Center for World Indigenous Studies

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GLOBAL FOURTH WORLD COVID-19 PANDEMIC RISK ASSESSMENT (Preliminary) 27-1020

Mexico

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The **CWIS Global Fourth World COVID-19 Risk Assessment** is a project of the Center for World Indigenous Studies. This Assessment continues the CWIS COVID-19 Indian Country Pandemic Risk Assessment (USA) begun in March 2020 and that was paused in May 2020 with a statement of findings. The COVID-19 Indian Country Risk Assessment focused on 574 American Indian Tribal and Alaskan Native communities, 46 urban Indian communities, Hawaiian Native communities, and indigenous migrant and refugee communities located in the United States with a combined estimated population of 8 million people. The results were posted on the CWIS website (cwis.org) and directly shared with numerous tribal governments and Urban Indian Community centers.

The **CWIS Global Fourth World COVID-19 Risk Assessment** is an extension of the initial assessment in the United States tribal communities expanded into the world at large, where there are 5,000 indigenous nations with a combined population of 1.9 billion people in 206 internationally recognized countries. The COVID-19 Risk Assessment Team is taking on an ambitious and complex study. We are conducting

research in states with different policies toward indigenous peoples[1], different political systems and government structures, and in particular varying health systems, capacities and competence as relates to public health and in particular conducting a response to the COVID-19 pandemic. Populations may vary from just a few families to many thousands of people[2]

MEXICO PROFILE

As of 18 October 2020, Mexico's health agencies had documented just over 86,100 fatalities directly tied to the COVID-19 pandemic. Mexico therefore has the world's fourth highest number of deaths, below India (114,031), Brazil (153,675), and the United States (219,286). In terms of the number of deaths per million population, Mexico is virtually the same as the United States, at 1,502 and 1,505, respectively.

Prevention of infections can only be achieved with masking, social distancing, and testing, but these measures are not being taken to the extent necessary to prevent the spread. As some diaspora and other communities have learned, closing access to the community or group has proved an effective measure for mitigating the spread of COVID-19 infections. In addition, traditional medicines and procedures long practiced by communities have proved effective.[3] As

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[1] Many countries assert they do not have indigenous peoples within their boundaries, or they claim that all of the citizens of the state are "indigenous", so it is not necessary to designate their communities as "indigenous." Still other states apply different definitions of "indigenous" such as only those communities that speak an indigenous language or communities that have not integrated into the general state population or all persons claiming to be "indigenous" are minority populations classified as a subset of the wider state population. The definition we are using: *Self-identifying peoples with historical continuity pre-dating colonial occupations, having a claimed territory with collective uses, a distinct culture and people and a collective resolve to maintain ancestral relationships.*

[2] The Nama (also known as San) located partly in Botswana, Namibia and Angola have been known to form in tiny communities comprised of several families suitable to the climate and geographic regions. They are a people with an 80,000-year history. https://www.britannica.com/topic/San Peoples of Aljaringa (Australia) also form into small multi-family communities while many of their neighboring 250 cultural communities may also organize into hundreds of people with populations of 370 (Yndjibarndi) or 390 (Nungar) people (https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/IQS5)

[3] Portella, Ghelman, Abdala, Schveitzer (2020) Evidence map on the contributions of traditional, complementary and integrative medicines for health care in times of COVID-19. ScienceDirect https://doi.org/10.1016/j.imr.2020.100473 The map presents and overview of possible Traditional, Complementary and Integrative Medicine contributions to various dimensions of COVID-19 pandemic, especially in the field of mental health. " Most of the antiviral activity outcomes described in this map refers to respiratory viruses in general, and not specifically to SARS-CoV-2 (Severe Acute Respiratory Syndrome CoronaVirus 2)"

noted above, poverty, living conditions - overcrowding, health status (chronic conditions), and community organization infrastructure are key factors contributing to the spread of COVID-19, but adjusting these conditions can significantly prevent or limit the spread in indigenous communities.

Descendants of the original peoples of Mexico are comprised of more than 89 "cultural ethnicities" as defined by the Constitution of Mexico. These peoples are said by the Mexican Government to comprise a combined population of about 28 million people. Based on the Principle of Self-Identification, the number of people identifying as indigenous to Mexico exceeds 100 million. The various concentrations of indigenous communities may range in size from 10 or so families[4] to more than 1 million persons in a community. Specific indigenous communities may be concentrated in a single area or in several regions across Mexico. This assessment seeks to assess the degree of risk that indigenous communities face due to their population concentration, their proximity to significantly COVID-19 infected cities, and the extent of population movement between infected and non-infected communities. The risk assessment characterizes the levels of risk to indigenous communities as "undetected or low risk of fatalities," "significant risk of fatalities," and "greatest risk of fatalities."

While the number of COVID-19 cases in any given municipality can be tracked over time to measure a trend, this assessment concentrates on "fatalities per 1000 persons" as a measure of the intensity of infections in a community and infers risk due to proximity. We take the view that fewer than 100 fatalities in a locality in close proximity to an indigenous community or communities constitutes either undetected or low risk of fatalities (i.e., local resources are too limited to accurately determine the cause of fatalities) or few fatalities. The number of fatalities measured at 100-119 per 1000 people

[4] The original peoples of Mexico are primarily concentrated in the states of Campeche, Chiapas, Guerrero, Hidalgo, Mexico, Oaxaca, Puebla, Quintana Roo, San Luis Potosi, Veracruz and Distrito Federal. An estimated 54% of the Mexico's original peoples live in urban areas with the remaining in rural areas. Multiple family dwellings is common and even considered necessary. https://theglobalamericans.org/2017/10/indigenous-political-representation-mexico/ and https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4546282/

in the indigenous community is considered significant. Fatality numbers of 120 per 1000 or greater places indigenous communities in proximity to such rates at “greatest” risk.

