



Changing levels of income and multidimensional poverty among persons with disabilities in Colombia: A pseudo panel analysis

Mónica Pinilla-Roncancio^{a,*}, Gustavo Cedeño-Ocampo^b, Ana Maria Medina Ch^c, Claudia M. Cortés-García^d, Beatriz Muñoz-Veira^d

^a School of Medicine and Centre of Sustainable Development Goals for Latin America and the Caribbean. Universidad de los Andes. Bogotá, Colombia

^b Centre of Sustainable Development Goals for Latin America and the Caribbean, Colombia

^c Pontificia Universidad Javeriana, Facultad de Medicina, Instituto de Envejecimiento, Colombia

^d Escuela de Ciencias Humanas. Universidad del Rosario, Colombia

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ABSTRACT

In Colombia, more than 4 per cent of the population lives with disability and high levels of income and multidimensional poverty have been recognised within this group. However, there is no information on how the levels of poverty have changed over time or whether households with members with disabilities are more likely to be chronically poorer than households without disabilities in the country. In addition, no evidence exists on the potential effect of the Covid-19 pandemic on the socioeconomic characteristics of persons with disability. This study aims to contribute to the literature on this topic by analysing a nationally representative survey (Quality of Life Survey) from 2018 to 2022 and studying the changes in the levels of income and multidimensional poverty of persons with disabilities and their household, and identifying whether any changes associated with the Covid-19 pandemic.

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1. Introduction

According to the World Health Organization (WHO), 16 per cent of the population around the globe live with a disability, with this percentage expected to increase in the coming years given the high prevalence of chronic diseases (World Health Organization (WHO), 2022). In Colombia, it is estimated that 4.3 per cent of the population five years or older live with disabilities, with visual limitations as the most prevalent functional limitation (Departamento Administrativo Nacional de Estadística (DANE), 2022a).

Persons with disabilities in Colombia represent a group that is frequently omitted from poverty reduction policies and programmes (Pinilla-Roncancio, 2022) even though persons with disabilities usually face barriers when accessing health, education and employment, and these barriers impact their ability to participate fully in society. Studies analysing the poverty levels of persons with disabilities in Colombia have found that this group presents higher multidimensional poverty levels and faces higher deprivation in health, employment and

education indicators. In Colombia, the largest gaps in indicators exist between persons with and without disabilities related to education and employment (Pinilla-Roncancio & Alkire, 2021; Departamento Administrativo Nacional de Estadística (DANE), 2022b).

Whilst the broader evidence base about the levels of income and multidimensional poverty of persons with disabilities and their families has grown in the last ten years, no study analyses whether poverty has changed over time for households and persons with disabilities in Latin America. Similarly, whilst the number of studies analysing the potential effect of the Covid-19 pandemic on the levels of poverty of individuals and households with members with disabilities has increased (Bargain & Aminjonov, 2021; Goyal et al., 2023), few studies have analysed how the pandemic affected the levels of income and multidimensional poverty of persons with disabilities (Sarker et al., 2022; Senjam, 2020). The main findings of studies that include a specific focus on disability are that persons with disabilities have faced an increasing or higher number of barriers to accessing healthcare (Sarker et al., 2022; World Health Organization (WHO), 2022; Lebrasseur et al., 2021); that they were left out of most Covid-19 related education strategies (Croft & Fraser, 2021); and that the levels of poverty (income and multidimensional) have

* Corresponding author.

E-mail address: Mv.pinilla@uniandes.edu.co (M. Pinilla-Roncancio).

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increased in a larger proportion than for those without disabilities (Sarker et al., 2022; United Nations (UN), 2021).

In Latin America and the Caribbean, the analysis of the potential impact of the Covid-19 pandemic on the levels of deprivation and poverty of persons with disabilities has been studied in specific reports (United Nations UN, 2021). Nevertheless, a detailed analysis has yet to be conducted studying how income and multidimensional poverty levels changed during the pandemic for this group.

In Colombia, the Covid-19 pandemic increased income levels and multidimensional poverty (Departamento Administrativo Nacional de Estadística (DANE), 2021). Indeed, according to the National Department of Statistics, income poverty increased by almost seven percentage points, poverty increased from 35.7 in 2019 to 42.5 per cent in 2020, and the incidence of multidimensional poverty increased from 17.5 to 18.1 per cent between 2019 and 2020. Although a reduction in the levels of income and multidimensional poverty was observed in 2021 compared to 2020 in absolute terms, the negative effects of the pandemic on the livelihood of poor individuals in the country have not been analysed yet (Departamento Administrativo Nacional de Estadística (DANE), 2021).

To date, there has not been a study in Colombia analysing the changes in the poverty levels of households with persons with disabilities and the potential effect of the Covid-19 pandemic on the income and multidimensional poverty levels of persons with disabilities and their families. This is the first study to conduct this analysis, through analysing the changes in income, multidimensional and subjective poverty of persons with disabilities using the Quality of Life Survey from 2018 to 2022. This includes the analysis of the incidence of poverty (income, multidimensional and subjective), as well as estimations of whether the probability of being poor was higher for persons with disabilities and their families and how those observable differences in trends have changed since 2020.

2. Methods

2.1. Data

The National Quality of Life Survey (QoLS) has the objective to collect information that allows the analysis of the socioeconomic conditions of households in Colombia. In addition, it provides information that allows the design and implementation of public policies in the country. The QoLS is the official data source used to compute Colombia's national Multidimensional Poverty Index (MPI). The QoLS collects information from households and individuals, allowing the analysis of the characteristics of households and their members. The QoLS uses standardised questionnaires to collect information on household characteristics, with specific questions about education, health, employment, subjective well-being, technology and child labour. Due to the standardised questionnaire format, the information collected is comparative over time as all years use the same sampling frame. This study sampled information from 2018 to 2022. During these years, QoLS data were collected through face-to-face interviews that took place from September to December each year. The QoLS is representative at the national level, for rural and urban areas, for the 32 provinces of the country and for Bogota, the capital city of Colombia. In 2020, during the pandemic, the survey was collected using the same method (face-to-face interviews) and in the same reference period making it quite unique.

