Scientific Abstracts for Environmental Impacts Project

**Abbey DE, N Nishino, WF McDonnell, et al. 1999. Long-term inhalable particles and other air pollutants related to mortality in nonsmokers. Am. J. Respir. Crit. Care Med. 159(2): 373-38.**

Long-term ambient concentrations of inhalable particles less than 10 micro-m in diameter (PM10) (1973- 1992) and other air pollutantstotal suspended sulfates, sulfur dioxide, ozone (O3), and nitrogen dioxidewere related to 1977-1992 mortality in a cohort of 6,338 nonsmoking California Seventh-day Adventists. In both sexes, PM10 showed a strong association with mortality for any mention of nonmalignant respiratory disease on the death certificate, adjusting for a wide range of potentially confounding factors, including occupational and indoor sources of air pollutants. The adjusted relative risk (RR) for this cause of death as associated with an interquartile range (IQR) difference of 43 d/yr when PM10 exceeded 100 micro-g/m3 was 1.18 (95% confidence interval [CI]: 1.02, 1.36). In males, PM10 showed a strong association with lung cancer deaths-RR for an IQR was 2.38 (95% CI: 1.42, 3.97). Ozone showed an even stronger association with lung cancer mortality for males with an RR of 4.19 (95% CI: 1.81, 9.69) for the IQR difference of 551 h/yr when O3 exceeded 100 parts per billion. Sulfur dioxide showed strong associations with lung cancer mortality for both sexes. Other pollutants showed weak or no association with mortality.

**Adam M, T Schikowski, et al 2015. Adult lung function and long-term air pollution exposure. ESCAPE: a multicentre cohort study and meta-analysis. European Respiratory Journal, 45(1): 38-50.**

The chronic impact of ambient air pollutants on lung function in adults is not fully understood. The objective of this study was to investigate the association of long-term exposure to ambient air pollution with lung function in adult participants from five cohorts in the European Study of Cohorts for Air Pollution Effects (ESCAPE).

Residential exposure to nitrogen oxides (NO2, NOx) and particulate matter (PM) was modelled and traffic indicators were assessed in a standardised manner. The spirometric parameters forced expiratory volume in 1 s (FEV1) and forced vital capacity (FVC) from 7613 subjects were considered as outcomes. Cohort-specific results were combined using meta-analysis.

We did not observe an association of air pollution with longitudinal change in lung function, but we observed that a 10 µg/m(-3) increase in NO2 exposure was associated with lower levels of FEV1 (-14.0 mL, 95% CI -25.8 to -2.1) and FVC (-14.9 mL, 95% CI -28.7 to -1.1). An increase of 10 µg/m(-3) in PM10, but not other PM metrics (PM2.5, coarse fraction of PM, PM absorbance), was associated with a lower level of FEV1 (-44.6 mL, 95% CI -85.4 to -3.8) and FVC (-59.0 mL, 95% CI -112.3 to -5.6). The associations were particularly strong in obese persons.

This study adds to the evidence for an adverse association of ambient air pollution with lung function in adults at very low levels in Europe.

**Adinolfi C, GP Suarez-Caceres, & P Carinanos. 2014. Relation between visitors' behaviour and characteristics of green spaces in the city of Granada, south-eastern Spain. Urban Forestry & Urban Greening, 13(3): 534-542.**

This paper examines the relation between visitor behaviour and certain features of a number of major green spaces in the city of Granada, south-eastern Spain, focussing on key urban, ecological and landscape-related issues. Information on user profiles and numbers, the various uses made of these areas, their design, plant species richness and local urban and sociological background, was collected by means of in situ observation in a total of ten urban green spaces with surface areas of over 5000 m2. Findings indicated that these spaces were used largely for purposes directly related to well-being: recreational and sporting activities, socialising, or simply relaxing. Interestingly, the most common activities in each space were governed by features intrinsic to the space itself: accessibility, design, maintenance and plant richness and distribution, all of which affected the health-related attributes and aesthetic value of the space. The study also highlighted a number of serious deficiencies in certain green spaces, which will need to be addressed in future action plans and replanning projects as an essential step in ensuring that they meet the real needs and expectations of the target population. The information provided by this research may prove particularly valuable for improving the systemic functions of green spaces in Mediterranean cities sharing similar bioclimatic and sociological features, and for ensuring that they fulfil the role assigned to green spaces in sustainable cities.

