

## DESIGN FOR A SOCIAL COHESION INDEX IN A RURAL AND INDIGENOUS CONTEXT: THE CASE OF HUEHUETLA, PUEBLA

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### ABSTRACT

Social cohesion is considered an essential component for the creation of integration networks, which facilitate local development. This research intended to define and implement an index for social cohesion within a rural and indigenous context, to evaluate its scale, and relationship with poverty and inequality. The research was carried out by applying a mixed methodology, where 92 women were interviewed, in order to estimate the horizontal index of social cohesion (HISC), using the exploratory factor analysis (EFA) technique. Using the EFA, a general index was designed consisting of three aspects: support networks for care, community support networks and economic support networks. Through the HISC, important networks for care support were identified, however only low levels in the case of economic and community support networks. No statistically significant correlation was found between income and social cohesion, although the population living in conditions of extreme poverty did present lower levels of social cohesion, a factor that aggravates their vulnerability. Important and statistically significant associations between social cohesion and educational levels in rural-indigenous contexts were identified, derived from the process of building socialization links that result from the transfer of knowledge, values, attitudes and development of capacities that particularly enable expanding the aspect of economic support networks.

**Keywords:** deprivation, integration networks, poverty and inequality, social integration.

### INTRODUCTION

The dynamics of relationships that promote the generation of social cohesion on a global scale are derived from complex material circumstances, related to the condition of slow economic growth (2.4%) in 2024 (World Bank, 2023), combined with high levels of extreme poverty (700 million people), especially among vulnerable groups such as the infant population, where 1 in 6 children in the world live on less than 2.15 dollars a day (United Nations Children's Fund-UNICEF, 2023). Likewise, the intensification of economic inequality is characterized by the growing accumulation of wealth by the richest people in the world, where according to a report by OXFAM (2023), two thirds of the new wealth generated on a global scale from 2020 until now, has been concentrated among the richest 1% of the population.

Given this scenario, social cohesion in the world has declined, as manifested in the social cohesion index (SCI) of the Institut de Publique Sondage d'Opinion Secteur (IPSOS, 2020), indicating that in their perception there has been a 20% reduction, meaning that the population that rates highest in the three most important respects has decreased considerably in terms of: I) social relationships (trust in people), II) connectivity (identity),

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III) common good (help and responsibility towards others); demonstrating that in the world, after the pandemic, there are twice as many citizens with weak social cohesion (41%) than there are those with strong cohesion (21%).

In Mexico, social cohesion presents great challenges in the face of an economic slowdown that projects a reduction in the growth rate, as this is projected to go from 2.5% in 2023 to 1.9% in 2024 (World Bank, 2023). This also shows a high percentage of the population in extreme poverty (7.1%) Consejo Nacional de Evaluación de la Política de Desarrollo Social- (National Council for the Evaluation of Social Development Policy-CONEVAL, 2022), representing 8,946,996 people, of which children and adolescents are the age group that suffers most from this condition, as from 2018 to 2020, this population group went from 8.7% to 10.6% (CONEVAL and UNICEF, 2023). Despite economic problems and poverty, income inequality in recent years has shown a decreasing trend, which is observed in the decrease in the Gini from 2016 to 2022, going from 0.486 to 0.431 respectively, however, this tendency has occurred because of a reduction in income among various social groups, classes and regions (Lozano *et al.*, 2023), although the fact should be emphasized that economic inequality due to labor income continues to be very high, with a Gini of 0.4893 (CONEVAL, 2023).

Economic inequality generates social divisions, especially when the income gap is wide; in this sense, for 2022, the income gap between the population in extreme poverty and the non-poor and non-vulnerable population on a national scale was 3.15, presenting large differences within the country; an example of this is Nuevo León, which has a gap of 0.28, whereas Puebla reaches a level of 11.76; this drastically increases in extreme cases, as is the case in Chiapas (38.19), Guerrero (25.39) and Oaxaca (26.91).

Despite the previously mentioned circumstances, the perception of having a high degree of social support networks among the country's entities has increased, going from 35.8% in 2020 to 46.3% in 2022, whereas those who perceive an average degree on social support networks was 53.8% (CONEVAL, s.f). This improvement should be considered with some reserve, as according to the results for the social cohesion index (SCI), the country's levels of social cohesion are not very positive, indicating that the country presents a negative result (-7 %), with only 27% of its citizens perceiving a strong level of social cohesion and 34% considering this to be weak (IPSOS, 2020).

Social cohesion has different manifestations among population groups, especially among those who historically present greater vulnerability and exclusion, such as indigenous groups. By 2018, 69.5% of the country's indigenous population was in poverty, in contrast to 39% of the non-indigenous population (CONEVAL, 2019a), with nine out of ten indigenous children and adolescents suffering from this condition (CONEVAL, 2023). However, the indigenous population has traditionally manifested strong expression of culture and identity with high social cohesion, which in the current situation has been modifying its individual, family and community behaviors, especially concerning their mechanisms for reciprocity. The aim of this research was to analyze and evaluate the levels of social cohesion that exist among the inhabitants of a homogenous indigenous

municipality with predominantly high levels of poverty, in both cultural and economic terms, for example in the municipality of Huehuetla, Puebla.

