Applied Demography

Population Association of America - Committee on Applied Demography

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Special Issue on COVID-19

Committee on Applied Demography

The Committee recommends sessions and events for PAA's annual meeting, and serves as the primary conduit between PAA members who practice applied demography and the larger PAA organization.

Editorial

Applied Demography, as the newsletter of the Committee on Applied Demography, is interested in the applications of demographic methods to inform decision-making processes in the public and private sectors.

On December 31, 2019 the China World Health Organization Office received a report of a pneumonia of unknown causes in Wuhan, China. One month after that day, the outbreak was declared a Public Health Emergency of International Concern. On February 11, 2020, the World Health Organization announced the name for the coronavirus disease: COVID-19. On March 11, the World Health Organization declared COVID-19 a pandemic. This was due to the more than 100,000 cases around the world and the "*sustained risk of further global spread*". Dr. Tedros Adhanom Ghebreyesus, Director-General at the WHO said "…*every sector and every individual must be involved in the fights*".

Our lives have been affected by this declaration. Those of us work academia have transitioned to remote teaching, members of the public and private sector have transitioned to tele-work or seen their activities and projects stopped. The strict measures put in place to prevent future cases of COVID-19 resulted in the cancellation of the Annual Meeting of the Population Association of America (PAA).

On March 11, we issued a call for contributions for a special issue of *Applied Demography* calling on PAA's community to submit the work they have been sharing through social media and other outlets for publication in this issue. The work presented in this issue of *Applied Demography* underscores the importance and relevance of our discipline. Now more than ever, denominators and age-sex structures matter. Everything we learned in our first "*Dem Tech*" course is relevant to the ongoing pandemic.

The lead piece of this special edition by Ashton Verdery and Emily Smith-Greenaway discusses potential family bereavement during this period. We have four articles that discuss healthcare capacity within Latin America. Astrid Arriaza presents two case studies about Guatemala. Enrique Acosta discusses healthcare saturation with a proposed visualization approach. Nadia Y. Flores-Yeffal presents a comparative analysis of responses by México and El Salvador at the onset of COVID-19.

Mark Mather and Beth Jarosz write about the risk faced by workers during the COVID-19 pandemic. Age and ageing are explored in three pieces. Beth Jarosz presents a dashboard to compare age structures in times of COVID-19; Andy Sharma discusses population health concerns for disabled older adults in New York. Ilya Kashnitsky and José Manuel Aburto discuss unequally ageing European regions and implications for understanding COVID-19. Finally, Lyman Stone presents an analysis of fertility responses to mortality by looking at past cases around the world.

The publication of this special issue marks the end of my term as Editor of *Applied Demography*. I hope the members of PAA appreciate this new format and the change in scope. Cases like this special edition highlight the possibility of it becoming a vehicle for dissemination of timely work by the membership of PAA.

I want to thank Danielle Staudt, Bobbie Westmoreland, Mary Jo Hoeksema, and Betsy Alafoginis for their help during my two years in this role. I want to thank the Committee on Applied Demography and Tom Godfrey for their help and support. Finally, I want to thank Beth Jarosz for her advice during my term as Editor.

Hoping that all of you and your loved ones remain safe and healthy.

Thank you for reading *Applied Demography*.

Alexis R. Santos-Lozada, Editor (2018-2020)

COVID-19 and Family Bereavement in the United States

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The COVID-19 pandemic may cause substantial excess mortality around the globe, and in the United States specifically (Ferguson & The Imperial college COVID-19 Response Team, 2020). Current estimated case fatality rates, combined with the potential of upwards of 40% of the U.S. population becoming confirmed cases, suggest that COVID-19 could lead to millions of deaths in this country. Even more stunning is the estimated number of bereaved family members that these deceased would leave behind, which itself will have tremendous consequences for population health.

Bereavement and grief in the wake of a family member's death is often culturally anticipated, yet some individuals experience more severe, prolonged mental health consequences, including major depression, anxiety, (Maj, 2012), Prolonged Grief Disorder (Prigerson et al., 2009), Complicated Grief (Horowitz et al., 2003), and other deleterious outcomes. Beyond mental health, bereavement is also tied to physical health risks including worse cardiovascular health and mortality (Carey et al., 2014; Elwert & Christakis, 2008; Stahl, Arnold, Chen, Anderson, & Schulz, 2016; Williams Jr, 2005). The risk of experiencing detrimental, bereavement-associated outcomes is more likely in the case of a family member's sudden, unexpected death (Parkes, 1976; Sanders, 1983), like those families may soon experience from COVID-19. Moreover, the potential for clustering of deaths within families due to highly transmissible nature of SARS-CoV-2 will lead to multiply bereaved family members, furthering risks of mental and physical health problems (Fletcher, Mailick, Song, & Wolfe, 2013; Li, Stroebe, Chan, & Chow, 2014; Sanders, 1980; Shear, Frank, Houck, & Reynolds, 2005).

Early evidence from China and Italy highlight the strong age gradient in COVID-19 mortality (Ferguson & The Imperial college COVID-19 Response Team, 2020). To estimate family bereavement burdens from these preliminary data requires consideration of the structure of U.S. kinship networks (Daw, Verdery, & Margolis, 2016). To estimate the potential scale of COVID-19 family bereavement, we draw on a recent demographic microsimulation that approximates the kinship networks of White and Black Americans (Margolis & Verdery, 2019; Verdery & Margolis, 2017).[1]

Combining estimates of U.S. kinship networks and population structure in March 2020 from this work with age-specific COVID-19 case fatality rates from Italy (Dowd et al., 2020), we simulate potential bereavement burdens in three scenarios of excess COVID-19 mortality: a scenario with 10% confirmed infection prevalence distributed uniformly at random in the population, a scenario with 20%, and a scenario with 40%, all in line with ranges used in prior work (Dowd et al., 2020; Ferguson & The Imperial college COVID-19 Response Team, 2020).[2] We focus on experiencing the loss of parents and grandparents and document how many surviving White and Black Americans may experience such events, multiplying estimates by counts of White and Black Americans ("Population Clock," 2020; "U.S. Census Bureau QuickFacts," 2020).

