105. Air pollution

P1031

Lung cancer risk of solid fuel smoke: A systematic review and meta-analysis

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Background: About 70% of people from economically less developed countries are exposed regularly to solid fuel smoke. The International Agency for Research on Cancer has classified smoke from in-home burning of coal as a Group 1 carcinogen and that from biomass as Group 2A. The aim of this systematic review was to quantify the impact of solid fuel on lung cancer and explore reasons for heterogeneity in the reported effect sizes.
Methods: A systematic review was carried out of primary studies reporting the relationship between solid fuel use and lung cancer. The review was based on pre-defined criteria and studies that dealt with confounding factors were used in the meta-analysis. Sub-group analyses considered fuel types, smoking, country, cancer cell type and gender. Publication bias and heterogeneity were also estimated.
Results: The pooled effect size for coal smoke as a lung carcinogen (OR=1.82, 95% CI 1.60 to 2.06) was greater than that from biomass smoke (OR=1.50, 95% CI 1.17 to 1.94). The risk of lung cancer for combined fuel was greater in women (OR=1.81, 95% CI 1.54 to 2.12) compared to men (OR=1.16, 95% CI 0.79 to 1.69). The pooled effect size were 2.33 (95% CI=1.72, 3.17) for adeno-carcinoma, 3.58 (1.58, 8.12) for squamous cell carcinoma, and 1.57 (1.38, 1.80) for tumours of unspecified cell type.
Conclusion: These findings suggest that burning of both coal and biomass is consistently associated with an increased risk of lung cancer. The review defined inadequate assessment of smoking in many studies (excluded from this review) and makes recommendations for factors which must be included in future studies in this area.

P1032

Impact of air pollution control measures and weather conditions on asthma during the 2008 summer olympic games in Beijing

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The alternative transportation strategy implemented during the 2008 Summer Olympic Games in Beijing provided an opportunity to study the impact of the control measures and weather conditions on air quality and asthma morbidity.
Methods: An ecological study compared the 41 days of the Olympic Games (8 August–17 September 2008) to a baseline period (1–30 June). Also, in order to emphasize the impact of weather conditions on air quality, a pollution linking meteorological index (Plam) was introduced to represent the air pollution meteorological condition.
Results: Our study showed that the average number of outpatient visits for asthma was 12.5 per day at baseline and 7.3 per day during the Olympics–a 41.6% overall decrease. Compared with the baseline, the Games were associated with a significant reduction in asthma visits (RR 0.58, 95%CI: 0.52–0.65). At 16.5 visits per day, asthma visits were also significantly higher, during the pre-Olympic period (RR 1.32, 95%CI: 1.15–1.52). The study also showed that the RR of asthma events on a given day, as well as the average daily peak ozone concentration during the preceding 48–72 h, increased at cumulative ozone concentrations of 70 to 100 ppb and 100 ppb or more compared with ozone concentrations ofless than 70 ppb ($P<0.05$).
Comments: We concluded that along with "good" weather conditions, efforts to reduce traffic congestion in Beijing during the Olympic Games were associated with a prolonged reduction in air pollution and significantly lower rates of adult asthma events. These data provide support for efforts to reduce air pollution and improve health via reductions in motor vehicle traffic.

P1033

Indoor PM2.5 levels in homes using different types of cooking fuels in a rural Indian population and it's association with COPD

