Incorporating Public Insecurity Indicators: A New Approach to Measuring Social Welfare in Mexico

Oscar A. Martinez-Martinez[1], Ana-Maria Vazquez-Rodriguez[2], Margaret Lombe[3], Pablo Gaitan-Rossi[1]

[1] Universidad Iberoamericana, Mexico City, Mexico

[2] Department of Sociopolitical and Legal Studies, Instituto Tecnológico y de Estudios Superiores de

Occidente, AC, Zapopan, Jalisco, Mexico

[3] Boston College, School of Social Work, Chestnut Hill, MA, USA

Abstract

This study presents evidence on the utility of including public insecurity indicators when assessing Social Welfare in Mexico. It estimates two multidimensional indices of social welfare using the DP2 method. The two measures (DP_2a index and DP_2b index) contain the following categories: (1) material welfare, (2) economic well-being, (3) subjective well-being, and (4) social capital. For the second, we included an additional category, (5) public insecurity, and examined its effect on social welfare. The results show that inclusion of indicators of insecurity, crime victimization, and homicides had a negative effect on social welfare within states. Specifically, trust in people, network membership, satisfaction with life, and happiness where reduced. Our results suggest that public insecurity should be a key consideration in the understanding of social welfare in Mexico.

Keywords: social welfare, public insecurity, welfare policy, Mexico

Introduction

Social Welfare (SW) is a multidimensional and contextual concept. It is generally adjusted to reflect the prevailing social realities of a given context (Grasso & Canova, 2008). It consists of a material dimension, including economic indicators such as income, employment, level of schooling, and access to social security services (Di Pasquale, 2008; Mæstad & Norheim, 2012). The other dimension of social welfare is subjective and includes elements such as happiness and satisfaction with life (Diener, 1994, 2000).

The concept of SW not only takes into account the different aspects of people's lives but also requires an ongoing revision and assessment of what each category means for a country, territory, or community (Tonon, 2012). This assessment is said to be essential in that it helps capture the needs and indicators that accurately reflect local realities (Noll, 2011). Indeed, research in this area has helped uncover useful indicators of SW such as social capital (Berigan & Irwin, 2011; Grootaert et al. 2002; Sarracino, 2013), use of technology

(Cuenca & Rodríguez, 2010; Kaino, 2012; Zhao, 2009), and access to culture and leisure (Berigan & Irwin, 2011; Gaddis 2013; Haller et al. 2013; Jaeger, 2009). Guided by this premise—the utility of using context-specific indicators of SW to measure complex phenomenon such as living conditions—this study presents evidence on the relevance of including public insecurity when measuring SW in Mexico. The relationship between public insecurity and SW at the state level is also provided.

This study is important in that Mexico has experienced a steady growth in violence (Leenen & Cervantes-Trejo, 2014). The numbers of Mexicans who have faced some type of crime increased from 24% in 2010 to 28.2% in 2015 (ENVIPE, 2014), this translates into 28,200 victims per 100,000 inhabitants. Moreover, only one in ten crimes is reported, and of these, only one in 100 leads to a sentencing; meaning that only one out of every 1,000 reported crimes is punished (Magaloni & Razu, 2016). These numbers persist despite the macro-strategy of the "National Program to Prevent Violence and Delinquency" launched by Enrique Peña Nieto's government (2012–2018) and the numerous actions taken by municipal governments in 2014 to prevent violence/crime in the 73 locations known for their high levels of crime and insecurity (México Evalúa, 2015).

To our knowledge, little attention has been devoted to understanding the effects of violence or crime on social welfare. Studies have centered mainly on how violence and crime affect social and economic performance and on locations that have high crime rates (Ackerman & Murray, 2004). Indeed, there is a dearth in evidence at the state level on how public-insecurity indicators interact or are included in a multidimensional measurement of wellbeing. This study attempts to rectify this gap in knowledge by using context-specific indicators of public insecurity and connecting them to social welfare. The manuscript is divided into four sections; first, we review the literature that focuses on the effects of public insecurity on social wellbeing. Second, the method is given, describing the indicators used and the technique applied to measure social wellbeing. Third, the results are shown, having included public-insecurity indicators and their repercussions on SW. Finally, the results are discussed and conclusions are provided.

<center>**Review of the Literature**</center>

Effects of public insecurity on welfare

The inclusion of public safety as one of the dimensions of social welfare has been under consideration for some time (Diprose, 2007). This is evident in prominent publications including the Report of the Commission on the Measurement of Economic Development and Social Progress (Stiglitz et al., 2009), the Organization for Economic Co-operation and Development's (OECD) "How's Life?" proposal (OECD, 2011), and the Mexican report (OECD, 2015). The pertinence of including public insecurity in accessing SW relates to the relationship between the two. Specifically, security/insecurity, objective welfare, and subjective welfare

are generally considered as parts of a whole (Wills-Herrera et al., 2011; Gasper, 2005). For example, evidence suggests that public insecurity is connected to neighborhood crime and police indifference (Alvarado, 2010), which in turn is inversely related to social welfare (Wills-Herrera et al., 2011).

Measuring insecurity and its effects on social welfare in Latin America has become especially important partly because of growing social instability (Kaino, 2012; Farhadi et al., 2012; Briceño-León et al., 2008; Imbusch et al., 2011) and the need to capture the complexity of the local reality. Indeed, insecurity is said to negatively affect physical (DeVerteuil, 2015; Torche & Villarreal, 2014) and mental health (Stafford et al., 2007; Wilson-Genderson & Pruchno, 2013). It is also said to be inversely correlated to educational attainment (Caudillo & Torche, 2014), income (Sen, 1999), and the overall happiness of individuals and communities in violence-inclined environments (Grahamy & Chaparro, 2011).

Individual-level effects (victims and offenders)

Generally, compared to those who have not suffered from crime victims of crime tend to perceive greater risk and a sense of loss of personal control (Hale, 1996; Russo et al., 2008; Shippee, 2012). Consequently, victims of crime report negative effects of crime on happiness (Graham & Chaparro, 2011) and life satisfaction (Hanslmaier, 2013). Furthermore, crime victimization is said to have far-reaching consequences, such as involvement in delinquency and the reproduction of violence (Hay & Evans, 2006). Nevertheless, reactions to the act of violence are not homogenous (Bunch et al., 2014). Traumatic effects may be linked to psychological attributes such as self-efficiency (Bosmans & Velden, 2015); interaction attributes like social connections (Fox & Bouffard, 2015), and social traits, such as poverty (Lowe et al., 2014).