Table 1 presents the sample size for each year analysed in this article.

Table 1
Sample size of QoLS per year.

Sample	2018	2019	2020	2021	2022
Households	89,522	93,993	88,310	89,203	88,328
Individuals	283,012	289,558	267,085	257,589	251,925

As can be observed, the household sample size is broadly similar for all years analysed, with an increase in the number of households included in 2019 and a slight reduction in 2020. Additionally, Table A2 presents the percentage of missing values in each of the variables and indicators used for the analysis. As can be seen in the table, the percentage of missing values in most variables it was zero.

2.2. Disability variable

The QoLS includes questions on disability status following to some extent the suggestions made by the Washington Group on Disability Statistics, which is an international measure of disability that allows tracking the fulfilment of the Convention of the Rights of Persons with Disabilities (Washington Group on Disability Statistics, 2022). In this article, we define a person with disabilities as a person who reported having severe difficulty or being unable to do at least one of the nine domains asked in the survey: hearing, speaking, seeing, moving or walking, grasping objects, understanding, eating/dressing or bathing on one's own, or any activity without producing heart problems. Since 2020, the domain related to limitations in conducting activities without producing heart problems was eliminated, thus, from that year we only considered the information available from the other domains. In addition, aiming to check the robustness of the results to changes in the definition of disability, we computed a second disability variable, where a person has a disability if s/he reported having some or, a lot of difficulties or was unable to perform at least one of the nine activities.

2.3. Poverty measure

2.3.1. Multidimensional poverty index

We used the official measure of Multidimensional Poverty for Colombia, which was constructed using the structure developed by Angulo-Salazar et al. (2011) and uses the Alkire-Foster Method (Alkire & Foster, 2011), which is one of the most widely used methods to compute multidimensional poverty measures. The Colombian National Multidimensional Poverty Index (MPI) has five dimensions and 15 indicators. All 15 indicators are calculated at the household level and assume that deprivations and achievements are equally shared by all household members (see Table A1). The poverty line was defined at 33 per cent, so a household and all its members are considered multidimensionally poor if they face 33 per cent or more of the weighted sum of deprivations (Angulo-Salazar et al., 2011). This paper follows all methodological decisions taken in the design of the National MPI for Colombia.

2.3.2. Monetary poverty measure

The National Statistics Office of Colombia (DANE) estimates the poverty and extreme poverty lines using information on the basic food basket, services, and other minimum goods needed to live every year (Departamento Administrativo Nacional de Estadística (DANE), 2020). The estimation of the food basket uses information from the National Household Budget Survey 2016/17. The official source of information to compute the national extreme poverty and poverty lines is the Continuous Household Survey (Departamento Administrativo Nacional de Estadística (DANE), 2020). However, this household survey did not include information on disability before 2020. Therefore, it was not possible to use it for this study. In order to analyse the changes on income poverty, a proxy variable that estimates household income in the QoL survey was used and the incidence of income poverty was computed using the national poverty line for each year. Using this data, we created estimates for DANE for each year included in the sampling thereby identifying households living under the poverty and extreme poverty line.

2.3.3. Subjective poverty measure

The QoLS includes a question that aims to collect information on the perception of poverty that the head of the household or the main

responder of the survey has. In Colombia, the head of the household is defined as the person who other household members recognise as the main provider or one making decisions. The question used is, “Do you consider yourself as poor?”. We recognise that subjective measures of poverty have different reliability issues; however, at the average level, measurement error problems are reduced, and it is possible to estimate the incidence of poverty and compare over time. We wanted to analyse differences in the poverty levels perceived by households. In this case, we considered a household and all its members as subjectively poor if the head of the household considered that the household as a unit was poor.

2.3.4. Pseudo-panel data

To study the poverty dynamics of households with members with disabilities, we created a synthetic panel data set. We used the pseudo-panel approach introduced by Dang and Lanjouw (2013, 2014, 2023), which allows us to construct synthetic panel data from repeated cross-sectional data. The process of computing the panel included the following steps: we first calculated the multidimensional, monetary, and subjective poverty measures for each household and year and aggregated the information using household characteristics such as year of birth of the head of the household, province of residence, sex of the head of household, and whether the household has a person with a disability. We guaranteed that the cross-sectional data were comparable, i.e., the sampling methodology did not change over time. Given that since 2018, the QoLS uses the same sampling frame (Departamento Administrativo Nacional de Estadística, 2018), this assumption was fulfilled and allowed the results on poverty and general well-being to be comparable over time. Finally, we recognise that the comparability of populations imposes some limitations. For example, the population could change due to alterations in household composition (i.e., births, deaths, migration, among others); therefore, to minimise the bias, we restricted the sample to households whose head was between 25 and 55 years old, as derived from the pseudo-panel literature (Dang & Lanjouw, 2023).

2.4. Empirical strategy

2.4.1. Main estimates

The empirical strategy aimed to analyse the association between a household with at least one member with disabilities and each of the poverty measures. To obtain the estimates, we considered two estimation alternatives. First, we consider a non-linear model such as a Probit model to analyse this relationship using repeated cross-sectional data. This allowed us to understand how the results have changed over time at the average level and how the year of data collection could be associated with changes in the poverty measures. Second, we used pseudo-panel data to estimate ordinary least squares (OLS) with a two-way fixed effects (TWFE) model. This method allows us to analyse poverty dynamics over time.

