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CASE REPORT

A Fragmented Health System, Socioeconomic and Climate Disasters aggravated COVID-19 in Mexico, while Governance Allowed Alternative Sanitary Facilities

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ABSTRACT

The objective of this article reviews the complex impacts of COVID-19 not only as a health problem, but also related to unemployment, poverty rise, gender violence, and climate disasters in Mexico. An open, dissipative, and self-regulating system methodology interlinks the complex socioeconomic, political, and sanitary feedback. Governmental and private corruption in the purchase of drugs, protective gear, badly equipped and unbuilt hospitals after the 2017 earthquakes, lack of trained personnel, and people with comorbidity produced excess mortality. Support from private hospitals, ventilators, medical specialists from Cuba, vaccines bought worldwide, and the immunization of 71.3% of the adult population in 2022, reduced dead and contagion. The socioeconomic and health impacts were wide, when in 2020 12.5 million people lost their jobs, mostly women and youth, poverty raised, and lockdown increased intrafamilial violence. Governance included direct money transfers to elderlies, students, youth in apprenticeship, single mothers, and peasants planting timber and fruit trees. The cash steered youth away from organised crime, granted food security, and the acquisition of protective gear. New public works created employment in the poorest southern regions highly affected by COVID-19 due to undernourishment, improving their livelihood. Further, 52 cyclones on both oceans, forced people to flee, while the Trump Administration declared Art. 42 and returned migrants from different countries to the Mexican border, increasing the contagion. The Biden Administration gave vaccine gifts against COVID-19 to stimulate export industries in the northern region. The Russian-Ukrainian war raised prices that affected the food security of poor people. Agreements with supermarkets and food providers, systematic increases in the minimum wage, and new public infrastructure enhanced jobs, improved livelihood, and alleviate poverty. A rigorous macroeconomic policy allowed free vaccination also for children over five years and the building of an alternative public health system, providing sanitary and preventive medical attention to the impoverished population in the indigenous southern regions.

Introduction

This article analyses the negative impacts of COVID-19 and the governmental emergency responses to the unexpected impacts of the pandemic in Mexico. The impact of the pandemic was global as Tedros Adhanom Ghebreyesus, Director of the World Health Organization¹ had indicated on 11th of March 2020. The epistemic question is how could Mexico, as a middle-income country, manage an already complex political system with the virulent outbreak of the COVID-19 pandemic at the beginning of a new governmental cycle (December 2018 to 2024). The first case in Mexico was detected on the 27th of February and Suárez et al have reported that 68 days later, 19,224 cases were confirmed with a high number of 1,859 deaths².

To deal with the unknown complex interactions, a system approach was developed, where Oswald-Spring³ included subsystems with internal and external surrounding conditions. Figure 1 reviews the COVID-19 pandemic not only as a sanitary problem and interrelates the outcomes of the pandemic with four subsystems: health, economy, socio-cultural, and policy, where unemployment, poverty rise, gender violence, climate disasters, forced migration, and responses of the US governments have produced at the beginning excess mortality, as Palacios et al analysed⁴. The fragmented health system suffered from unbuilt hospitals after the earthquakes of 2017, where corruption was described by Ramírez, Torres⁵. Lack of drugs, vaccines, and protective materials together with initial erratic management of the pandemic, as the Institute for Global Health Sciences has reported⁶ complicated the attention and increased the death rate. Three former monopolist drug providers, increased prices of medicaments, and Forbes informed⁷ that they were eliminated as official providers and fined. The government was obliged⁸ to buy vaccines, medicaments, and protective gear worldwide to reduce deal with the pandemic.

The government had also to deal at the same time with an economic dropdown and as CEPAL indicated⁹ the poverty raise occurred in all other Latin American countries. Additionally, Mexico suffered during 2020 from dangerous climate impacts due to a Niño year, as the National Water Commission informed¹⁰. Multiple hurricanes, landslides, and floods destroyed entire southern regions and the livelihood of thousands of people. The affected population was forced to leave their home and tried to migrate to the US. On their way, WOLA described the precarious hygienic conditions

and the lack of refugees¹¹. Therefore, COVID-19 infected entire families and migrant groups, and the Trump Administration emitted Article 42¹², which allowed the US Border Patrol to expel immediately all migrants coming from different countries to Mexico to avoid contagion. Only in 2023, this Article 42 was eliminated by the Biden Administration but expulsion continues. The northern border got converted into a focus of contagion. Confronted with these multiple complexities, Bello et al insisted¹³ that Mexico was unable to deal with disaster planning, when COVID-19 attention pressured, climate disasters affected the poorest southern region, and pressure from the US against all migrants. Fetzer, Schwarz¹⁴ reported the US pressure on Mexico to deploy the National Guard for limiting the migration on the southern and the northern borders, threatening the country to apply tariffs on exports. All these emergencies required instant solutions with a national budget that was highly limited.

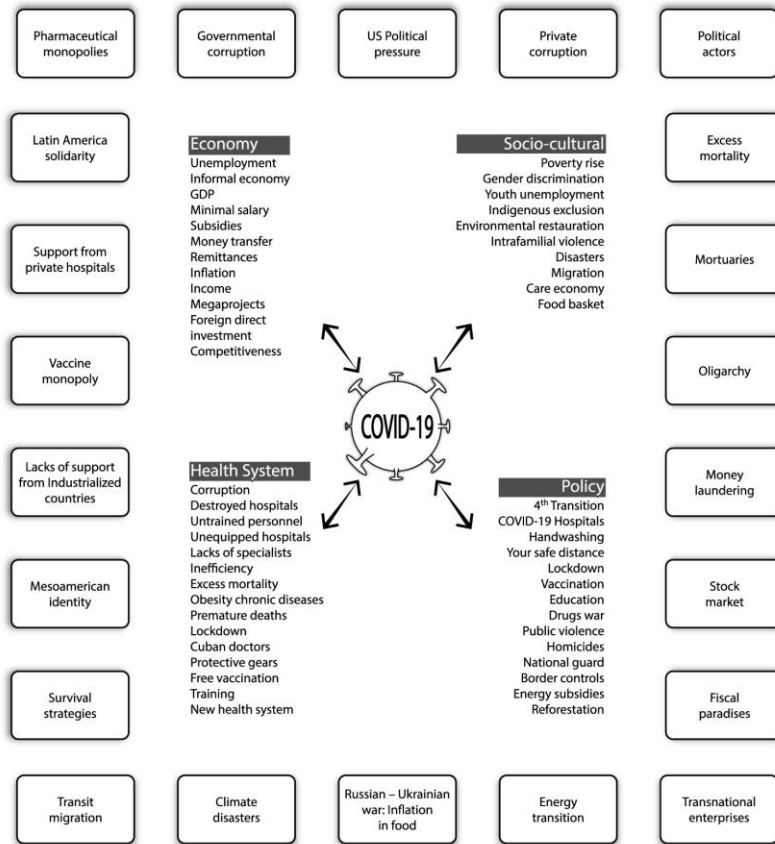
The article starts with a system methodology that analyses the complexity of positive and negative feedback of COVID-19, aggravated by socioeconomic factors and climate disasters. The Mexican government was able to maintain socioeconomic stability and controlled the propagation of SARS-CoV-2. The discussion reviews the failures and successes of this policy. To conclude, Mexico is building an alternative health system, capable to reduce obesity and associated diseases, and offering also the poorest sectors in the most remote regions quality health attention.

Method

The present research is based on participative observation of COVID-19, climate disasters, and forced migration. The article analyses the bibliography to understand the interrelations among the complex subsystems involved not only in the COVID-19 pandemic but in the negative and positive feedback of the four subsystems and the internal and external surrounding conditions (Figure 1), which help to understand national and international data for better management of the pandemic by the Mexican government and the reduction of excess mortality¹⁵. Scientific articles and books widened the understanding of the interrelations among the national and regional health services of COVID-19, the socioeconomic constraints, the taken and forgotten political decisions, and the climate disasters with forced migration due to a severe Niño year. The complex emergency impacted the political agenda at different levels and forced the government to multi-level governance, as explained by Srigiri,

Dombrowsky¹⁶ as a polycentric approach to the deteriorated hospital facilities, missing trained sanitary personnel, excess mortality, poverty raise,

climate disasters, and pressure from the US to control the forced migration analysed by Lee, Varas¹⁷.