The United States of Mexico is comprised of 31 states and the Federal District in Mexico City. This assessment considers the number of cases per 1000 by state and municipality and establishes the estimated indigenous population level in proximity to large general population centers. The number of fatalities in each municipality is further documented along with the officially documented number of recoveries. These measures are taken every two weeks.

Based on these measures, the number of fatalities per 1000 establishes whether a community is at undetected, significant, or greatest risk.

Using these measures, we determined that the five states with the highest level of risk of COVID-19 infection to indigenous communities are Baja California, Mexico, Puebla, Sinaloa, and Veracruz. The following sections explore each of these states and the primary indigenous communities and indigenous diaspora at greatest risk due to their proximity to populations experiencing greater fatalities. For comparison, we cover several states at significant risk as well.

COVID-19 Risk in Baja California

The State of Baja California is a border state of some significance, as it is a common cross-border transit point between Mexico and the state of California in the United States. Transit populations moving across this border daily number in the hundreds of thousands,[5] all representing potential sources of cross-border transmission of COVID-19. According to one study conducted by Christina Leza[6] estimates "tens of thousands of people belonging to U.S. Native tribes live in the Mexican states of Baja

[5] There are 36 Indian Nations whose territories have been divided by the establishment of the US/Mexican state border established by the 1848 Treaty of Guadalupe Hidalgo and the 1853 Gadsden Purchase--forming the US states of California, Arizona, New Mexico and Texas. These nations include but are not limited to: Kumeyaay, Pai, Cocopah, O’odham, Yaqui, Apache and Kickapoo peoples. (Leza, C. (2019) "For Native Americans, US-Mexico border is an 'imaginary line." The Conversation. March 19, 2019.)

[6] Associated Professor of Anthropology, Colorado College
https://theconversation.com/profiles/christina-leza-612762

California, Sonora, Coahuila and Chihuahua." Crossings within the original territories of these nations are typically due to visits at cultural sites, attending funerals, participating in family gatherings and going to school. Such movement of peoples within these nations across the state created border poses a significant risk for families and communities on both sides of the border. State-based treaties[7] grant free passage and repassing across state borders

Members of these tribes generally do not consider the US/Mexico border an obstacle to their movements in their own territories. The consequence of this circumstance is that the risk of infection and possible deaths in indigenous communities is heightened considerably. There are at least 33 indigenous community identities located in the five municipalities of Baja California. The larger indigenous communities are the Mixteco, Nahua, Otomi, Zapoteco, Mixe, Huasteco, and Purepecha are at greatest risk. All are distant from their main populations in southern Mexico and are hereafter referred to as diaspora populations.

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[7] Jay Treaty of 1794 - September - Article III .."It is agreed that it shall at all times be free to His Majesty's subjects, and to the citizens of the United States, *and also to the Indians dwelling on either side of the said boundary line, freely to pass and repass by land or inland navigation, into the respective territories and countries* of the two parties, on the continent of America, (the country within the limits of the Hudson's Bay Company only excepted.) and to navigate all the lakes, rivers and waters thereof, and freely to carry on trade and commerce with each other. (Emphasis added). nor shall the Indians passing or repassing with their own proper goods and effects of whatever nature, pay for the same any impost or duty whatever. ... Wyandots, Delawares, Shawanoes, Ottawas, Chippewas, Putawatimies, Miamis, Eel River, Weeas, Kickapoos, Piankashaws, and Kaskaskias.

The American Indian Religious Freedom Act of 1978 provides protection to American Indian tribes' religious rights including access to sacred sites and "possession of sacred objects." And, the Native American graves Protection and Repatriation Act enacted by the US Congress in 1990 offers legal protections for access to and ceremonies concerning human remains, burial sites and sacred objects. The US government furthermore has adopted the policy requirement that officials must consult tribal governments in federal border enforcement planning. But strict US identification laws are imposed with the result of increased obstruction to free movement by tribes along the US/Mexico border.

Figure 1. Map of major cities, original resident indigenous populations, and risk levels in Baja California