The Probit model can be written as:

$$y^* = X_i\beta + \gamma h_i + u_i \tag{1}$$

where Y^* is a latent variable of (monetary, multidimensional or subjective) poverty for each household, it takes the value of one if household i is (monetary, multidimensional or subjective) poor and zero otherwise. h_i is a dummy variable that represents that a household has at least one member with disabilities. X_i includes household-level control variables such as age, sex and education level of the head of household, number of children per household, number of adults over 65 per household, and place of residence. u_i is an error term. Under this setup, $\hat{\gamma}$ will capture the association between the probability of poverty (monetary, multidimensional or subjective) and being a household with persons with disabilities. Heteroscedasticity in this scenario was corrected using robust standard errors.

The TWFE model can be written as

$$z_{it} = +\mu h_{it} + \delta_t + \alpha_i + u_{it} \tag{2}$$

where z_{it} is the incidence of (monetary, multidimensional or subjective) poverty for each house-hold cohort. h_{it} is a disability dummy variable for each household cohort, it takes the value of one if the household has a member with disabilities and zero otherwise. δ_t is a year-specific fixed effect, capturing aggregate shocks that affect the incidence of poverty due to macroeconomic conditions, policy decisions, and others. α_i is the fixed effects associated with place of residence and captures unobservable variables over time. u_{it} is an error term that has idiosyncratic characteristics that are not observable over time. Under this setup, $\hat{\mu}$ will capture the association between the incidence of poverty (monetary, multidimensional or subjective) and being a household with members with disabilities. Heteroscedasticity in this scenario was corrected using a robust standard errors cluster at the province level.

3. Results

Table 2 presents the number of persons with disabilities per year. According to the QoLS, the percentage of persons with a disability in Colombia varied from 6.5 per cent in 2018 to 4.6 per cent in 2022. In addition, in 2018, almost 22.9 per cent of households had at least one member with disabilities, and this percentage reduced to 12.9 per cent in 2022. It is essential to highlight that the percentage of persons and households with disabilities varied between years. This has been discussed and analysed by DANE (Departamento Administrativo Nacional de Estadística (DANE), 2022b) and it is mainly related to the sampling frame of the QoL survey and given that it is not related to specific individual or households characteristics the sample is not biased and it represents the characteristics of persons and households with members with disabilities in the country.

When we analyse the characteristics of persons with disabilities and their households, we can observed that, on average, persons with disabilities have one year of education less than persons without disabilities. In addition, the percentage of persons with disabilities who are older than 60 years is, on average, 15 percentage points (pp) higher than for persons without disabilities, and the percentage of persons with disabilities who are employed is between 10 and 14 pp lower than for persons without disabilities. These differences are maintained over time and are significant in all cases (see Table 3).

In the case of households with members with disabilities, we also found substantial differences in comparison to households without members with disabilities. Specifically, households with at least one member with a disability are more likely to be larger, have a lower number of children and have a higher number of members older than 65 years. In addition, if the head of the household has a disability, the average number of years of schooling of the head of the household is lower compared to household heads without disabilities. Household heads with disabilities are, on average 10 years older than household heads without disability (see Table 3).

When we analysed the levels of income, multidimensional and subjective poverty for households with members with disabilities and compared them with the ones of households without members with disabilities, we found that, on average, households with members with disabilities face higher levels of multidimensional poverty compared to households without members with disabilities. The households with members with disabilities present an incidence of multidimensional poverty significantly higher in all years included in the analysis

Table 2 Percentage of persons and households with disability in Colombia per year.

Disability	2018	2019	2020	2021	2022
Persons (%)	6.47	6.66	4.68	5.03	4.60
Households (%)	22.89	22.36	16.28	17.11	12.95

Notes: Estimates are adjusted with the Weight Survey.

Table 3
Descriptive statistics per year.