**Atkinson RW, IC Mills, et al. 2015. Fine particle components and health-a systematic review and meta-analysis of epidemiological time series studies of daily mortality and hospital admissions. Journal of Exposure Science and Environmental Epidemiology, 25(2): 208-14.**

Short-term exposure to fine particle mass (PM) has been associated with adverse health effects, but little is known about the relative toxicity of particle components. We conducted a systematic review to quantify the associations between particle components and daily mortality and hospital admissions. Medline, Embase and Web of Knowledge were searched for time series studies of sulphate (SO4(2-)), nitrate (NO3(-)), elemental and organic carbon (EC and OC), particle number concentrations (PNC) and metals indexed to October 2013. A multi-stage sifting process identified eligible studies and effect estimates for meta-analysis. SO4(2-), NO3(-), EC and OC were positively associated with increased all-cause, cardiovascular and respiratory mortality, with the strongest associations observed for carbon: 1.30% (95% CI: 0.17%, 2.43%) increase in all-cause mortality per 1 µg/m(3). For PNC, the majority of associations were positive with confidence intervals that overlapped 0%. For metals, there were insufficient estimates for meta-analysis. There are important gaps in our knowledge of the health effects associated with short-term exposure to particle components, and the literature also lacks sufficient geographical coverage and analyses of cause-specific outcomes. The available evidence suggests, however, that both EC and secondary inorganic aerosols are associated with adverse health effects.

**Beaumont JJ, RM Sedman, SD Reynolds et al. 2008. Cancer mortality in a Chinese population exposed to hexavalent chromium in drinking water. Epidemiology 19(1): 12-23.**

Background: In 1987, investigators in Liaoning Province, China, reported that mortality rates for all cancer, stomach cancer, and lung cancer in 1970-1978 were higher in villages with hexavalent chromium (Cr+6)-contaminated drinking water than in the general population. The investigators reported rates, but did not report statistical measures of association or precision.

Methods: Using reports and other communications from investigators at the local Jinzhou Health and Anti-Epidemic Station, we obtained data on Cr+6 contamination of groundwater and cancer mortality in 9 study regions near a ferrochromium factory. We estimated: (1) person-years at risk in the study regions, based on census and population growth rate data, (2) mortality counts, based on estimated person-years at risk and previously reported mortality rates, and (3) rate ratios and 95% confidence intervals.

Results: The all-cancer mortality rate in the combined 5 study regions with Cr+6-contaminated water was negligibly elevated in comparison with the rate in the 4 combined study regions without contaminated water (rate ratio = 1.13; 95% confidence interval = 0.86-1.46), but was somewhat more elevated in comparison with the whole province (1.23; 0.97-1.53). Stomach cancer mortality in the regions with contaminated water was more substantially elevated in comparison with the regions without contaminated water (1.82; 1.11-2.91) and the whole province (1.69; 1.12-2.44). Lung cancer mortality was slightly elevated in comparison with the unexposed study regions (1.15; 0.62-2.07), and more strongly elevated in comparison with the whole province (1.78; 1.03-2.87). Mortality from other cancers combined was not elevated in comparison with either the unexposed study regions (0.86; 0.53-1.36) or the whole province (0.92; 0.58-1.38).

Conclusions: While these data are limited, they are consistent with increased stomach cancer risk in a population exposed to Cr+6 in drinking water. (C) 2008 Lippincott Williams & Wilkins, Inc.

**Chin MT. 2015. Basic mechanisms for adverse cardiovascular events associated with air pollution. Heart, 101(4): 253-6.**

Air pollution is a significant cause of cardiovascular morbidity and mortality worldwide. Although the epidemiologic association between air pollution exposures and exacerbation of cardiovascular disease (CVD) is well established, the mechanisms by which these exposures promote CVD are incompletely understood. This review provides an overview of the components of air pollution, an overview of the cardiovascular effects of air pollution exposure, and a review of the basic mechanisms that are activated by exposure to promote CVD.

**Eze IC, LG Hemkens, et al. 2015. Association between ambient air pollution and diabetes mellitus in Europe and North America: systematic review and meta-analysis. Environmental Health Perspectives (Online), 123(5): 381.**

BACKGROUND: Air pollution is hypothesized to be a risk factor for diabetes. Epidemiological evidence is inconsistent and has not been systematically evaluated.

OBJECTIVES: We systematically reviewed epidemiological evidence on the association between air pollution and diabetes, and synthesized results of studies on type 2 diabetes mellitus (T2DM).

METHODS: We systematically searched electronic literature databases (last search, 29 April 2014) for studies reporting the association between air pollution (particle concentration or traffic exposure) and diabetes (type 1, type 2, or gestational). We systematically evaluated risk of bias and role of potential confounders in all studies. We synthesized reported associations with T2DM in meta-analyses using random-effects models and conducted various sensitivity analyses.

