

42. Environmental risk factors for respiratory symptoms and COPD

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Vehicle exhausts outside home and incident asthma among adults. A prospective cohort study in three Swedish cities

Lars Modig¹, Kjell Torén², Bertil Forsberg¹. ¹Department of Public Health and Clinical Medicine, Umea University, Occupational and Environmental Medicine, Umea, Sweden; ²Department of Occupational and Environmental Medicine, Sahlgrenska University Hospital, Department of Respiratory Medicine and Allergology, Sahlgrenska University Hospital, Gothenburg, Gothenburg, Sweden

The harmful effects of air pollution on health are well known and have been shown in numerous studies. Levels of vehicle exhausts have been correlated with both respiratory morbidity and mortality. However, only a few studies have investigated the relation between levels of vehicle exhausts and incidence of asthma in adults. The aim of this prospective cohort-study was to investigate the relation between levels of vehicle exhausts outside the home and the cumulative incidence of asthma among adults.

Adults from the three Swedish cities within the RHINE cohort (Respiratory Health in Northern Europe) constituted the study population. The RHINE study is an extended follow up of participants in the European Community Respiratory Health Survey which for most centres started in 1990 and included a follow up in 1999. Subjects' home addresses at the beginning of study were geocoded and linked to a modeled long-term mean value of NO₂ representing the level of vehicle exhausts outside each participant's home. Exposure was calculated using meteorological dispersion models with high spatial resolution. All together 4109 participants had complete health data and addresses that could be correlated with a modelled level of NO₂. In the final analysis 107 incident cases of asthma were included. We used NO₂ level as a continuous variable.

The results showed a positive and significant association between the level of NO₂ outside the home and the incidence of asthma, OR=1.43 per 10 µg/m³ (95% CI=1.05-1.95).

This study shows that gradients of vehicle exhaust concentrations outside homes are associated with the risk of developing asthma among adults.

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Air travel and respiratory related symptoms in patients with COPD and controls

Anne Edvardsen¹, Aina Akerø², Tomas Mikal Eagan³, Morten Ryg¹, Jon Hardie³, Per Bakke³, Ole Henning Skjøsberg². ¹Dep of Respiratory Physiology, Glittrelinikken, Hakadal, Norway; ²Dep of Lung Medicine, Ullevål University Hospital, Oslo, Norway; ³Dep of Thoracic Medicine, Haukeland University Hospital, Bergen, Norway

For most passengers air travel is a safe mode of transportation. However, the low air pressure and dry air in the aircraft cabin may cause respiratory/hypoxia related symptoms in passengers with COPD.

Aim: To perform a survey of prevalence of respiratory/hypoxia related symptoms during air travel in COPD patients and controls.

Methods: Participants were recruited from Bergen COPD Cohort Study. All subjects completed a questionnaire elucidating air travel habits during the past two years, and possible respiratory related symptoms.

Results: 352 COPD patients and 140 controls were included, mean (SD) FEV1%pred was 53.4 (14.7)% and 110.5 (10.0)%, respectively. 57% patients and 89% controls undertook one or more flights (p<0.001). Significantly more COPD patients (25.5%) than controls (11.3%) experienced respiratory/hypoxia related symptoms during air travel (p<0.01). In those who were affected, the frequency of multiple respiratory/hypoxia related symptoms was 48.0% in the COPD patients versus 21.4% in the controls (p<0.01). The most common symptoms in the COPD group were dyspnoea, air hunger, headache, cough and dizziness. Prevalence of other symptoms than respiratory/hypoxia related did not differ between the groups.

Conclusion: Inside a two year interval, one fourth of the COPD patients experienced respiratory/hypoxia related symptoms during air travel, the prevalence being significantly higher than in controls.

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Are spirometric criteria good predictors of longitudinal outcomes in COPD patients without taking chronic respiratory symptoms into account? Results from ECRHS

Roberto de Marco¹, Simone Accordini¹, Christer Janson², Deborah Jarvis³, Matthias Wjst⁴, Peter Burney³. ¹Unit of Epidemiology and Medical Statistics, University of Verona, Verona, Italy; ²Department of Medical Sciences, Respiratory Medicine and Allergology, Uppsala University, Uppsala, Sweden; ³Respiratory Epidemiology and Public Health Group, Imperial College London, London, United Kingdom; ⁴Institute of Epidemiology, GSF-National Research Center for Environment and Health, Neuherberg, Germany

Background: In the recent debate on the spirometric criteria for the diagnosis of COPD, little attention has been paid on the weight of respiratory symptoms in the prognosis of the disease. We evaluated whether spirometric criteria are associated with long term clinical outcomes in COPD patients with or without chronic symptoms.

