the number of research studies, in the literature review, there are many more that emphasize the measures of residential segregation than the causes or consequences of this phenomenon. And even when in numerical terms, there is a broader approach to the term from empirical studies. It is evident that so far, there is no formally established model or models with econometric techniques that are entirely feasible, nor comparable databases or with temporal projection for global or homogeneous analysis of segregation (Bayer et al. 2004). However, we cannot ignore general definitions such as those of Park (1926), who

linked social distance with physical distance, followed by White (1983), who defined *residential segregation* as the distance between areas inhabited by different social groups. Which provided the basis for authors such as Jargowsky (1996) to give it the connotation of concentration and by analyzing the level of such conglomeration of social groups to see in which areas they were located to determine the degree of segregation. Logic followed by Rodriguez (2001), who would specify the areas of concentration of social groups to consider them segregated. Thus, what can be interpreted from this type of concept derived from empirical work is that they are somewhat generic. As mentioned by Sabatini et al. (2001), how spatial proximity or agglomeration is understood varies. However, the same assumption of social groups is maintained, which can be understood as race, religion, or income.

However, these issues are so complex that they would merit detailed analyses beyond mere indexing. Nevertheless, a work that goes further, and according to the literature reviewed, allows us to assure that it is the closest reached in terms of academic consensus is the definition of Massey and Denton (1988). They understood segregation from its multidimensionality in such a way that they consider it the product of multiple and different social interactions. The relevance of their work, in addition, to considering the various interrelationships, lies in the fact that as a result of a systematic review of indexes and literature, they present five dimensions for the definition of segregation: evenness, exposure, concentration, centralization, and clustering. Straightforwardly, they imply that evenness refers to how members of minorities may be overrepresented and underrepresented in different areas when distributed. When they coincide with others (majorities), they are exposed, and in general, will not share neighborhoods with them in the same way as others. They may also be concentrated in small areas, and being a minority, they occupy less space than those who are more representative. They will also be centralized, especially in the urban core; finally, the authors state that minority enclaves tend to be clustered to be located either in a single area of the city or in a group dispersed throughout the city (Massey and Denton 1988: 284).

Although quantitative analyses have given more weight to measuring segregation than to what it means and its transcendence, some approaches were found that serve as a basis for this research by showing aspects other than what is initially assumed to be social policies and their relationship with segregation. Based on that, the author divided the causes into endogenous and exogenous. The first group of causes converges because they are consequences of particular preferences or restrictions, either at the individual or group level,

instead of other causes that seem to be produced by externalities of the city itself. The importance of emphasizing the causes from empirical efforts, and a little more from economists' perspective, is to consider more conceptualizations of segregation and analyze if they are helpful to apply them in the proposed empirical exercise.

To simplify, the endogenous causes seen in the literature can be roughly subdivided into income and the predisposition of the agents (entering into the economic logic) to live close to and/or surrounded by their "peers." In the first instance, income is assumed to be the cause of segregation. Considering that agents decide to live according to their work location, especially of the Central Business Districts (CBD), the most important case was found in the "Bid-Rent" model. Which, in addition to associating income, intervenes transportation and its costs as a fundamental element for the location of housing. Research by Wingo (1961), Muth (1969), and Alonso (1964) assumed that land was superior-good and that people with lower incomes would seek to avoid transportation costs by seeking to live near CBDs. Of course, these works were based on northeastern realities.

Furthermore, they generalized as a characteristic assumption of households the only three classes: high, middle, and low, determined by income. It is helpful to verify this with cities' urban realities and structures such as Bucaramanga and their segregation. On the other hand, the models that relate the predisposition of people to live close to their peers (Papageorgiou 1978; Kanemoto 1980) do so under the assumption of the negative externalities that living with "other types of neighbors" would entail for people. In this sense, the main conclusion is that residential segregation is Pareto-efficient (Royuela 2019:24) for these authors.

Nevertheless, among the most relevant exogenous forms found, which could cause segregation, are public policies; and the real estate market as a precursor of dynamics that influence people, understanding them as consumers of housing services. In the first instance, the literature is divided into *de jure* policies, which explicitly require some form or type of segregation and are outlined in some law, such as the racial laws in South Africa, Zimbabwe, or Nazi Germany (Christopher 1990). Consistent with the findings of researchers such as Saff (1995) and Falah (1996), as a result of these policies, the development of social and economic interactions between the divided parties remained in incipient stages. On the other hand, it should be considered that there are also laws, even if they do not have explicit segregation. They can reinforce the exclusionary powers between the parties and result in legal support to residential segregation giving mechanisms to influence geographical trends (Royuela 2019:

27). Likewise, another type of public policy that became evident in the literature was zoning and public housing. Which often lie in limits or prohibitions either in the sizes of houses, locations, types of constructions, among others that influence costs, and again reduce segregation to an income issue. Precisely, Jacobs (1962) and Jackson (1985) state that housing policies that follow this type of desolate architecture end up hindering social interactions even more. And without leaving aside a phenomenon that a priori will be the most similar to the Latin American context, is the housing subsidies. Which limits the purchase of houses to particular places, resulting in ghettos of households whose main common characteristic is the lack of income, a subject that will indeed be discussed later and that is useful to see in the empirical exercise of the research. Indeed, the effects that public policies in design and implementation can have on segregation and the tendency to base them on income, and how these are directly related in the literature to people's well-being, are evident. Finally, the most common ways the housing market can segregate were the filtering process and its impact on urban structures and the creation of neighborhoods. Research such as Galster (2001), Vandell (1995), and Yates and Wood (2005) shows how filtering by income, price, or quality can occur, tending to polarize in terms of socio-economic groups that would live in homogeneous neighborhoods across categories.

### **3.4 Social problems and Segregation**

Perhaps the most important issue that was sought in the literature was the connection between residential segregation and social problems. Since, as mentioned, they often tend to be confused or intertwined, which is why this section will emphasize how it is understood, trying to give more weight to this from the Latin American context. Authors such as Sabatini et al. (2010) have tried to correlate the results of their empirical work on segregation with social problems, generally associating them as consequences of concentrations of poverty. Precisely, this seems logical to explain as an alternative to the mirror theory mentioned above. In this sense, a spatial situation, which in this particular case is segregation, is understood as the cause of social problems such as violence or unemployment (Ruiz-Tagle and López 2014:41). That is why, as previously discussed, the complexities involved in relating inequalities with spatial configurations such as segregation. It is even more difficult to relate these with future social problems since projections of social uncertainties are often made under the assumption of the "mirror," excluding other non-spatial variables with possible incidences. However, it is worth mentioning that, in this type of literature, the recognition by the authors of the multi-causality of social problems became evident, to such an extent that

The paradoxical combination between the reduction of segregation and the effects of social disintegration that have emerged more recently from segregation is due to the advance of social exclusion on the three levels previously discussed: job insecurity, segmentation in access to services and social protection, and disconnection between the social base and formal policy (Sabatini et al. 2010: 33, translated by the author).

Thus, under these assumptions, another concept comes into play: social exclusion, which in this case appears in the literature as separate from segregation, being distinct but aggravating it (under the understanding of segregation as a mere spatial process). Another social problem found that relates to segregation is that of "social fragmentation," which authors such as Schapira (2001) explain in five dimensions: residential segregation, dispersion in the city, the focalization of resources, dualization of spatial structures that are at the same time social, and segmentation and privatization of services. Therefore, following Roitman (2011), one could think that social fragmentation could better explain the questioned beliefs of the mirror theory between segregation and inequalities under the perception of highly segregated elites in the Latin American context. Under this framework of analysis, the empirical data about a decrease in segregation are surpassed by the inequality indexes in the region. With all this, limiting ourselves to treating segregation as a mere generator of problems again brings to the table divergent points that, although logical, are also criticizable and useful for the analysis in the following chapters contrasting with the reality of Bucaramanga.

Will return to Sabatini et al. (1982), who in their article, make mention this disjunctive between segregation and social problems in their article, referring to it as a "paradoxical combination." Since based on the Latin American reality (of interest given the context of this research), in recent decades. There has been a reduction in segregation at the metropolitan level—accompanied by an increase in the density of poor people concentrated in city areas with more or less homogeneous conditions- which is why the authors consider it paradoxical. However, it is not paradoxical since social problems have been increasing and occurring precisely in the most excluded areas. Here enters the questioning motive of this research, and that authors such as Ruiz-Tagle and López (2014) also try to controvert. Because from what was stated by Sabatini et al., It seems not paradoxical; however, if we understand this disconnection between urban space and social relations in conjunction with external dynamics that

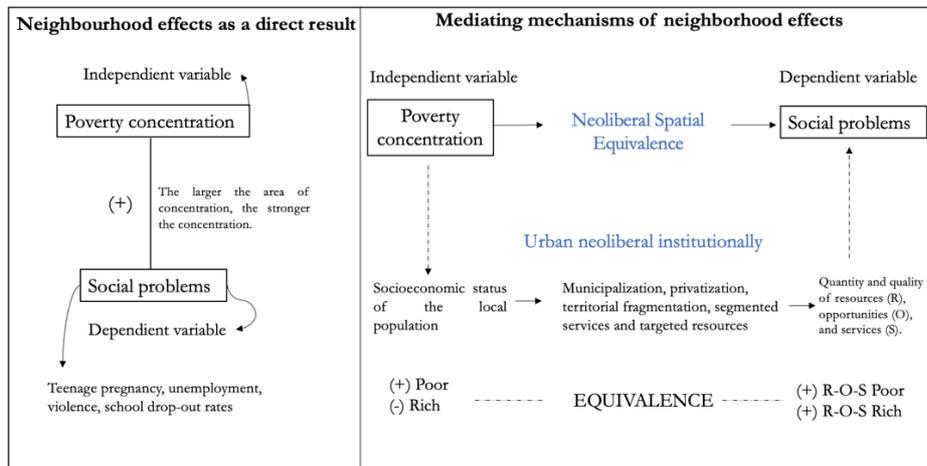
go at a different pace, the analysis can change. Precisely, Ruiz-Tagle argues that both inequality and segregation may depend on similar processes. The difference may be that the temporal dynamics governing them are different; thus, for example, he relates inequality as a result of non-redistributive social policies, while segregation may be caused by housing policies, which are applied in different ways and at different times. However, it would be hasty to take this assertion as accurate.

On the other hand, authors such as Franck (1989) warn of the possible spatial determinism which one could fall into when exaggerating the influence of segregation on social problems. Because, under their perspective, one would be assuming a passivity in people and environment, as an entity that is not modified. On the contrary, one would be exaggerating the influence of the physical environment on their behavior. On the other hand, another somewhat problematic interpretation is the absolute emphasis on the concentration of poverty as a constituent of poverty itself, influenced by The truly disadvantaged: the inner city, the underclass, and the public policy (Wilson 2012). However, once again, we fall into the generalization of terms. Authors such as Tienda (1991) question the lack of evidence of poverty concentration as an explanatory condition of poverty. Precisely because of this, authors such as Steinberg (2010) support these criticisms, agreeing that if segregation is put forward as a determinant, the structural forces of poverty, which make this phenomenon a complex one to explain, are overlooked. This is related to Castells (1977), who mentioned the same problem of redefining space as the cause of urban problems, without considering that the concentration of poverty has other particular causes.

Likewise, although it is not a social problem, the "neighborhood effects" have been a recurrent idea in segregation research (Sampson, Morenoff and Gannon-Rowley 2002; Lupton 2003; Oyserman and Yoon 2009), which propose several social pathologies based on the concentration of poverty. However, once again, we can fall into the operationalization having as a product only correlations without delving deeper into the mechanisms that generate such social problems (Small and Newman 2001; Ellen and Turner 1997). It would be worth thinking about whether it is a problem due to the homogeneity or size of segregated areas. Alternatively, how much influence do policies have on the processes of social fragmentation that provide segmented services or targeted resources, and their influence on the quality of resources or local opportunities that people have, finally, who or what produces the "neighborhood effects." Thus, authors such as Ruiz-Tagle and López approach this situation from the understanding of neoliberal policies, giving it a connotation of "neoliberal spatial

equivalence" (2014:42). Which as can be seen in Figure 3, there is poverty on both sides, having citizens in conditions of poverty and poor policies, services, and opportunities.

**Figure 3. Neoliberal spatial equivalence understanding**



Source: Author's adaptation, based on Ruiz-Tagle and López (2014)

However, it is worth taking up again authors such as Musterd and Ostendorf (2005). They emphasize an important element for the analysis, which is to consider the Welfare States of the place under study. Under this lens of analysis, the neighborhood effects generated depend on the territorial redistribution of resources. Thus, it would be expected that the greater the redistribution of resources, the smaller the effects. Precisely, the author compares European and American welfare states, obtaining empirical evidence that the former do not have such strong effects, unlike what occurs in countries such as the United States or Chile. For this reason, authors such as Gans (2008), Ruiz-Table (2003), and Blokland (2008) affirm that "neighborhood effects" are "state effects inscribed in space" (Wacquant 2009: 109), and therefore derive from powerful institutions. The above is useful for analyzing the programs and seeing to what extent the degree of territorial redistribution of resources in an intermediate city such as Bucaramanga can be known in the context of Colombian social policies.

## Chapter 4 From theory to practice

After the literature review, several particularities make residential segregation a phenomenon with edges and complexities that vary from analyzed. An empirical approach seems to be a way of delving a little deeper into specific characteristics that will allow us to question the theoretical postulates again. Confirming them with the data the author had access to allows saying that it is an approach to "reality." Thus, taking into account the context of the city of Bucaramanga, it is essential to mention how segregation has been measured in the national context and the city. On the other hand, it is also essential to return to the theoretical debate that led to choosing spatial autocorrelations to measure segregation at this stage of the research.

