

DR. CHAVA PERETZ ON AIR QUALITY TRENDS

The Ministry of the Environment publishes monthly and annual summaries of air pollution in different regions of the country. Why is a statistical study of air pollution trends necessary?

We are bombarded with large amounts of data all the time and with lots of numbers. What we need is a simple summary of these numbers and the ability to draw sensible conclusions. Statistical analysis allows us to do just this: to present large amounts of data in a simpler form and to infer trends. Mathematical models are used to neutralize different factors which may affect the results so that we can arrive at a more accurate picture of air quality trends. This allows us to ascertain whether efforts to reduce air pollution are fruitful.

Which statistical methods did you use to determine air pollution trends in recent years?

The seven monitoring stations of the Ministry of the Environment in the Tel Aviv region were our data sources. We then used two statistical methods: descriptive statistics and inferential statistics. In the first, we described pollution trends, based on time series, by means of summary measurements, means, medians and 95 percentiles. We used box plots to check extreme values from a statistical point of view as well as annual trends and prepared smoothed graphs to show the daily trends of each pollutant in a time series.

The second method was inferential statistics which is based on models of linear regression in which we checked the effect of the year, adjusted for day, month, temperature and relative humidity. We wanted to find out whether there was a difference between the years studied and whether there was a yearly linear effect, and if so, how it was manifested and whether the rate of decrease between



Dr. Chava Peretz, an environmental health and air pollution biostatistician in Tel Aviv and Haifa Universities, investigated air pollution trends from 1999-2004 on behalf of the Ministry of the Environment. The study, completed in December 2005, looks at air quality trends in the Tel Aviv metropolitan area for eight major air pollutants and assesses trends on the basis of statistical models.



Hadera power plant. Photo: Ilan Malester

1999 and 2004 was uniform. We also checked the correlation between pollution levels in the different stations.

What were the major conclusions of the study?

We found that there was a significant trend of reduction in nitrogen oxides, sulfur dioxide, and carbon monoxide levels but an increase in ozone in relation to base year 1999. As for particulates, we did not find a clear trend of increase or decrease for PM10 but we did find a slight increase for PM2.5, considered to be the most hazardous of air pollutants to human health.

In checking the relationship between NO, NO₂ and NO_x, a high correlation was found between NO₂ and NO and NO_x, as expected. A medium correlation was found between PM10 and PM2.5. A weak correlation was found between particulate levels and other pollutants. SO₂ was weakly correlated with CO and NO_x. CO was highly correlated with NO_x. There was no correlation between O₃ and SO₂, NO_x and CO.

As one concerned about the environment and as a resident, what do you think should be done in light of the results?

This study indicates that the most problematic pollutants are PM2.5 and PM10. Steps should be accelerated to bring about a decrease in these pollutants. Once intervention is implemented, a statistical assessment should be undertaken once again.

I should also mention that at about the same time that the study was

published, a seminar on air pollution in Tel Aviv took place. During the course of the seminar, on December 19, 2005, the heads of local authorities in the Tel Aviv metropolitan area signed a covenant on the reduction of air pollution in their region. These and other initiatives are certainly positive developments.