Figure 1 shows results. These models imply the potential for hundreds of thousands to millions of deaths, respectively, which would, in turn, lead to an even higher burden of bereavement. With a uniformly distributed 10% of the White and Black U.S. population confirmed infected and the most recent age-specific case-fatality rates from Italy, an estimated 537 thousand Americans would die; which would, in turn, translate into an estimated 1.238 million White and Black Americans losing a parent and an estimated 2.381 million losing at least one grandparent. In a severe 40% confirmed infection scenario (which could be exceeded), the bereaved would skyrocket to an estimated 4.731 million experiencing at least one parental death and 9.123

[1] The kinship networks of other race and ethnic groups, including those who identify as multiple race, are not possible to approximate with the demographic microsimulation methods used in these studies.

[2] Because of restricted access to testing, current estimates of case fatality rates do not reflect infection fatality rates (Roser et al. 2020); to be clear, we are modeling scenarios where "confirmed infections" reflect the age-specific denominators in the Italian setting.

million experiencing at least one grandparental death. These estimates represent a substantial fraction of the White and Black U.S. population with living parents and grandparents (e.g., 2.1% and 6.6%, respectively, in the 40% scenario).

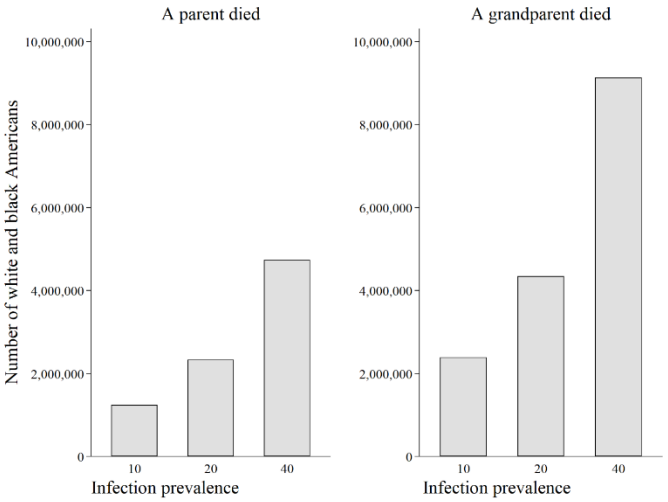

Figure 1. Numbers of White and Black Americans at risk of experiencing Parental and Grandparental Bereavement under three Infection Prevalence Scenarios.

This exercise demonstrates the potential bereavement burden the COVID-19 pandemic could produce in the United States. Of course, the accuracy of these estimates depends on assumptions about infection dynamics, such as whether current interventions fail to curtail infection prevalence, the applicability of Italy's age-specific case-fatality rates in this context, and the accuracy of kinship modeling. These estimates are also limited in that they pertain only to White or Black Americans.

The COVID-19 pandemic may lead to enormous loss of life in the United States. The collateral damage that this level of mortality would exact on American families cannot be overlooked. It is important that the burden of bereavement, and its potential mental and physical health consequences, is factored into discussions of the public health challenge facing all nations. Here we consider only two sources of family bereavement: the death of a parent or grandparent; not included in our estimates is the scale by which individuals' may lose other immediate or extended relatives, neighbors, co-workers, or friends, or the risks of multiple losses clustering within families. To be sure, even those who do not experience a direct loss will be at risk of non-bereavement related adverse psychological effects of the pandemic (Galea, 2020). Given the rapidly evolving estimates in this situation, our models should explicitly not be taken as predictions of numbers bereaved; they do, however, reflect the potential multipliers in bereavement that each death may cause. Systematic efforts to quantify this pandemic's collective trauma will be essential to fully appreciate its population health consequences.

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Guatemala case study: Demographic and public health considerations for understanding COVID-19 epidemic in settings with reduced health care capacity

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The coronavirus respiratory syndrome (COVID-19) pandemic represents a public health challenge around the globe. Different measures have been implemented across countries in order to reduce the impact of the epidemic. Public health measures to control the epidemic have to be further adapted to the social, epidemiological and health care system conditions of each country. Using Guatemala public health care system as a case study, this review highlights some of the demographic and public health considerations for understanding about this epidemic in settings with reduced health care capacity.

Given the immunological novelty and virus pathogenesis (1), it is estimated that up to 60% of the population might be exposed to the virus at some point (2). This is an alarming value for public health, particularly due to the acute respiratory distress symptoms (3, 4), which can develop into pneumonia (5, 6) with a possible fatal outcome (5, 6).

The fatality rate for confirmed cases has been around 2.3% [4, 7], which higher rates found for older adults (4, 7, 8) and for those individuals with preexisting health conditions [6, 8, 9]. The acute symptomatology of COVID-19 and the increased demand for health care services limits the epidemiological response and capacity of health care systems (1, 10). Further variations in lethality rates might be associated with the health care resources available at the time of the outbreak (11). Most of the efforts worldwide have been focused upon the reduction of mortality and modulation of the demand of health care services (12), a task that has been difficult to achieve even for countries with an increased health care capacity (1, 10).

The Ebola epidemic in West Africa highlighted the difficulties in controlling epidemiological outbreaks in settings with limited health care capacity; settings that includes poorly trained field epidemiologists, limited health care workers, lack of health care technologies, limited data registers and deficient resource mobilisation (13, 14). The Guatemala public health care system performance lags behind other countries in the Latin American Region, and its performance is comparable to some African countries, such as Ethiopia (15). Previous experiences have showed the limited capacity of the public health sector to react over epidemiological events (16), including facilities better equipped such as hospitals (17). The healthcare expenditures by the Government of Guatemalan is one of the lowest in Latin America, leading to having the highest out-of-pocket expenditure in the region (18). Additionally, Guatemala ranks second among the counties with the lowest density of physicians per 10,000 inhabitants (19), with the available doctors usually located at main urban areas (20).

Estimates about the impact of COVID-19 in Guatemala rely on epidemiological records from other countries. Moreover, local demographic and epidemiological circumstances have to be considered when trying to estimate the public health impact. In contrast to China and Italy, Guatemala has a younger population, with a higher average household size, greater extended family and a different population health profile. The first cause of death in the country is lower respiratory infections, for both children and older age groups (21). This is clearly a preventable cause of death and indicator of quality of health care (22).

Furthermore, fatal cases of respiratory infections in Guatemala have been associated with child

malnutrition, reduced breastfeeding, poverty and management of morbidities (23).