Results

COVID-19 POLICY IN MEXICO

The country was badly prepared during the beginning of a new governmental period (December 2019-2024) to deal with an unknown virus, calls SARS-CoV-2, which rapidly globally got converted into a pandemic. The Health Sector together with other government agencies and universities tried to cope with the demand for clinical care of patients, as well as to limit the number of contagions. Different behaviours in regions and among social groups produced different epidemiological situations. Health authorities distinguished 4 periods or waves of contagion. The first "wave" COVID-19 (Epidemiological Week) started from week 8 to 39, 2020 with 813,366 confirmed cases by laboratory (6.4/1000 inhabitants); the second from week 40, 2020 to 15, 2021 with 1,532,266 (11.9/1000); the third from 23-42 week, 2021 with 1,358,852 cases (10.5/1000) and the fourth from week 51, 2021 to 22 of February 2022 with 1,209,468 (9.3/1000). The number of infections was higher in Mexico City and the State of Mexico with a higher density of population and less in rural states such as

Chiapas. These data were informed by the General Direction of Epidemiology¹⁸.

Mexico was ill-prepared to manage the pandemic with precarious equipped hospitals. Only 11% of the nurses graduated and they lacked training and protective gear against the pandemic. The country accounted for only 154,786 medical specialists, while at the beginning of the pandemic, 114,410 health personnel was infected not knowing how to handle the virus. The number of doctors dropped to 307,000 due to the contagion with a high death rate, as UCFS found out⁶. Mexico City with the highest number of infected people received 585 physicians from Cuba and Céspedes, Ulloa explained¹⁹ that they trained and supported the overloaded capital's health system. Opposition parties rejected the Cuban support for ideological reasons, disseminating the lie that they would promote communism in the health system. Only Forbes²⁰ convinced these groups that Cuban physicians were graduated doctors with specialties that Mexico required urgently during the pandemic.

To reduce transmission, Mexico specialised official hospitals to treat only SARS-CoV-2 patients²¹ and agreements with 146 private hospitals supported at official prices 12,500 patients during the pandemic²². On April 20, 2020, the Government launched campaign²³, playing in Spanish with the female name 'Su-sana distancia' [your safe distance], which promoted a physical separation of 1.5 m in shops, banks, and offices. This creative campaign attracted different age groups and had a general impact, as IFPES reported²⁴. The Ministry of Health banned the habit of hugs²⁵, and special attention was given to elders, children, and immunologically depressed patients. Open windows in closed rooms in any home were promoted and the government declared a lockdown in schools, public services, and offices²⁶, where the internet substituted the personnel contacts and reduced the contagion. Group meetings were suspended, personal travel was limited, and frequent hand washing and basic hygienic measures were advised.

The excess mortality during the first wave of COVID-19, was also related to 73% of comorbidity, since 39.1% of adults were overweight and 36.1% obese, as the National Nutritional Survey indicated²⁷, while 19.7% of COVID patients suffered from heart diseases, cancer, and 12.8% from diabetes mellitus among other chronic diseases²⁸. The official speaker, a Health Vice Minister, gave daily preventive recommendations in mass media and reported on the progress of the pandemic with official data from the hospitals²⁹ but did not include people sick or dead probably of COVID-19 at home, as the National Institute of Health analysed³⁰.

The Ministry of Health confirmed on February 2023³¹ that 7.39 million infections of SARS-CoV-2 with 801,994 additional suspected, 11.2 million negative cases, 6.6 million patients recovered, and officially 332,483 deaths, while excess mortality was estimated by 600,590 persons. This high mortality was also related to the stockpiling of vaccines against COVID-19 in industrialized countries³², which allowed the dissemination of new strengths of the virus, often more contagious (delta, omicron). This occidental behaviour increased all over the world costs, including the vaccine

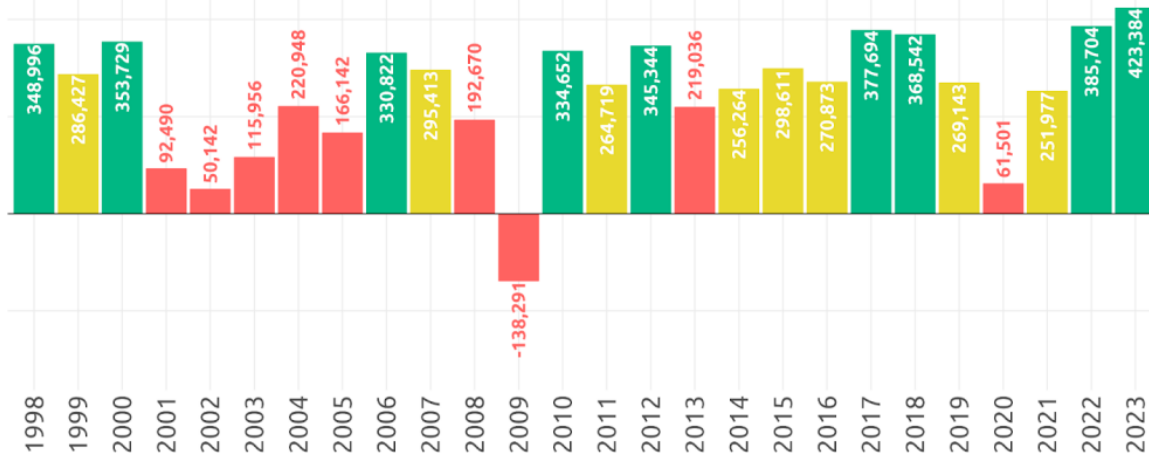
destruction in their own countries at the time of expiration.

In December 2020, the first vaccines arrived in Mexico and hospital personnel, later teachers, elderlies, the rest of the adults, and finally children over 5 years were immunized. The Mexican Government was obliged to buy vaccines all over the world, often at higher prices. The government bought 250 million of vaccines³³ and provided different types of immunizations, such as Pfizer, CanSino, AstraZeneca, Covax, Sputnik V y Sinovac. Confronted with this global scarcity, Argentina and México allied to produce massively AstraZeneca and CanSino vaccines³⁴, which were distributed at cost to the rest of Latin American countries. Later the scheme included also the Russian Sputnik and Mexico tried to produce its own vaccine called Patria. On July 2022, 71.3% of Mexicans got at least one shot, and contagion and mortality were reduced drastically. Additional hospital personnel was contracted with stable labour conditions, new universities opened to train sanitary personnel, and scholarships for medical specialisation in foreign were offered to medicine students, as the Foreign Ministry, AMEXCID reported in 2023³⁵.

POVERTY RISE AND UNEMPLOYMENT

Between the first and last quarter of 2020, the COVID-19 pandemic increased extreme income poverty by 5% (from 17% to 22%), and the general poverty rise is estimated by 7% (from 49% to 56%) by studies of the National Autonomous University³⁶. During the SARS-CoV-2 not only poverty increased by the official CONEVAL source³⁷ but formal employment by telephone survey by INEGI³⁸ dropped drastically during the second trimester of 2020. Formal work recovered only in March 2022 from the 12.5 million lost jobs during the pandemic (Figure 2), as the affiliation of workers to the IMSS³⁹ indicated. Informal workers were more severely affected as a survey at the household level of IMCO specified⁴⁰. In 2021 their unemployment rate was reduced from 56 to 47.7%, while the poverty rate has increased globally by 2.5 times among these unprotected workers. Unemployment in the first trimester of 2020 was 4.7%, increased in the second trimester to 12.2%, and was reduced in March 2023 to 2.4% (see Figure 2).

Figure 2: Number of unemployed and recovery: 1998-2023. Source, ³⁸ (each January to March)



CONEVAL estimated, that due to the pandemic, in Mexico the number of poor may rise to 58.1 million, which is 2.5 million more than two years ago and 6.1 million more than at the beginning of the presidential mandate of López Obrador. The percentage of people with labour income below the value of the food basket decreased in 2023 at the national level by 1.1% from 38.8% to 37.7%, respectively⁴¹. Pérez calculated also regional differences⁴² and Chiapas, the poorest state with high undernourishment, accounted for 76.2% of its population living in informality and poverty; 3.96 million persons are poor and 1.6 million are living in extreme poverty. To combat the lack of health services and poverty, the President promoted the project 'Sowing Live'⁴³ among poor peasants to reforest in their land 2.5 hectares of timber or fruit trees. The national reforestation produced 2022 1,188 million trees in 125,247 hectares increasing income, mitigating greenhouse gases (GHG), and supporting food security with a plot for basic food. The programme was evaluated also in El Salvador and Honduras by UNDP⁴⁴.

