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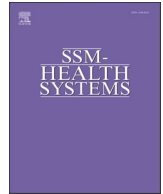
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Inequality in financial risk protection in health among displaced populations: The case of Venezuelan women in Brazil

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ABSTRACT

Objective: Worsening economic and social conditions in Venezuela have forced many to migrate. Women and girls are particularly at risk of health vulnerability in this context. This study examines healthcare expenditure and financial risk protection inequalities among Venezuelan migrant women in Brazil.

Methods: We conducted a survey of 2012 Venezuelan women aged 15–49 who migrated to Brazil between 2018 and 2021. We estimated and decomposed concentration indices to analyse inequalities in out-of-pocket healthcare expenditures (OOPHE) and catastrophic health expenditures (CHE) across the entire socioeconomic distribution. We applied Blinder-Oaxaca decompositions to explain differences in healthcare spending between migrant and Brazilian women.

Results: Venezuelan migrant women displayed noticeable disparities in OOPHE and incidence of CHE. Approximately half of our sample of migrants reported no income, no expenditures, and hence no CHE. OOPHE and CHE incidence were concentrated among less poor migrant women, whilst for Brazilian women, CHE was concentrated among the poorer. Location, time since arrival to Brazil, higher education, and income were key contributors to socioeconomic inequality in OOPHE and CHE for migrants. The main explanatory factor for differences in OOPHE between migrants and non-migrants was differences in income profiles.

Conclusions: Addressing financial risk protection in health is crucial for displaced populations, especially women and girls. While the public health system in Brazil offers universal healthcare coverage in principle, our results suggest that there is still a significant risk of lack of access to healthcare for Venezuelan migrant women, which may be driven by insufficient financial means.

1. Background

In recent years, Venezuela has been experiencing a deterioration in socioeconomic conditions marked by shortages of essential goods, along with high levels of violence, political instability and human rights abuses. Between 2013 and 2019 the GDP of the country fell 62 %, mortality rates rose sharply, and public services collapsed (Bull and Rosales, 2020). The deterioration of health infrastructure caused by the crisis has limited access to healthcare services. There have been substantial negative consequences from the shortage of basic inputs for healthcare like electricity, water, and medical supplies (Page et al., 2019). The lack of drug and medical supplies has led to the resurgence of controlled infectious diseases such as malaria and tuberculosis (Page et al., 2019), as well as the emergence of new health challenges like malnutrition and chronic diseases (Burki, 2017; Doocy et al., 2019). The reduced capacity for paying out-of-pocket for healthcare, due to the

decline of household incomes, has affected health and healthcare access further (Doocy et al., 2022).

As a result of the humanitarian crisis, over 4 million Venezuelans have been forced to migrate in search of better conditions, mainly to Colombia, Peru, Ecuador, Argentina, Chile, and Brazil (Freier and Parent, 2019). However, migration to other countries is not a guarantee of better health or healthcare access conditions for Venezuelans in their new places of abode. Compared to local populations, forcibly displaced groups face barriers to accessing healthcare (Asanin and Wilson, 2008); have difficulties navigating the health system or finding a health provider culturally or linguistically similar to theirs (Ang et al., 2022); and could be denied care because of discrimination (Lebano et al., 2020). Those issues may result in lower healthcare utilisation, poorer health status and a higher burden of healthcare expenditures for migrants compared to the local population (Tong and Kawachi, 2020).

Recent research conducted with Venezuelan women in Brazil (who

represent about 50 % of Venezuelan migrants in the country) has found a mixed health picture. Although Venezuelan migrant women have relatively good healthcare access and quality outcomes compared to Brazilian women, the former have important unmet sexual and reproductive healthcare needs and insufficient financial risk protection. Venezuelan migrant women are more likely to obtain healthcare when sought, and equally likely to receive free medicines from the public health system and antenatal care compared to their Brazilian counterparts (Moreno-Serra et al., 2024). Nevertheless, they face deficient access to pap smear testing (Moreno-Serra et al., 2024), unmet family planning needs e.g., access to contraception (Bahamondes et al., 2020; Rocha et al., 2022; Soeiro et al., 2022), unmet menstrual hygiene management needs (Makuch et al., 2021; Rocha et al., 2022; Soeiro et al., 2021), and lack of information on how to access to sexual and reproductive health services (Rocha et al., 2022; Soeiro et al., 2022). Compared to Brazilian women, migrant women have lower out-of-pocket spending but higher catastrophic health expenditure (Moreno-Serra et al., 2024).

Forced migration may exacerbate unfair health inequalities not only with respect to local populations, but also within migrant groups themselves, as some groups may fare worse than others during the migration journey and during their settlement in a new location. Among migrant groups, female migrants are an especially vulnerable population. They tend to experience greater incidence of gender-based violence throughout the migratory process (Makuch et al., 2021) including trafficking and exploitation, as well as other heightened risks around stigma, discrimination and social exclusion, which may lead to deficient access to publicly subsidised healthcare particularly among the less educated or poorest individuals (Barot, 2017; Fan et al., 2013; PAHO, 2019). For Venezuelan migrants, and in particular women and adolescent girls, the extent and drivers of health inequalities affecting these populations in their places of settlement remain unknown.

In this study, we investigate the issues above from a quantitative empirical perspective, focusing on the case of Venezuelan migrant women living in northern Brazil, most of whom have been arriving through the state of Roraima (displaced Venezuelans in that state accounted for nearly 40 % of all asylum requests by Venezuelans in Brazil in 2018; (Simões, 2017)). By law, upon arrival in Brazil, Venezuelans have the right to free and universal access to healthcare services through the general tax-funded national health service, *Sistema Único de Saúde* (SUS), including preventive care, primary care, hospitalisation and medicines, just like any other residents in Brazil. The only requirement for access to SUS is the obtention of a SUS health card, that is usually easily obtained by Venezuelan migrants (Riggirozzi et al., 2023). Nevertheless, there is evidence from other national contexts that displaced populations may put significant pressure on local public healthcare services (Doocy, Page, et al., 2019; Gedan, 2017), which in many cases - as in the relatively deprived North region of Brazil - had already been struggling to meet the care needs of native populations. This may result, among other consequences, in migrants resorting to purchases of services or medicines from the private sector if these items are unavailable in the public healthcare system (or if migrants are turned away from the public system due to discrimination, for instance), potentially leading to substantial healthcare payments relative to income for those who can afford to make such payments. The link between high out-of-pocket health expenditures and increased risk of households falling into poverty is well established (Wagstaff et al., 2003). For those migrants who cannot afford to make private healthcare payments, lack of access to subsidised health services may lead to foregone care and worsened health conditions, requiring more (and/or more expensive) treatment in the future.

Our study investigates inequalities in private health-related expenditures affecting a displaced population of Venezuelan women and adolescent girls, living in the Brazilian cities of Manaus (Amazonas state capital) and Boa Vista (Roraima state capital). We measure these inequalities across different sub-groups of the population of Venezuelan

migrant women, and also for Venezuelan migrant women compared to the local Brazilian female population. We decompose the measured inequalities into their main socioeconomic contributing factors, thus providing evidence-based insights for policies that seek to redress health-related inequities affecting migrant women.