Methods: In 1991-93, 5,085 non asthmatic participants in the ECRHS (20-44 years) were classified according to either the GOLD or the lower limit of normal (LLN) spirometric criteria. A subject was GOLD+ when FEV1/FVC<70% and LLN+ when FEV1/FVC<LLN. Each subject was also classified according to the presence of chronic respiratory symptoms. Percent change in FEV1 (%ΔFEV1) and hospital services utilization (HSU) during the follow-up were evaluated in 1999-2002.

Results: GOLD+ and LLN+ were 2.0% and 6.3%, respectively. Mean %ΔFEV1 and crude rate (1,000/yr) of HSU [with 95%CI] are reported in subjects with or without airflow obstruction:

	No airflow obstruction		Airflow obstruction	
	LLN- (no sympt.)	LLN- (sympt.)	LLN+ (no sympt.)	LLN+ (sympt.)
%ΔFEV1	6.5 [6.3-6.7]	6.6 [6.2-7.1]	7.1 [5.9-8.3]	8.7 [6.6-10.8] **
HSU	2.7 [2.2-3.4]	5.9 [4.6-7.7] **	4.2 [2.1-8.4]	15.8 [9.4-26.7] **

	No airflow obstruction		Airflow obstruction	
	GOLD- (no sympt.)	GOLD- (sympt.)	GOLD+ (no sympt.)	GOLD+ (sympt.)
%ΔFEV1	6.4 [6.2-6.7]	6.7 [6.3-7.1] *	8.9 [6.5-11.3] *	11.9 [7.4-16.3] **
HSU	2.8 [2.3-3.4]	6.5 [5.1-8.2] **	3.3 [0.8-13.2]	19.6 [8.8-43.7] **

*p<0.05, **p<0.001: vs GOLD-/LLN- (no sympt.)

Conclusions: Spirometric criteria for COPD that do not take the presence of chronic respiratory symptoms into account poorly predict longitudinal outcomes in young adults.

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Yearly seasonal changes in COPD exacerbations, cold symptoms, temperature and hours of sunlight

James Goldring, Gavin Donaldson, Ramin Baghai Ravary, John Hurst, Jadwiga Wedzicha. Academic Unit of Respiratory Medicine, University College and Royal Free Medical School, London, United Kingdom

Introduction: Both COPD exacerbations and the common cold occur seasonally, being more frequent in the winter, but the relationship between yearly fluctuations in their incidence and meteorological factors such as temperature and hours of sunlight have not been examined.

Methods: Patients with moderate to severe COPD (mean (SD): 68 (8) years; 63% male; 46 (19) FEV1% predicted) were instructed to record any increase in their respiratory symptoms on a diary card. Exacerbations were defined as 2 consecutive days of 2 worsening symptoms, one of which was major (dyspnoea, sputum volume and purulence). Colds were defined as 2 days or more of nasal symptoms. The percentage change between December/January and June/July in: total number of exacerbations and colds; duration of cold symptoms; average daily temperature; and average daily hours of sunlight were calculated over 1995/6-2006/7 only when patients were present for a successive winter and summer period.

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Results: 345 patients met the inclusion criteria. In Dec/Jan, there were on average 67.7% more COPD exacerbations and 106.4% more colds with 118.8% more days of cold symptoms compared to Jun/Jul. The average daily temperature and hours of sunlight were 67.0% and 76.0% lower, respectively. There were correlations between seasonal fluctuations in exacerbations and colds (spearman $\rho=0.67, p=0.017$) and days of cold symptoms ($\rho=0.66, p=0.019$) but not temperature ($\rho=0.24, p=0.46$) or hours of sunlight ($\rho=0.06, p=0.85$).

Conclusions: The pattern of change in exacerbations between winter and summer follows more closely the seasonal fluctuation in common cold incidence and duration than the seasonal fluctuation in either temperature or sunlight.