### THEORETICAL FRAMEWORK

The analysis of social cohesion has a long history in various disciplines; its antecedents can be found in those investigations that analyze the social order and its transformations, through complex dynamics (Markus, 2021) in varied contexts. This concept is attributed special attention in the formation of the European Union in the Maastricht Treaty, from which the social cohesion fund was established to promote development (Haro and Vázquez, 2018), and was further strengthened in the World Summit on Social Development in 1995, at the Millennium Summit (2000), and at the World Summit (2005), where it was pointed out that integration and social inclusion constitute fundamental elements of development initiatives, on a local and regional scale (Atkinson and Marlier, 2010).

The term social integration is considered to be closely related to that of social cohesion, because both of these refer to the ability to create a sense of belonging, acceptance and recognition for full and equal participation in economic, social, cultural and institutional contexts, while recognizing and valuing diversity. However, social integration mainly refers to citizens' access to basic levels of well-being (Haro and Vázquez, 2018); whereas social cohesion is a broader concept, considering different aspects and levels in the proximity-strength relationship (Ndiwakalunga and Yazdanifard, 2014).

In this regard, Moustakas (2023) states that the problem of social cohesion lies in a lack of consensus and clarity concerning its definition, which generates confusion in terms of consequences and interpretations. The Inter-American Development Bank, 2006 argues that this is the set of factors that lead to balance between the individuals in a society and is reflected in their degree of integration in economic, social, political and cultural aspects, for the purpose of achieving an objective. This is why, in rural and indigenous contexts, where the aim is to energize local development, social cohesion becomes an important mechanism in community management, through the creation of networks between people, reducing the risks of falling into extreme conditions of deprivation. Furthermore, it helps contribute to an analysis of the factors that weaken the social fabric such as globalization, migration, ethnocultural diversity, and technological transformations (Schiefer and Van der Noll, 2016). Currently, governments have placed social cohesion as a central factor within political discourse, making it a desirable element in itself; an example of this is the enormous influence that the Cohesion Policy has within the European Union, which through the so-called structural funds establishes the largest investment policy, in order to strengthen economic, social and territorial cohesion (European Parliament, 2023).

The concept of social cohesion is multidimensional, derived from mutual participation that generates relationships-networks-connections at different levels (micro-family, mezo-community, and macro-institutions) and degrees of integration, functionality and capacity for cooperation in problem solving or to achieve a common good. This implies that this is a question of intensity, so that societies with greater or lesser cohesion exist, reflected

in attitudes and behaviors that indicate resilient social relationships between individuals (Boehnke *et al.*, 2019).

There are two types of social cohesion; horizontal, which refers to the set of interrelationships between equals; whether family or small groups within a community, and vertical, which exists between different hierarchical levels. Boehnke *et al.* (2019) argue that three aspects (domains) of social cohesion must be considered: the first is conditioned by horizontal social relationships that depend on the degree of interrelationship between the members of a group; the second is connectivity, which is derived from positive vertical links; and the third, refers to the commitment to the common good, which is reflected in the actions and attitudes of the members of a society to collaborate or show solidarity for the community, which is not either entirely horizontal or vertical, but rather a reflection of their complementarity.

In this sense, Schiefer and Van Der Noll (2016) refer to six explanations of social cohesion; the first takes into account social relationships, derived from the strength of the ties between people with others (family, friends and community), generating connections and relationships between social units for example individuals, groups, associations and territorial units, both vertically, as well as horizontally for mutual cooperation. In the case of the second to the fourth, they refer to the sense of identity, the common good and shared values, which relate to the sense of belonging to the community and the fact of being recognized for their values, lifestyles and social contexts, for the purpose of the common good and social order. The fifth and sixth refer to the degree of inequality between individuals in terms of quality of life and groups within a society, adding to this the socioeconomic perspective, which refers to dispersion concerning access and availability of resources, both monetary, as well as goods and services, necessary for the well-being of people in the long term (education, employment, health and security, among others). If the socioeconomic perspective is included, the perspective of Talcott Parsons (1961) is assumed, which points out that social cohesion depends closely on the way in which material resources are allocated between society's individuals and the way values (motivations) and norms (cultural orientation) are integrated within these distributive processes, presenting an inverse relationship between inequality and social cohesion. This implies that social cohesion refers not only to the capacity for integration and strength of networks, but also includes its relationship with the material conditions for its development. Therefore, the allocation of material resources determines the different degrees of poverty and the population's expectations regarding their well-being and quality of life, thereby affecting the values and social ties that constitute social cohesion.

This is why the level of economic development affects social cohesion. In this sense, Durkheim (1984) points out that in societies where there is less division of labor, there is mechanical social cohesion determined by a system of common values, where ties of kinship and relationships are present in greater proportions, measured on a local or community scale; likewise as division of labor increases, more complex societies evolve, developing the individualism necessary for organic cohesion, as a central element to reach

a new level of coordination, cooperation and solidarity, thus ensuring that social unity is maintained.

Usually, people think that society progresses from mechanical to organic cohesion, however the development of societies is not linear and therefore, in a society with marked division of labor, mechanical solidarity continues to exist, because it never disappears. This process is linked to population growth, which triggers an increase in social interactions, generating a series of dynamic social equilibria that are interrupted and then reestablished (Merton, 2002).