Variables	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)		(10)	
	2018		2019		2020		2021		2022		2021		2022		2021		2022		2022	
	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No
A. Individuals characteristics																				
1. Men (%)	48.09**	49.41	47.76**	49.49	47.34**	48.94	47.67**	48.78	47.45**	48.52										
1. Women (%)	51.91**	50.59	52.24**	50.51	52.66**	51.06	52.33**	51.22	52.55**	51.48										
2. Urban (%)	57.41**	53.87	58.25**	52.09	56.17**	50.85	54.48**	50.85	53.38**	50.22										
2. Rural (%)	42.59**	46.13	41.75**	47.91	43.83**	49.15	45.52**	49.15	46.62**	49.78										
3. Head of the Household (%)	29.35**	32.21	30.32**	32.96	30.58**	33.49	31.89**	35.08	32.28**	35.43										
4. Years of Schooling	6.76**	7.58	6.81**	7.55	6.98**	7.80	6.75**	7.82	6.53**	7.75										
5. Age ∈ [5,15)	19.33**	27.56	19.26**	27.32	17.40**	25.95	16.83**	25.22	15.80**	25.01										
5. Age ∈ [15,30)	20.80**	24.77	20.25**	24.41	20.23**	24.84	19.24**	24.50	18.15**	23.63										
5. Age ∈ [30,45)	15.68**	20.88	15.45**	20.78	15.84**	21.23	15.63**	21.29	15.11**	20.94										
5. Age ∈ [45,60)	19.88**	16.15	19.99**	16.36	19.84**	16.41	19.64**	16.58	19.96**	16.86										
5. Age ∈ (>60)	24.31**	10.64	25.05**	11.13	26.69**	11.57	28.67**	12.41	30.98**	13.57										
6. Outside the labour force (%)	58.76**	49.17	58.44**	48.53	62.34**	51.66	62.19**	49.54	62.91**	49.31										
6. Unemployment (%)	3.39**	3.59	3.88	3.79	4.18	4.34	3.70	3.77	3.44**	3.18										
6. Employed (%)	37.85**	47.24	37.69**	47.67	33.48**	44.00	34.11**	46.69	33.66**	47.51										
B. Household characteristics																				
7. Men HH (%)	61.02**	65.74	58.95**	64.73	57.90**	62.55	53.45**	60.39	52.48**	57.70										
7. Women HH (%)	38.98**	34.26	41.05**	35.27	42.10**	37.45	46.55**	39.61	47.52**	42.30										
8. Years of Schooling HH	6.14**	7.80	6.29**	7.79	6.42**	8.04	6.27**	8.09	6.16**	8.08										
9. Age of the HH	57.84**	46.86	57.91**	46.92	58.43**	46.94	58.89**	47.03	59.70**	47.68										
10. Household size	3.41**	3.10	3.30**	3.03	3.27**	2.99	3.14**	2.85	3.10**	2.82										
11. Number of children younger than 12 in the household	1.58**	1.62	1.56**	1.61	1.50**	1.56	1.52	1.54	1.50**	1.55										
12. Number of individuals 65 years or older in the household	0.83**	0.33	0.83**	0.34	0.87**	0.35	0.90**	0.35	0.96**	0.38										
13. Household size: single person (%)	12.19**	18.41	13.13**	19.66	12.90**	19.07	14.05**	21.33	13.91**	21.35										
13. Household size: 2 to 4 members (%)	64.66*	63.88	65.58**	63.69	66.67**	65.72	68.24**	65.45	68.79**	65.92										
13. Household size: 5 or more members (%)	23.15**	17.72	21.29**	16.65	20.44**	15.21	17.70**	13.22	17.30**	12.73										

Notes: PwD: Household with Person with Disabilities. Columns (1), (3), (5), (7), and (9) show the significance levels of the difference of households with and without Persons with Disabilities for each year. *p < 0.10; **p < 0.05; ***p < 0.01.

compared to the one of households without members with disabilities. By contrast, the levels of income poverty for households with members with disabilities were lower compared to households without. Furthermore, after the Covid-19 pandemic, households with members with disabilities faced significantly higher income poverty levels than those without members with disabilities. The percentage of households with members with disabilities who are subjectively poor is lower in all the years compared to those without disabilities. This difference is significant in all years (see Table 4).

Importantly, our analysis demonstrated that the levels of income and multidimensional poverty increased between 2019 and 2020 for households with and without disabilities. Indeed, the increase in income poverty was 2.8 pp larger for households with members with disabilities than households without members with disabilities. In the case of the incidence of multidimensional poverty, the increase for households with and without disabilities was close to 1 pp.

The data also showed that there was a reduction in the percentage of

households living in income and multidimensional poverty, with a larger reduction for households with members disabilities. Indeed, in 2020, the reduction for households with members with disabilities was close to 3 pp compared to a reduction of 2 pp for households without members with disabilities. However, when the analysis includes 2022, it is clear that households with members without disabilities had a reduction of 9 pp, which was higher than for households without disabilities (6 pp). In the case of multidimensional poverty, a reduction of 3 pp was observed in both groups (households with and without members with disabilities) between 2020 and 2021 and 5 pp between 2021 and 2022.

Table 5 presents the results of the probit model using pooled data. We found that the probability of being multidimensionally and income-poor increased if the household had a member with a disability (columns 1 and 4). Consequently, households with members with disabilities have a 6.5 pp higher probability than households without members with disabilities of being multidimensionally poor and 2.7 pp of being

Table 4
Multidimensional, income and subjective poverty by disability status of the household.

Variables	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)		(10)	
	2018-		2019		2020		2021		2022		2021		2022		2021		2022		2022	
	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No
H (%)	31.95**	23.68	29.36**	20.76	30.40**	21.72	27.73**	18.90	23.89**	15.42										
A (%)	42.80**	42.54	42.01**	42.29	42.28*	42.04	40.66**	41.06	40.70**	41.00										
MPI	0.14**	0.10	0.12**	0.09	0.13**	0.09	0.11**	0.08	0.10**	0.06										
Monetary Poverty	38.27	37.86	45.48**	47.05	50.20**	49.06	47.54	47.24	41.44**	38.27										
Subjective Poverty	54.83**	61.22	56.63**	58.26	54.88**	60.16	43.47**	48.89	38.92**	44.66										

Notes: HwD: Households with members with Disabilities. Statistically significant differences are found in the incidence of multidimensional poverty [H (%)], the multidimensional poverty index [MPI], monetary poverty, and subjective poverty between households with and without persons with disabilities. Additionally, columns (2), (4), (6), and (8) show the significance levels of the difference between households with and without disabled members for each year. *p < 0.10; **p < 0.05; ***p < 0.01.

Table 5
Estimation results per group (pooled estimation).