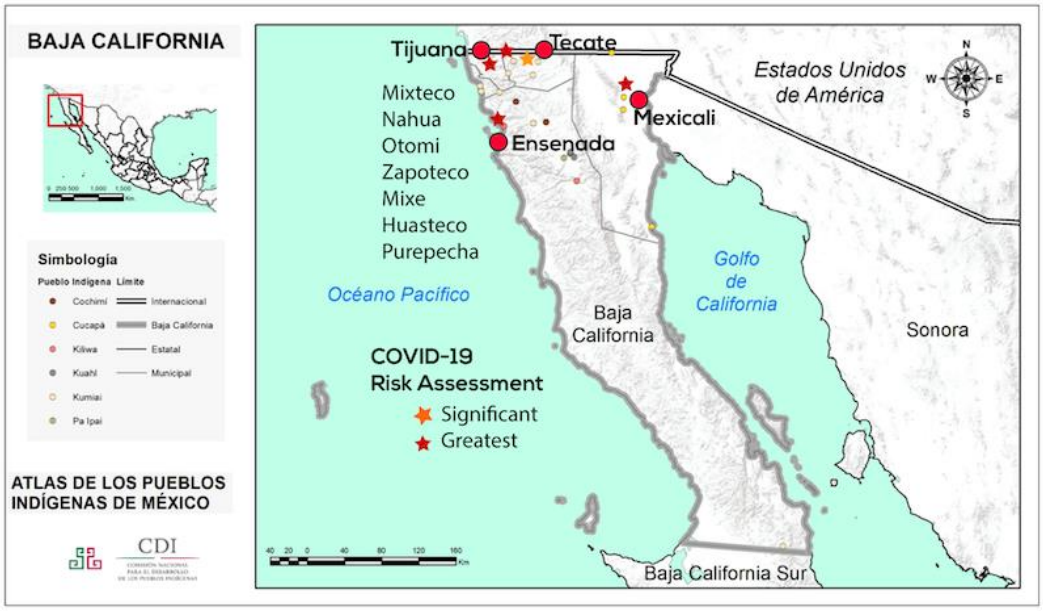

Table 1. Risk levels to indigenous peoples in municipalities of Baja California

Indigenous Community	Risk Level	State
Amuzgo	Greatest	Ensenada
Cora	Greatest	Ensenada
Huasteco	Greatest	Ensenada
Wixárika	Greatest	Ensenada
Kiliwa	Greatest	Ensenada
Kumeyaay	Greatest	Ensenada
Maya	Greatest	Ensenada
Mayo	Greatest	Ensenada
Mazahua	Greatest	Ensenada
Mazateco	Greatest	Ensenada
Mixe	Greatest	Ensenada
Mixteco	Greatest	Ensenada
Nahua	Greatest	Ensenada
Paipai	Greatest	Ensenada
Purepecha	Greatest	Ensenada
Tarahumara	Greatest	Ensenada
Tepehuano del sur	Greatest	Ensenada
Tlapaneco	Greatest	Ensenada
Totonaco	Greatest	Ensenada
Triqui	Greatest	Ensenada
Tseltal	Greatest	Ensenada
Tsotsil	Greatest	Ensenada
Yaqui	Greatest	Ensenada
Zapoteco	Greatest	Ensenada
Cora	Greatest	Mexicali
Cucapa	Greatest	Mexicali

Ch'ol	Greatest	Mexicali
Huasteco	Greatest	Mexicali
Wixárika	Greatest	Mexicali
Mam	Greatest	Mexicali
Maya	Greatest	Mexicali
Mayo	Greatest	Mexicali
Mixe	Greatest	Mexicali
Mixteco	Greatest	Mexicali
Nahua	Greatest	Mexicali
Otomi	Greatest	Mexicali
Purepecha	Greatest	Mexicali
Tarahumara	Greatest	Mexicali
Tseltal	Greatest	Mexicali
Tsotsil	Greatest	Mexicali
Yaqui	Greatest	Mexicali
Zapoteco	Greatest	Mexicali
Huasteco	Significant	Playas de Rosarito
Kumeyaay	Significant	Playas de Rosarito
Maya	Significant	Playas de Rosarito
Mixteco	Significant	Playas de Rosarito
Nahua	Significant	Playas de Rosarito
Purepecha	Significant	Playas de Rosarito
Tarahumara	Significant	Playas de Rosarito
Yaqui	Significant	Playas de Rosarito
Zapoteco	Significant	Playas de Rosarito
Kumeyaay	Greatest	Tecate
Mayo	Greatest	Tecate
Mazahua	Greatest	Tecate
Mixteco	Greatest	Tecate
Nahua	Greatest	Tecate
Otomi	Greatest	Tecate
Paipai	Greatest	Tecate
Purepecha	Greatest	Tecate
Tarahumara	Greatest	Tecate
Tojolabal	Greatest	Tecate
Tsotsil	Greatest	Tecate
Yaqui	Greatest	Tecate
Zapoteco	Greatest	Tecate
Amuzgo	Greatest	Tijuana
Cora	Greatest	Tijuana
Chinanteco	Greatest	Tijuana
Ch'ol	Greatest	Tijuana
Huasteco	Greatest	Tijuana
Wixárika	Greatest	Tijuana
Jakalteco	Greatest	Tijuana
Maya	Greatest	Tijuana
Mayo	Greatest	Tijuana
Mazahua	Greatest	Tijuana
Mazateco	Greatest	Tijuana
Mixe	Greatest	Tijuana
Mixteco	Greatest	Tijuana
Nahua	Greatest	Tijuana
Otomi	Greatest	Tijuana
Paipai	Greatest	Tijuana
Pame	Greatest	Tijuana

Purepecha	Greatest	Tijuana
Tarahumara	Greatest	Tijuana
Tlapaneco	Greatest	Tijuana
Tojolabal	Greatest	Tijuana
Totonaco	Greatest	Tijuana
Tseltal	Greatest	Tijuana
Tsotsil	Greatest	Tijuana
Yaqui	Greatest	Tijuana
Zapoteco	Greatest	Tijuana
Zoque	Greatest	Tijuana

COVID-19 Risk in Coahuila

Twenty-three distinct indigenous community identities are present in the state of Coahuila, with the vast majority in close proximity to population concentrations that have experienced COVID-19 infections. Despite Mexico's policy of associating indigenous identity with indigenous language ability, it is important to note that in the state of Coahuila there are no fewer than 26 different identified indigenous communities in 46 locations. Of these, 12 communities are identified as experiencing "significant risk" and 27 experiencing "greatest risk" of COVID-19 infections--some of which are illustrated for location reference.

