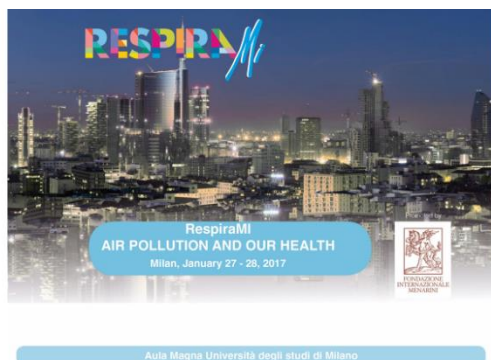# International Symposium: RespiraMI AIR POLLUTION AND OUR HEALTH
Milan (Italy), January 27-28, 2017
Highlights

Introduction

Prof. Mannucci and Prof. Harari, co-chairmen of the symposium, opened the congress, by highlighting the high scientific level of this meeting. The symposium was attended by many top researchers in Air Pollution coming from all the world. Prof. Mannucci pointed out that this was the second time RespiraMi meeting takes place in the Maggiore Hospital of Milan. This was a unique occasion for a better knowledge an understanding on air pollution and health. A very important topic for our era, particularly involved and touched by the consequences related to the worldwide pollutants' concentrations in urban and in rural area.

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The global burden of disease due to air pollution and its major sources

Air pollution and the global burden of disease was the topic discussed by Prof. Cohen in his lecture. The speaker, coming from Boston (USA), went deeper in his talk by presenting very interesting and alarming data on air pollution and the diseases directly derived from. More in particular Prof. Choen spoke about the Global Burden of Disease (GBD) project, the global health pattern underlying this burden, the diseases connected with air pollution in general and by specific sources. Speaking about the future trend of burden of disease due to air pollution, the speaker highlighted that it will likely increase in the next years even if air pollution levels decrease, due to the trends in population aging and non-communicable disease rates. Prof. Cohen presented also data given by an epidemiological study on the mortality risk due to the global burden of ambient $PM_{2.5}$, by pointing out that air pollution is the 4th leading global risk factor after diet, high BP and tobacco. The global deaths attributable to ambient $PM_{2.5}$ increased from 3.5 million in 1990 to 4.2 million in 2015, the speaker pointed out. In conclusion, Prof. Cohen highlighted that despite these challenges, there is the potential for considerable health benefits because reductions in exposure affect the entire population.

- What is the Global Burden of Disease Project?
- What's about the changes in Life-expectancy at birth from 1970 to 2015?
- What are the levels of ambient $PM_{2.5}$ from 1990 to 2015?
- What are the main GBD 2015 mortality risk factors presented by the speaker?
- What's about the percent of deaths in 2015 attributable to ambient $PM_{2.5}$?
- What's about the Chinese mortality in 2013 attributable to ambient PM2.5 from major air pollution sources?
- What's about the Chinese mortality trends from 2013 to 2030 from the speaker point of view?

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Towards a revision of the WHO Air Quality Guidelines

Prof. Jarosinska from Dusseldorf (Germany), spoke about the WHO air quality guidelines and its revision. The speaker went deeper in her talk, by presenting very interesting data about the existing WHO air quality guidelines, the mandate and context for updating these guidelines and finally about the WHO guideline development process and its scope.

Speaking about the existing guidelines, the speaker highlighted that they are the main resource for establishing or revising national standards for PM_{10} and SO_2 in 96 countries. These guidelines speak about ambient and indoor air quality, the speaker pointed out. Talking about the mandate and the context for the guidelines' update, Prof. Jarosinska pointed to the new scientific evidence on health effects, like IARC c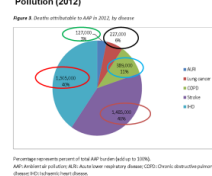lassification of air pollution as group 1 carcinogen and emerging studies from China and other non-NA/EU areas. In the last part of her presentation the speaker talked about the WHO guideline development and the scope of the updated guidelines, by highlighting that this is a very complex and global process coordinated by the WHO regional office located in Bonn, aiming to the selection of pollutants and health outcomes and the consideration of health impacts from natural sources.
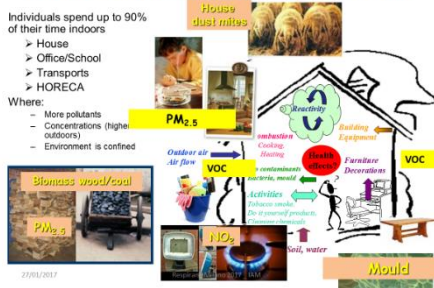
- What are the air pollutants covered by the WHO guidelines?
- What's about the new scientific evidence on health effects?
- What are the health impacts of air pollution?
- What is the burden of disease and the economic cost of air pollution?
- What's about the WHO guidelines development?
- What are the proposed general objectives for the guidelines development?
- What's about the update of WHO global AQG from the speaker point of view?