RESULTS:We included 13 studies (8 on T2DM, 2 on type 1, 3 on gestational diabetes), all conducted in Europe or North America. Five studies were longitudinal, 5 cross-sectional, 2 case-control, and 1 ecologic. Risk of bias, air pollution assessment, and confounder control varied across studies. Dose-response effects were not reported. Meta-analyses of 3 studies on PM2.5 (particulate matter <= 2.5 µm in diameter) and 4 studies on NO2 (nitrogen dioxide) showed increased risk of T2DM by 8-10% per 10-µg/m3 increase in exposure [PM2.5: 1.10 (95% CI: 1.02, 1.18); NO2: 1.08 (95% CI: 1.00, 1.17)]. Associations were stronger in females. Sensitivity analyses showed similar results.

CONCLUSION: Existing evidence indicates a positive association of air pollution and T2DM risk, albeit there is high risk of bias. High-quality studies assessing dose-response effects are needed. Research should be expanded to developing countries where outdoor and indoor air pollution are high.

**Frumkin H 2001. Beyond toxicity: Human health and the natural environment. American Journal of Preventive Medicine 20(3): 234-240.**

Research and teaching in environmental health have centered on the hazardous effects of various environmental exposures, such as toxic chemicals, radiation, and biological and physical agents. However, some kinds of environmental exposures may have positive health effects. According to E.O. Wilson's "biophilia" hypothesis, humans are innately attracted to other living organisms. Later authors have expanded this concept to suggest that humans have an innate bond with nature more generally. This implies that certain kinds of contact with the natural world may benefit health. Evidence supporting this hypothesis is presented from four aspects of the natural world: animals, plants, landscapes, and wilderness. Finally, the implications of this hypothesis for a broader agenda for environmental health, encompassing not only toxic outcomes but also salutary ones, are discussed. This agenda implies research on a range of potentially healthful environmental exposures, collaboration among professionals in a range of disciplines from public health to landscape architecture to city planning, and interventions based on research outcomes.

**Harris N, FR Minniss, & S Somerset. 2014. Refugees connecting with a new country through community food gardening. International journal of environmental research and public health, 11(9): 9202-16.**

Refugees are a particularly vulnerable population who undergo nutrition transition as a result of forced migration. This paper explores how involvement in a community food garden supports African humanitarian migrant connectedness with their new country. A cross-sectional study of a purposive sample of African refugees participating in a campus-based community food garden was conducted. Semi-structured interviews were undertaken with twelve African humanitarian migrants who tended established garden plots within the garden. Interview data were thematically analysed revealing three factors which participants identified as important benefits in relation to community garden participation: land tenure, reconnecting with agri-culture, and community belonging. Community food gardens offer a tangible means for African refugees, and other vulnerable or marginalised populations, to build community and community connections. This is significant given the increasing recognition of the importance of social connectedness for wellbeing.

**James KA, T Byers, et al. 2015. Association between lifetime exposure to inorganic arsenic in drinking water and coronary heart disease in Colorado residents. Environmental Health Perspectives (Online), 123(2): 128.**

BACKGROUND: Chronic diseases, including coronary heart disease (CHD), have been associated with ingestion of drinking water with high levels of inorganic arsenic (> 1,000 µg/L). However, associations have been inconclusive in populations with lower levels (< 100 µg/L) of inorganic arsenic exposure.

OBJECTIVES: We conducted a case-cohort study based on individual estimates of lifetime arsenic exposure to examine the relationship between chronic low-level arsenic exposure and risk of CHD.

METHODS: This study included 555 participants with 96 CHD events diagnosed between 1984 and 1998 for which individual lifetime arsenic exposure estimates were determined using data from structured interviews and secondary data sources to determine lifetime residence, which was linked to a geospatial model of arsenic concentrations in drinking water. These lifetime arsenic exposure estimates were correlated with historically collected urinary arsenic concentrations. A Cox proportional-hazards model with time-dependent CHD risk factors was used to assess the association between time-weighted average (TWA) lifetime exposure to low-level inorganic arsenic in drinking water and incident CHD.

