International Journal of Global Science Research **ISSN: 2348-8344 (Online)**
Vol. 5, Issue. 2, October 2018, pp. 846-853 **DOI: 10.26540/ijgsr.v5.i2.2018.110**
***Available Online* at www.ijgsr.com**

Research Paper

Contribution of vehicular traffic towards the particulate emission and its effects on human health

Parvaiz Ahmad Rather* and Ashwani Wanganeo
Department of Environmental Sciences Barkatullah University, Bhopal, Madhya Pradesh, India
*Corresponding author E-mail: uzairsultan88@gmail.com

Received: 16/09/2018
Revised: 28/10/2018
Accepted: 30/10/2018

Abstract: Particulate matter is small and medium solid and liquid particles which are present in the atmosphere. Vehicular traffic is one of the main contributors of particulate pollution in urban areas. The concentration of vehicular particulate pollution in atmosphere depends upon traffic intensity, time of the day, type of vehicles plying on roads and meteorology. The increase in particulate matter at alarming rate in Bhopal is a topic of measure concern. Congested roads, road side constructions and burning of fuel wood are contributing at high rates to the particulate matter. Both RSPM and SPM have risen to very high levels. Present study reveals that particulate matter during most of the months crossed the safe limits as per CPCB (2009). Current study was carried out at a busy crossing in old congested area of Bhopal township where there is close proximity of residential area besides heavy traffic load. People have been found to suffer from coughing, sneezing, phlegm, wheezing, breathlessness, irritation in eyes, heart problems, hypertension, skin allergy, head ache and nausea.
Keywords: atmosphere, traffic, pollution

INTRODUCTION

Pollution means the presence of undesirable substances in any segment of environment, primarily due to human activity such as discharging by-products, waste products or harmful secondary products, which are harmful to man and other organisms. Clean air is considered to be a basic requirement for human health and wellbeing. Airborne particulate matter (PM) has been a concern for at least the last century, initially as a nuisance dust and more recently as the effects resulting in acute mortality and morbidity (McClellan et al., 1998). Vehicular traffic on the haul road of mechanized opencast mines has been identified as the most prolific source of fugitive dust emitted from the surface coal mines (Cowherd, 1979).

The effects of exposure to air pollution are different among different groups of

International Journal of Global Science Research **ISSN: 2348-8344 (Online)**
Vol. 5, Issue. 2, October 2018, pp. 846-853 **DOI: 10.26540/ijgsr.v5.i2.2018.110**
***Available Online* at www.ijgsr.com**

individuals. In fact, there is considerable evidence showing that children are particular vulnerable to air pollution, due to their developmental, physiological and behavioral characteristics (WHO, 2002). Exposure to ambient air pollution has been linked to a number of different health outcomes, starting from modest transient changes in the respiratory tract and impaired pulmonary function, continuing to restricted activity/reduced performance, emergency room visits and hospital admissions and to mortality. There is also increasing evidence for adverse effects of air pollution not only on the respiratory system, but also on the cardiovascular system (WHO, 2004). Specifically, scientific studies have shown that there have been alterations in the air pollution mixture, which is now characterized by high concentrations of nitrogen oxides and photochemical oxidants, with motor vehicles emerging as the most important air pollution source (Brunekreefand Holgate 2002; Katsouyanni, 2003). A great deal of attention has focused on particulate matter (PM) pollution due to their severe health effects, especially fine particles. Several epidemiological studies have indicated a strong association between elevated concentrations of inhalable particles and increases mortality and morbidity (Samet*et al*., 2000; Kasydouyanni*et al*., 2001). Air pollution has emerged in the past few decades as the most crucial problem to the mankind. However, the magnitude of air pollution effects varies across cities and countries (Reddy and Ruj, 2003; Lin and Lee, 2004; Molina and Molina 2004; Namedo and Bell, 2005; Cachier*et al*., 2005). AnLitis, *et al*., 2006. Gaseous pollutants have major negative impacts on health. They also play an important role in environmental changes and changes in atmospheric chemistry. Concern about air pollution in urban region has received increasing importance worldwide, especially pollution by gaseous and particulate matter (Aalam, *et al*., 2008). SO_2 and NO_2 form acids through different chemical reactions in the atmosphere and these acids are subsequently deposited on land and ocean surfaces as acid rain. Numerous studies and the lack of effective policies reveal that air pollution continues to threaten public health (Medina *et al*., 2009). The condition of the population's health depends on social - economical circumstance, sanitary and epidemiological situation, preventive public health measures and the critical factors increasing the population's morbidity and influencing its physical level of development, possibility of reproduction, liability to morbidity and life duration seems to be the high level of air pollution on the atmosphere. Currently, in India air pollution is widespread in urban areas were vehicles are the major contributors and in a few other areas with a high concentration of industries and thermal power plants (Majumdar*et al*., 2010).