Community-level effects: The perception of public insecurity

Classic studies on fear of crime tend to highlight the relationship between victimization and fear. These studies suggest that people who are not in direct contact with crime tend to exhibit high levels of anxiety and insecurity. In addition, scholars argue that perceptions of social disorder are often connected to crime and feelings of insecurity (Skogan, 2015; Skogan & Maxfielcd, 1981). Furthermore, the paradox of victimization shows that people exhibiting higher levels of fear are more likely to become victims of crime (Pearson & Breetzke, 2014). For example, in Mexico, feelings of insecurity tend to be higher among women, people with little schooling, older people, individuals who do not trust their neighbors and the police, those who perceive a lack of social order, and people who have been victimized by violence (Vilalta, 2013).

On the other hand, the prospect of moving up socially—through secure employment, living in a county characterized by rule of law, or of living in a rural area is positively associated with perceptions of security (Graham & Chaparro, 2011). The foregoing discussion is suggestive and may point to the fact that perceptions

of insecurity are built into the collective imagination as a result of criminal activities, police actions along with the daily acts of neighbors (Alvarado, 2010). Indeed, feelings of insecurity are heightened when crime affects wide sectors of the population and when only a small number of the people who demand justice see it served (De la Barreda, 2007).

Structural-level effects of homicides (state-level effects)

Homicide rates are generally used as indicators the degree of violence in a given location (Galster, 2012; Sampson et al., 2002). Accordingly, several studies have shown the negative connection between this indicator and community violence (Fowler et al., 2009). Furthermore, there is some evidence suggesting that people living in communities characterized by violence resulting in high homicide rates exhibit different types of affectation. For example, children show reduced cognitive abilities (Sharkey & Faber, 2014); lower high-school graduation rates among youth (Wodtke et al., 2011), and substance use and abuse (Wright et al., 2013).

The literature reviewed in this discussion provides a sound background from which to review the relationships advanced by this study. Specifically, we analyze the levels of state-level welfare by using context-specific indicators, and we investigate the relationship between public insecurity and SW at the state level.

Methods

Measures

Social welfare was measured using a synthetic index made up of five categories: (1) material welfare, (2) economic welfare, (3) subjective welfare, (4) social capital, and (5) public insecurity. Indicators for each category were chosen taking into account the criteria established by Martinez-Martinez et al. (2016): (1) their consistency with previous research (Bellani & D'Ambrosio, 2011; Diener, 1994; Gaitán, 2006; Grootaert, et al., 2002; Jaeger, 2009; London et al., 2014; Luhmann et al., 2011); (2) their availability and level of representation for the categories of interest in the 32 states in the country; and (3) each indicator being mutually exclusive. The selected indicators are described on Table 1, and Table 4 of the appendix shows all of the indicators by state given in the unit of measurement from Table 1.

Table 1. Categories and Indicators

Category	Indicator	Measurement	Source
Material Welfare[h][i]	Educational Lag	Percentage of the Population that did not meet required basic education level [a] or did not attend a formal education center.	MCS-ENIGH 2014
	Food insecurity	Percentage of the population with food insecurity [b]	MCS-ENIGH 2014
	Social Security	Percentage of the population with no work benefits or access to a worker contribution or non-worker contribution pension system	MCS-ENIGH 2014

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	Access to health services	Percentage of the population with no health coverage at a public or private institution [c]	MCS-ENIGH 2014
	Quality of and spaces in the home	Percentage of the population in homes with dirt floors, weak roofs and walls, and where there is crowding [d]	MCS-ENIGH 2014
	Basic services in the home	Percentage of the population in homes without: electricity, drainage, or water and with a chimney if they use wood or coal to cook.	MCS-ENIGH 2014
Economic Welfare [h i]	Income	Percentage of the population earning less than the minimum wage [e]	MCS-ENIGH, 2014
Subjective Welfare [h i]	Satisfaction in life	Scale of satisfaction in life	BIARE 2014
	Happiness	Scale of happiness	BIARE 2014
Social Capital [h i]	Network membership	Index of belonging to neighborhood, sports, cultural, political, and religious groups [f]	BIARE 2014
	Trust in people	Number of people someone would count on in an emergency or need for help.	BIARE 2014
Public Insecurity [i]	Perception of Insecurity	Percentage of the population 18 and over perceiving insecurity in town or county	ENVIPE 2014
	Victims of Crime	Percentage of population 18 and over that has been a victim of a crime [g]	ENVIPE 2014
	Homicides	Percentage of deaths by homicide compared to total violent deaths	INEGI 2013

Source: Elaborated by the authors based on the selection and estimation procedure.

[a] The General Education Law in Mexico establishes required basic education as preschool, elementary, and secondary school.

[b] To measure food security, the Mexican Scale of Food Security (EMSA, in Spanish) has been used. It evaluates aspects such as worrying about a lack of food, changes in the quality and quantity of food, and feeling hunger (CONEVAL, 2010).

[c] The institutions that offer medical services are the Mexican Social Security Institute (IMSS) and the Institute of Security and Social Services of Workers of the State (ISSSTE); there are also services given by PEMEX, the Army or Marines to their workers, the Popular Insurance, and private medical services.

[d] The roof of a home is considered to be of weak material when made of cardboard or waste. Weak walls in homes are made of the following materials: (a) mud or adobe; (b) reeds, bamboo, or o palms; (c) cardboard, metal slats, or asbestos; (d) waste material. Crowding is when there are more than 2.5 people per room (CONEVAL, 2010).

[e] Minimum wage identifies the population that, even when using all of its income to buy food, cannot acquire enough for adequate nutrition (CONEVAL, 2010). It is determined by current per capita income and is compared to the cost of the basic food needs that the Mexican government has set. The cost in November 2014, the date when the INEGI finished applying the survey, was U.S.$64.47 a month, which is U.S.$2.15 per day in rural areas and U.S $3.05 a day in urban areas.

[f] The belonging to networks indicator is the average number of organizations or groups that the over-18 population belongs to, adjusted to the sample's expansion factor; it is determined by taking into consideration if the person: (1) is a member of a church group, (2) belongs to a political or social organization, or both, (3) belongs to a professional, guild, or union organization, (4) is a member of a student association, (5) is a member of a board of directors or a parent association, (6) is in a neighborhood organization, (7) is a member of a government organization, (8) is a member of a voluntary or philanthropic organization, (9) is in any self-help group, (10) is a member of an athletic group, (11) is a member of a volunteer civil association, (12) is registered in any online social network.