### 4.1 A review of the measurement of segregation in Colombia

Particularly in Colombia, studies on segregation have been of relative interest both from academia and public administration. In Bogotá, segregation has had an interest as an object of study in the last 20 years. Incidentally, Mayorga-Henao (2019) identifies about 33 studies conducted on the subject in the city, which have been carried out both in academia and public administration. Among the most relevant and most cited are the investigations carried out by the District Planning Secretariat in 2007 and 2013. The magnitude of the phenomenon is estimated from strata 2, taking as a basis the localities. In the case of Salas (2008), a social classification index is calculated based on the years of education of the population. The research by Aliaga-Linares and Álvarez-Rivadulla (2010) stands out in which quality of life conditions and spatial distribution are inferred from the socioeconomic strata. Dureau et al. (2015) develop research in which they classify social groups according to an index of the social condition of households (ICS) with three variables of the Census information and estimate indicators of dissimilarity at micro scales Bogotá. For his part, Alfonso (2017) generates results indicating that Bogota households tend to pay more for housing in areas with lower population density and a more significant endowment of public assets. However, research has been limited and concentrated on studying segregation in Bogotá, despite the importance of the urban system in Colombia, which highlights the existence of multiple agglomerations that exceed one million inhabitants (Garay 2013; Departamento Nacional de Planeación 2014; Rodríguez and Agudelo 2016). Little attention has been paid to segregation in other cities.

In the case of Cali, research by Vivas-Pacheco (2013) is identified. It is concluded that a high level of segregation of the Afro-Colombian population is present in the city. Cerón and Escobar (2014) obtain, as a result, that in Cali, there are city sectors that can be qualified as homogeneous in their socioeconomic composition, according to the calculation of the Spatial and Socioeconomic Segregation Index. In the city of Medellín, Medina and Morales (2008) formulate multiple indicators based on the 2005 census to illustrate spatial segregation in the city. For his part, Velásquez- Higueta (2012) identifies the relationship between land use planning and residential segregation during the period 2006-2011, based on an analysis of the location of social housing projects. However, studies in Colombia are limited to the three main cities, and intermediate cities have lagged in such studies, even though there are essential complexities within these cities.

Nevertheless, in the particular case of Bucaramanga, no studies were found related to the city's segregation in particular. Only works such as that of Mayorga, Hernández, and Lozano (2021) measured segregation considering metropolitan areas and the multidimensional poverty of Colombia's main cities. In the case of Bucaramanga, households in multidimensional poverty were concentrated mainly towards the north and east, in the communes Norte, García Rovira, Occidental, and Mutis. However, neither academia nor the government has analyzed the city's situation to improve the formulation of policies or other purposes.

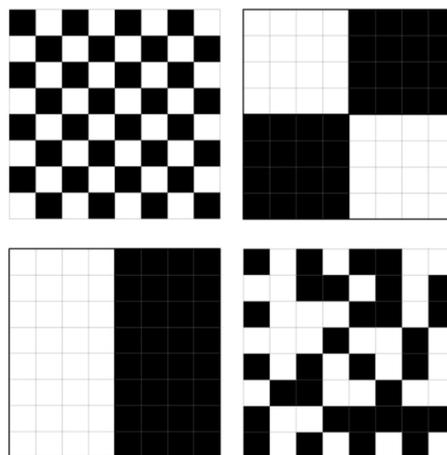
## **4.2 Methodological debates, what defines a neighbor**

Returning to the academic debate on segregation and emphasizing the measurement of this phenomenon. Although some approaches to the measurement of segregation were mentioned in the literature review. It is worth noting that non-spatial indices predominated, primarily those derived from classical schools such as the Chicago school and authors such as Massey and Denton. However, it is worth noting that the debate in the last decades has also gone in two generic directions, one for non-spatial indices (Massey and Denton 1988) and the other for spatial indices, led by authors such as Anselin (1995), Granis (2002), Johnston et al. (2010), among others. Although throughout history, the most widely used indexes have been non-spatial, their contribution to measurement is undeniable, especially for making temporal comparisons between studies of today and the past, as mentioned by Peach (2007). However, among the limitations that stand out the most is the inability to precisely explore what happens inside the city because of its non-spatial character, making them a little less solid in statistical terms (Marciczak 2012). Precisely, these criticisms have been

materialized in two significant problems, the first refers to the chess problem proposed by White (1983) and the second is the Modifiable Spatial Unit Problem (MAUP), deeply treated by Openshaw (1996).

In a simplified way, the problem of chess lies in the fact that non-spatial indicators give fundamental importance to the socio-demographic composition of the territories, ignoring their location (Morril 1991). To understand it better, some authors have compared it to a chessboard, where the board's squares are spatial units with different compositions. For ease of example, group them into two population groups; thus, when calculating the segregation indexes following the pattern of the squares of the chessboard, one would have particular results.

**Figure 4. The problem of chess table**

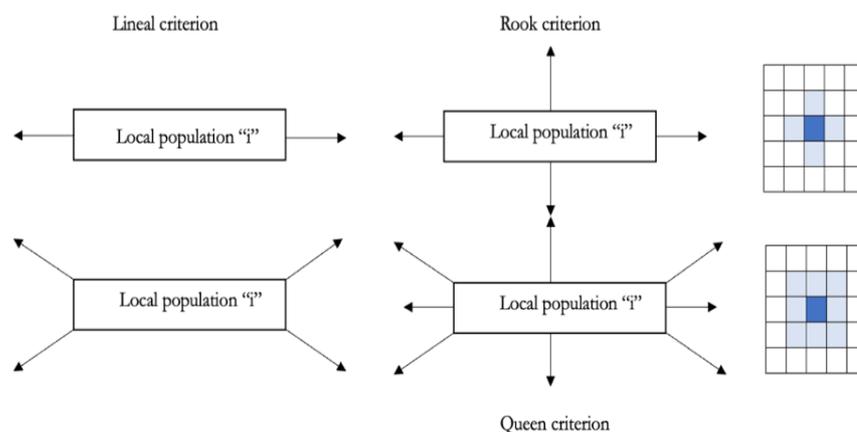


Source: Took from Garrocho and Campos-Alanís (2013)

However, the trivial part of the analysis comes when it is decided to change the distribution of the cells because in such a case, it would be expected that the segregation pattern would change. Thus, there would be a new spatial distribution. Nevertheless, being non-spatial, the results of the initial form will not change to those of the new arrangement, so the traditional segregation indices, in this case, do not allow to distinguish the change of pattern. They also do not permit understanding the neighborhood ratio and determine it under specific criteria, such as neighbors of neighbors or under distance thresholds, among other measures. In addition, they only allow the generation of global segregation indexes, which means that only one value reflects the intensity of this phenomenon in the study area under consideration, thus losing intra-urban information, which is essential in the spatial context we are dealing with (Garrocho and Campos-Alanís 2013: 12).

Understanding the MAUP problem is important to take a very popular law in spatial studies as a starting point. That is cited in countless works by economists and geographers: Tobler's first law states that "everything is related to everything else, but things that are close are more related than things that are distant" (Tobler 1970: 234). Moreover, although the reasoning is very logical, it is worth considering what is understood by the near; there are details such as the definition of the neighborhood that will give particular weights to Moran's I. Within this logic, it is necessary to generate a contiguity matrix that functions as a spatial weighting and that mathematically will take values of one for adjacent territorial units and zero for opposites (CEPAL and UNICEF 2010: 170).

**Figure 5. Neighborhood criteria according to contiguity**



Source: Author's elaboration, based on Pérez- Valbuena (2005)

In order to continue with what has been agreed in the literature. So far, the neighborhood between territorial units in the first order of contiguity will be defined by the queen criterion. As can be seen graphically in Figure 5, any part of the edges or vertices that are touched will be considered a neighbor. Unlike the rook criterion, which is more rigid by having as a condition that any edge must be common between both units to be considered neighbors. In this context, the problem of the definitions of territorial units and scale comes into play since it depends on how the information on the population in question was collected, aggregated, and published (this is what the spatial units refer to). For this reason, what often happens is that they choose a discrete space such as the city and divide it into boundaries that often do not exist in the daily life of the people who live in the city, so they do not have the same spatial meaning. In other words, the spatial operational units are generally defined according to the capture of data in the field, as is the case of the census operation that assigns numbers by areas.

The last National Population and Housing Census (2018) conducted by the National Statistics Administrative Department of Colombia (DANE) was the source used in the Colombian context. So the data that will be used in this research attend to that operational form. To be more specific, they are classified by blocks, and as a contribution of the author was made a geo-classification by communes. The risk is that the population phenomenon studied does not adjust to the geographic units for which the information is available. This is precisely one of the main challenges of this research, given the scarcity of statistical information. Finally, it cannot be ignore the fact that the level of spatial autocorrelation varies if it is calculated at the scale of the major administrative division (DAM), or at the level of region, department, province, or municipality, since it is a change in the scale of the analysis. In conclusion, it is worth reflecting, even though this is not the case in Colombia. However, the results of the analysis of segregation and the design of public policies to remedy it should not depend on how the information is organized in the data collection office. However, even if they do, spatial indicators have an advantage, since non-spatial indicators are unable to detect, let alone attempt to minimize, the Modifiable Spatial Unit Problem and, therefore, could be more easily challenged.

Trying to give continuity to the main thread of the research and the debates that have been dealt with. From a personal perspective, it is helpful to measure segregation with analyses that provide information on the neighborhood's situation in which people live, and not to limit oneself to an analysis that accounts for the overall situation of the city in general terms, as a complete entity. Moreover, in this case, priority is being given to the analysis of socioeconomic segregation. It can be said that this is a problem of degree rather than of belonging to a specific category, which makes it better to use continuous variables rather than dichotomous, the latter being more commonly used in analyses of racial segregation (Flores 2006). Precisely, within the spatial measures, a term determines the interpretation that will be given to the research, and it is that of spatial autocorrelation, which can be defined in terms of similarity between values and spatial locations (Flores 2006:8). The interpretation is usually given similarly to traditional correlations, so if some high or low values for a random variable tend to cluster in space, it implies a positive spatial autocorrelation. In the opposite case, in which the tendency is that neighbors surround the households we are analyzing with different values, it will be a negative spatial autocorrelation.

Given the above, Moran's I (I) proposed by Patrick Moran (1948) will be used, which accounts for what and how spatial autocorrelation is given a specific data and space. Regarding the functional form of I, it corresponds to the correlation of the Durbin-Watson test, which weights the values of the contact matrix, always between the distance of the points 0 and 1, depending on the continuity of these (Flores 2006 :15). Thus, according to the above, the null hypothesis will be that there is no spatial autocorrelation. For its interpretation, it is important to consider that the index has a range between -1 and 1. Moreover, following the logic of positive and negative autocorrelations, 1 will imply positive and -1 a negative autocorrelation; in the case of 0, it will mean that the process is under a randomized spatial structure (ibid:18).

Mathematically, Moran's I for n observations on a variable x is expressed as:

$$I = \left( \frac{N}{S_0} \right) \frac{\sum_{i=1}^n \sum_{j=1}^m c_{ij} (x_i - \mu)(x_j - \mu)}{\sum_{i=1}^n (x_i - \mu)^2}$$

Where  $\mu$  is the mean value of the variable x,  $c_{ij}$  are the components of the spatial weight's matrix, N represents how many geographic subunits there are, and  $S_0$  is a normalization factor, equivalent to the addition of the components of the spatial weight's matrix. However, I is an index that accounts for the information of an entire area, which, although it is valuable information. For a more rigorous study, it is important to identify the local concentrations of the variable in question. In the context of the segregation literature, it is sought to find the local hot spots (Goodchild 1987). For this reason, being a global measure, it may be the case that the magnitude of the spatial autocorrelation does not have to be uniform in the whole area, it may be that the spatial autocorrelation is high in some zones and low in other zones, which are part of the same urban area (Serrano and Valcarce 2000). Based on these assumptions, Anselin (1995) proposed local indicators of spatial autocorrelations, popularized as Local Indicators of Spatial Association (LISA),  $I_i$ , which allows finding significant patterns in local spatial autocorrelations, i.e., more specific associations around particular locations or the existence of spatial outliers. Thus,  $I_i$  takes different values for each observation, allowing to visualize local instabilities, such as deviations from the overall structure of the spatial association (Chen 2013).

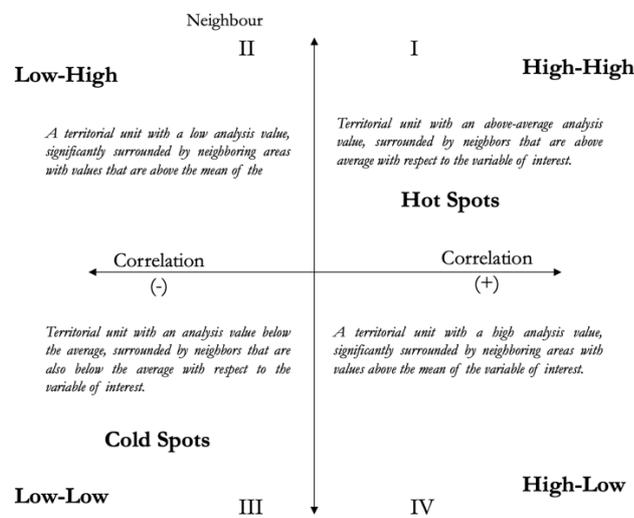
$$I_i = \frac{(x_i - \mu)}{m_0} \sum_{j=1}^n c_{ij} (x_j - \mu)$$

Where  $m_0$  is expressed as:

$$m_0 = \sum_{i=1}^n (x_i - \mu)^2 / n$$

For unit  $i$ , the Local Moran is defined very similar to the global one, with  $\mu$  as the mean value of the variable  $x$ , and  $c_{ij}$  are the components of the weight's matrix. It is worth mentioning, that considering the sum over  $j$ , only the neighborhood values of unit  $i$  accounted for.