With the growth of interindividual relationships, conditions are established for the development of social capital, a concept created by Putman (1995) which defines the set of social resources that individuals can use to access or obtain benefits from other forms of capital, particularly economic. This term includes the degree of strength in the relationships established to generate advantages and opportunities, classifying social capital as bonding (strong ties between people who are close and share an identity), bridging (weak ties between acquaintances, with sociodemographic differences) and linking (relationships between actors or groups) (González, 2023). Notably, social capital contributes to the formation of social cohesion, but these are not the same, as the latter includes aspects such as cultural and political, mechanisms that enable people to integrate within a community, with the aim of achieving a common goal, a fundamental factor in democratic societies.

The complexity of the concept of social cohesion has permitted the establishment of multiple indicators, which we could classify as objective or indirect, subjective or direct and mixed. The first are those that seek to measure concrete and quantitative elements, such as income, employment, education and housing, as well as relying on other indicators that can be as diverse as the Gini, income ratio, degree of marginalization, polarization, up to the degree of connectivity (roads); while subjective or direct indicators tend to evaluate the perception that exists concerning sense of belonging, trust, participation, inclusion, willingness to participate and strength of social ties or networks (Tromben *et al.*, 2022). The mixed indicators of social cohesion consider both objective and subjective variables; an example of this type of indicators is the one proposed by Easterly *et al.* (2006), which includes in its assessment, direct variables for social cohesion, such as interpersonal trust and civic participation, and likewise indirect variables, such as the Gini coefficient and ethnic heterogeneity.

According to Haro and Vázquez (2018), to measure social cohesion, it is necessary to design tools from a microsocial point of view, so that its management can be determined at both an individual and social level, thereby contributing to the development of strategies and public policies for its promotion, which are based not only on negative aspects (poverty, inequality, and other aspects of material well-being), but must also consider subjective elements of perception to maintain and evaluate the subjective point of view.

Subjective factors associated with social cohesion are difficult to assess, meaning that the indicators in this approach are constantly undergoing renovation, which is why it is important to exhaustively explore different ways to improve results.

In Mexico, the indicator that makes it possible to evaluate the subjective elements of social cohesion is the Indicator indicating the Degree of Support from Social Networks developed by CONEVAL (2019b), which measures the perception of people over 12, concerning the ease or difficulty for receiving support from social networks in different hypothetical situations: help to be cared for during an illness, to obtain the amount of money one earns in a month at home, help to get a job, help to be accompanied to the doctor, to obtain cooperation for making improvements in the neighborhood or locality and where appropriate, help to care for children in the home.

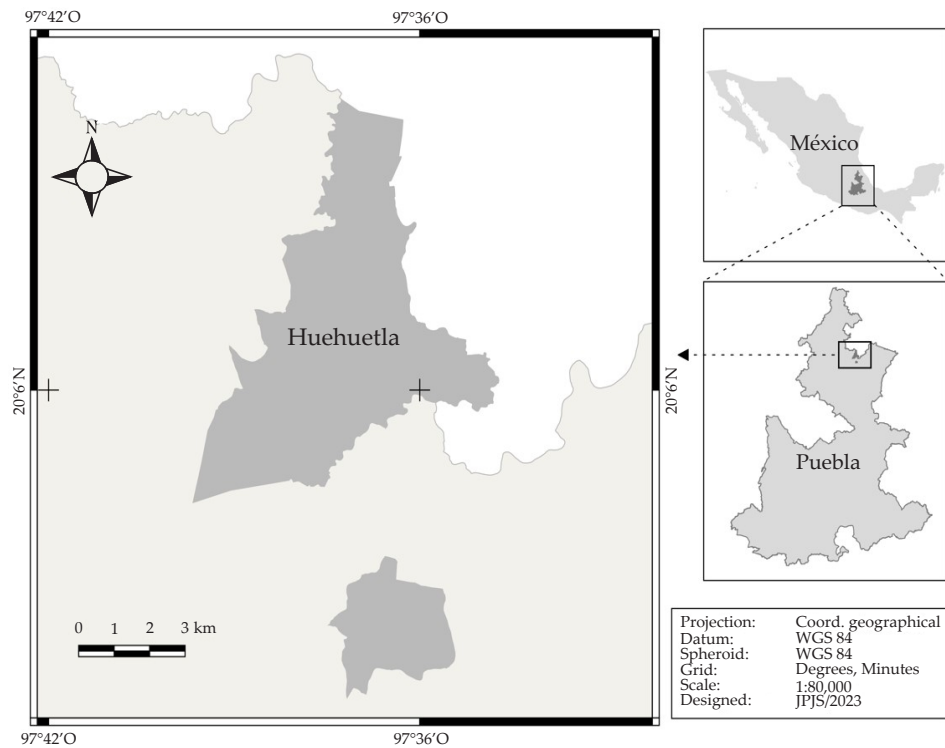
These variables are transformed into dichotomous variables, establishing 3 indicators; the first indicates whether the perception of access to support perceives problems or not, another indicates whether the perception of access to support is deemed easy or not and finally, whether this is neutral when another option is selected. From these indicators, a scale of perception of social networks is created per person (low, medium and high) and finally the perception of social networks is estimated for each federal entity, interpreted as follows: if the perception of support level is less than 20%, it is established that social networks are perceived as low; if the percentage of the population is 20% to 40%, it is considered to be medium; and if the percentage of the population is greater than 40%, it is considered that a high degree of social networks exists.