[g] The most-common crimes were: complete or partial theft of vehicle, theft in the home, being held up out on the street or on public transportation, fraud, extortion, threats, and injuries (ENVIPE, 2014).

[h] Categories included in the DP_2a index.

[i] Categories included in the DP_2b index.

Description of the Data

The indicators are drawn from four datasets obtained from the Mexican National Institute of Statistics (2014), Geography, and Computer Science (INEGI). When there was no data for that year, the nearest year was used.[1] The first dataset, the "Module of Socioeconomic Conditions of the National Survey of Home Income and Spending" (MCS-ENIGH, 2014) contains information on the distribution, amount, and structure

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[1] For example, in the case of homicides.

of the home income and spending. The second, the National Survey of Victims and Perceptions of Public Security (ENVIPE, 2014) explores the level of victimization directly experienced by people and/or homes. The third, the Self-Reported Welfare Survey (BIARE, 2014) measures subjective welfare of individuals and different dimensions of social capital. Finally, the data on homicides were obtained from INEGI (2013) mortality statistics.

Based on the aforementioned indicators, a database was built where indicators with a negative sign were noted if they had a negative correlation to welfare[2]; in this way, the highest values in absolute numbers meant a decrease in the general level of welfare (Cuenca & Rodríguez, 2010).

The technique used to create the index was the Pena-Trapero distance method (DP_2), which condenses several partial indicators into a synthetic one[3] to create a ranking between the analyzed territories, allowing for intertemporal comparisons of identical territorial units. Doing so requires comparison in absolute terms of differences of each indicator of a territorial unit x_{ji}, with the respective indicator of territorial unit reference base x_{*i}; in our case, the reference base unit is a theoretical scenario representing a territory with the lowest values seen in the indicators used (Cuenca & Rodríguez, 2010).

To define DP_2, n partial indicators of r different territories are considered first, and then the variables are defined.

- x_{ji} is the value of indicator i in territorial unit j;

- x_{*i} is the value of indicator i in the reference-base territorial unit, which will be compared to indicator i of all of the territorial units. Usually, x_{*i} is the lowest value of indicator i in the r territorial units;

- $X_* = (x_{*1}, x_{*2}, \dots, x_{*n})$ is called the reference vector and has the value of all of the indicators of the reference-base territorial unit.

Next, the distance indicator (DP_2) for territory j is calculated as

$$DP_{2_j} = \sum_{i=1}^{n} \left\{ \left(\frac{d_i}{\sigma_i} \right) \left(1 - R^2_{i,i-1,i-2,\dots,1} \right) \right\},$$

where

- $d_i = |x_{ji} - x_{*i}|$ is the difference in absolute terms between indicator i of territory j and indicator i of the reference territory;

- σ_i is the standard deviation of indicator i;

- $R^2_{i,i-1,i-2,\dots,1}$ is the coefficient of the determination of the linear regression of X_i over $X_{i-1}, X_{i-2}, \dots, X_1$ and represents the goodness of fit of the model to predict X_i. $R^2_1 = 0$ is defined.

- $\left(1 - R^2_{i,i-1,i-2,\dots,1}\right)$ is the correlation factor that shows the variance part of X_i not explained by the linear regression, which the indicator weighs with useful information not included before.

The DP_2 is the sum of the distances between the value in variable i of the territory versus the value of the hypothetical territory j (the lowest value of that variable in all of the territories), weighed by the standard deviation of indicator i and corrected by the non-explained variance of X_i. Modelling was conducted with R software.

Because the aim of the study is to show the importance of including public insecurity in measuring SW, two indices measuring welfare were created with the information in Table 1 and were later compared. The first index (DP_2a) contains the indicators from the categories (1) material welfare, (2) economic wellbeing, (3) subjective wellbeing, and (4) social capital; in the second (DP_2b) we included an additional category, (5) public insecurity, to examine its differentiated effect on the measure of social welfare.

To define how public insecurity affects SW at the states, Ivanovic's (1974) test was used

$$DC_i = \frac{2}{m(m-1)} \sum_{j,l>j}^{k_i} m_{ji} m_{li} \left| \frac{x_{ji} - x_{li}}{\bar{X}_i} \right|$$

where m is the number of territories, and m_{ji} is the absolute frequency of x_{ji}; it is used to calculate the discriminating power of each indicator i in territorial unit j and to break down the DP_2 in each territory. The results are shown in the next section. First, we present the synthetic measurement of welfare through a ranking in indices DP_2a and DP_2b; next we display the results showing the contribution of each category to the measure; finally, we present the behavior of the public insecurity indicators at the state level.

<div align="center">Results</div>

Synthetic Measurement of welfare: Ranking among states

The results of the measure of social welfare using the DP_2 technique in columns three and four are shown on Table 2; this reveals the ranking among the 32 states in Mexico, as well as their position according to level of welfare (very high, high, medium, and low). The ranking was obtained by calculating the quartiles of the data; the fixed cut point system of the Index of Human Development was not used because there is no base year.

Table 2 Welfare Indices

Level	State	DP_{2a}	DP_{2b}	Ranking	
				DP_{2a}	DP_{2b}
Very High	Nuevo León	17.82	20.85	1	1
	Sonora	16.26	20.05	2	2
	Coahuila	16.15	18.98	3	8
	Tamaulipas	15.93	18.99	4	7
	Querétaro	14.82	19.84	5	3
	Chihuahua [a]	14.70	16.98	6	11
	Aguascalientes	14.61	19.46	7	4
	Baja California Sur	14.11	19.20	8	5
High	Mexico City	14.03	16.40	9	16
	Baja California	14.02	16.87	10	12
	Colima	13.97	17.78	11	10
	Durango	13.27	16.49	12	14
	Nayarit	13.24	17.79	13	9
	Yucatán [b]	13.07	19.06	14	6
	Quintana Roo	13.06	16.64	15	13
	San Luis Potosí	13.01	16.48	16	15
Medium	Sinaloa	12.68	15.74	17	17
	Jalisco	12.40	15.38	18	20
	Zacatecas	12.24	15.44	19	19
	Campeche	11.30	15.60	20	18
	Guanajuato	10.80	14.39	21	22
	Mexico [a]	10.56	11.21	22	26
	Morelos [a]	10.31	12.34	23	25
	Tlaxcala	10.07	14.43	24	21
Low	Hidalgo [b]	9.19	13.36	25	23
	Tabasco [b]	9.00	12.36	26	24
	Veracruz	6.95	10.46	27	27
	Puebla	6.36	10.27	28	28
	Chiapas	5.76	10.09	29	29
	Michoacán	5.70	8.88	30	30
	Guerrero	5.12	7.21	31	32
	Oaxaca	4.27	7.84	32	31

Source: Authors, based results of the estimation.