COVID-19 and the lockdown forced 30 million students, at different levels of education, to access courses via the Internet, where remote regions lacked connections and many students dropped out of school. Chambilla reported⁴⁵ physical stress to access the courses and psychological frustration, which affected most of the students.

ECONOMIC CRISIS

COVID-19 has produced a loss of 1.1 million formal jobs, a reduction of 5.4% in formal jobs registered with the IMSS³⁸ that occurred during April and May 2020, when 900,000 jobs were lost. Construction dropped -29.2%, commerce -25.7, extractivism -21.3%, and professional service -10.1%³⁹. Mexico, the 16th largest economy in terms of GDP,

contributed to mitigate the impacts with 2% of GDP during the crisis but avoided the pressure of the International Monetary Fund to support enterprises increasing foreign debts. From the beginning of the new government, December 2018, CONSAMI increased in real terms minimal wage (MW)⁴⁶ of \$78.16 pesos in 2018 to \$105.26 in 2020, and \$169.55 in 2023, representing an increase of 101.6, 121.9, and 196.6 in the same order. Along the border with the US, in 2023 the new daily MW is 312.41, and in the rest of the country 207.44 pesos. These increases in salaries had direct impacts on the wellbeing and health conditions of poor people and together with vaccines and medicaments reduced the contagion of COVID-19.

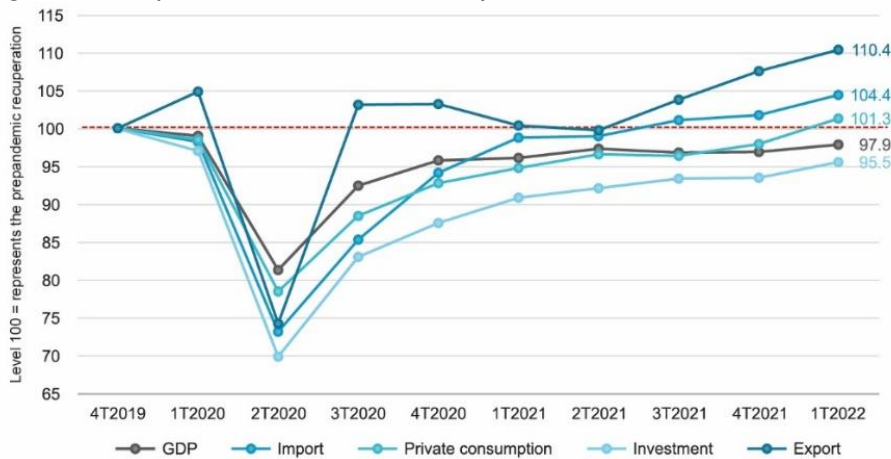
The strict macroeconomic management of the Mexican economy was combined with governmental direct monetary transfer to vulnerable people (elderlies, students, youth in apprenticeship, single mothers, and peasants planting timber and fruit trees), called Bienestar⁴⁷. All the programmes increased the income within the family, trained students, and steered youth away from organised crime. The government launched a campaign against junk food. From October 2021 obliged front labelling of food, explaining the excess of calories, sugar, sodium, saturated and trans fats⁴⁸ in the product. Food and soft drinks providers opposed legally these measures and people are learning that junk food is affecting their weight and health, while it has influenced the severity of the COVID-19 disease, resulting sometimes in death.

New jobs, an increase in salaries, and support of employment in the poorest southern regions with an alternative health system for families without any social security stabilised the post-pandemic recovery. IMCO synthesised in Figure 2 the

evolution of the macroeconomic factors after COVID-19⁴⁹ such as Gross Domestic Product, Import, Export, Private Consumption, and Investments. In February 2023, Mexico got

converted into the first exporter to the US with an inter-annual growth of 9.7%, which totalled 35.681 billion dollars, reported by the US Census Bureau⁵⁰.

Figure 3: Post-pandemic economic recovery ⁴⁹.



Nevertheless, the country had to manage additional complex problems directly linked to the pandemic or affecting the health system, such as climate disasters and the inflation caused by the Russian-Ukrainian war in food and energy prices.

CLIMATE DISASTERS IN MEXICO

The cascading effects of COVID-19 spread from health and socioeconomic difficulties to public violence and a severe hurricane season and drought in the Pacific region produced multiple disasters and conflicts. The hurricane season in 2020 was very intense from June 1 through November 30, as reported earlier by Conagua²⁶ and confirmed by Muñoz⁵¹. Mexico was hit on the Atlantic side with 23 named tropical storms and hurricanes including the Greek alphabet due to a severe Niño year⁵². Five hurricanes Paulette, René, Sally, Teddy, and Vicky occurred simultaneously in this ocean on September 14, 2020, producing conflicts for access to water⁵³ and forced migration with a massive propagation of COVID-19 due to precarious refugee conditions, lack of water, and missing governmental support, described by the High Commission for Refugees⁵⁴. Further, on October 30 and November 13 two catastrophic hurricanes: Eta and Iota, within two weeks' difference, flooded the entire region of northern Central America and southern Mexico. Both hurricanes left deaths and destruction, produced multiple landslides, disseminated COVID-19 due to a lack of hygienic conditions, and obliged the affected people to leave, while OCHA was unable to attend the emergency⁵⁵. Heavy rains and winds in southern Tabasco, Chiapas, and Veracruz have destroyed

20,000 homes, and the total death toll across Mesoamerica was estimated at over 200 people⁵⁶. Simultaneously, Mexico and part of Nicaragua on the Pacific slope suffered a severe drought with losses of 80% in staple food production, which destroyed their livelihoods⁵⁷, increased poverty, weakened their immune system due to lack of food and water, and forced an increasing number of people to migrate to the United States⁵⁸. Moreno et al.⁵⁹ indicated that Mesoamerica is the highest affected region in America by climate change disasters.

When food and energy prices increased globally due to the war between Russia and Ukraine, the government of Mexico reduced taxes on gasoline, maintained stable internal oil prices, and negotiated with supermarkets a stable value of the basic food basket. However, the government could not cope with the massive migration from the south and severe conflicts started with the US government.

CLIMATE INDUCED MIGRATION AND ARTICLE 42 TO PROTECT US CITIZEN AGAINST COVID-19

During 2020, besides a lockdown in the US, an increasing number of women, families, and children alone are crossing the border to the US in search of survival, work, or family reunification and were violently treated⁶⁰. In detention camps, COVID-19 spread rapidly due to the lack of water and hygienic conditions. The administration of D. Trump had strengthened border controls and threatened Mexico to tax their export to the US if they do not control the migrants with the National Guard. D.

Trump emitted Article 42 allowing the border authorities to expel immediately undocumented migrants to Mexico due to COVID-19 reasons⁶¹. The Mexican government was obliged to sign the agreement⁶² owing no compensation for receiving migrants from multiple countries. Border Patrol increased deportations and separated also families, banishing unaccompanied children thousands of kilometers away in Mexico from where parents were expelled⁶³. Border Patrol detained at the border, more than 200,000 people in July 2021; 45% were from Central America, 29% were Mexicans, and 26% were from other countries⁶⁴. In 2023, the Biden Administration eliminated Art.42 and oblige to receive monthly 10,000 expelled migrants to the Mexican side without any compensation, while the rest of the illegal migrants were returned directly to their home countries by the US Code of Article 8⁶⁵.

Redodem⁶⁶ indicated that Mexican facilities for refugees are deficient and in highly precarious conditions. Human rights are permanently violated due to a lack of food, water, safe shelter, and public security and COVID-19 had a high level at the northern border. The militarisation of the Mexico-US border has not reinforced migrant control and has deprived the US required labour force due to the high mortality during COVID-19 and the aging native population. At election time in 2023, the anti-migrant rhetoric is intensifying, increasing illegal migrations and intrafamilial violence, while Bloomberg estimates that the US requires jobs for 2.6 million people⁶⁷ for available jobs. WHO declared on the 5th of May 2023 the end of the COVID-19 pandemic⁶⁸, whenever people continue to get infected with the virus and they recommended maintaining hygienic measures to avoid new infections.