2. Data and methods

2.1. Data sources

Our main data source is the *Redressing Gendered Health Inequalities of Displaced Women and Girls in contexts of Protracted Crisis in Central and South America (ReGHID)* survey, which was carried out between July and September 2021 to collect information from Venezuelan migrant women aged between 15 and 49, who had been living in the Brazilian cities of Boa Vista or Manaus for up to three years at the time of the survey. A total of 2012 women participated in the survey, with 1257 from Boa Vista and 755 from Manaus. These cities, together with Pacaraima, concentrate the largest number of Venezuelan migrants in the country. Boa Vista is the initial major settlement for Venezuelans entering Northern Brazil (after their arrival in the small border town of Pacaraima); Manaus, a relatively wealthier city than Boa Vista, located 780 km further inland, represents a secondary migration destination that requires additional time and resources for migrants to reach.

The survey gathered socio-demographic data such as education and household expenditure, health-related information including care seeking and out-of-pocket health expenditures, along with details about the migration journey. The survey used a Respondent Driven Sampling (RDS) strategy to select participants based on successive recruitment cycles that depended on the network size of the participant. Additional information about the sampling strategy and the information collected can be found in the Supplementary Material.

We used the Brazilian Household Budget Survey (POF) 2017–2018 to obtain comparable data for the Brazilian female population. The POF survey is a household survey conducted by the Brazilian Institute of Geography and Statistics (IBGE), which collected data on monthly household expenditures, including healthcare payments, for 57,920 households. The POF data is representative of the general Brazilian population and of urban populations at both the state and urban levels. Although this is a national survey, we only used data from Manaus and Boa Vista, the two cities included in the ReGHID survey to ensure comparability. Moreover, the *ReGHID* survey questionnaire was designed to include questions that were similar in phrasing and time periods to the relevant questions in the POF survey, and was conducted in urban settings.

2.2. Variable description

2.2.1. Outcomes

We assess inequalities in two outcome measures that have become standard for monitoring levels of access to healthcare with financial risk protection across populations (Wagstaff et al., 2003; WHO and WB, 2023). The first measure is out-of-pocket healthcare expenditures (OOPHE), which refers to all payments made by a household at the time of receiving healthcare services or goods. These expenditures are recorded for a representative month. The second measure is catastrophic health expenditure (CHE) incidence, defined as health expenditures that constitute a high proportion of a household's total expenditure. We use a binary indicator to measure the incidence of CHE, whereby CHE is considered to have occurred if OOPHE amounted to at least 10 % of the household's total expenditures in the reference period. This is a standard indicator adopted in global initiatives to monitor national progress towards Universal Health Coverage (Wagstaff et al., 2018; WHO and WB, 2023). The Supplementary Material (S2) presents the key survey questions used to construct both indicators described above. All household expenditure data are expressed in Brazilian Reales (R$) at 2021 values

adjusting for inflation.

2.2.2. Explanatory variables

Our study examines inequalities in health expenditure outcomes affecting different sub-groups of female Venezuelan migrants, where such sub-groups are defined according to various socio-demographic indicators. These explanatory variables include city of residence (indicator for living in Manaus), age group (15–19, 20–29, 30–39, and 40–49 brackets), education level (less than primary education, primary education, secondary education, higher education), ethnicity (white, mixed, black, indigenous, other), household size (number of family members living together), and household monthly income expressed in Brazilian Reales (R\$) at 2021 values adjusting for inflation, and categorised in quartiles. For the analyses restricted to the migrant population only (where we have additional information available from the *ReGHID* survey), we also control for time since migration to Brazil (0–6, 7–18 and 19–36 months), marital status (indicator for married or living with a partner), number of children under 18 years-old, whether the individual sends money to family in Venezuela, whether she is in paid employment, whether she sought healthcare in the last two weeks, and self-reported health status (indicator for good or very good health).

2.3. Concentration index

We use concentration indices (O'Donnell et al., 2008) to measure the degree of socioeconomic inequality in our two health expenditure outcomes: OOPHE and CHE. We draw the concentration curve by plotting the cumulative proportion of the population ranked by total household expenditure, on the horizontal axis, against the cumulative proportion of OOPHE or CHE, on the vertical axis. The concentration index is equal to twice the area between the concentration curve and the line of perfect equality ($45°$).

The concentration index ranges from -1–1, with zero indicating perfect equality. A negative value implies that the health expenditure outcome is more concentrated among the poorer population, whereas a positive concentration index indicates that the expenditure outcome is more concentrated among the less poor population.

The concentration index can be conveniently defined in terms of the covariance between the outcome and the fractional ranking of socio-economic status (O'Donnell et al., 2008), as follows:

$$C = \frac{2}{\mu} \text{cov}(h, r) \tag{1}$$

Where h represents OOPHE or CHE, and r is the fractional rank of each individual in the total household expenditure distribution.

2.4. Decomposition of the concentration index

We then analyse inequalities in OOPHE and CHE across the entire distribution of socioeconomic status, through a decomposition of the concentration index (O'Donnell et al., 2008). The concentration index can be decomposed into the individual- and household-level factors that contribute to the observed socioeconomic inequalities in OOPHE and CHE among migrant women. This helps identify the factors that are the main drivers of these inequalities. The approach involves regressing our outcomes on a set of socioeconomic and demographic factors, and the estimated coefficients are then used to calculate the contribution of each factor to the overall level of inequality. The contributions are defined as the product of the sensitivity of the health expenditure outcome to that factor (i.e. elasticity) and the degree of income-related inequality in that factor. For a regression model of a health expenditure outcome y such as

$$y = \alpha + \sum_k \beta_k x_k + \varepsilon \tag{2}$$

Wagstaff et al., (2003) showed that the concentration index C for the

health expenditure outcome can be defined as:

$$C_x = \sum_k \left(\frac{\beta_k \bar{x}_k}{\mu} \right) c_k + \frac{GC_\varepsilon}{\mu} \tag{3}$$

Where μ is the mean of y, $\bar{x}_k$ is the mean of x_k, C_k is the concentration index for x_k, and GC_ε is the concentration index for the error term ε. The concentration index C is equal to the weighted sum of the concentration indices of the k regressors (socioeconomic factors), where the weight for x_k is the elasticity of y with respect to x_k. The last term is the residual component, the part not explained by the socioeconomic factors in the model.

2.5. Blinder-Oaxaca decomposition of differences in health expenditure outcomes between migrants and non-migrants

We also seek to explain the gap in each health expenditure outcome between migrant and non-migrant groups, by using the Blinder-Oaxaca decomposition method (Blinder, 1973; Oaxaca, 1973). The gap is decomposed into a part due to differences between groups in the *magnitudes* of the determinants of the health expenditure outcome; a part due to group differences in the *effects* of these determinants; and a last part due to the *interactions* between the differences in magnitudes and effects of these determinants. For a linear equation $f(x\beta) = x\beta$, the gap in mean outcomes between the two groups can be expressed as:

$$y^a - y^b = \beta^a(x^a - x^b) - x^b(\beta^a - \beta^b) \tag{4}$$

Where x^a and x^b are vectors of explanatory variables (i.e. determinants) evaluated at their means for non-migrants and migrants, respectively. In Eq. (4), the differences in the x's are weighted by the coefficients of the non-migrant group and the differences in the coefficients are weighted by the x's of the migrant group. The gap can be expressed also as:

$$y^a - y^b = \beta^b(x^a - x^b) - x^a(\beta^a - \beta^b) \tag{5}$$

Where the differences in the x's are weighted by the coefficients of the migrant group and the differences in the coefficients are weighted by the x's of the non-migrant group. Eqs. (4) and (5) are special cases of a general decomposition:

$$y^a - y^b = \beta^b(x^a - x^b) + x^b(\beta^a - \beta^b) + (x^a - x^b)(\beta^a - \beta^b) \tag{6}$$

$$= E + C + CE$$

Where the gap in mean health expenditure outcomes can be decomposed into a gap in endowments (E), a gap in coefficients (C), and a gap caused by the interaction of endowments and coefficients (CE). For example, the migrant population may be more likely to incur catastrophic health payments not only because they may have less access to publicly subsidised healthcare (endowment) than non-migrants, but also because they may be less knowledgeable about how to obtain the maximum benefit from that access when navigating the different care levels of the health system (coefficient), compared to non-migrants.

