

Sangjun Ko, Arnav Aggarwal (University of Illinois at Urbana Champaign)

Identifying and Addressing the Socioeconomic and Mental Health Impacts of COVID-19 in Mexico: A Data-Driven Approach Using ENCOVID-19

The COVID-19 pandemic, since its onset in early 2020, has profoundly disrupted global societies, posing unprecedented challenges to public health systems, economies, and social structures. In Mexico, the pandemic's impact has been particularly severe, exacerbating existing social and economic inequalities and revealing significant vulnerabilities across different demographic groups. As the country grappled with the health crisis, various segments of the population experienced substantial declines in mental health, employment, and educational outcomes.

The objective of this study is to analyze the pandemic's impact on Mexican households, focusing on mental health, employment, and education. Using the ENCOVID-19 dataset, this research aims to identify the most affected groups and propose strategic interventions to mitigate these effects in future pandemics. Our analysis reveals that young adults (18-35), females, and individuals from lower socioeconomic backgrounds faced disproportionately negative outcomes, including higher levels of anxiety and depression, greater job loss and income reductions, and significant educational disruptions.

The historical context of mental health in Mexico highlights systemic issues that have long plagued the country. Mental health services are often under-resourced, and barriers to access are significant, particularly for marginalized communities. The pandemic has intensified these pre-existing challenges, as noted in a study by Hernández-Díaz et al. (2022), which reports

increased anxiety, depression, and stress among the Mexican population during the COVID-19 pandemic.

Employment data from the ENCOVID-19 survey illustrates that vulnerable groups, such as those from lower socioeconomic backgrounds, experienced prevalent job loss and income reductions, impacting their economic recovery. According to Cottani (2020), Latin America faced significant economic contractions due to the pandemic, with Mexico being no exception. These economic hardships have had a cascading effect on the mental health of these populations, exacerbating their stress and anxiety levels. This study aims to underscore the necessity of targeted interventions in mental health services, and economic support programs. By addressing these areas, policymakers can better prepare for future pandemics, ensuring resilience among the most affected populations.

Methodology:

The dataset utilized for this study was derived from a comprehensive survey conducted in May 2021, aimed at assessing the impact of the COVID-19 pandemic on Mexican households. This survey encompassed various dimensions of household well-being, capturing data on employment status, income fluctuations, life satisfaction, mental health, and demographic details. Key variables selected for analysis included demographic indicators such as age, gender, state of residence, and socioeconomic level; economic impact measures like household employment loss, income reduction due to the pandemic, and changes in household income; occupation-related variables; and several well-being and mental health indicators.

Variables exhibiting more than 50% missing data were excluded from the analysis to maintain data integrity. For variables with moderate missing values (10-50%), the K-Nearest

Neighbors (KNN) imputation method was employed and variables with less than 10% missing data were imputed using the median value to ensure consistency. Additionally, categorical variables, including socioeconomic level and state of residence, were appropriately converted to categorical data types, and age was segmented into meaningful groups for more granular analysis. Then geospatial data was integrated, merging the survey data with a shapefile containing the geographic boundaries of Mexican states, thus facilitating a comprehensive geospatial analysis.

Results:

The analysis of COVID-19's impact across different age groups reveals stark disparities. Young adults (18-35) were particularly vulnerable during the pandemic, with around 40% reporting employment loss. Additionally, 29-34% of this group experienced income reduction. These economic hardships have had a significant impact on their mental health, as indicated by higher levels of anxiety compared to older groups. (Appendix Group 1) Life satisfaction within this age group shows significant variability, reflecting a range of experiences from relatively stable to highly stressful situations. According to Hernández-Díaz et al. (2022), "the findings show that COVID-19 has an impact on the Mexican population's mental health and is particularly associated with anxiety, depression, stress, and distress. Females and younger age are risk factors for developing mental health symptoms" (Hernández-Díaz et al., 2022).

Furthermore, lower socioeconomic levels (1-3) experienced the highest proportions of employment loss, with around 42% reporting job loss. This group also reported lower life satisfaction and higher levels of anxiety, indicating significant mental health challenges. Interestingly, mid to upper socioeconomic levels (5-7) reported higher proportions of income reduction (around 30-33%), suggesting that even these economically better-off groups were

significantly impacted financially. However, these groups maintained higher life satisfaction and lower anxiety levels, reflecting better resilience and coping mechanisms. (Appendix Group 2) According to Cottani (2020), "the Covid-19 pandemic has inflicted considerable pain in Latin America, both economically and socially. The region's economy is expected to contract by an estimated 8.1 percent this year, with significant scarring and solvency concerns affecting the Latin American outlook" (Cottani, 2020). This broad regional contraction is mirrored in the data for Mexico, where lower socioeconomic groups have faced disproportionate economic impacts.

