

Absence of protective ethnic density effect on Ecuadorian migrants' mental health in a recent migration setting: a multilevel analysis

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Abstract

Purpose We aimed to study the association between the Ecuadorians' ethnic density (EED) of the areas of residence (AR) with the mental health of Ecuadorians in Spain. **Methods** Multilevel study of 568 Ecuadorian adults in 33 AR randomly selected from civil registries and interviewed at home. Possible psychiatric case (PPC) was measured by scoring ≥ 5 in General Health Questionnaire-28. Ecuadorians' ethnic density was dichotomized in high and low EED ($< 6\%$). Multilevel logistic regression was used to estimate odds ratios (OR) and 95 % confidence intervals (CI). **Results** Prevalence of PPC, 24 % (95 %CI 20–28 %), varied by area of residence. Ecuadorians' ethnic density varied by area of residence ranging from 0.9 to 19.5 %. PPC prevalence in High Ecuadorians' ethnic density AR was

29.5 and 20.4 % in low EED AR ($p 0.013$). Ecuadorians from High EED AR had higher odds of PPC than those from Low EED AR (OR 1.65 95 %CI 1.01–2.72). Adjusting for individual confounders (largely self-perceived discrimination), OR decreased to 1.48 (95 %CI 0.87–2.55). The final model, adjusted by area of residence and educational level, yielded an OR 1.37 (95 %CI 0.78–2.40).

Conclusions No protective association between the Ecuadorians' ethnic density of the Area of residence and Ecuadorian migrants' mental health was found. Mechanisms underlying beneficial ethnic density effects may be absent in recent migration settings.

Keywords Mental health · Multilevel studies · Ethnic density · Ecuadorians

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Introduction

The effect of contexts and places on individuals' health is an important research area in social epidemiology. In the last decades, more attention has been placed on a particular type of contextual effect known as "ethnic density effect" [1]. Multiple studies have reported beneficial ethnic density effects on mental [2–5] and physical health [6, 7] and health behaviours [8]. A lower number of studies have reported no associations [9, 10], and fewer describe deleterious ones [3]. Economic deprivation of individuals and their neighbourhoods is associated with poorer health status too [11–15] and the poverty of a neighbourhood may be associated with its ethnic composition since migrants and ethnic minorities tend to concentrate in areas with higher levels of poverty and underinvestment in services [16]. The exact mechanisms through which ethnic density may influence mental health in ethnic minorities are not well established [17–21] but it has been proposed that it may buffer the effects of everyday racism and perceived risk of physical and psychological intimidation by providing social support from local networks and culturally specific services [17–21].

The differences in the direction of the association between ethnic density and health outcomes could be partially explained by the relative contribution of material and psychosocial determinants of health, although important methodological aspects have to be taken into account [17–20]. There is no consensus on how to model and categorise and measure ethnic density nor on the size of the area to be studied [17]. Furthermore, some studies lump all ethnic minority groups together and make no distinction as to whether migrants are included nor to the relative mix of different ethnic groups. Ethnic minorities include both established and recently arrived members of the community but health status and its determinants vary enormously between them [19, 22]. Whereas first generation migrants tend to be a selected group of people with good health, "healthy migrant effect", ethnic minorities have poorer health than the rest of the population. In spite of this good health on arrival, most migrant groups are reported to have worse mental health indicators [19, 22], although it has been different in Canada for children [23].

Spain has experienced a recent and rapid increase in economic migrants from the mid-90s onwards; Ecuadorians account for one of the largest groups [24]. Ecuadorians have settled in rural areas, which demanded agricultural work, and in large cities which offered jobs in the building industry and in the care of children and the elderly. Ecuadorians speak Spanish; the majority are Catholics and most have ethnic features which single them out [25]. Ethnic density effects on health are very context specific and depend on the historical and political processes which have determined the contact of the different groups; such as cultural distance between communities, velocity and duration of the settlements [17, 20]. In

this paper, we expand on the literature of the positive and negative associations of ethnic density with mental health in the context of a South European country with a recent migration process. Our hypothesis is that Ecuadorians living in areas with a higher density of Ecuadorians will have better mental health than those who do not. We aim to estimate the association between the Ecuadorians' ethnic density of the Area of residence and the mental health of the Ecuadorians living in 33 areas in Spain, accounting for material and psychosocial individual and contextual confounders.