[a] States where level of wellbeing goes down after including public-insecurity indicators.

[b] States where level of wellbeing goes up after including public-insecurity indicators.

The results of index DP_2a show that Nuevo León is positioned in first place (17.82) in the welfare index, followed by Sonora (16.26). At the other end of the spectrum, Michoacán (5.70), Guerrero (5.12), and Oaxaca (4.27) have the lowest welfare indices in the country; the latter, Oaxaca, is more than four times behind Nuevo León, which shows a good deal of disparity in welfare. The order on the DP_2b measures remains the same for the states with the highest welfare. However, with respect to low-ranked states, Guerrero remains the lowest in rank; almost three times behind Nuevo León.

When ranks of the two indices are compared, eight states are in the same position. However, when indicators of insecurity were included, 11 states change their position, indicating a decrease in welfare; Guanajuato and Guerrero moved down only one position, while Baja California, Durango, Jalisco, and Morelos moved down two positions, and Tamaulipas lost three. The states most affected in their level of welfare with the inclusion of insecurity were the State of Mexico (moved down by four positions), and Coahuila and

Chihuahua (moved down by five positions). It is worth noting that Mexico City went down seven positions, going from the 9th to the 16th place.

On the other hand, 13 states moved up in the DP_2b ranking with the inclusion of insecurity; Colima, San Luis Potosí, and Oaxaca moved up by one position; Querétaro, Quintana Roo, Campeche, Hidalgo, and Tabasco moved up by two positions; and Aguascalientes, Baja California Sur, and Tlaxcala moved up by three positions. Yucatán moved up the most (8 positions); suggesting that the insecurity indicators had a positive effect on welfare for this state.

Despite the inclusion of indicators of public insecurity, 26 states did not change their position on the welfare ranking (very high, high, medium, and low welfare) as registered in DP_2a index. Only six states moved down from their initial position: Chihuahua from very high to high, and Mexico and Morelos (both from midlevel to low). On the contrary, the welfare levels for Yucatán (high to very high) and Hidalgo and Tabasco (low to medium) changed position with respect to welfare; indicating the effect of public insecurity indicators on welfare.

Effects of public insecurity on welfare

A correlation factor was used to estimate the contributions of each partial indicator to the results of synthetic indices DP_2a and DP_2b previously shown. This estimator is useful in showing the real contribution of each indicator by eliminating redundant information from the others (see Table 3, columns 3 and 5). The correlation coefficients (columns 4 and 6) show the level of absolute correlation of each indicator with the synthetic index.

Table 3 Correction and correlation factors

Category	Partial Indicator	DP_2a Correction Factor	Correlation Coefficient	DP_2b Correction Factor	Correlation Coefficient
Material welfare					
	Social Security	1	0.94	1	0.88
	Access to health services	0.58	0.68	0.62	0.72
	Food insecurity	0.43	0.70	0.43	0.67
	Educational Lag	0.28	0.83	0.28	0.75
	Access to basic services in the home	0.27	0.80	0.27	0.72
	Quality of and spaces in the home	0.23	0.73	0.22	0.66
Economic welfare					
	Income	0.26	0.85	0.26	0.79
Subjective Welfare					
	Satisfaction with life	0.52	0.69	0.51	0.65
	Happiness	0.37	0.56	0.31	0.52
Social Capital					
	Network membership	0.49	0.54	0.49	0.59
	Trust in people	0.42	0.53	0.49	0.56
Public Insecurity					
	Perception of insecurity	---	---	0.55	0.51
	Victims of crime	---	---	0.40	0.08
	Homicides	---	---	0.38	0.19
Source: Authors, based on the results of the estimation.					

The results of the DP_2a correction factor show that social security is the indicator that contributes the most information to the creation of the index; it has the highest correlation to the index (0.94). The second-most-important indicator was access to health services, contributing about 58% of new information to the index, followed by satisfaction with life, which contributes 52%. Other indicators with a high level of correlation were network membership, food insecurity, and trust in people (49%, 43%, and 42%, respectively). Factors contributing the least were income (26%) and quality of spaces in the home (23%), although both had high correlations to the index. Regarding the correlation coefficient, the second-highest indicators were income and educational lag (0.85 y 0.83), followed by access to basic services in the home (0.80).

Similarly, social security had the highest contribution and the highest correlation for the DP_2b, index (0.88). The second-ranked indicator was access to health services, contributing 62% to the synthetic index. The perception of insecurity had the third-highest contribution, 55%, moving satisfaction with life down to the fourth place. Once again, network membership and trust in people had high correction factors (49% each). The two indicators that contributed the least to this index were income, at 26% (although it has a high correlation to the index), and quality of homes and living spaces, at 22%.

These results suggest that including the public-safety category affected the correction and correlation coefficients all the indicators (see Table 3). For example, access to health care and trust in people moved up in their contribution to the index; along the same lines, the three indicators of public insecurity contributed significantly to the creation of the index. Meanwhile, satisfaction with life, happiness, and quality of and spaces in homes had a minimal contribution.

Contribution of the public-insecurity indicators to understanding of state-level welfare

To examine the weight of each indicator at the state level, indices DP_2a and DP_2b were broken down using Ivanovic's (1974) test. Tables 5 and 6 (appendices), show the heterogeneity of the indicators in each territory.

Findings from the DP_2a index are presented on Table 5 show that social security, access to health services, trust in people, food insecurity, and satisfaction with life had the most effect on welfare at the state level. Some indicators had zero value, suggesting that they did not contribute to the construction of welfare on the DP_2a index. The zero-value indicators appeared mainly in the states of Chiapas (social security, educational lag, and income); Oaxaca (satisfaction with life, happiness, and basic services in the home); and Michoacán (access to health services and happiness).