A higher number of COVID-19 confirmed cases and possible cases are likely to be observed among the Metropolitan Area, the most densely populated administrative area, with up to 5,697 habitants/Km^2. However, it is also the area with the increased sanitary capacity (24). Possible cases of COVID-19 can be expected across the country, especially related to returned migrants from the United States who are most likely to live in the rural areas. With 82.8% of Guatemalan population living outside the main urban centre in the 22 geo-administrative regions (24) and increased travel times to a public health hospital there is a potential for large scale under-treatment of a widespread virus outbreak. Under the limited capacity to diagnose, provide treatment, record health care data, the main way to track the impact of epidemics with fatal outcomes such as COVID-9, relies on mortality records (25). Maintaining vital registrations through any outbreak must be a priority.

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Access to health care in Guatemala and population health implications of COVID-19

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The eyes of the world are obviously on the COVID-19 crisis, but the current focus seems to be on high-income countries where the majority of cases have been reported. There are confirmed reports of a growing number of cases in Low- and Middle-Income countries, especially in Latin America, and there is great fear over the potential impact of the virus in these countries due to the poor and more disorganized health systems. The research that I am conducting as a Global Health Demographer is on access to health in Guatemala, with emphasis on rural areas. The results of my work have a direct message and clear implications for the response that is needed within the country.

My research studies how far and to where people are travelling to get health care in the country during non-COVID periods. Under normal circumstances, only 20% of the population visit the primary public health sector each year. Auxiliary nurses with limited equipment and training provide primary health services in public facilities. The users of these facilities are mostly children and mothers. This closely matches the country policies for maternal and child healthcare implemented to achieve the MDGs and SDGs, but clearly ignores the majority of the population. Due to a lack of a clear referral system, many people directly access secondary healthcare facilities when needing more specialized care and to be attended by a physician. I have found that 8% of the population attend a secondary public facility each year skipping the primary public healthcare facility. However, the majority of the population use private services of varying quality, with high associated costs leading to Guatemala being the country with the highest out-of-pocket (OOP) costs for healthcare in the region.

The current organization of the health system in Guatemala is not conducive to dealing with the current pandemic. Due to the severity of the symptoms of COVID-19 many more individuals than usual are likely to seek healthcare, firstly in public facilities (due to cost reasons), quickly breaching the low capacity of public hospitals. These hospitals are likely not to prepared for the required care needs, while the complex and arcane administrative processes needed to obtain more resources will lead to bottlenecks in providing the extra equipment and care that is required. As a result, more people will have to seek care in the private sector, with the increase in OOPs and resulting catastrophic expenditure. However private hospitals vary in quality and there are many questions about how these facilities will be prepared for the outbreak. For example, there is only one laboratory testing facility for the virus in the whole country with long lead times – without knowledge of who actually has the virus the selection for the few critical care beds is likely to be based not only on need but also ability to pay. There are likely to be many patients excluded from care from both the public and private hospitals.

In my research, I delineate a clear path to identifying areas that need urgent strengthening. My research combines concepts and methodological considerations from demography, epidemiology and geography to measure access to health care, understanding the barriers of health services utilization and equitable distribution of health resources across the country.

Access to health care under a health system and public policy perspective requires understanding about access across population subgroups, levels of care and geographic variations.

My research has also shown about the different health profiles across different areas of the population. This clearly is important due to the interaction of COVID-19 with underlying health issues. The primary cause of death in the country over recent years is already lower respiratory diseases, which is associated with poverty, malnutrition and general poor healthcare management. These underlying diseases are easily combined with age profiles in different areas. Doing this would provide the government with good information about the areas of the country that are likely to be most affected if there is a widespread outbreak of the virus.

As simple and obvious this may seem to a Demographer, it does not seem they have done this exercise. Due to the lack of transparency in the public health system it seems that the measures that have already been implemented are quite conservative and do not take these simple steps for preparing the country to reduce mortality. Further, the current measures do not consider the impact of the virus on the public health sector, but are focused on the private sector, which is likely to have a coverage under 10% of the total population.

A healthcare saturation approach to visualize the trend of the COVID-19 across countries

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At least two factors highlight the immense threat that poses the current COVID-19 pandemic: the pace of increase in reported infections and deaths, and as a consequence, the overloading of the healthcare system. The reported cases of Covid19 are growing at an exponential pace. As a consequence of this fast increase, it has been a sadly commonplace the many testimonies of Italian medical workers expressing the tremendous burden and the unprecedented shortage of medical equipment. The saturation of the healthcare system translates to a larger risk of death for patients, worsening even more the negative impacts of the pandemic.

For these reasons, analyses of the current pandemic should focus both on the rapidity of the transmission and the consequent saturation of healthcare systems. Several visualizations presented in the news and shared in social media are compelling to monitoring the exponential increase. A good example is a visualization proposed by John Burn-Murdoch. A Twitter post with the image, and a discussion about the inclusion of population by country can be found here. John Burn-Murdoch shared his code via GitHub, which can be found here.

This plot allows us to compare the speed of increase across different countries using case counts. However, it is a limited approach because it does not take into account the differential burden across countries. For instance, 20,000 COVID-19 infections would have very different implications for Brazil and Costa Rica. Not only Brazil has 42.7 times the population size of Costa Rica, but it also has twice hospital beds per capita. Thus, Brazil has 78.3 times larger capacity than Costa Rica to absorb each new case of COVID-19.

After exploring different alternatives based on Burn-Murdoch's original plot, I constructed a visualization in which, besides the display of the trend in Covid19 increase, it also takes into account the capacity of the healthcare system by country (See the twitter thread here, and the materials to reproduce these plots here). To highlight the implications of including this information for the analysis, I present here, as an example, a comparison in the trend of infections across several Latin American countries. Figure 1 presents the increase in Covid19 cases by country. Looking at the cumulative cases in Figure 1, Brazil, Chile, Peru, and Ecuador are the most affected by the pandemic. On average, the observed countries are 19.6 days behind the situation of Italy today.

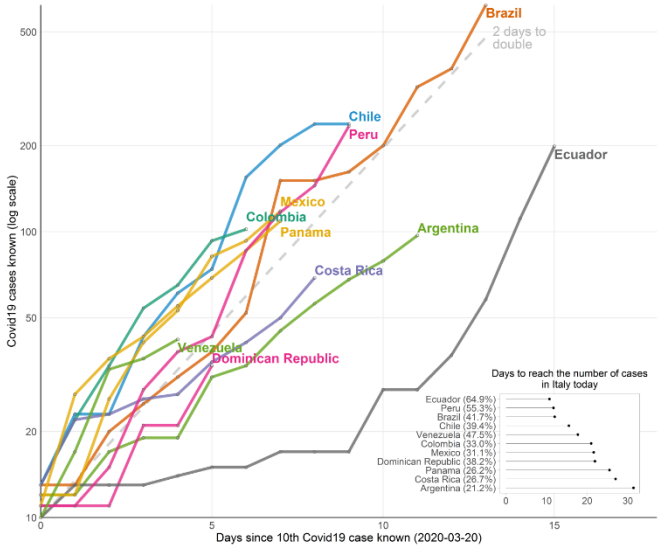

Figure 1. Trend in the prevalence of Covid19 cases across Latin American countries. The x-axis indicates the elapsed time since the 10th Covid19 case was identified, measured in days. The Y-axis indicates the cumulative cases identified. As a reference for the increase rate, the diagonal dashed line indicates the increase in which the prevalence would double in two days. The values in parenthesis in the embedded plot in the lower right corner indicate the average daily increase during the last five days.