Methods

We designed a multilevel study which included 1,186 adults aged 18–55 clustered in 33 areas of residence (AR). The 33 AR, 17 city neighbourhoods and 16 municipalities (largely rural) within 4 regions in Spain (Alicante, Almería, Madrid, Murcia) were chosen because the high influx of migrants experienced over the last decade. We chose these 33 AR to reflect variability in immigration density allowing for a minimum number of 200 Ecuadorians. A home survey was conducted in a probabilistic sample obtained from the civil registries allowing for an equal number of men and women, Spaniards and Ecuadorians. A second sample was drawn to account for invalid addresses, unavailable contacts and refusals. Definition of Spaniards and Ecuadorians was based on nationality. A ten-Euros token (phone card for Ecuadorians and petrol voucher for Spaniards) was given to participants. Ecuadorians were visited by trained Latin-Americans interviewers, mostly women. A minimum of two documented visits at different times were performed before moving to the next candidate. The home survey was conducted from September 2006 to January 2007, after a piloting survey in January–February 2006. The overall response rate (completed interviews/completed + refusals) was 61 %; 53 % for Spanish men and 57 % for Spanish women, and 69 % for Ecuadorians. Median duration of the interview was 20 min for Spaniards and 35 for Ecuadorians. In this work, we will analyze data based on interviews of 568 Ecuadorians from the 33 AR. The collection of the contextual level data was obtained during 2008. Detailed methodology of this study has been previously published [26].

Individual-level variables

The outcome variable, possible psychiatric case (PPC), was measured by scoring 5 or more in the Spanish version of the General Health Questionnaire of 28 items (GHQ-28), a mental health screening tool made up by four sub-scales which capture recent changes in somatic symptoms, anxiety, depression and social functioning [27, 28]. The response categories refer to the person's experience in the

last 4 weeks compared to their “usual state” (better/same/worse/much worse than usual). We used the coding scheme that assigns values of 0,0,1,1 to these responses. We collected information on socio-demographic characteristics such as civil status, number of children, maximum education attained. Social support was measured by the Duke scale [29], social network diversity by asking about number of friends, contact with neighbours and work colleagues and participation in associations. Emotional support from partner was explored through a five questions likert scale. We also inquired for the presence of a confidant (existence of a person to talk about personal matters) and economic confidant (“In case of need, do you have anybody from whom to borrow 100 Euros?”). *Financial strain* was assessed by the question: how would you rate your difficulty in making ends meet each month using your net monthly income? Individual and family unit monthly incomes were inquired as compared with the concurrent national minimal wage (NMW). Subjects were asked about their employment and type of contract, and about work atmosphere through a 5-item likert scale. Time of arrival to Spain, and whether subjects were still paying their migration debt were asked for. Perceived discrimination was recorded through a 5 items scale inspired in the works of Finch and Noh [30–32]. Detailed description of these variables has been previously published [26].

Contextual level variables

Second-level data were obtained from all the secondary sources available provided they were common to the 33 AR. A detailed description of the sources and institutions providing the data, as well as the size of the AR, has been previously described [26]. The following second-level data were collected for each of the 33 AR. The main exposure variable, Ecuadorian’s ethnic density, EED (proportion of people with Ecuadorian nationality among all subjects recorded in the municipal council registry) was obtained from the Municipal Registry 2006. We collected total ethnic density (proportion of people lacking Spanish nationality among all subjects recorded in the municipal council registry) and among the various indicators of socio-economic level of the AR, we chose to use the proportion of people with less than primary education from the National Census 2001 as recommended by Regidor et al. [33] and if the area was a neighbourhood (largely cities) or a municipality (largely villages).

As associations between ethnic density effects and mental health cannot be assumed to be linear [20], we assessed the shape of the relationship between EED with the log odds of PPC. To do so, we categorised EED in terciles, quartiles, quintiles and deciles and plotted it against the log odds of PPC. The relationship was not linear; the log odds of PPC in the three first quintiles were

similar and a higher odds of PPC was seen for 4th and 5th quintiles. Therefore, we set the cut-off for high versus low EED at the third tertile. This cut-off corresponded to 6 % of Ecuadorians, which was, in fact, the mean EED in the sample. Therefore, we categorised EED in two groups; one defined as high EED and the other defined as low EED. The other second-level variables: total ethnic density (% of people whose country of origin was not Spain), and proportion of people with less than primary education were categorised in tertiles. Ethics committee’s approval was obtained.