Results from the DP_2b index are presented on Table 6 suggest that the indicators that were important for understanding welfare at the state level were social security, access to health services, and victims of crime. As was the case with the DP_2a index, some indicators had a value of zero on this measure, adding nothing to the construction of welfare. This was observed mainly in Chiapas (social security, educational lag, and income); Oaxaca (satisfaction with life, happiness, and basic services in the home); Guerrero (homicides and quality of and spaces in the home); Michoacán (access to health services and happiness); and México (perception of insecurity and victims of crime).

The different effects of public insecurity at the state level suggest that measuring social welfare is a complex undertaking. For this reason, its indicators (perception of insecurity, victims of crime, and homicides), may contribute to and affect welfare in each state differently (Table 6). Furthermore, the observed high contribution of public insecurity to welfare in Querétaro, Baja California Sur, and Yucatán may be explained by their low levels of perception of insecurity (ENVIPE, 2015). Specifically, in the case of Yucatán, the contribution of public insecurity to welfare is higher than social security and access to health services. On the other hand, in the State of Mexico the value of public insecurity is zero (Table 6), suggesting that this indicator did not contribute to the construction of welfare. Similarly, at slightly above zero, the relationship between public insecurity and welfare in the states of Michoacán, Tamaulipas, and Morelos can be explained by the high level of perception of insecurity that characterize these states (ENVIPE, 2015).

We also note that victims of a crime had a high contribution to welfare in states such as Chiapas and Oaxaca (see Table 6), which can be explained by the low percentage of people who have been victims of a crime in these states (ENVIPE, 2015). On the other hand, in the State of México the contribution of this indicator to welfare was zero, meaning that it did not contribute to state welfare. This observation could be explained by the high percentage of victims of crime (ENVIPE, 2015). Baja California, Mexico City, and Jalisco reflect a similar situation.

Finally, Table 6 shows that in Yucatán, Aguascalientes, Querétaro, and Baja California Sur, homicides contributed highly to the construction of welfare. This may be explained by the low percentage of people who die as a result of homicide (INEGI, 2013). To the contrary, in Guerrero the observed figure, zero, suggests that this indicator did not contribute to welfare. Moreover, Chihuahua, Morelos, and Sinaloa have less than a percentage point; these results are as would be expected given that these states have the highest percentage of deaths by homicide in the country.

Discussion

Results of this study reveal the complexity of accessing welfare in Mexico and similar contexts. The measures utilized (such as income, household conditions, educational lag, happiness levels, network membership, and satisfaction with life), for the most part, show consistency in assessing welfare across states. These results underscore the usefulness of using context specific measures when assessing welfare. They further, point to the need for better-designed context specific indicators and policies that are guided by sound evidence.

In this study, we noted that none of the income indicators significantly contribute to welfare; they did not even feature among the most relevant indicators as suggested by previous research (see e.g. Rodríguez-Martín, 2011; Cuenca & Rodríguez, 2010). This contrasting finding deserves attention and may imply that in certain contexts, income may not be a good reflection of welfare. It could be that the levels of engagement in activities associated with income generation may be too low for income to matter in understanding welfare.

Another point of interest relates to the impact of public insecurity on welfare. Specifically, this study observed that welfare in all states was affected by public insecurity, but this effect was heterogeneous and had a different weight. For example, in some states, indicators of welfare such as network membership, happiness, and satisfaction with life, move down in importance with the inclusion of public insecurity. The observed results may point to the fact that public insecurity, in Mexico, may be reflected in the fear of losing stability or even one's life; negatively affecting subjective welfare (Wills-Herrera et al., 2011).

Furthermore, as observed by others, perceptions of public insecurity may be interpreted as a breakdown of social networks, impacting how people engage with such institutions (Carballo, 2013). On the other hand, having strong social ties and networks may help foster a sense of security in the face of crime, contributing to perceptions of decrease public insecurity (Vilalta, 2013). Overall, the evidence, indicated in the foregoing discussion, suggests that the direct or indirect impact of public insecurity on welfare may require different levels of interventions and that these may vary by state.

We also noted that states with both very high levels of wellbeing and the lowest levels of poverty were affected the most by inclusion of public-insecurity indicators (CONEVAL, 2015). Indeed, as revealed by Tables 2 and 6, the position of states like Coahuila, Tamaulipas, Chihuahua, and Mexico City was altered (they moved down) probably as a result of the weakening of indicators in the social-capital and subjective wellbeing categories. This observation is noteworthy and may point to the detrimental effect of public insecurity on welfare even in affluent locations. With respect to the lowest-ranked states, which in fact reported higher poverty levels, e.g., Chiapas, Michoacán, Guerrero, and Oaxaca, although public insecurity did not

significantly alter their position on welfare, we cannot claim the measure did not have an effect on welfare. Indeed, as exemplified in the case of Guerrero, a state with the highest percentage of homicides in the country, which moved from 31st to 32nd place on the measure of welfare when public insecurity included; public insecurity may be important in explaining welfare at the state level. Most importantly, the observed results might mean that states positioned in the middle of the welfare raking may be affected the most by the inclusion of public insecurity. These observations point to need for more-refined theories of security/insecurity and welfare for middle and low income locations.

Study limitations

A number of limitations are acknowledged. First, this study relies heavily on indicators and a database built from four different surveys with state representation. A potential challenge for future research is to use a single survey covering various welfare indicators with statistical representation at the municipal level and with a longitudinal perspective to allow comparison over time. Regarding the indicators utilized, even though inclusion of the category of public insecurity negatively impacted items such as belonging to networks, trust, happiness, and satisfaction with life, these findings may suggest that subjective indicators are at times affected by the problem of adaptive preferences (Crettaz & Suter, 2013).

Another limitation relates to the cross-sectional nature of this study, which restrict our ability to make causal inferences of insecurity on welfare. Similarly, it is likely that some indicators of insecurity, especially perception of insecurity, may be biased because of the number of exogenous variables that affect it in rural and urban areas. Therefore, it is possible that the effect size may be underestimated in some cases.

Despite the observed limitations, this study has merit. It reveals the need for inclusion of measures of public insecurity that allow understanding of ways in which individuals and communities may be affected (directly or indirectly), as well as how they may react, share their experiences, and survive in highly violent contexts.