**Figure 6. Representation of the categories and types of spatial association**



Source: Author's elaboration, based on Chacón, Rangel and Ramírez (2020), Pérez-Valbuena (2005) y Milanese (2018)

An additional tool that Moran's I allow is the graphical interpretation by quadrants, represented in Figure 6. Its interpretation does not differ much from the traditional scatterplot analysis. Thus, there will be a positive spatial dependence if the concentrations appear to be concentrated in quadrants I and III. Conversely, if it is in quadrants II and IV, it will be negative. Following this interpretation, it is worth pointing out that in quadrants IV and II, the households with high or low multidimensional poverty indices will be located, and their neighbors will have opposite indices (Anselin, 1996). Although this work is not the case, in the case of temporal variation, the diffusion process of diffusion of poverty among neighbors could also be analyzed. However, geospatial information is still being implemented in Colombia, so it does not allow this type of analysis.

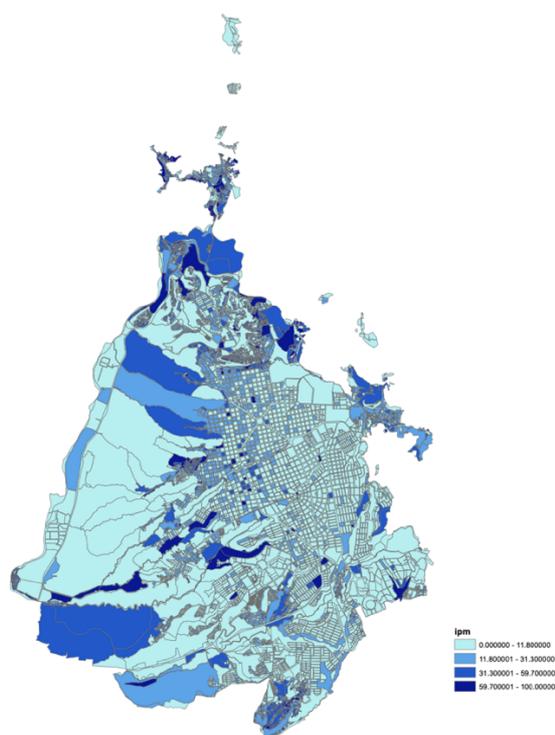
### **4.3 Spatial autocorrelations, an approximation from multidimensional poverty.**

After the previous sections, it is evident that the measurement of segregation in Colombia has been concentrated mainly in large cities such as Bogota, Medellin, and Cali. Although there are multiple efforts to measure segregation, the authors' limitations, given the accessibility of data and the geographic scales involved in this type of measurement, are also a reality. In turn, if we return to the context of Bucamaranga, the information from the mayor's office is given in terms of social strata, which, although it shows a distribution pattern. As discussed at the beginning of this research, it does not allow access to socioeconomic information of households due to its condition limited to the properties and its easily manipulated characteristics. Therefore, an alternative way to analyze segregation, trying to maintain the previously discussed, was to identify the distribution patterns of poverty in the city of Bucaramanga using the Multidimensional Poverty Index (MPI). In such a way, the magnitude of poor and non-poor segregation in the same spatial units could be known. This is a different form of measurement to go beyond the typical socioeconomic indicators, and at the same time, beyond the traditional measurement of monetary poverty. This, precisely because of the nuances that occur in the research, between segregation and poverty, and thus understand if there is any degree of segregation or if they should be understood as mere concentrations of poverty. Thus, in order to simplify, the concepts of segregation and poverty were integrated, with the latter serving as the unit of analysis, based on the assumption that measuring poverty in a specific territory would not be as effective if it were not linked to an analysis of segregation (Mayorga-Henao 2021: 118). Emphasizing the virtues again it could bring, such as knowing the characteristics of the population distribution between the poor and the non-poor, under the multidimensional measurement criterion.

However, before going to the results, it is pertinent to consider the implications of multidimensional poverty and the justification for its use, assuming the limitations that this measurement implies. Although, in this particular case, the MPI developed and adapted by Colombia will be used (see Appendix 2 to understand the methodology followed by DANE). The essence of the measurement derives from the relative deprivation approach, initially proposed by Amartya Sen (2000), who thinks more in terms of quality of life and the potentialities that are restricted by the implications of poverty. Which for authors such as Ferullo, are "deprivations that prevent the development of capabilities, and therefore of freedom" (2006:13). Precisely, taking into account Sen's (1993) approach to poverty as a deprivation

of capabilities and the constant call made by Atkinson (2003) for deprivation counting methods. Alkire and Foster (2011), mainly based on Bour-guignon and Chakravarty (2019), understood the definition of the multidimensionality of poverty as a deficit concerning multiple dimensions with mainly defined thresholds, proposed the MPI, defining thresholds and ten basic dimensions of poverty. In the Colombian case, the DANE groups the measurement in 5 dimensions: household education, childhood and youth, health, work, and housing conditions, which are broken down into 15 indicators, under the threshold of 33.3% to be considered multidimensionally poor (DANE 2019). Although, in response to the failures of monetary metrics, the MPI responds with multiple dimensions, overcoming the limitation and reductionism of poverty to lack of income. Authors such as Fischer (2018) emphasize how despite this, they do not solve fundamental problems, as they are still metrics governed by thresholds. Thus, it is worth considering this and the author's proposition to understand that "poverty measurement needs to be understood fundamentally as part of a political project of building state capacity in social provisioning and policy-making, as well as strengthening processes of local accountability with citizens on these matters" (Fischer 2018:26). Nonetheless, given the data limitations, it was considered the most complete measure to have an approach to the population distribution of the poor and non-poor, assuming the constraints that this implies.

**Map 3. Multidimensional Poverty Index in Bucaramanga, by blocks**

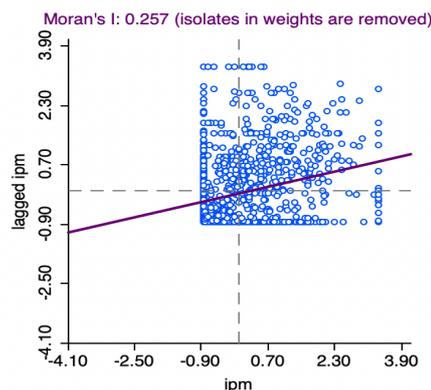


Source: Author's elaboration , using data from DANE (2018).

Descriptively, the MPI for the city of Bucaramanga is 14.2, being one of the lowest percentages in the department of Santander (DANE 2018). If deployed in the dimensions that make it up, those with the highest levels of deprivation are informal work with 77.3%, critical overcrowding 7.4%, and dependency rate 25.4%. Likewise, it shows heterogeneity in the distribution of households by poverty conditions, although the sectors with the greatest intensity of poverty are marked. Especially in the northern part of the city and the northeast, it contrasts with slight areas in the south. However, so far, this would only show the intensity of poverty that would be zoned. To analyze the consequences of segregation as measured by the MPI of households, the phenomenon must be defined and measured to obtain a local measure of segregation. In this way, it is possible to determine whether or not a neighborhood is socioeconomically segregated. In other words, segregation measurements will provide information about the neighborhood's situation in which the household resides rather than the overall situation of the city as a whole.

In this case, the blocks correspond to the census tracts of the city. Furthermore, each point will correspond to the association between the standardized value of the average multidimensional poverty index (MPI) of the block and the spatial lag of the surrounding neighborhoods. As mentioned above, the four quadrants describe where the autocorrelation value is located for each block.

**Figure 7. Univariate Local Moran's I**

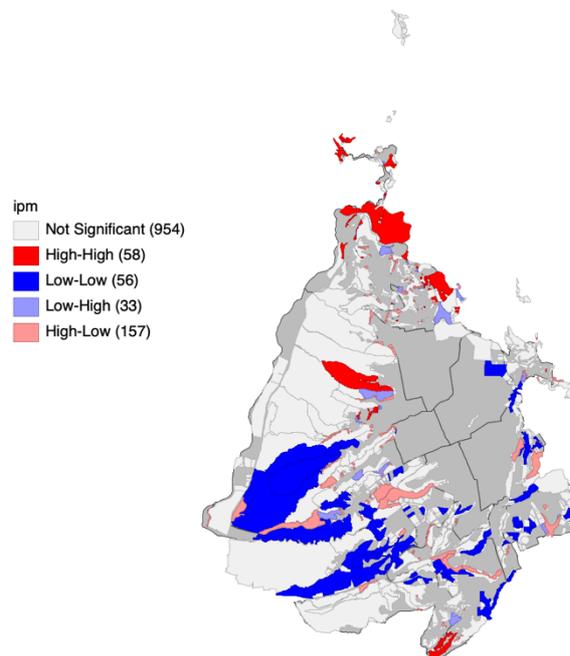


Source: Author's elaboration, using data from DANE (2018).

When the econometric analysis was performed, a local Moran's I of 0.257 was obtained, calculated without considering the outliers. The result is interpreted under the traditional hypotheses:  $H_0$  as no spatial autocorrelation and  $H_a$  as spatial autocorrelation. However, it is worth remembering that the alternative hypothesis is the one being tested. And in the case

of Moran's I, it is a two-tailed test of the  $H_a: \neq$  type, expecting the spatial autocorrelation to be non-zero, and the opposite assumes that  $H_o$  will be equal to zero<sup>8</sup>. So, with this information, it can be affirmed that the spatial association patterns of multidimensional poverty in Bucaramanga are statistically significant and tend to be spatially clustered. Then, according to the statistical evidence, we can reject the  $H_o$  of no spatial autocorrelation in favor of  $H_a$ . Therefore, this makes sense with the breakdown of Moran's I into local indicators of spatial correlation (Anselin 1995), which are seen more clearly in Map 4.

**Map 4. Spatial autocorrelation by city blocks, Bucaramanga**



Source: Author's elaboration, using data from DANE (2018).

Map 4. Provides us with the degree to which the individual's block is somewhat predictive of the level of multidimensional poverty in the surrounding blocks. Under this logic, if other poor areas significantly surround a multidimensionally poor neighborhood, it is safe to say that the household lives in a segregated situation. Thus, using the MPI, we can see that households located in the northern zone are surrounded by households with deprivations in the multiple dimensions that make up the index, as are their neighbors. In this way, one could suggest that they are segregated from the rest of the city. However, segregation is not as evident as in other cases, where it goes north-south or vice versa. As can be seen to the south

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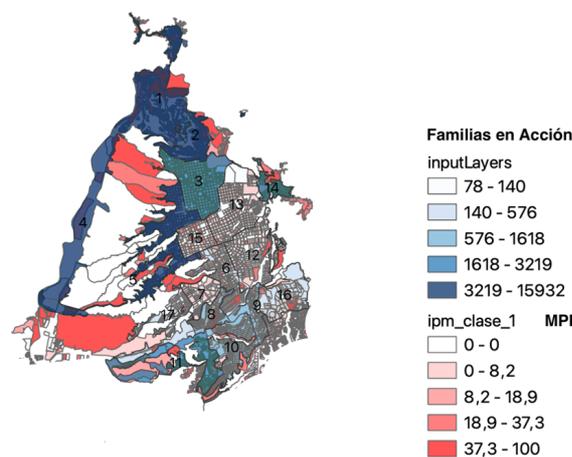
<sup>8</sup> A significance test was performed to affirm that the autocorrelation was significant. At the same time, a non-spatial segregation I was calculated to verify that in effect, segregation in the city is average (see Appendix 3).

and northeast, other segregated sectors surround significantly poor households with similar conditions (Flores 2006). Although it may be a bit hasty, these areas could be called enclaves of poverty, which will be analyzed in more detail later to understand what other factors influence the pattern being observed (Sabatini 2003). At the same time, to see the role of social policy or other policies in these areas and their development. Thus, these data reflect that, in general terms, there is the proximity between the different social groups through agglomeration, so the phenomenon of segregation is present with medium intensity. For, a large part of the city is not significant in the spatial autocorrelation assumptions, so it is presumed that in these areas, the distribution is random. There are no strong separations between households with high multidimensional poverty rates and households with better socioeconomic conditions. Although it shows some integration, it is worth seeing how the state responds to those households outside the segregated neighborhoods and has multiple deprivations in poverty (Mignone and Fantin 2001). For, as can be seen in the map, to the south, there are many blocks with high poverty rates and are surrounded by neighbors with much better conditions. It is worth clarifying that it is recognized that the study of segregation by poverty needs complementary approaches to support the results; these indicators allow recognizing particular aspects of the segregation of the poorest households (Henaio, Ortega and Lozano 2021). Therefore, in response to this limitation, an institutional analysis is proposed, presented in future lines.