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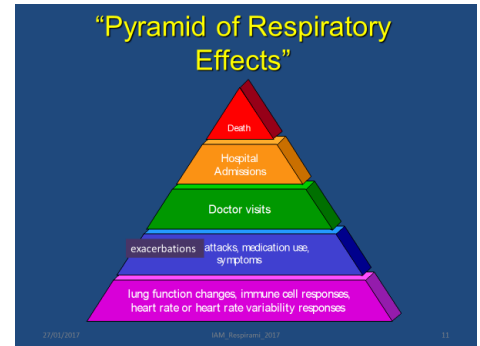
Air pollution and respiratory health

Air pollution and respiratory health, was the topic Prof. Annesi-Maesano spoke about in her lecture. The speaker coming from Paris (France), started her speech, by highlighting that there are 12581 publications on air pollution and respiratory health found in PubMed. More in particular Prof. Annesi-Maesano spoke about outdoor air pollution evolution, by highlighting that the 92% of the world's population lives in places where air quality levels exceed WHO limits. In the main part of her lecture, the speaker presented data on the major diseases directly due to air pollution like asthma, COPD and lung cancer. Speaking about asthma, Prof. Annesi-Maesano pointed out that the 14% of asthma prevalence is attributable to traffic-related air pollution. Concerning on COPD, the speaker presented data showing that air pollution has a direct correlation with COPD acute mortality and exacerbations. The 20% of respiratory death are attributable to air pollution Prof. Annesi-Maesano pointed out. In the last part of her presentation, the speaker talked about the correlation between air pollution, epigenetic effects and diseases. Finally, Prof. Annesi-Maesano presented data on prevention, by highlighting the importance to reduce inequalities between countries.
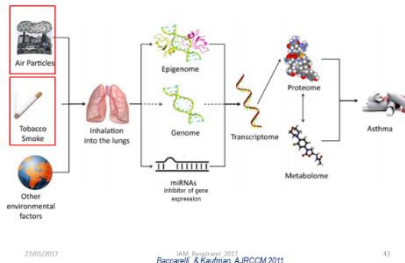
- What's about prevention of air pollution?
- What to tell patients for a better protection to the air pollution impact?
- What's about the relationship between air pollution and epigenetics?
- What's about the correlation between interstitial pulmonary fibrosis and air pollution?
- What's about asthma and air pollution?
- What's about COPD and air pollution?

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Cardiovascular disease

PM composition related to health effects

- PM Composition
  - Black carbonaceous particles
  - Secondary organic aerosols
  - Secondary inorganic aerosols
- Coarse particles
- Ultrafine particles
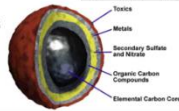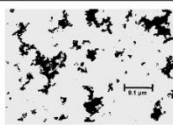
HelmholtzZentrum münchen
German Research Center for Environmental Health   REVIHAAP Project

Cardiovascular disease was the topic at the core of the lecture discussed by Prof. Peters from Munchen (Germany). In the main part of her talk the speaker presented very interesting data derived from epidemiological studies about the effects of PM particles at the cardiovascular level. More in particular Prof. Peters spoke about the triggering phenomena lead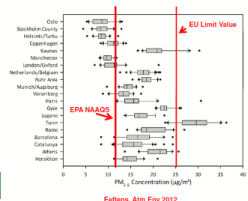ing to myocardial infarction, the long-term risk factors for MI and finally about the relationship between air pollution and stroke. Talking about PM, the speaker highlighted the relationship between the exposure to particles and the onset of cardiovascular diseases, by presenting a huge amount of data given by epidemiological studies about the correlation between air pollution and myocardial infarction. In the main part of her presentation Prof. Peters spoke about the relationship between atherosclerosis progression and air pollution due to fine particles. The

ESCAPE: European Study of Cohorts for Air Pollution Effects

- Existing cohort studies
- Spatial variability of air pollution based on Geographic Information Systems
- Outcomes
  - Children's health
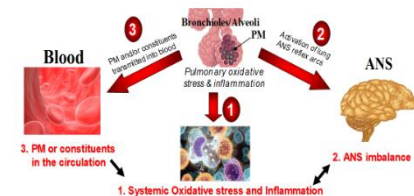 - Respiratory health
  - Cardiovascular Health
  - Mortality

