COVID-19 & ESG
PART 1: LIVES MATTER TO LIVELIHOODS

Pollution increases COVID-19 mortality, hence also economic fragility.

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COVID-19 & ESG, PART 1: LIVES MATTER TO LIVELIHOODS

Pollution Increases COVID-19 Mortality,

Hence Also Economic Fragility.

Bottom Line: Pollution can be used to rank the COVID-19 vulnerability of a population, and hence also the fragility of its economic recovery.

Economic forecasts and investment strategy are forthcoming in Part 3.

Introduction

The outlook for the global economy hinges on our collective recovery from the pandemic. In this report, we offer a bold new perspective -- a framework we hope will inform both investment allocation decisions of the private sector as well as policy decisions of the public sector.

We chose to use pollution because data collection is simpler and more accurate than health data. It is a better anchor.

1. Health related data is difficult to find, and when you do, it is not always comparable due to differences in data collection methods.
2. There are many undiagnosed conditions that would not show up in collected data.
3. There are double counting issues when looking at health conditions.

This report will focus on Latin America, but the framework can be applied broadly. Data for other regions is available upon request.

Figure 1: $PM_{2.5}$ Air Pollution, Vulnerability, and Comparative Morbidity Rates

$PM_{2.5}$ Air Pollution -- How bad is it? How do countries stack up globally? How does it feel?					
Country	2017 Level Population weighted mean annual exposure in micrograms/m^3	Pollution - Global Percentile Ranking 100 = most polluted	How much deadlier than the US experience?	How much deadlier than the Eurozone experience?	How much deadlier than the China experience?
Uruguay	9	7	15%	-26%	-347%
Panama	11	13	32%	-9%	-330%
Brazil	13	21	42%	1%	-320%
Argentina	13	22	47%	6%	-315%
Jamaica	13	23	48%	7%	-314%
Dom Rep	14	23	50%	10%	-312%
Ecuador	15	26	60%	19%	-302%
Colombia	17	31	73%	32%	-289%
Mexico	21	44	108%	67%	-254%
Chile	21	45	109%	68%	-253%
Bolivia	22	46	113%	72%	-249%
Guatemala	24	52	133%	92%	-229%
Peru	25	55	139%	98%	-223%
United States	7	4	--	-41%	-362%
Euro Area	13	20	41%	--	-321%
China	53	88	362%	321%	--

Source: World Bank Data, Global Burden of Disease Study 2017, Tourmaline Group

Thank you to our summer intern Tomer Tenengauzer for countless hours of collecting and parsing through data.

LIVES MATTER TO LIVELIHOODS

Pollution increases mortality rates… and hence dampens economic recoveries.

In the first of this three-part series we will explore the connection between the environment, COVID-19 and medium-term economic outlooks.

Part I was inspired by two studies.

The first establishes the link between medium term economic recoveries and pandemic related mortality.

It also outlines the direct impact that good governance can have on lowering mortality rates -- and hence improve medium-term economic outcomes.

The second establishes a direct relationship between air pollution and COVID-19 morbidity.

The higher the death rate, the harder it is for the economy to bounce back

No, that is not because there are less people.

A study titled "Pandemics Depress the Economy, Public Health Interventions Do Not: Evidence from the 1918 Flu" (Correa, Luck and Verner) finds that:

1. Areas with higher death rates have a harder time bouncing back economically.

2. No, the change in employment was not a result of less people being alive[1].

3. Good governance in the form of non-pharmaceutical interventions (NPI) – can lower the death rate.

The dots in Figure 3 below represent city-level data -- influenza mortality per 100,000 on the x-axis and the change in manufacturing employment around the time of the 1918 pandemic on the y-axis.

[1] See "Results" on page 28 of the study.

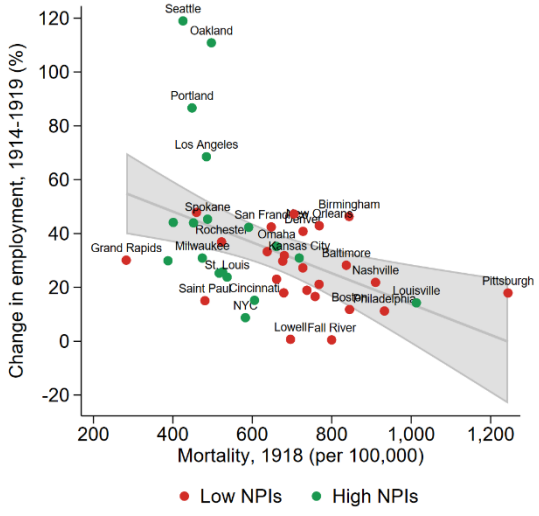
Note that the cities with the lower mortality rates tended to be the ones with better economic recoveries.