For the case of a binary outcome, as in the case of catastrophic expenditures incidence, $F(x\beta)$ is a nonlinear equation, and we follow the decomposition in Yun (2004) that can be written generally as:

$$y^a - y^b = \sum_{i=1}^{i=K} W_{\Delta x}^i \left[F'(x^a \beta^a) - F'(x^b \beta^a) \right] + \sum_{i=1}^{i=K} W_{\Delta \beta}^i \left[F'(x^b \beta^a) - F'(x^b \beta^b) \right] \tag{7}$$

Where $W_{\Delta x}^i$, $W_{\Delta \beta}^i$ are weights for each variable i.

We conducted a variance factor analysis (VIF) to check for multicollinearity in our covariates which strongly suggest that our main results are unaffected by multicollinearity (see Supplementary Methods 3).

3. Results

3.1. Descriptive statistics

Table 1 presents a description of the population samples of migrant (Venezuelan) and non-migrant (Brazilian) women living in Manaus and Boa Vista. Total expenditure differed substantially between the two populations: the average figure for non-migrants was R$3999, nine times the corresponding figure for migrants (R$447).[1] For context, these levels of expenditure placed 30 % of the sample of non-migrants and 71 % of migrants below the poverty line of US$5.50 PPP a day for upper-middle-income countries defined by the (World Bank, 2018). Health expenditure also showed substantial differences between populations: non-migrant women spent R$116 monthly on average compared to about R$31 for migrant women. CHE incidence rates were 5 % for non-migrants and 13 % for migrants.

Migrants were slightly younger compared to migrants, as a larger proportion of the former group was concentrated in the younger age categories. There were also noteworthy differences in education attainment favouring migrant women, with around 35 % of non-migrants reporting up to primary education level, compared to just 16 % of migrants. Income distribution showed substantial differences

Table 1
Descriptive statistics for the samples of migrant and non-migrant women.

	Non-migrants (N=1639)		Migrants (N=1584)	
Total expenditure	3999.41		447.36	
Health expenditure	116.37		30.96	
CHE 10 %	5 %	81	13 %	201
City				
Manaus	64 %	1051	34 %	541
Boa Vista	36 %	588	66 %	1043
Age group				
< 20	18 %	290	13 %	204
20–29	30 %	491	43 %	681
30–39	30 %	489	29 %	454
40–49	23 %	369	15 %	245
Education				
Less than primary	4 %	63	1 %	18
Primary	31 %	512	15 %	238
Secondary	41 %	669	68 %	1084
Higher	24 %	395	15 %	244
Ethnicity				
White	23 %	369	28 %	438
Mixed	69 %	1136	65 %	1024
Black	5 %	80	4 %	63
Indigenous	2 %	32	3 %	46
Other	1 %	22	1 %	13
Household size	4.4		2.64	
HH Income quintiles (R$)				
0–95	1 %	14	48 %	768
96–1003	13 %	220	36 %	574
1004–2603	39 %	640	11 %	180
2604 -	47 %	765	4 %	61
Months since migration				
<= 6			40 %	634
7 – 18			26 %	404
19 – 36			34 %	546
Lives with partner			58 %	917
Children under 18 y in HH			1.43	
Sends money to Venezuela			40 %	635
Paid labour			26 %	404
Sought healthcare			34 %	540
Reported good health			71 %	1118

between populations: migrants were mostly concentrated in the lowest part of the distribution (lowest income quintiles), while the majority of non-migrants belonged to the highest segments of this distribution.

3.2. Concentration curves and indices

Fig. 1 shows the concentration curves of health expenditures for migrant women (dotted line) and non-migrant (local) women (solid line). The concentration curve plots, for each of the two groups, the cumulative percentage of OOPHE on the vertical axis against the cumulative percentage of population, ranked by living standards measured by total household expenditures from the poorest to the richest, on the horizontal axis.

The concentration curves for both groups differ from the line representing perfect equality, implying that OOPHE are not evenly distributed across different socio-economic levels. Both curves lie below the line of equality, indicating that health expenditures are concentrated among the less poor. For the migrant group, the slower cumulative growth in OOPHE on the lowest part of the distribution suggests a greater level of inequality in that group: around half of the migrant sample reported no health expenditures and zero total expenditure. However, since the concentration curves for migrants and non-migrants cross, it is unclear whether any distribution dominates the other, implying that we cannot infer differences in patterns of inequality between the two groups. Nevertheless, for the majority of the total expenditure distribution (almost up to the 70th percentile), the migrant curve lies below the non-migrant curve, hinting at a lower degree of inequality in out-of-pocket health expenditures among migrants compared to non-migrants for that part of the distribution.

The concentration curve for CHE (Fig. 2) shows the cumulative percentage of catastrophic expenditures incidence plotted against total household expenditures, for the samples of migrant and non-migrant women. The non-migrant curve lies above the perfect equality line, implying that catastrophic health expenditures are concentrated among the poorer non-migrants. In contrast, for Venezuelan migrant women, CHE are concentrated among the less poor individuals.

3.3. Decomposition of concentration indices: migrant women

Results for the decomposition of the concentration index of out-of-pocket health expenditures among migrant women are presented in Table 2. The concentration index of OOPHE is decomposed into the contributions of various independent factors (e.g. age group) to the observed socioeconomic inequality in out-of-pocket health expenditures. These contributions are defined as the product of the sensitivity of OOPHE with respect to each factor and the socioeconomic related inequality in that factor. Socioeconomic related inequality in each factor is measured as the concentration index for that particular factor. Negative concentration indices indicate a relatively high concentration of the factor on the poorer individuals, whilst positive values imply a higher concentration of the factor on less poor individuals.

In Table 2, the first column shows the sensitivity of OOPHE with respect to each factor (elasticity), the second column presents the concentration index of each factor, and the third column shows the individual contribution of each factor to the out-of-pocket health expenditure inequalities observed across the distribution of total household expenditure.