## Chapter 5 Understanding maps through the lens of social policy

Under the assumption of this research, one way to approach the relationship between social policy and segregation in the city is from the multidimensionality of poverty expressed in the MPI. Thus, it is to see the spatial distribution of the multidimensional poor and who are beneficiaries of social policy. In this case, the Conditional Cash Transfer Program (CTP)<sup>9</sup> "Familias en Acción" was taken as a reference. It emphasizes that in Colombia (as in most developing countries), social protection and the fight against poverty are based on the social risk management (SRM)<sup>10</sup> approach. It is worth noting that risks are understood as threats to household income, and by not knowing how to prevent them, people are subject to poverty (Betancourt 2018). Precisely for this reason, social assistance in these types of social protection systems aims at reducing the risks of the poor through prevention, mitigation, and recovery, with CTPs being understood as social assistance specifically for recovery.

**Map 5. Spatial distribution of MPI and beneficiaries of the Families in Action program in Bucaramanga.**



Source: Author's elaboration, using data from DANE (2018).

<sup>9</sup> Cecchini and Madriaga (2011) define CTPs as "the delivery of monetary and non-monetary resources to families living in poverty or extreme poverty who have one or more minor children, on the condition that they comply with certain behaviors associated with the improvement of their human capabilities" (Cecchini and Madriaga, 2011: 7).

<sup>10</sup> The MSR approach arises as a response to the challenges of globalization and the global development agendas imposed by multilateral organizations. Generating a social protection system, where the main focus is on the risks affecting households, especially income, which is why poverty turns out to be a transitory event, caused by unforeseen risks (Holzman and Jogerzen 2000).

Before beginning to analyze the "Families in Action" (FeA) program, in particular, it is worth bearing in mind that the justification for the CTPs lies in the search to develop the beneficiaries' capacities, in the present and in the future, which is the reason for the conditionality on human capital. Also, women's leadership is justified in the search for more outstanding agency and decision-making in the household. Moreover, another critical point is the unrestricted use of the transfers, which is related to Sen's statement regarding freedoms and voice for the poor (Ospina 2010). Although they make sense, how the theory of capabilities can be instrumentalized cannot be ignored. Among the most popular criticisms applicable to Colombia is how poverty has been seen as dependent on the skills and decisions of the heads of households. It is often assumed that the blame falls on the beneficiaries (Betancourt 2018), and social mobility is focused on the individual, leaving aside social and group ties. Thus, with all these assumptions, FeA has become the main CTP within the country's Social Promotion System (SPS), focusing on two fronts: the first related to encouraging the demand for education and health services in the poor population, making use of other SPS offers, and the second, the demand for co-responsibilities on the part of families, where they are the ones who contribute to overcoming their condition of poverty (DPS 2013).

To interpret what Map 5. is showing, it is essential to consider how FeA reaches households, which derives from neoliberal theories, limiting state support to the extent that it does not generate distortions in the market (Ospina 2010). That is why FeA targets beneficiaries, seeking to concentrate resources more efficiently towards people with lower basic endowments—in other words, seeking the poorest of the poor. The methodology that, under its creation, seems to give results and reach those who need it. Spatially, it is evident that the program reaches the poorest (located in the northern and eastern areas of the city), and the rest of the areas coincide with the distribution of multidimensional poverty and the number of households that receive the program. However, it is worth noting that it is not entirely coincident in the city since it can be assumed that the targeting exercise does not overcome the complexity of reaching thousands of households with limited institutional offers. Precisely from this, it can be inferred that the multiple institutional requirements in the targeting universe are limited to money transfers that aim more at overcoming monetary poverty than the other dimensions such as education, health, and childhood services that are components of the MPI, and the basis of the measurement in the Map 5.

So, the map shows that the government's proposal is being met under the targeting scheme (*proxy means*)<sup>11</sup>. However, the relevance of targeting in Colombia could still be questioned, knowing that there are many people registered in the SISBEN<sup>12</sup> (System for the Identification of Potential Beneficiaries of Social Programs). They do not have access (as in the southern part of the city, where it does not reach with the same intensity as in the north) to the FeA program. It could also be questioned because of the principle of equality, embodied in the Political Constitution of Colombia that advocates for the equality of all Colombians (Art. 13)<sup>13</sup>. Which is blurred under the logic of targeting, where society is categorized between the poor (those who receive solidarity programs), and the non-poor (those who must access social rights through the market)(Betancourt 2018). Although the map does not allow to verify this information, other indicators that should be considered in future research, but as has been a constant in this RP, the data are not complete for this type of analysis. In fact, reviewing the institutional pages of the Department of Social Prosperity-DPS<sup>14</sup>- (the entity in charge of coordinating the program at the national level), in their unofficial reports, they state that, due to the effects of the vulnerability and poverty conditions of the families, the available information on the households and their members is insufficient, outdated or not even registered in the databases for the programming of interventions and offers on a large scale. In the institutional analysis, it was found that the immediate response offered by the government so far is in the National Development Plan "Pact for Colombia"<sup>15</sup>. This plan aims to achieve the interoperability of data and records between beneficiaries and benefits of social programs, which as can be seen is still incipient, especially in intermediate cities such as Bucaramanga. In addition, they relate it to the poverty traps and dimensions of the MPI, presenting the program as a contributor to the reduction of both notions.

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<sup>11</sup> It uses multivariate regressions to relate *proxies* such as household characteristics to income, and poverty status to give a score that classifies households as deserving of social assistance.

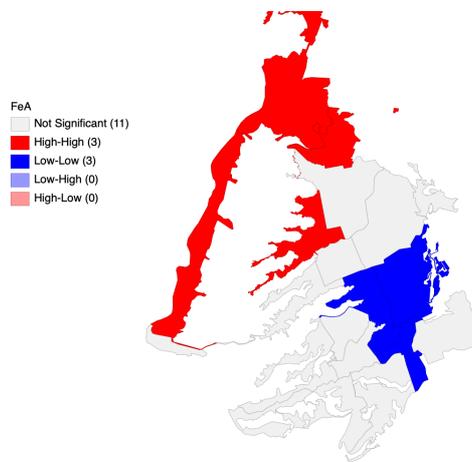
<sup>12</sup> The SISBEN is an information system that, according to socioeconomic conditions, assigns a score to citizens, thereby identifying those who can access the State's social programs. A score of 1 represents those with the worst conditions

<sup>13</sup> *"All individuals are born free and equal before the law, will receive equal protection and treatment from the authorities, and will enjoy the same rights, freedoms, and opportunities without any discrimination on account of gender, race, national or family origin, language, religion, political opinion, or philosophy"* (Colombia's Constitution 1991)

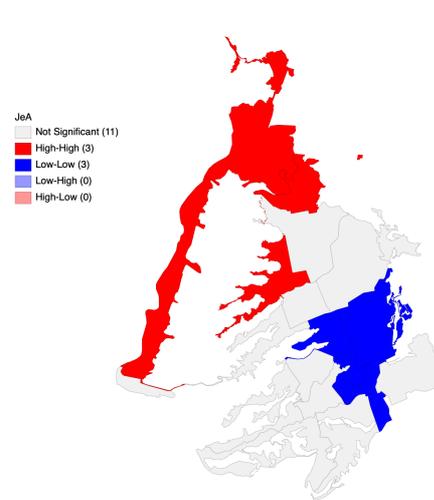
<sup>14</sup> <https://prosperidadsocial.gov.co>

<sup>15</sup> These are the public policy guidelines formulated by the President of the Republic and his government. The current National Development Plan runs from 2018- 2022 and is conceived as a pact for Equity. Seeking to achieve social and productive inclusion, through Entrepreneurship and Legality.

**Map 7. Spatial auto-correlation of Familias en Acción beneficiaries**



**Map 6. Spatial auto-correlation of Jóvenes en Acción (JeA) beneficiaries**

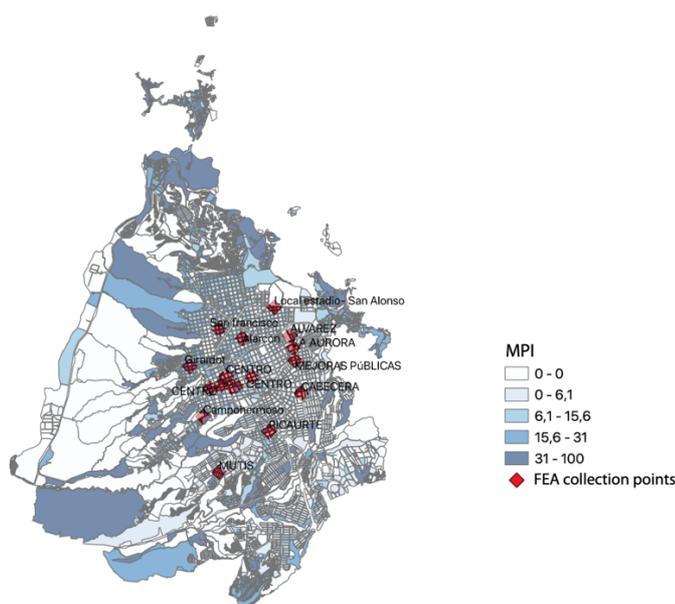


Source: Author's elaboration, using data from DANE (2018).

Returning to the spatial autocorrelation analysis that has been done in this research, it was considered relevant to evaluate the autocorrelation between the recipients of social programs, such as FeA and JeA (Jóvenes en Acción). Due to those programs are both CTPs and to check if there was a spatial relationship between neighbors. Indeed, what was obtained was an expected and logical result. In the northern zone, there is a significant concentration of recipients with high levels. In the southern zone, beneficiaries but live in an area with a lower general propensity of multidimensional poverty. However, unlike the first analysis by MPI, the raw significance and the distributions of high-low and vice versa are random. This makes it impossible to draw conjectures about any spatial pattern. Although it still corresponds to targeting, where the poorest of the poor receive more than the others, even when there are high MPI indices in other parts of the city, it is not spatially reflected in the distribution of the two social programs.

Taking into account the above maps and the value of their information in terms of targeting. It is worth noting that other aspects are left out, and spatially they do not say much. For example, in the case of people who are left out, or go beyond identification, and see if there are effects in implementing this type of social programs, with the location of the beneficiaries. The places related to the social programs, understanding that it is not possible, could be a form of segregation.

**Map 8. Spatial distribution of Familias en Acción (FeA) Collection points**



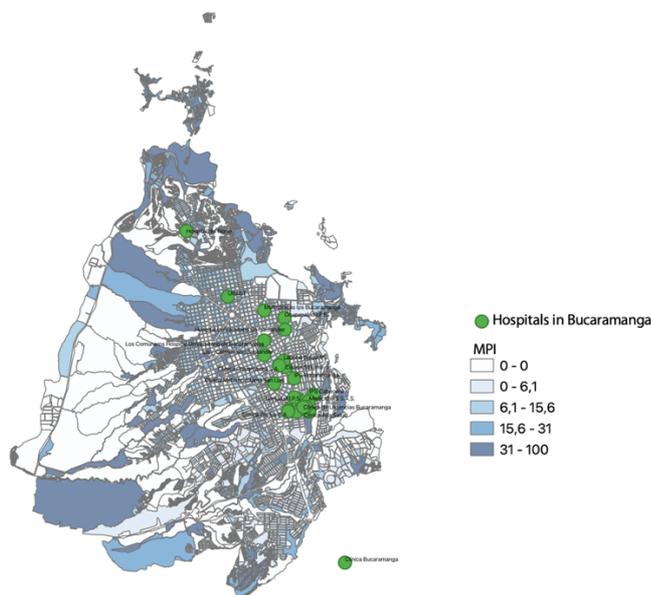
Source: Author's elaboration , using data from DANE (2018).

In an attempt to go beyond the previous maps, and under the limitation of the data. A method of manual geo-referencing of points related to the implementation of the FeA program was carried out. This, to understand the spatial effects of the social policy since it seems that it does not segregate itself up to this point. It is worth mentioning that no studies have been carried out to analyze the (non-direct) spatial effects of the implementation of social programs. Thus, the author manually geo-referenced the points where people can claim cash transfers as a first approach.<sup>16</sup> By October 2021, which are published on alternative channels such as Facebook rather than on the official DPS pages. The locations are important because many beneficiaries do not have a bank card (despite not having official data, the mayor's office has an estimate of more than 8,000 beneficiaries who are not banked). They must collect the money in cash in LA PERLA establishment (a company of money transfers, recharges, bets, and payments). In this case, the map clearly shows how the distribution of points is towards the center and east of the city, ignoring that the north is where there are more beneficiaries, who are forced to move from their area to others to claim the money. Although it is not a very orthodox source, precisely when transmitting the information through Facebook. Multiple comments complain about the procedures involved in going to

<sup>16</sup> Those who comply with co-responsibility can receive subsidies for health, which are \$160,000 (COP), approx. 35 euros, and for education \$120,000 approx. 26 euros. (At exchange value of 11/2021).

the claiming points, the queues, and the time to claim it (omitting more details, such as the implications in times of Covid, which has caused many to be suspended from the program for not collecting it).

**Map 9. Spatial distribution of Hospitals and MPI in Bucaramanga**



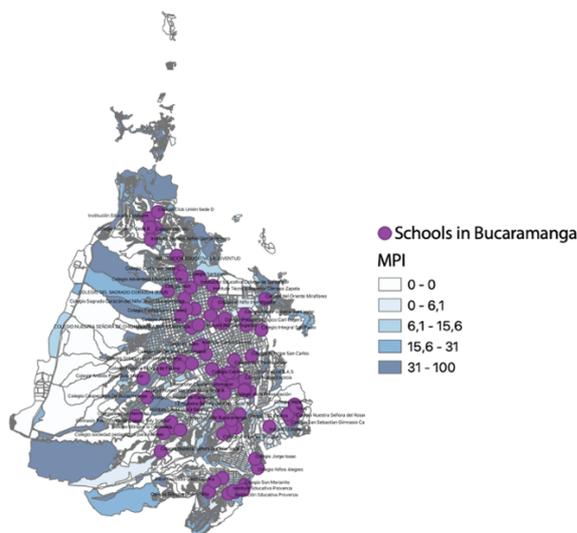
Source: Author's elaboration , using data from DANE (2018).