Although, in this work, the same variables that make up the Indicator of the Degree of Support of Social Networks were used, its estimation was carried out using another methodology, which is described in the following.

## METHODOLOGY

The research was carried out in the state of Puebla, Mexico, specifically, in the municipality of Huehuetla (Figure 1). It's spatial location is at the parallels 20° 01' 48" and 20° 09' 12" of North latitude and the meridians 97° 35' 00" and 97° 40' 24" West longitude (H. Ayuntamiento de Huehuetla, 2021) and covers a surface area of 47.95 km<sup>2</sup>. The selection of this municipality relates to the fact that it has a high concentration of indigenous population (17,082 inhabitants), 80.4% speak an indigenous language (National Institute of Statistics and Geography-INEGI, 2020), coupled with the fact that an important segment of this population lives in conditions of poverty (83.2%) and severe poverty (36.1%), with extreme lack of food (47.7%) and basic living services (71.9%) (National Council for Evaluation of the Policy of Social Development-CONEVAL, 2020).

In the research, the questionnaire technique was used and semi-structured interviews were applied, from which information was obtained concerning: a) General data about interviewees (age, education, marital status, occupation, income), b) Type of support / help to get a job or monetary resources from a family member, friend or acquaintance, c) Support in the form of care or support received in the event of an illness, d) Support for childcare and in the event of an emergency from a family member/friend/neighbor, e) Capacity for cooperation to improve the locality or community, f) Main shortcomings (food, housing, housing services, social security and health). The questions related to



Source: own elaboration with Geostatistical data from INEGI, 2020.

**Figure 1.** Location of study area.

support or help were based on the methodology of the Household Income Expenditure Survey-ENIGH (2022), in the section termed social networks.

The sample size consisted of 92 people, considering a maximum variance ( $p_n=0.5$  and  $q_n=0.5$ ) and a confidence level of 95% ( $Z_{\alpha/2}=1.96$ ); the sampling frame was the coffee census for the municipality of Huehuetla. The sample size was calculated applying the following equation:

$$n = \frac{NZ_{\alpha/2}^2 p_n q_n}{Nd^2 + Z_{\alpha/2}^2 p_n q_n}$$

where  $N$ : population size (1,966 producers);  $Z_{\alpha/2}$ : reliability (1.96);  $d$ : accuracy (0.1);  $p_n$ : proportion with the characteristic of interest (0.5);  $q_n$ : Proportion without the characteristic of interest (0.5).

Interviews were applied in the communities of 5 de Mayo (23), Leacaman (24), Xonalpu (22) and Lipuntahuaca (23). Households were the unit of analysis, and female heads of family were interviewed.

For the analysis of social cohesion among the target population, the exploratory factor analysis (EFA) technique was used, as it makes it possible to determine the

underlying dimensions or constructs of the variables as perceived (Mavrou, 2015), so that variables can be grouped into established aspects, not only in terms of theory, but also in terms of quantitative aspects determined from the configuration of correlations. For its application, we considered a continuous variable; age, in order to incorporate the temporal element of the life cycle. The rest were variables derived from the CONEVAL (2019) methodology for calculating the Perception Index of social networks, which measures the level of help/support: to get a job, for care in the event of an illness, for loans in emergencies, for being accompanied on a doctor's visit, support for the community, care of minors and support in emergencies. The measurement scale for these variables comprised: 1. Too easy, 2. Easy, 3. Regular, 4. Difficult, 5. Impossible.

To identify the structure of the interrelationships between the proposed variables, the EFA technique was used, applying the linear model:

$$X_{ij} = \lambda_{1j}f_{i1} + \lambda_{2j}f_{i2} + \dots + \lambda_{kj}f_{ik} + u_{ij}$$

where  $X_{ij}$ : the value of the  $i$ -th observation of the  $j$ -th variable;  $\lambda_{kj}$ : the set of linear coefficients or factor loadings;  $f_{ik}$ : the  $i$ -th observation of the  $k$ -th common factor (latent variable) with mean 0 and variance 1;  $u_{ij}$ : the random error term associated with the  $j$ -th variable.

The extraction of the factors was carried out using the principal component analysis technique; and for the factor extraction and rotation process, a minimum unique variance of 0.6 was considered. To estimate the factor scores, the Bartlett method was used, according to which  $\hat{f}_i$  of the  $K$  factor scores estimated for the  $i$ -th observation, is obtained by applying the following equation:

$$\hat{f}_i = (\hat{\Lambda}'\hat{\Psi}^{-1}\hat{\Lambda})^{-1}\hat{\Lambda}'\hat{\Psi}^{-1}x_i$$

where  $x_i$  is the vector of  $p$  data for the  $i$ -th observation.

Using the exploratory factor analysis technique, in addition to obtaining the structure for the interrelationships between the observed variables that make up the HISC, 3 aspects (factors) were identified:

- Support networks for care work, which refers to family/community help; they contain three variables, support for care in case of illness, for medical support and for the care of minors.
- Community support networks, which refers to family/community support to achieve common goals; this includes two variables, support for improvements in the community and support in case of an emergency.
- Economic support networks, which refers to family/community support to face

emergencies derived from the lack of monetary resources; this is made up of two variables, support to get a job and financial support or loan in case of an emergency.