Good governance matters – a lot

The graph also illustrates the importance of good governance. The green colored dots represent cities that implemented high levels of NPIs, and the red colored dots represent cities that implement low or none.

Note that the cities with higher NPIs also have better economic outcomes.

Figure 2: The cities that bounced back strongly all had lower death rates



Source: (Correa, Luck and Verner)

- NPI's (social distancing, masks, etc.) flattened the curve. They reduced peak mortality by about 45%.
- Cities that intervened early and aggressively had a 20% reduction in cumulative excess mortality.
- High NPI are associated with better economic outcomes in the medium run.

Lockdowns are not the problem

The last takeaway from the paper is that business disruptions *during* the pandemic were similar for cities with NPIs and those without.

This is corroborated by another research paper (Andersen, Hansen and Johannesen) titled "Pandemic, Shut-down, and Consumer Spending: Lessons from Scandinavian policy responses to COVID-19.

The study compared consumer spending in Denmark and Sweden and found no difference. Denmark has implemented NPIs, while Sweden has not.

In addition, recent economic forecasts published by the Riksbank and the IMF also

corroborate the two studies discussed above. According to the Riksbank, the Swedish economy is forecast to contract between 6.9% in a good scenario to 9.7% in a bad scenario – or roughly -8.3%. That compares with a better expected level of -7.5% for the Euro Area, according to IMF forecasts as of April 2020.[2]

Is it possible to ascertain a country's baseline vulnerability level to COVID-19?

Maybe, but that is beyond the scope of these reports. Using a study from the Harvard School of Public Health, we suggest it is possible to rank countries' relative baseline vulnerability.

An increase in 1 microgram/cubic meter of air pollution increases COVID-19 mortality by 8%

A study from Harvard's T.H. Chan School of Public Health (Nethery, Dominici and Braun) found that air pollution is associated with a higher risk of COVID-19 related death. Specifically, *researchers found that an increase of 1 microgram per cubic meter of PM2.5 increases the COVID-19 death rate by 8%*. The results from the study have made headlines in the New York Times, the Financial Times, Washington Post, and many other outlets globally.

For those of us who do not deal with these types of figures on a regular basis, the proportion is proportional to one additional grain of salt in a space the size of an average New York City hotel room.

What is $PM_{2.5}$?

The Global Burden for Disease Study (GBD) of 2017 states: "population-weighted exposure to ambient $PM_{2.5}$ pollution is defined as the average level of exposure of a nation's population to concentrations of suspended particles measuring less than 2.5 microns in aerodynamic diameter, which are capable of penetrating deep into the respiratory tract and causing severe health damage." (Bauer)

The exposure levels found in

Figure 1 and Figure 2 are data taken from the GBD study. They were calculated using mean annual concentrations of $PM_{2.5}$ in both urban and rural areas.

[2] The IMF's forecast for 2020 GDP in Sweden is -6.8% https://www.imf.org/en/Countries/SWE

Is there a recommended level of safety for $PM_{2.5}$ pollution?

Yes, there is.

The World Health Organization (WHO) established 10 micrograms per cubic meter in mean annual exposure as the maximum.

PM2.5 pollution is broadly harmful to health, but especially harmful to the lungs and heart

The link between air pollution and COVID-19 becomes especially clear in the WHO's Air Quality report of 2005 where it states:

> *"The evidence on airborne particulate matter (PM) and its public health impact is consistent in showing adverse health effects at exposures that are currently experienced by urban populations in both developed and developing countries.*
>
> *The range of health effects is broad but are predominantly to the respiratory and cardiovascular systems."*

Pre-existing lung and heart conditions are known hazards to COVID-19 morbidity[3]. Thus, the study findings from Harvard should not come as a shock.