Another aspect related to the implementation of the FeA program is access to health services, which was understood as the spatial distribution of hospitals in the city for simplification purposes. Moreover, how easy is the geographic access to health care institutions for the inhabitants related to the incidence and intensity of multidimensional poverty (the equivalent of the MPI ). Well, it is worth noting that FeA conditionality implies going to health and vaccination check-ups in particular. Thus, map 9 shows that the areas with greater multidimensional poverty do not have direct access to hospitals. However, the HLC (Hospital Local del Norte) is in the north for such a large area, and with so many needs, it seems little. Likewise, there are no high-level hospitals in the eastern zone, which means that people must leave their community zone if they need more specialized care. This would make this yet another way of being segregated under the framework of this research.

By analyzing the development plans and mayoral documents, the spatial analysis of hospital distribution coincides with their conditions and the vulnerability of their locations. For example, they are aware of the HLN and its poor conditions, lacking high-tech biomedical

equipment. And that in the north of the city there are more than 131,360 users<sup>17</sup>, with access to a hospital that does not comply with conditions or biomedical equipment. Nevertheless, it serves inhabitants who mainly belong to socioeconomic strata 1 and 2. In the public policy strategies, they stress the risk approach and a search for integral health care routes, through an intervention in inspection, surveillance, and control, issues that are still very incipient.

**Map 10. Spatial distribution of Schools in Bucaramanga**

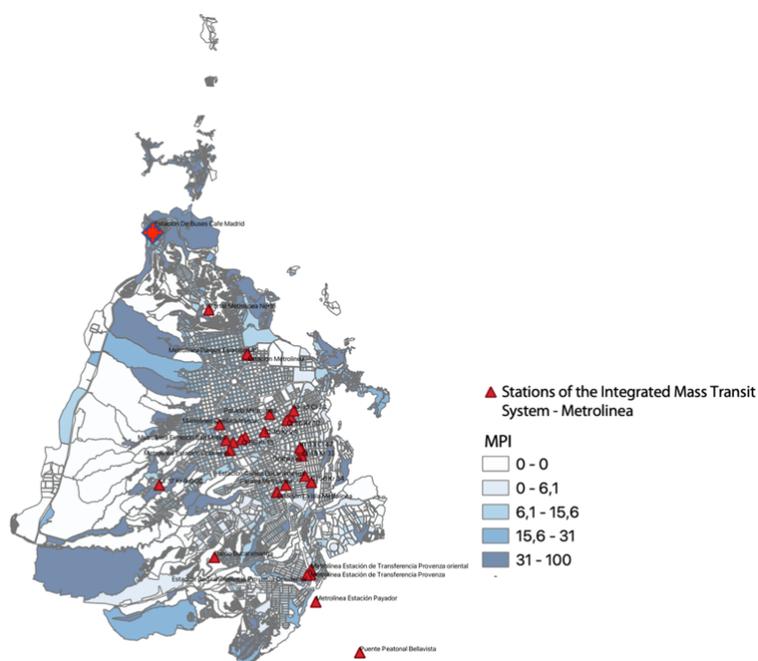


Source: Author's elaboration , using data from DANE (2018).

Continuing with the data related to program implementation, school attendance conditionality was related to the distribution of schools in the city, taking into account the MPI. However, it follows a similar spatial pattern, where the concentration of assets - as in this case schools - is more towards the most favored areas in terms of poverty. In education, there is greater access, which is supported by the search for an increase in student enrollment based on municipal development plans. This is driven by the number of enrollments in educational institutions of prevention actions for the "official" migrant population. However, the quality of schools to which they have access could be analyzed in greater detail, and roughly speaking, the best schools are not in these areas. Therefore, the relationship between the conditionality of schools and the quality they receive remains to be seen in addition to complying with the transfer requirement.

<sup>17</sup> The Health Centers are: Café Madrid, Kennedy, Rosario and Girardot, being the ones that concentrate the largest population (Instituto de Salud de Bucaramanga ISABU).

**Map 11. Spatial distribution of the Integrated Mass Transit System- Metrolínea**



Source: Author's elaboration, using data from DANE (2018).

Finally, another important aspect that goes in the same direction as segregation is access to the integrated transportation system. Because although we have seen the direct implementation, it is also worth looking at how they are transported to comply or receive the benefit. It is evident that the city's formal transportation still does not reach these areas, having only access to traditional (old) buses, which have no connectivity with the rest of the city, nor with other neighboring municipalities where the same transportation system is in force. On the other hand, the informal transportation system swarms with motorcycles or private cars that offer cheaper fares and arrive or start their routes in the most segregated sectors. As shown in Appendix 4 most of the points where the Bucaramanga Transit and Transportation Department detected more "piracy" were in the northern zone (Communes 1 and 2), the center of the city, and the east in Commune 14. Coinciding with Map 11, wherein effect there are not enough transportation routes, hindering mobility that could compromise the implementation of PTC.

Thus, it could be assured with the above results that although the strategy of targeting, conditioning, and investing in human capital reaches the poorest of the poor and seeing impact evaluations of the program, the results could be considered satisfactory. However, they may still be partial to the extent that the state of the supply of health and education services is still limited, this time verified from spatial analysis. Not to mention other

limitations such as the conditionality of poverty reduction in Colombia with the behavior of the country's economic growth, or the somewhat short-term vision that increases consumption (without allowing them to save or invest) (Fischer 2018), limiting itself to that, and not the real and overall improvement of household capabilities. In addition, another factor that could have an influence is that a generic formula was applied to developing countries without taking into account the specificities or structural causes of structural poverty or social inequality in the Colombian context. With more data and details, one could question the balance of the contributions of the CCTs with the perverse impacts that authors such as Fischer propose on income distribution-inequality and, above all, on social integration. However, for the moment, it can be suggested that social policy per se does not segregate spatially. However, its implementation would be deepening the differences between those who receive and those who do not.

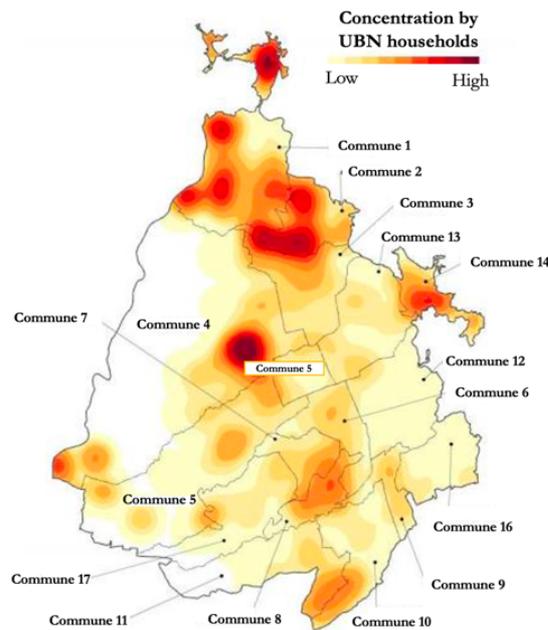
### **5.1 Beyond the social program, an approach to possible side effects of its implementation.**

In the municipal development plan, it is evident the projection of the city that the government and public policy are looking for: a city "with a technological infrastructure that allows making the right decisions and thus focuses actions on serving the neediest population of the city" (Alcaldia de Bucaramanga 2020: 15). Making a critical reading of the Municipal Development Plan (MDP), there are repeated proposals of objectives towards being an equitable and inclusive city, with a view towards fairer distributions and protection of rights. However, it is crucial to see how much influence these policies have on the segregation or not of the inhabitants, following the guiding thread of this research. For many times, these words can remain in the air.

An approach to the spatial component is articulating the Municipal Development Plan with the Land Use Plan. On paper, they stipulated the prioritization of actions on public space, understanding this as the transforming axis of the city (ibid: 25). The main goals were to improve connectivity and accessibility conditions for citizens through road, vehicular and pedestrian infrastructure, accompanied by alternative transportation. As a positive development, it is essential to emphasize the importance given in the municipal development plan to land use planning as an input for urban land management.

Regarding the diagnosis of the city, the main interest is directed towards the "subjects of special constitutional protection and vulnerable groups" (MDP 2020:38). A purely descriptive diagnosis from the multidimensionality of poverty coincides with what has been proposed in this research, concerning the concentration of poverty in the northern zone and south of communes 8 and 10, as shown in map 12.

**Map 12. Spatial concentration by UBN households**

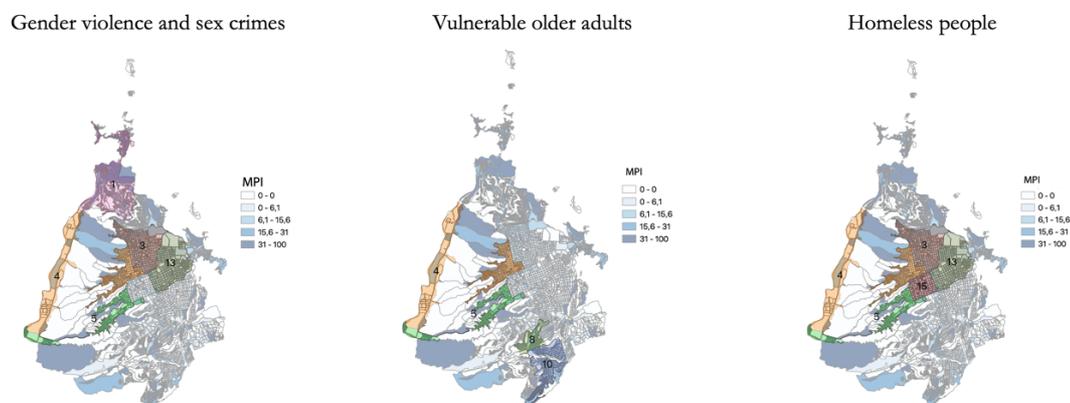


Source: Took from Dane (2018)

However, there is no mention of possible segregations or even spatial separations between citizens—neither integration policies with particular interventions. Nevertheless, from the mayor's office, it is possible to identify that the way to address the problems related to welfare is based on the provision of and access to public goods and services of education, health, recreation, and housing. Although, it is worth mentioning that in the institutional analysis, it is evident that there are other problems, without being very clear about the barrier between whether they are products of poverty (neighborhood effects) or are unrelated to it. Moreover, that these could be spatially related, and therefore would be contributing to segregation. Suppose the premise that has been derived in the development of the work is followed, of considering segregation: as the situation when the location options are limited, either by the spontaneous and organized actions of one or several groups. Among the alternative factors that were found in the municipal development plans, and that could have

negative implications in the phenomenon in question from the government's interpretation, were the following:

**Map 13. Spatial distribution of other variables, which refer to geographically negative aspects.**



Source: Author's elaboration, using data from DANE (2018).

1. *Contexts of Violence:* According to a review of the press on this problem, in Bucaramanga, it could be said that there is a culture permeated by power dynamics and inequalities that violently affect women. The lack of institutional articulation, response mechanisms, and statistics to record the actual situation is also evident. Between 2015 and 2019, approximately 5,285 women were victims of gender and intrafamily violence (Observatorio Digital Municipal de Bucaramanga 2019). As a fact to highlight is its territorial intensity, affecting in a more critical way communes 1, 3, 13, 5, and 4, to such a level that from the government itself they affirm that Bucaramanga is a violent city for women.

2. *Sexual crimes:* Between 2016 and 2019, 1,436 cases were officially presented in the city, having a higher incidence in adolescents and girls in childhood. In the territorial impact of this phenomenon, a similar trend to the context of violence is observed, with the most affected communes being 1, 3, 5, 13, and 4. In addition, from public policy<sup>18</sup>, the city has only one Integral Women's Center- CIM, located in Barrio Álvarez (C 13), where psychological and legal care services are offered.

3. *Vulnerable population:*

- *Older adults:* of the 66,103 people over 60 years old living in Bucaramanga, 50% of them are in the SISBEN base, and only 29% of that percentage receive a pension (National Planning Department 2019), and only 13.1% receive subsidies from Colombia Mayor<sup>19</sup>. Then,

<sup>18</sup> Agreement 008 of February 28, 2011

<sup>19</sup> Monthly economic subsidy for the elderly in indigence or extreme poverty.

according to the mayor's office, more than 400 people are on the waiting list for subsidies. Despite these alarming figures, the city has only 3 CENTROS VIDA, which offer health services and cultural activities, what was evidenced is a concentration of attention to the north leaving aside communes in the south such as 4,5,8, and 10, with high levels of UBN.

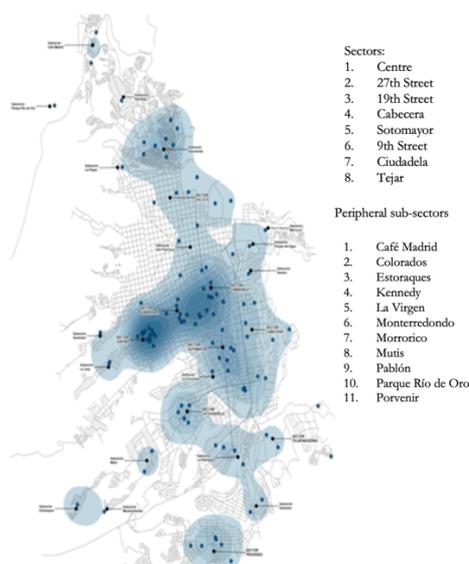
- *Homeless*: although not officially part of communes, the existence of street homeless people cannot be ignored, and how they are concentrated in the center of the city, and even so, the municipality does not have a public policy on homeless people or updated databases<sup>20</sup>. The information provided by DANE shows that 70% of the street dwellers have been living there for more than 5 years, and there are still no policies to improve their conditions. In addition to these deficiencies, the institutional weakness is reflected in the fact that, in the same survey, it became evident that 62% of the people do not know the services offered by the mayor's office.