Physical damage functions relating health (mortality and morbidity) to air pollution levels have been estimated over a number of years in different countries. Although the net effect of pollutants on health is unclear, the Committee of the Medical Effects of Air Pollution (COMEAP), set up by the UK government has found the strongest link between health and pollution to be for particulates (PM_{10}), Sulphur dioxide (SO_2) and ozone (O_3) (Powe Neil., *et al*, 2002). TSPM is associated with aesthetic and environmental impacts such as soiling of materials or smothering of vegetation (Air Quality Monitoring Network, 2008).It may pose the greatest threat to human health because, for the same mass, they absorb more toxic and carcinogenic compounds than larger particles and penetrate more easily deep into the lungs (Alias *et al*, 2007).

International Journal of Global Science Research
Vol. 5, Issue. 2, October 2018, pp. 846-853
Available Online at www.ijgsr.com

ISSN: 2348-8344 (Online)
DOI: 10.26540/ijgsr.v5.i2.2018.110

The increases in particulate matter have been shown to cause small, reversible decrements in lung function in normal asymptomatic children, and in both adults and children who have some form of pre-existing respiratory condition, particularly asthma. These changes were often accompanied, especially in adults, by increases in symptoms such as chronic bronchitis or cough (National Ambient Air Quality Objectives For Particulate matter, 1998). RSPM may pose the greatest threat to human health because, for the same mass, they absorb more toxic and carcinogenic compounds than larger particles and penetrate more easily deep into the lungs (Alias *et al*, 2007).

MATERIALS AND METHODS

Ambient air quality was monitored by using high volume Respirable Dust Sampler (Envirotech instrument APM 460NL) from May 2016 to April 2017 at Charbati Choraha in Bhopal for priority parameters total suspended particulate matter (TSPM), Respirable suspended particulate matter (RSPM), and non Respirable particulate matter (SPM). The particulate matter (RSPM) collected on glass microfiber filter was determined by weighing the filter before and after exposure to ambient air. SPM was determined from the initial and final weights of dust cup vial (cyclone cup). TSPM was determined from the sum of RSPMand SPM.

STUDY AREA

With the fast expansion of Bhopal City in almost all directions, air quality in residential area due to overcrowding and ongoing development etc. has deteriorated to a greater extent. Therefore with the increasing population, traffic density and the construction processes, the air quality need to be monitored regularly for the better living standards. So we selected Charbati Choraha to check how much concentration of pollutants like RSPM, NRSPM and TSPM is in the air and to what extent it effects the human population.