The results in Table 2 indicate that out-of-pocket health expenditure inequalities are (statistically significantly) more sensitive to living in Manaus, having attained higher education, having migrated more than 18 months before, belonging to the highest income quartile, and sending financial aid to family in Venezuela. The positive concentration indices indicate that all these factors tend to be concentrated among the less poor migrants in terms of total household expenditure, i.e. these factors drive higher levels of inequality in the upper part of the household expenditure distribution. According to the point estimates, the single
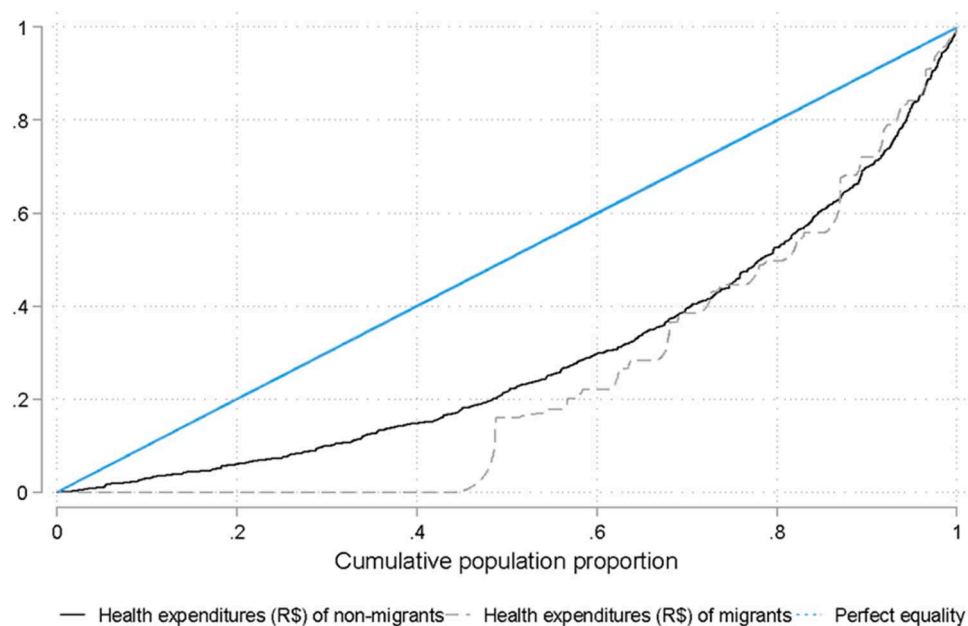

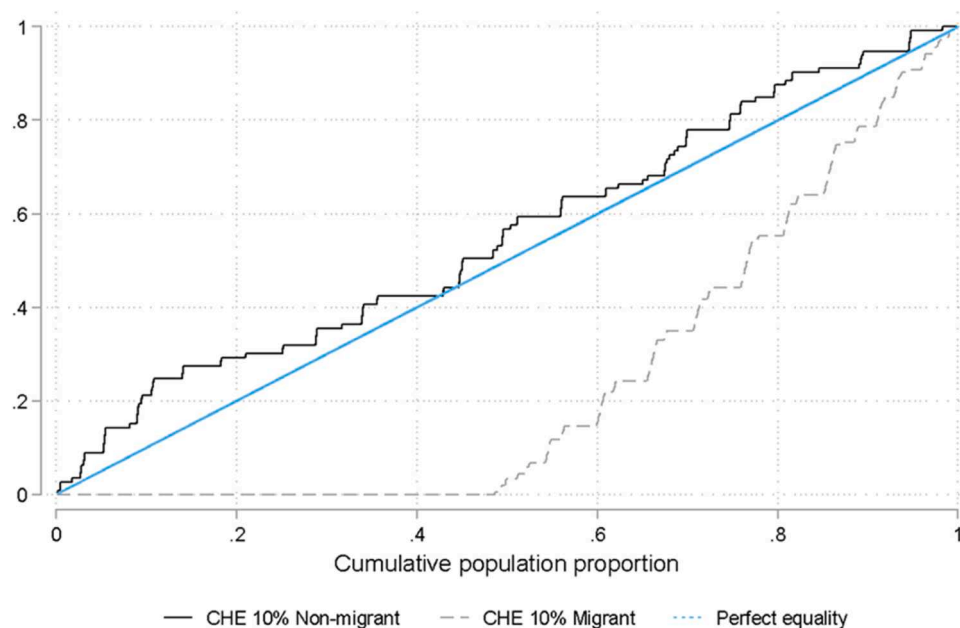**Fig. 1.** Concentration curves for out-of-pocket health expenditures.

Fig. 2. Concentration curves for CHE.

highest contribution to socioeconomic inequality in OOPHE among migrants comes from belonging to the highest income quartile. Our decomposition model performs well to explain inequalities in health expenditures: the individual and household-level factors included are able to explain about three-quarters (0.391/0.523) of the concentration index of health expenditures for migrants.

Table 3 presents the results for the decomposition of the concentration index of CHE among migrant women. Inequalities in CHE are (statistically significantly) more sensitive to living in Manaus, having been living in Brazil for less than 18 months, belonging to the two highest income quartiles, and reporting good health status. Except for the last one, all of these factors tend to be concentrated among the less poor migrants. The highest contributors to socioeconomic inequality in CHE among migrants are living in Manaus and belonging to the highest

income quartile, both of which drive higher levels of inequality in the upper part of the household expenditure distribution. The observable factors included in our decomposition model are able to explain a very high proportion of the CHE concentration index, over 91 % (0.473/0.517).

3.4. Decomposition of concentration indices: combined analysis for migrant and non-migrant women

In this subsection, we repeat the previous decomposition analyses but using the combined samples of migrant and non-migrant women. The goal is to investigate further the influence of factors that might prove important contributors for inequalities in our health expenditure outcomes, once comparisons are made on a bigger sample that accounts

Table 2
Decomposition of the concentration index of out-of-pocket health expenditures for migrant women.

		Elasticity	Concentration Index	Contribution
Resident of Manaus		0.191***	0.532***	0.102***
		(0.074)	(0.016)	(0.039)
Age group	20–29	−0.009	−0.023	0.000
		(0.079)	(0.016)	(0.002)
	30–39	0.036	0.024	0.001
		(0.070)	(0.023)	(0.002)
	40–49	−0.034	0.107***	−0.004
		(0.037)	(0.031)	(0.005)
Education	Primary	0.049	−0.075**	−0.004
		(0.035)	(0.032)	(0.004)
	Secondary	0.178	−0.034***	−0.006
		(0.138)	(0.010)	(0.005)
	Higher	0.213***	0.251***	0.053***
		(0.058)	(0.034)	(0.017)
Ethnicity	Mixed	−0.018	−0.004	0.000
		(0.139)	(0.010)	(0.001)
	Black	−0.005	−0.312***	0.002
		(0.009)	(0.069)	(0.003)
	Indigenous	−0.003	−0.301***	0.001
		(0.010)	(0.062)	(0.003)
	Other	0.009	−0.120	−0.001
		(0.009)	(0.197)	(0.002)
Time since migration (months)	7 – 18	0.009	0.043*	0.000
		(0.048)	(0.026)	(0.002)
	19 – 36	0.148**	0.328***	0.049**
		(0.072)	(0.019)	(0.024)
Household size		−0.019	−0.049***	0.001
		(0.120)	(0.013)	(0.006)
Lives with partner		0.135	0.030**	0.004
		(0.088)	(0.013)	(0.003)
Has children under 18 y		−0.052	−0.055***	0.003
		(0.124)	(0.014)	(0.007)
Household income quartiles	II	0.020	−0.222***	−0.004
		(0.031)	(0.046)	(0.007)
	IV	0.035	0.233***	0.008
		(0.059)	(0.020)	(0.014)
	IV	0.186***	0.608***	0.113***
		(0.063)	(0.019)	(0.039)
Sends financial aid to family in Venezuela		0.180**	0.336***	0.060**
		(0.073)	(0.015)	(0.025)
Payed labour in the last month		0.042	0.343***	0.015
		(0.065)	(0.021)	(0.023)
Sought healthcare		0.156**	−0.031	−0.005
		(0.076)	(0.022)	(0.004)
Good self-reported health		−0.102	−0.031***	0.003
		(0.135)	(0.010)	(0.004)
Concentration index of HE				0.523
Sum of factor's contributions				0.391
Residual				0.132

Standard errors in parentheses
*** p<0.01,
** p<0.05,
* p<0.1

Table 3
Decomposition of the concentration index of catastrophic health expenditures for migrant women.