Figure 2. Map of major cities, original resident indigenous populations, and risk levels in Coahuila

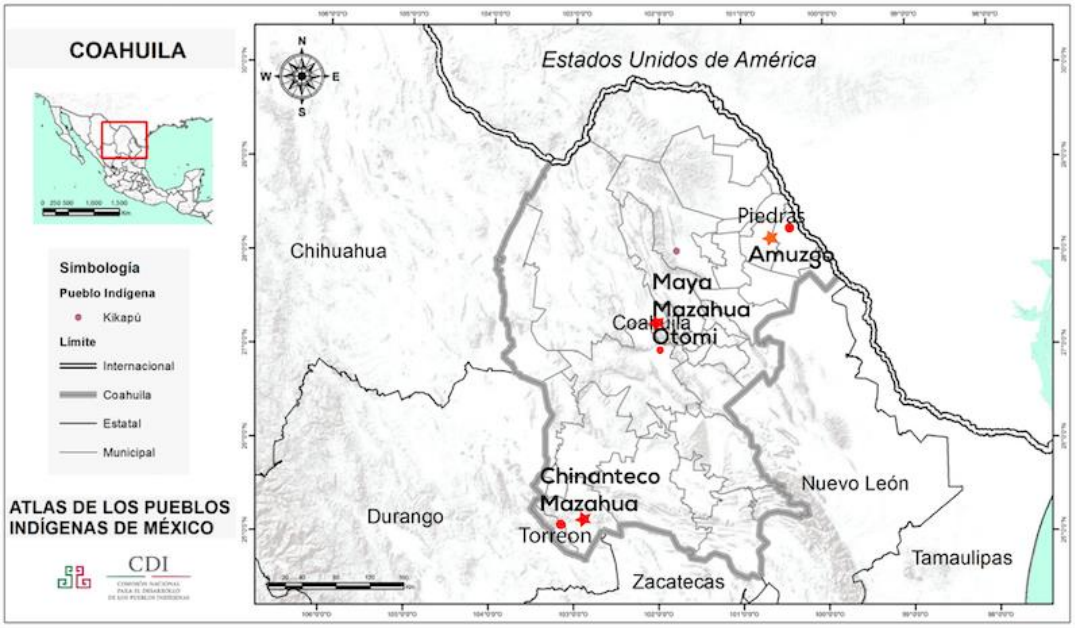

Table 2. Risk levels to indigenous peoples in municipalities of Coahuila

Indigenous Community	Risk Level	State
Ch'ol	Significant	Acuna
Mazateco	Significant	Acuna
Mixteco	Significant	Acuna
Nahua	Significant	Acuna
Totonaco	Significant	Acuna

Zoque	Significant	Acuna
Mixteco	Undetected/low risk	Frontera
Maya	Undetected/low risk	Monclova
Nahua	Undetected/low risk	Monclova
Zapoteco	Undetected/low risk	Monclova
Kickapoo	Undetected/low risk	Muzquiz
Nahua	Undetected/low risk	Muzquiz
Amuzgo	Significant	Piedras Negras
Chinanteco	Significant	Piedras Negras
Kickapoo	Significant	Piedras Negras
Nahua	Significant	Piedras Negras
Totonaco	Significant	Piedras Negras
Huasteco	Greatest	Ramos Arizpe
Nahua	Greatest	Ramos Arizpe
Totonaco	Greatest	Ramos Arizpe
Mazahua	Undetected	Sabinas
Nahua	Undetected	Sabinas
Maya	Greatest	Saltillo
Mazahua	Greatest	Saltillo
Mixe	Greatest	Saltillo
Mixteco	Greatest	Saltillo
Nahua	Greatest	Saltillo
Otomi	Greatest	Saltillo
Tarahumara	Greatest	Saltillo
Totonaco	Greatest	Saltillo
Tsotsil	Greatest	Saltillo
Zapoteco	Greatest	Saltillo
Nahua	Greatest	San Pedro
Zapoteco	Greatest	San Pedro
Chinanteco	Greatest	Torreon
Huichol	Greatest	Torreon
Maya	Greatest	Torreon
Mazahua	Greatest	Torreon
Nahua	Greatest	Torreon
Purepecha	Greatest	Torreon
Tarahumara	Greatest	Torreon
Zapoteco	Greatest	Torreon

These samples of indigenous communities in two states—Baja California and Coahuila—(see maps) suggest considerable mobility of the various indigenous populations in cities and towns close to the U.S. border, thus elevating the risk of COVID-19 infections and subsequent fatalities. The presence of many indigenous groups in these border states, reflecting the diversity of indigenous communities throughout Mexico, suggests the prospect of inter-community vectors carrying COVID-19 throughout indigenous communities from north to south.