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50% of world's population uses biomass fuel (BMF) for cooking and heating purposes, an important risk factor for COPD.
Aim: To measure indoor particulate matter diameter $<2.5\mu m$ (PM2.5) levels in homes that use different types of cooking fuels in a rural population, and to study its association with COPD.
Methodology: 287 homes using different types of cooking fuels (Liquefied Petroleum Gas (LPG): 91, BMF: 101, LPG+BMF- MIX: 95) were randomly selected from 22 villages. All male and female individuals above the age of 25yrs residing in these homes were invited to participate. After obtaining written consent, indoor PM2.5 levels were measured using "AirMetircs" low volume sampler over 24hrs and expressed as $\mu g/m^3$. All subjects performed pre and post bronchodilator spirometory. COPD was defined as post-bronchodilator FEV1/FVC <70%, and small airways obstruction (SAO) as FEF25-75% <65% predicted.
Results: 429 subjects (mean age 45±15 years; M: 217 and F: 212) consented to participate and 266 performed acceptable spirometry. Prevalences of COPD and SAO were 4.9% and 24.4%, and 100% and 92% respectively, were never smokers. 24hr mean levels of PM2.5 were significantly higher in homes that used BMF verses LPG [median (IQR): BMF 256.3 $\mu g/m^3$ (145-414) verses LPG 109.7 $\mu g/m^3$ (85-172); $p < 0.0001$]. Use of BMF was strongly associated with SAO [OR: 2.39 p=0.02] and was also associated with COPD (OR: 3.28), although this did not reach statistical significance (CI: 0.8-14.23).
Conclusion: In Indian villages, homes that use BMF have significantly higher indoor PM2.5 levels and this is strongly associated with increased prevalence of COPD and small airways obstruction.

P1034

Effects of air pollution from biomass burning in nasal mucociliary clearance of Brazilian sugarcane cutters

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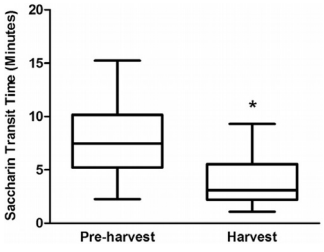
Nasal mucociliary (NM) system is the first line of defense of the upper airways and it is responsible for the clearance of inhaled particles, including particulate matter (PM) from biomass burning. Several epidemiological studies have demonstrated a consistent association between levels of air pollution from biomass burning and increase in hospitalization for respiratory diseases and mortality. About 44,3% of the sugarcane is burned to facilitate the manual harvesting every year and the most exposed people are the sugarcane cutters. Nevertheless no previous reports studied respiratory effects of PM from biomass burning in these individuals. This study evaluated the effects of exposure to PM from biomass burning on NM transport after harvest. Twenty-five non-smokers (mean age = 25,7±4,5 years; BMI 23,9±2,6 kg/m^2) workers in a Sugar and Ethanol Company located in Martinopolis, state of Sao Paulo, Brazil, in April/2010, were evaluated in two periods: pre-harvest season and three months after harvest. Mucociliary clearance by saccharin transit time test (STT) and nasal symptoms were assessed. STT was 7,9±3,4 min at pre-harvest and decreased significantly after harvest 3,9±2,2 min, p<0.001).



Nasal symptoms did not change following exposure. Our results suggest that acute exposure to particulate matter from sugarcane burned affects mucociliary clearance in non-smokers workers in the absence of symptoms.

P1035

The investigation of the relationship between respiratory exposures and the occurrence of the disease in patients with COPD

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We aimed to investigate the relationship with COPD and respiratory exposures.
711 patients admitted to our hospital with a diagnosis of COPD between May 2009-June 2010 were included. For the control group, 246 volunteer patients admitted to in-patient and out-patient clinics with any diagnosis other than COPD were included. Questionnaire including the questions according to socio-demographic characteristics, environmental and occupational exposures, patterns of tobacco use and passive-tobacco-smoke exposure of the patients was filled with face-to-face interview method.
The mean age was 62.7±10.8 for COPD and 64.9±10.9 for the control group (p>0.05). The average monthly-income-levels and educational-status of the patients for COPD group was significantly lower than the control group (p=0.015, p=0.002,respectively). In COPD group the number of people dealing with farming were greater than the people in the control group (p<0.001).Tandoor and fireplace were more commonly used by women with COPD (p=0.034 and p=0.002, respectively). Smoking rates in both groups were similar. However, duration of smoking and the amount of cigarette-consumption in COPD group was higher than the control (p=0.018, p<0.001, respectively). In childhood-period, exposure to passive smoke and life-long-exposure-time in COPD group were statistically higher than the control (both, p<0.001).
For the development of COPD, except smoking, biomass-fuels and environmental exposures including passive exposure to tobacco smoke, environmental and occupational exposure to pollutants are also important risk factors, and prevention of exposure to these pollutants impede the development of COPD significantly.

