**Worldwide Environmental Health in Relationship to Mental Health from 1990-2017**

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**Problem Identification**

Problem Statement

Would prioritizing environmental health have the added advantage of improving global human health, with a particular focus on mental health, and decreasing substance use disorders?

Context

What upstream factors would have the most influence on prevention when considering mental illness and substance use disorders? Should greater emphasis be placed on allocating funds towards environmental health as part of health promotion and disease prevention? Do negative changes in environmental health over time predict increases in overall healthcare spending?

The impact of environmental factors and environmental health on human health is already recognized for both its ability to improve health (e.g. exposure to nature, green spaces, etc) and to harm health (e.g. air pollution, noise pollution, etc.). Recently, concerns over environmental health and climate change have been raised by younger generations in particular. Along with this, new terms like “eco-anxiety” (although not an official condition) have been used to describe the anxiety some patients experience when considering the present and future health of the planet.

Immediate physical surroundings may impact various mental health and substance use disorders, but perhaps the overall environmental health of a country is also associated with the health of its inhabitants.

It has previously been noted that mental illness prevalence is becoming a greater portion of total disease burden, although prevalence is not necessarily increasing significantly over time.[1] However, there are many challenges with using prevalence to assess mental illness, as the definition, diagnosis, and stigma around different mental health conditions may vary from country to country and may remain underreported for many areas. As such, data sources for this project use estimates of mental health prevalence rather than diagnosis data.

If there is an association between environmental health and mental health and substance use disorders, are specific conditions more associated with this than others? And, where the data is available, are there greater associations for a particular gender or age group?

Prior studies have, for example, looked at the impact of urban settings on human health but with most populations being in the USA, Brazil, or Europe.[2] This project attempts to look at as many countries as data is available for a more even representation.

Criteria for Success

This work will be considered successful if it can identify an association or lack of association between changes in the selected indicators of environmental health over time and the selected human health/disease outcomes.

Scope of Solution Space

The main focus will be on the relationship between various environmental health indicators and the prevalence, disability adjusted life years and deaths for mental health and substance use disorders in countries across the world from 1990 to 2017 (where data is available for this time period). Different age groups may be expected to be impacted differently by changes in environmental health and age and gender data will be used where available. Given the conditions of interest, persons under five years of age will be excluded wherever data is broken down by age group.

If an association is found, it may provide reason for prioritizing improvements in environmental *as part of* public health promotion and prevention rather than as a separate initiative. Given this context, another question of interest is whether changes in environmental health indicators are associated with changes in health expenditures over time.

Of secondary interest is the relationship or lack of relationship between disability adjusted life years for other health conditions or causes of death and environmental health indicators. Also of secondary interest is potential impact of environmental health on micronutrient status of populations.

Although there are numerous constraints to this project, it may help illuminate areas for further investigation through more rigorous data collection. It might also identify whether investigation of within country variation in environmental health in relationship to human health is merited.

Indicators of Environmental Health (as available)

- Outdoor air quality by country
    - Concentration of fine particulate matter PM2.5
- Indoor air quality by country
    - Proportion of population with primary reliance on clean fuels and technology for cooking (%)
- Water quality/clean water supply
    - Population using at least basic drinking-water services (%)
    - Proportion of population using safely managed drinking water services (%)
- Temperature change
- Soil quality - no data set identified (yet)
    - Soil nutrients
    - Soil carbon/carbon sequestration capacity
- Abnormal weather events
    - Tropical storm
    - Extra-tropical storm
    - Convective storm

    - Extreme temperature (cold wave, heat wave, severe winter conditions)
    - Wildfire
    - Drought
    - Flood
    - Famine

Indicators of Human Health (as available)

- Prevalence: Mental illness and substance use disorders (primary interest)
- Disability adjusted life years: Mental illness and substance use disorders (primary interest)
- Disability adjusted life years: Various causes (secondary interest)
- Deaths: Mental illness and substance use disorders (primary interest)
- Deaths: Various causes (secondary interest), including deaths related to environment/climate change
- Population micronutrient status (secondary interest)
- Micronutrient status (secondary interest, if data available)
- Health expenditures over time

Constraints

This project cannot account for additional variation within countries that would also be predicted to have an impact, such as noise, urban/rural settings (and percent of population living in an urban setting), and income inequalities. It is also unlikely complete data will be available for all countries or for all years.

Stakeholders

National public health policy makers.