COVID-19 Risk in Colima

Families and communities in Colima located near concentrated populations are at risk of

contracting COVID-19. While Nahua-speaking communities are specifically identified as having sizable populations (e.g., 170 persons to over 1,900 persons per municipality), it should be noted that other indigenous communities are present in significant numbers as well, including Purepecha, Zapoteco, and Mixteco. The proximity of these communities to larger populations that already exhibit greater incidence of COVID-19 is similar to that of Nahua-speaking communities. More than 8,000 indigenous people in Colima are herein identified as being at significant and greatest risk.

Figure 3. Map of major cities, original resident indigenous populations, and risk levels in Colima

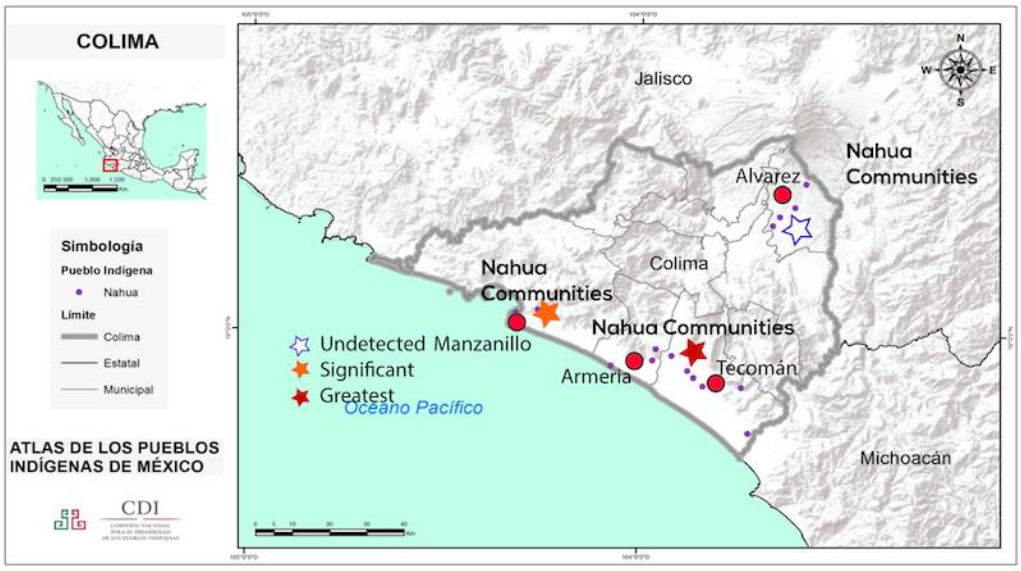

Table 3. Risk levels to indigenous peoples in municipalities of Colima

Indigenous Community	Risk Level	State
Nahua	Greatest	Armeria
Purepecha	Greatest	Armeria
Chatino	Undetected	Colima
Huasteco	Undetected	Colima
Mixteco	Undetected	Colima
Nahua	Undetected	Colima
Purepecha	Undetected	Colima
Zapoteco	Undetected	Colima
Nahua	Undetected	Comala
Nahua	Significant	Cuauhtemoc
Huasteco	Significant	Manzanillo
Maya	Significant	Manzanillo
Mazahua	Significant	Manzanillo
Mixteco	Significant	Manzanillo
Nahua	Significant	Manzanillo
Otomi	Significant	Manzanillo
Purepecha	Significant	Manzanillo
Tseltal	Significant	Manzanillo

Zapoteco	Significant	Manzanillo
Huasteco	Greatest	Tecoman
Mixteco	Greatest	Tecoman
Nahua	Greatest	Tecoman
Purepecha	Greatest	Tecoman
Huichol	Undetected	Villa de Alvarez
Mazahua	Undetected	Villa de Alvarez
Mixe	Undetected	Villa de Alvarez
Nahua	Undetected	Villa de Alvarez

The availability of medical facilities to indigenous communities depends on accessibility of private or federal hospitals and clinics. Private hospitals are often not accessible due to the costs involved. The level of poverty in these communities directly relates to the levels of risk since access to health facilities depends on transportation to health facilities, availability of money, and accessibility at health facilities to necessary personal protective equipment (PPE).[8] Furthermore, it is evident that the actual numbers of COVID-19 cases and fatalities depend on the capacity of small communities to identify and document cases and the causes of death—neither of which is assured. It is necessary, therefore, to estimate the true number of cases and fatalities to be at minimum 10% higher than in the official reports.[9] Such measures have been proven to improve accuracy in countries such as Italy, Norway, Switzerland and Germany where procedures for detecting COVID-19 infections and causes of death are well established.[10]

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[8] According to Gobierno de la República 79.3% of the Mexican indigenous population lived under the poverty line and a staggering 40.2% lived in extreme poverty. In a study of the 1918 Influenza Pandemic conducted by Brady and Bahr (2014) six factors made the indigenous populations 100 years ago most vulnerable to infections and fatalities included poverty:

> (1) demographic characteristics, especially age and gender; (2) socioeconomic status; (3) the availability of epidemic appropriate resources (nursing, food, shelter); (4) differential immunity related to health status and prior disease experience; (5) variations in social distancing, from overcrowding through quarantines; and (6) community organization and communication infrastructure.

SEE: Brady, B. and Bahr, H. (2014) The Influenza Epidemic of 1918–1920 among the Navajos: Marginality, Mortality, and the Implications of Some Neglected Eyewitness Accounts. American Indian Quarterly, Vol 39 No 4. (Fall 2014) pp. 459-491.