GENDER VIOLENCE DURING THE COVID-19 LOCKDOWN

Women suffering increased during the COVID-19 lockdown. Available data show an increase in emergency calls to 9-1-1, requesting help against female violence⁶⁹. These support calls increased during 2020 compared to those registered in the previous year from 197,693 to 260,067. The UN Special Rapporteur on Violence against Women reported a raise of 31.5% more telephone calls. Ms. Dubravka Šimonović⁷⁰ documented not only the increase in domestic violence against women but also its causes and consequences. She insisted on the dual purpose of the report: first, information on how COVID-19 has affected the violence against women during the lockdown, especially within the family context reporting its consequences. Second,

she analysed the governmental response to this violence. Especially, the judicial courts failed, offering insufficient support, and often hindering legal access. She insisted of insufficient Justice for gender violence during the health emergency. The Red Nacional de Refugios [Nacional Network of Refuge] provided accompaniment and guidance between March and May 2020 to 12,710 women, girls, and adolescents through telephone calls to distress the growing family tensions⁷¹.

Women in need sometimes could not ask directly for support against the physical violence and to give the address, they apparently ordered a pizza. Other women wrote the emergency number or the word help on a piece of paper fixed on the window, so neighbour could alert the police. SESNSP reported monthly gender violence, and in April 2020 with the highest number of reports, 49.47% of women experienced psychological and physical violence, 43.37% economic, 25.95% patrimonial, 17.62% sexual one, and 4% survived an attempted of femicide. From January to April 2020, 403,130 emergency calls for help were received in 9-1-1 and registered by SESNSP⁷².

Women who fled to a refuge experienced in April 2020 79% of two or more types of violence and their life was threatened at home. Inmujeres estimated that two-thirds of women in 2020 had suffered from gender violence⁷³, as a result, structural inequity and homicides, mostly femicides, increased during the first four months of 2020 in 11.7%. In April 2020, SESNSP documented those 6 federal entities (State of Mexico, Mexico City, Morelos, Guerrero, Chihuahua, and Baja California North) concentrated the highest number of women assassinated⁷⁴.

Violence against women occurred also in their working conditions. Women represented the highest percentage of informal workers who lost their occupations during the lockdown. Informal labour without social protection in the lowest income range raised in 2021 from 70 to 75%. From the third quarter of 2020 to the fourth quarter of 2021, the employment rate in the informal economy for women ranged between 27.6% and 30%, and the men between 26.7% and 28.2% in the same period. In the national survey of employment by INEGI⁷⁵ reported in the third trimester of 2021 59.9% of women and 71.8% of men were occupied, while in 2022 during the same period, 50.4% of women and 73.3% of men were employed. In relation to the occupied persons, 17.8% of women were underemployed and 20.1% of men in the first trimester of 2021, and in the same

period of 2022 11.9% of women and 13.2% of men did not have a full-time job.

PUBLIC INVESTMENTS INCREASED JOBS, INCOME, AND BETTER HEALTH FACILITIES

The labour improvement is related to the economic recuperation of the country and the new jobs created in the public mega-works, built by the government, especially in regions with high labour informality, important poverty, and lack of health facilities. The lowest labour informality during the fourth quarter of 2022 was registered in Coahuila (34.2 %), Nuevo León (35.8 %), Baja California (35.8%), Baja California South (36.6%), and Chihuahua (36.8%), all located on the border with the US and a variety of multinational assembly industries. The highest rates of labour informality by states were reported in Oaxaca (81.2 %), Guerrero (79 %) and Chiapas (75.2 %) in the south⁷⁶ with an important monolingual indigenous population, undernourishment of children²⁷, high biodiversity and multiple tourist attractions. The anti-corruption campaign and the elimination of tax privileges for businesses allowed direct cash transfers to vulnerable people and the increase of minimal salaries. These policies have produced in the country positive socioeconomic outcomes in the post-pandemic recuperation⁷⁷ with an improvement of the Basic Food Basket also in the most marginal regions. Minimal salaries⁴³ raised further and increased 98.9% in the four years of government⁷⁸.

Public constructions, such as the 1,525 km long-distance Mayan Train, are connecting five states in the Yucatan Peninsula⁷⁹, promoting archaeological and beach tourism in the indigenous Olmeca-Maya-Mexica cultures. It transports passengers and loads improving the quality of air with less emissions of GHG, whenever the deforestation for building the train caused severe ecological threats in this biodiverse region⁸⁰. The Interoceanic Train in the Isthmus of Tehuantepec⁸¹ links both oceans, competes with the Panama Chanel in time, and allows enterprises to create new jobs in this indigenous region. Both public rails created new employment, including jobs for Central American migrants. Bloomberg thinks⁸² that it may reduce the tension on the northern border with the present US Administration and the growing violence due to expelled migrants without any survival conditions, including small children who are fleeing alone, threatened by multiple unknown dangers⁸³.

Discussion

COVID-19 displayed cascading effects of interrelated economic, social, political, cultural, health, environmental, and survival problems

(Figure 1), requiring a systemic method approach, where positive and negative feedback influenced the stability of the government. Health is related to safe food, clean water, and available energy^{84,85}. At the beginning of the COVID-19 pandemic in 2020, the incoming government met a fragmented health system, a lack of drugs with monopolised providers⁷, a deficiency of trained hospital personnel⁶, and corruption⁵. The initial doubts by the WHO related to the virulence of the new virus and the expansion into a pandemic have influenced Mexican health management and the attitude of the people. The delay in identifying the severity of the pandemic is not only attributable to the health authorities but in general, to the policy of all countries in the American continent⁸⁶.

Lack of concern produced at the beginning high mortality^{4,30,45}, mostly related to existing comorbidities⁴⁶. Only on March 2020, the government released extraordinary measures^{21,26}, including a general lockdown in schools, work, public offices, and group meetings, limiting also unnecessary traveling. The campaign of 'Susana' for maintaining a safe distance and hand washing also helped children understand the danger of the pandemic^{23,24}. Health authorities were unprepared to deal with the dangerous virus, and the country accounted with the solidarity of private hospitals²², the training of Mexican doctors by Cuban physicians^{19,20}, and the acquisition of 250 million vaccines³³. The lack of initial vaccines due to the stockpiling in industrialised countries³² and its high prices by pharmaceutical enterprises allied with the governments of Argentina and Mexico to produce massively Astra Seneca inoculations³⁴, distributed at cost to all Latin American countries. The whole subcontinent was hit by multiple unexpected problems and CEPAL estimated that during 2021, 86 million people had fallen into extreme poverty, due to the sanitary and economic crises⁸⁷.

A massive vaccination of the Mexican population and the lockdown limited an unmanageable health crisis, whenever the confinement produced unemployment^{38,39}, poverty^{36,37}, and hunger in the poor indigenous regions²⁷. CONEVAL analysed income, social shortages, and vulnerabilities in Mexico⁸⁸, during and after the pandemic. Mexico introduced also an alternative socioeconomic management of the pandemic. A policy without foreign debts, poverty alleviation with direct monetary transfer to vulnerable people, increases of minimal salaries, higher remittances from the migrants, building of railways, an airport, and the refinery Olmeca in Tabasco⁸⁹, created jobs and

improved income. Figures 2 and 3 report that from the third trimester of 2021 the increase in private consumption and exports, and in 2022 also in imports. Direct foreign investments were raised, thanks to stable macroeconomic conditions, where interests were higher than inflation. Limiting indebtedness during the pandemic and nearshoring with the US and Canada improved also economic conditions⁴⁰, the result of the T-MEC trade agreement signed by Mexico, the US, and Canada. Both of these last countries are interested to access natural resources and cheap labour. In 2023, Mexico got converted into the first exporter of goods to the US. Nevertheless, political pressure from the US for migrant control^{12,61} increased. Mexico agreed with the Biden Administration to accept monthly 10,000 migrants expelled from the US against free vaccines for the border population⁹⁰, protecting the labour force in this region of foreign assembly industries with crowded workers.