RESULTS: We estimated a positive association between low-level inorganic arsenic exposure and CHD risk [hazard ratio (HR): = 1.38, 95% CI: 1.09, 1.78] per 15 µg/L while adjusting for age, sex, first-degree family history of CHD, and serum low-density lipoprotein levels. The risk of CHD increased monotonically with increasing TWAs for inorganic arsenic exposure in water relative to < 20 µg/L (HR = 1.2, 95% CI: 0.6, 2.2 for 20-30 µg/L; HR = 2.2; 95% CI: 1.2, 4.0 for 30-45 µg/L; and HR = 3, 95% CI: 1.1, 9.1 for 45-88 µg/L).

CONCLUSIONS: Lifetime exposure to low-level inorganic arsenic in drinking water was associated with increased risk for CHD in this population.

**Kessler RC, S Galeaz, et al. 2006. Mental illness and suicidality after Hurricane Katrina. Hurricane Katrina Community Advisory Group. Bulletin of the World Health Organization 84(12): 930-9.**

Objective: To estimate the impact of Hurricane Katrina on mental illness and suicidality by comparing results of a post-Katrina survey with those of an earlier survey.

Methods: The National Comorbidity Survey-Replication, conducted between February 2001 and February 2003, interviewed 826 adults in the Census Divisions later affected by Hurricane Katrina. The post-Katrina survey interviewed a new sample of 1043 adults who lived in the same area before the hurricane. Identical questions were asked about mental illness and suicidality. The post-Katrina survey also assessed several dimensions of personal growth that resulted from the trauma (for example, increased closeness to a loved one, increased religiosity). Outcome measures used were the K6 screening scale of serious mental illness and mild-moderate mental illness and questions about suicidal ideation, plans and attempts.

Findings: Respondents to the post-Katrina survey had a significantly higher estimated prevalence of serious mental illness than respondents to the earlier survey (11.3% after Katrina versus 6.1% before; c1= 10.9; P < 0.001) and mildmoderate mental illness (19.9% after Katrina versus 9.7% before; c1 = 22.5; P < 0.001). Among respondents estimated to have mental illness, though, the prevalence of suicidal ideation and plans was significantly lower in the post-Katrina survey (suicidal ideation 0.7% after Katrina versus 8.4% before; c1 = 13.1; P < 0.001; plans for suicide 0.4% after Katrina versus 3.6% before; c1 = 6.0; P = 0.014). This lower conditional prevalence of suicidality was strongly related to two dimensions of personal growth after the trauma (faith in one's own ability to rebuild one's life, and realization of inner strength), without which between-survey differences in suicidality were insignificant.

Conclusion: Despite the estimated prevalence of mental illness doubling after Hurricane Katrina, the prevalence of suicidality was unexpectedly low. The role of post-traumatic personal growth in ameliorating the effects of trauma-related mental illness on suicidality warrants further investigation.

**Markevych I, E Fuertes, et al. 2014. Surrounding greenness and birth weight: results from the GINIplus and LISAplus birth cohorts in Munich. Health & place, 26: 39-46.**

Aim We investigated the association between surrounding greenness at the mother's residential address at the time of delivery and birth weight in two German birth cohorts and explored potential underlying hypotheses.

Methods Complete data on 3203 newborns, recruited in Munich between 1996 and 1999, were available. Surrounding greenness was defined using the mean of the Normalized Difference Vegetation Index, which was derived from Landsat 5 TM satellite images.

Results An interquartile increase of surrounding greenness in a 500-m buffer was associated with an average birth weight increase of 17.6 g (95% CI=0.5 to 34.6). The effect strengthened after individual adjustment for NO2, PM2.5, distance to major road and population density. The strongest association was found for mothers with less than 10 years of school education. The results remained robust when additionally adjusted for noise or maternal stress during pregnancy. Neighbourhood green spaces were not associated with birth weight.

Conclusions Surrounding greenness at the birth address was positively associated with birth weight in two birth cohorts in Munich. The mechanisms driving this association remain unclear and warrant further investigation.

**Potchter O and HI Ben-Shalom. 2013. Urban warming and global warming: Combined effect on thermal discomfort in the desert city of Beer Sheva, Israel. Journal of arid environments, 98: 113-22.**

The effect of climatic changes on human comfort levels was investigated through examination and statistical analysis of long-term trends in human discomfort during summer months in the desert city of Beer Sheva, Israel and in the adjacent rural area of Wadi Hatzerim. In an era of global warming, the urban warming effect is likely to be amplified and as a result increase human discomfort, especially during summer.

