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Does Municipal Socioeconomic Development Affect Public Perceptions of Crime? A Multilevel Logistic Regression Analysis

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Abstract Chile is considered as one of the safest countries in Latin America, with a below-the-average world crime rate. However, during the last few decades, the country has experienced a deterioration in public perceptions of safety. This paper investigates public perceptions of crime in the 52 municipalities of the metropolitan area of Santiago, by employing an index of socioeconomic development for each municipality. Multilevel logistic regression analysis is used in order to assess the impact of individual and municipal-level variables on perceptions of crime in these municipalities. The results show that women exhibit higher perceptions of crime, while people living in rural areas, inactive people, and people with higher education and income have generally lower perceptions. Multidimensional poverty is positively associated with high perceptions of crime, while municipal spending on health and/or education does not show a relationship with perceptions of crime. Regarding socioeconomic development level of municipalities, the results show that people living in municipalities of high development show the lowest perceptions of crime, despite the fact that these municipalities do actually exhibit the highest crime rates, a fact confirming the '*perception gap*' and the '*neighbourhood favouritism*' theories. The results and conclusions of this study can be used not only by local policy-makers but also by officials in other cities that—like Santiago—are characterised by high urban segregation.

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1 Introduction

Research has shown that the negative impact of crime goes beyond victims and perpetrators. Fear of crime and general low perceptions of public security lead to detrimental health effects, including feelings of anxiety, alienation, isolation, and low well-being (Liska et al. 1982; Pearson and Breetzke 2014). People's physical and psychological isolation lower social cohesion, increase anti-social behaviour, and lower mutual trust (Brand and Price 2000; Skogan 1986).

Besides the disintegration of neighbourhoods' social organisation, low public safety perceptions have a negative impact on economic growth, income, employment, and the overall economic development of an area. Areas that are considered unsafe are not generally attractive for investment or for opening new businesses, thus leading to economic stagnation, deterioration, poverty, and crime. At the same time, high public perceptions of crime have a direct impact on local businesses, tourist numbers, and property values, trapping those places into a vicious cycle of poverty (Detotto and Otranto 2010).

More recent research has underlined the necessity to investigate perceptions of crime at a neighbourhood level, due to two reasons (Fitzgerald 2008). Firstly, because certain socioeconomic conditions of neighbourhoods may be directly linked to residents' behaviours and views, independently of their own personal characteristics (Sampson et al. 1997). Secondly, because residents' perceptions of crime and 'social disorder' in their neighbourhood may explain variations in perceptions of crime, even after controlling for individual and neighbourhood characteristics (Wyant 2008).

The aim of this study is to investigate public perceptions of crime across the municipalities of the metropolitan region of Santiago, Chile, by employing an index of socioeconomic development for each municipality. The hypothesis is that people living in more socioeconomically-developed municipalities have lower perceptions of crime if compared to people living in less-developed municipalities. The paper employs multilevel logistic regression analysis in order to see the effect that individual variables on the one hand, and municipal-level variables on the other, have on perceptions of crime. Using municipal-level variables, that is, a stricter context for level 2 analysis than city or province-level variables (Benavente and Turén 2012) or country-level variables (see for instance, Hummelsheim et al. 2011), allows for a more meaningful analysis of the factors affecting public perceptions of crime. Employing municipal-level variables is particularly important in the case of a highly-segregated city, like Santiago.

The remaining paper is organised as follows. Firstly, a brief literature review of perceptions of crime is provided, followed by background information regarding crime, and perceptions of crime in Chile. Next, the data and methodology are presented, before moving on to the results. Finally, the results are discussed, followed by conclusions and final comments.

2 Literature Review on Public Perceptions of Crime

Fear of crime can be defined as the fear for falling a victim to crime or for others being victimised, and is, therefore, more sensitive to objective risks than perception of crime. Perception of crime, on the other hand, is a more cognitive judgement and relates to people's estimation on crime within their own community and within society (Adams and Serpe 2000). Many studies have investigated individual and neighbourhood-level factors

that have an impact on perceptions of crime and fear of crime (see for example, Breetzke and Pearson 2015; Evans and Fletcher 2000; Skogan 1986).

Individual-level factors include determinants such as (a) *gender*: women consistently have higher perceptions of crime (Dichter and Gelles 2012; Tulloch et al. 1998); (b) *age*: older people have generally lower perceptions of safety in their own home (Harris and Jensen 1998) or outside (Hummelsheim et al. 2011); (c) *socioeconomic status*: people who live in poverty have higher perceptions of crime, most likely on account of lack of material and social resources (Lupton 1999; Pantazis 2000), while people with better education and income are less fearful, on large account because they can afford to live in safer neighbourhoods (Grabosky 1995; Núñez et al. 2012); (d) *prior victimisation*: both through direct and indirect experience of family and friends, people can have an increased fear of crime and higher perceptions of insecurity (Dichter and Gelles 2012); and e) *ethnicity*: people from ethnic minorities are more likely to exhibit higher perceptions of crime (Ceccato 2013), especially in certain environments, such as public transportation (Delbosc and Currie 2012).

On the other hand, neighbourhood-level determinants that have been investigated and been found to have a positive association with high perceptions of crime include communities with high ethnic diversity (Kershaw and Tseloni 2005), high levels of crime (Taylor 2001; Wyant 2008), a significant share of young population (Hale et al. 1994), low income (Fitzgerald 2008), and social and physical disorder (Skogan 1990).