Conclusion

To conclude, it is important to acknowledge that violence in Mexico has become more complex—moving from being a rural southern phenomenon to a more-urban reality, often linked to organized crime (Magaloni & Razu, 2016). This observation points to the need to utilize research evidence assessing the link between poverty, wellbeing, and crime (particularly crime related to drug trafficking). Inclusion of indicators of public insecurity when assessing welfare may be an essential step in this direction. As has been observed (Esquivel, 2015), the use of such measures allow for accurate investigation of multiple dimensions and may

facilitate examination of conditions under which social interaction, social practices, and the formation of networks interact to impact individual, family, and community life.

Further, results of this study suggest that 24 of the 32 states showed alteration in their ranking with regards to welfare when public-insecurity indicators were included. States whose welfare ranking moved down upon inclusion of the public security indicator are classified into three blocks for the purpose of this discussion. Public insecurity, in the first block, which is made up of states such as Tamaulipas, Morelos, Michoacán, Guerrero, Chihuahua, Coahuila, and Durango, may be attributed to drug trafficking and organized crime. Moreover, these states are also characterized by high rates of homicide and perception of insecurity (ENVIPE, 2014; INEGI, 2013).

With respect to the second block, public insecurity may result mainly from different types of crime – e.g., theft (at home, the street/public transportation), fraud, extortion, and threats. In fact, states like Baja California, Jalisco, the State of Mexico, and Mexico City, are at the top in the nation with regards to two indicators – victims of crime and perception of security (ENVIPE, 2014).

The third block consists of Oaxaca. Although we are unable to specify the primary sources of insecurity for this state, we can speculate that perceptions of insecurity come mainly from social conflicts characterized by constant blocking of highways, barricades,[4] and general civil unrest.

Overall, results indicated present evidence on the need to take into account public insecurity as an important dimension of social welfare especially in contexts characterized by high levels of violence, such as Mexico (Diprose, 2007). Indeed, perception of welfare need to be re-conceptualized to reflect contextual needs/challenges. This is essential for the enactment of evidence-informed policy decisions with great potential to address welfare and public safety concerns.

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[4] Barricades ocurr when people block streets and sidewalks, not allowing people to walk by or public transportation to drive through.

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Appendix.

Table 4. Indicators per unit of measure

State	Educational Lag	Access to health services	Social Security	Quality of and spaces in the home	Basic services in the home	Food insecurity	Income	Satisfaction with life	Happiness	Trust in people	Network membership	Perception of insecurity	Victims of crime	Homicides
Aguascalientes	14.35	12.48	43.19	3.31	3.60	21.55	12.91	7.74	5.97	2.53	0.84	49.10	26.78	8
Baja California	15.41	19.35	51.84	10.65	12.10	17.18	9.70	8.27	6.18	2.46	0.76	53.69	39.51	34.40
Baja California Sur	14.87	14.21	46.63	16.47	12.40	24.57	10.56	8.30	6.05	2.57	0.68	39.26	24.75	14.90
Campeche	18.78	12.47	60.14	19.54	38.80	24.26	19.20	7.77	6.04	2.25	0.82	58.92	23.71	17.90
Coahuila	12.49	15.57	34.20	4.98	5.60	22.03	11.80	8.04	6.19	2.71	0.77	78.50	24.04	41.30
Colima	17.46	12.70	51.91	10.91	9.60	25.44	10.57	7.78	6.10	2.55	0.89	56.87	22.06	41.20
Chiapas	30.67	20.65	82.76	26.90	57.40	27.52	48.46	7.94	6.20	2.26	0.59	62.09	16.45	22
Chihuahua	17.26	14.57	43.36	7.92	7.90	18.70	17.85	8.33	6.25	2.28	0.62	75.17	27.34	51
Mexico City	8.84	19.94	46.28	5.44	1.70	11.69	8.20	8.45	6.18	1.76	0.64	77.61	33.07	26.90
Durango	15.50	16.54	51.26	5.76	13.00	19.94	20.75	8.19	6.23	2.39	0.57	73.47	22.16	33.70
Guanajuato	20.96	15.42	57.85	9.77	14.90	22.94	17.91	7.94	6.09	2.36	0.46	64.80	27.29	24.50
Guerrero	26.78	19.24	78.10	32.89	58.00	38.46	35.58	7.75	6.02	2.31	0.59	78.92	26	60.20
Hidalgo	19.05	17.31	68.90	9.20	27.00	31.68	24.68	7.96	6.16	2.07	0.59	65.50	19.89	14.80
Jalisco	17.69	19.10	49.57	6.56	7.00	16.53	11.20	7.84	5.97	2.60	0.65	67.97	33.03	31.80
México	15.30	19.67	60.63	10.29	12.40	21.29	20.07	7.87	6.21	2.29	0.51	92.64	47.78	40.10
Michoacán	27.57	26.21	71.26	15.44	26.60	34.66	24.42	7.65	5.93	2.35	0.63	81.99	20	30.60
Morelos	16.56	16.63	66.20	13.42	24.60	26.85	20.53	7.66	6.07	2.40	0.76	89.05	26.15	49.70
Nayarit	17.36	16.26	54.35	10.12	15.30	24.14	18.80	7.92	6.11	2.83	0.77	51.10	18.53	32
Nuevo León	10.78	13.67	33.44	4.56	4.30	14.16	6.37	8.20	6.29	2.66	0.73	72.97	26.52	34.20
Oaxaca	27.20	19.93	77.91	24.53	60.50	36.11	42.11	7.46	5.93	2.25	0.62	77.08	16.29	34.10
Puebla	22.95	21.17	75.15	18.93	30.60	23.85	31.85	7.58	6.08	2.20	0.50	63.58	23.58	20.10
Querétaro	16.41	15.82	54.31	8.94	14.80	15.77	12.27	8.27	6.32	2.61	0.68	38.54	23.55	15
Quintana Roo	15.15	18.46	51.49	18.42	18.10	23.24	14.30	7.97	6.18	2.45	0.84	66.95	26.52	22.50
San Luis Potosí	18.44	10.71	59.12	11.00	28.10	21.65	23.22	7.95	6.16	2.44	0.73	73.13	25.71	23.10
Sinaloa	19.10	15.20	49.33	10.78	18.00	29.64	13.47	7.87	6.11	2.78	0.64	72.06	23.59	45.10
Sonora	12.11	14.42	41.80	10.13	8.90	24.86	9.69	7.97	6.14	2.99	0.91	57.19	27.39	33.10
Tabasco	16.96	16.92	72.75	13.41	43.90	45.03	17.87	7.92	6.12	2.50	0.69	86.07	22.73	16
Tamaulipas	15.96	15.02	45.52	8.21	11.50	19.51	16.14	8.30	6.33	2.77	0.70	83.91	17.57	38.50
Tlaxcala	14.93	17.48	71.47	9.42	12.10	24.00	27.05	7.83	6.06	2.31	0.70	59.99	21.92	15.30
Veracruz	27.80	21.73	68.46	16.84	40.00	30.00	29.18	7.74	6.04	2.28	0.60	80.71	20.25	20.10
Yucatán	21.82	14.48	54.45	17.48	40.40	18.37	20.72	8.02	6.24	2.58	0.74	29.48	18.44	7.10
Zacatecas	21.61	14.86	63.37	4.89	3.60	16.83	26.71	8.08	6.17	2.48	0.84	80.32	20.86	31.5