It was found that, with the study of this type of negative aspects, more outstanding care must be taken in the formulation of public policies to not generalize it as a violent neighborhood or one prone to sexual crimes because there is more violence there. Unfortunately, however, it de-merits specific interventions to solve these marked phenomena, and in this case, the correction of what Sabatini would call "Neighborhood Effects." As well as interventions that improve well-being beyond the socioeconomic, such as access to culture or alleviation of environmental risk. Because as can be seen in map 14. even the cultural and tourism offer of the city is concentrated towards the center and south, leaving aside the north. Which, in this case, the mayor's office geo-references the circuits of these areas as peripheral.

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<sup>20</sup> The only information available is that their income comes from collecting recyclable materials (39.4%), begging or begging (22.1%), and cleaning windows, taking care of cars, and touching tires (16.3%) (Municipal Development Plan, Bucaramanga ciudad de oportunidades 2020).

**Map 14. Cultural and tourist circuits of Bucaramanga**



Source: Author's elaboration, adapted and taken from IMCT (2019)

Precisely, these peripheral communities are not only locally segregated but also exposed to risks and environmental pollution associated with air and offensive odors<sup>21</sup>, As well as high levels of sound pressure. On the other hand, three key aspects that were found by reading plans and public interventions, and that intersect the links with the institutional framework and what happens in the city were the market processes, which in general terms were 3: transportation service, the costs and how it is developed (the implications of living far away, and the use of informal transportation to get to work), housing subsidies (which continue the location of people in poverty in places where they are being segregated and concentrating the poor in such areas), and the continuation of subsidies to public services under the stratification scheme that as mentioned at the beginning of the work has multiple questions, and often benefits those who need it the least. Also, employment and spatial location can influence, seeing the factors mentioned earlier that leave people living in the city's peripheral areas segregated and distant. Furthermore, although correlation does not imply causation in Appendix 6 it can be seen that unemployment rates are higher in such areas and without planned public interventions. On the contrary, there are labor markets

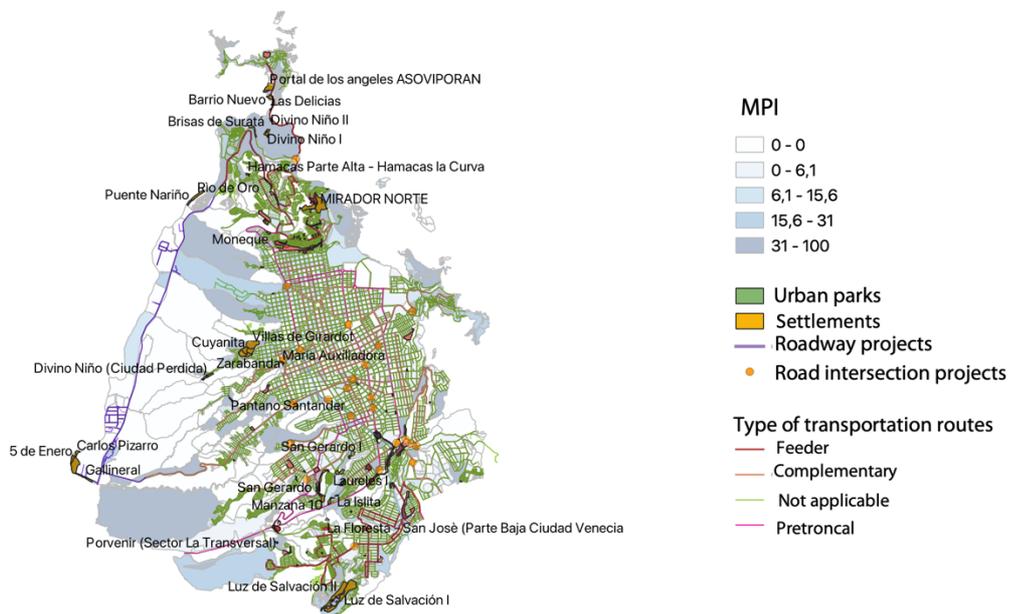
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<sup>21</sup> During 2016, the AMB and CDMB identified the Río Frío Wastewater Treatment Plant (PTAR) and the companies Harinagro, Coingra and Sebosander as the generators of these odors (located on the outskirts of the city). The mayor's office says it is following up, as the number of complaints about offensive odours continues to be representative.

with horizontal occupational segmentation, with segregated jobs for women and men, a consequence of gender inequality and informality.

As a second alternative, in addition to the extra dimensions we have been talking about and the consequences of the market. A fundamental aspect, which is ignored in many analyses, but makes total sense in the Latin American and Bucaramanga context, is the housing informality and the settlements that persist in the city, always understood as a problem. Furthermore, which receive as a solution mere "re-location" programs. It is precisely authors such as Berner (2001) who argue that "urban poverty is closely related to physical segregation; although it is not limited to the enclaves of slums and "depressed areas," it is strongly concentrated in these places" (p. 292). This coincides with the phenomena discussed above, such as crime and violence, which are generally negatively associated: poverty, places, and those who inhabit them. However, "this visual imaginary expresses a part of the reality and is so clear and obvious that the nature of the relationship between housing and poverty is rarely explored in-depth" (Pugh 1997:34).

**Map 15. Spatial distribution of urban settlements in Bucaramanga**



Source: Author's elaboration, using data from DANE (2018).

Thus, there could be segregated groups within the segregated, as would be the case of the settlements distributed throughout the city but more concentrated towards the peripheries. An explanation by Berner (2001) denotes that it could be a consequence of the aspects discussed above, such as market and state failures, relying on their initiative to find shelter.

Furthermore, indeed, even if they do find shelter, they live without drinking water, without sewage, without opportunities to access credit or aid for housing improvements, among other deprivations typical of subnormal neighborhoods. Moreover, where social policy is less effective, however, it shows other forms that people find of organization and advantages, especially in the sharing of costs related to development. Since "Ultimately, the difference between the two systems is probably not the price limit itself, but how low-income families stagger their housing expenses" (Baross 1990:7). They are, again, redounding to market consequences. Therefore, it is worth questioning to what extent our development policies have created a "poverty industry" that conceals the dynamic reproductions of poverty within contemporary capitalist development and pro-motes segregation in the name of science and charity (Fischer 2018:9)?

## Chapter 6 Conclusions

In the development of this research, the theoretical and methodological complexity of segregation became evident. Multiple nuances can be given to it as a concept of proximity or as a social problem. However, due to the analytical review of the literature, there are clear points to be taken into account in future research. Such as the need not limit segregation to the cause of social problems; to overcome the concept of concentration of poverty as an explanatory condition of poverty. Many calls for attention stand out, such as spatial determinism, which leaves people aside and reduces them to passive entities, or the instrumentalization of the multiple segregation indexes. At the same time, the debate between poverty-segregation, which re-constructs space as the cause of urban problems, continues to open up. And the role of social, urban, and housing policies as a whole, and their effects and implications are given a more holistic understanding of segregation, is still missing in academic debates. However, it is worth mentioning that the limitations of data, despite the new wave of GIS, are still limited to variables that do not account for the spatial dynamics and particularities of places. With the use of spatial analysis, although it did not go directly to those affected, the author tried to innovate, presenting a broader vision of their lives and the indirect implications of social policies.

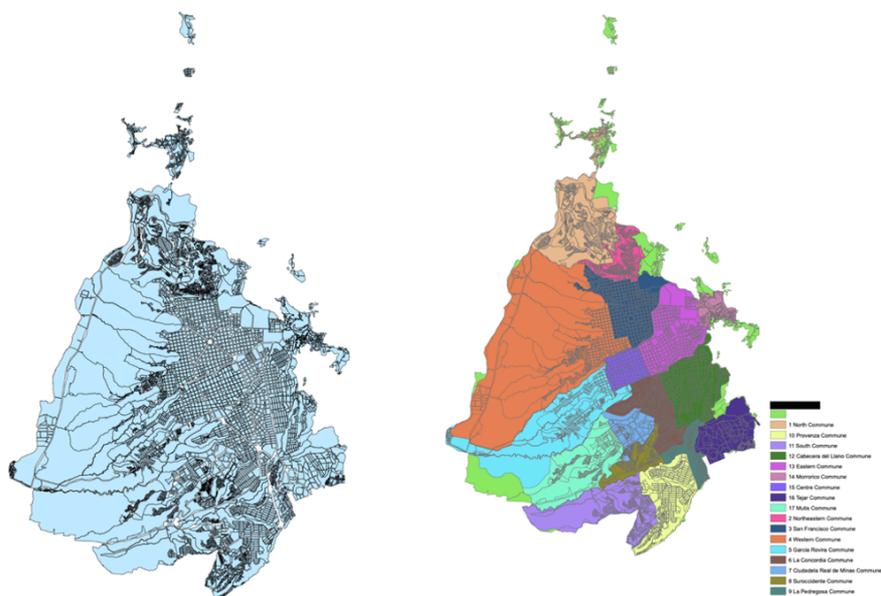
Now, when going to the detail of programs such as FeA that use targeting, it is evident that they require a wide diversity of supply that transcends the conditionality per se implied by the program. Although it addresses multidimensional poverty, it transcends more dimensions. Because what became evident was that FeA is indeed addressing poor families among the poor, but not the multidimensionality of spatial poverty observed with the use of maps. Then, it remains to be answered to what degree the social policy segregates or not, or if it is in its implementation where inequalities and differences related to the place where people live are deepened and ends up being a cause of being separated from being segregated. From all this, it is also pending proposals for socio-spatial integration policies, which take into account spatial segregation, understand integration in its various dimensions, the intrinsic hierarchical relationships between communities, the identification of different social groups with a common space, among other factors. As learning could result in mixed analyses, with qualitative and quantitative data, that transcend "neighborhoods."

Although the empirical study of Bucaramanga went into detail about the conditions of the city, it left insights that could be taken into account. Moreover, it left insights that could be taken generally and with options for further development. Such as, it showed that social systems reproduce themselves and generate inertias related to historical, social, cultural, and other components, which are being ignored due to the lack of policies to address segregation. Although there are none, it is a precedent that these cannot be directed to the symptoms (often negative as -neighborhood effects-), but to the structural forces that create more complex processes in the zones, which in the case of Bucaramanga are located in the periphery.

In addition to delving into more aspects to understand segregation, it would be worthwhile to integrate the voices of the communities that participate in a particular program - such as FeA- so that their visions can be integrated into the territorial analysis. In this way, geographic information would contribute more to social inclusion policy actions at different scales and almost real-time. Furthermore, although it sounds cliché, the challenge is to build new geographies that will guide us towards poverty eradication and integration without segregation of any kind.

# Appendices

## Appendix 1. Political administration in Bucaramanga by Communes



Source: Source: Author's elaboration, using data from DANE (2018).

## Appendix 2 MPI dimensions used in Colombia

Dimension	Variable
Household education conditions (0.2)	Educational achievement (0.1)
	Literacy (0.1)
Childhood and youth conditions (0.2)	School attendance (0.05)
	No school lag (0.05)
	Access to childcare services (0.05)
	Children not working (0.05)
Employment (0.2)	No one in long-term unemployment (0.1)
	Formal employment (0.1)
Health (0.2)	Health insurance (0.1)
	Access to health (0.1)
Access to public utilities and housing conditions (0.2)	Access to water source (0.04)
	Adequate elimination of sewer waste (0.04)
	Adequate floors (0.04)
	Adequate external walls (0.04)

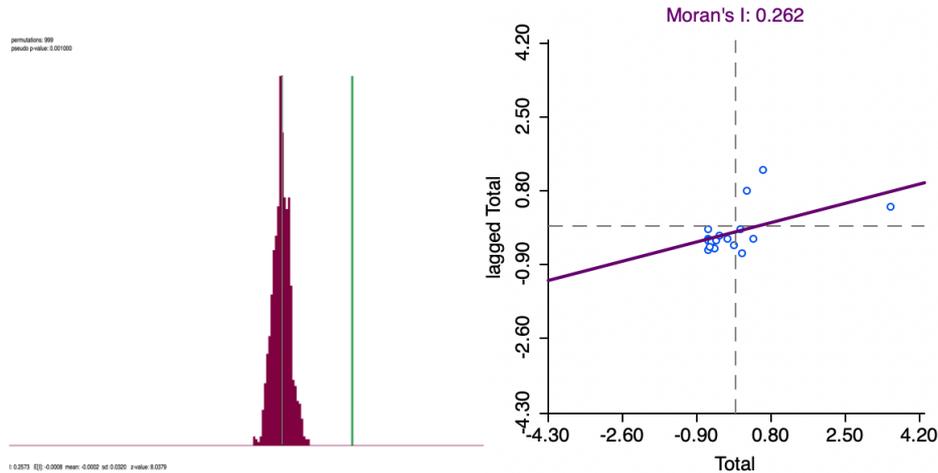
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No critical overcrowding  
(0.04)

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Source: OPHI and DANE (2018).

