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Multidimensional poverty in the Colombian pacific: identification, measurement and recent trends

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Abstract:

The Pacific is the region of Colombia with the greatest economic lag and the lowest living standards of its population. The objective of this study is to investigate poverty in the Colombian Pacific, taking as a reference the multidimensional approach, applying different identification methodologies and aggregation indicators. The main result is that despite the reduction in poverty between 2010 and 2018, it has not been systematic and has presented much more moderate levels than the situation in the rest of the country; in particular, the region has great deficiencies in education levels and access to health.

Keywords: Colombia; Colombian Pacific region; multidimensional poverty; quality of life; welfare economics.
JEL classification: I32; R20; D60.

Pobreza multidimensional en el Pacífico Colombiano: identificación, medición y tendencias recientes

Resumen:

El pacífico colombiano es la zona del país con el mayor rezago económico y los más bajos niveles de vida de su población. El objetivo de este artículo es indagar la pobreza en esa región de Colombia, considerando una perspectiva multidimensional, aplicando diferentes estrategias de identificación y estimando diferentes indicadores de agregación. El principal resultado es que, a pesar de la reducción de la pobreza entre 2010 y 2018 en el pacífico colombiano, esa tendencia no ha sido sistemática y los niveles han sido menores que los presentados para el resto del país. En particular, esta región del país tiene grandes deficiencias en niveles de educación y acceso a salud.

Palabras clave: Colombia; Pacífico colombiano; pobreza multidimensional; calidad de vida; economía del bienestar.
Clasificación JEL: I32; R20; D60.

1. Introduction

The main objective of economic and social development is the improvement of the living conditions of the population. In this sense, poverty and the high vulnerabilities of groups with drastic insufficiencies in their standard of living is a priority and urgent problem in the search for a more equitable and inclusive society. According to official figures and methodologies, in Colombia in 2018, 27 percent of the population was below the monetary poverty threshold, and 19.6 percent was multidimensionally poor, figures with

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great regional heterogeneities, concentrating low income and deficits in welfare levels in the coastal regions of the country. Poverty has been analyzed from different conceptual and methodological perspectives. The traditional measurement is monetary, which sets a threshold equivalent to the income or expenditure necessary to access a minimum standard of living considering food and nonfood goods and services. Based on the selected poverty line, it is determined whether a household is poor or not. This approach has been questioned by approximations that indicate that income or monetary spending is not an adequate variable, much less the only one to identify the lack of welfare of a population (Sen, 2001). In this way, the measurement of multidimensional poverty arises as a response to this limitation, seeking to analyze in a more comprehensive way different aspects of household life that influence the well-being of a population.

In this study, the Colombian Pacific, specifically the departments of Cauca, Chocó and Nariño[1], was the analyzed area. In this region, there is great ethnic diversity and biological richness, 48.8% of population is self-identified as a member of a Colombian ethnic group; the territory covers approximately 108,000 square kilometers and accounts for approximately 8 percent of the total population of the country and 4 percent of the national income. Additionally, it is considered the most lagging region in the country, with geographic isolation, institutional weaknesses and a significant influence of violence and armed conflict. From this context, the objective of the article is to study poverty in the Colombian Pacific, taking as a reference the multidimensional approach, applying different identification methodologies and aggregation indicators.

This article contributes to the analysis of quality of life in the Colombian pacific, suggesting an alternative approach to the measurement that includes the study of gaps and severity of deprivations and considering different dimensions, levels of substitution between them, and parameters of poverty aversion. Furthermore, it is checked whether the trends of change in multidimensional poverty in Colombia and the Pacific region is robust in the official and the alternative measurement.

The article is organized in six sections in addition to this introduction. In the first part, an outline of the notion of poverty is provided, emphasizing the relevance of the multidimensional perspective. The second part presents a brief review of studies on multidimensional poverty in Colombia. In the third part, the source of information and the multidimensional poverty indicators considered in the investigation are presented. The following sections present and analyze the results of multidimensional poverty estimates in Colombia and the Pacific using an official identification methodology (section 4) and an alternative (section 5). Finally, the article ends with the conclusions of the research and reflections.

2. Notion of poverty: from monetary to multidimensional

The diversity of approaches, the relevance in public discussion and the academic interest in the study of poverty reveals that this is the most immediate problem of economic and social development; in fact, it is the first Sustainable Development Goal, which means that it is a global concern and a priority on the public policy agenda. Its very importance explains the diversity of conceptual and methodological perspectives in the search for a better understanding of the subject (Economic Commission for Latin America and the Caribbean [ECLAC], 2019).

The conventional notion of poverty indicates that it is an 'inability to achieve a minimum standard of living' (World Bank, 1990, p. 26), that is, a limitation that prevents enjoying a pleasant life under a reference standard. Other approaches highlight the importance of the conception of poverty with reference to material deprivation. Fields (2008) considers that poverty is a lack of availability of resources for the satisfaction of basic needs or having a full life under a normative standard.

The traditional measurement of poverty is constructed from a monetary threshold equivalent to the level of income (consumption or expenditure) to access a standard of consumption of food and nonfood goods and services. A household is identified as poor if it is below that monetary reference; thus, from that

[1] This selection excludes the Valle del Cauca department, which has a stronger economic structure and a wider internal market, added to the population structure being different with much better living standards than that of the other three departments located on Colombia's Pacific coast.

operational approach, poverty is conceived as a lack of resources to have minimum consumption levels. In contrast to the above, other perspectives have highlighted the importance of broadening the focus of poverty, considering the lack of resources as a lack of means to achieve broader ends and not simply minimum levels of consumption of goods and services. That is, the needs and capacities of people, as stated by Amartya Sen (2001), are not only supplied by monetary resources; income, the satisfaction of needs and the consumption of goods should be seen as opportunities that constitute mechanisms through which individuals can have a life according to the expansion of their freedoms.

In this way, Amartya Sen introduces the perspective of opportunities and capabilities, in which poverty involves limitations of individuals functioning in a society, and this implies restrictions on capabilities and freedoms. Not all individuals have the same characteristics to generate income, but not all individuals require the same level of income to achieve the same level of welfare (Sen, 2001); therefore, a monetary approximation is an imprecise way to measure poverty.

In response to these issues, broader methodological alternatives have been proposed that go beyond the monetary and unidimensional measurements, from the traditional Unsatisfied Basic Needs (ECLAC, 2009) to multidimensional approaches (Alkire & Foster, 2007, 2011). There are variations of this angle such as an approach that differentiates between monetary dimensions and basic goods and services (López-Calva & Ortiz, 2009) and perspectives that link objective measurements with subjective poverty studies (Benfield, 2008). All of these provide viewpoints whose objective is to have a better understanding of the problem and, thus, a better diagnosis to formulate a solution.

In this context, the measurement of multidimensional poverty is introduced, seeking to construct synthetic indices that measure a broader vector of fundamental dimensions in human development and in the quality of life of the population. Based on this premise, this study opted to utilize the multidimensional approach with different official and alternative methodological variants, thus contributing to the study of poverty and low living standards of the population in Colombia and, in particular, in the Colombian Pacific.

3. Context and research on multidimensional poverty in Colombia

3.1. Poverty in Colombia and the Pacific

Historically, poverty in Colombia, especially in the Colombian Pacific, has been an acute and persistent problem. According to official figures, 47.6 percent of the Pacific population in 2018 was below the threshold of monetary poverty, 19.6 percent was under extreme poverty, and 33.3 percent of households experienced multidimensional poverty (Departamento Administrativo Nacional de Estadística [DANE], 2019a). With one third of the population experiencing multidimensional poverty, the Pacific has the highest levels of poverty in the country. In comparison, departments of the Eastern region (Boyacá, Cundinamarca, Meta and Santander) experience much lower multidimensional poverty (between 11.5 and 16.6). Chocó and Cauca (which are departments of the Pacific) suffer monetary poverty figures that are more than double the national total (DANE, 2019a).

The high headcount and chronicity of poverty in the Pacific has been a pervasive concern for the social development of the country. As will be illustrated below, the levels of deprivation in the Pacific region in home services, the lack of access to social services, and informal labor insertion explain why the population living in these departments is in a situation characterized by high vulnerability and very low living standards, substandard conditions that have continued for the past decade.

The retrenchment of critical institutional services, coupled with corruption and violence throughout the region, have greatly limited the economic and social development of the Pacific. Bonet (2007) highlights that aspects such as geographical traits and economic lag might contribute to the difficulties of improving the living conditions in this region because they impede integration and participation with the internal market of the main cities (truer for Chocó) and the creation of economies of scale.

3.2. Studies on multidimensional poverty in Colombia

This article contributes to the literature that analyzes the importance of regional characteristics and heterogeneities in explaining multidimensional poverty. Burchi et. al. (2022) find that multidimensional poverty has reduced globally, but less than monetary poverty, and at different levels between countries. While there is a general trend of reduction in global poverty, much less success has been observed across Sub-Saharan Africa, where poverty has increased for some years during the last two decades (Burchi et. al., 2022). The disparity with respect to the well-being of populations between regions of the world can be viewed at the national level as well (Turriago-Hoyos, Martínez & Thoene, 2020). In light of these considerations, this paper examines the persistent welfare gaps and associated historical failure to reduce multidimensional poverty throughout the Colombian Pacific, as compared to the national level.

Multidimensional analysis of poverty has been increasingly investigated in the last decade. At the macro level, poverty is associated with economic heterogeneities, geographical characteristics, physical endowments, the structure of the labor market, institutions, and in the Colombian case, violence and armed conflict. At the household level, there are decisions and circumstances that affect the standard of living of members such as fertility choices, time allocation, education, health, nutrition, and migration.

Regarding the macro analysis of poverty, it has been found that, in Colombia, the Pacific and Amazon populations are the most vulnerable socially, a condition not only attributed to the geographic characteristics within which they live, but the absence of government and institutions, the lack of investment and infrastructure, as well as a history of armed conflict (Roncancio, Cutter & Nardocci, 2020). Indeed, armed conflict and violence have restricted the potential reduction of multidimensional poverty. Loaiza, Muñetón and Vanegas (2018) analyze how the presence of illegal groups and armed attacks were more frequent in municipalities with higher deprivation in multiple dimensions of social welfare in Antioquia, a department in northwest Colombia. This Colombian department is an exemplary case of pervasive inequality, as it has a high overall average income and better standard of living for the population, whilst some of its municipalities have high levels of poverty and an average income far below the mean (Turriago-Hoyos, Martínez & Thoene, 2020). Hernández and Zuluaga (2022) argued that vulnerability to multidimensional poverty is higher in rural areas and in the Atlantic region[2], where populations confront poverty traps; and Rojas-Botero, Fernández-Niño and Borrero-Ramírez (2022) examined the vulnerability of children under five years of age and the special role of geographic inequalities in explaining both the lack of opportunities and child mortality.

At the household level, less studies have analyzed microeconomic decisions and their influence in multidimensional poverty. Besides, there are two discussions when it comes to identifying and analyzing multidimensional poverty at the micro level. On the one hand, researchers have highlighted the relative arbitrariness in the selection of variables that can contribute to a better to standard of living, and the different weight that people can give to different aspects of their lives and their context (Decancq & Lugo, 2013). Building on this consideration, Piñeros and Clavijo (2015) explored the relationship between multidimensional and subjective poverty in Colombia, and Benvin, Rivera and Tromben (2016) proposed to include time allocation in the multidimensional indicators of welfare for some Latin American countries. On the other hand, there is controversy regarding the complexity of standardizing a measurement that does not include cultural heterogeneities, norms, or values, aspects that can be quite different between population groups. It is a special concern in developing countries and in regions such as the Colombian Pacific, where the ethnic component is crucial. Territory, cultural identity, language, natural wealth, and the relationship with nature are essential dimensions of human welfare that could not be more critical for ethnic communities, and conventional methods usually overlook them (Renshaw & Wray, 2004). Moreover, there is an inconclusive debate with respect to the influence of ethnic diversity on poverty, even when conventional measurement is considered (Churchill & Smith, 2017; Talla Fokam & Fomba Kamba, 2023).

[2] They did not find that the Pacific region is particularly vulnerable to poverty, their estimate is completely different compared to the rest of literature including this article. There are reasons to doubt about it, they used a household survey with a much smaller sample that is not representative of the "Pacific" region, and the geographical area of reference is not the same for them.

Identifying factors that explain the geographical differences influencing quality of life is complex because there are many challenges to isolating causal relations, with most studies only able to provide evidence of correlations in this relationship, whilst failing to tackle the issue of reverse causality. For example, in the study of Loaiza, Muñetón and Vanegas (2018) it is not clear if people living in some municipalities are poorer because they were more exposed to armed attacks, or armed attack was more frequent and easy to carry out as those areas were poorer. In contrast, the article of Ramírez, Diaz and Bedoya (2017) dealt with this matter of endogeneity more carefully, showing a more reliably causal relation between an institutional dimension and multidimensional poverty in Colombia. Their main conclusion underlines that property tax revenues and fiscal decentralization is an effective mechanism to reduce multidimensional poverty. Therefore, considering the variation in the decentralized taxation of municipalities, they suggest that local budget independence is a key aspect to promote proper policies against poverty.