To construct the HISC, a weighted average for each factor was obtained, following the methodology of Guillermo and García (2015), re-scaling the results to obtain values from 0 to 100. The following intervals were established by dividing into tertiles, based on the distribution of the index itself for interpretation: 1. Low social cohesion (1-42); 2. Medium social cohesion (43-60); and 3. High social cohesion (61 to 100). Although the interview was carried out with one person from the household, information was collected from all its members, so the index obtained is representative of the household, based on its characteristics and particularities, determining their perception of the possibility of receiving support.

By identifying these aspects, it is apparent that research will not address the problem of social cohesion in terms of perceived ethical values, formed from cognitive or affective aspects that Janmaat (2011) terms ideational in relation to their particularly subjective character; instead social cohesion will be considered in terms of its horizontal nature concerning the perception and ability of the network to reduce uncertainty in problematic family and community conditions by the construction of an index that considers the capacity for support-solidarity-help for facing adverse situations in three important contexts, economic, care work and community, discerning its relationship with inequality and poverty.

Likewise and notably, the indicator to be developed will evaluate social cohesion from a perspective that Durkheim (1984) would call mechanics, that is, the solidarity manifested in small-scale societies due to integration and homogeneity, in this case in a rural and indigenous context. This seeks to evaluate the degree of social bond between individuals, understanding that these result from a set of values, beliefs and affective elements, which will be considered as exogenous variables.

In order to analyse the results, age groups were established according to the classification provided by the National Population Council (CONAPO, 2000) for the estimation of the Social Development Index referring to stages in life cycle. To estimate total household income, both monetary and non-monetary income of all household members were considered; the latter estimate based on the entire volume of goods produced for self-consumption, multiplied by average prices in the town. The per capita income used to determine the population in poverty or extreme poverty was obtained by dividing the entire income between the members of the household. The data were interpreted through correlation tests using Pearson's coefficient ( $r$ ) and Spearman coefficient ( $s$ ), to establish the degree of adjustment and linear relationship between variables of interest.

## RESULTS

### General information about the interviewees

The average age of the interviewees was 34.3 years; the majority are adult women (76.7%) with an age range of 25 to 44 years, only 10% are young women between 20 and 24 years

old and 13.3% are older women with an age range of 45 to 60 years. Almost all of them, according to their perception and culture, considered themselves indigenous (98.9%) and speak an indigenous language (97.8%). They were mostly educated up to Secondary school (41.1%), followed by Primary school (37.8%) and High school (14.4%); only 4.4% have completed university studies and 2.2% did not attend school.

The family structure of the interviewees is characterized by a system consisting of two people, thus married women represent 27.8% of the sample and 54.4% are in a free union; notably some are single (11.1%), separated (5.6%) or widowed (1.1%). In terms of family leadership, 71.1% are headed by the father, 8.9% by the grandfather, whereas 17.8% are headed by the mother and 2.2% by the grandmother. Regarding employment, only 25.6% work and 55.6% carry out other activities to obtain more income. The total monthly per capita income (monetary and non-monetary) on average was 52.5 USD, which means that families are below the average rural poverty and extreme poverty line established by CONEVAL (2022), at 146.4 and 78 USD respectively. A considerable part of household income comes from state transfers, specifically from the Benito Juárez Scholarships and the Universal Pension program for older adults, representing 34.9% of their total income.

Although 76.7% of households are in conditions of extreme poverty, as they perceive it, 57.8% stated that they considered themselves poor compared to the other people in their community; among the main reasons they mentioned for why they have this perception are the poor conditions of their homes (37.7%), the poor quality and limited variety in their diet (26.7%) and not having access to adequate health services. (23.3%). In this sense, they also stated that the biggest problems in the community mainly referred to provision of health services and medicines (33.3%), better highways and roads (27.8%), better schools (8.9%), jobs (7.8%) and public spaces (5.7%).

### **Estimate of HISC**

To assess HISC, the factor analysis matrix was obtained, from which the factor loadings and their rotation were calculated (Table 1). This analysis shows that 3 factors or dimensions must be extracted. In this case, the variables that make up the HISC have a total variance indicated up to the third factor of 67.9 percent.

To calculate the specific weights of each factor in the weighted index, the proportion of total variance explained by each extracted factor is obtained (Guillermo and García, 2015). The first factor (care networks) indicates 29.5% of common variance, the second factor (community networks) indicates 19.4% and the third factor (economic support networks) indicates 18.9%, therefore to each factor its corresponding weighting is attributed to Factor 1  $(0.2955/0.6794)=0.43$ , Factor 2  $(0.1941/0.6794)=0.29$  and Factor 3  $(0.1898/0.6794)=0.28$ , so HISC was obtained by means of a weighted average expressed by the following equation.

$$HISC = 0.43\hat{f}_1 + 0.29\hat{f}_2 + 0.28\hat{f}_3$$

**Table 1.** Rotation matrix of factor loadings and proportion of explained variance after orthogonal rotation of the HISC.