	Multidimensional Poverty			Income Poverty			Subjective Poverty		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Disability [1 = Yes]	0.065*** (0.003)			0.027*** (0.003)			-0.040*** (0.003)		
Women [1 = Yes]	0.040*** (0.002)	0.039*** (0.002)	0.051*** (0.006)	0.051*** (0.002)	0.053*** (0.002)	0.035*** (0.006)	-0.040*** (0.002)	-0.041*** (0.002)	-0.035*** (0.006)
Years of schooling of Household Head	-3.785*** (0.019)	-3.722*** (0.020)	-4.245*** (0.060)	-3.305*** (0.020)	-3.294*** (0.021)	-3.331*** (0.060)	2.847*** (0.022)	2.865*** (0.023)	2.663*** (0.066)
Age Household Head	-0.334*** (0.009)	-0.317*** (0.010)	-0.468*** (0.027)	-0.528*** (0.010)	-0.537*** (0.011)	-0.502*** (0.028)	0.336*** (0.011)	0.345*** (0.012)	0.258*** (0.030)
Year: 2019	-0.012*** (0.003)	-0.012*** (0.003)	-0.012 (0.008)	0.124*** (0.003)	0.124*** (0.003)	0.124*** (0.008)	-0.043*** (0.003)	-0.048*** (0.004)	-0.013 (0.009)
Year: 2020	0.049*** (0.003)	0.048*** (0.003)	0.050*** (0.009)	0.164*** (0.003)	0.163*** (0.003)	0.168*** (0.009)	-0.062*** (0.003)	-0.065*** (0.004)	-0.040*** (0.010)
Year: 2021	-0.005** (0.003)	-0.006** (0.003)	0.000 (0.009)	0.136*** (0.003)	0.135*** (0.003)	0.141*** (0.010)	-0.166*** (0.003)	-0.170*** (0.004)	-0.136*** (0.010)
Year: 2022	-0.039*** (0.003)	-0.041*** (0.003)	-0.019** (0.010)	0.042*** (0.003)	0.038*** (0.003)	0.078*** (0.011)	-0.186*** (0.003)	-0.186*** (0.004)	-0.189*** (0.011)
All	✓			✓			✓		✓
PwD [1 = Yes]			✓			✓			✓
PwD [0 = No]		✓			✓			✓	
N	361,026	303,935	57,091	361,026	303,935	57,091	361,026	303,935	57,091

Robust SE in parenthesis.
*p < 0.10, **p < 0.05, ***p < 0.01.

income poor compared to households without members with disabilities. In the case of subjective poverty, households with members with disabilities have a probability of 4.0 pp lower than households without members with disabilities of being subjectively poor (column 7).

The regression analysis results only for households with members with disabilities (column 3), indicate that the variable associated with 2020 presents a positive and significant coefficient larger than the one presented in column 2 for households without members with disabilities. The coefficients capturing the information for 2021 and 2022 for all households (column 1) present a negative and significant coefficient. This aspect is associated with the recovery after the pandemic that was observed in the country. In the case of income poverty for households with members with disabilities (column 6), the coefficient associated with 2020 reveals a positive increase in the probability of being income-poor (16.8 pp), which is slightly higher than the one presented in column 5 for households without members with disabilities (16.3 pp). In addition, the coefficients associated with 2021 and 2022 present a positive sign reflecting the potential negative effect of the Covid-19 pandemic on the poverty levels of households with and without members with disabilities in comparison with the levels of poverty in 2018. It should be noted that poverty in 2021 was higher than in 2018. Although there was a reduction compared to 2020 in the probability of being income-poor, the poverty levels did not reach pre-pandemic levels. Furthermore, in 2022, the coefficients for both groups are also positive and significant compared to 2018. However, the magnitude of the coefficient is smaller than in 2021.

In the case of subjective poverty, the coefficient associated with 2020 for the regression only including households with members with disabilities (column 9) shows a reduction of 4.0 pp on the probability of being subjectively poor in 2020 in comparison to 2018, which is smaller than for households without members with disabilities (6.5 pp column 8). In addition, the coefficient associated with 2021 also reveals a reduction in the probability of being subjectively poor for households with members with disabilities (13.6 pp) in comparison to 2018. It is important to highlight that in both groups (households with and without members with disabilities), the probability of being subjectively poor reduced in 2019, 2020 and 2021 compared to 2018, with a larger magnitude in households with persons with disabilities in 2022.

The pseudo-panel estimation revealed that households with at least one member with a disability are more likely to be income-poor over

time (see Table 6). Indeed, households with members with disabilities have a 2.3 pp higher probability of living in income poverty (column 5). In the case of multidimensional poverty, we found that households with members with disabilities have a higher probability of being multidimensional poor than households classified as not having a member with disabilities in the pseudo-panel estimation (6.3 pp) (column 2). When we used fixed effects on the pseudo-panel data, the results demonstrated that households with disabilities have a positive and significant probability of being multidimensional and income-poor. Indeed, being in a household with a member with a disability increases the probability of being multidimensional poor by 8.2 pp and by 3.7 pp of being income poor. In the case of subjective poverty, the results are consistent with the pooled analysis, where households with members with disabilities have a significantly lower probability of being subjectively poor. As shown in Fig. 1, the pseudo-panel estimation presents that households with members with disabilities have a higher 0.02 Coefficient probability of being income and multidimensionally poor over time and a lower probability of being subjectively poor.

Pseudo-panel analysis allows us to study the movements out and into poverty. Table 7 presents the percentage of households with members with disabilities who became poor from 2019 to 2020, showing that the percentage of households with disabilities moving to poverty in 2019 and 2020 was higher than for households without members with disabilities and also higher than the percentage of households who moved out of poverty. In the case of 2021 and 2022, the percentage of households moving out of poverty is larger than the number of households moving into poverty. One important finding of note is that the percentage of households with members with disabilities moving into income or multidimensional poverty is larger than those without members without disabilities in all years. These results might be associated with the fact that households with members with disabilities are more likely to have members older than 65 years, a group that faced more severe restrictions for their mobility during 2020, which limited their capacity to generate income.

3.1. Robustness analysis

Based on the results and to ensure the robustness and sensitivity of our findings, we conducted estimations of the regression models using various thresholds for multidimensional poverty (ranging from 20 per

Table 6
Estimation results by type of poverty.