Figure 2 presents the trends in identified prevalence, measured in Covid19 cases per 1,000 hospital beds. Data for hospital bed counts come from the World Health Organization (WHO) and can be accessed here and from the OECD data, which is available here. As a reference for the increase rate, the diagonal dashed line indicates the increase in which the prevalence would double in two days. The values in parenthesis in the embedded plot in the lower right corner indicate the average daily increase during the last five days.

These estimates are substantially different than those based on case counts. Compared to estimates in Figure 1, the burden in Costa Rica and Panama is more salient, whereas the opposite is true for Brazil, Mexico, and Argentina. The average time for the observed countries to reach the healthcare saturation that Italy experiences today is 15.1 days, that is, 4.5 days less than the time estimated to reach the number of cases. Furthermore, the differences are larger when looking at each country individually.

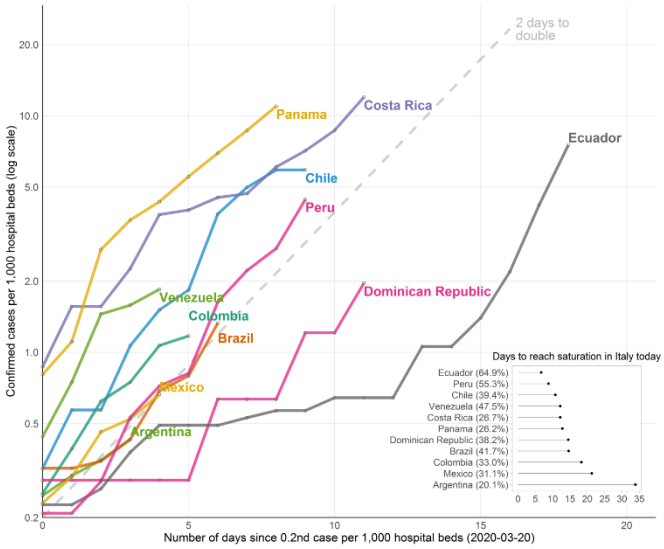

Figure 2. Trend in the prevalence of Covid19 cases per 1,000 beds across Latin American countries. The x-axis indicates the elapsed time since 0.2 Covid19 cases per 1,000 hospital beds were identified, measured in days. The Y-axis indicates the cumulative cases identified per 1,000 hospital beds.

Given the variability in health infrastructure between populations, such as the observed between the European and Latin American countries, the inclusion of such information is highly useful for raising awareness, the planning, and the implementation of the contention and mitigation strategies required to face the current and the upcoming pandemics.

References

References to online materials, online repositories, and data sources are included as hyperlinks within the text.

Early approaches to face the COVID-19 Pandemic by México and El Salvador

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Some of the most powerful countries around the world such as, The United States of America, Italy, and Spain have been struggling with the COVID-19 pandemic as they do not have enough hospital beds, ICU units, respirators, protective masks, medical gear, and medical supplies to deal with the pandemic. Here, I present the different early mitigation strategies and the timing taken by the governments of México and El Salvador to try to slow down the effect of the pandemic in their own territories. According to the World Bank the total population of El Salvador in 2018 was 6,420,744 people while the total population of México was 126,190,788. Therefore, México's population is approximately twenty times larger than that of El Salvador.

While El Salvador closed all flights to all international flights even before the first case of COVID-19 was reported, México decided to avoid the ban of those traveling from nations with the highest incidence of cases.

In addition, El Salvador began taking extreme measures and called the entire country to shelter in place immediately after the diagnosis of its first COVID-19 case (March 18). The Salvadoran government distributed $300 dollars to the poorest households and asked all large employers to continue to pay their workers and froze all utilities and mortgage payments for the entire country. On the other hand, México decided to wait as much as possible, for about a month, after their first case was reported before executing any aggressive mitigation measures because this could hurt its economy, in particular, those who are working in the informal sector of the economy.

In addition, both countries had very different explanations in order to justify their different mitigation strategies. El Salvador used projections of the number of people who could acquire the virus in order to warn Salvadorans of the danger coming ahead: For example, Figure 1 shows the chart shared by the Salvadoran government via Twitter to help convince Salvadorans to cooperate with the extreme measures taken too early by President Nayib Bukele to contain the virus.

Figure 1. Tweet posted on March 21st, 2020, while El Salvador only had one case of COVID-19. "If we don't act quick enough the mathematical progression tells us that our health system would collapse and that every three days the cases would be duplicated"

In the case of México, the government did not use projections to justify its more relaxed approach; instead, they used current data from México and other countries shown on Figure 2. On March 24, 2020 when México had almost 400 cases and 4 deaths, the Health authorities presented Figure 2 in a televised press conference which was televised to almost 8 million household across the country.

In this Figure 2 the blue line is México's incidence and all the other lines according to the color show the progression of cases of Spain (España), Italy (Italia), France (Francia), Germany (Alemania), The United States (USA). The circles with the arrows show when each of these countries began to take extreme mitigation measures to slow down the pandemic. The main argument was that the other countries were already in trouble because they began taking these measures too late, while México was going to act early (which was before completing the first 30 days since its first case, which happened on February 27th).

Beginning on March 23rd, 2020, México closed all schools at all levels for one month and began practicing "*Susana Distancia*" or "Healthy Distance" which consists of being at least one and a half meters away from each other, washing hands, and asked older adults and those with chronic medical conditions to stay home (with paid leave) among other measures.