Statistical analyses

We used multilevel logistic regression models, with individuals at the first level and AR at the second level, to estimate odds ratios (OR) and 95 % confidence intervals (CI) accounting for the nesting of individuals within AR. We performed four models. Model 1 was an empty model (intercept-only model) that allowed us to calculate the intraclass correlation coefficient (ICC) or the proportion of the total variance in PPC that occurs at the AR level. The ICC was estimated using the latent variable method [34]. Model 2 included EED to estimate the crude relation between EED and PPC. Model 3 included EED and the individual-level variables, i.e. sex, individual salary, economic confidant, attend associations, atmosphere at work and discrimination, that were identified as confounders for the relation between EED and PPC. That is, of all variables collected in the survey summarised before and described in previous publications [26], only those risk factors for PPC who had a different distribution between areas with high and low EED were included in the model. Finally, model 4 also included other area-level variables, such as the proportion of people with less than primary education, as this was the strongest area-level confounder of the association between EED and PPC. Total ethnic density and urbanisation of the area confounded the association of interest in univariate analyses but not when the proportion of people with less than primary studies was included in the model. We tested possible cross-level interactions between the second-level variable EED and the first-level variables sex and discrimination. All analyses were performed in Stata 10 [35].

Results

Overall, 568 Ecuadorians were analysed. The prevalence of PPC was 24 % (95 %CI 20–28 %). There was variation in this prevalence according to AR, which ranged from 0 % in AR1 to 61 % in AR33 (Fig. 1). The distribution of EED within the 33 AR ranged from 0.9 to 19.5 % with a median of 4.7 % and a mean of 6.1 %. The prevalence of PPC in

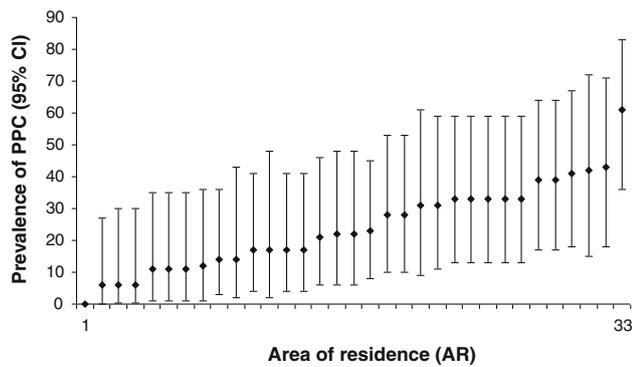


Fig. 1 Prevalence of possible psychiatric case (PPC) (95 % CI) according to the area of residence (AR)

AR with EED equal or over 6 %, from now onwards, high EED, was 29.5 % and that of AR with less than 6 % EED, from now onwards, low EED, was 20.4 %. This difference was statistically significant ($p = 0.013$).

The descriptive characteristics of subjects living in low EED areas and high EED areas are summarised in Table 1. Median time in Spain was 5 years (IQR 4–6) in low EED AR and 5.5 (IQR 4–6) in high EED AR ($p = 0.13$). There were some small differences in the individual salary and economic confident distributions between areas with low and high EED. A larger proportion of people living in high EED areas attended associations, reported worse atmosphere at work and higher exposure to discrimination. Total ethnic density was higher in areas with high EED, so was the proportion of people with less than primary education (a proxy for low socio-economic status). Up to 60 % of the people living in areas with high EED were municipalities compared to 43 % of those living in areas with low EED.

The upper part of Table 2 describes the individual risk factors for poor mental health. The prevalence of PPC was higher in women and in those with lower salaries. Those with lack of economic support, bad atmosphere at work and those who participated in community associations were more likely to be PPC. The probability of being a PPC increased with increasing levels of self-perceived discrimination. The lower part of Table 2 describes the OR for PPC for area-level variables. Ecuadorians living in areas with lower levels of education had higher odds of PPC ($p = 0.19$), though these differences were not statistically significant. Ecuadorians living in municipal areas (that is, largely in villages) had a 61 % increase odd of PPC ($p = 0.06$).