Additionally, COVID-19 had different impacts on gender, regions, and social classes. The pandemic dropped female income, formal jobs^{71,72}, and their empowerment. Gender violence increased during the lockdown⁷³, and the judicial system failed to grant women a safe life⁷⁴. During the confinement, unpaid female domestic work increased and intrafamilial violence rose, obliging authorities to establish refuges for women and children victims of male aggression⁷⁵. Femicides increased especially in the central and northern parts of Mexico⁷⁶. The deep-engrained machismo⁷⁷ is maintaining gender inequity and discrimination against women and girls. Furthermore, internal colonialism and racism relegate indigenous people, as González has studied⁷⁸. Against this historical discrimination, the present government started in the South a new health system in remote indigenous zones, built the Maya and the Interoceanic trains, created formal jobs, and improved livelihood among these impoverished people. Reforestation may mitigate deforestation during the train construction⁷⁹. Bilingual schools are also promoting multicultural education, conserving the rich cultural diversity and knowledge existing among these indigenous, where also multiple traditional medical practices exist, which have alleviated the lack of hospital and medical care during the pandemic.

The agreements with the US obliged Mexico to control with the National Guard⁸⁰ the internal and transmigration⁶² and undocumented people were immediately expelled to Mexico. The Inter-Oceanic Corridor should develop the indigenous region of the Isthmus of Tehuantepec⁸¹, promoting economic,

productive, and cultural consolidation. The train links the Pacific with the Atlantic and the transfer of containers competes positively in time with the Canal of Panama and is not limited by water scarcity. New industrial parks along the rail track should create employment, training Mexicans in modern technological development. The promotion of nearshoring with the US and Canada may substitute some imports from China. The Isthmus is also the region with the highest wind potential in the country and is therefore crucial for the energy transition.

Moreover, the Mayan Train is a 1,525 km long-distance railway with 20 stations connecting five states in the Yucatan Peninsula⁸², transporting passengers and loads. It promotes archaeological and beach tourism in Olmeca-Maya-Mexica indigenous cultures. The estimated costs were 300 billion pesos, including the doubling of electric power in the state of Yucatan, a region with poor electricity. To build the train, 2,500 hectares of dry forest and jungle were deforested, and water is under the ground due to its karstic subsoil, which produces high vulnerability to pollution and scarcity⁸³. Therefore, special care is given to the environment with the consolidation of 22 protected areas passing through jungles, mangroves, coastal dunes, savannahs, petens, and cenotes (groundwater). It includes also wildlife crossings underneath the tracks. Additional jobs with the construction of trains facilitated temporary visas to Central American refugees⁸⁴, reducing the pressure on the US border. Whenever, the migration of small children continues to be dangerous and the human rights of children are not respected, because the US has never signed it⁸⁵.

SARS-CoV-2 also exhibited the importance of maintaining safe air quality, either to recover from severe COVID-19 or to prevent complications of airborne diseases. Mexico committed during the COP-27 to reduce 38% of its GHG with international support during the next eight years with an energy transition⁸⁶ of sun, wind, hydrothermal and hydrological renewables⁸⁷. To maintain stable energy costs during and after the pandemic, the government bought from Shell in Texas in a 50-50 joint venture, the refinery Dear Park for 596 million USD⁸⁸. With higher international oil prices, Pemex amortized the purchase in 2022 and 2023 estimates new profits⁸⁹. The Mexican government reduced also taxes on the purchase of gasoline and diesel, restored six refineries in the country⁹⁰, and is building a new one called Dos Bocas in Tabasco⁹¹, which should assure fuel self-sufficiency in 2024⁹².

These socioeconomic, construction, cultural, and energy policies may provide the country with a stable transition during the next presidential election in 2024, even though the costs of public works have exceeded the proposed budgets⁹³, and the political opposition is against the model to protect poor people.

Conclusion

The pandemic in Mexico met a fragmented healthcare system, lack of trained personnel, and poorly equipped hospitals⁶ which led to excess mortality⁹⁴. Strong North American pressure and free vaccines⁹⁵ forced Mexico to control transmigration⁸⁰ and accept thousands of expelled people⁶² in their country. During COVID-19⁹⁷, women, youth, and indigenous were the most vulnerable⁹⁶ and suffered from multiple impacts. Cascading interconnected links across different domains, represented systemic challenges to health, economy, employment, gender, poverty, indigenous, violence, and climate⁹⁸. Simultaneously, severe climate disasters impacted the southern region and the north of Central America¹⁰ obliging the government to reduce transmigration. The political agenda of the present government is therefore a genuine effort to mitigate complex negative feedback from external and internal pressures and the unexpected pandemic effects⁹⁹. Drastic cuts in the public administration, greater tax incomes, and a frontal combat against corruption allowed the government to create stable macroeconomic conditions, and new jobs, including for Central American migrants¹⁰⁰. In June 2023, 36 million informal workers and women got medical insurance, ambulant attention, preventive health,

and hospitalisation with a new health system, called IMSS-Bienestar¹⁰¹. However, the election in 2024, a Niño year in 2023, and the organized crime controlling drugs and migrant routes to the US are potential destabilisers of the whole system¹⁰².

The complex connections among interacting multiple crises have affected not only Mexico but the entire humanity and Earth, where climate change disasters¹⁰³, biodiversity loss¹⁰⁴, poverty raise¹⁰⁵, and new pandemics from viruses trapped in the ice, as Gupta et al explored¹⁰⁶, may threaten all humans and natural life. These interconnected factors require system approaches, where negative nexuses should be prevented. The COVID-19 pandemic in Mexico offered an example to address these structural threats (Figure 1), producing an alternative public health organisation, governance, stable finances, and poverty alleviation, whenever the root causes are still in place¹⁰⁷. At the global level, timeframes for structural changes are getting increasingly shorter due to growing miss-governance, violence, inequity, war¹⁰⁸, environmental destruction, and climate disasters, where only an integrated health-socioeconomic-political-environmental systemic management may prevent future human suffering.

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References

1. Tedros Adhanom G. WHO Director-General's opening remarks at the media briefing on COVID-19. Published 11 March 2020. <https://www.who.int/director-general/speeches/detail/whjesús-Eo-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>. Accessed May 15, 2020.
2. Suárez V, Suárez Quezada M, Oros Ruiz S, Ronquillo De Jesús E. Epidemiology of COVID-19 in Mexico: From the 27th of February to the 30th of April 2020. *Rev Clin Esp (Barc)*. 2020 Nov; 220(8): 463–471.
3. Oswald-Spring Ú. *Earth at Risk in the 21st Century*. Springer International; 2020.
4. Palacio LS, Hernández JE, Hernández M. Leading causes of excess mortality in Mexico during COVID-19 pandemic 2020-2021: A death certificates study in a middle income country. *The Lancet*. 2022 Sep; 13(100303). doi: <https://doi.org/10.1016/j.lana.2022.100303>
5. Ramírez, HT, Torres AT. La corrupción en el sector salud de México ante la pandemia: perspectiva de la confianza. *Gestión y estrategia*; 2022. <https://gestionyestrategia.azc.uam.mx/index.php/rge/article/view/714/1236>. DOI: 10.24275/uam/azc/dcsh/gye/2021n60/Ramirez.
6. UCFS. *La respuesta de México al Covid-19: Estudio de caso*. Institute for Global Health Sciences; 2022.
7. Forbes. Cofece multa con 903 mdp a empresas farmacéuticas y personas físicas por monopolio. Published August 16 2021. <https://www.forbes.com.mx/noticias-cofece-multa-903-mdp-empresas-farmacauticas-personas-fisicas-monopolio/>. Accessed January 12, 2022.
8. Gobierno de México. Gobierno de México inicia proceso de compra eficiente de medicamentos y vacunas junto a la UNOPS y la OPS/OMS. Published July 31 2020. <https://www.gob.mx/presidencia/prensa/gobierno-de-mexico-inicia-proceso-de-compra-eficiente-de-medicamentos-y-vacunas-junto-a-la-unops-y-la-ops-oms#:~:text=Comunicado%20conjunto%20de%20Gobierno%20de%20M%C3%A9xico%20UNOPS%20y%20OPS%20FOMS&text=Ciudad%20de%20M%C3%A9xico%2031%20de,Servicios%20para%20Proyectos%20>. Accessed January 12, 2022.
9. CEPAL. *América Latina: Más de 28 millones de personas entrarán en situación de pobreza este año por el COVID-19*. CEPAL; 2020.
10. Lujano, B. *Tropical Cyclone Season. Summary of the Year 2020*. Conagua; 2021.
11. WOLA [Washington Office on Latin America]. *Despliegue militarizado en frontera sur de México pone en peligro a personas solicitantes de asilo y migrantes*. Published March 2021. <https://www.wola.org/es/2021/03/despliegue-militarizado-frontera-sur-migrantes/>. Accessed June 15, 2021.
12. Cano, M. ¿Fin del Título 42? Llamada entre Biden y AMLO tuvo a la migración como protagonista. *France 24*, Published February 9, 2022. <https://www.france24.com/es/ee-uu-y-canad%C3%A1/20220430-estados-unidos-m%C3%A9xico-migraci%C3%B3n-frontera-t%C3%ADtulo-42-elecciones>. Accessed February 10, 2022.
13. Bello O, Bustamante A, Pizarro P. *Planificación para la reducción del riesgo de desastres en el marco de la Agenda 2030 para el Desarrollo Sostenible*. CEPAL; 2020.
14. Fetzer T, Schwarz C. Tariffs and Politics: Evidence from Trump's Trade Wars. *The Economic Journal*. 2021; 131(636): 1717–1741. <https://doi.org/10.1093/ej/ueaa122>.
15. INSP [Instituto de Salud Pública]. Exceso de mortalidad por todas las causas durante la emergencia por COVID-19. December 31, 2022. <https://coronavirus.gob.mx/exceso-de-mortalidad-en-mexico/>. Accessed January 12, 2023.
16. Srigiri S R, Dombrowsky I. Analysing the water-energy-food nexus from a polycentric governance perspective: Conceptual and methodological framework. *Frontiers in Environmental Science*. 2022; 10(725116); 2022.
17. Lee T, Varas J. The Total Costs of US Tariffs. May 10, 2022. American Action Forum. <https://www.americanactionforum.org/research/the-total-cost-of-tariffs/>.
18. Dirección General de Epidemiología. *Informe Integral de COVID-19 en México*. Secretaría de Salud; 2022.
19. Céspedes-Tamayo, G, Ulloa-Cedeño, HA. Médicos residentes cubanos durante la COVID-19. *Educación Médico*. 2021;22(1): 41-42. DOI: 10.1016/j.edumed.2020.10.001.
20. Forbes. CDMX aclara que médicos cubanos contratados sí estaban acreditados. Forbes. Online Archive. <https://www.forbes.com.mx/cdmx-aclara->