This article develops the analysis of multidimensional poverty in Colombia from a regional perspective. There are two distinctions compared to studies summarized previously. First, the objective is not to find correlations or causal determinants of poverty, but to check whether the level of multidimensional poverty (compared to other regions) and the changes between 2010 and 2018 in the Colombian Pacific are robust regardless of the number and type of dimensions, thresholds, indicators, and parameters used for measuring. Second, unlike previous studies that consider the *official* methodological approach proposed by Angulo, Alvarado, Pardo and Riveros (2012) and Angulo, Diaz and Pardo (2016) for the National Planning Department [Departamento Nacional de Planeación - DNP], this article utilizes estimates of this measurement, but in a critical context. Hence, an alternative approach is introduced and estimated for the Colombian Pacific and the total national, letting to study the gaps and severity in deprivations within different dimensions of well-being, introducing levels of substitution between them, and checking if trends in multidimensional poverty are robust.

4. Source of information and multidimensional poverty indicators

4.1. Source of information

The source of information for this investigation is the National Survey of Quality of Life [Encuesta Nacional de Calidad de Vida - ENCV], conducted by the National Administrative Department of Statistics [Departamento Administrativo Nacional de Estadística - DANE] in Colombia. The first version of this statistical exercise was applied in 1991 for Bogotá and 1993 for the 4 main cities in the country. Since 2010, it has been applied annually between September and November of each year, with representative information by region for all years, except 2017[3]. This is the same source of information with which multidimensional poverty is officially measured in the country. For the preparation of this research, all the modules of all years were consolidated for each geographic domain available in the national total and specifically considering the information for the Pacific region[4].

From the microdatabases, the possible variables (questions) for the identification of multidimensional poverty were selected considering different aspects, such as relevance in the study of the living conditions of the population, availability for all years, information for all or most of the respondents, and unchanged response options.

[3] 2017 was not considered in the estimates because of the lack of regional representative information.

[4] Since 2018 the ENCV is a representative survey at department level. For this research it was not estimated the multidimensional poverty at that geographical level given the objective of analyzing the trend between 2010 and 2018 in the Pacific region, and verifying whether the pattern is robust.

4.2. Multidimensional poverty indicators

In the study of poverty, two methodological problems have traditionally arisen: on the one hand, identification of the poor and, on the other, aggregation in synthetic indicators. Regarding identification, the conventional operation is to propose a reference threshold from which it is identified whether the individual or household is poor; in this sense, the approximation is dichotomous, that is, below (poor) or not. In the multidimensional case, identification becomes somewhat complex because the person may have deprivation in one dimension and not in others; in this way, the person is not necessarily multidimensionally poor. In this regard, two extreme criteria and several intermediate possibilities are proposed. According to the criterion of the *union,* a household is multidimensionally poor if it has deprivation in some dimension considered; at the other extreme is the *intersection* criterion according to which a household is identified as poor if it has deprivation in all dimensions considered. In the middle of these criteria, different thresholds are proposed according to the number of dimensions considered (Alkire & Foster, 2007, 2011).

Regarding the aggregation of multidimensional poverty, several proposals have been offered. The simplest indicator is the number considered poor and the percentage with respect to the total population, an indicator known as the *headcount ratio*. This indicator is interpreted in the same way as the unidimensional indicator, that is, the percentage of those identified as poor according to the established threshold. Another index is *the poverty gap*, which corresponds to the missing aggregate of income of all those considered poor with respect to that of the poverty line. In the unidimensional case, the interpretation is direct, that is, the average distance between the level observed in the dimension considered and the reference threshold; in the multidimensional case, the analysis is broader because it is necessary to consider the number of dimensions and their deprivations (Alkire & Foster, 2011). These indicators, together with the *severity of poverty*, are known as the Foster, Greer and Thorbecke [FGT] indicators (1984) in the unidimensional analysis.

$$FGT(\propto) = \frac{1}{N}\sum_{i=1}^{N} k_i \left(1 - \frac{x_i}{z_i}\right)^{\propto} ;\ \propto \geq 0, \begin{cases} k_i = 1 & if\ x_i < z_i \\ k_i = 0 & otherwise \end{cases} \quad (1)$$

In (1), the generalized version of unidimensional poverty measures is presented; when α = 0, the *headcount ratio* is obtained, when α = 1, *the poverty gap* is calculated, and when α = 2, the FGT indicator is equal to the *severity of poverty,* which decreases the relative importance of minor deficits and increases the effect of major deficits. Thus, with the measurement presented by Foster, Greer and Thorbecke (1984), a better measurement of poverty aversion can be obtained because a larger α value gives greater emphasis to the poorest poor.

Based on the above, different identification and aggregation criteria have been developed for the multidimensional poverty approach, based on the unidimensional FGT measures already discussed. In the rest of the section, the indicators of Alkire and Foster (2007; 2011) and Bourguignon and Chakravarty (2003) are presented, which have been the most used in the measurement of multidimensional poverty.

Alkire and Foster indicator

The identification criterion proposed by Alkire and Foster [AF] consists of proposing different dimensional thresholds and analyzing the way in which the indicators change in the face of changes in these thresholds. In this sense, the identification method proposed by AF is:

$$p_k(y_i; z) = \begin{cases} 1 & if\ \ c_i \geq k \\ 0 & if\ c_i < k \end{cases} \quad (2)$$

That is, p_k identifies the individual or household i as poor when the number of dimensions in which i suffers deprivation is at least *k.* The *dual cutoff* (p_k) depends on both the cutoff z_j within the dimensions as well as the cutoff line k between the dimensions. Two basic indicators are the headcount *H*, which indicates the percentage of the population that is multidimensionally poor, and *A, the average proportion*

of deprivation among the poor. However, these indicators do not consider several desirable properties that are necessary in the measurement of poverty.

In the multidimensional case, the levels of deprivation should be considered as long as the individual or household is multidimensionally poor, according to the established threshold. The gap for dimension *j* of the individual or household *i* is given by the function:

$$g_{ij}(k) = \begin{cases} 1 - \dfrac{x_{ij}}{z_j} & if \;\; x_{ij} < z_j;\; c_i \geq k \\ 0 & otherwise \end{cases} \tag{3}$$

In this case, the gap is positive if the individual is lacking in the dimension considered *j* and if he or she is identified as multidimensionally poor, that is, if he or she is deprived in *k* or more dimensions. Due to methodological rigor and verification of robustness between groups and/or changes in the indicators, computations are usually performed for several multidimensional thresholds *k*. The Alkire and Foster [AF] indicators are constructed from the dimensional gap presented in equation (3) and the FGT aggregation. The formulation of this family of indicators is given by:

$$AF_{\propto}^{k} = \frac{1}{N}\sum_{i=1}^{N}\left[\sum_{j=1}^{J} w_j g_{ij}(k)^{\propto}\right] \;\; ; \propto \geq 0 \tag{4}$$

The AF indicator represents a weighted sum of the vector of dimensional gaps (3) for each individual and is adjusted for a parameter of poverty aversion ($\propto$), which illustrates the sensitivities of the indicator to higher or lower unidimensional gaps. In (4), the dimensional gap is taken from (3), and the weights w_j are established ex ante by some external evaluative criterion, whose sum must be equal to one. The AF indicator is conventionally estimated with three levels of α, as in the traditional FGT indicators, but in this case, the results are adjusted to the multidimensional perspective.

Bourguignon and Chakravarty indicator

The Bourguignon and Chakravarty indicator [BC] (2003) proposes *union* as a criterion of identification of the multidimensional poor, that is, an individual or household with deprivation in one dimension is poor. Given that the criterion involves at least one dimension, the identification function illustrated in (2) is not proposed based on a multidimensional threshold but rather on the existence of some deficit; therefore, the conditions for the dimensional gap (3) to be positive are reduced to $x_{ij} < z_j$, regardless of the number of dimensions on which there is deprivation because k = 1.

After identifying poor households from a multidimensional perspective, the BC proposal uses a synthetic indicator that takes into account different levels of poverty aversion but that also considers, in the aggregation, different degrees of substitution between dimensions for the same household. This is particularly relevant in extreme situations of high deprivation in one dimension. If a household exhibits deprivation in several dimensions but there is one in which it is totally deprived, with a total gap (according to (3) equal to 1), the poverty of that household would be reduced to a greater extent if its consumption or endowment in that dimension with total deprivation improves over other dimensions in which there are deficits but the deficits are not far from the threshold. Consequently, BC proposes the following multidimensional poverty indicator:

$$BC_{\alpha}^{\theta} = \frac{1}{N}\sum_{i=1}^{N}\left[\sum_{j=1}^{J} w_j \left(g_{ij}(k)\right)^{\theta}\right]^{\frac{\alpha}{\theta}} \;\; ; \propto \geq 0, \qquad \theta \geq 1 \tag{5}$$

As in the case of AF (4), for BC (5), $\propto$ is the parameter of aversion to poverty ($\propto \geq 0$); $g_{ij}(k)$ is the unidimensional gap, in this case conditioned only by the existence of a deficit in the respective dimension *j*; and θ is the parameter of elasticity of substitution between dimensions ($\theta \geq 1$).

The BC indicator will change as a function of the two parameters considered: the coefficient of poverty aversion, $\propto$, and the degree of constant substitution θ. The higher is the $\propto$, the greater the degree of aversion to poverty, that is, greater sensitivity to the population with greater deficits in the dimensions. Furthermore, the greater is the θ, the lower the degree of substitution between dimensions, that is, the greater importance of the dimension with the greatest deficit. Additionally, as pointed out by BC (2003), the degree of substitutability does not necessarily have to be constant; this can change depending on the degree of poverty. Particularly relevant is the case when the relationship between poverty levels and substitution arises in the inverse function, that is, the poorer the household, the less importance given to the substitution between dimensions. In (6), the equation of the BC indicator with a variable substitution level as a function of the degree of poverty is illustrated, specifically, $a(p) = {}^{1}/_{p}$.

$$BC_{\alpha}^{a(p)} = \frac{1}{N}\sum_{i=1}^{N}\left[\sum_{j=1}^{J} w_j \left(g_{ij}(k)\right)^{a(p)}\right]^{\frac{\alpha}{a(p)}} \quad (6)$$

In the rest of the article, the AF (4) and BC (5) and (6) indicators will be computed for the case of Colombia and the Colombian Pacific with different identification criteria, dimensions, variables and thresholds. In the following section, the *official* construction methodology of the multidimensional poverty index calculated by DANE and proposed by the DNP is taken as a reference (Angulo et al., 2016), and in the fifth section, an alternative analysis approach for determining multidimensional poverty in Colombia is applied.

5. Multidimensional poverty in the Colombian pacific – official methodology

In Colombia, it was proposed to measure multidimensional poverty taking as a reference the contribution of Alkire and Foster (2007; 2011); the methodological operation was formulated by the DNP (Angulo et al., 2016), and implementation has been carried out by DANE[5] since 2010. In this section, these estimates are replicated and expanded. In addition, computations are performed with a different methodological approach and with different aggregation indicators, an exercise that is presented in the following section.

Before presenting the results of the estimation of multidimensional poverty using the *official* methodology, it is necessary to point out some of its limitations. The way in which DANE estimates the multidimensional poverty index [MPI] is based on the dichotomization of 15 variables and nested weights with the same equivalences between dimensions and within each dimension with equal weights for variables. This implies the impossibility of estimating gaps; therefore, it is not possible to analyze degrees or depths of poverty. Moreover, subdividing the dimensions into variables with marginal contributions means focusing on the fulfillment of specific achievements and not on the comprehensive outcome of all dimensions of well-being.

In estimating AF indicators, Angulo et al. (2016) proposed a cardinality within households, according to the percentage of individuals who have or have not made achievements in each of the variables considered. From this perspective, the gap is the ratio between the household members who present this deficit and the total number of people who could present the deficit; this is a strategy that overcomes the dichotomization initially proposed in the MPI. This approximation implies that the household age characteristics would determine its levels of poverty and its contribution to the aggregate gap and severity of poverty. In addition, if each variable is analyzed, more than 50 percent have gaps of 1, which results in the dichotomization problems that are proposed to be solved. Likewise, the construction of cardinality is not entirely accurate; for example, in a household composed of a child between 6 and 16 years of age, if the child does not attend an educational institution, the gap is 1 (maximum), while in a household with

[5] Both official institutions that depend on the national government and whose direction is selected at the discretion of the president of the republic.

4 children in that age range, if 3 do not go to school, the gap is 0.75. Therefore, the contribution of this household to the aggregate poverty gap is lower, although the problem is quantitatively greater.

In the *official* methodology, 15 variables are considered (Appendix 1), which in turn make up five dimensions; the same inter- and intradimensional weighting is used. The MPI is a factorial construction based on the deficit or lack in each of the 15 variables. Lack or deprivation is ascertained with an identifying variable (1 if there is a lack, 0 if not) and is multiplied by its respective weighting factor (0.2 for each dimension, a figure that is divided into the number of variables that make up each dimension); thus, the MPI ranges from 0 (when there is no lack in any variable) to 1 (when there is lack in all variables). The threshold that is considered to identify a household as multidimensionally poor is 1/3 (0.33), equivalent to a multidimensional threshold k = 5 (5/15) (which strictly refers to variables and not to dimensions). From this methodology, a household is poor if it has a deficiency in 5 or more of 15 variables or in 1.66 of 5 dimensions. Based on this identification criterion, *headcount* is proposed as the percentage of multidimensional poor, *average deprivations* is equivalent to the percentage of deprivations among the poor, and *adjusted headcount* is the product of the two previous factors, which weights the headcount as a function of the magnitude of variables in which there is a lack.