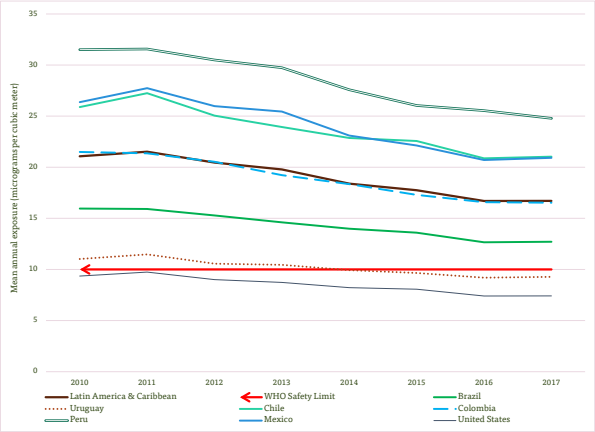
Pollution is trending downward, but not by enough

The chart in Figure 2 below shows the population weighted mean annual exposure to PM2.5 air pollution for a select group of Latin American countries, the US, as well as the average for the region. The red line with an arrow represents the WHO's safety limit on pollution levels.

The good news is that for the most part, pollution levels have been trending downward. The bad news is that these levels are still above the safety level.

[3] See chart in Appendix for graphic depiction

Figure 3: PM2.5 Air Pollution Levels vs. WHO Safety Limit



Source: World Bank, Global Disease Study 2017

How bad is bad?

Figure 1 on the front page of the report contains a table with the 2017 level of pollution[4], global percentile rankings, and the estimated difference in morbidity between LatAm countries and the US, Europe and China.

The percentile ranking of 2017 $PM_{2.5}$ pollution was calculated based on 241 countries and regions, where 100 represents the worst level possible.

The percentile average for the LatAm countries listed is 33rd percentile and 31st percentile for the whole region including the Caribbean. The worst country listed is Peru at 55th percentile – a bit worse than the global average, but the good news is it isn't anywhere near Chinese levels.

Why are the US and Europe listed as comps?

Our clientele lives primarily in Europe and the US, so we added a dimension of "feel" to the report.

While statistics here in the US and around the globe are incomplete and understated, we do have a sense of what is happening locally. A comparison to the familiar helps to anchor the framework amidst a world overwhelmed by constantly changing information.

What stood out for us is that while Latin America's population is more vulnerable, many governments have implemented NPIs more seriously than here in the US. This angle will be explored in Part 2 & 3.

The results in the comparative columns were calculated thus:

> *(LatAm PM2.5 level – [other country] PM2.5 level) * 0.8 = % difference in morbidity rate*

[4] Population weighted, $PM_{2.5}$

Why is China used as a comp?

We wanted to shine a light on how different the situation is China vs. the Western world.

1. The Chinese population is 3-4x more vulnerable to COVID-19 than any population in the West, due to high levels of pollution.

2. This may help explain the more stringent interventions in China.

3. The response in LatAm will have different needs than those in the US or Europe.

Pollution does not have to be the determining factor for economic outcomes, but it highlights the baseline level of burden to expect.

We cannot stress enough that pollution does not need to be the determining factor for COVID-19 mortality.

It is an indicator of the vulnerability of the population – and hence the fragility of the medium-term economic outlook.

In Part 2 and 3 of this series we will explore governance and social distancing behaviors. Economic forecasts will incorporate information from all three reports and are forthcoming in Part 3 of this three-part series.

Why a focus on an environmental problem? Why not a deep dive on health conditions?

An analysis of heath conditions is problematic for many reasons:

1. Diagnostics and data collection methodologies are not consistent across regions.

2. Availability and access to health care facilities are not comparable.

3. Differing portions of the population may go undiagnosed.

4. Even if all of the above was perfect, you still end up having to choose just one health condition due to overlap problems.