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Relationships between school indoor viable moulds and dry cough at night in children of five European countries (HESE study)

Marzia Simoni¹, Isabella Annesi-Maesano², Torben Sigsgaard³, Dan Nordback³, Gunilla Wieslander³, Wenche Nystad³, Mario Canciani³, Giovanni Viegi¹, Piersante Sestini³. ¹Pulmonary Environmental Epidemiology Unit, CNR Institute of Clinical Physiology, Pisa, Italy; ²UMR-S 707, Medical School St-Antoine, University Pierre et Marie Curie, Paris, France; ³Hese Collaborative Group, University of Siena, Siena, Italy

Aim: to assess how indoor viable moulds can affect dry cough at night in school-children.

Methods: Health status and related risk factors were assessed through questionnaire in 628 children (mean age 10yrs) of Italy, Denmark, Sweden, Norway, and France (EU-funded HESE Study, Health Effects of School Environment). Measurements of pollutants were performed in each classroom. Viable moulds (VM) were determined by incubation on two different media (detection limit 30 colony forming units (cfu) per m³ of air). VM level was defined as "elevated" when $\geq 300\text{cfu/m}^3$, otherwise "elevated".

Results: Mean concentration of VM was 320cfu/m³, significantly higher in France (685) and Italy (448) than in Sweden (78), Norway (91), and Denmark (120). VM exceeded 300cfu/m³ in 33% of classrooms, that resulted in 41% of children exposed to "elevated" levels. The prevalence of dry cough was 34%, the highest in Italy (47%), and the lowest in Sweden (17%). It was significantly higher in children exposed to "elevated" than "elevated" VM levels (46 vs 26%), in exposed than unexposed to passive smoking at home (46 vs 28%), in asthmatics and rhinitics than in subjects without these conditions (60 vs 29%, and 55 vs 25%, respectively). Multiple logistic regression accounted for centre, sex, presence of asthma and/or rhinitis, and passive smoking at home, "elevated" levels of VM were a significant risk factors for dry cough (OR 2.23, 95%CI 1.23-4.04). The results did not change when carbon dioxide, particulate matter, and cat air allergens levels were added in the analysis.

Conclusion: an "elevated" exposure to indoor viable moulds in European classrooms is a risk factor for dry cough at night.

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Social class, climate, and building age as confounders influencing associations between respiratory symptoms, moulds and dampness in dwellings within the ERCHS-II

Dan Norback¹, Estel Plana², Jan-Paul Zock², Joachim Heinrich³, Cecilie Svanes⁴, Jordi Sunyer², Nino Kunzli², Simona Villani⁵, Mario Olivieri⁶, Argo Soon⁷, Deborah Jarvis⁸. ¹Uppsala University, Dept. of Medical Science, Uppsala, Sweden; ²Municipal Institute of Medical Research, (IMIM) and CREAL, Barcelona, Spain; ³GSF, Institute of Epidemiology, Neuherberg, Germany; ⁴University of Bergen, Dept. of Thoracic Medicine, Bergen, Norway; ⁵University of Pavia, Dept. of Health Science, Pavia, Italy; ⁶University of Verona, Occupational Medicine, Verona, Italy; ⁷University of Tartu, Dept. of Public Health, Tartu, Estonia; ⁸King's College, Dept. of Public Health Sciences, London, United Kingdom

Social class, climate, and building type can be confounders influencing associations between indoor moulds, dampness and respiratory health. Subjects from the general population (20-45 y) were randomly selected in 1991-1993 within the European Community Respiratory Health Survey (ECRHS). A follow-up took place from 1998 to 2002, with 4194 men and 4576 women from 27 centres. Self-reported dampness and indoor moulds in the dwelling (ever) and last 12 months were assessed in the beginning and end of the follow up. Totally 3118 European homes (200/centre) were inspected at the end of the follow-up. Water damage and visible moulds were common. There was a slight but significant decrease of indoor moulds and water damage during the follow-up. Totally 15.7% reported new occurrence of water damage during the follow-up, and 12.4% new indoor moulds. Totally 43.0% had ever lived in a home with water damage, and 43.3% had ever lived in a home with indoor moulds. Both self-reported and observed dampness/moulds were more common at warmer climate (higher annual mean temperature), higher annual precipitation and higher building age. Less pronounced associations were found between social class and moulds/dampness. In conclusion, dampness and moulds in the dwelling are common and related to both climate, social class, and building related factors such as building age. Confounding by these factors could be considered when studying effects of building dampness and moulds on respiratory health. However, climate and building age can also be considered as intermediate variables, increasing the risk for water leakage and indoor mould growth.