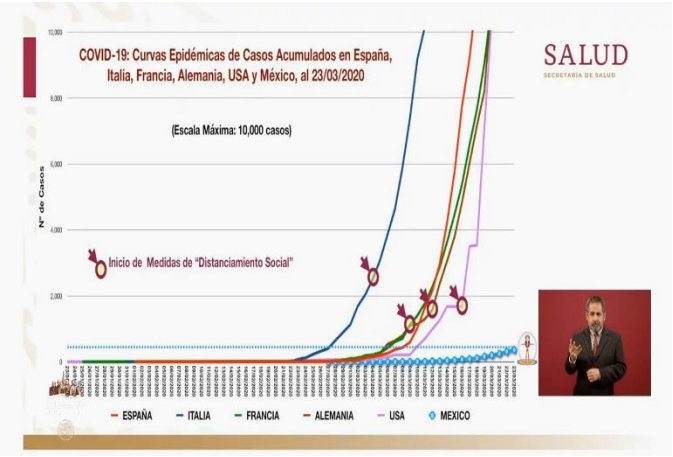

Figure 2. Graph Presented at Press Conference by the Mexican Health Sub-Secretary, Dr. Hugo López-Gatell Ramírez on National TV.

Very soon, we will find out the extent of the success of the different approaches and different types of communication used to justify these actions by these two country governments. This suggests that the different demographic characteristics of a population and its economic circumstances could guide the mitigation strategies used to face a pandemic by different nation states.

References:

Hyperlinks are provided with the text.

Workers at Risk during the COVID-19 Pandemic: Four in 10 Food Preparers and Servers Are Low-Income

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The COVID-19 pandemic sweeping the globe in 2020 will have long-term and widespread effects on the U.S. economy and labor force. A PRB analysis finds that workers in one of the hardest-hit sectors—food preparation and server-related occupations—are among the most economically vulnerable.

Food preparers and servers include cooks, wait staff, and others who help prepare and serve our meals in restaurants, coffee shops, hospitals, and school cafeterias.

In 2018, the United States had 8.8 million food preparers and servers, and more than four in 10 of them (41%) were low-income, meaning they had family incomes below 200% of the official poverty threshold ($50,930 for a family with two adults and two children). Nationwide, 19% of workers were low-income in 2018 (Table 1).

Food preparers and servers face additional challenges:

A high housing cost burden: In 2018, more than three in 10 workers in food preparation and server-related occupations (31%) had a high housing cost burden—defined as spending more than 30% of household income on housing costs such as mortgage or rent payments, utilities, and other expenses. The national average for all workers was 20%.

Lack of health insurance: About 21% of food preparers and servers lacked health insurance coverage in 2018—more than double the national average (10%). Health insurance coverage is important not only so low-income families have access to affordable health care when they need it, but also because persistent health issues and chronic conditions can affect their ability to work and provide for their families.

Very low pay for unskilled workers: Among workers in restaurants and other locations that serve meals, dishwashers are among the most economically vulnerable. In 2018, more than 300,000 people worked as dishwashers in the United States, and nearly half of them (49%) were low-income. Chefs and head cooks were among the least likely to be low-income, at 28%.

Table: Low-Income Status of U.S. Workers in Selected Occupations, 2018

	Total	Low-income	Percent
All occupations	155,982,549	30,059,749	19%
Food preparers and servers	8,803,519	3,596,843	41%
Personal care and service workers	4,404,322	1,388,299	32%
Sales workers	15,709,547	3,432,743	22%

Note: Families with incomes below 200% of the official poverty threshold are classified as low-income. These estimates are subject to both sampling and nonsampling error.

PRB analysis of data from the U.S. Census Bureau's American Community Survey Public Use Microdata Sample (PUMS).

Personal Service and Sales Workers Are Also Vulnerable

Personal care and service workers—including child care workers, personal and home care aides, workers in hotels and casinos, fitness instructors, and others—are also expected to be hit hard by lost wages and unemployment stemming from the COVID-19 pandemic. In 2018, the United States had 4.4 million personal care and service workers and 32% were low-income. Salespeople, also at high risk of layoffs and lost earnings, make up a larger group of workers—15.7 million in 2018—but were less likely to be low-income, at 22%.

In combination, food preparers and servers, personal care and service workers, and salespeople make up 28.9 million workers, or about 19% of the total U.S. workforce. Yet they account for 28% of all workers who are low-income.

Policymakers Can Help COVID-19-Affected Workers and Businesses

Low-income workers face significant challenges—including housing stability and access to affordable health care and childcare—under normal circumstances. The pandemic crisis puts these workers at a double disadvantage. Lack of health insurance may discourage low-income workers from seeking health care when they need it, and treatment may result in medical debt. The risk of lost wages may lead people to go to work when sick, increasing the health risk for others. Workers who are laid off due to illness or government-imposed distancing measures may not have enough money to meet basic needs, including food and housing.

Policymakers can help by providing direct cash transfers to affected workers and the businesses that employ them. Some jurisdictions and service providers are also implementing moratoria on evictions and utility shut-offs, and making other accommodations to address the COVID-19 crisis. By providing an adequate safety net for workers who are most economically affected by the pandemic, policymakers can improve the economic outlook for millions of people and speed the recovery of the U.S. economy.

Comparing age structures in times of COVID-19

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There is still much we do not know about the novel coronavirus SARS-CoV2 (commonly known as COVID-19).

However, evidence to date suggests that deaths among those who have tested positive for the coronavirus are highest at older ages and near zero for young children.

Age structure alone cannot tell us which countries will be hardest hit in the pandemic but can provide important context in understanding and responding to the crisis.

You can use this interactive chart to compare age structures across countries.

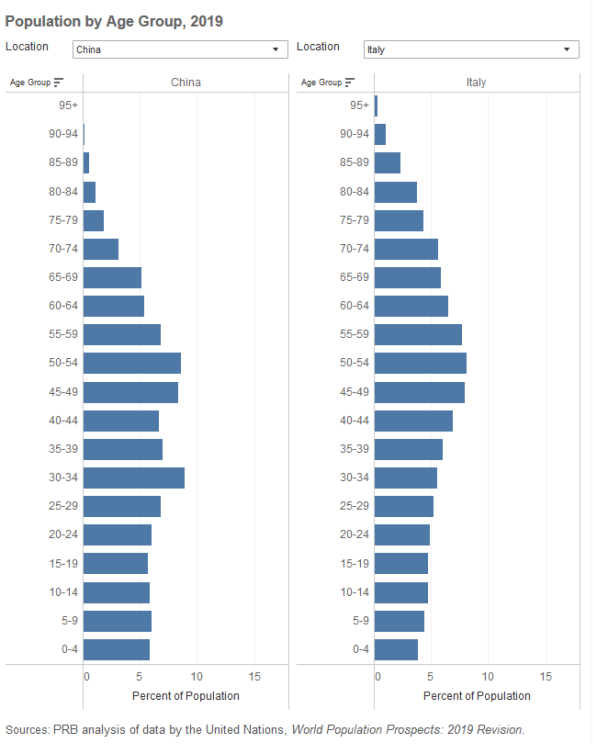

Figure 1. Comparison between China and Italy (produced by the editor)