P1036

Prenatal environmental tobacco smoke exposure and children's respiratory health

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Background: Exposure to environmental tobacco smoke (ETS) is associated with respiratory symptoms.
Prenatal ETS exposure is associated with impaired lung function and wheezing illnesses, particularly in preschool children. Although negative impact of prenatal ETS exposure on children is evident, ETS impact on respiratory system of infants is still poorly explored.
Purpose: To assess the possible effects of ETS exposure in utero on lower respiratory disease in children from infants up to seven years of age.
Methods: We evaluated the health impact of ETS in 117 infants born from asthmatic mothers. We also analyzed the onset of wheeze & asthma by the age of 7 with regard to the impact of ETS.
Results: The prevalence of wheeze during the first year of life was 4.7 times higher in infants who were prenatally exposed to ETS (OR-4.69 [CI:1.63-13.52]) compared to children without ETS exposure. However, no differences in allergic asthma prevalence by 7 years of age were found between the patient groups.
Conclusions: The research results provide strong evidence linking prenatal ETS to impairments in infants' respiratory system.

P1037

Inhaled black carbon in the lower airways of London cyclists

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Background: Inhalable elemental black carbon (BC) from fossil fuel combustion impairs lung health. We recently developed a novel method for assessing internal dose of BC using the amount of BC phagocytosed by airway macrophages (AM). To date, the determinants of AM carbon in healthy individuals living in urban areas remain unclear. Personal external monitoring indirectly suggests that cyclists have high levels of BC exposure.
Aim: To compare AM carbon in healthy adult cycling (cyclist) and non-cycling (pedestrian) London commuters.
Methods: AM carbon was assessed in non-smoking urban commuters aged 18 to 40 yr. AM were sampled using sputum induction, imaged under light microscopy (x60) and the area of carbon in 50 random AM determined using image analysis (mean AM carbon, μg/m^2).
Results: Cyclists and pedestrians had similar lung function and home-main road distance. Cyclists reported more weekly exercise but this difference did not reach significance (Table 1).

Table 1. Demographics and baseline data

	Cyclists (mean, ±SEM)	Pedestrians (mean, ±SEM)	P (t test)
n	5	5	N/A
Age (yr)	31.0±2.4	24.8±2.4	NS
Baseline FEV1 (% predicted)	99.2±4.0	95.2±3.2	NS
Distance of home from main road (km)	0.16±0.0	0.18±0.0	NS
Reported exercise (hr/week)	4.4±1.5	1.6±1.2	NS

Cyclists had significantly more AM carbon than pedestrians (Chart 1).

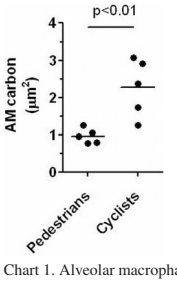

Chart 1. Alveolar macrophage carbon in cyclists vs pedestrians.

Conclusion: Cycling in London is associated with a higher internal dose of BC. These data suggest a need for low-pollution cycling routes.

P1038

Association between traffic-related air pollution exposure and risk of obstruction

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Background: Air pollution is associated with a number of respiratory diseases, but there is still a relatively small evidence between traffic-related (T-R) air pollutants concentration and a risk of obstruction among people living close to busy roads in East-Central Europe.
Material: In 2 studies taken in 2005-2006 (Warsaw, Poland) and 2008-2009 (Gliwice, Poland) there were analyzed 1506 and 2000 persons respectively (inhabitants of urban and rural areas). Pulmonary function tests were completed (using Easy One spirometer) and occurrence of common respiratory system diseases symptoms, allergies, smoking habit, etc. were proved. Simultaneously traffic density and air pollutants concentration were measured. Association between place of living and