Household with members with disability [1 = Yes]	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Multidimensional Poverty			Income Poverty			Subjective Poverty		
	0.116*** (0.007)	0.063*** (0.013)	0.082*** (0.008)	0.039*** (0.007)	0.023* (0.013)	0.037*** (0.008)	-0.059*** (0.007)	-0.048*** (0.010)	-0.064*** (0.008)
Pool	✓			✓			✓		
Pseudo-panel		✓	✓		✓	✓		✓	✓
TWFE	✓		✓	✓		✓	✓		✓
n	685,456	52,820	52,820	685,456	52,820	52,820	685,456	52,820	685,456

Robust standard errors in parentheses.

*p < 0.10, **p < 0.05, ***p < 0.01.

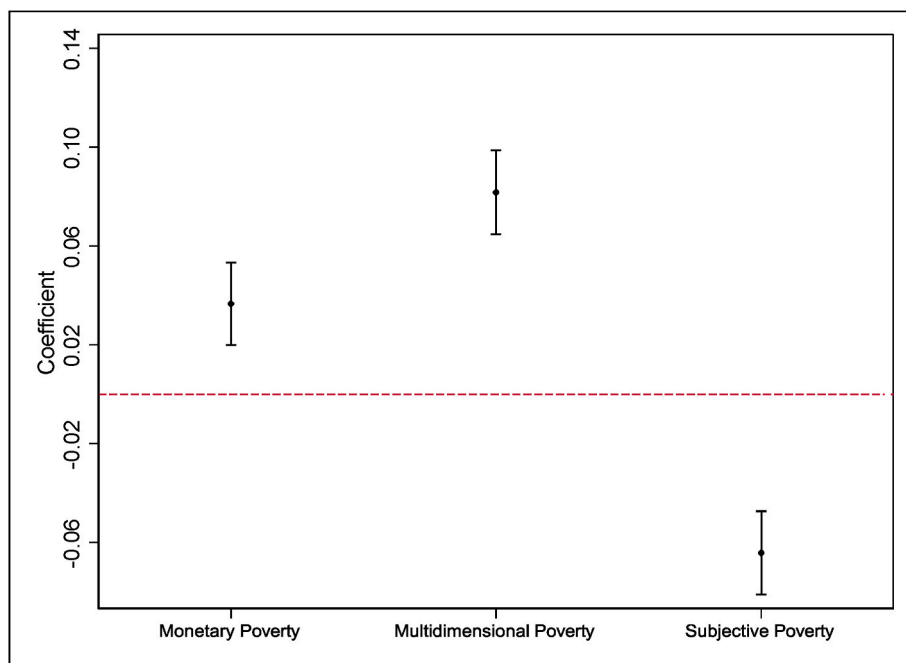


Fig. 1. Regression Coefficient TWFE and Pseudo-panel by type of poverty for households with members with disabilities. Notes: Results of Equation (2) using TWFE.

Table 7
Percentage of households with and without members with disabilities moving in and out of poverty per year.

Variables	Δ2019		Δ2020		Δ2021		Δ2022	
	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes	PwD: No	PwD: Yes
A. Income Poverty								
1. Poor to No Poor	6.86 (0.36)	10.05 (0.32)	10.28 (0.43)	13.26 (0.36)	12.57 (0.47)	14.02 (0.37)	14.54 (0.50)	14.99 (0.38)
2. No Poor to Poor	14.94 (0.51)	23.98 (0.45)	13.54 (0.49)	16.52 (0.40)	11.63 (0.45)	17.14 (0.40)	7.58 (0.38)	13.01 (0.36)
B. Multidimensional Poverty								
1. Poor to No Poor	8.51 (0.40)	12.58 (0.35)	5.91 (0.33)	10.65 (0.33)	8.65 (0.40)	12.24 (0.35)	6.76 (0.36)	11.04 (0.33)
2. No Poor to Poor	7.10 (0.36)	13.93 (0.37)	8.51 (0.40)	13.21 (0.36)	5.05 (0.31)	11.87 (0.34)	5.25 (0.32)	10.88 (0.33)

Notes: HwD: Household with Persons with Disabilities. The standard error is in parentheses.

cent to 50 per cent) and the extreme monetary poverty line. The outcomes of these additional analyses exhibited similar patterns to those discussed in the preceding sections. In addition, we used a different cut-off to define a person with disabilities (as explained earlier), and the results were consistent with those presented in the article’s main body.

4. Discussion

Little evidence exists that analyses the levels of income, multidimensional and subjective poverty of households with members with disabilities over time. This study contributes to this neglected area by analysing how income, multidimensional and subjective poverty levels changed for this group between 2018 and 2022 in Colombia and how those changes might be associated with the Covid-19 pandemic. The