Population Health Concerns: COVID-19 and Disabled Older Adults at/above Poverty in New York

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The emergence of COVID-19 (or the novel coronavirus) has altered economic, health, and social life across the world during the past month. While China and Italy had a high number of confirmed cases initially, the virus has spread quickly and has been categorized as a pandemic by the World Health Organization (WHO) since March 11, 2020 (see the announcement). As of March 25, the number of global cases approximated 453,000 with nearly 20,500 deaths. While the number of confirmed coronavirus cases was relatively low in the United States (U.S.), recent estimates suggest a large surge with over 61,000 confirmed cases and nearly 830 deaths as of March 25, 3PM EST (CDC and JHU).

The pandemic and ensuing crisis present a unique challenge to the U.S. and New York, in particular. For one, New York leads the nation with nearly 50% (or approximately 31,000 cases) of the total. With 285 deaths and zero recovered cases thus far, New York also has a high mortality estimate.

While on-going epidemiological assessments are needed to better understand mortality and recovery estimates, what remains of concern is the dire situation for those who are vulnerable due to old age, disability, and poverty status. Therefore, this short geographical analysis provides estimates of disabled older adults (i.e., at least 65 years of age) at/above poverty in New York by census tract. By examining the spatial distribution and local clustering, community public health professionals and social workers may be able to develop targeted outreach efforts to ensure these individuals receive medical care and food services. This is particularly important not only due to these older adults' disability and poverty status, but also given reduced transportation services, social distancing, and limited business hours of various establishments.

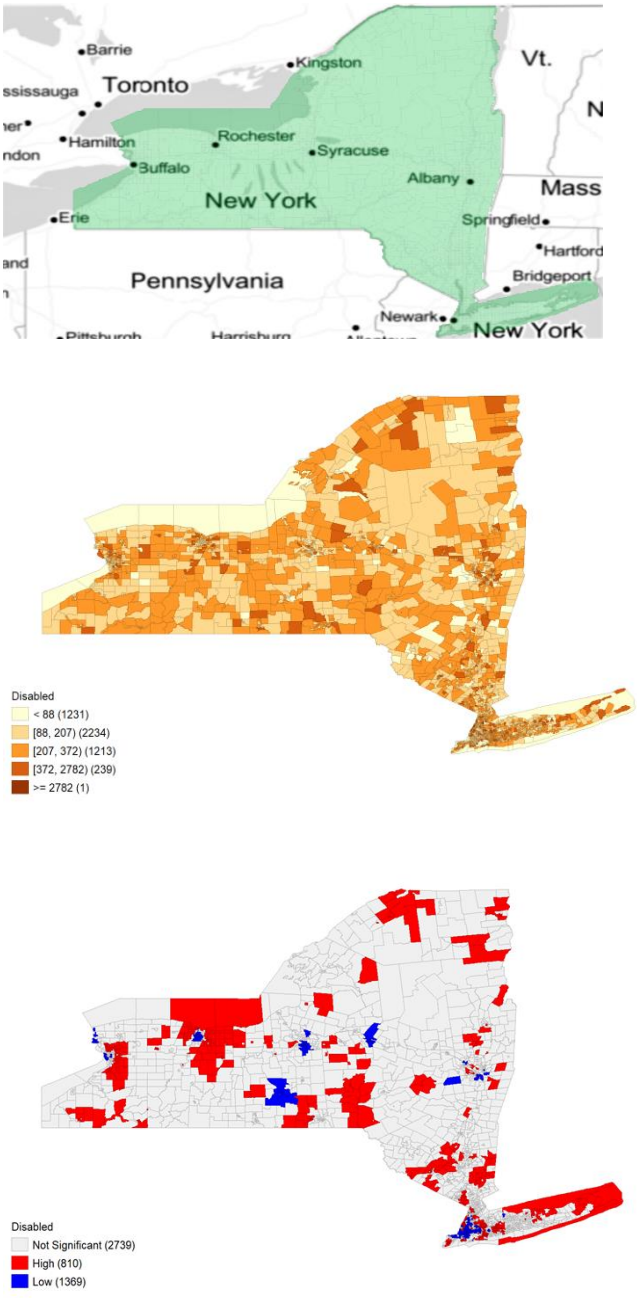

Figure 1: Study area (Map 1), Disabled older adults at/above poverty where darker shades represent areas with a higher count (Map 2) and a clustering map (Map 3).

The clustering map depicts areas of high/low concentration of disabled older adults at/above poverty where red represents high areas next to other high areas and blue represents low areas next to other low areas

The maps show census tract areas where disabled older adults at/above poverty reside. As can be seen, clustering largely occurs in the southeast (near New York City) and the northwest (Rochester). Local health officials, community health workers, and gerontology social workers can use these maps to target specific neighborhoods with outreach communication which informs poor and disabled older adults about food drives, medical necessity efforts (e.g., doctor visits, prescriptions, etc.), family outreach efforts, and other messages to help with social isolation.

The Association of Aging in New York, in coordination with the New York State Department of Health, can tailor the Home Delivered Meal program and the Expanded In Home Services for the Elderly Program (EISEP) to ensure disabled older adults receive proper health and social care during this period. Such a concerted effort may help alleviate the difficult living condition of those already enduring both disability and poverty.

Materials and Methods

Data from the 2013-2017 American Community Survey (ACS) and analysis performed using GeoDa.

References

Hyperlinks are embedded within the text.

The pandemic threatens aged rural regions most

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The COVID-19 pandemic (1) claims lives differently over age, with older people presenting higher death risks if infected by SARS-CoV-2 (2, 3). The new coronavirus therefore challenges particularly aged populations. Age structures play an important role on explaining differences in the spread of the disease and death tolls (4).

Europe, as the oldest region of the world, has large variations in the degree of ageing (5). A new preprint (6) explores differences in population age structures and its relationship with the potential impact of the COVID-19 pandemic in European subregions (7). Using age- and sex-specific case-fatality ratios of the disease, estimated based on the first 5017 deaths in Italy (8), as weights for the population age profiles, the proportion of population at risk of death due to COVID-19 was calculated.