		Elasticity	Concentration Index	Contribution
Resident of Manaus		0.351***	0.517***	0.181***
		(0.066)	(0.016)	(0.035)
Age group	20–29	0.114*	−0.022	−0.003
		(0.065)	(0.018)	(0.003)
	30–39	0.097**	0.022	0.002
		(0.048)	(0.026)	(0.003)
	40–49	0.029	0.111***	0.003
		(0.037)	(0.033)	(0.005)
Education	Primary	−0.080	−0.074**	0.006
		(0.092)	(0.035)	(0.008)
	Secondary	−0.287	−0.033***	0.009
		(0.437)	(0.011)	(0.016)
	Higher	−0.038	0.252***	−0.010
		(0.098)	(0.033)	(0.025)
Ethnicity	Mixed	−0.043	−0.006	0.000
		(0.093)	(0.012)	(0.001)
	Black	0.005	−0.303***	−0.002
		(0.012)	(0.073)	(0.004)
	Indigenous	−0.008	−0.300***	0.002
		(0.007)	(0.071)	(0.002)
	Other	0.005	−0.129	−0.001
		(0.007)	(0.176)	(0.001)
Time since migration (months)	7 – 18	0.092***	0.044*	0.004
		(0.034)	(0.024)	(0.003)
	19 – 36	0.139**	0.329***	0.046**
		(0.061)	(0.020)	(0.021)
Household size		−0.091	−0.048***	0.004
		(0.069)	(0.013)	(0.003)
Lives with partner		0.073	0.030**	0.002
		(0.073)	(0.013)	(0.002)
Has children under 18 y		0.097	−0.053***	−0.005
		(0.067)	(0.014)	(0.004)
Household income quartiles	II	−0.009	−0.225***	0.002
		(0.010)	(0.045)	(0.002)
	IV	0.171***	0.241***	0.041***
		(0.046)	(0.019)	(0.012)
	IV	0.195***	0.608***	0.119***
		(0.054)	(0.020)	(0.033)
Sends financial aid to family in Venezuela		0.133*	0.335***	0.045*
		(0.072)	(0.015)	(0.024)
Payed labour in the last month		0.050	0.343***	0.017
		(0.048)	(0.023)	(0.017)
Sought healthcare		0.098**	−0.034	−0.003
		(0.043)	(0.022)	(0.002)
Good self-reported health		−0.357***	−0.032***	0.011**
		(0.106)	(0.011)	(0.005)
Concentration index of HE				0.517
Sum of factor's contributions				0.473
Residual				0.044

Standard errors in parentheses
*** p<0.01,
* p<0.1
** p<0.05,

also for the characteristics of non-migrant women. The downside of making the combined sample analyses is that we have fewer factors to include in the decompositions, because some information was not available or was not relevant for the non-migrant sample. Thus, we add to the model a binary indicator equal to one if the woman is a migrant, in order to capture the possible influence of factors concentrated among migrants and which could not be included directly in the decomposition analyses.

Table 4 shows the decomposition of the concentration index of out-of-pocket health expenditures for migrant and non-migrant women. It points to higher education, number of people living in the household, and income quartiles as the main contributing factors to socioeconomic inequality in OOPHE. The most important contributing factor to OOPHE inequalities is belonging to the highest income quartile. The newly

added variable, i.e. being a migrant, is not a statistically significant factor.

The results for the decomposition of the concentration index of CHE for migrants and non-migrants are shown in Table 5. Living in Manaus and belonging to the two highest income quartiles drive higher levels of inequality in the upper part of the household expenditure distribution. Conversely, being a migrant, which is identified in this model as the most important contributing factor to CHE inequalities, drives higher inequality levels in the lower segment of the distribution.

3.5. Blinder-Oaxaca decomposition of socioeconomic inequalities between migrant and non-migrant women

Table 6 shows the results of the Blinder-Oaxaca decomposition of

Table 4
Decomposition of the concentration index of our-of-pocket health expenditures for migrant and non-migrant women.

		Elasticity	Concentration Index	Contribution
Resident of Manaus		0.024	0.262***	0.006
		(0.038)	(0.009)	(0.010)
Age group	20–29	0.043	−0.101	−0.004
		(0.033)	(0.013)	(0.003)
	30–39	0.074**	0.026*	0.002
		(0.029)	(0.015)	(0.001)
	40–49	0.020	0.137***	0.003
		(0.020)	(0.021)	(0.003)
Education	Primary	−0.019	0.080***	−0.001
		(0.063)	(0.018)	(0.005)
	Secondary	−0.019	−0.139***	0.003
		(0.148)	(0.010)	(0.021)
	Higher	0.125**	0.283***	0.035**
		(0.057)	(0.020)	(0.016)
Ethnicity	Mixed	−0.038	−0.002	0.000
		(0.063)	(0.007)	(0.001)
	Black	0.000	−0.016	−0.000
		(0.008)	(0.052)	(0.000)
	Indigenous	−0.003	−0.224***	0.001
		(0.004)	(0.057)	(0.001)
	Other	0.002	0.128	0.000
		(0.004)	(0.102)	(0.001)
Household size		0.092*	0.119***	0.011*
		(0.051)	(0.006)	(0.006)
Household income quartiles	II	0.101***	−0.187***	−0.019***
		(0.021)	(0.013)	(0.004)
	IV	0.158***	0.240***	0.038***
		(0.037)	(0.011)	(0.009)
	IV	0.415***	0.641***	0.266***
		(0.047)	(0.011)	(0.030)
Migrant		−0.027	−0.463***	0.013
		(0.076)	(0.009)	(0.035)
Concentration index of HE				0.473
Sum of factor's contributions				0.353
Residual				0.120

Standard errors in parentheses
*** p<0.01,
** p<0.05,
* p<0.1

Table 5
Decomposition of concentration index for catastrophic health expenditures of migrants and non-migrants.