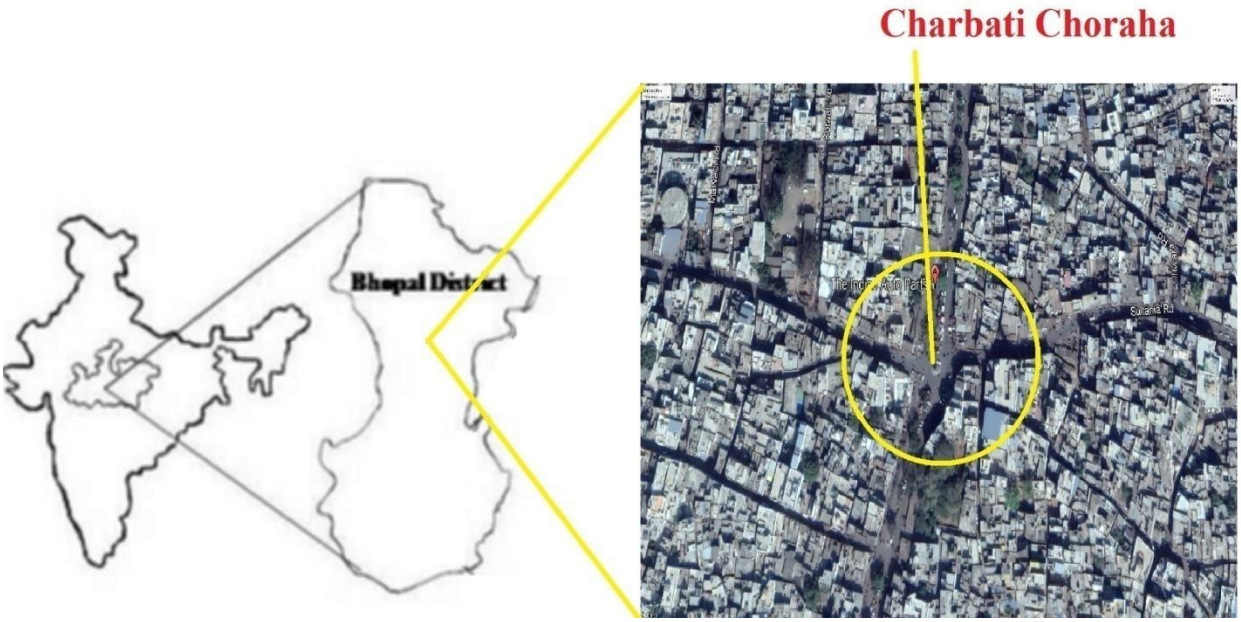

Figure 1: Location of sampling station.

International Journal of Global Science Research **ISSN: 2348-8344 (Online)**
Vol. 5, Issue. 2, October 2018, pp. 846-853 **DOI: 10.26540/ijgsr.v5.i2.2018.110**
***Available Online* at www.ijgsr.com**

RESULTS AND DISCUSSION

Air pollution is a problem of growing importance; public interest seems to have risen faster than the level of pollution in recent years. In present study we report an investigation of the effects of air pollution on human health. Exposure to traffic related air pollution is known to contribute to adverse respiratory and cardiovascular outcomes. The concentration of $PM_{2.5}$, PM_{10} and TSPM recorded during present study are given in Table-1.

Present study was carried out to investigate the impact of air pollution on human health. Study was carried from May 2016 to Feb 2017. During the present study high concentration of particulate matter was recorded at Charbati Choraha. Both NRSPM and SPM crossed the standard limits given by CPCB during the maximum of months. RSPM showed the highest concentration of $289_{\mu g/m^3}$during the month of December and lowest concentration of $109_{\mu g/m^3}$ during the month of August (Table-1, Fig-2). The unmanaged expansion of market, lack of parking areas and frequent traffic jams in the market area and combustion of fuels in the hotels and restaurants are the main factors for fairly high levels of particulate matter (Joshi & Chan2000). Vehicular emissions are the dominant source of RSPM along the roadsides (Kukkonam et al 2001). Particulate matter also crossed the permissible standard limits given by CPCB, during the present study SPM showed highest concentration of $289_{\mu g/m^3}$during the month of June and lowest concentration of $132_{\mu g/m^3}$was recorded during the month of August(Table-1, Fig-3). Vehicular pollution is the dominant source of particulate pollution along roadsides (Kukkonam et al 2001). During the present study lowest concentration of TSPM $241_{\mu g/m^3}$was recorded during the month of August while as highest concentration $500_{\mu g/m^3}$was recorded during the month of December (Table-1, Fig-4). There is mounting evidence that ambient levels of air pollution have adverse effects on human health. Numerous studies have cited direct relation op particulate pollution with both mortality and morbidity. There is extensive evidence that ambient air pollution effects human health (Brunekreef & Holgate 2002, Kunzli*et.al*. 2000, Pope e*t. al*., 2002). Current study revealed that Air pollution is directly proportional to morbidity in humans. A number of diseases were found in all age groups of humans at the study area. Almost all age groups were found effected. The most dominant diseases found in all age groups were respiratory diseases (Zeidberg*et al*., 1967). Found respiratory diseases mortality with higher level of air pollution. Reduced lung function was also found in some people. Respiratory diseases and decline in lung function studies in number of cities have shown increase in mortality rates are positively related to high PM_{10} levels. (Bates 1992). The common diseases found on account of PM in present study were respiratory diseases viz., Cough, Sneezing, Phlegm, and Wheezing in chest, Shortness of Breath and Lung trouble. Other diseases found in human were irritation in eyes, Headaches and Skin allergy. PM may pose the greatest threat to human health because, for the same mass, they absorb more toxic and carcinogenic compounds than larger particles and penetrate more easily deep into the lungs (Alias *et al*, 2007).