Especially the last determinant has received increasing attention in the relevant literature on neighbourhood characteristics and perceptions of crime. Studies have shown that '…*public insecurities about crime are rooted in concerns about neighbourhood breakdown and stability*' (Hummelsheim et al. 2011, p. 4), and that personal victimisation or crime rates do not have a large impact on public perceptions of crime (Warr 2000). Instead, high perceptions of crime are linked to a generalised feeling of insecurity, stemming from 'incivilities' or 'disorder' in neighbourhoods (Sampson and Raudenbush 2004; Skogan 1986), and may reflect different socioeconomic and political conditions that exist in those neighbourhoods, and that in the end influence perceptions of social order, trust, and well-being (Hummelsheim et al. 2011). 'Incivilities' and 'disorder' may include anti-social behaviour, such as the existence of graffiti, broken windows, vandalism, or litter on the streets, which residents perceive as deterioration in neighbourhood conditions and worsening of crime (Cordner 2010; Ceccato 2013); in fact, the worse the neighbourhood conditions are, the lower the perceived level of safety is (Austen et al. 2002). This applies as well to neighbourhoods that are characterised by low social cohesion, and even neighbourhood breakdown: when people feel disconnected, perception of crime increases (Jackson et al. 2009). These feelings of insecurity are amplified by domestic and international conflicts, job uncertainty, increase in socioeconomic inequality, and reduction in welfare support (Bauman 1999; Walklate and Mythen 2008).

Concerning the methodology of investigating perceptions of crime, multilevel models have gained popularity in the analysis of perceptions of crime since they may disentangle individual from neighbourhood/city/region/country-level determinants (Raudenbush and Bryk 2002). Such models "…*not only provide an efficient illustration of the degree to which a given individual-level outcome varies across geographic areas, but also formally adjust for the non-independence of sample members living within the same city*" (Franklin et al. 2008, p. 214). In other words, multilevel models can analyse data that includes individuals nested in higher-level units, in this case, municipalities.

Previous studies focusing on perceptions or fear of crime and employing multilevel models have mostly focused either on a national level (Hummelsheim et al. 2011; Vauclair and Bratanova 2017; Visser et al. 2013), on a city/province level (Benavente and Turén

2012), or on neighbourhood level with a quite broad definition of what 'neighbourhood' is (Fitzgerald 2008; Latkin et al. 2009; Roman and Chalfin 2008). Many of these studies have employed the usual individual-level variables, such as age, gender, employment status, and education. Regarding Level 2, variables that have been used include crime rate, immigration rate, employment rate, various welfare indicators, spending on education and health, proportion of low-income families, proportion of minorities, and income inequality.

The current study adds to existing literature on perceptions of crime by combining four factors: (a) it analyses perceptions of crime at a municipal-level, a clearly-defined geographical area, where residents share many common characteristics; (b) it investigates both residents' perception on 'disorder' and 'incivilities' (such as alcohol consumption in public places), as well as their perceptions on crime/offences (such as robberies and attacks); (c) it includes a measurement of the level of socioeconomic development of each municipality, based on the Human Development Index methodology, which—to the best of the author's knowledge—has not been employed before at a municipal-level; and (d) it includes multi-dimensional poverty as a Level 2 variable, which includes a wider range of deficiencies, than merely income. Overall, the study provides useful conclusions regarding perceptions of crime for cities that—as Santiago—are characterised by high urban segregation, a fact that can lead to vast differences in perceptions of crime among residents of different areas, which in turn can hinder efforts of addressing inequality and promoting residents' well-being.

3 Crime and Public Perceptions of Crime in Chile

Chile is regarded as one of the most developed and stable countries in Latin America, and has the lowest homicide rate in the region (3.6/100,000 people in 2014) (United Nations Office on Drugs and Crime-UNODC 2013). It has strong and independent institutions, low corruption, and the judicial system is largely not plagued by inefficiency (International Security Sector Advisory Team-ISSAT 2015). Security forces are also well-equipped and well-trusted, and are not characterised by high levels of corruption and criminal infiltration seen elsewhere in the region (ISSAT 2015). As a result, Chile does not suffer from a generalised problem of serious violence and crime (Government of Chile 2009).

Nevertheless, various reports reveal that crimes/offenses have greatly increased in the country (INE and Carabineros de Chile 2011, 2016; Mertz 2013). Reports to the police (from minor offences to serious crimes) have more than doubled in fifteen years: from 1,409,939 in 2000 to 3,091,471 reports in 2015. On the other hand, the number of people detained has dropped by 40% during the same period (INE and Carabineros de Chile 2016).

Overall, controlling for the influence of variables that have a significant impact on crime (for instance, income and employment, education, poverty and inequality, quality of life in neighbourhoods and cities, effectiveness of the state in the provision of public goods, production and trafficking of drugs), the homicide rate in Chile is 25% lower than in the world average country, but the rate of theft and robberies is 30% higher than the world average (Loayza and Schmidt-Hebbel 2013). Indeed, Chile shows rates of victimisation related to property crimes several times higher than those recorded in developed countries and sometimes equal or superior to other countries in the region (Government of Chile 2009, 2014).