		Elasticity	Concentration Index	Contribution
Resident of Manaus		0.266***	0.248***	0.066***
		(0.066)	(0.010)	(0.017)
Age group	20–29	0.106**	−0.101***	−0.011**
		(0.052)	(0.014)	(0.005)
	30–39	0.163***	0.026*	0.004
		(0.050)	(0.015)	(0.003)
	40–49	0.031	0.140***	0.004
		(0.034)	(0.020)	(0.005)
Education	Primary	−0.184**	0.075***	−0.014*
		(0.089)	(0.018)	(0.007)
	Secondary	−0.449**	−0.140***	0.063**
		(0.208)	(0.010)	(0.029)
	Higher	−0.121	0.289***	−0.035
		(0.081)	(0.023)	(0.023)
Ethnicity	Mixed	−0.018	−0.004	0.000
		(0.103)	(0.007)	(0.001)
	Black	0.005	−0.021	−0.000
		(0.011)	(0.050)	(0.001)
	Indigenous	−0.000	−0.219***	0.000
		(0.007)	(0.066)	(0.002)
	Other	−0.001	0.155	−0.000
		(0.005)	(0.107)	(0.001)
Household size		0.017	0.120***	0.002
		(0.089)	(0.007)	(0.011)
Household income quartiles	II	0.528***	−0.183***	−0.096***
		(0.037)	(0.014)	(0.009)
	IV	0.472***	0.233***	0.110***
		(0.056)	(0.012)	(0.014)
	IV	0.447***	0.641***	0.287***
		(0.062)	(0.013)	(0.039)
Migrant		0.936***	−0.474***	−0.443***
		(0.100)	(0.010)	(0.047)
Concentration index of HE				−0.025
Sum of factor's contributions				−0.063
Residual				0.038

Standard errors in parentheses
*** p<0.01,
** p<0.05,
* p<0.1

inequality in out-of-pocket health expenditures between migrant and non-migrant women, i.e. the gap in OOPHE between these two groups. Column 1 shows the overall (mean) difference in health expenditures between the two groups, decomposed into differences in the magnitude of determinants (endowments), differences in the effect of those determinants on expenditures (coefficients), and the interaction of these two components. The monthly average of out-of-pocket health expenditures among non-migrant women was R$116.37, compared to R$41.56 among migrants. The difference of R$74.81 was mainly driven by differences in endowments, which is the explained component (52.15/74.81 ~70 %); while differences in coefficients and the interaction between coefficients and endowments – the unexplained part – were not statistically significant ([39.25–16.58]/74.81 ~30 %).

Column 2 shows the differences across groups in the endowment of each individual factor. There are significant differences in the numbers of people living in Manaus and in the numbers of people belonging to the third- and fourth-income quartiles, factors increasing the gap in out-of-pocket health expenditures, while differences in people belonging to the second income quartile slightly reduced such gap. These differences in endowments account for about 70 % of the difference in OOPHE between non-migrant and migrant women (i.e. the higher health expenditure level among non-migrants).

Column 3 shows the differences in the effect of each contributing factor on the observed gap in out-of-pocket health expenditures. Broadly speaking, the coefficients in column 3 indicate the degree to which the

effect of a given factor (e.g. living in Manaus) on observed health expenditure varies between a migrant and a non-migrant woman. We find differences between migrants and non-migrants in the OOPHE effects of living in Manaus and the number of people living in the household. However, these differences in OOPHE effects tend to cancel themselves out. Similarly, the interactions between endowments and effects for these same four factors, shown in column 4, tend to counterbalance themselves and do not help explain the gap in health expenditures.

The results of the Yun (2004) decomposition of inequality in CHE incidence between migrant and non-migrant women are shown in Table 7. Nearly 5 % of non-migrant women incurred CHE, compared to a higher incidence of nearly 13 % among migrant women, with the gap of around eight percentage points between the two groups being mostly driven by differences in the effects of socioeconomic factors the interaction between these – the part not explain by endowments – (column 1).

Important contributions of differences between groups in factor endowments include city of residence, age and income profiles (column 2). Whilst the share of non-migrant women living in Manaus drives CHE incidence upwards among the latter group, the concentration of younger age groups and lower income categories among migrant women contributes to increase the difference in CHE incidence for migrant vis-a-vis non-migrant women.

However, it is the differences in the effect of income and interaction

Table 6
Blinder-Oaxaca decomposition of out-of-pocket health expenditures.

		(1) Overall	(2) Endowments	(3) Coefficients	(4) Interaction
Resident of Manaus			10.734***	−16.435***	−15.389***
			(3.210)	(4.611)	(4.362)
Age group	20–29		−0.696	2.474	−0.747
			(1.563)	(7.705)	(2.327)
	30–39		0.197	3.165	0.143
			(0.293)	(5.325)	(0.297)
	40–49		0.038	2.706	1.182
			(1.001)	(3.204)	(1.418)
Education	Primary		1.320	−2.780	−3.050
			(6.049)	(6.572)	(7.212)
	Secondary		−1.356	−3.549	1.430
			(9.942)	(29.593)	(11.925)
	Higher		4.199	1.014	0.552
			(3.238)	(7.007)	(3.813)
Ethnicity	Mixed		−0.017	−8.208	−0.619
			(0.418)	(8.893)	(0.702)
	Black		−0.097	0.462	0.132
			(0.234)	(1.155)	(0.340)
	Indigenous		−0.033	−1.060	0.363
			(0.238)	(1.220)	(0.456)
	Other		0.149	−0.289	−0.147
			(0.220)	(0.509)	(0.282)
Household size			−2.316	24.792***	16.571***
			(2.949)	(7.841)	(5.274)
Household income quartiles	II		−3.974*	−20.476	12.897
			(2.253)	(18.277)	(11.533)
	III		13.971***	−9.221	−22.379
			(3.877)	(5.765)	(13.957)
	IV		30.032***	−0.678	−7.523
			(9.518)	(2.055)	(22.794)
Non-migrants		116.374***			
		(4.657)			
Migrants		41.559***			
		(3.889)			
Difference		74.814***			
		(6.067)			
Endowments		52.150***			
		(10.394)			
Coefficients		39.248			
		(24.490)			
Interaction		−16.584			
		(25.961)			
Constant				67.332	
				(67.745)	
Observations		3324	3324	3324	3324

Standard errors in parentheses
* p<0.1
*** p<0.01, ** p<0.05

between this effect and income levels which explain most of the gap in CHE by migration status (columns 3 and 4). While the higher income of non-migrants increases the incidence of CHE in that group, the interaction of those income levels with the effect of income on CHE contributes to increase the difference in CHE (i.e. it drives higher CHE) for migrants. Finally, for the group of migrant women, column 4 suggests that the interaction between the share of women living in Manaus and the different CHE effect of living there for migrant women represents another important determinant of the higher CHE incidence among migrants.

4. Discussion

Despite being a fairly homogenous group regarding their relatively low socioeconomic status, the forced displaced population of Venezuelan women living in Brazil displays noticeable disparities in out-of-pocket health expenditures and incidence of catastrophic health expenditures. Healthcare expenditures are concentrated among the less poor migrant women. This segment of the population, after crossing the *Pacaraima* border with Venezuela in Northern Brazil, has more frequently relocated to Manaus and typically lived in Brazil for longer than 18 months; they also tend to have higher education levels than the poorer migrants and be more able to send financial aid to family in Venezuela. Therefore, location, longer time since arrival in Brazil, higher education and capacity to pay for healthcare are the key contributors to socioeconomic inequality in OOPHE. The direct relationship identified between socioeconomic status and out-of-pocket healthcare expenditures raises concerns about foregone care due to financial barriers to access among the poorer migrant women - a large share of whom reported zero health expenditures (Fig. 1).