Rotation of factor loadings - HISC				
Variable	Factor1	Factor2	Factor3	Unique variance
Support for finding a job	0.1025	-0.1514	0.8396	0.2617
Support when sick	0.7932	-0.0662	0.1624	0.34
Monetary resource support	0.0823	0.3298	0.7498	0.3223
Support by being accompanied to doctor	0.8075	0.2198	0.027	0.2989
Support to improve community	0.0453	0.822	-0.0411	0.3206
Help to take care of children	0.8021	0.1888	0.0799	0.3145
Help in case of emergency	0.3528	0.6807	0.1618	0.3859
Proportion of variance explained by each factor after orthogonal rotation				
Factor	Variance	Differences	Proportion	Acumulated variance
Factor1	2.06845	0.70941	0.2955	0.2955
Factor2	1.35904	0.03054	0.1941	0.4896
Factor3	1.3285		0.1898	0.6794

LR test: independence *vs* saturation:  $\chi^2(21)=112.81$ ,  $\text{Prob}>\chi^2=0.0000$ .  
 Source: own elaboration based on survey data, 2022.

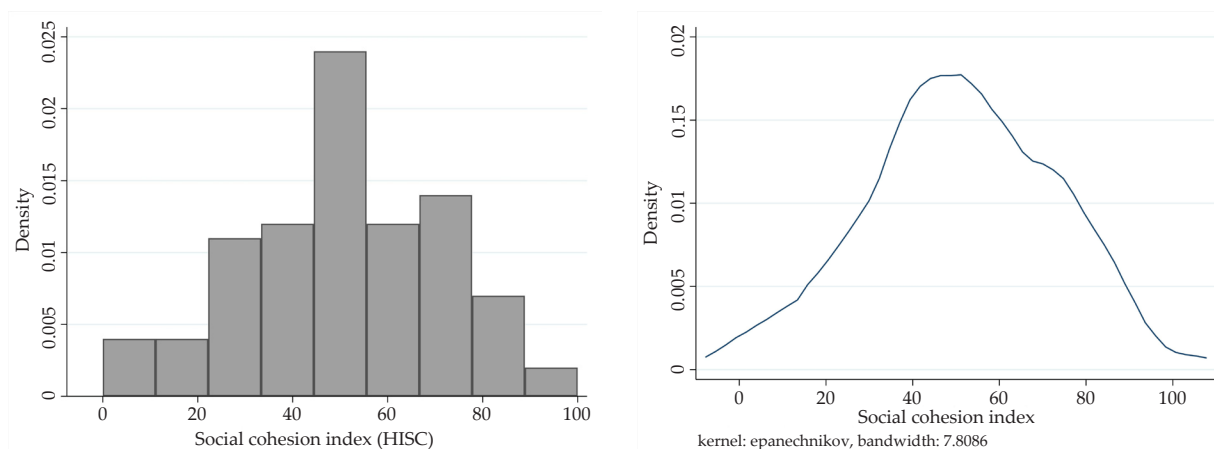
The result obtained from the HISC produced an average of 51.1, that is, among the interviewed population there is a medium social cohesion index, showing a continuous Kernel density distribution that is concentrated in the middle values, meaning that if you have an HISC, it will most probably be in the range of 40-60 (Figure 2).

### Aspects that constitute the HISC

The social cohesion index is at medium level, which is explained to a greater extent by aspect 1, referring to support networks in form of care work, especially support from family and neighbors, so that should an eventuality arise where the care of minors or sick people is required they receive assistance, presenting an average index of support networks for care tasks of 55.2. For the economic support networks, the average cohesion index was 40.2, which is considered low and concerning the community support aspect, an average of 39.6 was calculated (Table 2). This is an indication that, despite being relatively homogeneous spaces (rural and indigenous), coordination problems arise for achieving goals that contribute to the well-being of the community's inhabitants.

### Life cycle and HISC level: analysis by aspect

Apparently 44% of young women had access to a low level of social cohesion, while 36% of adults and 8% of older women reported being in this situation; despite this, there was no statistically significant correlation between social cohesion and age. When analyzing



Source: own elaboration based on survey data, 2022.  
**Figure 2.** Histogram and Kernel Density Plot for HISC.

the relationship between age and community support networks, a positive and significant correlation was observed at 10% confidence level ( $s=0.382$ ,  $p=0.054$ ), which implies that in households where the interviewees are older, their reciprocal ties within the community are stronger.

#### Gender and HISC level: analysis by aspect

Notably, the average HISC in households headed by women was lower (46.7) compared to that of households headed by men (52.3); this behavior is maintained when the analysis is carried out by aspect, but is more evident in the case of care support networks, as the average index for this aspect among female-headed households was 50.2, whereas among male-headed households it was 56.4 (Table 3).

#### Social cohesion and educational level

There is a positive relationship between levels of social cohesion and educational level ( $r=0.26$ ,  $p=0.01$ ), derived from economic support networks ( $r=0.29$ ,  $p=0.006$ ) and from community support networks ( $r=0.21$ ,  $p=0.04$ ). This is clarified by observing Table 4, where the lowest HISC levels are found in households where the head has only reached

**Table 2.** Average levels for aspects of the HISC.

	Aspects	Average	Standard deviation
1	Support networks for care work	55.2	26.03
2	Community support networks	39.6	18.34
3	Economic support networks	40.2	25.64

Source: own elaboration based on survey data, 2022.

**Table 3.** Average levels for aspects of HISC by head of household

Head	HISC	Support networks for care	Community support networks	Economic support networks
Man	52.3	56.4	40.0	41.1
Woman	46.7	50.2	38.4	36.8

Source: own elaboration based on survey data, 2022.

primary educational level (47.5); likewise as educational levels increase, the index rises, reaching to its maximum level with university studies (72), as apparent in Table 4.