results revealed that households with members with disabilities face higher levels of multidimensional and income poverty compared to households without members with disabilities in all the study years. In addition, households with members with disabilities face a higher probability of being multidimensionally and income-poor than households without members with disabilities. However, in all years, a smaller percentage of households with members with disabilities reported feeling less poor than households without members with disabilities. When we analyse the potential impact of the pandemic, the increase in income poverty was higher for households with members with disabilities compared to households without members with disabilities. In addition, households with members with disabilities faced a reduction in their levels of multidimensional poverty in 2022, in comparison to households without members with disabilities, reaching pre-pandemic levels. Finally, a larger percentage of households with members with disabilities fell into poverty in all years in comparison with those who moved out of poverty and compared to the percentage of households without members with disabilities that went into poverty. The results of this article support the hypotheses that persons with disabilities and their households generally present higher levels of poverty and usually have a lower probability of getting out of poverty. In addition, households with members with disabilities had a higher probability of living in poverty in 2020 in comparison with 2018 and to persons without members with disabilities. This clearly illustrates the negative effect of the Covid-19 pandemic on the economic levels of persons with disabilities and their households. In addition, contrary to what was expected, the increase in multidimensional poverty was not higher for this group compared to households without members with disabilities in 2020. In the case of income poverty, households with members with disabilities faced an increase in their levels of poverty, 5 pp higher than in 2019, a percentage that was higher than for households without members with disabilities. Colombia measures monetary poverty according to the family's income level to cover a food basket, which varies according to the person's place of residence ([Departamento Administrativo Nacional de Estadística \(DANE\), 2020](#)). Normally, income or consumption poverty measures do not capture the additional costs associated with disability ([Zaidi & Burchardt, 2005](#)). Therefore, Colombia's measure of poverty does not consider the potential reductions in the levels of income that households with members with disabilities might have to cover for the additional costs associated with disability. This aspect can be associated with the fact that there are not large differences in the percentage of households with members with disabilities in comparison to households without members with disabilities. Pre-pandemic levels revealed that in 2019, households without members with disabilities presented significantly lower levels of income poverty compared to households with members with disabilities, but given the lack of inclusion of the extra costs of disability suggests that these results might present a situation that is not completely real for persons with disabilities. Additional analysis is necessary to understand why the levels of income poverty previous to the pandemic were higher for households without disabilities in Colombia.

As was observed at the national level, households with members with disabilities presented a reduction in multidimensional poverty levels in 2021 and 2022 compared to 2018. However, in the case of income poverty, there was a reduction in the percentage of households with members with disabilities who were income-poor, but the levels of poverty had not returned to pre-pandemic levels in our sample. This result can be associated with the poly-crises that it is currently in progress, with the war in Ukraine and the rising inflation, with an increase in the price of energy and food, which affects all the countries in the world including Colombia.

In all study years, households with members with disabilities presented lower levels of subjective poverty. Therefore, a lower percentage of persons with disabilities perceived themselves as poor compared to households without members with disabilities. This finding is contrary to the literature on poverty and disability, where usually persons with

disabilities and their families face higher levels of poverty ([Banks et al., 2017](#); [Mitra et al., 2013](#); [Mitra & Yap, 2021](#); [Pinilla-Roncancio & Alkire, 2021](#)). Also, it contradicts research analysing the relationship between subjective well-being and disability, where there is usually a reduction in the well-being of households with members with disabilities as a consequence of the higher care demands and households with members with disabilities have to cover additional direct and indirect costs associated with disabilities ([Hayden, 2023, 3](#); [Totsika et al., 2017](#); [Grech, 2016](#); [Jones et al., 2018](#)). Nevertheless, it is essential to consider the potential reasons why households with members with disabilities feel less poor than households without members with disabilities in Colombia. Some potential explanations are adaptive preferences, which can be associated with a lower expectation of households with disabilities regarding their optimal levels of well-being. Finally, although we recognise the importance of subjective measures of poverty, it is crucial to acknowledge the limitations in comparison between groups and over time when using these measures [Krueger and Schkade \(2008\)](#).

In addition, the results of this study revealed that a larger percentage of households with members with disabilities fell into poverty in all years compared to households without members with disabilities. This finding supports the argument that persons with disabilities and their families are more likely to be chronically poor [Bizoza et al. \(2023\)](#) and have a higher probability of being monetarily and multidimensionally poor. This paper contributes evidence that with significant world events, such as a pandemic, those households with members with disability are more vulnerable to falling into poverty. Another critical finding is that the percentage of households with members with disabilities going out of poverty is always lower than the percentage moving into poverty in all the years in Colombia. These findings reveal how important is that poverty reduction policies include explicitly persons with disabilities and their households.

In the context of the Covid-19 pandemic, it is important to identify what policies and strategies countries implemented to prevent or mitigate the increasing risk of poverty for individuals. No specific or tailored social protection measures were implemented in Colombia for households or individuals with disabilities ([Pinilla-Roncancio & Caicedo, 2023](#)). Although it is expected that households with members with disabilities would have benefited from the implementation of national poverty reduction programmes, there is no evidence of the effectiveness of those measures in reducing or mitigating the negative effect of the control measures implemented in 2020 and part of 2021 for households with members with disabilities. Therefore, there is a need for social protection strategies and programmes to be specifically tailored for persons and households with disabilities and their unique needs. In Colombia, no state programme exists whose primary purpose is to reduce poverty and vulnerability for persons with disabilities [Pinilla-Roncancio \(2022\)](#). Without these programmes the risk of impoverishment and chronic poverty, in the case of an income shock is increased for households with one or more persons with a disability. Therefore, it might be that households with members with disabilities who were income and multidimensionally-poor after the pandemic are in a worse situation than households who were not poor and fell into poverty due to the pandemic, and so further research is needed to understand these nuances and their impacts.

4.1. Limitations

This study aims to analyse the poverty situation of households with members with disabilities over time. However, Colombia does not have longitudinal data sources that include questions on disability and information on income, multidimensional and subjective poverty. Therefore, a pseudo panel was created. This methodology compares cohorts of individuals and assumes that those cohorts are comparable over time, an aspect that can be a limitation in comparison to panel data because we are not following the same individual over time. Another limitation of this study is the definition of disability. Although, the QoL survey

follows a similar definition to the one provided by the Washington Group, in 2020, the number of domains changed, affecting the comparability between years. In addition, the sample of the QoL survey does not include a specific sampling for persons with disabilities. Therefore, disaggregation by functional limitations is not possible. We are using measures of income and multidimensional poverty that have been already designed therefore, it is not possible to include different indicators in the case of multidimensional poverty or use another methodological approach to compute a multidimensional poverty index. Finally, we used a measure of subjective poverty, which has critical reliability limitations.