air pollutants exposure and lung obstruction was explored by logistic regression analysis.
Results: In both studies T-R air pollutants concentrations were statistically significant higher ($p<0,05$) in the vicinity of road in comparison to the rural areas. The significant association between living close to a busy road and risk of obstruction was found. In the Warsaw study risk was 4,35 times higher (95%CI: 2,57-7,35) among non-smoking inhabitants of the city comparing with rural area residents. The second study resulted in similar observations – the risk was 3,16 times higher (95%CI: 1,09-9,16). Amid smokers the difference in risk of obstruction between urban and rural areas residents was insignificant.
Conclusion: Presumably high T-R air pollutants concentration in the proximity of main roads is one of the significant reason of airways flow limitation. Therefore the risk of obstruction highly depends on place of living, particularly among non-smoking people.

P1039
Effect of daily pollution exposure in the autonomic system in traffic workers of Sao Paulo
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Background: Heart rate variability is used to quantify autonomic response and to detect cardiovascular diseases. Chronic pollution exposure is known to increase arterial pressure and the incidence of cardiac ischemia leading to cardiovascular diseases and death; however the effect of variation of daily pollution in chronically exposed subjects remains poorly known.
Objective: To study the effect of acute pollution exposition in the autonomic system at rest and exercise in traffic workers.
Methods: Twenty-one male subjects were studied in 4 randomized working days (once a week) with distinct pollution exposure. The amount of pollution (ozone (O3) and nitrogen dioxide (NO2)) was measured 24 hours before the day test by a pollution analyzer. Activity of autonomic system response was measured during 5 minutes either at rest or during treadmill exercise (moderate intensity).
Results: The levels of exposure pollution were considered intermediate and ranged from 133.9 $\mu g/m^3$ to 317.2$\mu g/m^3$ and 0.1$\mu g/m^3$ and 26.3 $\mu g/m^3$ (respectively, of NO2 and O3). In the days with higher levels of pollution, it was observed a reduction in the activity parasympathetic system (RMSSD) at rest ($p<0.05$). In addition, it was observed a linear correlation between the levels of pollution and a reduction in the RMSSD measure at rest ($r=0.52$; $p=0.01$). Interesting, during exercise, the parasympathetic response was increased in the most polluted days ($p<0.05$).
Conclusion: Our results suggest that even low changes in daily pollution exposure selectively modify the autonomic system to either rest of exercise.
Supported by CNPq.

P1040
Non-malignant abnormalities by chest radiography and high-resolution computed tomography in millers and miners with different levels of asbestos exposure
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The diagnostic performance of high-resolution computed tomography (HRCT) and conventional chest radiography (CXR) has not been compared on a large sample of subjects with widely-different degrees of cumulative exposure to asbestos, i.e., with ample differences in pre-test likelihood of disease. We evaluated 1427 ex-workers in chrysotile millers and mines who were separated into 4 groups (Gr) of decreasing cumulative exposure (Groups I to IV). The prevalence of either parenchymal or pleural abnormalities were markedly reduced as exposure decreased ($p<0.01$). Assuming HRCT as the criterion method, CXR was associated with increased false-positive and false-negative rates for parenchymal and pleural abnormalities, respectively. These findings were consistent across the groups of asbestos exposure (table).

	Exposure Period			
	Gr I (1940–1966) (N=124)	Gr II (1967–1976) (N=604)	Gr III (1977–1980) (N=482)	Gr IV (after 1980) (N=217)
Parenchymal				
CXR (N, %)	17 (13.7)	44 (7.3)	23 (4.8)	5 (2.3)
HRCT (N, %)	12 (9.7)	26 (4.3)	8 (1.6)	–
Pleural				
CXR (N,%)	14 (11.3)	7 (1.2)	4 (0.8)	3 (1.4)
HRCT (N,%)	60 (48.4)	53 (8.8)	14 (2.9)	4 (1.8)[#]

[#]Two of these subjects had previous exposition before 1980 in the cement-asbestos industry.