Similar to the increase in actual crime, so have public perceptions of crime been on the rise. Since the early 1990s, there has been a wide perception in Chile that crime has reached uncontrollable levels; in the 1990s and early 2000s, crime was regarded as the country's second most important problem, after poverty (Frühling 2007). Since 2005, however, crime and public security have become Chileans' number one problem

(Government of Chile 2009). According to the 2015 Citizen's Security Survey, 23.2% of people interviewed answered that the most important problem of national importance for them is delinquency, followed by health (13.1%), and poverty (12.1%) (INE 2016). Concerning delinquency, the same survey revealed that:

- Country level: most people (86.6%) believe that delinquency in the country has increased: this percentage reaches 89.6% for people in the first quintile and falls to 81.2% for people in the fifth quintile;
- Municipal level: most people (69.5%) believe that delinquency in their municipality has increased: this percentage reaches 70.6% for people in the first quintile and falls to 66% for people in the fifth quintile; and
- Neighbourhood level: 46.4% believe that delinquency in their neighbourhood has increased while 42.8% believe it has remained the same: there is no significant difference among the quintiles.

The results confirm international studies indicating lower perceptions of crime for people living in more affluent neighbourhoods (Ross and Jang 2000; Varela and Schwaderer 2010). They are also in line with previous research indicating that women and the elderly have higher public perception of crime (Dichter and Gelles 2012; Harris and Jensen 1998). Overall, various surveys on public perception of crime in Chile (for example, of Fundación Paz Ciudadana-Adimark, and ENUSC) have consistently suggested that Chileans are increasingly worried about delinquency and crime, especially because many perpetrators are young men—often minors—that use violence, and who are frequently not punished (de Rementería 2005).

According to de Rementería (2005), this problem is more of an insecurity perception than a real experience, generated by the mass media and experts interested in promoting their services in the emergent '*security market*'. Media coverage in Chile—with a more influential role played by television—is particularly focussed on lengthy reports and discussions regarding delinquency and thus, may influence to a certain degree Chileans' perceptions of crime (Browne and Tomicic 2011; Scherman and Etchegaray 2013). Indeed, in the last decade there has been an increase in television time dedicated to public security, and thus the media has become an important variable in explaining public security as a significant issue in the public agenda (Universidad Católica 2013).[1] Another study has also shown that public perception of crime in Chile is associated with the political preferences of the population: right-wing people or people leaning towards the right are more likely to believe that crime and delinquency are one of the most important issues for the country when compared to left-winged or centrist people (Universidad Católica 2013).

4 Methodology

4.1 Aims and Hypotheses

The aim of this study is to investigate the effect of individual and municipal-level variables on public perceptions of crime in the 52 municipalities of the metropolitan region of Santiago, Chile, by employing an index of socioeconomic development for each

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[1] In their study on news and fear of crime in Chile, Scherman and Etchegaray (2013) found that the variables with the greatest impact on fear are not related to the media, but include perceptions on environment problems, respondent's gender, age, and whether he or she has been the victim of a crime.

municipality. The study tests the hypothesis that people living in municipalities with a higher degree of socioeconomic development have lower perceptions of crime, even after controlling for the effect of socio-demographic variables (for example, gender and age), and conditions in the local area that could affect fear and perception of crime (such as crime rate, employment rate, and spending on health).

While this is the main hypothesis, the study also tests hypotheses at an individual and municipal level. At the individual level, the study expects to find that women, the elderly, and the unemployed have higher perceptions of crime, while people living in rural areas, the more educated, and people with higher incomes have lower perceptions; these assumptions are based on previous research (Amerio and Roccato 2005; Hipp 2010; Vieno et al. 2013). At the municipal level, the study expects to find that high socioeconomic development of municipalities is negatively associated with public perceptions of crime, that is the higher the level of development the lower residents' perceptions of crime are. On the other hand, crime rate and multidimensional poverty are expected to be positively linked with high perceptions of crime, since these variables increase people's vulnerability. Employment rate (as a proxy for people's economic security), and spending on education and health are expected to be negatively associated with high perceptions of crime.

4.2 Study Area

The area under investigation includes the 52 municipalities of the metropolitan region of Santiago, Chile. The metropolitan region is divided into six provinces: Santiago province (with 32 municipalities), Cordillera province (with 3 municipalities), Talagante province (with 5 municipalities), Maipo province (with 4 municipalities), Chacabuco province (with 3 municipalities), and Melipilla province (with 5 municipalities). The geographical location of the metropolitan region of Santiago is provided in Fig. 1.

According to the latest census (2012), the metropolitan region of Santiago concentrates 41% of the country's total population, i.e. 7,142,893 people (INE 2014).
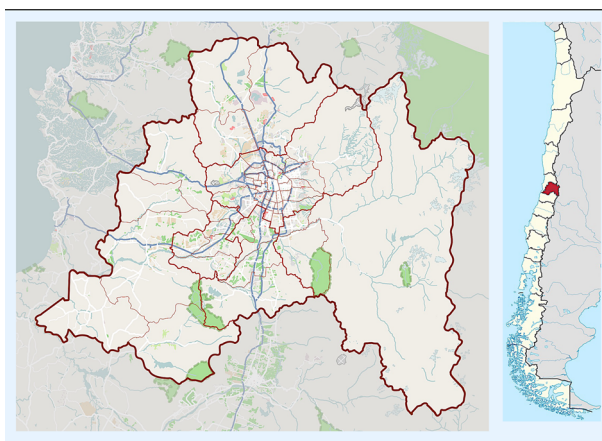