Eeftens, Atm Env 2012

HelmholtzZentrum münchen
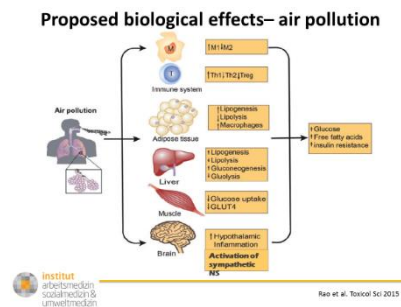German Research Center for Environmental Health

speaker presented data given by many epidemiological studies demonstrating a strong correlation between air pollution and the risk for incident coronary artery disease. In the last part of her presentation, Prof. Peters spoke about the association between fine particles and stroke incidence, by presenting very interesting data given by the ESCAPE study. In conclusion, the speaker pointed out that despite these data novel technologies such as e-mobility or energy efficient cities will change exposure.

Cardiovascular disease due to traffic exposures and fine particles

Blood   Bronchioles/Alveoli   PM   ANS

1. Systemic Oxidative stress and Inflammation
2. ANS imbalance
3. PM or constituents in the circulation

HelmholtzZentrum münchen
German Research Center for Environmental Health   Brook et al. 2010

- What's about the evidence for associations between cardiovascular diseases and short-term exposure to fine particles?
- What are the main pathomechanisms activated by fine particles leading to cardiovascular diseases?
- What's about the correlation between the induction of ischemia and the exposure to diesel exhausts?
- What are the main mechanism leading to myocardial infarction caused by air pollution?
- What are the toxicological evidences about fine and ultrafine particles?
- What is the PM composition related to health effects?

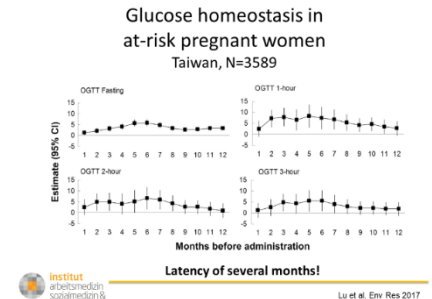To follow the presentations of this congress, click on the link below:
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How fine particles can influence diabetes: much ado about nothing?

Prof. Hoffmann talked about diabetes and fine particles. The speaker, coming from Bonn (Germany), introduced her talk by presenting data on the epidemiology of diabetes, by highlighting the global burden of disease characterized by 415 million affected people in 2015 with a projection to 642 million in 2040. More in particular Prof. Hoffmann talked about primary prevention and the environmental causes at the basis of this disease. The speaker presented data on the relationship between air pollution, fine particles and the classic risk factors leading to the onset of diabetes, by highlighting the effects of air pollution on immune system, adipose tissue, liver muscle and brain. Prof. Hoffmann discussed a huge amount of data given by epidemiological studies on the correlation between PM and incidence of Type 2 diabetes and on the correlation between PM and glucose control, insulin sensitivity and metabolism in potentially sensitive groups like pregnant women. In the last part of her presentation, the speaker talked about the relationship between traffic exposure and risk of diabetes. In conclusion, Prof. Hoffmann pointed out that there are biological plausibility and experimental evidence for the association between air pollution and type 2 diabetes.
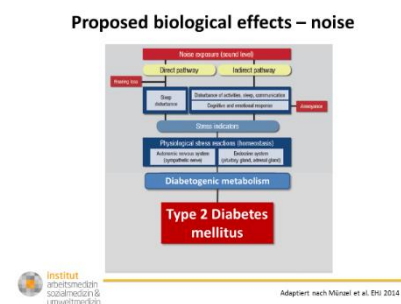
- What's about the correlation between Noise and Type 2 diabetes?
- What's about the source-specific PM and the prevalence of diabetes?
- What is the correlation between air pollution and insulin resistance in adults?
- What's about air pollution and glucose homeostasis in at-risk pregnant women?
- What's about the effect of air pollution exposure during the preconception period?

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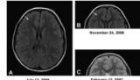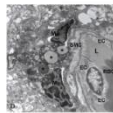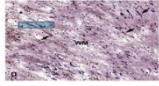
Childhood neurodevelopment

Early Alzheimer's and Parkinson's disease pathology in urban children (Calderón-Garcidueñas 2013).

In dogs and children autopsies, higher prevalence of diffuse amyloid-β peptide deposits (C-G 2008).