Table 3 presents the multilevel modelling. Model 1 estimates the ICC, that is, the proportion of the total variance in PPC that occurs at the AR level, which was 6.9 %. Ecuadorians living in areas with high EED had a 65 % increased odds of PPC than those living in areas with low EED (OR 1.65 95 %CI 1.01–2.72) (model 2). After adjusting for individual confounders for poor mental health, the OR of interest decreases to

Table 1 Descriptive characteristics of Ecuadorians, globally and according to the Ecuadorians Ethnic Density (EED) of the Area of Residence (AR)

	Low EED [N (%)]	High EED [N (%)]	All [N (%)]	<i>p</i> value ^a
Individual characteristics	344 (61)	224 (39)	568 (100)	
Sex				0.65
Men	174 (51)	109 (49)	283 (50)	
Women	170 (49)	115 (51)	285 (50)	
Age				0.62
≤25	77 (22)	41 (18)	118 (21)	
26–35	174 (51)	114 (51)	288 (51)	
36–45	79 (23)	58 (26)	137 (24)	
>45	14 (4)	11 (5)	25 (4)	
Educational level				0.012
No formal education	10 (3)	16 (7)	26 (5)	
Primary	104 (30)	85 (38)	189 (33)	
Secondary	205 (60)	111 (50)	316 (56)	
University	25 (7)	12 (5)	37 (7)	
Marital status				0.33
Single	129 (37)	73 (33)	202 (36)	
Married	189 (55)	128 (57)	317 (56)	
Separated/widow/divorced	26 (8)	23 (10)	49 (9)	
Lives with partner				0.18
No	102 (30)	55 (25)	157 (28)	
Yes	242 (70)	169 (75)	411 (72)	
Emotional support from partner				0.19
Low	81 (24)	49 (22)	130 (23)	
Medium	61 (18)	52 (23)	113 (20)	
High	137 (40)	93 (42)	230 (40)	
Unknown	65 (19)	30 (13)	95 (17)	
Has children				0.12
No	80 (23)	40 (18)	120 (21)	
Yes	264 (77)	184 (82)	448 (79)	
Has a confident				0.69
No	18 (5)	14 (6)	32 (6)	
Yes, one	246 (72)	164 (73)	410 (72)	
Yes, more than one	80 (23)	46 (21)	126 (22)	
Attend associations				0.008
No	280 (81)	161 (72)	441 (78)	
Yes	64 (19)	63 (28)	127 (22)	
Contacts with neighbours				0.013
No	138 (40)	67 (30)	205 (36)	
Yes	206 (60)	157 (70)	363 (64)	
Talks with work colleagues				0.063
No	111 (32)	56 (25)	167 (29)	

Table 1 continued

	Low EED [N (%)]	High EED [N (%)]	All [N (%)]	<i>p</i> value ^a
Yes	233 (68)	168 (75)	401 (71)	
Has friends				0.15
No	34 (10)	31 (14)	65 (11)	
Yes	310 (90)	193 (86)	503 (89)	
Social support				0.041
Low	162 (47)	113 (50)	275 (48)	
Medium	118 (34)	56 (25)	174 (31)	
High	62 (18)	55 (25)	117 (21)	
Unknown	2 (1)	0	2 (1)	
Employment				0.37
Working currently	300 (87)	203 (91)	203 (91)	
Home	19 (6)	11 (5)	30 (5)	
Student	4 (1)	1 (1)	5 (1)	
Unemployed	21 (6)	8 (4)	29 (5)	
Unknown	0	1 (1)	1 (1)	
Type of contract				0.19
Independent worker	11 (3)	4 (2)	15 (3)	
Civil servant/long-term contract	92 (27)	63 (28)	155 (27)	
Short-term contract	133 (39)	97 (43)	230 (40)	
No contract	49 (14)	20 (9)	69 (12)	
Does not know duration	48 (14)	37 (17)	85 (15)	
Unknown	11 (3)	3 (1)	14 (2)	
Work dissatisfaction				0.52
No	270 (78)	175 (78)	445 (78)	
Yes	30 (9)	25 (11)	55 (10)	
Unknown	44 (13)	24 (11)	68 (12)	
Atmosphere at work				0.010
Excellent/good	242 (70)	141 (63)	383 (67)	
Regular/bad	55 (16)	59 (26)	114 (20)	
Unknown	47 (14)	24 (11)	71 (13)	
Individual salary				0.36
Higher than NMW	232 (67)	153 (68)	385 (68)	
Similar to NMW	67 (19)	49 (22)	116 (20)	
Inferior to NMW	26 (8)	9 (4)	35 (6)	
Has no salary	4 (1)	5 (2)	9 (2)	
Unknown	15 (4)	8 (4)	23 (4)	
Economic difficulties				0.46
A lot	53 (15)	35 (16)	88 (15)	
Some	125 (36)	74 (33)	199 (35)	
Not much	84 (24)	62 (28)	146 (26)	
Little/one	78 (23)	53 (24)	131 (23)	
Unknown	4 (1)	0	4 (1)	