Fig. 1 Geographical location of metropolitan region of Santiago, Chile. *Source*: Wikimedia (2016) and Wikipedia (2016)

4.3 Data and Variables

The study investigates public perception of crime in the municipalities of the metropolitan region of Santiago. The municipalities have been categorised according to their development level, on the basis on the Index of Socioeconomic Development (ISED) developed by Gattini et al. (2014), who calculated the ISED score for 324 municipalities in the country. Gattini et al. (2014) applied the same methodology as the UNDP's Human Development Index, adapted to existing information at municipal level. Thus, the ISED includes the components of economy (per capita monthly income and poverty), education (average years of schooling), and housing and sanitation (percentage of good and acceptable housing materials, and sewer or septic tanks), with a 1/3 weighting for each component. The relative index of each indicator is expressed with a relative value between 0 and 1.

The municipalities are then ranked according to their ISED score, from very highly-developed municipalities to municipalities of very low development. In the case of the municipalities of the metropolitan region of Santiago, three municipalities are characterised as of very high development (ISED score > .900), nine municipalities as of high development (.900 > ISED score > .700), fifteen as of medium development (.700 > ISED score > .650), eleven as of low development (.650 > ISED score > .600), and fourteen municipalities are characterised as of very low development (.600 > ISED score > .450).

For the socio-demographic and dependent variables, the study employs data from the 2013 National Socioeconomic Survey (Encuesta de Caracterización Socio-Económica Nacional—CASEN), conducted every two to three by the Ministry of Social Development of the Government of Chile. The survey estimates the magnitude of poverty and income distribution, identifies the needs of the population, especially those living in poverty and those groups that are identified as priority, and evaluates the gaps separating different social segments and geographical areas. It also assesses the impact of social policy and social programmes on household income and redistribution (Ministry of Social Development 2016a). The units of analysis of the survey (households and individuals) were selected in a probabilistic, stratified, and multistage manner, with the sample being representative at country level, geographic area (urban and rural), and region. The 2013 CASEN survey covered 66,725 households—218,491 people—across the fifteen country regions and 346 municipalities.

A secondary analysis on the 2013 CASEN data was performed, complemented with municipal-level data taken from the National System of Municipal Information (SINIM) and the National Statistical Institute (INE). The variables used for the study are the following:

- *Dependent variables*: (a) *Robberies and assaults on people, homes and/or vehicles*; (b) *Existence of points/areas of alcohol consumption*; (c) *Drugs trafficking*; and (d) *Insufficient police vigilance*. In the CASEN survey, the question is phrased as follows: "Are/Is '….' a public security problem?", 0 = No, 1 = Yes. These direct questions—as opposed to the more general but frequently-used 'How safe do you feel walking alone in this area after dark?'—evaluate more directly concrete fears, for example, how worried people are of a particular crime or disorder (Boers 2003; Farrall, Jackson and Gray 2009).
- *Individual-level variables*: (a) *Gender*: male/female; (b) *Zone*: urban/rural; (c) *Age*: from 0 to 101 years of age; (d) *Age²*; (e) *Employment*: employed/unemployed/inactive;

(f) *Education*: years of schooling; and (g) *Equalised income* (log): household income divided by the square root of household size.

- *Municipal-level variables*: (a) *Economic development*: socioeconomic development of municipalities measured according to their ISED score; (b) *Crime rate*: ratio between reported number of criminal offences per municipality and its corresponding population; (c) *Employment rate*: ratio of the employed to the working-age population for each municipality; (d) *Multidimensional poverty*: percentage of population in each municipality qualified as multidimensionally-poor;[2] (e) *Municipal spending on education*: spending on education per capita in each municipality; and (f) *Municipal spending on health*: spending on health per capita in each municipality.

5 Results

5.1 Data Analysis

Data is analysed using multilevel logistic regression with STATA Version 11.2. The analysis involves fitting two logistic regression models for the dependent variable: a within-municipality level (Model 1) and a between-municipality model (Model 2). Model 1 estimates the links between the individual variables and perceptions of crime for individual i in municipality j. Model 2 estimates the influence of municipalities' characteristics on municipal-level adjusted perceptions of crime. In the study, no cross-level interactions were analysed; therefore, no individual-level variables were centred while municipal-level variables were grand mean centred. Logistic regressions for binary dependent variables were employed to calculate odds ratios.

No collinearity distorted the results. While *age* and *age²* were highly correlated, as expected, the mean VIF for the remaining variables was 1.70.

5.2 Descriptive Results

The sample (N = 27,588) was representative of the population living in the 52 municipalities of the metropolitan region of Santiago. 46% of people in our sample were male, and 95% lived in urban areas. Age-wise, 5.8% of people were in the 0-17 age group, 28% in the 18-30 age group, 23.7% in the 31-45 age group, 29.4% in the 46-65 age group, and the remaining 13.1% were above 66 years of age. Regarding employment, 57.2% were employed, 3.6% were unemployed, and 39.2% inactive. Descriptive statistics for the remaining individual and municipal-level variables are shown in Table 1.

Table 2 provides the correlation matrix of the individual and municipal-level variables in the study.