Table 1 shows the percentage of people with deficits in Colombia and the Pacific for each of the 15 variables considered by DANE in the official measurement of the MPI[6]. The deficit in educational achievement and informal employment is critical; the low academic level of adults is a barrier to social mobility and improving the income of the population. Likewise, the labor situation in Colombia, and even more so in the Pacific, is worrying; 9 out of 10 households have members with problems related to the quality of work performed; 'Informal employment' is the variable with the highest levels of deprivation, and 'Long-term unemployment' is the variable with the worst performance in recent years at the national level.

The variables that underwent the greatest reductions between 2010 and 2018 in the Pacific were 'Health Insurance' and 'Critical Overcrowding', 48 and 39 percent respectively. However, in that region, deprivation levels were higher in 11 of the 15 variables compared to the national total, with differences exceeding 100 percent in child labor, access to health and the variables associated with housing. This highlights the major problems in the well-being of the Pacific population, the lack of institutional presence in providing basic social goods and services, and the economic lag of the region, which adds to problems of violence, armed conflict and corruption (Bonet, 2007).

[6] Confidence intervals were estimated at the 99% level for every indicator illustrated in this article. It was used the bootstrap resampling methodology.

Table 1.
Percentage of deficiencies per variable. National Total and Pacific

Variable	National Total			Pacific		
	2010	2014	2018	2010	2014	2018
Educational achievement	56.7	52.0	45.3	71.8	67.8	65.1
	(54.5 - 59.1)	(50.8 - 53.3)	(44.6 - 46.1)	(69.4 - 74.2)	(65.2 - 70.5)	(63.7 - 66.4)
Illiteracy	13.1	10.6	9.4	19.8	16.6	16.9
	(12.5 - 13.8)	(10.0 - 11.3)	(9.1 - 9.8)	(17.4 - 22.1)	(14.7 - 18.7)	(15.8 - 18.2)
School lag	35.9	32.6	28.8	43.0	36.2	33.7
	(34.7 - 37.3)	(31.7 - 33.7)	(28.2 - 29.5)	(39.6 - 46.5)	(34.0 - 38.5)	(32.2 - 35.3)
School attendance	4.5	3.3	3.3	7.4	4.9	4.8
	(4.3 - 4.8)	(2.8 - 3.8)	(3.0 - 3.6)	(6.0 - 8.9)	(3.7 - 6.3)	(4.0 - 5.7)
Early childhood care services	11.7	9.3	9.2	10.9	8.9	7.9
	(10.8 - 12.6)	(8.6 - 10.2)	(8.9 - 9.6)	(9.0 - 12.9)	(7.5 - 10.3)	(7.1 - 8.8)
Child labor	4.5	3.4	2.1	7.2	6.2	4.6
	(3.8 - 5.3)	(3.0 - 3.8)	(1.9 - 2.3)	(5.8 - 8.7)	(4.8 - 7.6)	(4.0 - 5.2)
Health insurance	20.9	12.2	10.9	19.1	10.0	9.9
	(19.2 - 22.7)	(11.4 - 13.0)	(10.4 - 11.5)	(16.7 - 21.6)	(8.6 - 11.5)	(9.1 - 10.8)
Access to health care given a need	6.5	6.3	6.1	7.3	12.8	13.9
	(5.5 - 7.7)	(5.8 - 6.8)	(5.9 - 6.4)	(5.7 - 8.9)	(11.5 - 14.3)	(13.1 - 14.8)
Long-term unemployment	10.4	10.4	12.0	8.7	9.2	9.0
	(9.1 - 11.7)	(9.7 - 11.2)	(11.5 - 12.6)	(7.2 - 10.3)	(7.7 - 10.8)	(8.2 - 9.9)
Informal employment	79.7	76.6	71.9	90.9	89.0	88.6
	(78.7 - 80.7)	(75.7 - 77.7)	(71.1 - 72.9)	(89.0 - 93.0)	(87.9 -90.1)	(87.4 - 89.8)

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TABLE 1.
Percentage of deficiencies per variable. National Total and Pacific

Variable	National Total			Pacific		
	2010	2014	2018	2010	2014	2018
Access to improved water source	11.5	11.4	11.5	19.2	20.8	23.0
	(11.3 - 11.8)	(11.1 - 11.8)	(11.1 - 11.8)	(17.0 - 21.4)	(18.8 -22.8)	(22.5 - 23.5)
Inadequate excreta disposal	12.0	10.5	11.7	25.9	19.6	24.0
	(11.1 - 12.8)	(9.9 - 11.0)	(11.5 - 12.1)	(23.9 - 28.1)	(17.8 -21.6)	(22.5 - 25.5)
Inadequate flooring material	6.3	5.2	6.0	12.4	12.2	11.0
	(5.9 - 6.7)	(4.8 - 5.7)	(5.8 - 6.4)	(10.4 - 14.6)	(10.4 - 14.0)	(10.0 - 12.0)
Inadequate material of exterior walls	3.0	1.7	2.7	8.5	4.1	6.6
	(2.6 - 3.3)	(1.4 - 2.1)	(2.5 - 2.9)	(6.8 - 10.3)	(3.2 - 5.1)	(5.6 - 7.7)
Critical overcrowding	15.2	10.9	9.1	14.3	12.1	8.7
	(14.7 - 15.9)	(9.9 - 11.9)	(8.7 - 9.6)	(12.4 - 16.4)	(10.0 - 14.3)	(7.8 - 9.6)

Note: Confidence intervals are shown in parentheses and were estimated at the 99% level using the bootstrap resampling methodology
Source: Own elaboration based on the National Quality of Life Survey [Encuesta Nacional de Calidad de Vida - ENCV] for each year. National Administrative Department of Statistics [Departamento Administrativo Nacional de Estadística - DANE] (2019b).

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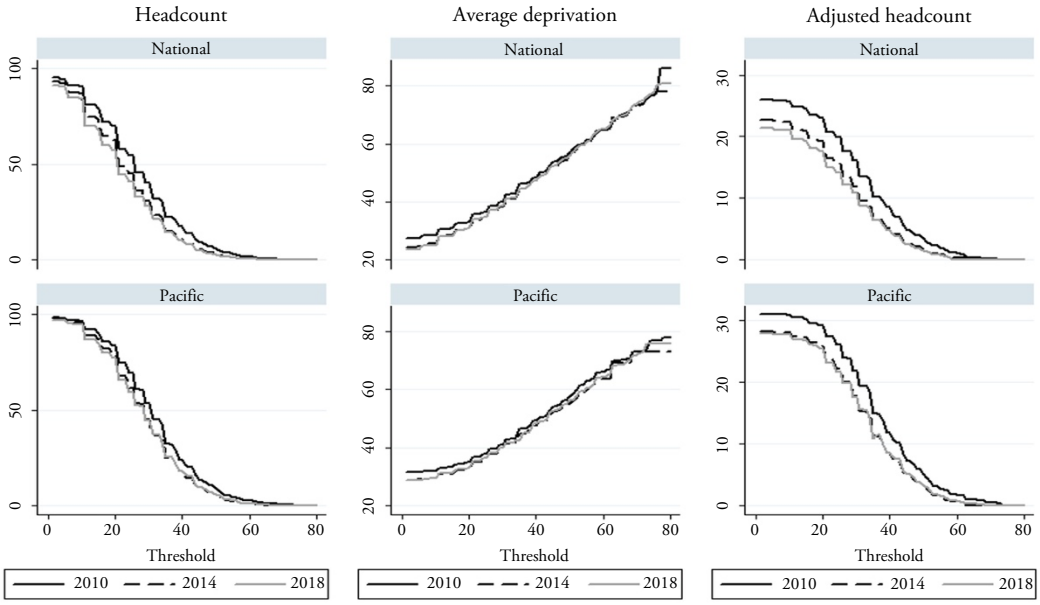
5.1. Headcount, deprivation and adjusted headcount with official methodological approach

Continuing with the *official* methodological approach, the headcount, average deprivation and adjusted headcount were estimated, proposing a continuous multidimensional threshold, equivalent to the percentage of variables (of the 15 used) that are considered for a household to be identified as multidimensionally poor (from 1% to 100%)[7]. Clearly, as the threshold increases, the headcount will decrease, and the percentage of deprivations will increase. The interesting thing in this case is to contrast the levels and changes in the indicators between the national total and the Pacific as the threshold is modified.

Figure 1 shows that when the threshold is very low, practically the entire population is poor. That is, even people with high incomes and adequate living standards experience deficits in some variable; in turn, there are no households deprived in all dimensions. Although the difference is smaller, the Pacific maintains higher deprivation levels independent of the threshold considered. Although the percentage of deprivations increases with an increasing threshold, because households with a higher level of deprivation are increasingly included as poor, the relationship tends to be higher for the Pacific. The illustration of the adjusted headcount indicates with greater evidence the high levels of poverty in the Pacific, higher by approximately 33 percent.

Finally, robustness is verified in the reduction in poverty measured from the headcount and adjusted headcount between 2010 and 2018. For all values of k, the 2018 line is below the 2010 line; therefore, the conclusion supporting the reduction in poverty is independent of the threshold considered. However, the level does change when considering k, which tends to be greater when k is between 20 and 40. This is not the case when comparing 2014 and 2018, a period when there were no major changes in the indicators. A notable fact is that the reduction in multidimensional poverty in the Pacific has been much lower than that of the national total, considering the indicators illustrated in Figure 1, which verifies regular improvements in the living conditions of the population in the Colombian Pacific.

Figure 1.
Headcount, deprivation and adjusted headcount for continuous multidimensional thresholds



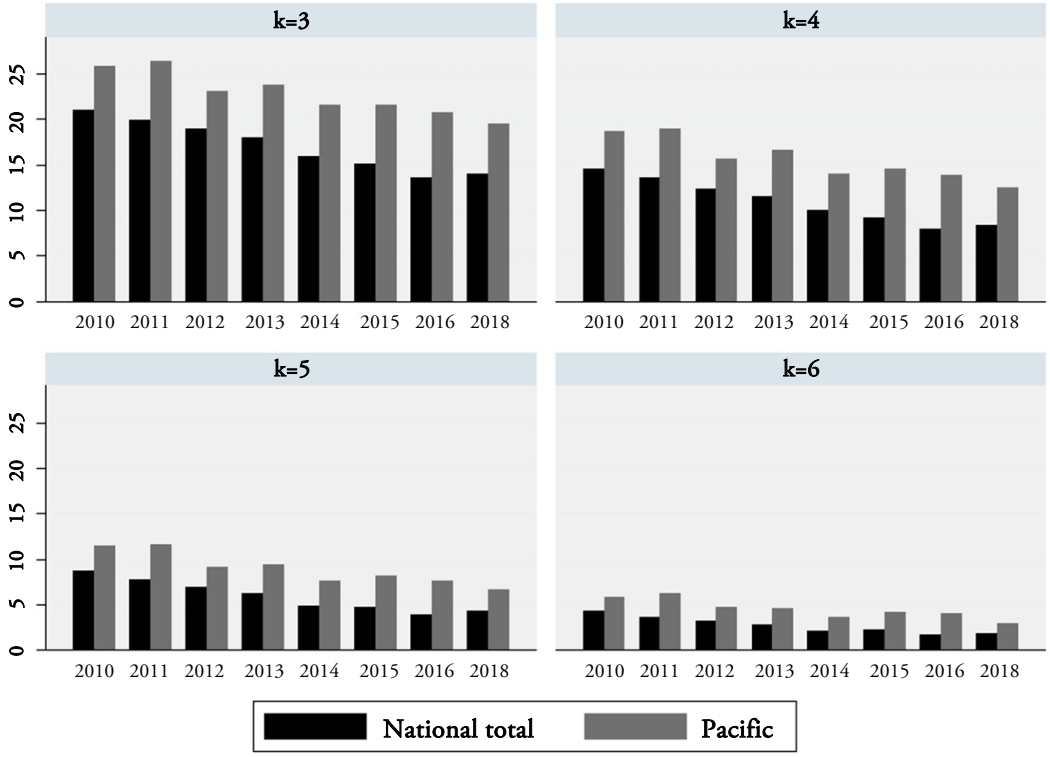
Source: Own elaboration based on the ENCV for each year. DANE (2019b).

[7] The threshold is not entirely continuous, but just as the weights are built, it tends to be so when $k \geq 4$.

5.2. AF indicators with the official methodology

The indicators illustrated in Figure 1 do not meet certain desirable properties of the poverty analysis, such as the multidimensional transfer principle (Bourguignon & Chakravarty, 2003); therefore, it is important to conduct studies considering better aggregation alternatives. With this objective, the AF indicators proposed in (4) represent a better methodological alternative; however, due to the dichotomization on which the *official* methodology is based, it is impossible to estimate these indicators due to the lack of cardinality. As mentioned at the beginning of this section, the official proposal was offered by Angulo et al. (2016), an operational approach that is replicated in this article for a recent period and specifically for the Pacific. In this document, it is proposed to analyze levels of deficits within households and estimate the gap as a function of the proportion of household members deprived in each variable. In the case of the variables associated with housing, the proposed cardinality could not be obtained for 4; therefore, they were excluded from the analysis, and only overcrowding was left as a variable related to that dimension.