White matter lesions and perivascular pathology contributing the the neuroinflamation (Calderon-G 2012)

MIF, PrP(C), IL-6, IL-1Ra, IL-2 in cerebrospinal fluid in urban children exposed to severe vs. low air pollution. (Calderón-Garcidueñas 2013).
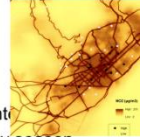
The childhood neurodevelopment was the topic of Prof. Sunyer presentation. The speaker, coming from Barcelona (Spain), talked about the effects of air pollution on the onset of neurological diseases like Alzheimer and Parkinson in urban children, by presenting very interesting data given by the BREATHE project, an investigation performed in the schools aimed to find a correlation between the brain development and the


School study
- Schools stratified by traffic pollution
- Match each pair by similar social conte
- Two sampling periods of one week by season
- Five monitoring stations at the same time: in/out & high/low, fixed site
- 39 schools, 1,092 PM filters during 2012

presence of air pollution ultrafine particles in school children. Primary school is a vulnerable age for brain cortex development and schools have a very high exposure to air pollution, the speaker pointed out. Prof. Sunyer went deeper in his lecture, by discussing about the main points of this project like the school study, the neurophysiological study characterized by the implementation of specific computerized tests and the MRI sub study. The speaker presented a huge amount of data demonstrating the inverse correlation between age, performance and pollution on brain function: the higher is the exposure to pollution at any age and performance level, the slower is the brain maturation, the speaker pointed out. In the last part of his presentation Prof. Sunyer talked

Early life green exposure

Increased **grey matter** volume in the left and right prefrontal cortex and left premotor cortex (A) and increased **white matter** volume in right prefrontal region, left premotor region, and both cerebellar hemispheres (B).
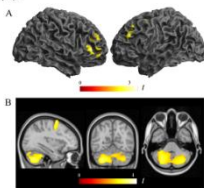
about the correlation between the brain development in term of grey matter and white matter volume and the level of the green exposure in the early life. Finally, the speaker presented data on the relationship between the early life exposures to air pollution and the presence of structural permanent effects in the children's brain, by highlighting that the exposure to specific environmental factors in the developmental phases, can change the capacity to cope with the environment in the later life.

- What is the correlation between the brain development and the green exposure in the early life?
- What 's about the effects of noise and air pollution on behaviour and ADHD symptoms?
- What are the main points of the BREATHE project?
- How do air pollutants reach the brain?
- What's about the association between traffic-related air pollution in schools and the cognitive development in primary school children?

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Air pollution and neurological diseases

Air pollution and neurological diseases was the topic of Prof. Oudin presentation. The speaker, coming from Umeå (Sweden), addressed the audience, by talking about epidemiological studies on the correlation between air pollution and dementia and dispensed medications for psychiatric disorders in children and adolescents. Prof. Oudin presented very interesting data given by an epidemiological study performed in Sweden on air pollution and its correlation with neurological diseases. Starting from the evidences given by the literature about the correlation between air pollution, the brain and the onset of dementia, the speaker went deeper in her talk, by presenting data on dementia and air pollution incidence in northern Sweden in 1806 subject, 302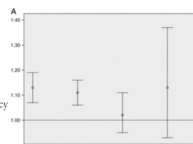 of which were affected by Alzheimer disease or vascular dementia. The sensitivity analysis performed on the results of the study showed a correlation between air pollution and dementia of about 2.2. In the last part of her presentation, the speaker talked about the Swedish national registries on dispensed medications from 2005 and the correlation with the exposure to air pollution. In conclusion, Prof. Oudin, pointed out that this correlation is quite strong with 9% increase in dispensed medications for any 1 point increase in exposure to air pollution.
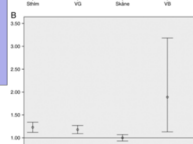
- What are the key points of the Air Pollution study performed in Sweden?
- What are the main correlations between air pollution and brain from the speaker point of view?
- What's about the relationship between the dispensation of medicines and the air pollution levels in Sweden?

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Reproductive health

Maternal Active Smoking

- Fetal growth restriction (-200 g in birth weight, RR of 3 for LBW, -0.4 cm in head size)
- Fertility
- Miscarriage
- Preterm delivery
- Multiple adverse effects later in life (MacArthur & Knox, 1988; Abbott et al. 2012)