Moreover, gender-based analysis reveals significant disparities in how males and females were affected by the pandemic. A higher proportion of females (41.96%) reported employment loss compared to males (29.65%). Similarly, 31.61% of females experienced income reduction, compared to 25.12% of males. This economic impact correlates with lower life satisfaction among females (8.12) compared to males (8.29), and higher anxiety levels (1.03 for females vs. 0.72 for males). (Appendix Group 3) According to the Latin American Bishops' Council (2021), "the Covid-19 pandemic has magnified existing structural inequalities, particularly affecting women in Latin America and the Caribbean" (Latin American Bishops' Council, 2021). This report highlights that women were disproportionately employed in sectors heavily impacted by the pandemic, such as tourism, manufacturing, and domestic work, leading to higher unemployment rates among women.

Lastly, the geospatial analysis reveals significant regional disparities in the impact of COVID-19 across Mexico, with central and southern regions, including Mexico City and Veracruz, experiencing higher employment loss and income reduction due to their dense populations and reliance on tourism and services. These economic challenges contributed to heightened anxiety levels in these areas, underscoring the fragility of urban economies and the

compounded effects of financial strain and mental health issues. Conversely, some northern states reported higher life satisfaction despite economic difficulties, likely due to better social support systems and less severe industry disruptions, suggesting that community support and living conditions play a crucial role in mitigating the pandemic's psychological impact.

Conclusion

The COVID-19 pandemic has profoundly impacted various demographic and socioeconomic groups in Mexico, highlighting existing vulnerabilities and exacerbating inequalities in mental health, employment, and education. This study, leveraging the ENCOVID-19 dataset, has identified that young adults (18-35), females, and individuals from lower socioeconomic backgrounds are the most affected, experiencing higher levels of anxiety, job loss, and income reductions. The geospatial analysis further revealed significant regional disparities, with central and southern regions, including Mexico City and Veracruz, facing severe economic hardships and heightened anxiety levels. (Appendix Group 4)

To mitigate these effects in future pandemics, it is imperative to implement targeted interventions. Expanding mental health services, especially for young adults and females, can help address the increased levels of anxiety and depression observed in these groups. Enhancing economic support programs, including social safety nets and job assistance initiatives, can aid in stabilizing incomes and reducing financial stress on vulnerable populations. Policymakers must prioritize these areas to build resilience among the most affected populations, ensuring that the response to future pandemics is comprehensive and inclusive. Addressing the mental health and economic needs of these vulnerable groups will not only aid in recovery but also strengthen the social fabric, making it more resilient to future crises.