Out of the four issues of public concern, people were more worried about *robberies and attacks* with half the people concerned about this issue, followed by *points of alcohol consumption* and *insufficient police vigilance* (44% of people), and *drugs trafficking* with 33% of people answering that it is indeed a serious issue of public concern.

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[2] Multidimensional poverty includes the dimension of education, health, employment and social security, and housing (25% weight each); these dimensions have 12 indicators in total (8.33% weight each). A household is considered multidimensionally-poor if it presents 25% or more deficiencies (Ministry of Social Development 2016b).

Table 1 Descriptive statistics for individual and municipal-level variables

Variables	Mean	S.D.	Min	Max
Education (years)	11.18	4.12	0	22
Equalised income (Chilean pesos)*	613,315	770,614	2799	23,200,000
Economic development	.692	.108	.484	.992
Crime rate	.123	.064	.050	.475
Employment rate	60.57	5.60	44.1	78.2
Multidimensional poverty	18.60	8.41	.48	50.89
Spending on education (Chilean pesos)*	82,612.11	53,607	30,385	326,397
Spending on health (Chilean pesos)*	56,656	24,129	8646	118,163

* 1USD = 495 Chilean pesos (average for 2013)

5.3 Logistic Regression: Unconditional Model (Model 0)

Following usual multilevel modelling strategies, an empty model without any explanatory variables at either individual or municipal level is estimated first (Model 0). This model estimates the proportion of total variation in public perceptions of crime that is related to differences between municipalities rather than differences between individuals (Table 3).

In our sample, all variations in public perceptions of crime at municipal level were significant, that is, all likelihood ratio tests comparing the null model with the logistic regression were statistically significant with $p < .000$. Between 15 and 24% of the total variation in perceptions of crime can be attributed to differences between municipalities; all constitute a sizable proportion, so using multilevel logistic regression is appropriate for the analysis.

5.4 Logistic Regression: Individual-Level Determinants (Model 1)

Model 1 introduces key individual characteristics associated with public perceptions of crime at an individual level (Table 4, Model 1). Previous research has shown that certain degree of perception of crime in neighbourhoods could be explained by the characteristics of the individuals that live there; as a result, it is expected that these individual characteristics reduce the amount of variation between neighbourhoods (Willms 2002). Model 1 shows that individual-level variables did reduce the variance between municipalities (the exception being for 'insufficient police vigilance', for which there was no reduction): the proportion of total variation in perception of crime that was explained by the municipality where one lives in was reduced to between .14 and .22% after controlling for individual characteristics, representing a 3–10% reduction from Model 0.

Consistent with our hypotheses, women predicted higher levels of the dependent variables. People living in rural settings of these municipalities, and inactive people were less likely to report high perceptions of crime. Contrary to expectations, old age had no impact on perceptions of crime, while being unemployed did not show a statistical significant relationship with the dependent variables. Education and income—while statistically significant—did not show a clear general relationship (either positive or negative) with the dependent variables.

Table 2 Correlations matrix of individual and municipal-level variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. Sex	1.000											
2. Zone	−.013*	1.000										
3. Age	.070***	.008	1.000									
4. Employment	.236***	.018*	.093*	1.000								
5. Education	−.045***	−.114***	−.350***	−.249***	1.000							
6. Income	−.040***	−.058***	.105***	−.186***	.431***	1.000						
7. Econ.develop.	.010	−.203***	.050***	−.048***	.376***	.508***	1.000					
8. Crime rate	−.006	.155***	.029***	−.031***	.093***	.105***	.223***	1.000				
9. Health care p.c.	.002	.113***	.025***	.033***	−.172***	−.194***	−.499***	.051***	1.000			
10. Education p.c.	−.011*	.278***	.037***	−.003	−.024***	−.029***	−.116***	.500***	.416***	1.000		
11. Poverty	−.010	.122***	−.019***	.026***	−.258***	−.330***	−.651***	.069***	.484***	.314***	1.000	
12. Employment r.	−.006	−.119***	−.008	−.018***	.184***	.198***	.417***	.281***	−.295***	.104***	−.090***	1.000

* $p < .05$; *** $p < .001$

Table 3 Unconditional model (Model 0), coefficients

Variables	(1)	(2)	(3)	(4)
Intercept	−.128 (.082)	−.376** (.113)	−.885*** (.149)	−.382*** (.098)
Between-municipalities variance	.586***	.810***	1.066***	.700***
Intraclass correlation coefficient-ICC	.15	.20	.24	.18

(1) Robberies and assaults on people, homes and/or vehicles; (2) Existence of points/areas of alcohol consumption; (3) Drugs trafficking; and, (4) Insufficient police vigilance

** $p < .01$; *** $p < .001$

5.5 Logistic Regression: Municipal-Level Determinants (Model 2)

Model 2 looks at whether the variation in perceptions of crime could be better explained by certain characteristics of municipalities rather than the characteristics of people living there (Table 4, Model 2).

The results of Model 2 show that the addition of municipal-level variables had a relatively minor influence on the strength of the relationship between individual-level variables and perceptions of crime, which remained significant after controlling for municipal variables. Consistent with our hypothesis, the higher the socioeconomic development of a municipality the less chance there is for people residing there to have high perceptions of crime. Spending on education and health—while statistically significant—do not have an impact on perceptions of crime (with coefficients being very close to 1), while multidimensional poverty is positively associated. Crime rate and employment rate were statistically insignificant.