Prof. Pedersen, coming from Copenhagen (Denmark) spoke about reproductive health, by presenting very interesting data on air pollution during pregnancy and its effect on the fetal life. More in particular the speaker talked about the ESCAPE study, that is the european cohort study on ambient air pollution and low birthweight. Prof. Pedersen went deeper in her talk, by presenting the major topics of this project like the study design, the air pollution exposure assessment, the pregnancy exposure levels and the propose mechanisms underly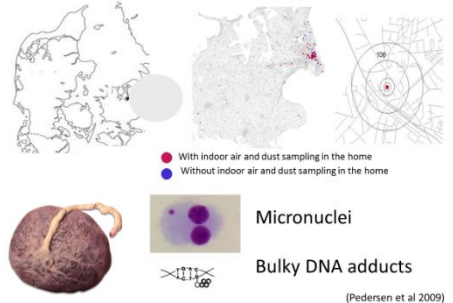ing the associations between air pollution and adverse birth outcome. In the second part of her lecture, the speaker presented other data given by the Danish national birth cohort studies on the hypertensive disorders in pregnancy like eclampsia and the effects of air pollution and road traffic noise. In conclusion, Prof. Pedersen pointed out that the maternal exposures to air pollution and noise can increase the DNA damage in the fetus and the risk of hypertensive disorders in pregnancy.

Traffic-Related Air Pollution And DNA damage in Newborns

- With indoor air and dust sampling in the home
- Without indoor air and dust sampling in the home

Micronuclei

Bulky DNA adducts

(Pedersen et al 2009)

Ongoing Danish National Birth Cohort Studies

- ≈90,000 Danish women (101,002 pregnancies in 1996-2002) (Olsen et al. 2001)
- Impact of exposure to traffic-related air pollution and road noise on hypertension and diabetes in pregnancy and childhood
- All the noise about air pollution – is it the air pollution, noise or both?

- What's about the association between air pollution, noise and preeclampsia?
- What's about the ongoing Danish National Birth Cohort study?
- What are the proposed biological mechanisms underlying the associations between air pollution and adverse birth outcomes?
- What are the key points of the European Study of Cohorts for air pollution effects (ESCAPE)?
- What's about the traffic-related air pollution and the DNA damage in new-borns?
- What are the main effects of the maternal active and passive smoking on fetus growing and development?

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Effects of air pollution on fragile and vulnerable people
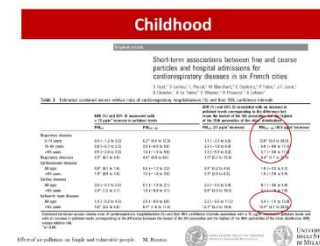
Effects of air pollution on fragile and vulnerable people was the topic at the core of Prof. Bonzini presentation. The speaker, coming from Milan (Italy), presented very interesting data given by epidemiological studies on the effects of air pollution on pregnant women, on older age people, on gender, on people affected by non-communicable diseases like CVDs, asthma, diabetes and obesity.
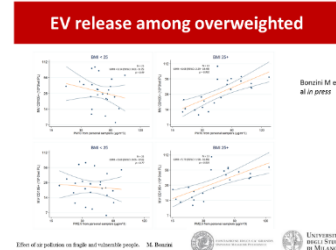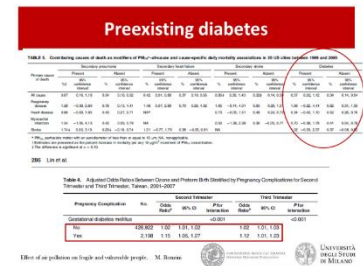
In the main part of his talk, the speaker talked about the release of plasma extracellular vesicles in overweight people related to air pollution levels. Finally, Prof. Bonzini presented data on vulnerability related to social economic status. In conclusion, the speaker pointed out that vulnerability for air pollution can reflect higher exposure, poorer access to medical care or an intrinsic biological hyper susceptibility.

- What's about vulnerability related to the Social Economic Status?
- What's about the EV release among overweight people from the speaker point of view?
- What are the key points of the SPHERE project?
- What is the correlation between air pollution and pre-existing cardiovascular disease?
- What's about ait pollution and childhood?
- What is the correlation between air pollution and older age?

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Health impacts of industrial contamination

Premature deaths caused by PM$_{2.5}$ in the Italian industrial sites

Health impacts of industrial contamination was the topic at the core of Prof. Forastiere presentation. The speaker, coming from Rome (IT), presented very interesting data, starting from the description of the main industrial sites located in Italy. Prof. Forastiere went deeper in his lecture, by presenting the main results of an epidemiological study on the Taranto Ilva steel plant and the mortality rate in 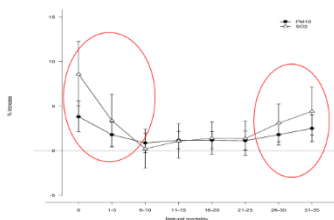Taranto area. More in particular the speaker talked about the study design-cohort study, the study's methods, the data on PM$_{10}$ and SO$_2$ levels, the long-term exposure and the mortality rate in Taranto area. The main outcomes of interest were mortality, all causes cardiovascular diseases, respiratory diseases, neurological diseases, renal diseases and cancer at any organ level, the speaker pointed out. In the second part of his lecture, Prof. Forastiere presented and discussed the results of this epidemiological study and more in particular he spoke about the correlation between PM$_{10}$ and SO$_2$ industrial emissions and mortality, showing a strong correlation between these pollutants and mortality and between long-term and more recent exposion. In conclusion, Prof. Forastiere pointed out that exposure to PM$_{10}$ and SO$_2$ of industrial origin and the work at the steel industry were associated with an increase in mortality and morbidity for specific causes in the cohort study.