We conclude that decreased exposure to asbestos led to a marked reduction in the prevalence of chest abnormalities according to either CXR or HRCT. CX, however, was associated with unacceptable rates of false-positive for asbestose and false-negative for pleural plaques, independent of cumulative exposure.
Supported by: CNPq/Ministry of Science and Technology, FUNAPE (GO) and Brazilian Crysotile Institute.

P1041
Acute respiratory effects in atopic humans exposed to short-term controlled exposure to diluted wood smoke
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Growing evidence suggests that particulate air pollution derived from wood stoves causes acute inflammation in the respiratory system and possibly increases the incidence of asthma and other respiratory diseases.
The aim of this study was to evaluate acute respiratory effects from short-term wood smoke exposure in humans. A total of 20 non-smoking atopic subjects with normal lung function and without bronchial responsiveness completed the study. The subjects were monitored during three different experimental exposure sessions, aiming at particle concentrations of 200$\mu g/m^3$, 400$\mu g/m^3$, and clean air as control exposure. A balanced cross-over design was applied and the subjects were randomly allocated to exposure orders.
Diluted wood smoke were generated in a wood-burning facility and added to a full-scale climate chamber exposure lasted for 3 hours under controlled environmental conditions. Respiratory effects were evaluated at baseline and follow-up measurements during exposure in relation to changes in lung function and were assessed in relation to changes in airway inflammation status measures by fractional exhaled nitric oxide (FE_{NO}), exhaled breath condensate (EBC) and nasal lavage (NAL), samples.
No statistically significant differences between the three exposures were found for any of the lung function outcomes: FEV1 ($p=0.6283$); and FVC ($p=0.8364$), or for $feNO_{50}$ ($p=0.3578$). Mild signs of airway inflammation were found in few of the analyzed markers of inflammation in the NAL and EBC samples. In conclusion, short term exposure with wood smoke causes only mild inflammatory response.

P1042
Biodiesel usage in Austria: Improving or deteriorating respiratory health?
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We estimated respiratory health outcomes for two scenarios for the fraction of biodiesel used in road vehicles: B10 a blend of 10% bio- and standard diesel; B100 biodiesel only.
Data of the composition of vehicle exhausts, vehicle frequency and exhaust volumes were entered into a dispersion model to obtain estimates for the change in particulate matter (PM10, PM2.5) and nitrogen dioxide (NO2) for Vienna and the surrounding region (Lower Austria). From established exposure-response-relationships the health impacts (respiratory mortality and hospital admissions) of the scenarios were expressed as a difference to the reference scenario (year 2007). Impacts of B10 were very small. For B100 fine particles would decrease by 4 (countryside) to 8% (city of Vienna) while NO2 would increase by 11% in Vienna. Based on effect estimates for chronic exposure the reduction of PM2.5 would lead to 53 less cardiorespiratory annual deaths. Effect estimates based on time series studies resulted in smaller numbers: Reduction of ambient PM10 levels were estimated to result in 8 less annual respiratory hospital admissions. Concerning respiratory mortality the increase of NO2 could result in additional 20 premature deaths per year, while the beneficial effect of the reduction in particles only would lead to a reduction of one case per year.
If health impacts of these air pollutants were independent, the increase in NO2 would strongly outweigh the reduction of PM2.5. However, dose-response relationships of PM and NO2 are not independent and NO2 is indicating traffic related exposures as is PM2.5. Therefore the adverse impact might be less pronounced than indicated by the net difference.