Climate data for the city of Beer Sheva over the last 40 years shows an increase of temperature and air humidity in comparison to the surrounding rural area. Wind velocity data for Wadi Hatzerim show that changes are inconstant and not significant, while in Beer Sheva, wind velocity is significantly reduced. Two indices - the Discomfort Index (DI) and Physiological Equivalent Air temperature (PET) - were used to evaluate the effect of these climatic changes on human discomfort. Although the bio-meteorological indices showed the same tendency of increasing heat stress values and duration, in Beer Sheva they were more pronounced and more significant than in the desert environment. The study concludes that these combined climatic effects negatively impact human comfort and are more noticeable in desert cities at peak daytime hours during summer.

**Soderstrom M, C Boldemann, et al. 2013. The quality of the outdoor environment influences childrens health - a cross-sectional study of preschools. Acta Paediatrica. 102(1): 83-91.**

Aim: To test how the quality of the outdoor environment of child day care centres (DCCs) influences children's health.

Methods: The environment was assessed using the Outdoor Play Environmental Categories (OPEC) tool, time spent outdoors and physical activity as measured by pedometer. 172/253 (68%) of children aged 3.0-5.9 from nine DCCs participated in Southern Sweden. Health data collected were body mass index, waist circumference, saliva cortisol, length of night sleep during study, and symptoms and well-being which were scored (1-week diary - 121 parent responders). Also, parent-rated well-being and health of their child were scored (questionnaire, 132 parent responders). MANOVA, ANOVA and principal component analyses were performed to identify impacts of the outdoor environment on health.

Results: High-quality outdoor environment at DCCs is associated with several health aspects in children such as leaner body, longer night sleep, better well-being and higher mid-morning saliva cortisol levels.

Conclusion: The quality of the outdoor environment at DCCs influenced the health and well-being of preschool children and should be given more attention among health care professionals and community planners.

**Tzivian L, A Winkler, et al. 2015. Effect of long-term outdoor air pollution and noise on cognitive and psychological functions in adults. International journal of hygiene and environmental health, 218(1): 1-1.**

It has been hypothesized that air pollution and ambient noise might impact neurocognitive function. Early studies mostly investigated the associations of air pollution and ambient noise exposure with cognitive development in children. More recently, several studies investigating associations with neurocognitive function, mood disorders, and neurodegenerative disease in adult populations were published, yielding inconsistent results. The purpose of this review is to summarize the current evidence on air pollution and noise effects on mental health in adults. We included studies in adult populations (>=18 years old) published in English language in peer-reviewed journals. Fifteen articles related to long-term effects of air pollution and eight articles on long-term effects of ambient noise were extracted. Both exposures were separately shown to be associated with one or several measures of global cognitive function, verbal and nonverbal learning and memory, activities of daily living, depressive symptoms, elevated anxiety, and nuisance. No study considered both exposures simultaneously and few studies investigated progression of neurocognitive decline or psychological factors. The existing evidence generally supports associations of environmental factors with mental health, but does not suffice for an overall conclusion about the independent effect of air pollution and noise. There is a need for studies investigating simultaneously air pollution and noise exposures in association mental health, for longitudinal studies to corroborate findings from cross-sectional analyses, and for parallel toxicological and epidemiological studies to elucidate mechanisms and pathways of action.

**Yassin MM, SS Amr, and HM Al-Najar. 2006. Assessment of microbiological water quality and its relation to human health in Gaza Governorate, Gaza Strip. Public Health, 120(12): 1177-87.**

Objective

To assess the contamination level of total and faecal coliforms in water wells and distribution networks, and their association with human health in Gaza Governorate, Gaza Strip.

Methods

Data were obtained from the Palestinian Ministry of Health on contamination of total and faecal coliforms in water wells and distribution networks, and on the incidence of water-related diseases in Gaza Governorate. An interview questionnaire was conducted with 150 residents of Gaza.

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Results

The contamination level of total and faecal coliforms exceeded that of the World Health Organization (WHO) limit for water wells and networks. However, the contamination percentages in networks were higher than that in wells. Giardiasis was strongly correlated with faecal coliform contamination in water networks (r=0.7) compared with diarrhoeal diseases and hepatitis A (r=0.3 and 0.1, respectively). Diarrhoeal diseases were the highest self-reported diseases among interviewees in Gaza city. Such diseases were more prevalent among people using municipal water than people using desalinated water and water filtered at home for drinking (OR=1.6). Intermittent water supply and sewage flooding seemed to contribute largely to self-reported diseases. People in Gaza Strip have good knowledge on drinking water contamination, and this is reflected in good practice.

Conclusions

Water quality has deteriorated in Gaza Strip. This may contribute to the prevalence of water-related diseases. Self-reported diseases among interviewees in Gaza City were associated with source of drinking water, intermittent water supply, sewage flooding and age of water, and wastewater networks.