### Economic inequality, poverty and social cohesion, a territorial expression

In terms of economic inequality, a low Gini index was found (0.33), however, this is explained because most households have very low levels of per capita income. The Gini index is an further indicator of inequality, which does not allow an individual analysis according to aspect, which is why it is more convenient to carry out an analysis of distribution of income contrasting it with the HISC. There is no clear relationship between income levels and HISC; this is evident if the HISC is considered by decile (Table 5).

In the study locations, similar levels were found between Lipuntahuaca and May 5 with an HISC of 55.7, followed by the town of Xonalpu (49.6), with the lowest level being the town of Leacamán (43.08); notably this last locality is characterized by presenting the highest levels of social deprivation in the municipality.

Regarding the level of social cohesion among households that are in conditions of extreme poverty, a similar distribution was observed between the groups of low, medium and high social cohesion, so there is no clear and significant correlation. However, households that are not in extreme poverty manifest different behavior, because they show a distribution that is concentrated in high levels of social cohesion. This is made evident when considering that 38.6% of households in extreme poverty present low levels of social cohesion, compared to 15% of households that were not in this condition (Figure 3). The correlation between social cohesion and population living in poverty was not significant ( $s=0.13$ ,  $p=0.219$ ).

When comparing the relationship between the different aspects and conditions of extreme poverty, a negative correlation was observed between economic support networks and the

**Table 4.** Average HISC and support networks by educational level.

Education	HISC	Support networks for care	Community support networks	Economic support networks
Primary	47.5	55.3	37.4	21.4
Secondary	48.9	48.9	38.2	22.4
High school	61.3	64.8	43.6	36.7
University	72.0	72.5	59.4	26.5

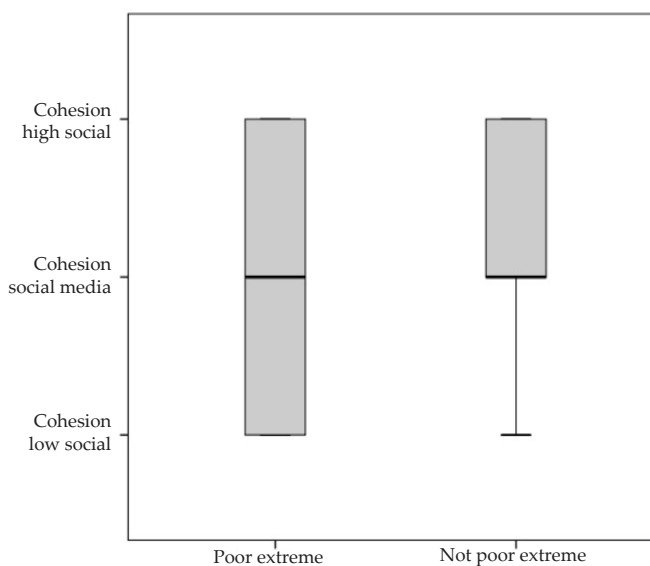
Source: own elaboration based on survey data, 2022.

**Table 5.** Deciles by monthly income per capita and levels of social cohesion.

Deciles	Monthly income by decile	Average level of HISC	Aspect 1	Aspect 2	Aspect 3
			Support networks for care	Community support network	Economic support networks
I	313	54.7	60.5	40.5	40.7
II	404	46.3	49.2	46.3	25.6
III	505	44.5	42.0	38.0	42.3
IV	624	63.6	66.8	46.0	51.7
V	788	52.7	53.8	38.2	49.7
VI	952	64.5	69.2	52.7	44.4
VII	1,169	37.7	32.4	32.1	40.9
VIII	1,473	46.6	57.3	33.0	33.0
IX	1,833	52.3	65.3	29.6	42.1
X	2,259	48.5	55.3	40.0	31.6

Source: own elaboration based on survey data, 2022.

population that suffers from extreme poverty ( $s=-0.374$ ,  $p=0.06$ ). Similar behavior was apparent in terms of community support networks, although the latter was not statistically significant ( $s=-0.038$ ,  $p=0.85$ ), whereas concerning care networks no correlation was observed ( $s=0.009$ ,  $p=0.96$ ). These results show that regardless of the conditions of extreme poverty, care networks are present in an undifferentiated manner in different households,



Source: own elaboration based on survey data, 2022.

**Figure 3.** Levels of social cohesion and whether people are in conditions of extreme poverty.

whereas economic networks are lacking among households suffering from conditions of extreme poverty.

## DISCUSSION

Due to the complexity involved in measuring and analyzing social cohesion, various indicators have been constructed, one of them developed by CONEVAL (2019), known as the Degree of Support of Social Networks Indicator; its methodology indicated that by 2022, 46.3% of the country's population stated that they were at a high level concerning perception of social networks and 53.7% were at a medium level. The State of Puebla presented a medium social network perception index (CONEVAL, s.f.), a similar conclusion to that obtained for the HISC with a result of 51.1, despite the fact that the study was carried out in a rural and indigenous context, characterized for having a high degree of homogeneity, not only territorial, but also cultural, social and political, where the perception persists that these are spaces where the community has special importance for the future of its daily life and in the implementation of social functions.