[9] The undercount for cases and fatalities was first advanced by Angelo Borrelli, the head of the Civil Protection Agency in Italy (March 2020) asserting, "A ratio of one certified case out of every 10 is credible," CNBC (2020) "The total number of Italian coronavirus cases could be '10 times higher' than known tally, according to one official." https://www.cnbc.com/2020/03/24/italian-coronavirus-cases-seen-10-times-higher-than-official-tally.html

[10] The American Council on Science and Health noted the lag in identification of COVID-19 cases due to the latent period before infection symptoms. Two research studies concluded that suggest when the tests were taken 3% of the individuals tested were infected by coronavirus at a time (April-May) when 5 million cases had been reported across the US. Extrapolating the 3% researchers suggested that nearly 10 million people would have been infected--a 50% undercount of cases. https://www.cnbc.com/2020/03/24/italian-coronavirus-cases-seen-10-times-higher-than-official-tally.html

COVID-19 Risk in Mexico State/Mexico City

The largest indigenous communities in Mexico State include the Mazahua, Matlatzinca, Otomi, Tlahuica, and Mexica [Nahua]. In addition, there are numerous diaspora communities including the Amuzgo, Chinanteco, Huasteco, Mixe, Mazateco, and Mixteco. The combined total population of resident indigenous communities and diaspora was estimated to be 1.341 million in the State of Mexico and Mexico City combined.

One example of a resident population is the Mixteca (Nahua speaking) in the municipality of Metepec, which has about 2.9 million people and 820 Nahua-speaking Mixteca. The municipality is located to the northeast of the Federal District of Mexico City and has an economy nearly entirely dependent on agriculture and fish farms which can contribute to a higher risk level due to poverty or near poverty. An example of a diaspora is the Amuzgo in the municipalities of Ecatepec de Morelos and Nezahualcoyotl on the borders of Mexico City; they are at greatest risk due in part to their proximity to Mexico City. The Amuzgo have small numbers, but they are located in an area where the fatality rates are the highest in Mexico State.

The city of Toluca consistently had the third-highest number of cases in the state, exposing its estimated 520 members of the Chinanteco diaspora to the greatest risk of COVID-19 infection. With more than 4,100 individuals, Toluca is at risk of very sizable numbers of people suffering from post-recovery organ damage. The Huasteco diaspora located just outside northwestern Mexico City has a vulnerable population of 314 that we have identified as being at greatest risk due to their proximity to Mexico City vectors and lack of access to health facilities.

Post-recovery organ damage

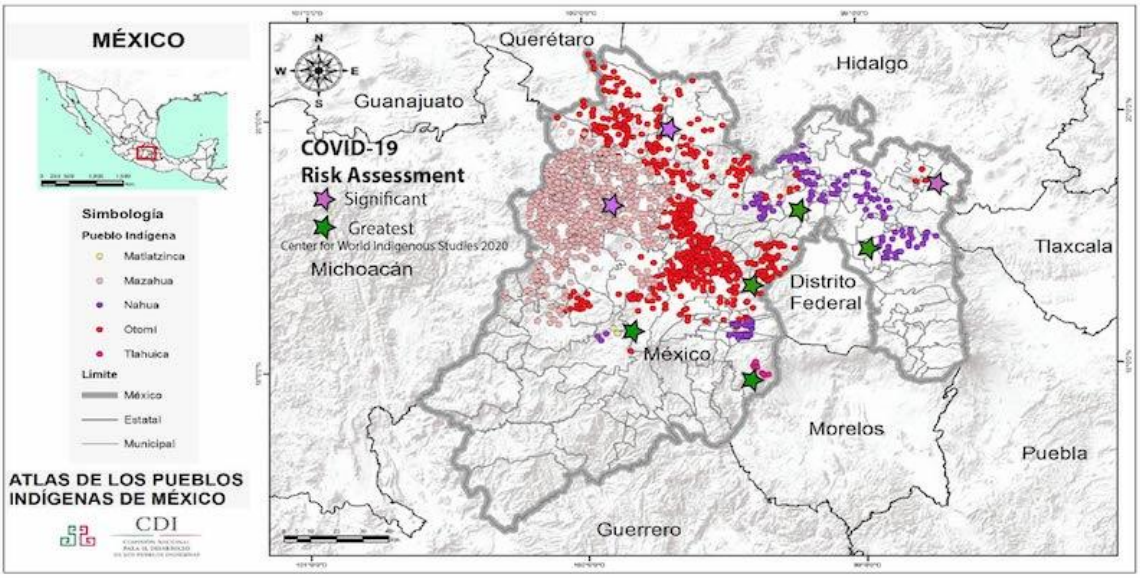
Post COVID-19 infection recovery can result in short term and sometimes long-term adverse health effects including neurological complications such as stroke and thromboembolic heart scarring and lung scarring. The heart scarring has the potential effect of weakening the heart muscle and lung scarring has the effect of potentially reducing oxygen levels in the body. These conditions and others that are still being discovered introduce significant complications for long term health in indigenous communities in Mexico whether they are diaspora or resident. Obtaining sustained medical care in circumstances where individuals experience long term damage adversely affecting health capacity suggests the potential for large numbers of undetected health problems in indigenous communities that are debilitating or life threatening after the COVID-19 infection. Health facilities are not readily available to indigenous communities causing an increased reliance on traditional healing and medicine practices that while being studied[11], have yet to be proven effective.