Figure 2.
Headcount of multidimensional poverty – Official methodology

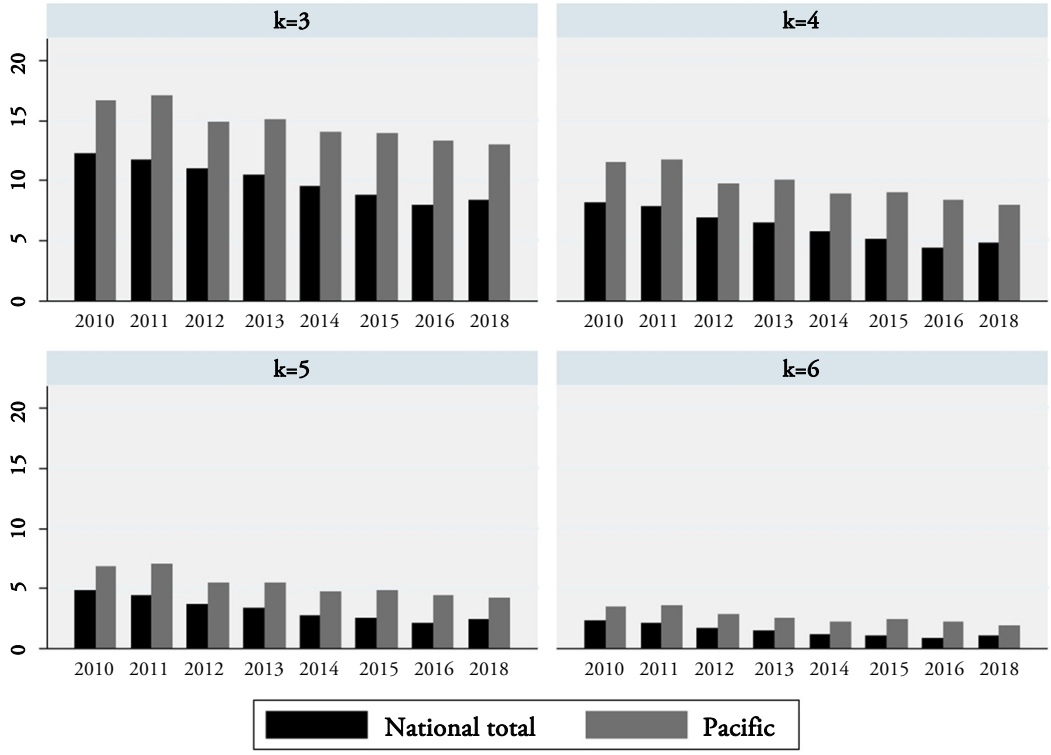


Source: Own elaboration based on the ENCV for each year. DANE (2019b).

All AF indicators were estimated for a continuum of thresholds per variable (multidimensional threshold = k/11), considering from k = 1 (union criterion) to k = 11 (intersection criterion) for the case of the national total and the Pacific in the 2010-2018 period. Figures 2 and 3 show the results for 4 thresholds (when k = 3, 4, 5 and 6) and for headcount and severity of multidimensional poverty. In general terms, under this estimate, a robust reduction of multidimensional poverty can be confirmed for the national total between 2010 and 2018 but with a stagnation in that trend in recent years. The situation is less clear in the case of the Pacific because there are years in which all indicators tend to increase for all values of k. Consequently, although from the initial year to the end of the analysis the headcount reduced in the Pacific, the gap in the levels with the national total increased, showing that the improvement of the welfare of the population in the Pacific was much less than that of the national total. This reflects a great social problem, to the extent that

the lags are maintained and widened, and shows a lack of effectiveness of public policy and a political disinterest to combat fundamental and immediate problems, such as poverty, in these departments of the country. This is verified both with the adjusted headcount of poverty (Figure 2) and with the severity (Figure 3), which even presents a greater distance between the national indicator and the Pacific indicator.

FIGURE 3.
Severity of multidimensional poverty – Official methodology



Source: Own elaboration based on the ENCV for each year. DANE (2019b).

6. MULTIDIMENSIONAL POVERTY IN THE COLOMBIAN PACIFIC – ALTERNATIVE APPROACH

In this study, unidimensional and multidimensional indicators were estimated based on an alternative methodology considering five dimensions: 'Housing', consisting of 8 variables, 'Health', consisting of 4, 'Subjective well-being', consisting of 7, and 'Education' and 'Economic dependence', each composed of a continuous variable. There were proposed two thresholds to compare, both nationally and in the Pacific region, poverty levels with indicators that use different criteria for identifying poverty. First, low thresholds [LT] which are linked to the BC methodology (low, more flexible) and, second, high thresholds [HT] to make a proposal closer to the AF methodology. It is important to note that in the BC methodology, when considering a criterion as strict as that of *union*, flexible thresholds should be available to not identify as poor those who are not, unlike the AF methodology, where the thresholds are stricter to add more poor people to the measurement, given the higher multidimensional threshold.

The construction of the new unidimensional thresholds for the implementation of the AF methodology (4) provided (in all dimensions except 'Health') a greater number of achievements that a household must meet to not be considered poor compared to the thresholds that are used in the BC indicators (5 and 6). For 'Housing', the threshold went from 5 (BC) to 6. In the 'Education' dimension, on average, a household must have 6 years of schooling (compared to 5 in the LT) in order not to be

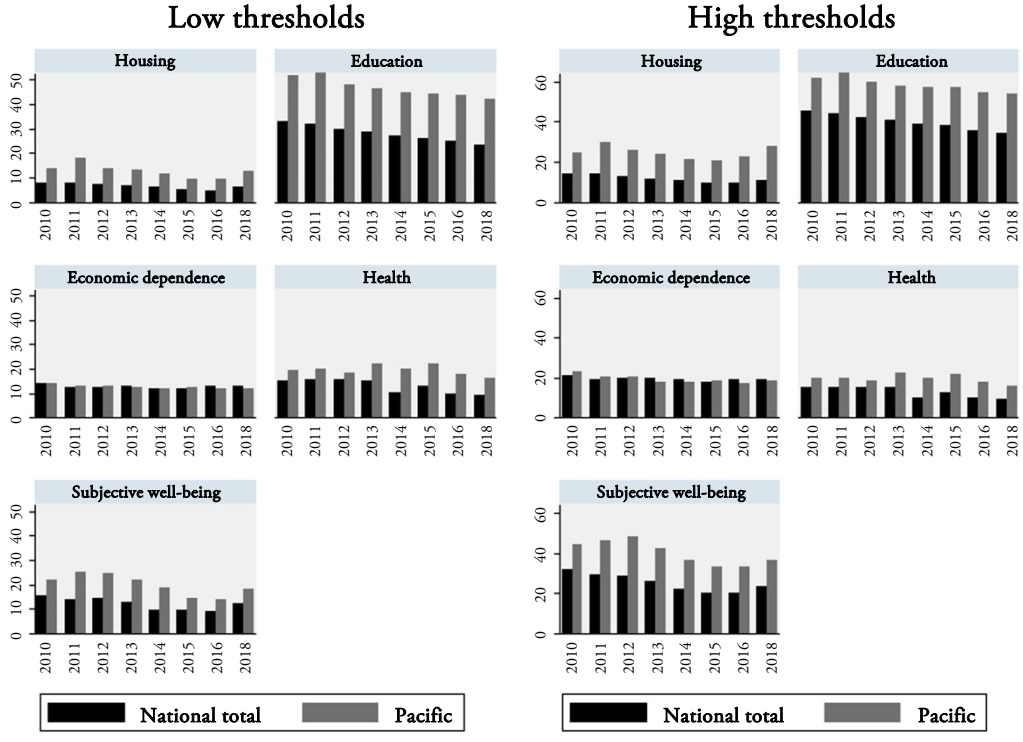
deprived in this dimension. For the 'Economic dependence' dimension, the high threshold is one-fourth (1/4), and the low threshold is one-fifth (1/5), considering all households where there are no employed persons as poor. For the 'Health' dimension, the same dimensional threshold was maintained in both HT and LT. Finally, for 'Subjective well-being', the threshold was adjusted to 5 (in contrast to 4 in LT). The five dimensions considered, the two different proposed dimensional thresholds and the deficits in each of the variables are presented in Appendix 2.

6.1. Unidimensional analysis

Next, the results of headcount, gap and severity of unidimensional poverty for the analyzed period will be presented, that is, the FGT indicators (1) for each dimension, considering the two types of dimensional thresholds previously proposed (low [LT] and high [HT]).

Figure 4 shows the headcount of unidimensional deprivation for the national total and the Colombian Pacific, while Appendix 3 shows the gap and severity. Taking into account the two proposed thresholds, it is observed that both nationally and in the Pacific region, the dimensions included in this study exhibited reduced headcounts between 2010 and 2018; however, not all presented a secular trend. Likewise, the gap and severity of poverty exhibited reduced levels between 2010 and 2018 in both domains, except for the dimensions 'Economic dependence' at the national level and 'Housing' in the Pacific, which exhibited an increased gap. Another aspect that is important to note and is generally seen is that despite considering different thresholds, both measurements share the majority of patterns in the changes in the FGT indicators.

Figure 4.
Headcount of unidimensional poverty – Alternative measurement



Source: Own elaboration based on the ENCV for each year. DANE (2019b).

In the Pacific region, the headcount percentages in most dimensions show values above the national average, except for 'Economic dependence'. Moreover, comparing the two proposed thresholds, the levels of deprivation in some of the dimensions are very deep considering HT, highlighting the great vulnerability

of households in the Colombian Pacific. Likewise, as mentioned above, all dimensions reduced the poverty headcount, but for the region, this trend is neither systematic nor quantitatively high.

Both nationally and in the Pacific, 'Housing' exhibits the lowest headcount ratios compared to that for the other dimensions. Besides, it shows the largest difference between headcount and the gap, revealing that households with deprivation in this dimension are not far from reaching the threshold. In contrast to the above, 'Education' maintains the highest count rates, showing in the HT that 54.6 percent of households in the Pacific region are deprived of it. Nevertheless, 'Education' is the only dimension with a systematic reduction in the period analyzed. On the other hand, this dimension, in both geographical references, does not present large decreases in its figures of gap and severity. This situation is even more critical for the Pacific, which demonstrates the low educational levels of the head of household and the spouse.

It is important to highlight the deterioration in the living standards of Colombians in recent years (from 2015 to 2018) and in particular of the inhabitants of the Pacific, which is more noticeable in the characteristics of housing and domestic public services as well as in the sensation of deteriorating living standards and security. At the national level, 'Economic dependence' shows the growing problem of the labor market, i.e., the increase in the unemployment rate despite the reduction in labor participation, which is reflected in the increase in unidimensional indicators in this regard.

6.2. Estimation of the AF indicator with alternative methodology

Unlike the *official* methodology, the proposal illustrated in the Appendix 2 considers greater continuity in the reference dimensions, which makes the study of gaps and severities much more interesting. In this case, there is greater variability in the possible dimensional gaps, in addition to the fact that the reweighted adjustment is not performed with the number of variables used in each dimension; therefore, the dimension is considered an integral aspect of the analysis of well-being within households.

Thus, in this application, the AF indicators for Colombia and the Pacific region were estimated, considering three and five dimensions, for all possible thresholds (from the criterion of the union to that of the intersection), and three levels of aversion to poverty (indicators of headcount, gap and adjusted severity). The results for the five-dimensional case are illustrated in Appendix 4, and the approximation with three and five dimensions in selected years, together with the results of the BC estimation, are presented in Tables 2 and 3.

In general, the reduction in multidimensional poverty between 2010 and 2018 is statistically significant and is verified considering any AF indicator for all thresholds and both approximations with three and five dimensions, a trend that is maintained for both the national total and the Pacific region. However, there are two worrying facts: first, this reduction is more moderate in the poorest region of the country (Pacific); second, since 2014, there has been a halt in the reduction in multidimensional poverty in Colombia based on the majority of indicators.

Multidimensional poverty in the Colombian Pacific has the highest headcount and severity levels, and although there is a statistically significant reduction between the initial and final year of analysis, this trend is lower than that of the national total. In addition, in this region, there is no secular reduction in multidimensional AF indicators; even in certain years, the indicators increased when, simultaneously, they were reduced in the national total.

A particularity of the changes in multidimensional poverty in the Pacific is that for this geographical reference, the gap and severity indicators are reduced more than the headcount, while in the national total, the variation is higher for this last indicator. This situation is robust to the selected thresholds and to the approximation with three and five dimensions. This indicates that in the Pacific, given the levels of depth of poverty, the improvement of living conditions occurs marginally in the population with greater vulnerabilities, which is important but not sufficient in the search for greater welfare of the Pacific population and even more to mitigate the geographic gaps in the living conditions of the population.