Mortality Taranto area,1995-2002, reference Puglia region.Men

Latency of the effects on mortality

- What's about the mortality rate related to the industrial PM$_{10}$ emissions?
- What's about industrial air pollution and hospital admissions?
- What's about the latency of the effects on mortality?
- What are the correlations between PM$_{10}$ and SO$_2$ industrial emissions and mortality?
- What are the main outcomes of interest presented by the speaker?
- What is the Age standardized mortality rates in Taranto from 1980 to 2008?

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Air pollution in Italy: PM_{10} and $PM_{2.5}$ prediction of daily data at 1 km grid using satellite data

FOUR SAMPLE AREAS

Po river valley. One of the most polluted areas in Europe because of industrial plants, intensive agriculture and high population density. The presence of the Alps and Apennines acts as a barrier favoring stagnation conditions and accumulation of pollutants.

Rome metropolitan area. Divided into five concentric circular zones, corresponding to different levels of urbanization, population density and road traffic. The main pollutants emission sources are road vehicles exhausts, especially diesel, and domestic heating units.

Taranto city. One of the most industrialized areas in southern Italy and Europe. Presence of the second largest steel plant in Europe (ILVA, in purple), mineral deposits, oil refineries, cement production, fuel storage, power production, mining industry, military plants and the harbor.

Sicily. Located in central Mediterranean Sea, is densely populated, with several important industrial sites. Has a typical Mediterranean climate with mild winters and hot, dry summers. For around half of the days, Sicily is affected by desert dust intrusions from North Africa.
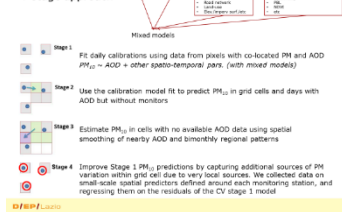
Air pollution in Italy was the topic discussed by Prof. Stafoggia. The speaker, coming from Rome (IT), presented very interesting data about air pollution and its prediction through satellite data. At the beginning of his presentation, Prof. Stafoggia spoke about open qu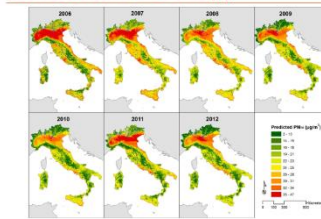estions on exposure and the related health effects, like short-term and long-term effects and their relative magnitude and on the project's objectives like the building of a national database on spatial and spatio-temporal parameters and the daily PM estimations of their concentrations at 1x1 km resolution of the entire Italy. In the main part of his lecture, the speaker presented the results of this project, characterized by the comparison between the observed and the predicted PM_{10} concentrations and the annual time trends. In conclusion, Prof. Stafoggia pointed out that the Spatio-temporal PM_{10} model presents a high accuracy in northern Italy and in large metropolitan areas, but fits less in industrial and natural sources areas.


- What are the main annual time trends in PM_{10} average variations?
- What's about the observed vs. predicted out-of-sample PM_{10} concentrations in the four sample areas?
- What's about the 4-stage approach of this project presented by the speaker?
- What are the main sample areas of this model?
- What are the main environmental data collected in this project?
- What are the open questions at the basis of this project?

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Long-term effects of air pollution in the Rome Longitudinal Study: diabetes and neurological diseases
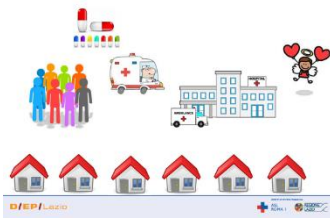
Prof. Cesaroni from Rome (IT), spoke about the long-term effects of air pollution in Rome, by presenting very interesting data of the Rome longitudinal study on diabetes and neurological diseases. The speaker went deeper in her lecture, by talking about the objective of this study, the census cohort, the exposure assessment and finally about the data. More in particular, Prof. Cesaroni presented data about the incidence of diabetes, Parkinson's disease, dementia and their correlation with air pollution levels in Rome and its suburbs. Finally, the speaker talked also about the limitations of this project, like the main exposure based on only the measures taken in 2010. In conclusion, Pro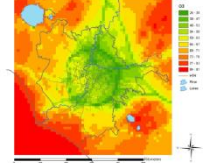f. Cesaroni, pointed out that, based on the results of this study, the risk of diabetes is associated with the long-term exposure to NO_2 and ozone.

