

Seasonal Variation in Deaths Associated with Cystic Fibrosis

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The Northern New England Cystic Fibrosis Consortium



The NNECFC is a regional, voluntary consortium of more than 80 clinicians and researchers from the CF care centers in Maine, New Hampshire and Vermont.

The mission of the group is to improve CF care and patient outcomes.

Goals

- Examine seasonal variation in CF deaths
- Explore associations with air quality

Methods

- Dataset consisted of 30,126 patients from the US CFF Registry from 1990-2000. There were 4,309 deaths in this period.
- Air Quality Index (AQI) data from the US Environmental Protection Agency (EPA) were merged with Registry data.
- The AQI is used for measuring daily air quality for five major air pollutants – ozone, particulates, CO, SO₂, NO₂
- 3842 (89.1%) of the deaths occurred among patients at CF centers near EPA air monitoring stations.
- Centers were stratified by the mean annual number of days with an AQI over 100, a pollution level unhealthy for sensitive groups.

Air Quality at EPA Sites Across the US



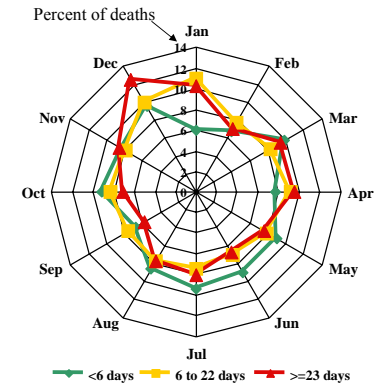
Number of days at unhealthy levels

● <6 days ● 6 to 22 days ● ≥23 days

Results

- If there was no seasonal effect, the proportion of deaths would be directly related to the number of days in the month (approx. 8.3%).
- The largest number of deaths (n=738) were seen during the two months of December and January, 20.6% more than would have been expected. The Edwards test was significant ($\chi^2_{(2 \text{ d.f.})} = 21.3, p < 0.0001$).
- This seasonal mortality effect was strongest where the number of AQI days over 100 was highest (≥ 23 days per year), with 36.7% more deaths than expected ($\chi^2_{(2 \text{ d.f.})} = 18.5, p = 0.0001$).
- Seasonal variation in mortality does not reach statistical significance in areas with fewer than 6 AQI days over 100.

Seasonal Variation in Mortality by Annual AQI Days > 100



Conclusions

- There is evidence of seasonal variation in deaths associated with Cystic Fibrosis, with a strong early winter peak.
- Seasonal variation in CF mortality is exacerbated in areas with the largest number of AQI days over 100.
- Understanding which of the five pollutants of the AQI is most detrimental to Cystic Fibrosis patients is important future work.
- Further study of the etiology of seasonal variation in environmental conditions is also needed.