**Data Sources: Mental Health Data 1990-2017**

This project uses the following works:

- Hannah Ritchie and Max Roser (2018) - "Opioids, cocaine, cannabis and illicit drugs". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/illicit-drug-use' [Online Resource]
- Saloni Dattani, Hannah Ritchie and Max Roser (2021) - "Mental Health". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/mental-health' [Online Resource]
- Hannah Ritchie and Max Roser (2018) - "Alcohol Consumption". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/alcohol-consumption' [Online Resource]
- Hannah Ritchie and Max Roser (2019) - "Drug Use". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/drug-use' [Online Resource]

Which are based on the following data sources:

Institute of Health Metrics and Evaluation (IHME), Global Burden of Disease (GBD)
Data: Deaths, DALYs and prevalence of mental health and substance use disorders, by age and sex
Geographical coverage: Global by country and region
Time span: from 1990 onwards
Available at: http://ghdx.healthdata.org/gbd-results-tool

World Health Organization (WHO) International Classification of Diseases (ICD)
World Health Organization. (1992). The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines (Vol. 1). World Health Organization.
Data: Definitions and classifications of mental and substance use disorders
Available at: ICD-10 Classification of Mental and Behavioural Disorders

World Health Organization (WHO) Global Health Observatory (GHO)
Data: Prevalence of substance use disorders, trends in alcohol consumption
Geographical coverage: Global by country
Time span: Variable depending on datasets. Most inconsistent years post-2000
Available at: http://www.who.int/gho/en/

Institute of Health Metrics & Evaluation (IHME), Global Burden of Disease (GBD)
Data: Deaths, DALYs and prevalence of substance use disorders, by age and sex
Geographical coverage: Global by country and region
Time span: since 1990
Available at: http://ghdx.healthdata.org/gbd-results-tool

World Health Organization (WHO) International Classification of Diseases (ICD)
World Health Organization. (1992). The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines (Vol. 1). World Health Organization.
Data: Definitions and classifications of mental and substance use disorders
Available at: ICD-10 Classification of Mental and Behavioural Disorders

World Health Organization (WHO) Global Health Observatory (GHO)
Data: Prevalence of substance use disorders, trends in alcohol consumption
Geographical coverage: Global by country
Time span: Variable depending on datasets. Most inconsistent years post-2000
Available at: http://www.who.int/gho/en/

**Data Sources: Micronutrient Status**
World Health Organization (WHO) Vitamin and Mineral Nutrition Information System (VMNIS)
Data: Micronutrient/Indicators - Anaemia, Calcium, Copper, Fluoride, Folate, Iodine, Iron, Magnesium, Riboflavin, Selenium, Thiamine, Vitamin A, Vitamin B12, Vitamin B6, Vitamin C, Vitamin D, Vitamin E, Zinc.
Time Period: 1990-2019 (availble for earlier years as well)

Available at:
https://www.who.int/teams/nutrition-and-food-safety/databases/vitamin-and-mineral-nutrition-information-system/data

**Data Sources: Environmental Health**
As a measure of outdoor air pollution:
World Health Organization (WHO) Global Health Observatory (GHO)
Data: Concentrations of fine particulate matter (PM2.5)
Geographical coverage: Global by country
Time span: 2010-2016
Available at:
https://www.who.int/data/gho/data/indicators/indicator-details/GHO/concentrations-of-fine-particulate-matter-(pm2-5)

As a measure of indoor air pollution:
World Health Organization (WHO) Global Health Observatory (GHO)
Data: Proportion of population with primary reliance on clean fuels and technology for cooking (%)
Geographical coverage: Global by country
Time span: 2000-2019
Available at: https://www.who.int/data/gho/data/themes/air-pollution/household-air-pollution

As a measure of water quality/clean water supply:
World Health Organization (WHO) Global Health Observatory (GHO)
Data: Population using at least basic drinking-water services (%)
Geographical coverage: Global by country
Time span: 2000-2020
Available at:
https://www.who.int/data/gho/data/indicators/indicator-details/GHO/population-using-at-least-basic-drinking-water-services-(-)

World Health Organization (WHO) Global Health Observatory (GHO)
Data: Proportion of population using safely managed drinking water services (%)
Geographical coverage: Global by country
Time span: 2000-2020
Available at:
https://www.who.int/data/gho/data/indicators/indicator-details/GHO/population-using-safely-managed-drinking-water-services-(-)

Temperature:
Data Hub
Data: Global Temperature Time Series
Time span: 1880-2016

Available at: https://datahub.io/core/global-temp#python

Soil Quality:
Fischer, G., F. Nachtergaele, S. Prieler, H.T. van Velthuizen, L. Verelst, D. Wiberg, 2008. *Global Agro-ecological Zones Assessment for Agriculture (GAEZ 2008)*. IIASA, Laxenburg, Austria and FAO, Rome, Italy.

Abnormal weather events:
EM-DAT: The International Disaster Database
Time span: 1999-2025
Available at: https://www.emdat.be/

**Health Expenditures Data Source**
World Health Organization (WHO) Global Health Expenditure Database
Data: Global Health Expenditure Database
Time span: 2000-2018
Available at: https://apps.who.int/nha/database/Select/Indicators/en

**References**


1. Ritchie, H. (2018) - "Global mental health: five key insights which emerge from the data". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/global-mental-health' [Online Resource]
2. Salgado, M. *et al.* Environmental determinants of population health in urban settings. A systematic review. *BMC Public Health* **20**, 1–11 (2020).