In the figure below, regions are colored according to the deviation from the total European population estimate of the proportion at risk of death due to COVID-19. These estimates assume age-sex case-fatality ratios the same as in Italy for the 5017 first registered COVID-19 deaths (March 23, 2019) and two thirds of the total population infected. Such an estimate for the total European population is 2.2%. Please note, this estimate is very rough and unlikely to hold true by the end of the pandemic. However, the relative differences between regions would hold as long as the age-sex profiles of case-fatality ratios stays proportional. The map reflects the unequal population age structures rather than the precise figures on COVID-19 fatality.

The preprint acknowledges that careful interpretation of the assumptions and limitations is needed. Specially regarding the imperfect data on the unfolding pandemic. The estimated proportions of population at risk of death would only be useful in predicting the pandemic tolls if the age- and sex-specific profile of case-fatality ratios stays constant and the virus does infect 2/3 of the population (9) uniformly across all the subregions of Europe.

The regional differences in population age- and sex-structures keep relevance for the unfolding pandemic in Europe. The key result is that if conditions hold, the rural areas might be the next in being hit hard by COVID-19.

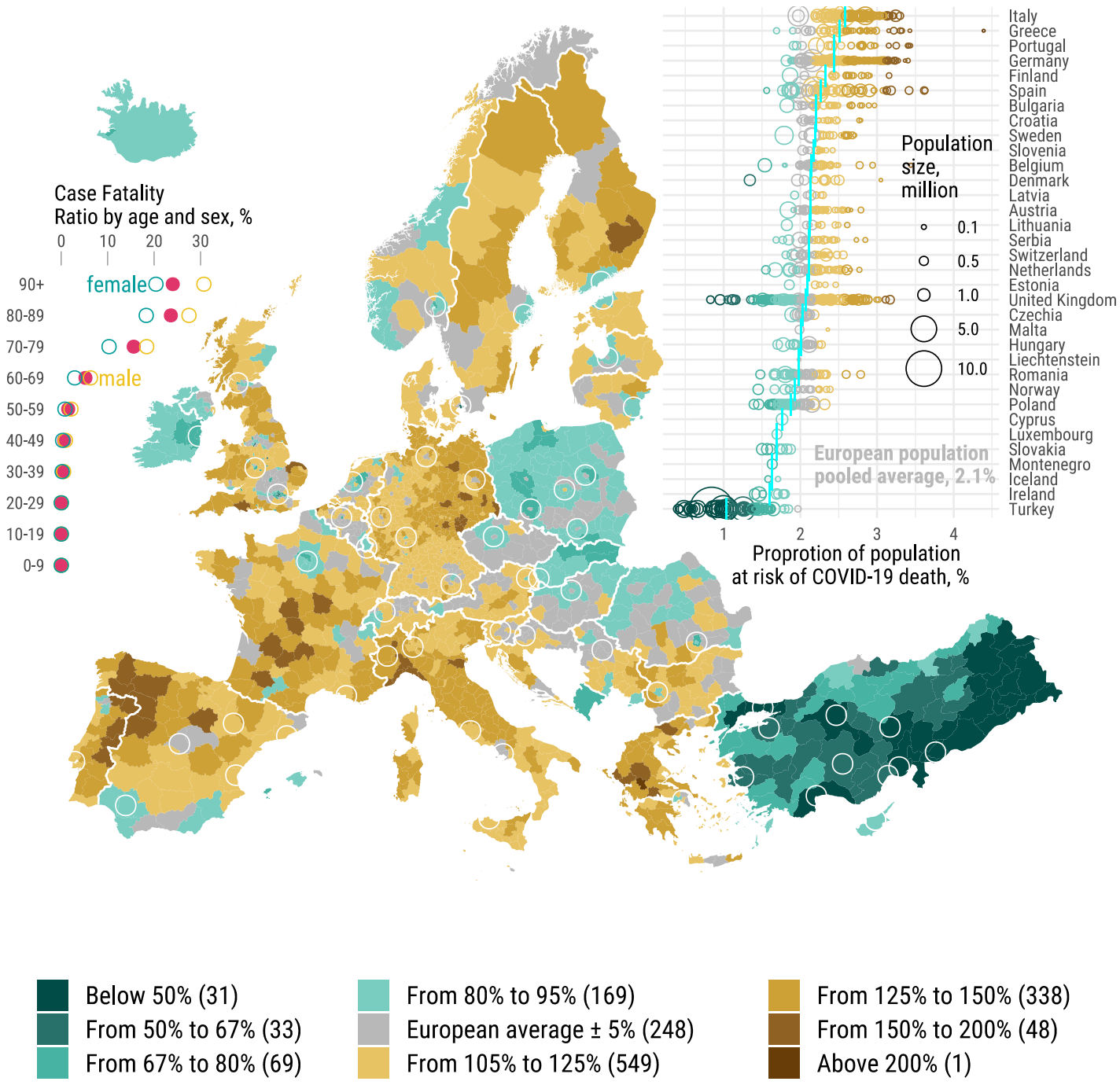

Figure 1. COVID-19 in unequally ageing European regions. The circles in the map correspond to the major cities and capitals of the countries. (Data: Eurostat, Instituto Superiore di Sanità)

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Short-Run Fertility Responses to Mortality Events: A look to the past

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COVID-19 has obviously impacted mortality in a significant way in many regions, and has the potential to have even larger impacts in the future. However, the ongoing pandemic may also impact fertility. Illness, quarantine, and death can all impact conception, pregnancy, and birth. This note presents an overview of selected literature on fertility responses to disease and mortality events, and governmental responses to them. These past cases are illustrative about how COVID-19 will alter births in the future.

Disasters and Births

Research has shown that high-mortality events such as famines, earthquakes, heatwaves, and diseases have predictable effects on reducing births nine months later. Figure 1 presents estimates from "death spike" events taken from a variety of sources.

Some are estimates developed in prior academic literature, including estimates from Herteliu et al (2018) for major French flu seasons and heat waves since 1945; from Richmond and Roehner (2018) for neutral countries and selected U.S. states during the 1918-1920 influenza pandemic, the 1889 French flu season, Finland's 1868 famine, and the 1923 Tokyo earthquake; and my own estimates of birth responses to three major hurricanes in the United States (Katrina, Maria, and Harvey), two major tornado events (Alabama and Joplin, both 2011), U.S. flu seasons 2003-2017, all Iceland winter mortality seasons 1854-1900, and a novel estimate of fertility responses to the 2014-2016 Ebola outbreak in Guinea, Liberia, and Sierra Leone.