TABLE 2.
Multidimensional poverty indicators – National total

Year	Indicator		Alkire and Foster					Bourguignon and Chakravarty			
			Threshold					Substitution level			
			k=1	k=2	k=3	k=4	k=5	θ=1	θ=2	θ=5	θ=(1/p)
2010	Five-dimensional	α=0	25.4 (24.6 - 26.3)	19.2 (18.6 - 20.0)	10.5 (9.8 - 11.2)	3.5 (3.0 - 4.1)	0.6 (0.4 - 0.8)	54.2 (53.1 - 55.3)	54.2 (53.1 - 55.3)	54.2 (53.1 - 55.3)	54.2 (53.1 - 55.3)
		α=1	10.9 (10.7 - 11.3)	8.4 (8.1 - 8.7)	4.6 (4.4 - 4.9)	1.6 (1.4 - 1.8)	0.3 (0.2 - 0.4)	8.2 (8.0 - 8.5)	14.8 (14.5 - 15.1)	22.3 (21.8 - 22.8)	17.4 (16.5 - 18.3)
		α=2	6.5 (6.2 - 6.9)	5.0 (4.7 - 5.3)	2.7 (2.5 - 3.0)	0.9 (0.8 - 1.1)	0.1 (0.1 - 0.3)	1.8 (1.7 - 1.8)	5.2 (5.1 - 5.5)	11.7 (11.2 - 12.3)	9.6 (9.1 - 10.1)
	Three-dimensional	α=0	26.8 (26.1 - 27.6)	14.7 (13.8 - 15.7)	3.9 (3.2 - 4.7)	-	-	42.2 (41.1 - 43.4)	42.2 (41.1 - 43.4)	42.2 (41.1 - 43.4)	42.2 (41.1 - 43.4)
		α=1	12.6 (12.2 - 13.0)	7.0 (6.7 - 7.4)	1.8 (1.5 - 2.1)	-	-	9.7 (9.4 - 10.1)	14.9 (14.5 - 15.4)	19.9 (19.5 - 20.4)	16.0 (15.1 - 16.9)
		α=2	8.3 (8.0 - 8.7)	4.6 (4.3 - 5.0)	1.1 (0.9 - 1.3)	-	-	3.1 (3.1 - 3.3)	6.9 (6.7 - 7.3)	12.2 (11.6 - 12.9)	9.7 (9.3 - 10.3)
2014	Five-dimensional	α=0	20.3 (19.7 - 21.0)	13.8 (13.1 - 14.5)	6.3 (5.8 - 7.0)	1.7 (1.4 - 2.0)	0.1 (0.0 - 0.2)	45.0 (43.5 - 46.5)	45.0 (43.5 - 46.5)	45.0 (43.5 - 46.5)	45.0 (43.5 - 46.5)
		α=1	8.6 (8.3 - 9.0)	6.0 (5.8 - 6.2)	2.7 (2.5 - 3.0)	0.7 (0.6 - 0.8)	0.1 (0.0 - 0.1)	6.4 (6.2 - 6.7)	12.1 (11.7 - 12.5)	18.5 (17.8 -19.2)	14.2 (13.5 - 14.8)
		α=2	5.2 (5.0 - 5.4)	3.6 (3.4 - 3.8)	1.6 (1.5 - 1.7)	0.4 (0.3 - 0.5)	0.0 (0.0 - 0.0)	1.3 (1.2 - 1.4)	4.2 (4.1 - 4.5)	9.8 (9.5 - 10.3)	7.8 (7.6 - 8.2)

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TABLE 2. CONT.
Multidimensional poverty indicators – National total

Year	Indicator		Alkire and Foster					Bourguignon and Chakravarty			
			Threshold					Substitution level			
			k=1	k=2	k=3	k=4	k=5	θ=1	θ=2	θ=5	θ=(1/p)
	Three-dimensional	α=0	23.1 (22.4 - 23.9)	11.2 (10.7 - 11.8)	2.4 (2.0 - 2.9)	-	-	36.4 (35.1 - 37.8)	36.4 (35.1 - 37.8)	36.4 (35.1 - 37.8)	36.4 (35.1 - 37.8)
		α=1	10.7 (10.3 - 11.1)	5.3 (5.0 - 5.8)	1.0 (0.8 - 1.3)	-	-	8.1 (7.9 - 8.5)	12.8 (12.3 - 13.4)	17.2 (16.7 - 17.9)	14.2 (13.7 - 14.8)
		α=2	7.1 (6.8 - 7.5)	3.5 (3.4 - 3.8)	0.6 (0.5 - 0.7)	-	-	2.6 (2.4 - 2.9)	6.0 (5.7 - 6.3)	10.7 (10.2 - 11.3)	8.6 (8.3 - 9.1)
2018	Five-dimensional	α=0	19.9 (19.5 - 20.5)	13.9 (13.5 - 14.3)	6.3 (6.0 - 6.7)	1.7 (1.5 - 1.9)	0.1 (0.1 - 0.2)	44.6 (43.7 - 45.6)	44.6 (43.7 - 45.6)	44.6 (43.7 - 45.6)	44.6 (43.7 - 45.6)
		α=1	8.7 (8.6 - 8.9)	6.1 (5.9 - 6.3)	2.8 (2.7 - 3.0)	0.7 (0.7 - 0.8)	0.1 (0.0 - 0.1)	6.5 (6.4 - 6.7)	12.3 (12.1 - 12.7)	18.9 (18.5 - 19.4)	13.9 (13.6 - 14.3)
		α=2	5.4 (5.3 - 5.6)	3.7 (3.6 - 3.9)	1.7 (1.6 - 1.8)	0.4 (0.4 - 0.5)	0.0 (0.0 - 0.0)	1.3 (1.3 - 1.5)	4.4 (4.3 - 4.6)	10.3 (10.1 - 10.6)	7.5 (7.4 - 7.8)
	Three-dimensional	α=0	21.8 (21.4 - 22.3)	11.0 (10.5 - 11.5)	2.2 (2.1 - 2.4)	-	-	34.4 (33.7 - 35.2)	34.4 (33.7 - 35.2)	34.4 (33.7 - 35.2)	34.4 (33.7 - 35.2)
		α=1	10.4 (10.2 - 10.7)	5.2 (5.1 - 5.5)	1.0 (0.9 - 1.1)	-	-	8.1 (7.9 - 8.3)	12.7 (12.3 - 13.2)	17.1 (16.6 - 17.7)	13.7 (13.4 - 14.1)
		α=2	7.1 (7.0 - 7.4)	3.5 (3.4 - 3.7)	0.6 (0.6 - 0.7)	-	-	2.6 (2.6 - 2.8)	6.1 (6.0 - 6.3)	11.0 (10.7 - 11.4)	8.3 (7.9 - 8.7)

Note: Confidence intervals are shown in parentheses and were estimated at the 99% level using the bootstrap resampling methodology.
Source: Own elaboration based on the ENCV for each year. DANE (2019b).

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TABLE 3.
Multidimensional poverty indicators – Colombian Pacific

Year	Indicator		Alkire and Foster					Bourguignon and Chakravarty			
			Threshold					Substitution level			
			k=1	k=2	k=3	k=4	k=5	θ=1	θ=2	θ=5	θ=(1/p)
2010	Five-dimensional	α=0	34.7 (32.9 - 36.7)	28.7 (26.4 - 31.1)	17.3 (15.3 - 19.4)	6.4 (4.8 - 8.1)	1.4 (0.4 - 2.5)	72.0 (69.6 - 74.6)	72.0 (69.6 - 74.6)	72.0 (69.6 - 74.6)	72.0 (69.6 - 74.6)
		α=1	15.3 (14.4 - 16.2)	12.5 (11.5 - 13.6)	7.5 (6.6 - 8.6)	2.9 (2.0 - 4.0)	0.7 (0.0 - 1.6)	11.5 (10.5 - 12.6)	20.3 (18.9 - 21.8)	30.3 (28.2 - 32.5)	24.7 (23.3 - 26.1)
		α=2	9.0 (8.3 - 9.9)	7.3 (6.5 - 8.2)	4.4 (3.7 - 5.2)	1.8 (1.2 - 2.4)	0.5 (0.1 - 0.9)	2.6 (2.2 - 3.2)	7.3 (6.5 - 8.1)	15.9 (14.2 - 17.7)	13.9 (12.9 - 15.1)
	Three-dimensional	α=0	36.5 (34.8 - 38.3)	21.3 (19.1 - 23.6)	5.1 (3.2 - 7.0)	-	-	61.8 (59.2 - 64.4)	61.8 (59.2 - 64.4)	61.8 (59.2 - 64.4)	61.8 (59.2 - 64.4)
		α=1	17.6 (16.2 - 19.1)	10.0 (8.5 - 11.6)	2.4 (1.5 - 3.3)	-	-	13.7 (13.0 - 14.6)	21.3 (19.5 - 23.2)	28.6 (25.9 - 31.5)	24.4 (22.7 - 26.1)
		α=2	11.5 (10.6 - 12.6)	6.5 (5.3 - 7.7)	1.5 (0.9 - 2.2)	-	-	4.3 (3.9 - 4.8)	9.6 (8.5 - 10.8)	17.1 (15.9 - 18.4)	14.9 (14.2 - 15.8)
2014	Five-dimensional	α=0	30.5 (29.2 - 31.9)	24.1 (22.1 - 26.3)	13.1 (11.4 -14.9)	4.5 (3.2 - 6.0)	0.4 (0.0 - 0.8)	67.0 (64.2 - 69.9)	67.0 (64.2 - 69.9)	67.0 (64.2 - 69.9)	67.0 (64.2 - 69.9)
		α=1	13.1 (12.4 - 13.8)	10.4 (9.6 - 11.3)	5.7 (4.8 - 6.7)	1.9 (1.4 - 2.5)	0.1 (0.0 - 0.3)	9.8 (9.2 - 10.5)	17.7 (16.8 - 18.7)	26.6 (25.2 - 28.0)	21.0 (19.6 - 23.3)
		α=2	7.6 (7.0 - 8.2)	6.0 (5.5 - 6.6)	3.3 (2.7 - 4.0)	1.1 (0.7 - 1.6)	0.1 (0.0 - 0.2)	2.1 (1.8 - 2.4)	6.0 (5.6 - 6.5)	13.4 (12.7 - 14.2)	11.1 (10.2 - 12.2)

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TABLE 3. CONT.
Multidimensional poverty indicators – Colombian Pacific

Year	Indicator		Alkire and Foster					Bourguignon and Chakravarty			
			Threshold					Substitution level			
			k=1	k=2	k=3	k=4	k=5	θ=1	θ=2	θ=5	θ=(1/p)
	Three-dimensional	α=0	32.1 (30.5 - 33.9)	16.9 (15.0 - 18.9)	4.1 (2.5 - 5.8)	-	-	54.9 (51.7 - 58.2)	54.9 (51.7 - 58.2)	54.9 (51.7 - 58.2)	54.9 (51.7 - 58.2)
		α=1	14.8 (14.0 - 15.7)	7.7 (6.8 - 8.6)	1.7 (1.1 - 2.5)	-	-	11.3 (10.5 - 12.2)	17.8 (16.6 19.1)	24.0 (22.5 - 25.6)	19.9 (18.0 - 21.9)
		α=2	9.4 (8.7 - 10.2)	4.9 (4.2 - 5.7)	1.0 (0.6 - 1.5)	-	-	3.3 (3.0 - 3.7)	7.7 (7.0 - 8.5)	13.7 (12.6 - 15.0)	11.4 (10.2 - 12.8)
2018	Five-dimensional	α=0	30.9 (30.1 - 31.7)	24.9 (24.0 - 25.9)	13.8 (12.5 - 15.1)	4.7 (3.9 - 5.6)	0.6 (0.3 - 1.0)	64.0 (62.0 - 66.0)	64.0 (62.0 - 66.0)	64.0 (62.0 - 66.0)	64.0 (62.0 - 66.0)
		α=1	13.0 (12.6 - 13.5)	10.5 (10.2 - 11.0)	5.9 (5.3 - 6.5)	2.0 (1.7 - 2.4)	0.2 (0.1 - 0.4)	9.6 (9.2 - 10.0)	17.2 (16.6 - 17.9)	25.9 (25.0 - 26.8)	19.7 (18.9 - 20.4)
		α=2	7.5 (7.2 - 7.8)	6.0 (5.8 - 6.4)	3.4 (3.1 - 3.8)	1.1 (1.0 - 1.4)	0.1 (0.1 - 0.2)	2.0 (1.9 - 2.2)	5.9 (5.7 - 6.2)	13.2 (12.7 - 13.8)	10.2 (9.4 - 10.9)
	Three-dimensional	α=0	33.4 (32.4 - 34.4)	19.7 (18.7 - 20.7)	4.87 (3.7 - 6.0)	-	-	53.0 (51.1 - 55.0)	53.0 (51.1 - 55.0)	53.0 (51.1 - 55.0)	53.0 (51.1 - 55.0)
		α=1	15.2 (14.7 - 15.7)	8.8 (8.4 - 9.4)	2.2 (1.9 - 2.5)	-	-	11.5 (11.1 - 11.9)	17.8 (16.9 - 18.8)	23.9 (22.8 - 25.2)	19.2 (18.4 - 20.1)
		α=2	9.6 (9.2 - 10.1)	5.5 (5.2 - 6.0)	1.3 (1.1 - 1.6)	-	-	3.5 (3.3 - 3.8)	7.8 (7.5 - 8.3)	14.0 (13.5 - 14.5)	10.8 (10.3 - 11.6)

Note: Confidence intervals are shown in parentheses and were estimated at the 99% level using the bootstrap resampling methodology.
Source: Own elaboration based on the ENCV for each year. DANE (2019b).

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A critical aspect of the results found in the estimates illustrated in Table 2 is that between 2014 and 2018, the reduction in multidimensional poverty in Colombia stalled. This situation is most notable in the three-dimensional measurement due to the increase in deprivation in economic dependence linked to the problematic situation of the Colombian labor market.