In our sample of women living in Boa Vista and Manaus, where most migrants belong to the lowest income quartiles, CHE incidence is concentrated among the upper segment of the socioeconomic distribution, i.e. the less poor migrant women. A possible explanation for this finding is that the poorest segment of our migrant sample simply cannot afford to pay for any healthcare goods or services (e.g. medicines, travel to a health clinic, and so on), even if they need them. This is supported by our finding that healthcare expenditures are highly concentrated among the less poor migrants. The main factors contributing to socioeconomic inequality in CHE, such as living in Manaus and having lived

Table 7
Yun decomposition of catastrophic health expenditures.

		(1) Overall	(2) Endowments	(3) Coefficients	(4) Interaction
Resident of Manaus			0.012***	0.139***	−0.065***
			(0.003)	(0.015)	(0.008)
Age group	20–29		−0.001	0.019**	0.008**
			(0.002)	(0.009)	(0.004)
	30–39		−0.000	0.016*	−0.001
			(0.000)	(0.009)	(0.001)
	40–49		0.001	0.014*	−0.004*
			(0.001)	(0.008)	(0.003)
Education	Primary		0.009*	−0.011	0.006
			(0.005)	(0.025)	(0.013)
	Secondary		−0.017**	−0.003	−0.002
			(0.008)	(0.032)	(0.021)
	Higher		0.004	−0.002	0.001
			(0.003)	(0.019)	(0.007)
Ethnicity	Mixed		0.000	−0.005	0.000
			(0.001)	(0.015)	(0.001)
	Black		0.000	0.001	−0.000
			(0.000)	(0.002)	(0.001)
	Indigenous		0.000	−0.001	−0.000
			(0.000)	(0.001)	(0.001)
	Other		0.000	0.001	−0.001
			(0.000)	(0.001)	(0.001)
Household size			−0.005	−0.017	0.007
			(0.005)	(0.020)	(0.008)
Household income quartiles	II		−0.005	0.021***	0.033***
			(0.010)	(0.007)	(0.011)
	III		0.015	0.066***	−0.047***
			(0.012)	(0.020)	(0.015)
	IV		0.024	0.064**	−0.058**
			(0.018)	(0.029)	(0.027)
Migrants		0.129***			
		(0.008)			
Non-migrants		0.049***			
		(0.005)			
Difference		0.079***			
		(0.010)			
Endowments		0.036			
		(0.022)			
Coefficients		0.166***			
		(0.023)			
Interaction		−0.123***			
		(0.031)			
Constant				−0.136	
				(0.094)	
Observations		3242	3242	3242	3242

Standard errors in parentheses
*** $p<0.01$,
** $p<0.05$,
* $p<0.1$

in Brazil for more than 18 months, are concentrated in the higher segment of the migrant socioeconomic distribution. A plausible interpretation is that by having lived in Brazil for longer, the group of less poor migrant women may be more assimilated into the new country context - for instance, by having built wider social networks and better access to paid employment opportunities, as well as to formal or informal mechanisms to borrow money – which may allow for greater payments for healthcare when such services cannot be accessed through the public system. However, since even the less poor migrant women tend to belong to the lowest quartiles of the overall income distribution (including migrant and non-migrant women; cf. Table 1), this indicates a high risk of migrant women incurring CHE for even relatively small private health payments.

Our analyses for the pooled sample of migrant and non-migrant women add comparative insights to the picture above. For non-migrants only, CHE incidence is concentrated among the poorer segments instead. This finding is in line with (intuitive) results for general populations in other settings, suggesting that individuals with better socioeconomic status can protect themselves more effectively from

financial hardship when faced with a health shock, being able to spend larger amounts on healthcare without incurring CHE (Wagstaff et al., 2018). Being a migrant, after controlling for other factors, did not seem to influence health expenditure inequalities. This is in contrast with evidence suggesting that discrimination may play a role for health-related inequalities in other contexts (Fan et al., 2013; Lebano et al., 2020; PAHO, 2019). However, the pooled decomposition analyses pointed to being a migrant as the major factor driving the higher incidence of CHE in the lower part of the overall (migrant and non-migrant) income distribution. This result raises concerns about the degree to which migrant women – when compared to the native female population – are able to cope with health shocks within the Brazilian health system, without incurring financial catastrophe or foregoing necessary healthcare altogether.

We further investigated to what extent being a migrant explains socioeconomic inequalities in health expenditure outcomes, using a Blinder-Oaxaca decomposition approach. OOPHE are greater for non-migrants by about R\$75, with 70 % of this difference (around R\$52) being due to differences in endowments between the two groups. The

main explanatory factor related to differences in endowments was belonging to the fourth income quartile, which accounts for 58 % of the gap (30.03/52.15). This means that if the proportion of migrant women in the fourth quartile was the same as that for non-migrants, the average OOPHE among migrants would increase by R$30. Living in Manaus drives the gap in out-of-pocket health expenditures further in favour of the non-migrant population by 14 % (10.73/74.81). Since migrants living in Manaus have better socioeconomic status than migrants in Boa Vista, if the proportion of migrants living in Manaus increased to 64 %, OOPHE among migrant women would be predicted to rise by R$10.73 on average.

However, although migrant and non-migrant female populations differ largely in income levels, that fact alone does not seem to explain the gap in health expenditures. The remainder of this gap (the unexplained part) may be due to non-observable characteristics in which these populations differ, including factors such as cultural differences or even language barriers that may influence effective access to public healthcare services, as found in other contexts (Ang et al., 2022; Asanin and Wilson, 2008). Another important factor is the health status differences between these two populations: migrant women generally self-reported a poorer health status compared to their Brazilian counterparts (Moreno-Serra et al., 2024). The traumatic life event faced by these Venezuelan women can have immediate and long-lasting health impacts due to stress (Haukka et al., 2017), challenges integrating to hosts communities, including limited access to quality healthcare (Bauer et al., 2018), precarious living conditions prior to resettlement (e.g. poor sanitation, inadequate shelter, overcrowding and insufficient nutrition) (Shackelford et al., 2020), and exposure to various types of violence (Makuch, Osis, Becerra, et al., 2021; Mollica et al., 2001), among others.

We found that the profile of CHE incidence also differs substantially between migrant and non-migrant women. The incidence of CHE among non-migrants is slightly under 5 %, whilst this figure reaches around 13 % for migrants. The eight-percentage point gap is due to differences in socioeconomic factors across groups; to differences in the effects of those factors on CHE inequalities; and to the interaction between differences in endowments and their effects. Whilst migrant and non-migrant female populations are significantly different in endowments, this does not explain by itself the existing gap in CHE incidence among groups. In fact, the contribution of socioeconomic factors to this gap is about half (.04/.08), which implies that the observed CHE incidence gap between migrant and non-migrant women is explained by different effects of socioeconomic factors on CHE incidence between these two groups. Our results suggest that if we evaluate the socioeconomic factors of migrants with the coefficients of non-migrants, then the CHE incidence gap between groups would be reduced by half, since better socioeconomic status is related to lower CHE incidence among migrants.