- que-medicos-cubanos-contratados-si-estaban-acreditados/. Published September 20, 2021. Accessed September 30, 2021.
21. DOF [Diario Oficial de la Federación]. Acuerdo por el que se establecen acciones extraordinarias para atender la emergencia sanitaria generada por el virus SARS-CoV2. DOF. Online Archive. https://www.dof.gob.mx/nota_detalle.php?codigo=5590914&fecha=31/03/2020#gsc.tab=0. Published March 31, 2020. Accessed September 30, 2021.
 22. Gobierno de México. Sector Salud suscribe convenio con hospitales privados para hacer frente a la pandemia de COVID-19-Coronavirus. Online Archive. <https://coronavirus.gob.mx/2020/04/13/sector-salud-suscribe-convenio-con-hospitales-privados-para-hacer-frente-a-la-pandemia-de-covid-19/>. Published April 13, 2020. Accessed September 30, 2021.
 23. Gobierno de México. ¡Hola! Me encanta que aprovechen la sana distancia, dibujándome. Muchas gracias. Online Archive. <https://coronavirus.gob.mx/susana-distancia/>. Published, March 21, 2020. Accessed March 22, 2020.
 24. IFPES. *Campaign of safe distance*. Institute of Vocational Training and Higher Studies; 2020.
 25. DGE-SS. COVID-19. México. Online Archive. <https://datos.covid-19.conacyt.mx/#COMNac>. June 26, 2023. Accessed June 26, 2023.
 26. DOF [Diario Oficial de la Federación]. Acuerdo por el que se establecen acciones extraordinarias para atender la emergencia sanitaria generada por el virus SARS-CoV2. Diario Oficial de la Federación; March 03, 2020.
 27. ENSANUT. *Encuesta Nacional de Salud y Nutrición Continúa 2022*. ENSANUT; 2023.
 28. Gobierno de México. Exceso de Mortalidad por todas las causas durante la emergencia COVID-19 en México, 2020-2022. Online Archive. <https://coronavirus.gob.mx/exceso-de-mortalidad-en-mexico/>. Published December 31, 2022. Accessed January 15, 2023.
 29. Forbes. 73% of deaths from Covid-19, with some comorbidity, says López-Gatell. Online Archive. <https://www.forbes.com.mx/politica-el-73-de-las-muertes-por-covid-19-con-alguna-comorbilidad-asegura-lopez-gatell/>. Published July 28, 2020. Accessed July 29, 2020.
 30. INSP [Instituto de Salud Pública]. Exceso de mortalidad por todas las causas durante la emergencia por COVID-19. Online Archive. <https://coronavirus.gob.mx/exceso-de-mortalidad-en-mexico/>. Published January 30, 2023. Accessed February 5, 2023.
 31. Gobierno de México. COVID-19. México. Comparativo Confirmados por Estados. Online Archive. <https://datos.covid-19.conacyt.mx/#COMNac>. Published June 25, 2023 (actualized). Accessed July 1, 2023.
 32. Jarret, S., Pagliusi, S., Park, R. et al. The importance of vaccine stockpiling to respond to epidemics and remediate global supply shortages affecting immunization: strategic challenges and risks identified by manufacturers, *Vaccine: X* 9(100119); 2021. doi.org/10.1016/j.jvax.2021.100119.
 33. Gobierno de México. Garantizada la compra de 250 millones de vacunas contra COVID-19. Online Archive <https://www.capital21.cdmx.gob.mx/noticias/?p=18501>. Published April 19, 2021. Accessed January 2, 2022.
 34. Gobierno de México. Presidente de Argentina y canciller de México supervisan laboratorio donde se formularán y envasarán vacunas. Online Archive <https://www.gob.mx/sre/prensa/presidente-de-argentina-y-canciller-de-mexico-supervisan-laboratorio-donde-se-formularan-y-ensasaran-vacunas?idiom=es>. Published February 22, 2021. Accessed February 23, 2021.
 35. Foreign Ministry, AMEXCID. Convocatoria Especialidades Médicas AMEXCID. Online Archive. https://www.gob.mx/cms/uploads/attachment/file/812412/Convocatoria_Beca_de_Especialidades_Medicas_AMEXCID.pdf. Published February 7, 2023. Accessed June 12, 2023.
 36. PUED. *La pandemia y la pobreza en México en 2020*. PUED-UNAM: 2021.
 37. CONEVAL. Líneas de Pobreza por Ingresos. Online Archive. https://www.coneval.org.mx/Medicion/Documents/Lineas_de_Pobreza_por_Ingresos/Lineas_de_Pobreza_por_Ingresos_COVID_mar_2022.pdf. Published March, 2022. Accessed June 1, 2022.
 38. IMSS. Puestos de trabajo afiliados al Instituto Mexicano del Seguro Social, 2018-2023. Online Archive. [http://www.imss.gob.mx/prensa/archivo/202301/009#:~:text=%C2%B7%20A%2031%20de%20diciembre%20de,13.4%25%20\(trece%20punto%20cuatro%20por](http://www.imss.gob.mx/prensa/archivo/202301/009#:~:text=%C2%B7%20A%2031%20de%20diciembre%20de,13.4%25%20(trece%20punto%20cuatro%20por). Published January, 2018 to June 7, 2023. Accessed June 7, 2023.