### Appendix 3 Moran's I significance test



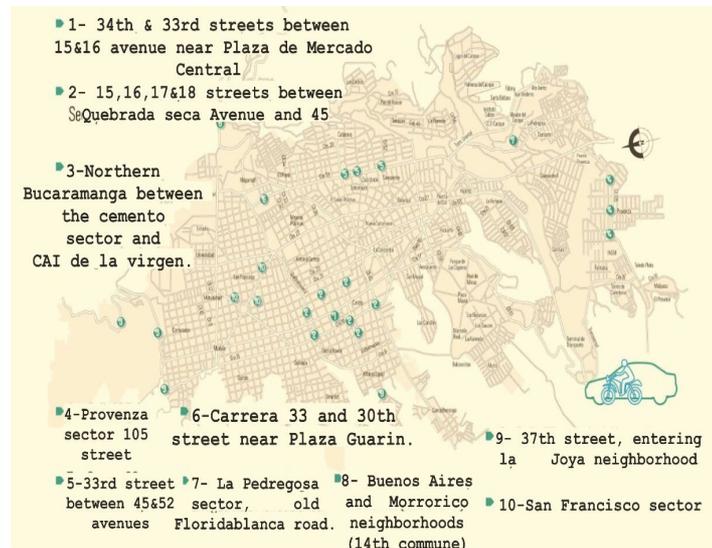
Source: authors elaboration, using GeoDa and QGIS softwares

What can be seen in the figures is that there is a positive slope, which implies a correlation of the same type. However, the value is not very high, so it was considered that the autocorrelation was medium for the city of Bucaramanga. At the same time, in the figure on the left, it is evident that there is correlation using the test with a z-value of 8.037, which indicates significance. In addition, visually the distribution is distant from the green line, which according to Anselin (1995) the greater the distance, the greater the autocorrelation.

Name	IS	IS(adj)	IS(w)	IS(s)
QL_ipm	0.3663	0.3647	0.3660	0.3662

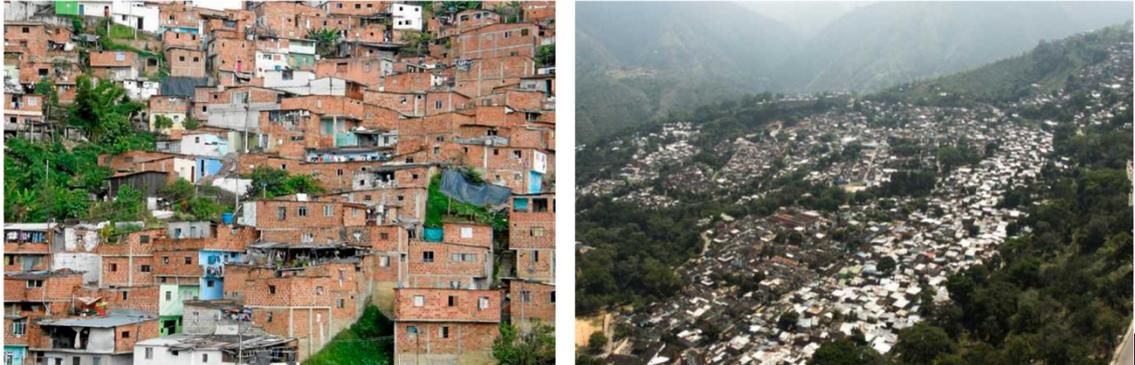
At the same time, using the Segregator software, an IS which was a segregation index, IS (s) adjusted for measuring continuity and IS (w) which is a segregation index adjusted for continuity to measure boundary lengths. Finally, an IS (s) which is segregation index adjusted for contingent tract boundary lengths and perime-ter/area ratio. As a conclusion it was obtained that all the indices were significant and at the same time positive, confirming from **non**-spatial conception. The daily segregation of the city of Bucaramanga.

#### Appendix 4. 10 points where "piracy" is detected the most in Bucaramanga



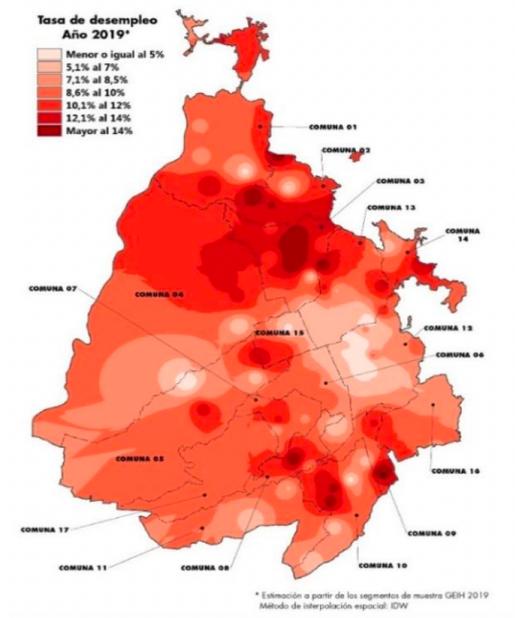
Source: Vanguardia (2019). Available: <https://www.vanguardia.com/area-metropolitana/bucaramanga/las-cifras-que-tienen-al-transporte-de-bucaramanga-en-crisis-DF3667243>

#### Appendix 5. Image of what the settlements on the outskirts of Bucaramanga look like



Source: Vanguardia. (2018). Available: <https://www.vanguardia.com/area-metropolitana/bucaramanga/inicio-gestion-para-legalizar-cinco-asentamientos-en-bucaramanga-durante-2021-XL3397404>

## Appendix 6. Unemployment rate by communes in Bucaramanga



Source: Took from the Plan de Desarrollo Municipal de Bucaramanga (Alcaldía de Bucaramanga 2020)

## References

- Alfonso, O., 2017. La calidad de Bogotá en perspectiva comparada: urbanismo, simbolismos y segregación. *Bogotá en la Encrucijada del Desorden*, pp.27-82.
- Alcaldía de Bucaramanga, A., 2020. Plan de desarrollo municipal 2020-2023: Bucaramanga, ciudad de oportunidades.
- Aliaga-Linares, L. and Alvarez-Rivadulla, M.J., 2010. Segregación residencial en Bogotá a través del tiempo y diferentes escalas. *Documento de Trabajo de Lincoln Institute of Land Policy. Cod. np10ll1sp. Consultado el, 18.*
- Alkire, S. and Foster, J., 2011. Understandings and misunderstandings of multidimensional poverty measurement. *The Journal of Economic Inequality*, 9(2), pp.289-314.
- Alonso, W., 1964. The historic and the structural theories of urban form: Their implications for urban renewal. *Land Economics*, 40(2), pp.227-231.
- Anselin, L., 1995. Local indicators of spatial association—LISA. *Geographical analysis*, 27(2), pp.93-115.
- Atkinson, A.B., 2003. Multidimensional deprivation: contrasting social welfare and counting approaches. *The Journal of Economic Inequality*, 1(1), pp.51-65.
- Baross, P., 1990. Sequencing land development: the price implications of legal and illegal settlement growth. *The transformation of land supply systems in Third World cities*, 57.
- Bayer, P., McMillan, R. and Reuben, K., 2004. *The causes and consequences of residential segregation: an equilibrium analysis of neighborhood sorting*. working paper.
- Berner, E., 2001. Learning from informal markets: Innovative approaches to land and housing provision. *Development in practice*, 11(2-3), pp.292-307
- Betancourt, V.A., 2018. Condicionar, focalizar e Invertir en capital humano: El programa " Familias en Acción" o la receta internacional de lucha contra la pobreza para Colombia. *Panorama Económico*, 26(1), pp.43-64.
- Blokland, T., 2008. From the outside looking in: A “European” perspective on the Ghetto. *City & Community*, 7(4), pp.372-377.
- Bonal, X., Zancajo, A. and Scandurra, R., 2019. Residential segregation and school segregation of foreign students in Barcelona. *Urban Studies*, 56(15), pp.3251-3273.
- Bourguignon, F. and Chakravarty, S.R., 2019. The measurement of multidimensional poverty. In *Poverty, social exclusion and stochastic dominance* (pp. 83-107). Springer, Singapore.
- Bridgeland, W.M., 1977. Fischer. The Urban Experience (Book Review). *Rural Sociology*, 42(1), p.122.
- Burgess, S.M., Wilson, D., Briggs, A. and Piebalga, A., 2008. *Segregation and the attainment of minority ethnic pupils in England*. Centre for Market and Public Organisation, University of Bristol.
- Cabeza, A.M., 1998. Determinantes de los planes de ordenamiento territorial. *Perspectiva geográfica*, 20, pp.7-70.
- Castells, M., 1977. *The urban question: A Marxist approach* (No. 1). London: E. Arnold.
- Castells, M., 1978. Urban Crisis, State Policies and the Crisis of the State: the French Experience. In *City, Class and Power* (pp. 37-61). Palgrave, London.
- Cazenave, N.A. and Maddern, D.A., 1999. Defending the white race: white male faculty opposition to a “white racism” course. *Race and Society*, 2(1), pp.25-50.
- Cecchini, S. and Madariaga, A., 2011. Conditional cash transfer programmes: the recent experience in Latin America and the Caribbean. *Cuadernos de la CEPAL*, (95).
- CEPAL, N. and UNICEF, 2010. Pobreza infantil en América Latina y el Caribe.
- Cerón, W.L. and Escobar, Y.C., 2014. Índice de Segregación Espacial y Socioeconómico (ISES) en las comunas de Santiago de Cali. *Cuadernos de Vivienda y Urbanismo*, 7(13).
- Chiodelli, F., 2013. Planning and urban citizenship: suggestions from the thoughts of Henri Lefebvre. *Planning Perspectives*, 28(3), pp.487-494.
- Chen, Y., 2013. New approaches for calculating Moran’s index of spatial autocorrelation. *PLoS one*, 8(7), p.e68336.

- Davis, K., 1965. The urbanization of the human population. *Scientific American*, 213(3), pp.40-53.
- Departamento Administrativo Nacional de Estadística-DANE. 2018. *Censo Nacional de población y vivienda 2018*. Bogotá DC: DANE.
- Departamento Administrativo Nacional de Estadística-DANE. 2018. *Encuesta Calidad de Vida*.
- Departamento Administrativo Nacional de Estadística-DANE. 2018. *Gran encuesta integrada de hogares, GEIH*. Bogotá DC: DANE.
- Departamento Administrativo Nacional de Estadística-DANE. 2019. *Censo Habitante de Calle 2019, Resultados Bucaramanga y Área Metropolitana*.
- Departamento Administrativo Nacional de Estadística-DANE. 2019. *Gran encuesta integrada de hogares, GEIH*. Bogotá DC: DANE.
- Departamento Nacional de Planeación (DNP). 2014. Sistema de Ciudades, una aproximación al caso colombiano. Bogotá, DNP.
- Dureau, F., Le Roux, G. and Piron, M., 2012, September. Evolución de la intensidad y de las escalas de la segregación residencial en Bogotá: un análisis comparativo con Santiago de Chile y São Paulo. In *X seminario ACIUR (Asociación Colombiana de Investigadores Urbano Regionales)*.
- Durkheim, E., 2014. *The division of labor in society*. Simon and Schuster.
- Edelman, D.J., 2003. The World of Cities: Places in Comparative and Historical Perspective. *The Town Planning Review*, 74(4), p.474.
- Ellen, I.G. and Turner, M.A., 1997. Does neighborhood matter? Assessing recent evidence. *Housing policy debate*, 8(4), pp.833-866.
- Ellen, I.G. and Turner, M.A., 1997. Does neighborhood matter? Assessing recent evidence. *Housing policy debate*, 8(4), pp.833-866.
- Engels, F., 2015. The great towns. In *The city reader* (pp. 58-86). Routledge.
- Falah, G., 1996. Living together apart: Residential segregation in mixed Arab-Jewish cities in Israel. *Urban Studies*, 33(6), pp.823-857.
- Ferullo, H., 2006. El concepto de pobreza en Amartya Sen. *Cultura económica*, (66), pp.10-16.
- Fischer, A.M., 2018. *Poverty as ideology: rescuing social justice from global development agendas*. Zed Books Ltd.
- Flanagan, W.G., 1999. *Urban sociology: images and structure*. Rowman & Littlefield.
- Flores, C., 2006. Consecuencias de la segregación residencial: Teoría y métodos. *JM Cunha (Comp.), Metrópoles paulistas: População, vulnerabilidade e segregação*, pp.197-230.
- Flores, C., 2006. Consecuencias de la segregación residencial: Teoría y métodos. *JM Cunha (Comp.), Metrópoles paulistas: População, vulnerabilidade e segregação*, pp.197-230.
- Franck, K.A. and Paxson, L., 1989. Women and urban public space. In *Public places and spaces* (pp. 121-146). Springer, Boston, MA.
- Gans, H.J., 2008. Involuntary segregation and the ghetto: Disconnecting process and place. *City & Community*, 7(4), pp.353-357.
- Garay, J.W.M., 2013. El sistema urbano colombiano frente a la globalización: reestructuración económica y cambio regional. *Cuadernos de vivienda y urbanismo*, 6(12).
- Garrocho, C. and Campos-Alanís, J., 2013. Réquiem por los indicadores no espaciales de segregación residencial. *Papeles de población*, 19(77), pp.269-300.
- Goodchild, M.F., 1987. A spatial analytical perspective on geographical information systems. *International journal of geographical information system*, 1(4), pp.327-334.
- Gottdiener, M., 2019. New Urban Sociology. *The Wiley Blackwell Encyclopedia of Urban and Regional Studies*, pp.1-5.
- Gottdiener, M., Hohle, R. and King, C., 2019. *The new urban sociology*. Routledge.
- Grannis, R., 2002. Discussion: Segregation indices and their functional inputs. *Sociological methodology*, 32(1), pp.69-84.