The number of fatalities reported by countries are suggested to be much higher than these numbers. Many official statistics "exclude victims who did not test positive for coronavirus before dying, and hospitals and civil registries may not process death certificates for several days, or even week--creating a lag in the data, according to the Economist that cites the European Centre for Disease Prevention and Control, Our World in Data, Statistik Austria, direccion General del Registro Civil (Mexico), Moscow government Open Data Portal among other sources. https://www.economist.com/graphic-detail/2020/07/15/tracking-covid-19-excess-deaths-across-countries

[11] https://www.sciencedirect.com/science/article/pii/S1744388120307039

Original resident indigenous populations are at significant risk (Mazahua, Matlatzinca, Otomi, Tlahuica), and greatest risk (Mexica [Nahua]), respectively.

Figure 4. Map of major cities, original resident indigenous populations, and risk levels in Mexico State



The peoples depicted in the map above are original resident populations, but there are numerous other diasporas reflecting the mobility of peoples in and out of the State of Mexico.

Table 2. Notable diaspora in the State of Mexico - 2015 populations

Matlatzinca	2,753	Original Resident
Mazahua	222,417	Original Resident
Nahua	203,203	Original Resident
Otomi	288,745	Original Resident
Tlahuica	2,674	Original Resident
Maya	5,232	Diaspora
Mazateco	38,990	Diaspora
Mixteco	15,040	Diaspora
Mixe	190,040	Diaspora
Purepecha	6,414	Diaspora
Totonaco	33,660	Diaspora

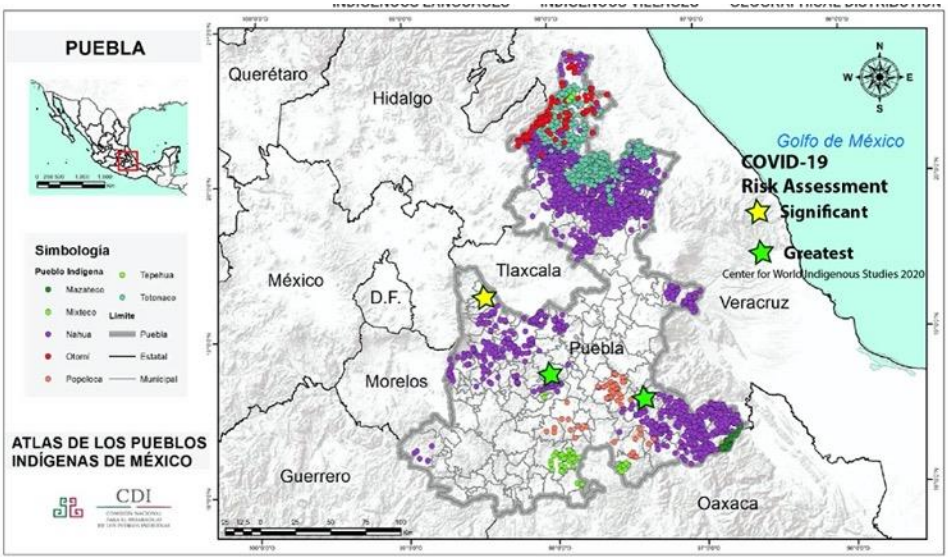
Tseltal	1,667	Diaspora
Zapoteco	40,962	Diaspora

COVID-19 Risk in Puebla

The State of Puebla has seven original resident populations and two major diaspora populations with a combined population of 308,303. The Mazateco, Mixteco, Mixteca (Nahua), Otomi, and Popoloca are the original residents of this state, though their populations do reach into other states. The Mixe and Totonaco (not shown on Figure 5) are diaspora with original residence in other states. The municipality of Tehuacan has experienced a relatively small number of COVID-19 cases, at 1,381 as of October 1. But remarkably, the municipality has experienced 303 fatalities, or a rate of 219.4 fatalities per 1000. Tehuacan and its indigenous populations are at the greatest risk of COVID-19 infection beyond these numbers. Many municipalities in Puebla are experiencing a 25% fatality rate that may be determined to be this high if we take into account non-hospitalized patients and variable determination for cause of death between health facilities.

The municipality of Puebla, with a population of 1.576 million, includes twenty original resident and diaspora indigenous communities with a combined population of over 115,920. The Mixteca (Nahua), Mazateco, Popoloca, Otomi, and Mixteco comprise the largest original resident populations, while the Totonaco constitute the largest diaspora, with smaller groups including the Tlapaneco, Tepehua, and Maya. Remarkably, COVID-19 infections have had limited spread outside the main cities of Puebla, in which zero infections have been reported in many municipalities. The indigenous communities located in more rural areas and in closer proximity to each other and not to cities have remained essentially COVID-19 free.