5. Pollution directly impacts two important pre-existing conditions for COVID-19 mortality.

Conclusion

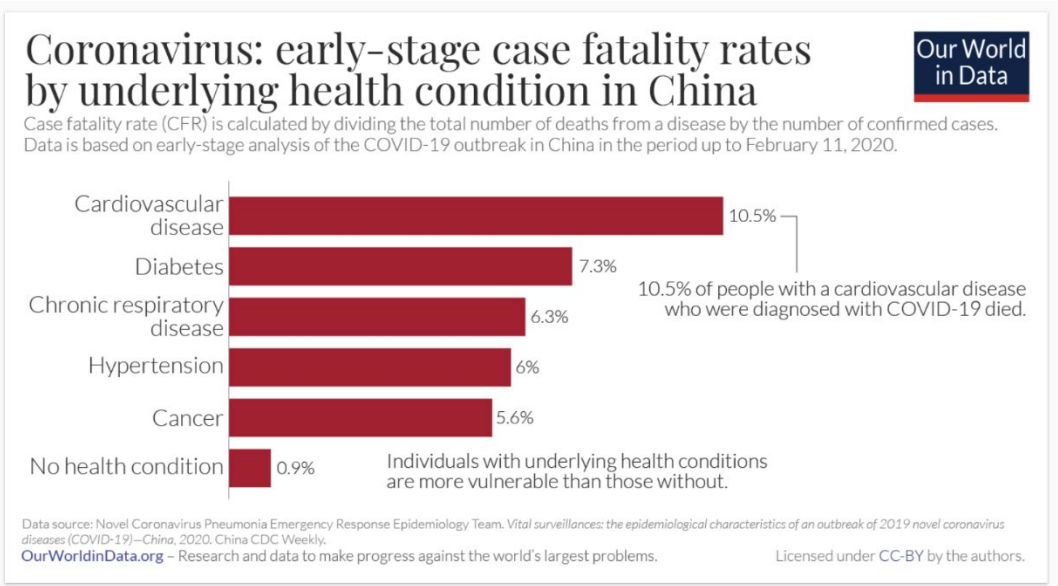
Recent research suggests that post-pandemic economic recoveries are a function of mortality and government response.

Pollution should be considered an indicator of mortality, and hence economic fragility.

Economic forecasts are forthcoming in Part 3 of this three-part series.

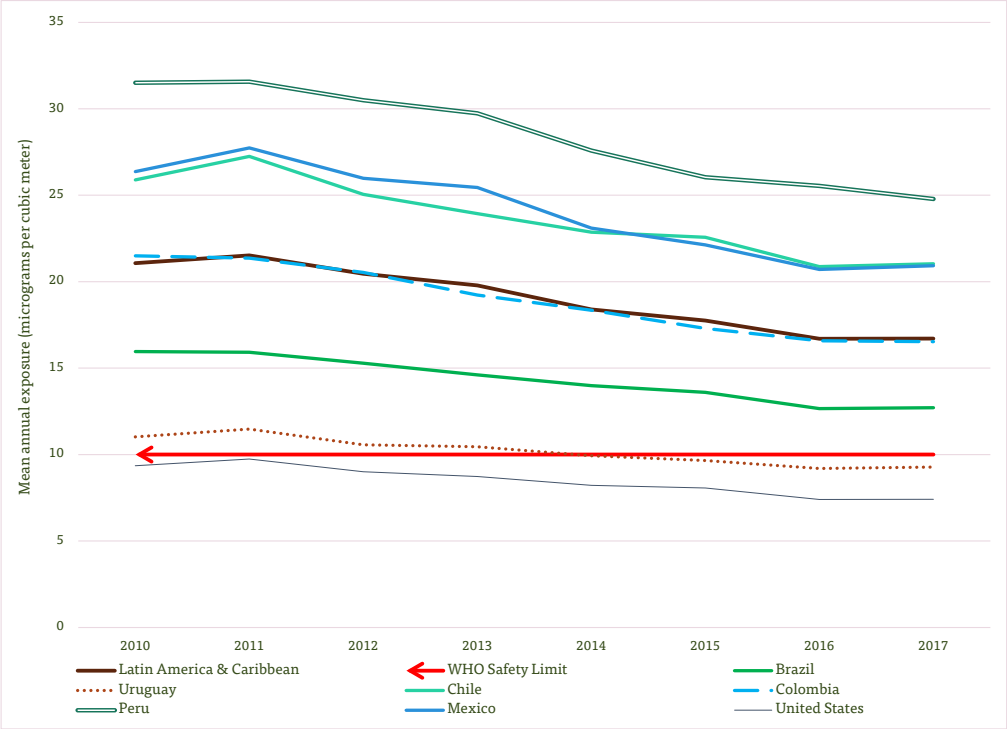
Appendix

Chart below was taken from Ourworldindata.org, referenced in Footnote 1.



Source: Ourworldindata.org

Enlarged picture of Figure 2: PM2.5 Air Pollution Levels vs. WHO Safety Limit



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