P1043
Relation between fractional exhaled NO and lung function and exposure to ambient particulate matter from contrasting sources
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Epidemiological studies demonstrated the adverse health effects of ambient particu-

late matter (PM) but it is not clear which specific characteristics (size, components) or sources of PM are responsible for the observed effects.
The aim of RAPTES project is to establish which specific characteristics of ambient PM are responsible for health effects associated with PM. To address this we combined exposure of volunteers with real-world exposure conditions at sites with high contrast and low correlation between PM characteristics.
30 young, healthy volunteers were exposed multiple times at different sites in Netherlands: two traffic sites, underground train station, farm and an urban background site. Exposure of volunteers and air pollution characterization took place on 30 days and included PM_{10}, $PM_{2.5}$, particle number concentration (PNC; ultrafines) and total oxidative potential of PM among the measurements. Volunteers were exposed for 5 hours and FE_{NO} (marker of airway inflammation), FEV_1 and FVC were measured at different timepoints.
Exposure to PNC was associated with volunteers' FE_{NO} - immediately and 2 hours after exposure we observed an 11.6% increase over baseline, and 7.4% increase the next morning. PNC was also associated with an about 1% decrease in FEV_1 and FVC at almost all measured timepoints.
PM_{10}, $PM_{2.5}$ and total oxidative potential were not associated with changes in FE_{NO} or lung function parameters.
An increase in FE_{NO} and decrease in lung function were observed in young, healthy volunteers after five-hour exposure to ambient air pollution, specifically associated with high concentrations of ultrafines and not with other major PM characteristics.

P1044
Short-term effect of ozone in a panel study of asthmatics
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Introduction: Particulate matter, exhaust and ozone concentrations in ambient air have been associated with respiratory effects, and asthmatics are especially sensitive.
Aims: Our objective was to study short-term effects of particles (PM10), vehicle exhaust (NO2) and ozone in relation to lung function among adults with asthma residing in the two major Swedish cities Stockholm and Gothenburg.
Methods: 27 study subjects (17 females) with asthma recruited from the GA2LEN survey (aged 25-72 years) used a daily diary over a 10 week period (winter-spring) and recorded peak expiratory flow (PEF), forced expiratory volume in the first second (FEV1). We collected urban background concentrations of PM10, NO2 and ozone in the city centre, and adjusted for participant (intercept), time trend, day of week, temperature and humidity in the regression analysis. We evaluated the effect of the same day concentrations, and lagged one and two days, respectively.
Results: Negative effects on FEV1 of ozone lag 0, lag 1, lag 2 and lag 0-2 were seen in both cities, some significant. In Stockholm there was also a significant negative effect of ozone on PEF. No significant effects were seen for PM10 or NO2 in Stockholm or Gothenburg.
Discussion: We found the most consistent negative effects on lung function of ozone. Fluctuations in daily mean concentrations of PM10 and NO2 may be less well represented by a central monitoring station.

P1045
The effects of whole life arsenic exposure via drinking water on airway hyperresponsiveness in C57BL/6 mice
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Background: Arsenic exposure via drinking water is a significant global environmental health issue. Epidemiological data suggest a relationship between arsenic exposure and the development of obstructive lung disease.
Aims: We aimed to determine if whole life arsenic exposure via drinking water impairs lung function and results in airway hyperresponsiveness.
Methods: Pregnant C57BL/6 mice were exposed to drinking water containing 0 (control) or 100μg/L arsenic from gestational day 8 to parturition. After birth, offspring were exposed to arsenic (or control) in breastmilk/drinking water until adulthood (8 weeks of age). At this time lung mechanics and responsiveness to methacholine were assessed using the forced oscillation technique.
Results: Arsenic exposed mice had significantly higher baseline airway resistance (R_{aw}: arsenic 0.47±0.15 cm $H_2O.s.mL^{-1}$; control 0.35±0.09 cm $H_2O.s.mL^{-1}$, $p = 0.03$) and significantly higher maximum response to methacholine (R_{aw}: arsenic 2.08±0.15 cm $H_2O.s.mL^{-1}$; control 1.25±0.42, $p < 0.001$) compared to controls.
Conclusions: We have shown that mice exposed to arsenic throughout life have impaired baseline lung function and airway hyperresponsiveness as adults. These findings support the notion that ingested arsenic is a novel respiratory toxin and may be an important risk factor for the development of obstructive lung disease in arsenic exposed populations.