6.3. Estimation of the BC indicator with alternative methodology

Regarding the estimation of the BC indicator (5) and (6), low thresholds were considered because *union* was the identification criterion. The complete estimation for the Colombian Pacific is presented in Appendix 5, and the national total and the Pacific in selected years is illustrated in Tables 2 and 3. The estimation of the indicator was performed for the headcount, gap and severity indicators (α = 0, 1 and 2) and 3 constant substitution levels and 1 variable (θ = 1, 2, 5 and 1/p). As observed in Appendix 5, to the extent that there is a lower degree of substitution, the attributes with greater deficiency are given greater scope; as expected, by giving relevance to the differences in the levels of deprivation between dimensions, the gap and severity indices increase.

It is confirmed that in the selected period, there are two stages: the first between 2010 and 2014, when there is a systematic and robust reduction in multidimensional poverty based on the selected indicators and parameters, and the second between 2014 and 2018, when poverty levels remain above the same approximate levels, ruling out any statistically significant reduction in the BC indicator for all specifications. Unlike 'Economic dependence', the dimension with the best performance in the Pacific (explained in part by the abundant informal employment), living standards for the inhabitants of that region changed drastically due to temporary changes in the gap and severity of certain dimensions: subjective well-being in 2011, education in 2016 and housing in 2018.

In the case of the Pacific, both the gap and the severity show a greater percentage reduction than in the national total for the majority of substitution levels, although the decrease in headcount was lower. In this way, it is evident that despite the persistence of multidimensional poverty in the region, the magnitude of deficit levels in households that remain poor has been mitigated.

6.4. Synthesis and joint analysis of multidimensional indicators

For the national total, a reduction in multidimensional poverty is verified considering both AF and BC indicators and variations in all the estimated parameters. This reduction tends to be higher in headcount than in gap and severity. Despite its reduction, 45 percent of the population still has a deficit in one of the five dimensions of well-being considered in this study, even when there are very low thresholds, as in the BC estimate. In addition, the high gap and severity of the three-dimensional measurement shows the importance of the measurement with continuous variables, while showing the large gap that occurs in 'Education' and 'Economic dependence' (Appendix 3).

When contrasting all the multidimensional indicators for the national total (Table 2) with those for the Colombian Pacific (Table 3), the robustness of the results is evidenced, which is one of the contributions of this article: independent of the threshold, the level of substitution and the degree of aversion to poverty, it is considerably higher in the Pacific than in the rest of the country, reaching a difference of more than 35 percent with respect to the national total. In addition, the reduction in many of the indicators (not all) is lower in the Pacific, showing great limitations in the improvement of the welfare levels of the poor population in the most lagging region of the country in the recent period.

7. Conclusions

The Colombian Pacific is the region with the highest levels of poverty and lowest living standards in the country. Therefore, understanding the associated factors and analyzing the dimensions on which this deficit is concentrated in the levels of well-being of its inhabitants is a transcendental academic objective, in which this research is inserted. Considering the multidimensional approach to poverty and different

identification and measurement methodologies, this article finds that recent changes in poverty in the country have been important but have widened regional gaps in the living standards of the population.

The high levels of deprivation in the welfare of the Pacific population are unacceptable; in certain dimensions, the deficits are greater than 100% percent of the national total. While in the national total there is a reduction in poverty that is systematic and robust based on the thresholds, estimated indicators and identification criteria, the situation is not the same in the Pacific, where even in certain years poverty levels increased. The reduction in poverty in the Pacific has been slower and at lower rates than in other regions, considering most of the indicators estimated in this investigation. The gap between multidimensional indicators for the national total and the Pacific reaches levels above 35 percent, which shows the limitations in expanding the welfare levels of the population in this historically lagging region in the country.

The changes in multidimensional poverty levels in the Pacific are more significant in the case of the gap and severity, indicating a lower level of multidimensional deprivation of the population that remains poor, thus mitigating low living standards. However, the headcount has been reduced at lower rates than in other regions, showing that the changes have been important but marginal and focused on basic improvements in certain dimensions; some are at worrisome levels, such as informal employment levels, low education levels, and access to health and improved water sources.

Based on these results, the urgency of generating public policies regionally focused on the Pacific region and with greater efficiency and sustainability in improving the welfare of its population is evident. It is urgent to convene the state and its different entities, as well as the Pacific community, to generate strategies and guarantee resources for the improvement of quality of life. Among the needs are greater social investment in education, school and hospital infrastructure, strategies for access to public services at home, and a comprehensive labor policy that recognizes the particularity in the occupational and population structure, promoting productive projects and alternative forms of work with recognition of the ethnic, social, geographic, and environmental diversity, not as an obstacle but as an opportunity to generate alternative or unconventional development strategies. Finally, it is important to highlight the importance of reducing violence and armed conflict, seeking peace and combating the influence of armed groups on future generations, which are essential for improving the well-being of the population.

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Appendices

Appendix 1.

Dimensions and variables in the official methodology of multidimensional poverty

Dimension	Variable	Deficit	Weight
Education **(0.2)**	Educational achievement	If the average education level for people over the age of 14 in the household is less than 9 years.	0.1
	Illiteracy	If one or more people over the age of 14 in the household are unable to read and write.	0.1
Childhood and youth conditions **(0.2)**	School lag	If at least one individual between the age of 7 and 17 years is suffering from school lag. It means, if he/she is 7 years old and does not have at least 1 year of education; 8 years old and 2 year of education, (...) 17 years old and 11 year of education.	0.05
	School attendance	If within the household one or more individuals between the age of 6 and 16 do not attend school.	0.05
	Early childhood care services	If at least a child below 6 years old does not stay the majority of time in a kindergarten, a school, or is not cared by an adult. If the child is not fed there or does not have health insurance.	0.05
	Child labor	If within the household at least someone between 12 and 17 years old is working.	0.05
Health **(0.2)**	Health insurance	If one or more people over the age of 5 are not insured by health in the contributory or the subsidized system.	0.1
	Access to health care given a need	If during the last month within the household someone faced a health problem but did not go to the doctor, dentist, therapist, or any healthcare professional.	0.1
Labor **(0.2)**	Long-term unemployment	If within the household someone is in the labor force and has been looking for a job for more than a year.	0.1
	Informal employment	If someone 18 or older, who is in the labor force and is not long-term unemployed, is working but does not make contributions to any pension scheme.	0.1

Dimensions and variables in the official methodology of multidimensional poverty CONT.

Dimension	Variable	Deficit	Weight
Housing **(0.2)**	Access to improved water source	If the urban household is living in a house that does not have aqueduct; in the rural household, if the water to prepare food comes from wells, rainwater, rivers, springs, public sinks, tanker trucks, water sellers or other sources.	0.04
	Inadequate excreta disposal	If the urban household is living in a house that does not have public sewage system; in the rural household if the house does not have toilet or has toilet without a sewage connection.	0.04
	Inadequate flooring material	If the household is living in a house whose flooring material is mainly soil.	0.04
	Inadequate material of exterior walls	If the urban household is living in a house whose exterior walls are mainly built of rough wood, planks, any other vegetation, zinc, fabric, cardboard, tin, waste, plastic, or it does not have walls. In the rural case there is not deficit if the material is rough wood or planks.	0.04
	Critical overcrowding	If three or more people are sleeping in the same bedroom in the urban household. In the rural household case, if four or more people are sleeping in the same bedroom.	0.04

Source: Own elaboration based on Angulo et. al. (2016).

Appendix 2.

Dimensions, variables and thresholds in the alternative approach to multidimensional poverty

Dimension	Number of variables	Dimensional deprivation BC	Dimensional deprivation AF	Variables	Deficiency if (binary variables)
Housing	8	If the household has deficiency in more than 3 variables. ($z_{Hou} = 5$)	If the household has deficiency in more than 2 variables. ($z_{Hou} = 6$)	Aqueduct	The household is living in a house without continue service of water through system of pipes.
				Sewage system	The urban household is living in a house that does not have public sewage system; in the rural household if the house does not have toilet or has toilet without a sewage connection.
				Flooring	The household is living in a house whose flooring material is mainly soil.
				Walls	The urban household is living in a house whose exterior walls are mainly built of rough wood, planks, any other vegetation, zinc, fabric, cardboard, tin, waste, plastic, or it does not have walls. In the rural case there is not deficit if the material is rough wood or planks.
				Overcrowding	Three or more people are sleeping in the same bedroom in the urban household. In the rural household case, if four or more people are sleeping in the same bedroom.
				Electricity	The household are living in a house without electric energy.
				Access to water	In the urban household the water to prepare food comes from wells, rainwater, rivers, springs, public sinks, water sellers or other resources. There is not deficiency in the rural household if the water comes from wells or water sellers.
				Energy to cook	The energy to prepare food comes mainly from coal, wood, firewood or waste.

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Dimensions, variables and thresholds in the alternative approach to multidimensional poverty CONT.

Dimension	Number of variables	Dimensional deprivation BC	Dimensional deprivation AF	Variables	Deficiency if (binary variables)
Education	1	If the average years of education of the head of household and the spouse is less than 5. ($z_{Edu} = 5$)	If the average years of education of the head of household and the spouse is less than 6. ($z_{Edu} = 6$)	Average years of education of the head of household and the spouse.	
Economic dependence	1	There are more than 5 members of the household per worker. ($z_{Dep} = 1/5$)	There are more than 4 members of the household per worker. ($z_{Dep} = 1/4$)	Ratio of economic dependence. (workers over members).	
Health	4	If the household has deficiency in more than 1 variable. ($z_{Hea} = 3$)	If the household has deficiency in more than 1 variable. ($z_{Hea} = 3$)	Health insurance	One or more people within the household are not insured by health in the contributory or the subsidized system.
				Access to health care	During the last month someone within the household faced a health problem but did not go to the doctor, dentist, therapist, or any healthcare professional.
				Self-perception of health	One or more people within the household think that the general self-perception of health is fair or bad.
				Environment	One or more people within the household think that the place where they live is affected by waste or air pollution.

Dimensions, variables and thresholds in the alternative approach to multidimensional poverty CONT.

Dimension	Number of variables	Dimensional deprivation BC	Dimensional deprivation AF	Variables	Deficiency if (binary variables)
Subjetive well-being	7	If the household has deficiency in more than 3 variables. ($z_{Sw} = 4$)	If the household has deficiency in more than 2 variables. ($z_{Sw} = 5$)	Poverty	Someone considers living in a poor household.
				Income sufficiency	Within the household someone thinks that they do not have enough income to afford basic expenditures.
				Security	Within the household someone feels insecure in the neighbourhood, town or village where he/she is living.
				Violent experience	During the last year, within the household someone underwent robbery, theft, burglary, assassination, kidnapping, rape, blackmail and/or eviction.
				Living conditions	Within the household someone thinks that his/her current living conditions are fair or bad.
				Past well-being	Within the household someone thinks that his/her current economic situation is worse than when he/she was a child.
				Recent well-being	Within the household someone thinks that his/her current economic situation is worse than five years ago.

Source: Own elaboration.

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Appendix 3.

Gap and severity of unidimensional poverty. Low and high thresholds

α	Year	National total										Pacific									
		Low thresholds (BC indicator)					High thresholds (AF indicator)					Low thresholds (BC indicator)					High thresholds (AF indicator)				
		HOU	EDU	DEP	HEA	SW	HOU	EDU	DEP	HEA	SW	HOU	EDU	DEP	HEA	SW	HOU	EDU	DEP	HEA	SW
Gap (α=1)	2010	2.7	17.4	8.9	5.7	6.2	4.6	21.9	11.3	5.7	11.3	4.2	28.3	8.8	7.4	8.9	7.6	33.8	11.5	7.4	16.0
	2011	2.8	16.4	8.2	5.9	5.4	4.7	20.9	10.3	5.9	10.2	5.8	27.7	7.8	7.6	10.5	9.8	33.6	10.2	7.6	17.7
	2012	2.5	15.4	8.4	5.9	5.4	4.2	19.6	10.6	5.9	10.0	4.8	25.3	8.1	7.0	10.3	8.3	30.9	10.4	7.0	17.9
	2013	2.2	14.8	8.6	5.8	4.8	3.8	19.0	10.7	5.8	9.1	4.2	24.5	8.3	8.8	8.4	7.5	29.9	10.2	8.8	15.2
	2014	2.0	14.0	8.5	3.7	3.8	3.5	18.0	10.6	3.7	7.4	3.3	23.1	7.5	7.7	7.5	6.3	28.7	9.5	7.7	13.2
	2015	1.6	13.5	8.2	4.7	3.7	2.9	17.4	10.1	4.7	7.0	3.1	22.3	7.8	8.8	5.3	6.0	27.8	9.9	8.8	10.9
	2016	1.4	13.1	9.1	3.6	3.3	2.7	16.7	11.1	3.6	6.7	2.6	23.2	7.6	7.0	5.1	5.9	28.2	9.5	7.0	10.8
	2018	2.3	12.2	9.7	3.4	4.9	3.9	15.7	11.6	3.4	8.9	4.3	22.3	7.8	6.2	7.1	8.3	27.4	9.8	6.2	13.4
Severity (α=2)	2010	1.1	11.9	7.7	2.4	3.1	1.9	14.3	8.6	2.4	5.2	1.5	19.7	7.5	3.1	4.4	2.9	23.3	8.5	3.1	7.4
	2011	1.3	11.0	7.2	2.5	2.6	2.0	13.4	8.0	2.5	4.6	2.4	18.5	6.5	3.2	5.6	4.1	22.3	7.4	3.2	8.8
	2012	1.1	10.4	7.5	2.5	2.5	1.8	12.6	8.3	2.5	4.5	2.2	17.0	6.9	3.0	5.4	3.6	20.4	7.8	3.0	8.7
	2013	0.9	10.0	7.7	2.5	2.2	1.6	12.1	8.4	2.5	4.0	1.6	16.2	7.3	3.9	3.9	3.0	19.6	8.1	3.9	6.9
	2014	0.8	9.5	7.7	1.5	1.8	1.4	11.5	8.4	1.5	3.2	1.1	15.3	6.5	3.3	3.8	2.3	18.6	7.2	3.3	6.3
	2015	0.7	9.0	7.4	1.9	1.7	1.2	11.0	8.1	1.9	3.1	1.4	14.5	6.8	4.0	2.4	2.4	17.7	7.6	4.0	4.6
	2016	0.5	9.0	8.3	1.5	1.5	1.0	10.8	9.0	1.5	2.9	0.9	15.6	6.7	3.2	2.4	2.0	18.7	7.4	3.2	4.5
	2018	1.0	8.4	9.0	1.4	2.4	1.7	10.2	9.6	1.4	4.1	1.6	15.0	6.9	2.6	3.4	3.1	18.1	7.6	2.6	6.0

Note: HOU: Housing; EDU: Education; DEP: Economic dependence; HEA: Health; SW: Subjetive well-being.
Source: Own elaboration based on the ENCV for each year. DANE (2019b).