- What about the relationship between dementia and air pollution based on the Rome study?
- What's about the correlation between Parkinson disease and air pollution?
- What's about the correlation between new cases of diabetes and air pollution?
- What is the objective of the Rome longitudinal study?
- What's about the exposure studied in this study?

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Health impact assessment of PM$_{2.5}$ and NO$_2$ in Italy: the VIIAS national study
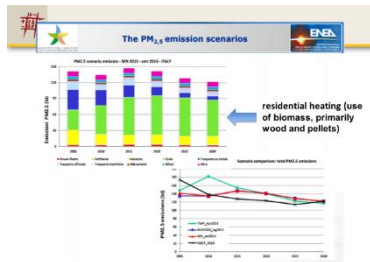
The Health impact assessment of PM$_{2.5}$ and NO$_2$ in Italy based on the VIIAS national study, was the topic discussed by Prof. Ancona from Rome (IT), more in particular the speaker presented very interesting data on the VIIAS national study, by talking about the study's objective, the PM$_{2.5}$ and NO$_2$ emissions, the EU Air quality and finally on the result related to PM$_{2.5}$ and NO$_2$ levels and their

relationship with premature deaths and their mortality reductions related to the different scenarios. In conclusion, Prof. Ancona pointed out that this project discovered an important negative impact due to air pollution in Italy and that the compliance with the current EU legislation would have a large impact on the health of the Italian residents.
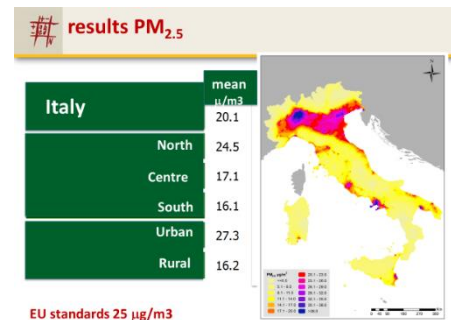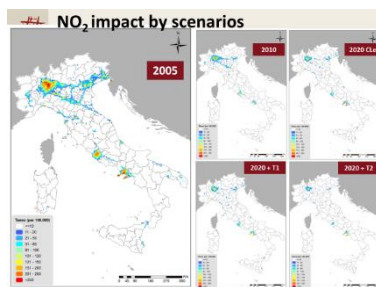
- What is the number of deaths attributable to PM$_{2.5}$ in Italy calculated in the project?
- What's about the PM$_{2.5}$ and NO$_2$ mortality reduction rate attributable to the scenarios presented by the speaker?
- What's about the premature death caused by PM$_{2.5}$ and NO$_2$ respectively?
- What is the objective of the project?

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Drug consumption: a new indicator of air pollution
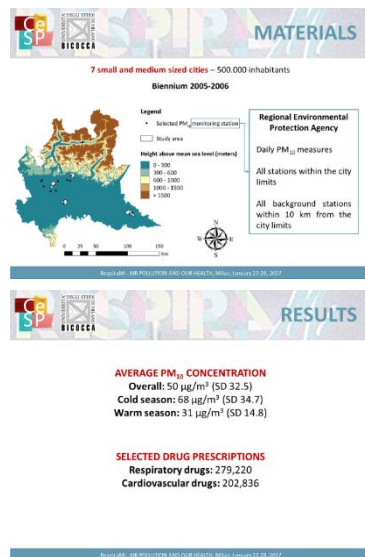
Dr. Conti from Milan (IT), spoke about drug consumption as a new indicator of air pollution. The speaker in the main part of his talk presented very interesting data on a pilot study in Lombardy, aiming to investigate the short-term effect of PM_{10} exposure on the prescription of specific medications used for COPD, asthma, arrhythmia, angina and CHF. Going deeper in her presentation, Dr. Conti spoke about the study materials, methods and results. In conclusion, the speaker pointed out that in this pilot study a short-time association between PM_{10} exposure and cardiorespiratory drug prescription was observed.

- What are the main results of this project?
- What's about the average PM_{10} concentration and the selected drug prescriptions?
- What's about the time-stratified case-crossover design of the study?
- What's about the area selected for this study?
- What are the main problems linked with the current measurements of the short-term effects of particulate matter on the cardiorespiratory health?