P1046
Carbon content of airway macrophages and lung function in children within the London low emission zone (LEZ)
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Introduction: The London Low Emission Zone (LEZ) was introduced in 2008 with the aim of reducing traffic emissions to improve respiratory health. Increased airway macrophage carbon (AM) content is associated with decreased FEV1.
Aims: Investigate the association between AM carbon and lung function as part of a larger study into impact of the LEZ on children's respiratory health.
Methods: Cross sectional study of children aged 8-9 within schools. Sputum induction with nebulised 4.5% saline. Nebulisation extended from 15 to 20-30 minutes. Sputum processed with standard techniques. Images were obtained for 50 random AM per child. AM carbon was assessed using imaging software. Analysis of mean carbon area per cell with lung function and distance from main road was performed.
Results: 2008-10, 20 schools and 619 children taken part in LEZ study, with 59 (9.5%) attempting sputum induction. Standard 15 minute nebulisation led to a sample yield of 20%, compared to modified nebulisation (mean 22.35 minutes) with 52% yield. 15 samples so far have identified macrophages, 13 suitable for imaging.

Characteristics children with imaged AM

Male	8 (62%)
Ethnicity – White	9 (69%)
Reported wheeze	5 (38%)
Average carbon area per cell (μm^2)	0.51±0.22
FEV1% predicted	95.5±12.1
Distance from main road (m)	808±429

Spearman rank correlation for carbon area per cell were negative for% predicted FEV1 (r -0.32) and distance from main road (r -0.1).
Conclusion: Sputum induction is practical and acceptable within schools. Prolonging nebulisation can improve sample yield. Further children will be recruited over the next 2 years to investigate this potential association and applicability to future research.

P1047
Copper nanoparticles generate reactive oxygen species (ROS) after air delivery to alveolar type-II cells *in vitro*
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Rapid screening methods for NP are needed that replicate *in vivo* toxicity. We assessed cytotoxicity and ROS generation from Cu NP using an *in vitro* dynamic exposure model (IVDEM) that overcomes limitations of submerged-cell methods and mimics *in vivo* exposure conditions by generating and depositing airborne NP directly onto cells grown at an air-liquid interface (ALI).
A549 cells were exposed to particle-free air or Cu NP aerosols (12±1 μm) for 4 h at 0.4 $\mu g/cm^2$ after which cells were incubated 4, 8, 12, or 24 h. Cytotoxicity was assessed by Alamar Blue assay of mitochondrial function and ROS using carboxy-H_2DCF-DA as an indicator of steady-state levels of pro-oxidants.
Aerosolized Cu NPs were 30 nm (σ_g=1.9) indicating that the system produced a nanoscaled distribution of NP. Direct exposure of cells at the ALI minimized agglomeration and retained inherent particle characteristics. Viability for cells exposed to particle-free air or Cu NPs for 4 h were no different than cells maintained in the incubator (controls) indicating no trauma associated with exposure in the IVDEM. The production of intracellular ROS in particle-free, air-exposed cells was the same as controls. However, intracellular pro-oxidant levels after Cu NP exposure were increased at 4 and 8 h post-incubation (130% and 170% of control). ROS levels resolved to baseline at 24 h postexposure indicating that Cu NP-induced oxidative stress did not exceed the cells' ability to neutralize ROS.
Cu NPs generate significant intracellular ROS after air-delivery to human alveolar cells in this IVDEM. This *in vitro* test system using lung epithelial cells with an ALI has potential utility for NP toxicity assessment.