According to a report prepared by Eurosocial (2021), social cohesion varies when considering gender approaches, because historically patriarchal societies can achieve high levels of social cohesion, although this may be superficial and based on gender inequalities. This aspect was analyzed for the country by the National Institute for Women-INMUJERES (2015), finding that for 2012, the percentage of the population that considers it difficult or impossible to obtain monetary help through the networks was 74.9. % for men and 80.8% for women, followed by work (66.1% men and 71.7% for women), sick care (36% men and 41% women), child care (31.1% men and 35.4% women) and finally, someone to accompany them to the doctor (20.9% men and 23.2% women), concluding that "for women, regardless of their age, family relationship in the home, location of residence and indigenous language speaking status, the perception of difficulty getting support is greater than for men" (INMUJERES, 2015: 6). These results are similar to those found in the research, because it was found that the levels of social cohesion for households headed by women (46.7) are at lower levels than for households headed by men (52.3) and that this is for all aspects.

This difference can be attributed to the fact that female-headed households have a greater need for support networks, as they have to take charge of both caring for their family members and participating in the labor market, presenting the "gender paradox" of social cohesion. This indicates that women are the main providers of social cohesion, however, they are primarily excluded in terms of equal opportunities, citizenship and participation (Eurosocial, 2021); this was confirmed by the observation that 83.3% of households headed by women are in extreme poverty, compared to 76.4% of households headed by men. These results, on a national scale, are not only lower, but additionally, the gap between the two is also lower, according to CONEVAL (2022), 36.9% of the population of women in Mexico live in poverty, compared to 35.6% of men, and 7.2% of women live in conditions of extreme poverty, compared to 6.9% of men.

In this research, education was found to represent a fundamental factor in social cohesion; in this sense, Gvirtz and Beech (2014) argue that education allows us to rebuild ties in an increasingly fragmented society, concerning both socioeconomic and cultural aspects, and that likewise it increases the possibility of becoming involved in productive activities, improving capabilities and levels of well-being. However, this is affected by the capacity of labor markets to generate quality jobs (Reyes *et al.*, 2017). In this study, we confirmed how education is positively related to the generation of social cohesion, especially in the creation of community and economic networks, derived from the ability to improve the conditions of monetary support and networks that facilitate gaining employment, without specifying whether this is of good quality.

It is important to recognize the relationship between education and life cycle, because older women have stronger community networks than young women, but young women with more education have much stronger economic support networks than those with only community networks. This result shows the need to work for intercultural education that develops not only productive skills and abilities among young people, but also the transmission of cultural values into and out of their community, to promote social cohesion.

The process of erosion of the social fabric in the country has been documented, derived from the conditions of poverty that limit reciprocity in horizontal relationships of mutual aid, causing segregation and isolation (Aboites *et al.*, 2015). However, there is no evidence to demonstrate a statistically significant relationship between poverty and social cohesion, as low levels of social cohesion can occur among both the poor and non-poor population (Boltvinik *et al.*, 2010).

In this sense, the results obtained show that there is indeed no statistically significant relationship between income-poverty-level of social cohesion, but there are patterns of concentration, as there is a greater proportion of households in extreme poverty with low levels of social cohesion, compared to households that are not in this condition, coupled with the fact that economic networks are diminished among households that are in conditions of extreme poverty, placing them in a position of greater uncertainty and vulnerability.

Another variable of interest is economic inequality; in this regard, a study carried out by Crouch *et al.* (2009) in Latin America, demonstrated that the relationship between inequality and cohesiveness is weak, so they are not the same thing and should be treated separately, although they did discern a negative correlation. Results from this research showed that the income inequality of the interviewed households (Gini=0.33) is lower than that presented at the state level (0.40) or national level (0.46) (INEGI, 2022), however, their level of social cohesion is similar, in the medium range.

Faced with the growing modernizing and individualizing tendencies enhanced by the current economic system, rural and indigenous societies are confronted with different social values, which have disrupted the social fabric of the community, which is why

the strength of community support networks has been declining. As Sartorello (2021) mentions, negative values have strongly penetrated the socio-natural frameworks of indigenous communities due to multiple and diverse factors, such as migration, television, low-quality industrial production and the integration of peasant economies into regional marketing groups, to mention a few.

### CONCLUSIONS

The operationalization of the HISC, carried out through exploratory factor analysis, enabled us to estimate a general indicator that meets the criteria of continuity and cardinality, and also to identify 3 dimensions of analysis: support networks for care work, community and economy. Being able to break down the index into aspects made it possible, not only to make a general analysis, but also to establish disaggregated and specific relationships with other variables of interest (poverty, inequality, income, education, and life cycle).

Through this analysis, it became apparent that the pre-conceived idea that a society with little inequality has greater cohesion, must be tempered, as it was apparent from the results, when studying an almost homogeneous rural-indigenous area, with low levels of inequality, that social cohesion has a medium rating in terms of the care support network, which implies that the relationship with the most closely related people is the strongest, however, this becomes weaker, especially when seeking to increase help to meet monetary commitments or extend this to the community network.

A common argument is that social cohesion can act as a mechanism to solve the problems of poverty, inequality and development, however, the most vulnerable population groups, such as the population in extreme poverty, face extremely adverse socioeconomic conditions, coupled with the fact that this presents greater problems for creating support networks to obtain monetary needs or employment.

The role of education in rural and indigenous contexts is fundamental to improving the conditions of social cohesion in the weakest support networks, including economic and community support.

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