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Gender differences in the relation between respiratory symptoms and emphysema estimated by HRCT

Theomas Grydeland¹, Harvey Coxson², Asger Dirksen³, Sanjay Sharma⁴, Sreekumar Pillai⁴, Wayne Anderson⁴, Amund Gulsvik¹, Per Bakke¹.

¹Department of Thoracic Medicine, Haukeland University Hospital, Bergen, Norway; ²Radiology Dep., University of British Columbia, Vancouver, Canada; ³Pulmonary Dep., Gentofte Hospital, Copenhagen, Denmark; ⁴Research Dep., GlaxoSmithKline, NC, United States of America

Limited data is available on how the relationship between respiratory symptoms and emphysema estimated by High resolution computed tomography varies between genders.

HRCT scans were obtained from 463 COPD cases (GOLD II-IV) (299 men, 164 women) and 488 healthy controls (260 men, 228 women). All participants were current or ex-smokers from Norway. Respiratory symptoms assessed: Morning cough (S1), continuous cough for more than 3 months per year (S2), usually phlegm when coughing (S3), ever had wheezy chest (S4), ever had a wheezing attack with shortness of breath (S5) and the MRC dyspnea scale (MRCDS).

Male and female cases and controls had a mean (SD) age of 65.2 (9.4), 62.6 (9.0), 56.2 (9.7) and 54.7 (9.1) years, respectively. The median (25, 75) PE950 score (Percent Emphysema, <-950HU) was 8.9 (2.8, 19.1) and 4.7 (1.5, 15.5) in male and female cases and 0.7 (0.3, 1.6) and 0.3 (0.1, 0.9) in male and female controls. 90 and 81% of male and female controls, and 31 and 26% of cases were MRCDS grade 1. The prevalence of the other symptoms varied from 19% to 77%. The median PE950 score was significantly associated with the MRCDS in both male and female cases, more pronounced in men. In male cases, age and smoking adjusted odds ratios for symptoms S1, S3 and MRCDS grades 2-5 vs. 1 were 1.03, 1.06 and 1.05, respectively, for every unit increase in PE950 ($p<0.01$). The only significant association in female cases was for MRCDS grades 2-5 vs. 1, with an adjusted OR of 1.13 for every unit increase in PE950.

The significant relation between symptoms and quantitative HRCT measurements of emphysema was observed in both genders with regard to dyspnea, male cases only with regard to cough and phlegm.

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The lifetime risk of developing COPD. The Rotterdam study

Yannick van Durme¹, Katia Verhamme², Geert Van Pottelberge¹, Theo Stijnen³, Guy Joos¹, Albert Hofman², Bruno Stricker², Guy Brusselle¹.

¹Department of Respiratory Diseases, Ghent University Hospital, Ghent, Belgium; ²Department of Epidemiology & Biostatistics, Erasmus University Medical Center, Rotterdam, Netherlands; ³Department of Medical Statistics and Bioinformatics, Leiden University Medical Center, Leiden, Netherlands

Introduction: Chronic obstructive pulmonary disease (COPD) is worldwide a highly prevalent disease, but there are only few studies regarding the incidence and no studies regarding the lifetime risk of COPD.

Objective: The aim of this study was to calculate the incidence and lifetime risk of COPD in a general West-European population.

Methods: This study was part of the Rotterdam Study, a prospective population-based cohort study among elderly (≥ 55 years), that includes 7983 participants with a total follow-up time of 15.5 years (Hofman et al. Eur J epidemiol 2007). COPD cases were identified by spirometry and validation of medical reports from hospitals and general practitioners. The lifetime risk of COPD was calculated based on a Cox regression model with adjustment for the competing risk of mortality (Rosthøj S et al. Computer Methods and Programs in Biomedicine 2004).

Results: 648 subjects with incident COPD were identified. This resulted in an overall incidence rate of 9.2/1000 person years (PY) (95% CI, 8.5 to 10.0). The incidence rate was higher in men than in women, and higher in smokers than in non-smokers. For a man, still free of COPD at the age of 55 years, the risk to develop COPD over the coming 10, 20, 30 and 40 years was 4%, 10%, 18% and 24%, respectively. For a 55 year-old woman, the risk was 3%, 8%, 13% and 16%, respectively.

Conclusion: The overall incidence of COPD in a general West-European population, older than 55 years, is 9.2/1000 PY. During their further life, one out of 4 men and 1 out of 6 females, still free of COPD at 55 years, will develop COPD.

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