Figure 5. Map of major cities, original resident indigenous populations, and risk levels in Puebla



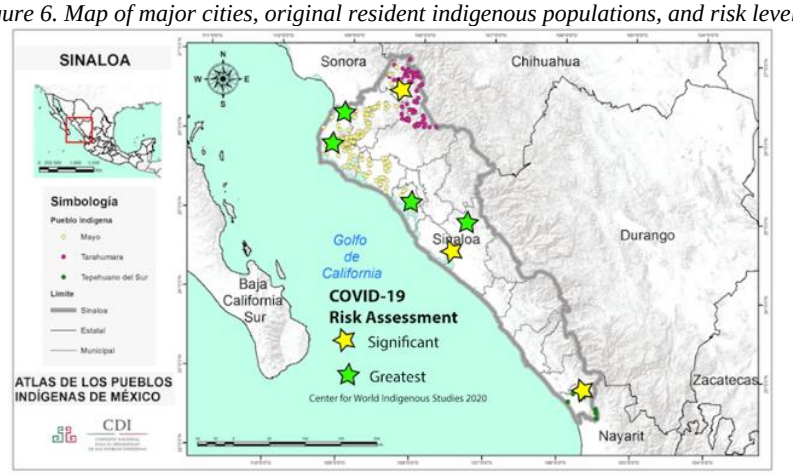
By virtue of their separation from major metropolitan centers, the original resident indigenous communities have established limited proximity and thus reduced their exposure to

COVID-19. Diaspora and original resident indigenous people living in urban settings are under the greatest risk.

COVID-19 Risk in Sinaloa

The State of Sinaloa has an overall population of 2.958 million as of 2014, of which 64,571 are original resident peoples and diaspora communities. The Mayo, Tarahumara, and Tepehuano del Sur comprise the original resident communities.

Figure 6. Map of major cities, original resident indigenous populations, and risk levels in Sinaloa



The twenty-five diaspora communities include Purepecha, Nahua, Tsotsil, Huasteco, Otomi, Triqui, Ch'ol, and Yaqui, among others. The diaspora primarily resides in larger communities, placing them at greatest risk of contracting COVID-19. Since Sinaloa is heavily commercialized, much of the population co-mingles in the larger communities, thus increasing the risk of COVID-19 infection.

COVID-19 Risk in Veracruz

The State of Veracruz has a population of 7.110 million people, of which 1.019 million are identified in the Mexican census as indigenous people. Its eleven original resident populations include Chinanteco, Huasteco, Mazateco, Mixteca (Nahua), Oluteco, Otomi, Sayulteco, Tepehua, Texistepequeño, Totonaco, and Zoque. Diaspora populations include Maya, Mixe, Popoluca del Sierra, Tseltal, and Tsotsil.

The original resident peoples are at greatest risk by virtue of their proximity to urban settings with high case numbers. Mixteca (Nahua) communities are at greatest risk since their population is the largest and closely located to major sources of infection. The diaspora populations are at significant risk in several locations due to their proximity to Coatzacoalcos.

Figure 7. Map of major cities, original resident indigenous populations, and risk levels in Veracruz

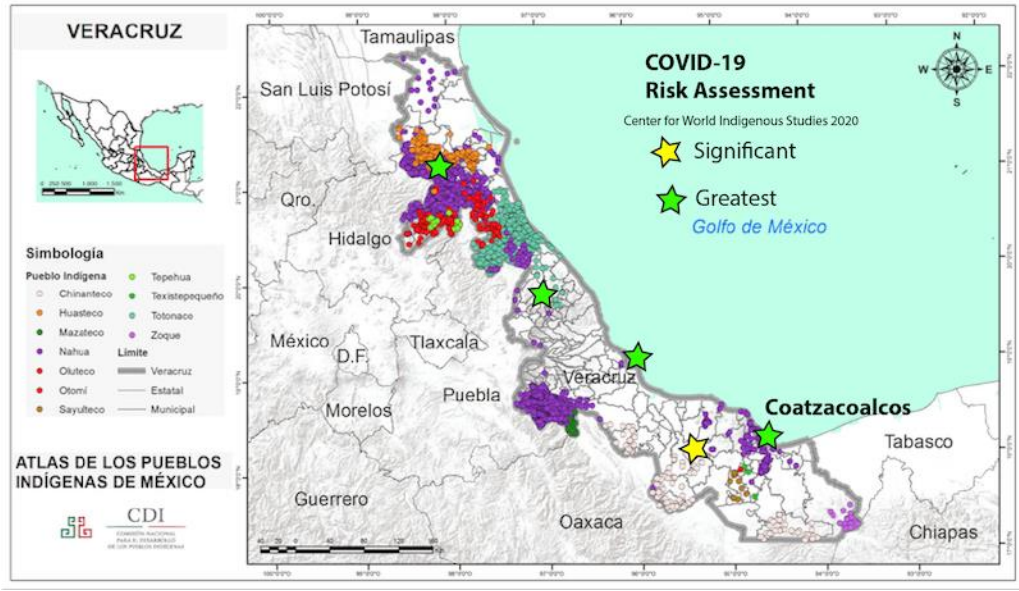


Figure 8. Global Fourth World COVID-19 Risk Assessment: Mexico - Preliminary

Indigenous populations are at greatest risk when their communities are in close proximity to Mexico's cities and large towns that register as significant or greatest risk of COVID-19. According to state-wide figures as of October 20, 7 states have recorded fewer than

1000 fatalities, 15 states had 1,000 – 3,000 fatalities, and 10 states had more than 3,000 fatalities. Figure 1 illustrates the locations of indigenous communities at significant and greatest risk due to proximity to high concentrations of infections. The states of Baja California, Sinaloa, Mexico, Veracruz, Puebla and the Federal District of Mexico are notable hotspots that include significant indigenous populations.