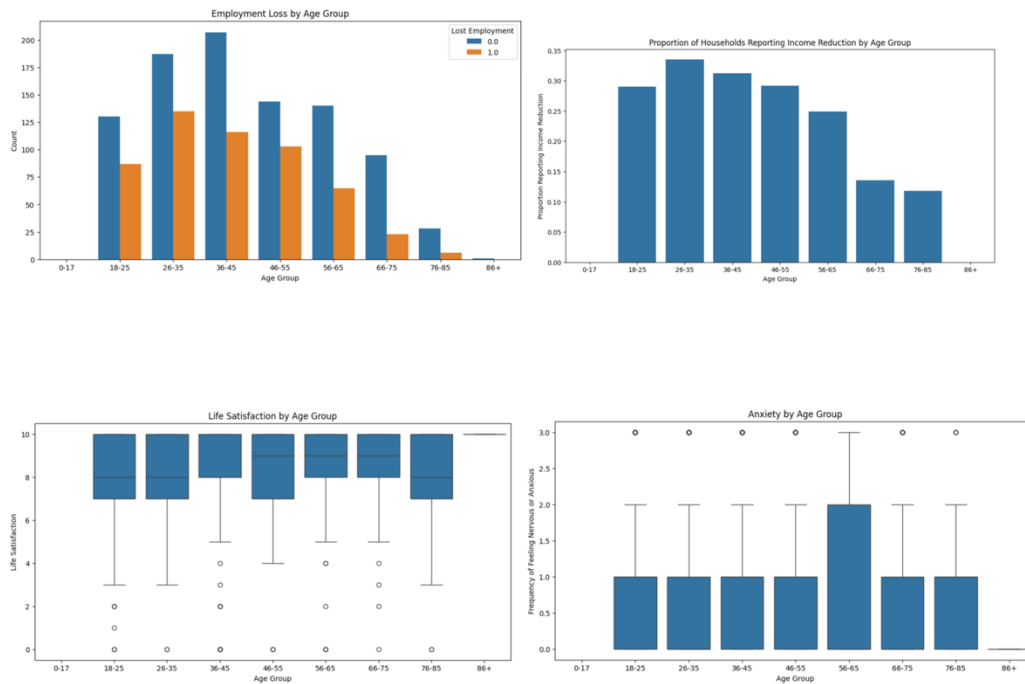
References

- Hernández-Díaz, Y., Genis-Mendoza, A. D., Ramos-Méndez, M. Á., Juárez-Rojop, I. E., Tovilla-Zárate, C. A., González-Castro, T. B., López-Narváez, M. L., & Nicolini, H. (2022). Mental Health Impact of the COVID-19 Pandemic on Mexican Population: A Systematic Review. *International Journal of Environmental Research and Public Health*, 19(11), 6953. <https://doi.org/10.3390/ijerph19116953>
- Cottani, J. (2020). *The Effects of Covid-19 on Latin America's Economy*. Center for Strategic and International Studies (CSIS). Retrieved from <https://www.csis.org/analysis/effects-covid-19-latin-americas-economy>.
- Latin American Bishops' Council. (2021). Impact of COVID-19 on Women in Latin America and the Caribbean. World Union of Catholic Women's Organisations. Retrieved from <https://www.wucwo.org>.

Appendix

Group 1:

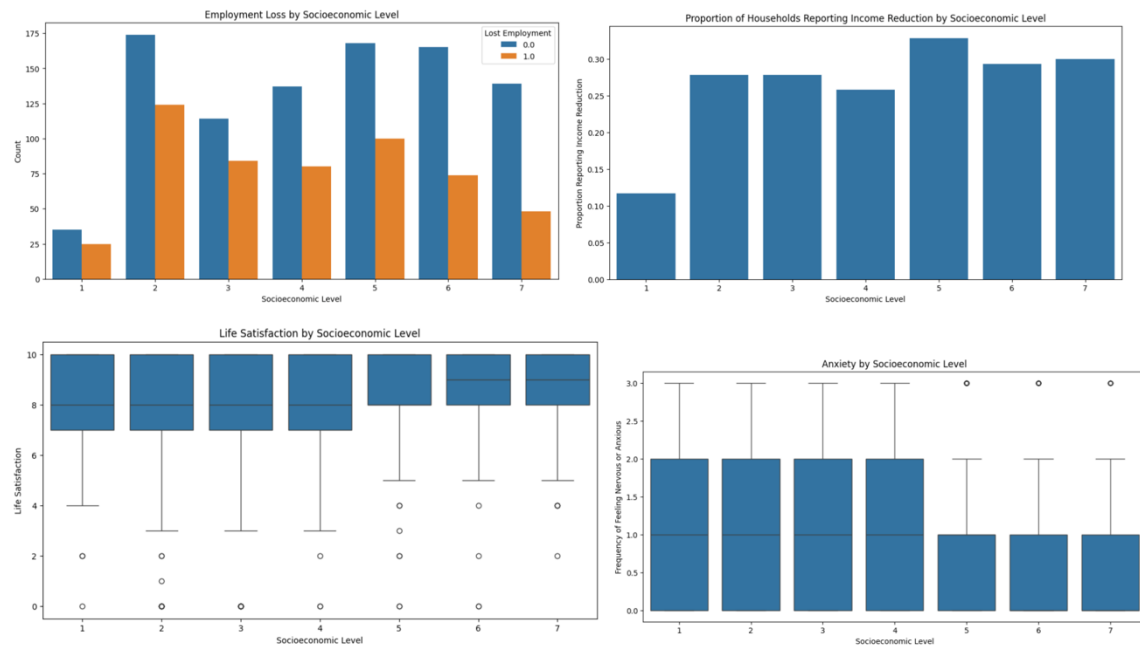
Figures 1-4



Figures 1-4 provide a comprehensive overview of the socioeconomic and mental health impacts of COVID-19 on different age groups in Mexico. Figure 1 illustrates that individuals aged 26-45 experienced the highest rates of employment loss, with a notable concentration among the 36-45 age group, while younger (18-25) and older (56-65) age groups also faced significant job losses. Figure 2 shows that households with members aged 26-45 reported the highest levels of income reduction, particularly peaking within the 26-35 age group, reflecting the financial strain on these demographics. Figure 3, a boxplot of life satisfaction by age group, reveals substantial variability in life satisfaction, with younger adults (18-35) experiencing a broader range of outcomes from relatively stable to highly stressful situations. Figure 4 highlights that anxiety levels were notably higher among individuals aged 56-65, suggesting that this age group faced considerable mental health challenges during the pandemic. These figures collectively underscore the pandemic's disparate impact on employment, income, life satisfaction, and anxiety across different age groups, emphasizing the need for targeted interventions.

Group 2:

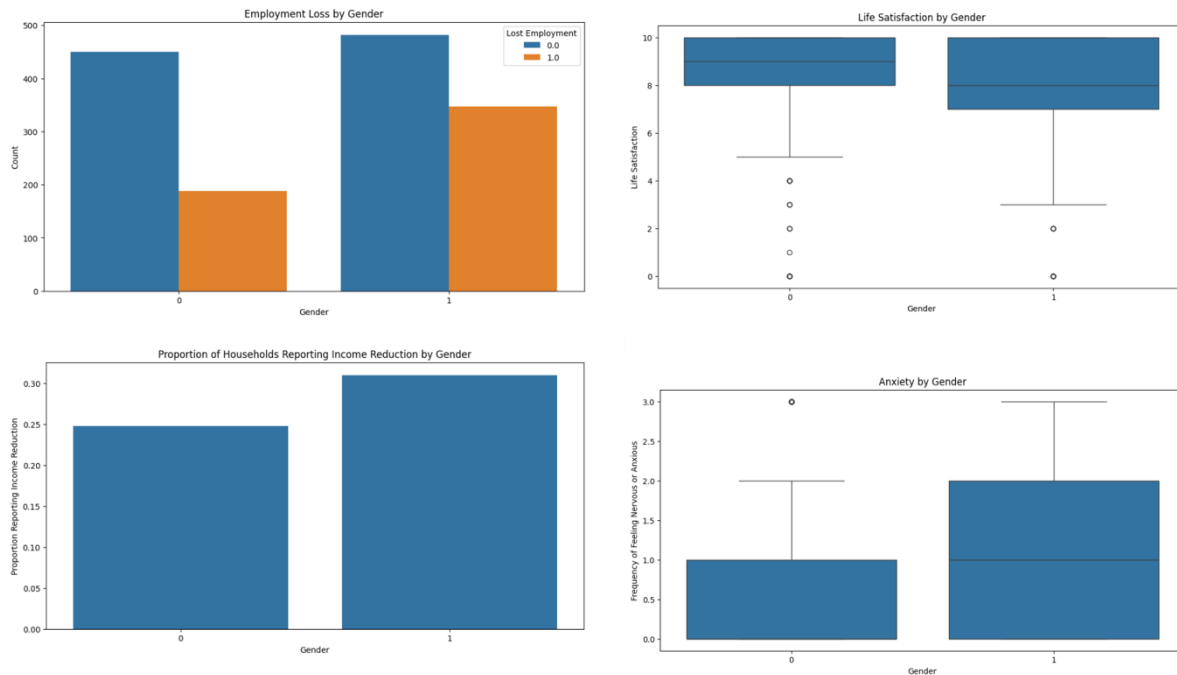
Figures 5-8



Figures 5-8 provide insights into the socioeconomic impacts of COVID-19 across different socioeconomic levels in Mexico. Figure 5 illustrates that individuals from lower socioeconomic levels (1-3) experienced the highest rates of employment loss, with level 2 being particularly affected. Higher socioeconomic levels (4-7) also faced job losses, but to a lesser extent. Figure 6 shows that households from mid to upper socioeconomic levels (5-7) reported the highest proportions of income reduction, peaking at level 5, indicating that even economically better-off groups were significantly impacted financially. Figure 7, a boxplot of life satisfaction by socioeconomic level, reveals that lower levels (1-3) reported lower life satisfaction and greater variability, while higher levels (5-7) maintained relatively higher and more stable life satisfaction. Figure 8 highlights that anxiety levels were notably higher among lower socioeconomic levels (1-4), with level 4 experiencing the highest frequency of anxiety, suggesting that economic hardship during the pandemic significantly affected mental health in these groups. These figures collectively underscore the pandemic's disparate impact on employment, income, life satisfaction, and anxiety across different socioeconomic levels, emphasizing the need for targeted interventions to support the most vulnerable populations.