Model 2 indicates that between-municipalities variation in perceptions of crime is due more to municipal factors than individual ones. Adding municipal-level variables reduced the proportion of total variance in perceptions of crime that was explained by municipal variables by up to 33%, compared to up to 10% in Model 1. Nevertheless, despite the statistically significant contribution of municipal-level variables, a significant amount of variation in perceptions of crime was left unexplained, indicating that differences between municipalities regarding perceptions of crime are not totally accounted for by the socioeconomic conditions in those areas.

6 Discussion

This study used multilevel logistic regression analysis in order to model public perceptions of crime among people living in the 52 municipalities of the metropolitan region of Santiago, Chile. The results of the study showed that women are more likely to report higher levels of fear of crime, in accordance to previous studies (Amerio and Roccato 2005; Fitzgerald 2008; Hipp 2010). People living in rural parts of these municipalities were up to 3.3 times less likely to have high perceptions of crime than people living in urban areas. Although few studies (see for example, Lawtey and Deane 2000) have found that perceptions of crime in rural areas are higher despite the fact that crime levels are usually lower, most studies have found that perceptions of crime are actually lower in rural settings (Marshall and Johnson 2005). Regarding older people, the results showed that old age had no impact on perceptions of crime. While many studies have found that older people

Table 4 Multilevel logistic regression, Models 1 and 2 (odds ratios)

	Model 1				Model 2			
	1	2	3	4	1	2	3	4
Level 1: Individual (N = 27,588)								
Gender:[a] Female	1.090** (1.036–1.146)	1.089** (1.033–1.148)	1.033 (.976–1.093)	1.048 (.995–1.103)	1.091** (1.036–1.149)	1.090** (1.033–1.150)	1.042 (.983–1.104)	1.043 (.989–1.099)
Zone:[b] Rural	.992 (.864–1.140)	.335*** (.286–.393)	.286*** (.239–.342)	.678*** (.585–.787)	.955 (.828–1.102)	.345*** (.293–.405)	.300*** (.250–.360)	.617*** (.530–.720)
Age	1.004 (.997–1.011)	1.003 (.996–1.011)	1.001 (.994–1.009)	1.001 (.993–1.008)	1.004 (.997–1.011)	1.003 (.996–1.011)	1.002 (.994–1.010)	1.001 (.994–1.009)
Age^2	1.000 (.999–1.000)	.999* (.999–.999)	.999* (.999–.999)	.999 (.999–.999)	.999 (.999–1.000)	.999* (.999–.999)	.999** (.999–.999)	.999 (.999–1.000)
Education	1.024*** (1.017–1.032)	.977*** (.969–.985)	.954*** (.946–.962)	1.002 (.994–1.010)	1.026*** (1.018–1.034)	.978*** (.970–.986)	.953*** (.944–.961)	.999 (.991–1.007)
Employment:[c] unemployed	.976 (.853–1.118)	1.080 (.940–1.241)	.931 (.802–1.080)	1.058 (.923–1.212)	.982 (.856–1.126)	1.094 (.951–1.260)	.933 (.802–1.085)	1.069 (.931–1.226)
Inactive	1.043 (.982–1.109)	.908** (.852–.968)	.858*** (.801–.918)	.964 (.906–1.026)	1.053 (.989–1.120)	.910** (.853–.970)	.857*** (.799–.918)	.970 (.910–1.033)
Equalised income (log)	1.001 (.960–1.043)	.796*** (.761–.832)	.751*** (.715–.789)	1.091*** (1.045–1.138)	.992 (.951–1.035)	.804*** (.769–.842)	.761*** (.724–.800)	1.081*** (1.035–1.129)
Level 2: Municipality (N = 52)								
Economic development					.488 (.073–3.256)	.027*** (.004–.184)	.003*** (.000–.029)	.141 (.013–1.568)
Crime rate					.429 (.021–8.837)	3.699 (.152–89.859)	3.582 (.080–160.741)	.650 (.018–24.092)
Employment rate					1.010 (.986–1.034)	1.016 (.976–1.058)	1.030 (.997–1.065)	1.012 (.984–1.042)
Multidimensional poverty					1.005 (.990–1.021)	1.032** (1.010–1.055)	1.013 (.992–1.033)	1.022 (.997–1.047)

Table 4 continued

	Model 1				Model 2			
	1	2	3	4	1	2	3	4
Spending on education (per capita)					.999 (.999–1.000)	.999** (.999–.999)	.999*** (.999–.999)	.999 (.999–1.000)
Spending on health (per capita)					.999** (.999–.999)	1.000 (.999–1.000)	1.000 (.999–1.000)	.999 (.999–1.000)
Between-municipalities variance	.559***	.701***	.928***	.703***	.517***	.542***	.641***	.624***
$\chi^2(52)$	1378.45	1839.44	2391.69	1815.11	1225.80	993.15	1032.15	1133.40
Intraclass correlation coefficient (ICC)	.14	.18	.22	.18	.14	.14	.16	.16
Percentage reduction in ICC from Model 0	3.33	10.0	8.33	.00	10.00	30.0	33.3	11.11

95% confidence intervals in parentheses

(1) Robberies and assaults on people, homes and/or vehicles; (2) existence of points/areas of alcohol consumption; (3) drugs trafficking; and, 4) insufficient police vigilance

* $p < .05$, ** $p < .01$, *** $p < .001$

[a] Male as reference

[b] Urban as reference

[c] Employed as reference

express higher fear of crime (Fitzgerald 2008; Hummelsheim et al. 2011), Moore (2010) has found that if other important determinants of fear of crime, such as income and gender, are highlighted then this paradox of older people being more afraid of crime become less important; in such a case, fear of crime is related to other factors that genuinely reflect risk. Moore and Shepherd (2007) confirm contradictory results of research focusing on fear of crime and age.