Table 1 continued

	Low EED [N (%)]	High EED [N (%)]	All [N (%)]	<i>p</i> value ^a
Economic confident				0.46
Yes	264 (77)	180 (80)	444 (78)	
No	74 (22)	39 (17)	113 (20)	
Unknown	6 (1)	5 (2)	11 (2)	
Discrimination				0.001
Never	146 (42)	68 (30)	214 (38)	
Sometimes	140 (41)	93 (42)	233 (41)	
Always/almost always	58 (17)	63 (28)	121 (21)	
Area characteristics				
Total ethnic density				<0.001
1 (7–15 %)	175 (51)	18 (8)	193 (34)	
2 (16–22 %)	151 (44)	36 (16)	187 (33)	
3 (23–45 %)	18 (5)	170 (76)	188 (33)	
Proportion of people with less than primary education				<0.001
1 (13–36 %)	145 (42)	36 (16)	181 (32)	
2 (37–52 %)	72 (21)	116 (52)	188 (33)	
3 (53–66 %)	127 (37)	72 (32)	199 (35)	
Type				<0.001
Neighbourhood	197 (57)	90 (40)	287 (51)	
Municipality	147 (43)	134 (60)	281 (49)	

NMW National minimal wage

^a *p* value for the comparison of individual and area characteristics between low and high EED areas derived from the Chi-squared test

1.48 and confidence intervals include 1 (model 3). The single largest individual confounder (which produced a 10 % decrease in the OR of interest) was self-perceived discrimination; the adjusted OR was 1.49 (95 %CI 0.93–2.4). There were other positive and negative confounders of the relationship between EED and PPC which justified the inclusion of these in model 3, though. Adjusting for atmosphere at work decreased by 7 % the OR of interest and adjusting by individual salary and economic confident increased the OR of interest by 9 and 5 %, respectively. Model 4 adjusts for the only area-level confounder that remained in the multivariate analyses, the proportion of people without primary education, and which further decreased the OR of interest to 1.37. Although area urbanisation and total ethnic density behaved as confounders in the univariate analyses, after adjusting by the proportion of people without primary education (data not shown), they did not produce any relevant change in the OR of interest. None of the second-level interactions were statistically significant.

Table 2 Prevalence and odds ratios for possible psychiatric case (PPC) in Ecuadorians, according to selected covariates