Source: Authors, based on surveys: MCS-ENIGH, 2014; BIARE, 2014; ENVIPE, 2014; INEGI, 2013.

Table 5. Matrix of indicators weighed without insecurity.

Entity	Social Security	Access to health services	Satisfaction with life	Network membership	Food insecurity	Trust in people	Happiness	Educational Lag	Basic services in the home	Income	Quality of and spaces in the home	DP2
Nuevo León	3.85[a]	2.25[b]	1.64	1.24	1.85	1.59	1.28	1.10	0.92	1.12	0.97	17.82
Sonora	3.20[a]	2.12	1.12	2.03	1.21	2.17[b]	0.72	1.03	0.85	1.03	0.78	16.26
Coahuila	3.79[a]	1.91[b]	1.28	1.38	1.38	1.67	0.90	1.01	0.90	0.98	0.96	16.15
Tamaulipas	2.91[a]	2.01[b]	1.86	1.10	1.53	1.77	1.42	0.82	0.80	0.86	0.85	15.93
Querétaro	2.22[a]	1.87[b]	1.79	0.98	1.76	1.50	1.38	0.79	0.75	0.96	0.82	14.82
Chihuahua	3.08[a]	2.09[b]	1.92	0.70	1.58	0.91	1.14	0.74	0.86	0.82	0.86	14.70
Aguascalientes	3.09[a]	2.47[b]	0.64	1.71	1.41	1.36	0.13	0.90	0.93	0.95	1.01	14.61
Baja California Sur	2.82[a]	2.16[b]	1.85	0.98	1.23	1.42	0.42	0.88	0.79	1.01	0.56	14.11
Mexico City	2.85[a]	1.13	2.18[b]	0.83	2.00	0.00[c]	0.86	1.21	0.96	1.07	0.94	14.03
Baja California	2.41[a]	1.23	1.80[b]	1.36	1.67	1.22	0.89	0.85	0.79	1.03	0.76	14.02
Colima	2.41[b]	2.43[a]	0.71	1.92	1.18	1.40	0.61	0.73	0.83	1.01	0.75	13.97
Durango	2.46[a]	1.74[b]	1.62	0.49	1.51	1.11	1.05	0.84	0.78	0.74	0.93	13.27
Nayarit	2.22[a]	1.79	1.02	1.40	1.25	1.88[b]	0.64	0.74	0.74	0.79	0.78	13.24
Yucatán	2.21[a]	2.11[b]	1.25	1.26	1.60	1.44	1.10	0.49	0.33	0.74	0.53	13.07
Quintana Roo	2.44[a]	1.39	1.14	1.71[b]	1.31	1.22	0.89	0.86	0.69	0.91	0.50	13.06
San Luis Potosí	1.85[b]	2.79[a]	1.09	1.24	1.40	1.20	0.81	0.68	0.53	0.67	0.75	13.01
Sinaloa	2.61[a]	1.98[b]	0.91	0.81	0.92	1.79	0.63	0.64	0.70	0.93	0.76	12.68
Jalisco	2.59[a]	1.28	0.85	0.87	1.71[b]	1.47	0.14	0.72	0.88	0.99	0.90	12.40
Zacatecas	1.51	2.04[a]	1.37	0.72	1.69[b]	1.27	0.82	0.50	0.77	0.58	0.96	12.24
Campeche	1.77[b]	2.47[a]	0.68	1.64	1.25	0.87	0.37	0.66	0.36	0.78	0.46	11.30
Guanajuato	1.95[a]	1.94[b]	1.07	0.00[c]	1.33	1.06	0.57	0.54	0.75	0.81	0.79	10.80
México	1.73[a]	1.17[b]	0.91	0.23	1.42	0.93	1.00	0.85	0.79	0.76	0.78	10.56
Morelos	1.29	1.72[a]	0.45	1.36[b]	1.09	1.13	0.48	0.78	0.59	0.74	0.67	10.31
Tlaxcala	0.88	1.57[a]	0.82	1.07	1.26[b]	0.97	0.45	0.87	0.79	0.57	0.80	10.07
Hidalgo	1.08	1.60[a]	1.11[b]	0.61	0.80	0.54	0.80	0.64	0.55	0.63	0.81	9.19
Tabasco	0.78	1.67[a]	1.02	1.03	0.00[c]	1.30[b]	0.68	0.76	0.27	0.82	0.67	9.00
Veracruz	1.12[a]	0.80	0.62	0.64	0.90	0.92[b]	0.38	0.16	0.34	0.51	0.55	6.95
Puebla	0.59	0.90[b]	0.28	0.18	1.27[a]	0.77	0.53	0.43	0.49	0.44	0.48	6.36
Chiapas	0.00[c]	1.00	1.08[a]	0.57	1.05[b]	0.88	0.93	0.00[c]	0.05	0.00[c]	0.21	5.76
Michoacán	0.90[b]	0.00[c]	0.42	0.75	0.62	1.04[a]	0.00[c]	0.17	0.56	0.64	0.60	5.70
Guerrero	0.36	1.25[a]	0.65	0.58	0.39	0.96[b]	0.32	0.22	0.04	0.34	0.00[c]	5.12
Oaxaca	0.38	1.13[a]	0.00[c]	0.71	0.54	0.87[b]	0.00[c]	0.19	0.00[c]	0.17	0.29	4.27

Source: Authors. a: Highest-contributing indicator; b: second-highest contributor; c: no contribution.