Regarding employment, whereas being unemployed was not statistically significant in the study, being inactive was negatively associated with high perceptions of crime. Many studies divide people into employed or not employed, and find that being employed is usually negatively associated with high perceptions of crime while not being employed is positively associated (Fitzgerald 2008; Hummelsheim et al. 2011); a few studies find no relationship (Visser, Scholte and Scheepers 2013). Further research is needed that will explore perceptions of crime among the employed, unemployed, and inactive people.

Education and income were generally negatively associated with high perceptions of crime (for variables 'existence of points/areas of alcohol consumption' and 'drugs trafficking'), thus agreeing with previous research (Hummelsheim et al. 2011; Fitzgerald 2008; Vieno et al. 2013). This might be due to the fact that more educated people and people with higher incomes can afford to live in a safer and well-ordered environment, with better infrastructure and police vigilance, and therefore their perceptions of crime might be lower. In one case ('robberies and assaults on people, homes and/or vehicles'), the odds of more educated people reporting that this is an issue of public concern was 2.6% higher; this might be due to the fact that assaults and/or robberies with intimidation have been increasing significantly in wealthier municipalities, where most educated people live (La Tercera 2016). This reason might also be behind why people with higher income were more likely to answer that 'insufficient police vigilance' is an issue of public concern.

Concerning municipal-level variables, the coefficients of 'spending on health per capita' and 'spending on education per capita', while statistically significant, approached one, thus indicating no relationship between such spending and perceptions of crime.[3] Currently, the highest spending per capita on education and health in the metropolitan region of Santiago is in municipalities of very low development, followed by the ones of low development (National System of Municipal Information-SINIM 2017). On the other hand, most people living in municipalities of very high and high development can afford private hospitals and schools, and therefore, those municipalities do not spend so much on education and health. Thus, these results could be an indication of the highly stratified and unequal health care and education systems in Chile, where often the provision of good-quality health care and education services are provided by the private sector in more affluent areas, which are usually also characterised by lower perceptions of crime.

In the case of Chile, increased spending on education and health is necessary in order to decrease feelings of vulnerability that in turn are positively associated with high perceptions of crime (Vieno et al. 2013). Although the country has made impressive efforts in trying to lower inequality (2015 GINI index of .495), and address the educational and health needs of most vulnerable neighbourhoods, it needs to make long-term investments in these areas, since the results of such policies cannot be observed in the immediate future.

Furthermore, the existence of a higher proportion of people living in multidimensional poverty is associated with a 3.2% increase in the likelihood of people expressing high

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[3] Other studies have shown that education expenditures explain a significant amount of variation in perceptions of crime among regions or countries, and that welfare expenditure can lessen social anxieties that are linked to high perceptions of crime (Hummelsheim et al. 2011).

levels of fear (for the variable 'existence of points/areas of alcohol consumption), confirming previous studies linking poverty with high perceptions of crime (Fitzgerald 2008; Hummelsheim et al. 2011). The other two municipal-level variables, that is, *crime rate* and *employment rate*, were not found to have a significant statistical relationship with public perceptions of crime.

Concerning the level of socioeconomic development of municipalities of the metropolitan region of Santiago, the results of the study show that for 'existence of points/areas of alcohol consumption', municipal development is negatively associated with high perceptions of crime, thus confirming that 'incivilities' and 'disorder' have a negative impact on people's perceptions of crime. According to Russo et al. (2013), this relationship is on account of three factors: (a) disorder may increase perceptions of crime because people may see it as an inability of the residents and the police to manage the neighbourhood; (b) disorder may increase perceptions of crime because residents relate it to social control breaking down; and (c) highly disordered neighbourhoods are also dangerous because of high crime rates. In the case of 'drugs trafficking', low development level of a municipality is also associated with high perceptions of crime. These results can be backed by 2013 police reports on drugs trafficking: most reports were in the provinces of Melipilla, Chacabuco, and Cordillera, which mostly concentrate municipalities of very low and low development (INE and Carabineros de Chile 2014).

The results confirm the study's main hypothesis that people living in highly-developed municipalities show the lowest perceptions of crime. These results agree with previous research showing that residents living in more affluent areas have lower levels of perceptions of crime (Universidad Católica 2013; Varela and Schwaderer 2010). Most of these studies found that actual crime rates were usually lower in richer areas (Cheshire 2007; Levitt 1999). However, in this case, municipalities of very high development have the highest crime rate on average, due to the high crime rate of one of the three municipalities, Providencia. This paradox may be a confirmation of the '*perception gap*' theory, that is, a dissonance between actual crime rate and the public view regarding crime, and of the '*hometown favouritism*' theory, that is the belief that one's own neighbourhood/municipality is superior (in this case, safer) to other neighbourhoods or municipalities in the country (Office for National Statistics 2015; Smith 1998).