Our study has limitations that must be acknowledged. Health expenditure figures for migrants were collected in 2021, whereas for non-migrants these data refer to years 2017–2018. Although we have adjusted all expenditure figures for inflation, so these are directly comparable over time between migrants and non-migrants, this adjustment has been done using a general price deflator that includes, but is not specific to, prices of healthcare goods and services. A health sector-specific deflator is not available for our analysis. If migrant and non-migrant women have different profiles of health goods and services purchased from the private sector (e.g., migrants tend to buy certain medicines more), and the prices of the goods and services consumed by migrants vs. non-migrants are changing at different rates, this could explain part of differences found in OOPHE and CHE between groups that in our Blinder-Oaxaca-Yun decomposition models are captured by the unexplained component (i.e. drivers of differences that cannot be attributed to income or the other endowments included in our model). In additional decomposition analyses (Supplementary Material, Table 4.1), where we restricted our migrant sample to include only women who reported positive income, we found that health expenditures are still

higher for non-migrants, but with 75 % of such gap attributed to unexplained factors (compared to only 30 % in the Blinder-Oaxaca decomposition analysis; see Table 6). This implies that income and other endowments are not the major drivers of differences in health expenditures between non-migrant and migrant women who have at least some ability to afford private payments for healthcare. Therefore, this result corroborates the potential importance of unobserved differences in healthcare consumption patterns between migrants and non-migrants, possibly arising also due to unobserved differences in health needs between groups (note that we have been unable to include the self-reported health variable and the indicator for healthcare seeking in the Blinder-Oaxaca decomposition analyses, as these variables are not available for the Brazilian sample from the POF survey). Similarly, unobserved differences in healthcare needs and seeking patterns may help explain inequalities in OOPHE and CHE specifically among migrant women, including between those living in the cities of Boa Vista and Manaus. Evidence for our sample of Venezuelan migrant women presented elsewhere indicated, for instance, that the numbers of women who arrived pregnant in Brazil and those who used health services due to illness are higher in Boa Vista than Manaus (Leal et al., 2024). Unfortunately, without comparable information for both migrant women and local populations on healthcare seeking, needs and expenditure patterns by types of services, along with information about changes in prices for such services, we are unable to explore the possibilities above further and must leave them for future research.

Differences in healthcare consumption patterns between migrant and non-migrant women might have been further influenced by the onset of the COVID-19 pandemic in Brazil, since our data for migrants was collected during the pandemic, when healthcare seeking behaviour, health expenditures, income and other factors might have been affected differently for migrants compared to the local population. Again, differences in health expenditures arising from changed care seeking patterns due to the pandemic would be captured by the unexplained part of our decomposition analysis. A final limitation related to our survey data is the possibility that the sample of Brazilian female population in Boa Vista and Manaus, taken from the POF survey, might include some respondents who are Venezuelan migrants living in these communities. The POF survey has no information about whether the respondent is a migrant or not. However, any number of Venezuelan migrant women can be expected to be very low in the POF and other similar surveys conducted in highly populated state capital cities of Brazil, compared to the non-migrant population surveyed, thus reducing concerns about any major influence on the results of our analysis.

5. Conclusions

Taken together, the results in our study highlight financial risk protection in health as a key issue to be addressed by policies that seek to protect the welfare of displaced populations, and more specifically of women and girls. Venezuelan migrant women in Brazil face an important risk of incurring CHE when they have some ability to afford out-of-pocket payments for care. At the same time, about half of our sample of migrants reported having no income and no expenditures in the month of reference, and therefore no catastrophic expenditures. This situation likely obscures serious cases where people forgo (or are denied) health services that they need because they do not have the means to pay for them (Fan et al., 2013). The existing gap in CHE incidence disfavouring Venezuelan migrant women, relative to natives, points to a large share of that vulnerable population group being at risk of lack of access to healthcare, due to insufficient financial means to compensate for any unavailability of publicly subsidised health services. This is of particular concern in settings, like northern Brazil, where local public health systems are often under-resourced. Public health financing policy then becomes a central issue in contexts where mass displacement affects disease burden, healthcare demand and supply (World Bank, 2023). To improve financial risk protection for all groups of Venezuelan migrant

women, there is a need for policies that ensure appropriate mobilisation of resources to the public health systems of areas in Brazil that host large numbers of migrants, such as Boa Vista and Manaus. This could include the implementation of mechanisms that adjust fiscal transfers from the federal government to states and municipalities according to the magnitude of the local migrant population and the particular health needs arising locally from such displacement. Given the continued influx of displaced Venezuelans in Brazil, it is fundamental that these adjusted health financing mechanisms can be feasibly sustained over time, to allow local public systems to keep delivering all essential health services to both native and migrant populations, in light also of changing health needs.

From the healthcare delivery side, strengthening the Brazilian primary care strategy (Family Health Strategy, or ESF in its Portuguese acronym), which is based on the deployment of multi-professional healthcare teams to visit families in a given catchment area (Montoya Diaz et al., 2022), seems a promising strategy to improve healthcare access and financial risk protection among Venezuelan migrant women. ESF teams can help mitigate gaps in knowledge among displaced women about where certain health services are actually available in practice to be obtained cost-free within the local public network, including services that constitute potential drivers of high out-of-pocket expenditures if purchased privately, such as diagnostic tests and prescription drugs (WHO and WB, 2023). A potential initiative could be expanding the capacity of ESF teams that operate locally to target the needs of female migrants living in shelters or in the community, actively registering these migrants to receive ESF visits and providing them with comprehensive information about local healthcare provision, in addition to the ESF teams' usual activities that focus on conducting basic healthcare actions. Our empirical results indicate that this initiative could be beneficial to reduce unmet healthcare needs particularly among migrants who have arrived in Brazil relatively more recently.

Other complementary policies that would seem promising to ensure the successful inclusion of Venezuelan migrant women in the Brazilian public health system may involve concerted efforts that extend beyond the health system. These include, for instance, the implementation of dedicated health and social interventions for trauma recovery (not least given the enhanced risk of gender-based violence among Venezuelan migrant women), and language acquisition, which could facilitate the obtention of public services, labour market insertion and income generation by migrant women (World Bank, 2023).

Finally, our results also highlight the need for analysts and policymakers to adopt monitoring indicators that are better able to provide a rounded picture of inequalities in care access with financial protection for vulnerable populations like migrants, than basic indicators such as CHE incidence inequalities. The latter may mask the presence of substantial unmet needs arising from inability to pay for healthcare among particular sub-groups. To better understand the health vulnerabilities of migrant populations, and facilitate the design of effective mitigating policies, financial protection indicators such as CHE incidence must not be monitored in isolation, but always in tandem with measures of effective healthcare access, including in service domains often identified as drivers of high healthcare expenditures, such as access to medicines (WHO and WB, 2023).

List of abbreviations

CHE: catastrophic health expenditures
OOPHE: out-of-pocket health expenditures
POF: Brazilian Household Budget Survey
ReGHID: Redressing Gendered Health Inequalities of Displaced Women and Girls in contexts of Protracted Crisis in Central and South America
SUS: *Sistema Único de Saúde* (Brazilian national health service)

CRediT authorship contribution statement

Ivan Ochoa-Moreno: Writing – original draft, Methodology, Formal analysis, Conceptualization. **Rodrigo Moreno-Serra:** Writing – review & editing, Validation, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ssmhs.2024.100022.

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