* More accurately aggregating gridded data into county boundaries, i.e. increasing resolution before calling contains point function or a mathematical approach
* Use hospital admissions and/or ED visits as the target variables rather than deaths, if accurate datasets for hospital records are found/created and not only limited to hospitals with emergency departments.[[1]](#footnote-1)
  + Underlying Cause of Death data is limited on the county level due to CDC WONDER’s data suppression constraints [[2]](#footnote-2) where monthly death counts that are below 10 for a single county is redacted, thus accounting for the need to estimate redacted values by comparing against state values, which are not redacted as long as the total value for the state is above 10 for the given month.
    - This is the reason for using death counts associated with chronic lower respiratory disease (J40-J47) instead of just asthma (J45). This is viable because chronic lower respiratory diseases, i.e. emphysema [[3]](#footnote-3), chronic bronchitis, tend to be caused be air quality factors rather than infectious agents. (citations needed)
  + Healthcare is more accessible in developed countries and may account for lower death rates, but this may not explain nonfatal asthma exacerbation rates.
  + Asthma emergency room visits (ERVs) have been used as a proxy for asthma exacerbation, though many cases of exacerbation may be self-treated with medication and may not manifest in an ERV.[[4]](#footnote-4)
  + Constructing datasets of the rate of ERV’s among asthmatics is difficult, especially on the global scale. Anenberg et al. [3] constructed a dataset of the rate of ERV’s among asthmatics around the world by conducting a literature review where they identified 16 studies surveying health care utilization rates among asthmatics in 54 countries and Hong Kong (...)

1. ftp://ftp.cdc.gov/pub/Health\_Statistics/NCHS/Dataset\_Documentation/NHAMCS/doc-ed18-508.pdf [↑](#footnote-ref-1)
2. [Underlying Cause of Death 1999-2019 (cdc.gov)](https://wonder.cdc.gov/wonder/help/ucd.html) [↑](#footnote-ref-2)
3. [Emphysema - Symptoms and causes - Mayo Clinic](https://www.mayoclinic.org/diseases-conditions/emphysema/symptoms-causes/syc-20355555) [↑](#footnote-ref-3)
4. [Estimates of the Global Burden of Ambient PM2.5, Ozone, and NO2 on Asthma Incidence and Emergency Room Visits | Environmental Health Perspectives | Vol. 126, No. 10 (nih.gov)](https://ehp.niehs.nih.gov/doi/10.1289/EHP3766) [↑](#footnote-ref-4)