39. INEGI Encuesta Telefónica de Ocupación y Empleo (ETOE). 2020. Online Archive. <https://www.inegi.org.mx/investigacion/etoe/>. Published June 24, 2020. Accessed February 7, 2021.
40. IMCO. Empleo Informal en Hogares y de Trabajadores por Cuenta Propia Aumenta a Dos Años de la Pandemia. Online Archive. <https://imco.org.mx/empleo-informal-en-hogares-y-de-trabajadores-por-cuenta-propia-aumenta-a-dos-anos-de-la-pandemia/>. Published April 19, 2022. Accessed April 20, 2022.
41. CONEVAL. Líneas de Pobreza por Ingresos. Online Archive. https://www.coneval.org.mx/Medicion/Documentos/Lineas_de_Pobreza_por_Ingresos/Lineas_de_Pobreza_por_Ingresos_mar_2023.pdf. Published March, 2023. Accessed April 15, 2023.
42. Pérez Méndez MA. Una propuesta para el análisis regional de la pobreza en México. INEGI. 2022; 13(1): 58-75.
43. Presidente. Sembrando Vida. Programa de Comunidades Sustentables. Online Archive. <https://presidente.gob.mx/sembrando-vida/>. Published June 7, 2023. Accessed June 8, 2023.
44. UNDP. Nuestras voces, desde abajo: Diagnóstico sobre los resultados de Sembrando Vida. Online Archive. <https://www.undp.org/es/mexico/publicacion-es/nuestras-vozes-desde-abajo-diagnostico-sobre-los-resultados-de-sembrando-vida-y-jovenes-construyendo-el-futuro-en-el-salvador-y-honduras>. Published January 20, 2023. Accessed June 21, 2023.
45. Chambilla Mamani HY, Coayla Maquera LL, Silvera Reynaga H, Astete López EJ. Impacto del confinamiento por la covid 19 en el estado emocional de los adolescentes. *Ciencia Latina Revista Científica Multidisciplinar*. 2022; 6(3): 2748-2767. DOI: https://doi.org/10.37811/cl_rcm.v6i3.2416
46. CONSAMI. Evolución e índice del Salario Mínimo. Comisión Nacional de Salario Mínimo [National Minimum Wage Commission]. Online Archive. https://www.gob.mx/cms/uploads/attachment/file/824133/_ndice_de_Salario_M_nimo_Real_Abril_2023.pdf. Published April, 2023. Accessed May, 2023.
47. Secretaría de Bienestar. Pensiones y Programas para el Bienestar. Online Archive. <https://programasparaelbienestar.gob.mx/wp-content/uploads/2023/05/4.-30052023-STP-Programas-del-Bienestar.pdf>. Published May 30, 2023. Accessed May 31, 2023.
48. Gobierno de México. Etiquetado frontal de alimentos y bebidas. Online Archive. <https://www.gob.mx/promosalud/acciones-y-programas/etiquetado-de-alimentos->. Published October 2021. Accessed September 7, 2022.
49. IMCO. La Economía en el Segundo Trimestre de 2022. Online Archive. <https://imco.org.mx/la-economia-en-el-segundo-trimestre-de-2022-el-impulso-externo-al-pib/2022>. Published August 30, 2022. Accessed September 16, 2022.
50. Censos Bureau. Trade in Goods with Mexico. Online Archive. <https://www.census.gov/foreign-trade/balance/c2010.html>. 2023. Published May, 2023. Accessed June 2, 2023.
51. Muñoz, R. *Los más devastadores huracanes de este siglo en Centroamérica y el Caribe*. 2020; DW. Online Archive. <https://www.dw.com/es/los-m%C3%A1s-devastadores-huracanes-de-este-siglo-en-centroam%C3%A9rica-y-el-caribe/a-55548254>. Published November, 2020. Accessed December 3, 2020.
52. NOAA. Online Archive. *Tropical Cyclones Report*, <https://www.ncei.noaa.gov/access/monitoring/monthly-report/tropical-cyclones/202009>. Published September, 2020. Accessed September 30, 2020.
53. Sitati A, Joe E, Pentz B, Grayson C, Jaime C, Gilmore E, et al. Climate change adaptation in conflict-affected countries: A systematic assessment of evidence. *Discov Sustain*. 2021; 2: 42.
54. ACNUR [Alto Comisionado de las Naciones Unidas para los Refugiados] Solicitudes de asilo en México batieron su récord en marzo. *Noticias ONU*. Online Archive. <https://news.un.org/es/story/2021/04/1490802>. Published April 13, 2021. Accessed July 17, 2021.
55. OCHA [Office for the Coordination of Humanitarian Affairs]. *Annual Report 2021*. OCHA: 2022.
56. US-Spider. UN-Spider Updates November 2020. Online Archive. <https://www.un-spider.org/about/un-spider-updates-november-2020>. Published November, 2020. Accessed December 12, 2020.
57. Pérez, I. *La sequía severa en México*. Mexico City: UNAM-DGDC: 2021.

58. Bolter, J. *It is too simple to call 2021 a record year for migration at the U.S.-Mexico Border*. Migration Policy Institute: 2021.
59. Moreno, J. M., Laguna-Defior, C., Barros, V., Calvo Buendía, E., Marengo, J. A. y Oswald Spring, Ú. (Eds.). *Adaptation to climate change risks in Ibero-American countries: RIOCCADAPT Report*. McGraw-Hill: 2020.
60. Sassen S. Border regions, migrations and the proliferation of violent expulsions. In Ribas-Mateos N, Zambrano M, Dunn TJ (Eds.). *Handbook on human security, borders and migration*. Edward Elgar Publishing Lim; 2021: 285-299.
61. Shoichet, C. ¿Qué es Título 42? Una política fronteriza que permite la deportación rápida y que genera debate. Online Archive. <https://cnnespanol.cnn.com/2022/12/27/que-es-titulo-42-politica-fronteriza-permite-deportacion-rapida-orix/>. Published December 27, 2022. Accessed December 28, 2022.
62. Gobierno de México. Declaración conjunta. Online Archive. https://www.gob.mx/cms/uploads/attachment/file/467956/Declaracion_Conjunta_Mexico_Estados_Unidos.pdf. Published June 7, 2019. Accessed May 19, 2023.
63. Ruiz, A. *Un año después del Acuerdo Estados Unidos-México. La transformación de las políticas migratorias mexicanas*. Online Archive. <https://www.migrationpolicy.org/research/unano-acuerdo-estados-unidos-mexico>. Migration Policy Institute. Published June, 2020. Accessed June, 2023.
64. Gramlich, J. Migrant encounters at U.S.-Mexico border are at a 21-year high. *Pew Research Center*. Online Archive. <https://www.pewresearch.org/fact-tank/2021/08/13/migrant-encounters-at-u-s-mexico-border-are-at-a-21-year-high/>. Published August 13, 2021. Accessed August 16, 2021.
65. US Code 2011. United States Code, Edition Title 8 - Aliens and Nationality. Online Archive. <https://www.govinfo.gov/content/pkg/USCODE-2011-title8/html/USCODE-2011-title8-chap12-subchapII-partII-sec1182.htm>. Published, 2011. Accessed October 12, 2022.
66. Redodem [Red de Documentación de las Organizaciones de Defensa del Migrante]. *Migraciones en México: fronteras, omisiones y transgresiones. Informe 2019*. COLEF: 2020.
67. Bloomberg. Job Market's 2.6 Million Missing People Unnerves Star Harvard Economist. Online Archive. https://www.bloomberg.com/news/articles/2023-01-18/job-market-update-2-6-million-missing-people-in-us-labor-force-shakes-economist?in_source=embedded-checkout-banner. Published January 18, 2023. Accessed January 19, 2023.
68. WHO. WHO chief declares end to COVID-19 as a global health emergency. Online Archive. <https://news.un.org/en/story/2023/05/1136367>. Published May 5, 2023. Accessed May 12, 2023.
69. EQUIS: Justicia para las Mujeres, Informe (Des)Protección Judicial en tiempos del COVID-19. Online Archive. <https://equis.org.mx/wp-content/uploads/2020/08/informe-dospandemiasmexico.pdf>. Published August, 2020. Accessed September 30, 2020.
70. Relatora Especial de Naciones Unidas sobre la violencia contra la mujer. Las dos pandemias. Violencia contra las mujeres en México en el contexto de COVID-19. Online Archive. <https://equis.org.mx/wp-content/uploads/2020/08/informe-dospandemiasmexico.pdf>. 2020. Published August, 2020. Accessed September 30, 2020.
71. INEGI. *Encuesta Nacional de Ocupación y Empleo, Nueva Edición (ENOEN). Tercer Trimestre 2022*. INEGI: 2022.
72. INEGI. *Encuesta Nacional de Ocupación y Empleo, Nueva Edición (ENOEN). Cuarto Trimestre 2022*. INEGI: 20 February 2023.
73. SESNSP. Información sobre la violencia contra las mujeres. Online Archive. <https://www.gob.mx/sesns/articulos/informacion-sobre-violencia-contra-las-mujeres-incidencia-delictiva-y-llamadas-de-emergencia-9-1-1-abril-2020>. Published April 30, 2020. Accessed September 30, 2020.
74. Inmujeres-GobMex. *Violencia contra las mujeres. Indicadores básicos en tiempo de pandemia*. Inmujeres; 2021.
75. Red Nacional de Refugios A.C., Urge que Secretaría de Hacienda y Crédito Público libere presupuesto para Casas de las Mujeres Indígenas (CAMIS). Online Archive. <https://www.facebook.com/RedNacionaldeRefugiosAC/photos/a.886447411371461/3547502838599225/?type=3&theaterInmujeres>. Published May 15, 2020. Accessed May 16, 2020.
76. SESNSP-CNI [Including Reports from the 32 Federal States' Attorneys]. Informe de Seguridad. Online Archive. https://www.gob.mx/cms/uploads/attachment/file/666966/SSPC_INFORME_JULIO_20-08-2021.pdf. Published August 2, 2021. Accessed September 30, 2021.