Group 3:

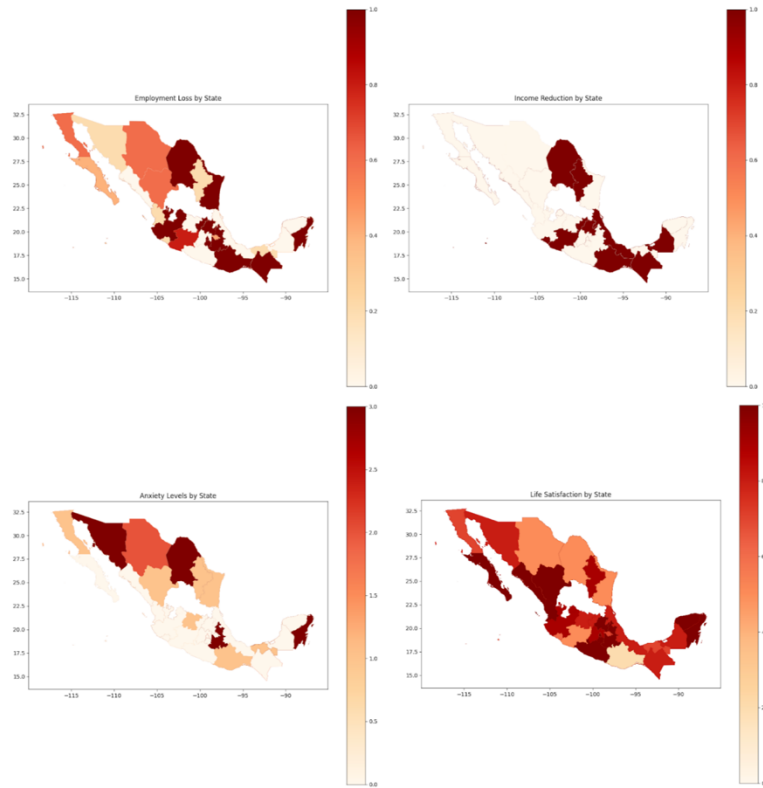
Figures 9-12



Figures 9-12 provide insights into the gender-based impacts of COVID-19 on employment, income, life satisfaction, and anxiety in Mexico. Figure 9 shows that females experienced higher employment loss compared to males, indicating that women were more vulnerable to job losses during the pandemic. Figure 10 illustrates that a higher proportion of females reported income reductions compared to males, highlighting the financial strain on women. Figure 11, a boxplot of life satisfaction by gender, reveals that females reported slightly lower life satisfaction with greater variability compared to males, suggesting that women experienced more significant fluctuations in their well-being. Figure 12 indicates that females reported higher anxiety levels compared to males, reflecting the greater mental health challenges faced by women during the pandemic. These figures collectively underscore the pandemic's disparate impact on employment, income, life satisfaction, and anxiety between genders, emphasizing the need for gender-specific interventions to support women who were disproportionately affected.

Group.4:

Figures 13-16



Figures 13-16 provide a geospatial analysis of the impacts of COVID-19 across different states in Mexico, focusing on employment loss, income reduction, anxiety levels, and life satisfaction. Figure 13 highlights that central and southern states, including Mexico City and Veracruz, experienced the highest employment loss, reflecting the vulnerability of these densely populated areas to economic disruptions. Figure 14 shows that income reduction was most pronounced in the same central and southern regions, indicating that these areas faced significant financial strain during the pandemic. Figure 15 illustrates that anxiety levels were higher in states with greater economic hardships, particularly in central regions, underscoring the link between financial stress and mental health challenges. Figure 16 reveals that life satisfaction varied across states, with northern states generally reporting higher satisfaction despite economic difficulties, likely due to better social support systems and less severe industry disruptions. These figures collectively underscore the regional disparities in the pandemic's impact, emphasizing the need for targeted regional interventions to support the most affected areas.