International Journal of Global Science Research
Vol. 5, Issue. 2, October 2018, pp. 846-853
Available Online at www.ijgsr.com

ISSN: 2348-8344 (Online)
DOI: 10.26540/ijgsr.v5.i2.2018.110

Table 1: Monthly Variations in various parameters of air quality at sampling station during May-2016 to February 2017.

MONTH	RSPM$_{\mu g/m^3}$	SPM$_{\mu g/m^3}$	TSPM $_{\mu g/m^3}$
	2016-17	2016-17	2016-17
17 MAY 2016	252	197	449
14 JUNE 2016	267	289	434
19 JULY 2016	229	149	378
16 AUGUST 2016	109	132	241
20 SEPTEMBER 2016	123	203	323
18 OCTOMBER 2016	109	196	305
15 NOVEMBER 2016	272	201	473
20 DECEMBER 2016	289	211	500
17 JANUARY 2017	252	223	475
15 FEBUARY 2017	211	172	383

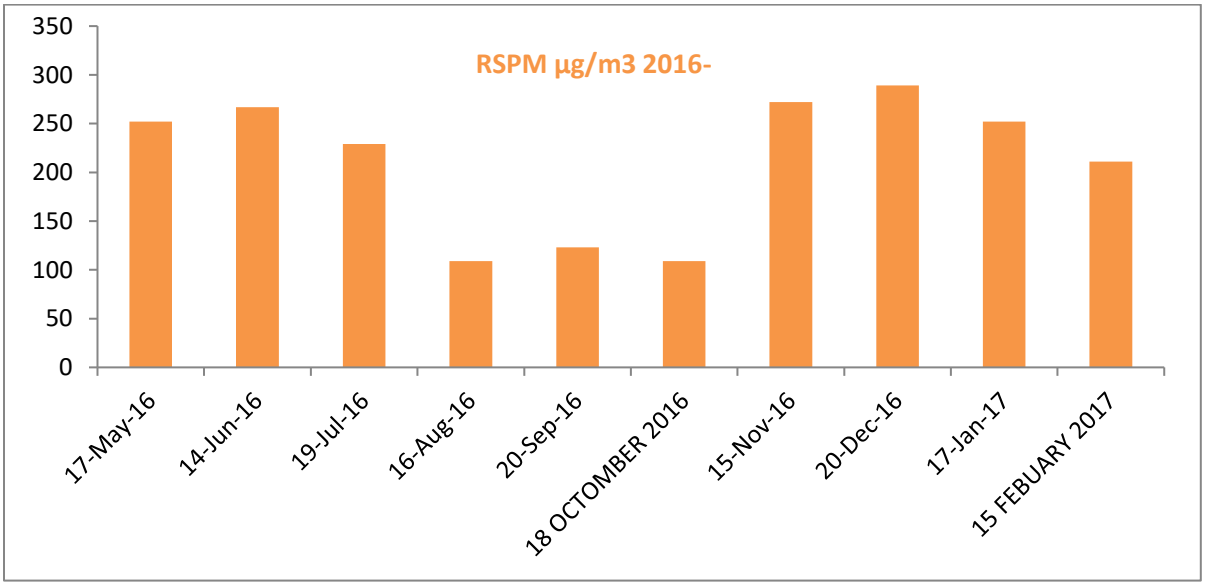

Figure: 2 Monthly variations in RSPM at Charbati Choraha.

International Journal of Global Science Research
Vol. 5, Issue. 2, October 2018, pp. 846-853
Available Online at www.ijgsr.com