77. Curcó C. Lenguaje e inclusión social. ¿Es realmente machista el español?, Online Archive. <https://revista.unaminternacional.unam.mx/nota/4/lenguaje-e-inclusion-social-es-realmente-machista-el-espanol>. Published April 19, 2023. Accessed June 17, 2023.
78. González Casanova. *Colonialismo Interno*. IIS-UNAM: 2023.
79. Presidencia de la República. *Cuarto Informe de Gobierno 2021-2022*. Presidencia de la República; September 1, 2022.
80. Gobierno de México. Guardia Nacional. Online Archive. <https://www.gob.mx/guardianacional>. Published September 26, 2022, Accessed December 12, 2022.
81. Gobierno de México. Corredor Interoceánico Istmo de Tehuantepec. Online Archive. https://dof.gob.mx/nota_detalle.php?codigo=5682765&fecha=14/03/2023#gsc.tab=0. Published March 14, 2023. Accessed June 17, 2023.
82. Gobierno de México-Fonatur. Proyecto Regional Tren Maya. Online Archive. https://www.dof.gob.mx/nota_detalle.php?codigo=5608690&fecha=24/12/2020#gsc.tab=0. Published December 24, 2020. Accessed January 7, 2021.
83. CEMDA. Postura del Centro Mexicano de Derecho Ambiental respecto al Tren Maya. Online Archive. <https://www.cemda.org.mx/nuestra-opinion-postura-del-centro-mexicano-de-derecho-ambiental-respecto-al-proyecto-tren-maya/2022>. Published December 24, 2020. Accessed January 15, 2021.
84. Bloomberg. México dará visas temporales de trabajo a centroamericanos: ¿a quiénes beneficiaría? Online Archive. <https://www.bloomberglinea.com/2023/05/22/mexico-dara-visas-temporales-de-trabajo-a-centroamericanos-a-quienes-beneficiaria/>. Published May 22, 2023. Accessed May 23, 2023.
85. Council on Foreign Relations. U.S. Detention of Child Migrants. Online Archive. <https://www.cfr.org/backgrounders/us-detention-child-migrants>. Published March 27, 2023. Accessed March 28, 2023.
86. Villavicencio DH, Millán JC. La transición energética en México: disyuntivas, tensiones y avances en la ejecución del proyecto nacional. *L'Amérique Latine face à la Transition Énergétique*. 2020; 115: 25-40. doi.org/10.4000/caravelle.8635.
87. INFOBAE. En la COP27, México se comprometió a reducir un 35% su emisión de gases contaminantes. Online Archive. <https://www.infobae.com/america/mexico/2022/11/12/en-la-cop27-mexico-se-comprometio-a-reducir-un-35-su-emision-de-gases-contaminantes/>. Published November 11, 2022. Accessed November 30, 2022.
88. Shell Global. Shell completes sale of interest in Deer Park refinery to partner Pemex. Online Archive. <https://www.shell.com/media/news-and-media-releases/2022/shell-completes-sale-of-interest-in-deer-park-refinery-to-partner-pemex.html>. Published January 20, 2022. Accessed January 21, 2022.
89. Pemex. *Informe anual 2021*. Pemex: 2022.
90. SHCP. La reducción del estímulo al IEPS no aumenta precios de gasolinas. Comunicado 91. Online Archive. <https://www.gob.mx/shcp/prensa/comunicado-no-75-la-reduccion-del-estimulo-al-ieps-no-aumenta-precios-de-gasolinas?idiom=es-MX>. Published October 26, 2018. Accessed 11 February, 2022.
91. IMCO. Refinería de Dos Bocas ¿Hacia el sector energético más competitivo. Online Archive. <https://imco.org.mx/refineria-de-dos-bocas/> Published June 29, 2022. Accessed June 30, 2022.
92. Torres I, Niewöhner J. Whose energy sovereignty? Competing imaginaries of Mexico's energy future. February 2023; *Energy Research & Social Science*. 96: 102319.
93. Banxico. Sistema de Información Económica. 2013-2023. Online Archive. <https://www.banxico.org.mx/SielInternet/>. Published January, 2013 to June 2023. Accessed June 12, 2023.
94. Gobierno de México. Exceso de Mortalidad en México. 2023. Online Archive. <https://coronavirus.gob.mx/exceso-de-mortalidad-en-mexico/>. Published January 5, 2023. Accessed May 15, 2023.
95. SRE. Por acuerdo bilateral, llegan a México 1.35 millones de vacunas Johnson & Johnson desde Estados Unidos. Online Archive. <https://embamex.sre.gob.mx/eua/index.php/es/boletines/1844-por-acuerdo-bilateral-llegan-a-mexico-1-35-millones-de-vacunas-johnson-johnson-desde-estados-unidos>. Published June 15, 2021. Accessed June 20, 2021.
96. Vidal, G. COVID-19 y la respuesta del Estado mexicano. 2021; Veredas. veredas.xoc.uam.mx/index.php/2021/04/19/covid-19-y-la-respuesta-del-estado-mexicano/.

97. Oswald-Spring, Ú. Dual vulnerability among female household heads. *Acta Colomb de Psicol.* 2013; 16: 19-30.
98. Tuler SP, Webler T, Hansen R, Vörösmarty CJ, Melillo JM, Wuebbles DJ. Prospects and challenges of regional modeling frameworks to inform planning for food, energy, and water systems: Views of modelers and stakeholders. *Front. Environ. Sci.*; 2023. 11:1067559. doi: 10.3389/fenvs.2023.1067559.
99. CONEVAL. *La Política Social en el Contexto de la Pandemia SARS-CoV-2 (COVID-19) en México.* CONEVAL; 2021.
100. Prieto, S. Southern Border of México: disputed territories, megaprojects and (im)mobilities, *Academia Letters*; 2021: 933.
101. IMSS. IMSS-Bienestar brinda servicios de salud a 21.8 millones de personas sin seguridad social; se suman entidades en 2023. Online Archive. <http://www.imss.gob.mx/prensa/archivo/202301/023>. Published January 23, 2023. Accessed January 31, 2023.
102. Heinrich Böll Foundation. *Reconceptualización de la violencia en el triángulo norte. Abordaje de la seguridad en los países del norte de Centroamérica desde una visión democrática.* Böll Foundation; 2017.
103. IPCC. *Synthesis Report of the IPCC Sixth Assessment Report.* 2023. IPCC; 2023.
104. GBF. Kunming-Montreal Global Biodiversity Framework (GBF). CGRFA Special Event. Online Archive. <https://www.cbd.int/gbf/>. Published July 17, 2023. Accessed July 20, 2023.
105. Hasell J, Roser M, Ortiz-Ospina E, Arriagada P. *Poverty.* Our World in Data. Online Archive. <https://ourworldindata.org/poverty>. Published November, 2022. Accessed January 7, 2023.
106. Gupta S, Rouse BT, Sarangi PP. 2021. Did Climate Change Influence the Emergence, Transmission, and Expression of the COVID-19 Pandemic? *Front. Med. Sec. Infectious Diseases: Pathogenesis and Therapy.* 08 December 2021: 8. doi.org/10.3389/fmed.2021.769208.
107. Millan Valenzuela H., Pérez Archundia E. Educación, pobreza y delincuencia: ¿nexos de la violencia en México. *Convergencia*; 2019: 26(80): 1405-1435. doi.org/10.29101/crcs.v26i80.10872.
108. Goldstein B. Suicide of a Superpower. The Implosion of *Pax Americana.* The Cornell Diplomat. Online Archive. <https://journals.library.cornell.edu/index.php/tcd/article/view/670/638>. Published 2022. Accessed May 31, 2023.