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Impact of urban air pollution on acute upper respiratory tract infections (AURTI)
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In São Paulo city (11.2 million inhabitants) the main source of air pollution is its automotive fleet running on a gasoline-ethanol mixture.
The aim of the study was to assess the effect of pollutants on AURTI. We obtained

from 2001 to 2003 daily records: of attendances at São Paulo Hospital Emergency Unit (SPHEU) with ICD 10th J01-J06, of levels of PM_{10}, NO_2, SO_2, CO, and O_3, of temperature and humidity.
GLM Poisson regression was adopted using daily number of AURTI visits as dependent variables. Long-term trend was controlled by a semi parametric function. Linear terms were used for temperature and humidity.
Effects were presented as percentage increase and 95% CI in AURTI SPHEU visits due to interquartile range increases in air pollutants daily levels.
During the study period, 177,325 visits occurred in the SPHEU and 137,530 (72%) were due to AURTI.
In terms of age groups, emergency visits of children and younger than 13 years of age were the most frequent, followed by the groups 40 to 65 years, 30 to 39 years, older than 64 years and adolescents from 13 to 19 years old.
PM_{10} presented effects at lag zero on daily visits due to AURTI and this pattern was observed for all age groups. Among those younger than 13 years of age this effect started at lag zero (2,1%; 95% CI 0,9 – 5,8) and remained almost four days. NO_2, SO_2, and O_3 presented effects at lag zero.
URTI cannot be considered severe health outcomes. However, it is one of the most frequent groups of respiratory diseases and affects different age groups. Despite of the well known susceptibility of the extreme age groups to air pollutants there are other age groups to present susceptibility enlarging the burden of air pollutants on health.

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Wood stoves and coal burning smoke exposure is associated with COPD development especially in women

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Introduction: Worldwide data indicate that exposure to passive smoking as well as to occupational dusts and chemicals and indoor air pollution is associated with COPD development.
Aims and objectives: To identify the association between burning coal smoke exposure and COPD development in Greek urban and rural population.
Methods: The study was conducted in Greek rural and urban population in Thessaly, Greece, after an open invitation in residents over 65 years old. The study team visited the study participants and performed spirometry. Data regarding smoking status, respiratory symptoms, wood stoves and coal burning smoke exposure were recorded.
Results: Finally, 494 subjects (248 males – 246 females) were included in the study. Overall COPD prevalence was 41.2% being more prevalent in males. In females, COPD prevalence was 32.4%, although only 10.6% were current or ex-smokers. COPD diagnosis in the total population was associated with male sex (OR: 1.973, p=0.01), type of area of residence (OR: 1.458, p=0.009), smoking status (OR: 1.714, p=0.003), dyspnea (OR: 0.620, p=0.019) and exposure to wood stoves and coal burning smoke exposure (OR: 1.722, p=0.046). However, COPD diagnosis was associated with smoking status only in males (OR: 1.923, p=0.002), whereas with the type of area of residence (OR: 2.216, p=0.001) and wood stoves and coal burning smoke exposure (OR: 2.305, p=0.039) in females
Conclusion: Exposure to wood stoves and coal burning smoke was associated with COPD development especially in women of rural areas in Greece. Such type of exposure may explain the high prevalence of COPD in nonsmoking women.

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Affective disorders among fishermen and women exposed to indoor air pollution

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Introduction: Toxic effects of air pollution can lead to psychiatric symptoms such as anxiety and changes in mood and behaviour.
Objectives: To examine the relationship between anxiety and depression with exposure to indoor air pollution and respiratory symptoms.
Methods: 521 fishermen and women from a fishing community in the Niger Delta region of Nigeria who were chronically exposed to firewood smoke completed the Hospital Anxiety and Depression Scale (HADS) and a modified British Medical Research Council Questionnaire (BMRC) for other respiratory symptoms. Lung volumes were measured with a spirometer.
Results: 71 (13.6%) subjects had symptoms of anxiety while 72 (13.8%) had depression and 53 (10.2%) had a combination of anxiety and depression. Anxiety symptoms was significantly more common among women. Symptoms of anxiety and depression were significantly more common among subjects with airway obstruction and subjects with chronic bronchitis. There was no significant association between symptoms of anxiety and depression and age. HADS scores correlated significantly with levels of exposure to indoor air pollution.
Conclusion: Symptoms of anxiety and depression are common among people with long term exposure to indoor air pollution and they usually go undiagnosed due to low accessibility to proper health facilities. They should be routinely screened for psychiatric morbidities.