ISSN: 2348-8344 (Online)
DOI: 10.26540/ijgsr.v5.i2.2018.110

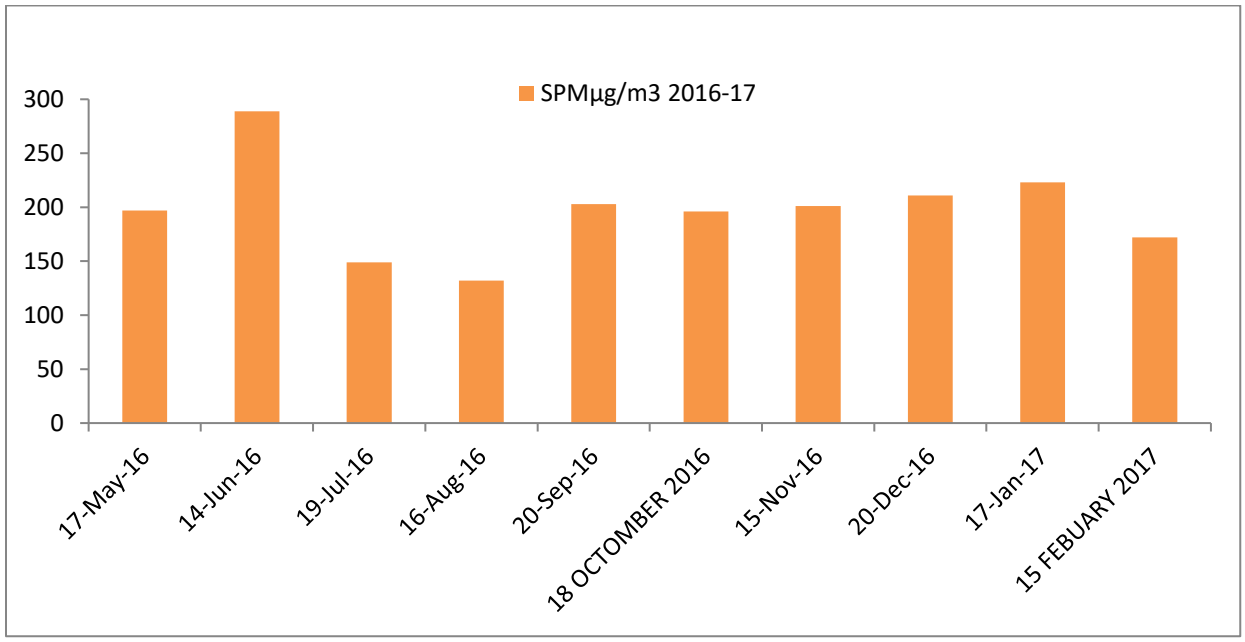

Figure: 3 Monthly variations in SPM at Charbati Choraha.

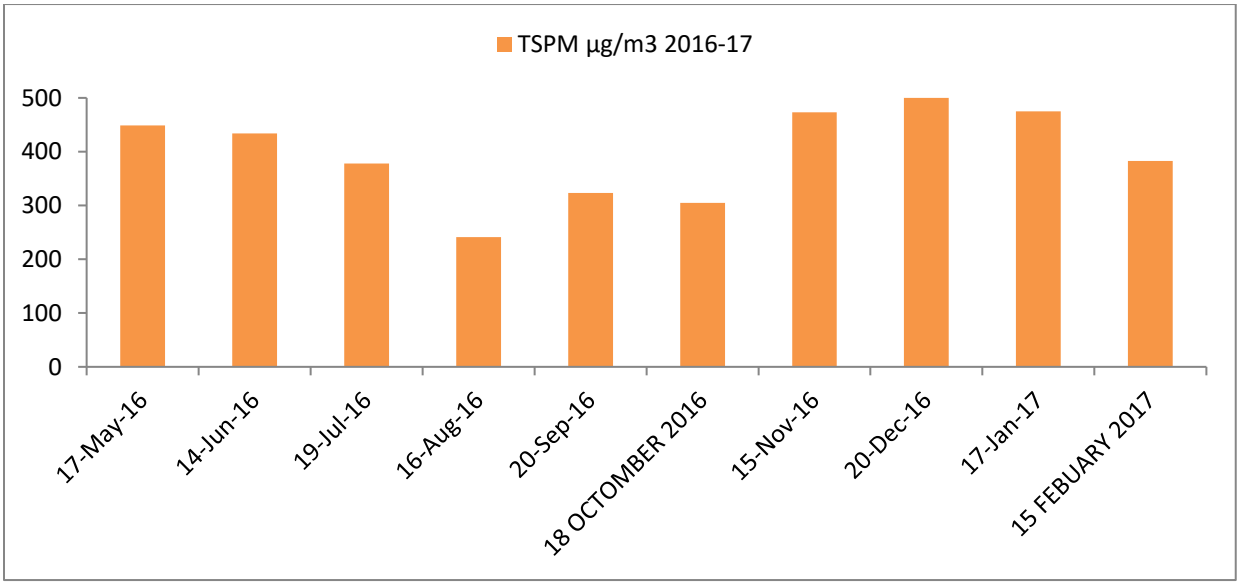

Figure: 4 Monthly variations in TSPM at Charbati Choraha.