One of the limitations of this study was that in the CASEN surveys, the typical single-item questions on fear of crime are not included. While more precise questions on perceptions of crime, like the ones employed in this study, have been found to be better at evaluating concrete fears (Boers 2003; Farrall et al. 2009), general feelings of insecurity may be better assessed by more general questions, such as for example, 'How safe do you feel walking alone in the area where you live after dark?, a question which has been employed extensively. A useful suggestion would be the inclusion of such question on fear of crime in the next CASEN survey.

Also, there was no question in the CASEN survey on victimisation, which some research has shown to be positively correlated with high fears of crime (see for instance, Hummelsheim et al. 2011). Studies have illustrated that the link between victimisation and fear of crime can be confirmed when victimisation is measured analytically and when fear of crime is seen as a multidimensional concept (see for instance, Lane and Meeker 2003). Face-to-face interviews may hide this relationship, however, on account of social desirability distortion, particularly among women (Bilsky and Wetzels 1997). More recent studies have concluded that this relationship is often weak or non-existent, and that removing victimisation from the analysis did not change the results (for example, Vieno

et al. 2011). However, more research needs to be done in order to determine the relationship of victimisation with fears of crime.

Another limitation of the study was that it was impossible to obtain data on municipal immigration rates for 2013. It would have been interesting to add such data in order to see whether it confirms the traditional thesis on the 'rationality' of fear of crime (Lupton and Tulloch 1999). In any case, the other variable related to the 'rationality' of fear of crime, that is *crime rate*, was statistically insignificant in the current study.

Despite these limitations, the study improved our knowledge of the complexities behind people's perceptions of crime. On the one hand, the study included variables at the municipal level, which is a much more clearly-defined territory than neighbourhoods. Thus, the stricter context used at Level 2, as opposed to national level seen in other studies, provided a more meaningful analysis of perceptions of crime. As Lorenc et al. (2014) suggest, "*…perceptions of crime are not a free-floating social phenomenon but make sense only when situated in particular physical locations…perceptions of space and the physical environment at a local level may interact with the broader determinants of fear in complex and unpredictable ways*". Thus, the addition of the socioeconomic development of municipalities as a Level 2 variable provided a significant characteristic of the 'physical location' where residents live, while the inclusion of concrete questions on residents' perceptions of crime and 'disorder' captured better residents' 'perceptions of space and physical environment'.

Using multilevel regression analysis is particularly useful when investigating perceptions of crime for cities suffering from high urban segregation, such as Santiago. The latest 2009 data on urban inequality showed that Santiago is a very socioeconomically-segregated city, with a GINI coefficient of .558 (UN Habitat 2013). A more recent study showed that 23% of urban segregation in the metropolitan region of Santiago—measured as lack of connectivity, infrastructure, access to services, and urban infrastructure—is gathered in just four municipalities of low and very low development; in contrast, the municipality of Las Condes (one of the three very highly-developed municipalities) concentrated only .7% of urban segregation (Moraga 2017). It is, therefore, imperative that better city regulatory plans are introduced that would promote the development of certain areas or create zones of urban renovation, which in the end would diminish urban inequality and promote people's quality of life. This is particularly important since high inequality—among the many other negative consequences—is positively associated with high perceptions of crime (Vauclair and Bratanova 2017).

7 Conclusions and Final Comments

High levels of crime and violence can undermine economic growth, threaten well-being, and impede social development. While the results of actual high crime rates are more tangible, low perceptions of security can have similar negative impacts on local development and residents' life satisfaction. Research has shown that low perception of safety is '*…a problem in its own right, separate from crime itself*' (Gray et al. 2008, p. 363), and that public perception of crime is heavily influenced by a series of factors, including gender, age, ethnicity, and socioeconomic status (Delbosc and Currie 2012; Dichter and Gelles 2012; Grabosky 1995; Núñez et al. 2012).

This paper employed multilevel regression analysis in order to investigate public perceptions of crime in the 52 municipalities of the metropolitan area of Santiago, Chile. The

study found that women are more likely to express high perceptions of crime, while inactive people, and people with a higher education and income are generally more likely to have lower perceptions of crime. On the other hand, a higher percentage of multidi-mensionally-poor people in a municipality is linked to higher perceptions of crime. Concerning the socioeconomic development of municipalities, people living in poorer areas with lower levels of economic and social infrastructure have higher perceptions of crime than people living in more affluent neighbourhoods, agreeing with previous studies (Austen et al. 2002; Núñez et al. 2012; Pantazis 2000). The study also confirmed the 'perception gap' theory, since it showed that people living in municipalities of high development are more likely to have lower perceptions of crime, despite the actual higher crime rates in those areas.

Overall, strategies that could narrow the existent 'perception gap' between crime rate and perceptions of crime include: (a) environmental audits of public places and pro-grammes to improve physical appearance; (b) cohesion strategies to increase community connectedness; (c) implementation of 'alcohol free zones' and other initiatives to dis-courage various types of anti-social behaviour; (d) high visibility of foot police patrols that connect and build a relationship of trust with the community; and (e) strategies that enable women to report violence or harassment and that provide access to support services (Shepherdson 2014). Community building, social programmes, policing strategies, and neighbourhood renewal policies are all necessary in order to lower elevated public per-ceptions of crime. These measures are essential so as to ensure people's well-being, local economic stability and development, as well as to avoid any increase in the actual crime rates, which is one of the negative consequences that high perceptions of crime can bring.

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