	PPC [N (%)]	OR (95 % CI)	<i>p</i>
Individual characteristics			
Sex			
Men	38 (13)	1.00	<0.001
Women	98 (34)	3.57 (2.31–5.51)	
Age			
≤25	21 (18)	1.00	0.148
26–35	78 (27)	1.83 (1.04–3.22)	
36–45	33 (24)	1.46 (0.77–2.76)	
>45	4 (16)	0.94 (0.28–3.15)	
Individual salary			
Higher than NMW	78 (20)	1.00	<0.001
Similar to NMW	35 (30)	1.82 (1.11–2.99)	
Inferior to NMW	18 (51)	5.16 (2.38–11.16)	
Has no salary/ Unknown	5 (16)	0.75 (0.27–2.11)	
Economic confident			
Yes	92 (21)	1.00	0.002
No	41 (36)	2.37 (1.47–3.83)	
Unknown	3 (27)	1.72 (0.41–7.23)	
Attend associations			
No	94 (21)	1.00	0.015
Yes	42 (33)	1.78 (1.12–2.84)	
Atmosphere at work			
Excellent/good	74 (19)	1.00	<0.001
Regular/bad	43 (38)	1.73 (1.09–2.74)	
Unknown	19 (27)	–	
Discrimination			
Never	35 (16)	1.00	0.003
Sometimes	59 (25)	1.72 (1.06–2.78)	
Always/Almost always	42 (35)	2.54 (1.47–4.38)	
Area characteristics			
Total ethnic density			
1 (7–15 %)	41 (21)	1.00	0.42
2 (16–22 %)	42 (22)	1.09 (0.58–2.04)	
3 (23–45 %)	53 (28)	1.48 (0.79–2.74)	
Proportion of people with less than primary education			
1 (13–36 %)	33 (18)	1.00	0.19
2 (37–52 %)	51 (27)	1.73 (0.92–3.26)	
3 (53–66 %)	52 (26)	1.61 (0.86–3.01)	
Urbanisation			
Neighbourhood	57 (20)	1.00	0.06
Municipality	79 (28)	1.61 (0.98–2.65)	

NMW National minimal wage

Discussion

We have found no protective association between the Ecuadorians' ethnic density of the area of residence and the mental health of Ecuadorian economic migrants in a recent migration setting in Southern Europe. Contrary to our research hypothesis, the prevalence of poor mental health in Ecuadorians living in areas with high EED was higher than for those living in areas with low EED. This difference was statistically significant in univariate analyses and became smaller and non significant after adjustment for individual and contextual variables. The association between EED and mental health was partially confounded by self-perceived discrimination and by the socio-economic status in the area of residence

A number of individual variables did partially confound the crude association found between EED and poor mental health. That is, part of the increased odds of poor mental health in areas with high EED was explained by the characteristics of the Ecuadorians who lived there. Ecuadorians from high EED areas perceived that their atmosphere at work was worse and felt they were discriminated against more frequently than those from low EED areas so, adjusting for those negative confounders decreased the OR. However, Ecuadorians living in areas with high EED had higher earnings and a higher proportion had an economic confident so adjusting for those increased the OR of interest. Perceived discrimination was the strongest confounder. Our group has previously published a paper stating the individual risk factors associated to poor mental health [31, 36] and, as reported by many authors [37–39], perceived discrimination was a very important risk factor for poor mental health in the Ecuadorians [31].

In our study, the areas with high EED had a higher overall proportion of migrants from all geographical origins (total ethnic density), were more rural and the average education of their census population (a proxy of socio-economic status) was lower than in the areas with low EED. The negative effect on mental health associated with a high EED was also partially confounded by socio-economic deprivation of the area. Indeed, the proportion of registered people with less than primary education was one of the largest single confounders suggesting that much of the effect associated to EED could be explained by the poverty of the area. This effect has been found by many other authors and favour material versus psychosocial causes of ill health [11–13]. After adjusting for contextual and individual confounders of PPC, the odds of having poor mental health was still 37 % higher in Ecuadorians

Table 3 Odds ratios for the association between Ecuadorians Ethnic Density (EED) and Possible Psychiatric Case (PPC) adjusting for individual and contextual variables

	Model 1, Empty model	Model 2, EED included	Model 3, EED and individual- level variables	Model 4, EED, individual variables, proportion of people with less than primary education
<i>Fixed effects</i>				
AR-level variables				
EED				
Low (<6 %)		1.00	1.00	1.00
High (≥6 %)		1.65 (1.01–2.72)	1.48 (0.87–2.55)	1.37 (0.78–2.40)
Proportion of people with less than 1 education				
1 (13–36 %)				1.00
2 (37–52 %)				1.34 (0.67–2.69)
3 (53–66 %)				1.48 (0.77–2.84)
Individual-level variables				
Sex				
Men			1.00	1.00
Women			3.67 (2.21–6.09)	3.69 (2.22–6.12)
Individual salary				
Higher than NMW			1.00	1.00
Similar to NMW			0.92 (0.52–1.64)	0.90 (0.51–1.61)
Inferior to NMW			2.95 (1.28–6.80)	2.95 (1.28–6.79)
Has no salary/ Unknown			0.56 (0.18–1.70)	0.55 (0.18–1.67)
Economic confident				
No			1.00	1.00
Yes			0.51 (0.30–0.85)	0.52 (0.31–0.87)
Unknown			1.07 (0.22–5.20)	1.07 (0.22–5.19)
Attend associations				
No			1.00	1.00
Yes			2.14 (1.26–3.61)	2.19 (1.29–3.70)
Atmosphere at work				
Excellent/good			1.00	1.00
Regular/bad			1.91 (1.14–3.21)	1.85 (1.10–3.11)
Unknown			0.95 (0.46–1.92)	0.92 (0.45–1.88)
Discrimination				
Never			1.00	1.00
Sometimes			1.32 (0.78–2.24)	1.32 (0.78–2.23)
Always/almost always			2.34 (1.28–4.31)	2.38 (1.30–4.38)
<i>Random effects</i>				
Between AR variance (SE)	0.246 (0.154)	0.179 (0.136)	0.187 (0.160)	0.157 (0.154)
ICC (%)	6.95			