Conclusion: During the present study it was found that both RSPM and SPM crossed the standard limits during all the months. The motor vehicles emit significant amount of particulate matter besides blowing up the dust present on the roadside. Due to higher density of both RSPM and SPM people were found to suffer from Coughing, sneezing, phlegm, wheezing, breathlessness, and irritation in eyes which ultimately leads to hypertension and head ache.

AKNOWLADGEMENT

Authors are thankful to DBT-Builder Programme, Department of Biotechnology (DBT), Ministry of Science and

Technology, New Delhi, India for financial support under Grant Number: BT/PR4479/INF/22/175/2012.

REFRENCES

McClellan R. O. and Miller F. J. (1998) Critical Issues in Placing Particulate Matter Risks into Perspective. In: Vostal JJ, editor. Health Effects of Particulate Matter in Ambient Air, Prague.

Cowherd (1979) Cowherd C. Measurements of fugitive dust emission from haul roads, Report No. EPA-600/7–79–182. Research Triangle Park, NC: USEPA Industrial Environmental Research Lab, 1979.

W.H.O (2002) Outdoor air pollution is to accessing the environment burden of decrease at national and local levels. World health organisation protection of the environment Geneva.

Brunekreef B. and Holgate S. T. (2002) Air pollution and health.Lancet 360-1233.Bates, D. (1992). Health indices of the adverse effects of air pollution: the question of coherence. Environ. Res. 59, 336-449.

Katsouyanni K., (2003) Ambient air pollution and health. Br. Med. Bull. 68-143.

Samet J. M., Dominici F., Curriero F. C., Coursacand I., Zeger S. L. (2000) Fine particulate air pollution andmortality in 20 US cities, 1987–1994.N. Engl. J. Med. 343, 1742–1749.

Reddy G. S. and Biswajit R. (2003).Ambient air quality status in Raniganj-Asansol area, India. Environ. Monit. Assess. 89(2), 153–163.

Lin J. and Lee L. C. (2004) Characterization of the concentration and distribution of urban submicron PM10 aerosol particles. Atmos. Environ. 38, 469–475.

Molina M. J. and Molina L. T. (2004) Megacities and atmospheric pollution.J.Air.Waste. Manage. Assoc.54:644–680.

Namdeo A. and M. C. Bell, (2005) Characteristics and health implications of fine and coarse particulates at roadside, urban background and rural sites in UK.Environ. Int. 31, 565–573.

Cachier H., Aulagnier F., Sarda R., Gautier F., Masclet P. and Besombes J. L. (2005) Aerosol studies during the ESCOMPTE experiment: 108. Air. Qual. Atmos. Health.1, 101–109.

Medina S., Tertre A. L. and Saklad M. (2009) The Apheis project: Air Pollution and Health—A European Information System. Air Qual Atmos. Health. 2, 185–198.

Majumdar D. A., Chakrabarty S. and Ray S. (2010) Assessment of vehicular pollution in Kolkata, India, using CALINE 4 model. Environmental Monitoring andAssessment.170:33–43.

Alias M., Zaini H. and Kenn L. S. (2007) PM_{10} and Total Suspended Particulates (TSP) Measurements in various power stations. *The Malaysian Journal of Analytical Sciences.*11 (1), 255-261.

Kukkonen J., Bozó L. Palmgren F. and Sokhi R. S. (2001) Particulate matter in urban air. National Environmental Research Institute, Frederiksborgvej 399, DK-4000 Roskilde, P.O.Box 358, Denmark

ISSN: 2348-8344 (Online)
DOI: 10.26540/ijgsr.v5.i2.2018.110

Analitis A., Katsouyanni K. Dimakopoulou K. Samoli E. Nikoloulopoulos A. K. and Petasakis Y. (2006) Short term effects of ambient particles on cardiovascular and respiratory mortality. Epidemiology.17, 230–233.

Bates D. (1992) Health indices of the adverse effects of air pollution: the question of coherence. Environ. Res. 59, 336-449.