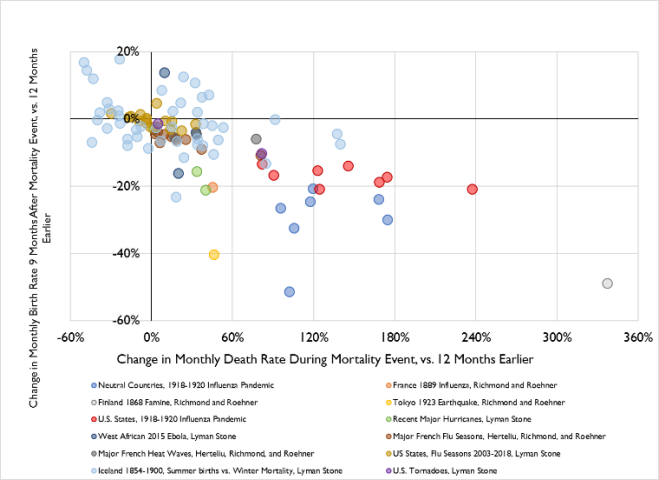

Figure 1. High-Mortality Events Are Followed By Lower Birth Rates Nine Months Later. Each point represents changes in the relevant birth and death rates associated with specific time-period corresponding to a given type of event.

Results show that there is an association between deaths and births. Large increases in deaths are associated with correspondingly large decreases in births about nine months later. This relationship appears to be approximately stable across different kinds of events, in different countries, and in very different time periods, and thus may help inform expectations about how births may respond to future high-mortality events.

However, large variance exists in these observed effects. Particularly as death spikes become very large, the association with births becomes more variable, perhaps because such very-large mortality events are simply rarer. Furthermore, the association between birth and death changes is not 1-to-1: a disease that kills 5% of the population is not usually associated with 5 times as large a birth decline as a disease that kills 1% of the population.

Births Recover Quickly

After these losses, fertility tends to rebound. Figure 2 presents the change in local birth rates in areas hit by various crises. The values shown reflect the deviation from some expected value; usually based on expected seasonality of births, but in the case of the Zika virus in Brazil, based on difference-in-difference estimates provided in Rangel et al (2019) for Recife. This sample of events is smaller than the sample in Figure 1 due to the greater amount of data required to produce these estimates but it also includes several events with comparatively low death tolls in the aggregate, such as the 2003 SARS outbreak in Hong Kong, and the Zika virus outbreak in Brazil.

As can be seen, starting around 10 or 11 months after a designated event, birth rates usually begin to recover.

Fertility rebounds of this kind have been widely documented in the literature surrounding the 1918-1920 influenza pandemic (Boburg-Fazlic et al 2017; Chandra and Yu (2015a, 2015b); Chandra et al 2018; Donaldson and Kenistan 2014; Mamelund 2004). They have also been documented in the wake of the 2004 Indian Ocean tsunami, and other natural disasters (Davis 2017; Nandi 2017; Nobles 2014). Likewise, the existential insecurity caused by the Cuban Missile Crisis and Oklahoma City bombings have been previously suggested to have caused brief fertility increases, and the 9/11 attacks may also have done so (Raschky 2017; Rodgers 2005; Ruther 2010).

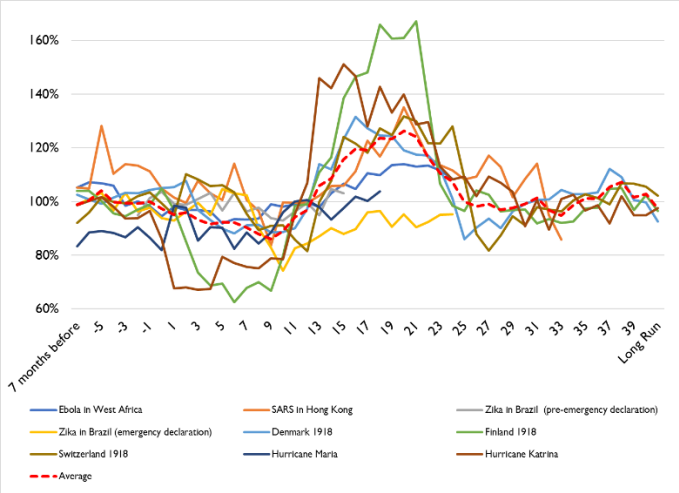

Figure 2. Selected Birth Rate Responses to Mortality or Epidemic Events (As a ratio of prior seasonal norm)

A separate line of research has explored disruptive events which did not necessarily lead to higher mortality or existential insecurity. While Udry (1970) found that the New York City 1965 blackouts did not cause a baby boom, Burlando (2014) finds that power outages in Zanzibar caused a significant baby boom 8-10 months later, while Fetzer et al (2016) finds that rolling power shortages in Colombia in 1992 led to higher births in the near term, and higher completed fertility as much as 12 years later. Evans et al (2007) find that, in the United States, low-level storm advisories do tend to lead to modest birth increases 9 months later, but that more severe storm warnings reduce births.

Thus, events which are disruptive to normal life but which do not impose high death tolls, appear to have mixed effects, but with most studies showing small increases in births. However, at this point, COVID death tolls in most developed countries are much higher than all but the most severe recent disasters, and still rising, even as economic dislocations are extremely large, thus the comparison to these low-mortality temporarily-disruptive events may not be very instructive.

Conclusion

Seven to ten months after an epidemic or other high-mortality events, birth rates appear to fall in almost every studied case. This decline is generally larger in events with unusually high death rates. However, in most studied cases, birth rates speedily recover, returning to normal within 24 months of the end of the studied mortality-increasing event.

While studies of low-mortality but high-disruption events like power outages have had inconsistent findings, none have identified declines in births in the immediate wake of the event. Thus, events which cause large numbers of actual deaths like epidemics or severe hurricanes, or events which lead to elevated expectations of death like the Cuban Missile Crisis, appear to be different from other kinds of disruptions.

However, these findings suggest that a “COVID baby boom” is unlikely to manifest, at least in the period 7-10 months after the epidemic. Lost births in that period would likely be shifted in considerable part to sometime in the summer of 2021, perhaps resulting in an even more pronounced “summer season” for births in the United States than is usually the case.

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