5. Conclusions

This article analysed the changes in income, multidimensional and subjective poverty for house-holds with and without members with disabilities in Colombia. The results suggest that persons with disabilities are more likely to be income and multidimensionally poor but less likely to re-port feeling poor (subjective poverty). In addition, households with members with disabilities faced a larger increase in their levels of income poverty in 2020. This group’s multidimensional poverty levels reduced in 2021 and 2022 and reached pre-pandemic levels. However, this has not been achieved in the case of income poverty. Finally, the percentage of households with members with disabilities who are falling into poverty is larger than the percentage of households with members with disabilities going out of poverty. These results have important policy implications, especially revealing the need to design and implement policies to reduce income and multidimensional poverty for persons with disabilities and their households in the country because this group has a high risk of being left behind and presents higher risks of being poor in all its dimensions.

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Appendix A

Table A1

Dimensions, Variables, Indicators, Cutoffs and Weights of the MPI

Dimensions	Variable	Indicator
Education	Educational achievement (1/10)	A household is deprived if at least one person over 15 years of age is not attending school and does not have 9 years of education.
	Literacy (1/10)	A household is deprived if at least one person over 15 years of age cannot read and write.
Childhood and youth conditions	School attendance (1/20)	A household is deprived if at least one school age child (aged 6–16 years) does not attend school.
	No school lag (1/20)	A household is deprived if at least one school age child is two or more years behind the school year according to her age.
	Access to childcare services (1/20)	A household is deprived if at least one child aged 0–5 years simultaneously lacks access to health, nutrition, and education.
Health Employment	Children not working (1/20)	A household is deprived if at least one child aged 5–11 years worked at least 1 h in the week previous to the survey, or, aged 12–15 years, worked more than 14 h in the week previous to the survey, or, aged 16 and 18 years, worked more than 40 h the week previous to the survey.
	Long-term unemployment (1/10)	A household is deprived if at least one economically active person is unemployed for more than twelve months.
	Formal employment (1/10)	A household is deprived if at least one member currently in employment does not receive a pension scheme or contribute to a pension or does not receive any type of benefit.
	Health insurance (1/10)	A household is deprived if at least one member does not have health insurance.
Access to public utilities and housing conditions	Access to health services (1/10)	A household is deprived if at least one household member did not have access to health care services when needed
	Access to water source (1/25)	A rural household is deprived if the source of drinking water is obtained from an open well, river, canal, stream, pond, tanker truck, bottled, or others. An urban household is deprived if it does not have sewer- age services.
	Adequate floors (1/25)	A households is deprived with dirt floors.
	Adequate external walls (1/25)	An urban household is deprived if the exterior walls are built of untreated wood, boards, planks, guadua or other vegetation, zinc, cloth, cardboard, waste material or when no exterior walls exist A rural household is deprived when exterior walls are built of guadua or other vegetation, zin, cloth, cardboard, waste materials or if no exterior walls exist.
	No critical overcrowding (1/25)	A household is deprived if 3 or more people share a room (excluding kitchen, bathroom, and garage)

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Ethics statement

Given that this article analysed secondary data, which is publicly available, it does not have ethical implications.

CRediT authorship contribution statement

Mónica Pinilla-Roncancio: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Writing – original draft, Writing – review & editing. **Gustavo Cedeño-Ocampo:** Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Ana Maria Medina Ch:** Conceptualization, Funding acquisition, Project administration, Validation, Writing – original draft, Writing – review & editing. **Claudia M. Cortés-García:** Conceptualization, Funding acquisition, Project administration, Resources, Validation, Writing – original draft, Writing – review & editing. **Beatriz Muñoz-Veira:** Conceptualization, Validation, Writing – original draft, Writing – review & editing.

Data availability

Data is available in www.dane.gov.co.

Table A2
Missing values per year.

Variables	2018	2019	2020	2021	2022
1. Men (%)	0	0	0	0	0
1. Women (%)	0	0	0	0	0
2. Urban (%)	0	0	0	0	0
2. Rural (%)	0	0	0	0	0
3. Head of the Household (%)	0	0	0	0	0
4. Years of Schooling (1)	7.84	7.92	7.53	7.26	7.10
5. Age	0	0	0	0	0
6. Outside the labour force (1) (%)	20.25	20.29	19.31	18.73	18.77
6. Unemployment (1) (%)	20.25	20.29	19.31	18.73	18.77
6. Employed (1) (%)	20.25	20.29	19.31	18.73	18.77
7. Men HH (%)	0	0	0	0	0
7. Women HH (%)	0	0	0	0	0
8. Years of Schooling HH	0	0	0	0	0
9. Age of the HH	0	0	0	0	0
10. Household size	0	0	0	0	0
11. Number of children younger than 12 in the household (2)	5.63	5.75	5.84	6.10	6.21
12. Number of individuals 65 years or older in the household	0	0	0	0	0
13. Household size: single person (%)	0	0	0	0	0
13. Household size: 2 to 4 members (%)	0	0	0	0	0
13. Household size: 5 or more members (%)	0	0	0	0	0
14. Headcount of Monetary Poverty	0	0	0	0	0
15. Headcount of Multidimensional Poverty	0	0	0	0	0
16. Headcount of Subjective Poverty	0	0	0	0	0
17. Disabilities	0	0	0	0	0

Notes: (1) the missing values correspond to individuals not in the reference population. (2) the missing values correspond to individuals living in households without children younger than 12.

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