Table 6. Matrix of indicators weighed with insecurity.

State	Social Security	Access to health services	Perception of insecurity	Satisfaction with life	Trust in people	Network membership	Food insecurity	Victims of crime	Homicides	Happiness	Educational Lag	Basic services in the home	Income	Quality of and spaces in the home	DP2
Nuevo León	3.85[a]	2.42[b]	0.73	1.61	1.87	1.24	1.85	1.34	0.79	1.09	1.10	0.92	1.12	0.92	20.85
Sonora	3.20[a]	2.28	1.31	1.11	2.55[b]	2.04	1.21	1.28	0.82	0.61	1.03	0.85	1.03	0.74	20.05
Querétaro	2.22[a]	2.01[b]	2.00	1.77	1.76	0.98	1.76	1.53	1.37	1.17	0.79	0.75	0.96	0.77	19.84
Aguascalientes	3.09[a]	2.65[b]	1.61	0.63	1.60	1.72	1.41	1.32	1.58	0.11	0.90	0.93	0.95	0.96	19.46
Baja California Sur	2.82[a]	2.32[b]	1.98	1.83	1.67	0.98	1.23	1.45	1.37	0.35	0.88	0.79	1.01	0.53	19.20
Yucatán	2.21	2.27[b]	2.34[a]	1.24	1.70	1.26	1.60	1.85	1.61	0.94	0.49	0.33	0.74	0.50	19.06
Tamaulipas	2.91[a]	2.16[b]	0.32	1.84	2.08	1.10	1.53	1.90	0.66	1.20	0.82	0.80	0.86	0.80	18.99
Coahuila	3.79[a]	2.06[b]	0.52	1.26	1.96	1.38	1.38	1.50	0.57	0.77	1.01	0.90	0.98	0.90	18.98
Nayarit	2.22[a]	1.92	1.54	1.00	2.21[b]	1.40	1.25	1.84	0.85	0.54	0.74	0.74	0.79	0.74	17.79
Colima	2.41[b]	2.61[a]	1.32	0.70	1.64	1.92	1.18	1.62	0.57	0.52	0.73	0.83	1.01	0.71	17.78
Chihuahua	3.08[a]	2.25[b]	0.65	1.89	1.07	0.70	1.58	1.29	0.28	0.96	0.74	0.86	0.82	0.81	16.98
Baja California	2.41[a]	1.32	1.44	1.77[b]	1.44	1.36	1.67	0.52	0.78	0.75	0.85	0.79	1.03	0.72	16.87
Quintana Roo	2.44[a]	1.50	0.95	1.12	1.44	1.71[b]	1.31	1.34	1.14	0.75	0.86	0.69	0.91	0.47	16.64
Durango	2.46[a]	1.87[b]	0.71	1.60	1.30	0.49	1.51	1.61	0.80	0.89	0.84	0.78	0.74	0.88	16.49
San Luis Potosí	1.85[b]	2.99[a]	0.72	1.08	1.41	1.24	1.40	1.39	1.12	0.69	0.68	0.53	0.67	0.71	16.48
Mexico City	2.85[a]	1.21	0.56	2.15[b]	0.00[c]	0.83	2.00	0.93	1.01	0.73	1.21	0.96	1.07	0.89	16.40
Sinaloa	2.61[a]	2.13[b]	0.76	0.89	2.11	0.81	0.92	1.52	0.46	0.54	0.64	0.70	0.93	0.71	15.74
Campeche	1.77[b]	2.66[a]	1.25	0.67	1.03	1.64	1.25	1.52	1.28	0.31	0.66	0.36	0.78	0.43	15.60
Zacatecas	1.51	2.19[a]	0.46	1.35	1.49	0.72	1.69	1.70[b]	0.87	0.70	0.50	0.77	0.58	0.91	15.44
Jalisco	2.59[a]	1.37	0.91	0.84	1.73[b]	0.87	1.71	0.93	0.86	0.12	0.72	0.88	0.99	0.85	15.38
Tlaxcala	0.88	1.69[a]	1.21	0.81	1.14	1.07	1.26	1.63[b]	1.36	0.38	0.87	0.79	0.57	0.76	14.43
Guanajuato	1.95[b]	2.09[a]	1.03	1.05	1.25	0.00[c]	1.33	1.29	1.08	0.48	0.54	0.75	0.81	0.75	14.39
Hidalgo	1.08	1.72[b]	1.00	1.10	0.64	0.61	0.80	1.76[a]	1.37	0.68	0.64	0.55	0.63	0.77	13.36
Tabasco	0.78	1.79[a]	0.24	1.01	1.53	1.03	0.00[c]	1.58[b]	1.34	0.57	0.76	0.27	0.82	0.63	12.36
Morelos	1.29	1.85[a]	0.13	0.44	1.33	1.36	1.09	1.36[b]	0.32	0.41	0.78	0.59	0.74	0.63	12.34
México	1.73[a]	1.26	0.00[c]	0.90	1.09	0.23	1.43[b]	0.00[c]	0.61	0.85	0.85	0.79	0.76	0.73	11.21
Veracruz	1.12	0.86	0.44	0.61	1.09	0.64	0.90	1.73[a]	1.21[b]	0.33	0.16	0.34	0.51	0.52	10.46
Puebla	0.59	0.97	1.08	0.27	0.90	0.18	1.27[b]	1.52[a]	1.21	0.45	0.43	0.49	0.44	0.45	10.27
Chiapas	0.00[c]	1.07	1.13	1.06	1.04	0.57	1.05	1.97[a]	1.15[b]	0.79	0.00[c]	0.05	0.00[c]	0.19	10.09
Michoacán	0.90	0.00[c]	0.39	0.41	1.23[b]	0.75	0.62	1.75[a]	0.89	0.00[c]	0.17	0.56	0.64	0.56	8.88
Oaxaca	0.38	1.21[b]	0.58	0.00[c]	1.02	0.71	0.54	1.98[a]	0.79	0.00[c]	0.19	0.00[c]	0.17	0.27	7.84
Guerrero	0.36	1.35[b]	0.51	0.64	1.13	0.58	0.39	1.37[a]	0.00[c]	0.27	0.22	0.04	0.34	0.00[c]	7.21

Source: Authors. **a: Highest-contributing indicator; b: second-highest contributor; c:no contribution.**