NMW National minimal wage,
SE Standard error, ICC
Intraclass correlation coefficient

who lived in areas with more than 6 % of Ecuadorians compared to fewer than 6 %. We acknowledge that this difference is not statistically significant and speculate that there may be other unmeasured contextual effects. Nevertheless, the magnitude of the association between these unmeasured confounders and PPC should have to be extremely high to reverse the direction of the OR, and this is unlikely.

Our results join the pool of reports that have found no protective effect of ethnic density for mental health in ethnic minority members [9, 10], but, as far as we know, are the first to show these effects in a Southern European setting of recently arrived economic migrants. We decided to study Ecuadorians' Ethnic Density rather than total ethnic density as we were interested in co-ethnics support.

As mentioned in the introduction, we anticipated ethnic density effects to be context specific. Our findings have to be explained within the recent migration processes into Spain that may have neither permitted the establishment of the ethnic networks and community links nor the creation of Ecuadorian institutions, newspapers or the establishment of local businesses, thought to underlie the protective effect for health outcomes. Indeed, publications reporting positive ethnic density effects come from Anglo-Saxon and Northern European countries with established ethnic minority communities [2–8], a different scenario to the Spanish one, where Ecuadorian migrants started settling in during the mid-90s. The median residence time in Spain of the Ecuadorians in this study was 5 years. Building up a community requires time and permanence in a given site suggesting that the mechanisms through which ethnic density effects may benefit established minorities may not be present in recent migration settings.

Pickett and Wilkinson have described some of the challenges and limitations of assessing ethnic density effects on health [20]; the shape and the cut-off point for ethnic density is an important one. We have taken special care in deciding which cut-off point to choose after exploring the shape of the relationship between EED and PPC, which was far from linear. We repeated the analyses with different cut-off points for EED and the main conclusion remained unaltered (data not shown). We are aware that our sample size is small but, by conducting an ad-hoc survey rather than using general surveys, we have been able to collect with great detail a high number of individual variables which have allowed us to perform fine adjustments by first-level factors. However, collecting other area level variables such as unemployment rates, housing prices and measures of Ecuadorians' social capital was an impossible task as those data were not available at the area level we were studying [26]. We have used the educational level attained by the people of the AR as from the Census 2001 as a proxy of socio-economic status. This has been used by Regidor et al. [33] in Spain. Attending an association was associated with an increased odds of poor mental health. Given the transversal designs of our study it is not possible to establish directionality and this result may suggest that people who have poor mental health or risk factors to develop mental health problems seek help by attending associations.

These are the first analyses exploring ethnic density effects on mental health in a recent migratory context and the first in a Southern European country. We have found no protective association between the Ecuadorians' ethnic density of the area of residence and the mental health of the Ecuadorians. In this study, we have identified that Ecuadorians living in areas with a higher density of Ecuadorians have poorer mental health than those who live in

areas with lower density and that, as well as individual risk factors such as exposure to discrimination, part of that effect is explained by the low socio-economic status of the area of residence. These results are relevant for policy interventions as the areas with high EED are largely rural, have also higher total ethnic density and have little formal education, mimicking the patterns described in other countries. Efforts to fight against racism and to reduce discrimination are needed. Besides, our results call for further research into how ethnic density effects operate in different contexts.

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