Appendix 4.

AF Indicators of five-dimensional poverty

		National total					Pacific				
Year	k	Headcount	% Deprivation	Adjusted headcount	Adjusted gap	Adjusted severity	Headcount	% Deprivation	Adjusted headcount	Adjusted gap	Adjusted severity
2010	1	68.6	37.0	25.4	10.9	6.5	84.3	41.2	34.7	15.3	9.0
		(67.2 - 70.2)	(36.4 - 37.7)	(24.6 - 26.3)	(10.7 - 11.3)	(6.2 - 6.9)	(82.5 - 86.2)	(39.3 - 43.2)	(32.9 - 36.7)	(14.4 - 16.2)	(8.3 - 9.9)
	2	37.8	50.9	19.2	8.4	5.0	54.4	52.8	28.7	12.5	7.3
		(36.4 - 39.2)	(50.2 - 51.7)	(18.6 - 20.0)	(8.1 - 8.7)	(4.7 - 5.3)	(50.7 - 58.1)	(51.2 - 54.6)	(26.4 - 31.1)	(11.5 - 13.6)	(6.5 - 8.2)
	3	15.8	66.1	10.5	4.6	2.7	25.8	67.1	17.3	7.5	4.4
		(14.6 - 17.1)	(65.4 - 66.9)	(9.8 - 11.2)	(4.4 - 4.9)	(2.5 - 3.0)	(21.9 - 29.8)	(64.7 - 69.5)	(15.3 - 19.4)	(6.6 - 8.6)	(3.7 - 5.2)
	4	4.2	82.8	3.5	1.6	0.9	7.7	83.8	6.4	2.9	1.8
		(3.7 - 4.8)	(82.1 - 83.6)	(3.0 - 4.1)	(1.4 - 1.8)	(0.8 - 1.1)	(5.5 - 9.9)	(80.4 - 87.3)	(4.8 - 8.1)	(2.0 - 4.0)	(1.2 - 2.4)
	5	0.6	100.0	0.6	0.3	0.2	1.4	100.0	1.4	0.7	0.4
		(0.4 - 0.9)	-	(0.4 - 0.8)	(0.2 - 0.4)	(0.1 - 0.3)	(0.3 - 2.6)	-	(0.4 - 2.5)	(0.0 - 1.6)	(0.1 - 0.9)
2011	1	67.9	36.0	24.5	10.4	6.1	84.9	42.7	36.2	15.8	9.2
		(66.3 - 69.6)	(35.4 - 36.7)	(23.9 - 25.2)	(10.2 - 10.7)	(5.9 - 6.4)	(83.9 - 86.1)	(41.8 - 43.6)	(35.4 - 37.2)	(15.3 - 16.4)	(8.7 - 9.7)
	2	36.8	49.6	18.2	7.8	4.6	59.1	52.6	31.1	13.6	7.9
		(34.7 - 38.9)	(49.0 - 50.3)	(17.6 - 19.0)	(7.6 - 8.1)	(4.4 - 4.8)	(57.1 - 61.1)	(51.6 - 53.7)	(29.8 - 32.4)	(12.9 - 14.3)	(7.4 - 8.4)
	3	14.2	65.0	9.2	4.0	2.3	28.4	66.2	18.8	8.3	4.8
		(13.5 - 15.0)	(64.5 - 65.6)	(8.6 - 9.9)	(3.8 - 4.3)	(2.2 - 2.6)	(26.4 - 30.5)	(65.4 - 67.2)	(17.5 - 20.2)	(7.7 - 9.0)	(4.4 - 5.4)
	4	3.3	81.6	2.7	1.1	0.7	7.9	82.5	6.5	2.9	1.7
		(2.9 - 3.7)	(81.1 - 82.2)	(2.3 - 3.1)	(1.0 - 1.3)	(0.6 - 0.8)	(7.0 - 8.8)	(81.3 - 83.8)	(5.5 - 7.5)	(2.3 - 3.6)	(1.5 - 2.1)
	5	0.3	100.0	0.3	0.1	0.1	1.0	100.0	1.0	0.4	0.3
		(0.2 - 0.4)	-	(0.2 - 0.4)	(0.1 - 0.2)	(0.0 - 0.1)	(0.2 - 1.9)	-	(0.4 - 1.6)	(0.2 - 0.7)	(0.1 - 0.5)

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		National total					Pacific				
Year	k	Headcount	% Deprivation	Adjusted headcount	Adjusted gap	Adjusted severity	Headcount	% Deprivation	Adjusted headcount	Adjusted gap	Adjusted severity
2012	1	66.0	36.0	23.7	10.1	5.9	82.7	41.8	34.6	14.9	8.7
		(64.9 - 67.0)	(35.4 - 36.7)	(23.1 - 24.4)	(9.9 - 10.4)	(5.8 - 6.1)	(80.5 - 84.9)	(40.6 -43.1)	(33.2 - 36.1)	(14.4 - 15.6)	(8.2 - 9.3)
	2	35.0	50.1	17.5	7.5	4.4	56.3	52.0	29.3	12.8	7.5
		(33.7 - 36.4)	(49.6 - 50.7)	(16.9 - 18.2)	(7.3 - 7.9)	(4.3 - 4.7)	(53.1 - 59.6)	(51.0 - 53.1)	(27.8 - 30.9)	(12.0 - 13.7)	(7.0 - 8.1)
	3	14.1	65.1	9.2	4.0	2.3	27.0	65.1	17.6	7.8	4.5
		(13.4 - 14.9)	(64.5 - 65.8)	(8.7 - 9.8)	(3.8 - 4.2)	(2.2 - 2.5)	(24.6 - 29.6)	(64.5 - 65.6)	(15.7 - 19.6)	(7.0 - 8.6)	(4.0 - 5.2)
	4	3.2	82.2	2.7	1.1	0.7	6.1	82.4	5.0	2.3	1.4
		(2.9 - 3.7)	(81.4 - 83.1)	(2.2 - 3.2)	(1.0 - 1.3)	(0.6 - 0.8)	(4.5 - 7.8)	(80.1 - 84.9)	(4.0 - 6.2)	(1.7 - 3.0)	(1.1 - 1.7)
	5	0.3	100.0	0.4	0.1	0.1	0.7	100.0	0.7	0.3	0.2
		(0.2 - 0.5)	-	(0.3 - 0.5)	(0.1 - 0.2)	(0.0 - 0.1)	(0.2 - 1.4)	-	(0.2 - 1.4)	(0.0 - 0.7)	(0.0 - 0.4)
2013	1	63.9	35.5	22.7	9.7	5.7	81.1	40.5	32.9	14.4	8.3
		(62.3 - 65.6)	(34.9 - 36.2)	(22.1 - 23.3)	(9.5 - 10.0)	(5.6 - 6.0)	(79.0 - 83.3)	(39.1 - 42.0)	(31.7 - 34.2)	(13.5 - 15.2)	(7.9 - 8.8)
	2	33.6	49.5	16.6	7.2	4.3	52.7	51.6	27.2	11.9	6.9
		(32.5 - 34.7)	(49.1 - 50.1)	(16.0 - 17.3)	(6.9 - 7.6)	(4.1 - 4.5)	(50.2 - 55.3)	(50.0 - 53.3)	(25.5 - 29.0)	(11.0 - 12.8)	(6.4 - 7.5)
	3	12.9	64.8	8.3	3.6	2.2	23.2	66.4	15.4	6.9	4.0
		(12.0 - 13.9)	(64.2 - 65.4)	(7.8 - 9.0)	(3.4 - 3.9)	(2.0 - 2.4)	(21.0 - 25.6)	(64.8 - 68.1)	(13.7 - 17.2)	(6.0 - 7.9)	(3.5 - 4.6)
	4	2.7	82.5	2.2	1.0	0.6	6.3	83.4	5.3	2.3	1.4
		(2.3 - 3.2)	(81.2 - 83.8)	(1.9 - 2.6)	(0.8 - 1.2)	(0.5 - 0.7)	(4.6 - 8.1)	(81.0 - 86.0)	(3.5 - 7.1)	(1.7 - 3.1)	(0.9 - 1.9)
	5	0.3	100.0	0.3	0.1	0.1	1.1	100.0	1.1	0.5	0.3
		(0.1 - 0.6)	-	(0.1 - 0.5)	(0.1 - 0.2)	(0.0 - 0.1)	(0.4 - 1.8)	-	(0.4 - 1.8)	(0.0 - 1.0)	(0.0 - 0.6)
2014	1	60.9	33.3	20.3	8.6	5.2	79.2	38.5	30.5	13.1	7.6
		(59.9 - 62.0)	(32.7 - 33.9)	(19.7 - 21.0)	(8.3 - 9.0)	(5.0 - 5.4)	(76.3 - 82.2)	(36.8 - 40.2)	(29.2 - 31.9)	(12.4 - 13.8)	(7.0 - 8.2)
	2	28.4	48.5	13.8	6,0	3.6	47.4	50.9	24.1	10.4	6.0
		(27.1 - 29.8)	(48.1 - 49.0)	(13.1 - 14.5)	(5.8 - 6.2)	(3.4 - 3.8)	(44.5 - 50.4)	(49.4 - 52.5)	(22.1 - 26.3)	(9.6 - 11.3)	(5.5 - 6.6)
	3	9.9	64.5	6.3	2.7	1.6	19.9	66.0	13.1	5.7	3.3
		(9.2- 10.6)	(63.6 - 65.4)	(5.8 - 7.0)	(2.5 - 3.0)	(1.5 - 1.7)	(17.0 - 22.8)	(64.6 - 67.6)	(11.4 -14.9)	(4.8 - 6.7)	(2.7 - 4.0)

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		National total					Pacific				
Year	k	Headcount	% Deprivation	Adjusted headcount	Adjusted gap	Adjusted severity	Headcount	% Deprivation	Adjusted headcount	Adjusted gap	Adjusted severity
	4	2.0	81.4	1.7	0.7	0.4	5.6	81.3	4.5	1.9	1.1
		(1.6 - 2.6)	(80.7 - 82.1)	(1.4 - 2.0)	(0.6 - 0.8)	(0.3 - 0.5)	(3.8 - 7.5)	(79.7 - 83.0)	(3.2 - 6.0)	(1.4 - 2.5)	(0.7 - 1.6)
	5	0.1	100.0	0.1	0.1	0.0	0.4	100.0	0.4	0.1	0.1
		(0.1 - 0.2)	-	(0.0 - 0.2)	(0.0 - 0.1)	(0.0 - 0.0)	(0.0 - 0.8)	-	(0.0 - 0.8)	(0.0 - 0.3)	(0.0 - 0.2)
2015	1	59.5	33.1	19.7	8.4	5.1	79.4	37.9	30.1	12.7	7.2
		(58.0 - 61.1)	(32.5 - 33.8)	(19.2 - 20.3)	(8.2 - 8.8)	(4.9 - 5.3)	(77.3 - 81.7)	(36.6 - 39.3)	(28.9 - 31.5)	(12.1 - 13.4)	(6.7 - 7.9)
	2	27.3	48.6	13.3	5.7	3.4	46.5	50.6	23.5	9.8	5.6
		(26.1 - 28.7)	(48.1 - 49.1)	(12.8 - 13.9)	(5.5 - 6.0)	(3.2 - 3.7)	(42.9 - 50.2)	(49.0 - 52.3)	(21.8 - 25.4)	(9.2 - 10.6)	(5.0 - 6.2)
	3	9.8	63.9	6.3	2.7	1.6	20.2	64.4	13.0	5.5	3.1
		(8.9 - 10.8)	(63.4 - 64.6)	(5.8 - 6.8)	(2.6 - 3.0)	(1.5 - 1.8)	(17.2 - 23.4)	(63.1 - 65.8)	(11.1 - 15.0)	(4.8 - 6.2)	(2.7 - 3.7)
	4	1.8	81.9	1.4	0.6	0.4	4.1	82.2	3.3	1.4	0.8
		(1.5 - 2.1)	(81.0 - 82.9)	(1.2 - 1.7)	(0.5 - 0.8)	(0.3 - 0.5)	(2.5 - 5.6)	(80.3 - 84.2)	(2.3 - 4.4)	(1.0 - 1.8)	(0.6 - 1.0)
	5	0.2	100.0	0.2	0.1	0.0	0.5	100.0	0.4	0.2	0.1
		(0.1 - 0.3)	-	(0.1 - 0.3)	(0.0 - 0.1)	(0.0 - 0.0)	(0.0 - 0.9)	-	(0.0 - 0.9)	(0.0 - 0.4)	(0.0 - 0.3)
2016	1	57.7	32.7	18.9	8.2	5.1	77.1	37.7	29.1	12.3	7.2
		(56.4 - 59.1)	(32.1 - 33.4)	(18.3 - 19.5)	(7.9 - 8.5)	(4.9 - 5.3)	(74.6 - 79.7)	(36.4 - 39.1)	(27.5 - 30.8)	(11.7 - 13.0)	(6.8 - 7.6)
	2	26.4	47.8	12.6	5.5	3.5	44.9	50.5	22.6	9.4	5.4
		(25.5 - 27.4)	(47.2 - 48.4)	(12.0 - 13.3)	(5.3 - 5.9)	(3.3 - 3.6)	(41.6 - 48.2)	(49.4 - 51.6)	(20.9 - 24.4)	(8.7 - 10.3)	(4.9 - 6.0)
	3	8.6	64.0	5.5	2.4	1.5	18.3	65.6	12.0	5.1	3.0
		(7.9 - 9.3)	(63.3 - 64.7)	(4.9 - 6.1)	(2.2 - 2.6)	(1.3 - 1.7)	(15.9 - 20.9)	(63.4 - 67.9)	(10.1 - 14.0)	(4.3 - 6.0)	(2.5 - 3.5)
	4	1.6	81.5	1.3	0.5	0.4	4.7	82.0	3.8	1.6	1.0
		(1.2 - 2.0)	(80.1 - 83.0)	(1.1 - 1.5)	(0.4 - 0.7)	(0.3 - 0.5)	(3.1 - 6.4)	(80.2 - 83.8)	(2.3 - 5.5)	(1.2 - 2.2)	(0.7 - 1.4)
	5	0.1	100.0	0.1	0.0	0.0	0.5	100.0	0.4	0.2	0.1
		(0.0 - 0.2)	-	(0.0 - 0.2)	(0.0 - 0.1)	(0.0 -0.0)	(0.1 - 1.0)	-	(0.0 - 0.9)	(0.0 - 0.4)	(0.0 - 0.3)