- Harvey, D., 2012. *Rebel cities: From the right to the city to the urban revolution*. Verso books.
- Henao, J.M.M., Ortega, L.M.H. and Lozano, M.C., 2021. Segregación y pobreza multidimensional en el sistema urbano colombiano. *Revista Bitácora Urbano Territorial*, 31(2), pp.113-129.
- Henao, J.M.M., Ortega, L.M.H. and Lozano, M.C., 2021. Segregación y pobreza multidimensional en el sistema urbano colombiano. *Revista Bitácora Urbano Territorial*, 31(2), pp.113-129.
- Hernández Peña, Y.T., 2010. El ordenamiento territorial y su construcción social en Colombia:¿ un instrumento para el desarrollo sustentable?. *Cuadernos de Geografía: Revista Colombiana de Geografía*, (19), pp.97-109.
- Holzman. and Jorgensen, H., 2000. *Gestion du Risque sociale: Théorique cadre de la Protection sociale*. Discussion Paper Series. no. SP 6. Banco Mundial: Washington, DC.
- Jargowsky, P.A., 1996. Take the money and run: Economic segregation in US metropolitan areas. *American sociological review*, pp.984-998.
- Johnston, R., Poulsen, M. and Forrest, J., 2011. Evaluating changing residential segregation in Auckland, New Zealand, using spatial statistics. *Tijdschrift voor economische en sociale geografie*, 102(1), pp.1-23.
- Kanemoto, Y., 1980. Externality, migration, and urban crises. *Journal of urban Economics*, 8(2), pp.150-164.
- Kaztman, R., 2002. Seducidos y abandonados: pobres urbanos, aislamiento social y políticas públicas.
- Lineros, J.D., Figueredo, A. and Figueredo, D., 2021. Modelamiento geoespacial para la identificación de vías que puedan presentar riesgo de deslizamiento debido a la pendiente en el área rural del municipio de bucaramanga en el año 2019.
- Lupton, R., 2003. Neighbourhood effects: Can we measure them and does it matter?. *LSE STICERD Research Paper No. CASE073*.
- Marcinczak, S., 2012. The evolution of spatial patterns of residential segregation in Central European Cities: the Łódź functional urban region from mature socialism to mature post-socialism. *Cities*, 29(5), pp.300-309.
- Massey, D.S. and Denton, N.A., 1988. The dimensions of residential segregation. *Social forces*, 67(2), pp.281-315.
- Massey, D.S., 1996. The age of extremes: Concentrated affluence and poverty in the twenty-first century. *Demography*, 33(4), pp.395-412.
- Massey, D.S., 1996. The age of extremes: Concentrated affluence and poverty in the twenty-first century. *Demography*, 33(4), pp.395-412.
- Massey, D.S., White, M.J. and Phua, V.C., 1996. The dimensions of segregation revisited. *Sociological methods & research*, 25(2), pp.172-206.
- Mayorga-Henao, J.M., 2019. Equipamientos colectivos: "lugares" de producción de capital social. *Revista de Arquitectura (Bogotá)*, 21(2), pp.68-75.
- Mayorga Henao, J.M., 2021. Comparación de los patrones espaciales e incidencia de la segregación residencial en las principales ciudades de Colombia.
- Mignone, A.M. and Fantin, M.A., 2011. Análisis cuantitativo de la segregación por pobreza en el núcleo Gran Resistencia-Gran Corrientes. Una mirada a través del índice de privación material de los hogares, 2001.
- Mignone, A.M. and Fantin, M.A., 2011. Análisis cuantitativo de la segregación por pobreza en el núcleo Gran Resistencia-Gran Corrientes. Una mirada a través del índice de privación material de los hogares, 2001.
- Milanese, J.P., 2019. Patrones espaciales de comportamiento electoral. Análisis de la distribución geográfica de los votos de Iván Duque y Gustavo Petro. In *En Barrero, Fredy, Elecciones presidenciales y de Congreso 2018. Nuevos acuerdos ante diferentes retos. Bogotá (Colombia): Konrad Adenauer Stiftung.*. Konrad Adenauer Stiftung.
- Morales, L.F. and Medina, C., 2008. Quality of life in urban neighborhoods in Colombia: The cases of Bogotá and Medellín. *Borradores de Economía; No. 536*.
- Moran, P.A., 1948. The interpretation of statistical maps. *Journal of the Royal Statistical Society. Series B (Methodological)*, 10(2), pp.243-251.
- Morrill, R.L., 1991, January. On the measure of geographic segregation. In *Geography research forum* (Vol. 11, No. 1, pp. 25-36).

- Musterd, S. and Ostendorf, W., 2005. Social exclusion, segregation, and neighbourhood effects. *Cities of Europe: Changing contexts, local arrangements and the challenge to urban cohesion*, pp.170-189.
- Muth, R.F., 1969. Cities and housing; the spatial pattern of urban residential land use.
- Openshaw, S., 1996. Developing GIS-relevant zone-based spatial analysis methods. *Spatial analysis: modelling in a GIS environment*, pp.55-73.
- Ossa, J.A.G. and Estrada, G.A.U., 2011. Los sistemas de información geográfica y los planes de ordenamiento territorial en Colombia. *Perspectiva Geográfica*, pp.247-266.
- Ospina, M.P., 2010. The indirect effects of conditional cash transfer programs: an empirical analysis of familias en accion
- Oyserman, D. and Yoon, K.I., 2009. Neighborhood effects on racial–ethnic identity: The undermining role of segregation. *Race and Social Problems*, 1(2), pp.67-76.
- Oyserman, D. and Yoon, K.I., 2009. Neighborhood effects on racial–ethnic identity: The undermining role of segregation. *Race and Social Problems*, 1(2), pp.67-76.
- ONU - Hábitat & Área Metropolitana de Bucaramanga. 2019. DTS Plan Maestro Limitrofe entre Bucaramanga, Floridablanca y Girón 2030
- Observatorio Digital Municipal de Bucaramanga. (2019). *Observatorio Digital Municipal de Bucaramanga*. Obtenido de <http://observatorio.bucaramanga.gov.co/>
- Papageorgiou, G.J., 1978. Spatial externalities I: theory. *Annals of the Association of American Geographers*, 68(4), pp.465-476.
- Park, R.E., 1915. The city: Suggestions for the investigation of human behavior in the city environment. *American journal of sociology*, 20(5), pp.577-612.
- Parks, R., Burgess, E.W. and McKenzie, R.D., 1925. The city. *Chicago, IL*.
- Peach, C., 2007. Sleepwalking into ghettoisation? The British debate over segregation. *Residential segregation and the integration of immigrants: Britain, the Netherlands and Sweden*, pp.7-40.
- Pérez-Valbuena, G.J., 2005. Dimensión espacial de la pobreza en Colombia. *Revista Ensayos Sobre Política Económica; Vol. 23. No. 48. Junio, 2005. Pág.: 234-293*.
- Pugh, C., 1997. The changing roles of self-help in housing and urban policies, 1950-1996: experience in developing countries. *Third World Planning Review*, 19(1).
- Retamoso, A. and Kaztman, R., 2005. Segregación espacial, empleo y pobreza en Montevideo. *Revista de la CEPAL*.
- Roca, M., 2012. Segregación social: distribución y construcción espacial en Lima metropolitana. *Espacio y Desarrollo*, (24), pp.119-134.
- Rodríguez, N.L. and Agudelo, C.A.R., 2016. El sistema urbano en Colombia y la formación metropolitana: una aproximación desde la Nueva Geografía Económica. *Cuadernos de Geografía: Revista Colombiana de Geografía*, 25(2), pp.21-37.
- Rodríguez, G.I. and Calderón, M.A., 2015. La economía informal y el desempleo: el caso de la ciudad de Bucaramanga (Colombia). *Revista Innovar Journal Revista de Ciencias Administrativas y Sociales*.
- Roitman, S., 2003. Barrios cerrados y segregación social urbana. *Scripta Nova: revista electrónica de geografía y ciencias sociales*, 7(146 (118)).
- Royuela, V. and Vargas, M., 2010. Residential segregation: A literature review. *Universidad Diego Portales: Facultad de Economía Y Empresas*.
- Ruiz-Tagle, J. and López, E., 2014. El estudio de la segregación residencial en Santiago de Chile: revisión crítica de algunos problemas metodológicos y conceptuales. *EURE (Santiago)*, 40(119), pp.25-48.
- Ruiz-Tagle, J., 2016. La segregación y la integración en la sociología urbana: revisión de enfoques y aproximaciones críticas para las políticas públicas. *revista invi*, 31(87), pp.9-57.
- Ruiz-Tagle, J., 2013. A theory of socio-spatial integration: Problems, policies and concepts from a US perspective. *International Journal of Urban and regional research*, 37(2), pp.388-408.

- Sabatini, F. and Brain, I., 2008. La segregación, los guetos y la integración social urbana: mitos y claves. *EURE (Santiago)*, 34(103), pp.5-26.
- Sabatini, F. and Wormald, G., 2013. Segregación de la vivienda social: reducción de oportunidades, pérdida de cohesión. *Segregación de la vivienda social: ocho conjuntos en Santiago, Concepción y Talca. Santiago de Chile: Pontificia Universidad Católica de Chile.*
- Sabatini, F., 2003. The social spatial segregation in the cities of Latin America. *Social Development. Strategy Document. Washington, DC: Inter-American Development Bank, Sustainable Development Department, Social Programs Division IADB.*
- Sabatini, F., Cáceres, G. and Cerda, J., 2001, July. Residential segregation pattern changes in main Chilean cities: scale shifts and increasing malignancy. In *International Seminar on segregation in the city* (pp. 25-28). Cambridge, MA: Lincoln Institute of Land Policy.
- Sabatini, F., Wormald, G., Sierralta, C. and Peters, P., 1982. Segregación residencial en Santiago: Tendencias 1992-2002 y efectos vinculados con su escala geográfica. *Tendencias de la segregación en las principales ciudades chilenas: Análisis censal, 2002*, pp.19-42.
- Sabatini, F., 2010. Tendencias de la segregación en las principales ciudades chilenas.
- Sabatini, F., Rasse, A., Mora, P. and Brain, I., 2010. ¿ Es posible la integración residencial en las ciudades chilenas?: Disposición de los grupos medios y altos a la integración con grupos de extracción popular. *EURE (Santiago)*, 38(115), pp.159-194.
- Sampson, R.J., Morenoff, J.D. and Gannon-Rowley, T., 2002. Assessing “neighborhood effects”: Social processes and new directions in research. *Annual review of sociology*, 28(1), pp.443-478.
- Saunders, P., 2003. *Social theory and the urban question*. Routledge.
- Schapira, M.F.P., 2001. Fragmentación espacial y social: conceptos y realidades. *Perfiles latinoamericanos: revista de la Facultad Latinoamericana de Ciencias Sociales, Sede México*, 9(19), pp.33-56.
- Sen, A., 2000. A decade of human development. *Journal of human development*, 1(1), pp.17-23.
- Serrano, R.M. and Valcarce, E.V., 2000. *Técnicas econométricas para el tratamiento de datos espaciales: la econometría espacial* (Vol. 44). Edicions Universitat Barcelona.
- Small, M.L. and Newman, K., 2001. Urban poverty after the truly disadvantaged: The rediscovery of the family, the neighborhood, and culture. *Annual Review of sociology*, 27(1), pp.23-45.
- Small, M.L. and Newman, K., 2001. Urban poverty after the truly disadvantaged: The rediscovery of the family, the neighborhood, and culture. *Annual Review of sociology*, 27(1), pp.23-45.
- Soja, E.W., 1989. *Postmodern geographies: The reassertion of space in critical social theory*. Verso.
- Tiempo, E., 2019. *Con estratos, ricos y pobres están en el lugar equivocado*. [online] El Tiempo. Available at: <<https://www.eltiempo.com/economia/sectores/en-colombia-hay-que-revaluar-los-estratos-analisis-338438>>
- Tienda, M., 1990. *Poor people and poor places: Deciphering neighborhood effects on poverty outcomes*. Chicago-Population Research Center.
- Tobler, W.R., 1970. A computer movie simulating urban growth in the Detroit region. *Economic geography*, 46(sup1), pp.234-240.
- Velásquez-Higueta, C., 2012. *Vivienda social y ordenamiento territorial en Medellín durante el periodo 2006-2011. Pasos hacia la segregación residencial socioeconómica*. Universidad del Rosario.
- Vivas-Pacheco, H., 2013. Persistence of the residential segregation and composition of the human capital For neighborhoods in the city of Cali. *Ensayos sobre política económica*, 31(SPE70), pp.121-155.
- Wacquant, L., 2009. The body, the ghetto and the penal state. *Qualitative sociology*, 32(1), pp.101-129.
- White, M.J., 1983. The measurement of spatial segregation. *American journal of sociology*, 88(5), pp.1008-1018.
- Wilson, W.J., 2012. *The truly disadvantaged: The inner city, the underclass, and public policy*. University of Chicago Press.
- Wingo, L., 1961, December. An economic model of the utilization of urban land for residential purposes. In *Papers of the Regional Science Association* (Vol. 7, No. 1, pp. 191-205). Springer-Verlag.
- Zukin, S., 1980. A decade of the new urban sociology. *Theory and Society*, 9(4), pp.575-601.