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AF Indicators of five-dimensional poverty CONT.

		National total					Pacific				
Year	k	Headcount	% Deprivation	Adjusted headcount	Adjusted gap	Adjusted severity	Headcount	% Deprivation	Adjusted headcount	Adjusted gap	Adjusted severity
2018	1	59.1	33.8	19.9	8.7	5.4	78.6	39.3	30.9	13.0	7.5
		(58.2 - 60.2)	(33.5 - 34.1)	(19.5 - 20.5)	(8.6 - 8.9)	(5.3 - 5.6)	(77.2 - 80.2)	(38.4 - 40.2)	(30.1 - 31.7)	(12.6 - 13.5)	(7.2 - 7.8)
	2	28.7	48.4	13.9	6.0	3.7	48.7	51.2	24.9	10.5	6.0
		(28.1 - 29.3)	(48.0 - 48.9)	(13.5 - 14.3)	(5.9 - 6.3)	(3.6 - 3.9)	(46.5 - 50.9)	(50.4 - 52.0)	(24.0 - 25.9)	(10.2 - 11.0)	(5.8 - 6.4)
	3	9.8	64.6	6.3	2.8	1.7	20.8	66.2	13.8	5.9	3.4
		(9.3 - 10.4)	(64.2 - 65.0)	(6.0 - 6.7)	(2.7 - 3.0)	(1.6 - 1.8)	(18.9 - 22.9)	(64.9 -67.5)	(12.5 - 15.1)	(5.3 - 6.5)	(3.1 - 3.8)
	4	2.1	81.4	1.7	0.7	0.5	5.7	82.2	4.7	2.0	1.2
		(1.9 - 2.3)	(81.0 - 81.9)	(1.5 - 1.9)	(0.7 - 0.8)	(0.4 - 0.5)	(4.8 - 6.8)	(81.3 - 83.2)	(3.9 - 5.6)	(1.7 - 2.4)	(1.0 - 1.4)
	5	0.1	100.0	0.1	0.1	0.0	0.6	100.0	0.6	0.2	0.1
		(0.1 - 0.2)	-	(0.1 - 0.2)	(0.0 - 0.1)	(0.0 - 0.0)	(0.3 - 1.0)	-	(0.3 - 1.0)	(0.1 - 0.4)	(0.1 - 0.2)

Appendix 5.

BC indicator of multidimensional poverty - Colombian Pacific

Indicator	Year	Three-dimensional poverty				Five-dimensional poverty			
		Substitution level				Substitution level			
		θ=1	θ=2	θ=5	θ=(1/p)	θ=1	θ=2	θ=5	θ=(1/p)
Headcount (α=0)	2010	61.8	61.8	61.8	61.8	72.1	72.1	72.1	72.1
		(59.2 - 64.4)	(59.2 - 64.4)	(59.2 - 64.4)	(59.2 - 64.4)	(69.6 - 74.6)	(69.6 - 74.6)	(69.6 - 74.6)	(69.6 - 74.6)
	2011	62.7	62.7	62.7	62.7	73.8	73.8	73.8	73.8
		(60.7 - 64.7)	(60.7 - 64.7)	(60.7 - 64.7)	(60.7 - 64.7)	(72.5 - 75.1)	(72.5 - 75.1)	(72.5 - 75.1)	(72.5 - 75.1)
	2012	57.5	57.5	57.5	57.5	69.1	69.1	69.1	69.1
		(55.1 - 59.9)	(55.1 - 59.9)	(55.1 - 59.9)	(55.1 - 59.9)	(67.0 - 71.3)	(67.0 - 71.3)	(67.0 - 71.3)	(67.0 - 71.3)

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BC indicator of multidimensional poverty - Colombian Pacific CONT.

Indicator	Year	Three-dimensional poverty				Five-dimensional poverty			
		Substitution level				Substitution level			
		θ=1	θ=2	θ=5	θ=(1/p)	θ=1	θ=2	θ=5	θ=(1/p)
	2013	55.6	55.6	55.6	55.6	68.5	68.5	68.5	68.5
		(52.8 - 58.5)	(52.8 - 58.5)	(52.8 - 58.5)	(52.8 - 58.5)	(65.6 - 71.5)	(65.6 - 71.5)	(65.6 - 71.5)	(65.6 - 71.5)
	2014	54.9	54.9	54.9	54.9	67.0	67.0	67.0	67.0
		(51.7 - 58.2)	(51.7 - 58.2)	(51.7 - 58.2)	(51.7 - 58.2)	(64.2 - 69.9)	(64.2 - 69.9)	(64.2 - 69.9)	(64.2 - 69.9)
	2015	54.3	54.3	54.3	54.3	66.7	66.7	66.7	66.7
		(51.2 - 57.5)	(51.2 - 57.5)	(51.2 - 57.5)	(51.2 - 57.5)	(64.1 - 69.4)	(64.1 - 69.4)	(64.1 - 69.4)	(64.1 - 69.4)
	2016	52.2	52.2	52.2	52.2	63.0	63.0	63.0	63.0
		(49.3 - 55.1)	(49.3 - 55.1)	(49.3 - 55.1)	(49.3 - 55.1)	(60.1 - 66.0)	(60.1 - 66.0)	(60.1 - 66.0)	(60.1 - 66.0)
	2018	53.0	53.0	53.0	53.0	64.0	64.0	64.0	64.0
		(51.1 - 55.0)	(51.1 - 55.0)	(51.1 - 55.0)	(51.1 - 55.0)	(62.0 - 66.0)	(62.0 - 66.0)	(62.0 - 66.0)	(62.0 - 66.0)
Gap (α=1)	2010	13.8	21.3	28.6	24.4	11.5	20.3	30.3	24.7
		(13.0 - 14.6)	(19.5 - 23.2)	(25.9 - 31.5)	(22.7 - 26.1)	(10.5 - 12.6)	(18.9 - 21.8)	(28.2 - 32.5)	(23.3 - 26.1)
	2011	13.8	20.9	27.8	23.2	11.9	20.6	30.4	23.9
		(13.3 - 14.3)	(20.0 - 21.9)	(26.6 - 29.1)	(22.3 - 24.1)	(11.5 - 12.4)	(19.9 - 21.3)	(29.3 - 31.6)	(22.7 - 25.1)
	2012	12.7	19.5	26.0	21.8	11.1	19.4	28.7	23.1
		(11.7 - 13.9)	(18.7 - 20.4)	(24.6 - 27.5)	(19.9 - 23.7)	(10.4 - 11.9)	(18.4 - 20.4)	(27.0 - 30.4)	(21.6 - 24.9)
	2013	12.4	19.1	25.5	21.5	10.9	19.0	28.2	22.6
		(11.6 - 13.3)	(17.7 - 20.5)	(24.2 - 26.8)	(20.0 - 23.0)	(10.3 - 11.5)	(17.8 - 20.3)	(27.0 - 29.5)	(21.3 - 24.1)
	2014	11.3	17.8	24.0	19.9	9.8	17.7	26.6	21.0
		(10.5 - 12.2)	(16.6 19.1)	(22.5 - 25.6)	(18.0 - 21.9)	(9.2 - 10.5)	(16.8 - 18.7)	(25.2 - 28.0)	(19.6 - 23.3)
	2015	11.1	17.6	23.8	19.9	9.5	17.4	26.3	21.1
		(10.5 -11.8)	(16.5 - 18.7)	(22.2 - 25.4)	(18.4 - 21.5)	(9.0 -10.1)	(16.4 -18.4)	(25.1 - 27.5)	(19.6 - 22.6)
	2016	11.1	17.7	23.9	19.8	9.1	16.9	25.6	20.3
		(10.5 - 11.9)	(16.2 - 19.2)	(21.9 - 25.9)	(18.7 - 21.2)	(8.5 - 9.8)	(16.1 - 17.7)	(23.9 - 27.3)	(18.7 - 22.0)

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BC indicator of multidimensional poverty - Colombian Pacific CONT.

Indicator	Year	Three-dimensional poverty				Five-dimensional poverty			
		Substitution level				Substitution level			
		θ=1	**θ=2**	**θ=5**	**θ=(1/p)**	**θ=1**	**θ=2**	**θ=5**	**θ=(1/p)**
	2018	11.5	17.8	24.0	19.3	9.6	17.2	25.9	19.7
		(11.1 - 11.9)	(16.9 - 18.8)	(22.8 - 25.2)	(18.4 - 20.1)	(9.2 - 10.0)	(16.6 - 17.9)	(25.0 - 26.8)	(18.9 - 20.4)
Severity (α=2)	2010	4.3	9.6	17.1	15.0	2.7	7.3	15.9	13.9
		(3.9 - 4.8)	(8.5 - 10.8)	(15.9 - 18.4)	(14.2 - 15.8)	(2.2 - 3.2)	(6.5 - 8.1)	(14.2 - 17.7)	(12.9 - 15.1)
	2011	4.3	9.1	16.0	13.4	2.7	7.3	15.6	12.7
		(4.1 - 4.6)	(8.7 - 9.7)	(15.0 - 17.0)	(12.6 - 14.2)	(2.5 - 3.0)	(6.9 - 7.7)	(14.9 - 16.4)	(12.0 - 13.4)
	2012	4.0	8.7	15.1	12.9	2.6	6.9	14.8	12.8
		(3.5 - 4.6)	(7.9 - 9.5)	(13.7 - 16.6)	(11.8 - 14.1)	(2.3 - 2.8)	(6.5 - 7.3)	(14.0 - 15.7)	(11.9 -13.7)
	2013	3.8	8.4	14.8	12.5	2.4	6.6	14.3	12.1
		(3.5 - 4.1)	(7.7 - 9.1)	(13.8 - 15.8)	(11.7 - 13.4)	(2.2 - 2.7)	(6.3 - 7.0)	(13.4 - 15.3)	(11.2 - 13.1)
	2014	3.3	7.7	13.7	11.4	2.1	6.0	13.4	11.1
		(3.0 - 3.7)	(7.0 - 8.5)	(12.6 - 15.0)	(10.2 - 12.8)	(1.8 - 2.4)	(5.6 - 6.5)	(12.7 - 14.2)	(10.2 - 12.2)
	2015	3.2	7.5	13.6	11.6	1.9	5.8	13.1	11.4
		(2.9 -3.6)	(7.0 -8.2)	(12.3 - 15.0)	(10.3 - 12.8)	(1.7 - 2.1)	(5.2 - 6.4)	(12.3 - 14.0)	(10.1 - 12.8)
	2016	3.3	7.7	14.0	11.6	1.9	5.8	13.1	11.0
		(2.9 - 3.6)	(7.1 - 8.5)	(13.1 - 14.9)	(10.6 - 12.7)	(1.7 - 2.1)	(5.3 - 6.3)	(12.1 - 14.2)	(10.1 - 11.9)
	2018	3.5	7.9	14.0	10.9	2.0	5.9	13.2	10.2
		(3.3 - 3.8)	(7.5 - 8.3)	(13.5 - 14.5)	(10.3 - 11.6)	(1.9 - 2.2)	(5.7 - 6.2)	(12.7 - 13.8)	(9.4 - 10.9)