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Health effects of source-related components of PM$_{2.5}$ in Emilia-Romagna: the Supersite Project

Study area
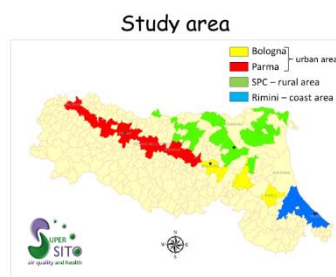
The Health effects of source-related components of PM$_{2.5}$ in Emilia-Romagna was the topic discussed by Prof. Ranzi in his lecture. The speaker coming from Modena (IT), talked about the Supersite Project, by presenting very interesting data on the project structure, the study area divided into cost, rural and urban areas and characterized by different weather conditions and finally on the environmental and the population and on the health data. In the main part of his talk, Prof. Ranzi spoke about the study results obtained in the
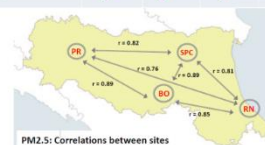

Enviromental data

short-term and in the long-term analyses. More in particular the speaker highlighted that PM$_{2.5}$ is associated with Respiratory health outcomes in the two models and that PNC needs further investigation for confirming interesting signals. In conclusion, Prof. Ranzi pointed out that both traffic and biomass burning were associated with short-term total mortality, while only biomass burning was associated with long-term mortality.

Population and health data

- What are the long-term effects on the cohort residents presented by the speaker?
- What 's about the chemical composition of PM$_{2.5}$?
- What's about the statistical analyses performed in this study?
- What are the main population and health data presented by the speaker?
- What's about the environmental data?
- What is the Supersito Project Structure?

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The situation in Lombardy

Daily mean concentrations of PM$_{10}$ in 2014

The red and dark-red dots indicate stations with exceedances of the PM$_{10}$ daily limit value, allowing 35 exceedances of the 50µg/m³ threshold over 1 year.

EEA, 2016
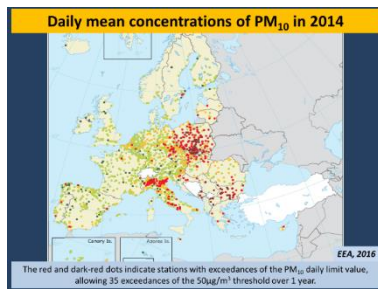
Dr. Bertazzi from Milan (IT), presented very interesting and alarming data on the air pollution exposure in Lombardy and its effects on health. More in particular the speaker talked about the daily mean concentration of PM$_{10}$, PM$_{2.5}$, N0$_2$ and 0$_3$ in 2014, the correlation with the temporal trends and the impact on the population health, by presenting data given by epidemiological studies performed by several teams of researchers. Going deeper in his lecture, Dr. Bertazzi discussed all these data, by highlighting the high-level pollutants exposure in the city of Milan and the tight correlation with the incidence of hospitalization and even death for cardiac, cerebrovascular and respiratory diseases. In the second part of his lecture, the speaker presented data on the correlation between pollutant exposure and the relapses for multiple sclerosis and lung cancer in Lombardy. Finally, Dr. Bertazzi talked about the air pollution effects in the Po river valley during all the month of December 2015, by presenting very impressive data on mortality, attributable to exceeding the daily EU limits for PM$_{10}$ and PM$_{2.5}$ by day. In conclusion, the speaker pointed out that the days above the limits might be more important than the average annual concentration in determining the attributable deaths.

Natural deaths attributable to PM$_{10}$ levels exceeding given thresholds: Effect of COMMUTING

Impact of PM$_{10}$ on mortality within 2 days from the exposure in **Lombardy** for the year **2007**, at the municipality level, examining exposure entailed by daily **intermunicipality commuting** and accounting for **uncertainty propagation**.

Counterfactual	Residence		Commuting
EU 40 µg/m³	173.1 (103.2, 251.1)	+30%	224.9 (110.6, 367.8)
WHO 20 µg/m³	709.1 (384.4, 1081.5)	+22%	865.3 (475.3, 1400.6)

Baccini M et al., EHP 2015

Deaths Attributable to exceeding the daily EU limits 50µg/m³ (PM$_{10}$) and 25µg/m³ (PM$_{2.5}$) by day, 2015

Results obtained after excluding the 35 exceeding days allowed by EU regulations.

Carugno M et al., Public Health, 2017

- **What are the deaths attributable to exceeding the daily EU limits for PM$_{10}$ and PM$_{2.5}$ by day, presented by the speaker?**
- **What's about the effect of "commuting" presented by the speaker?**
- **What is the annual number of deaths attributable to PM$_{10}$ levels exceeding 20µg/m³ in the city of Milan?**
- **What's about the EAGLE project related to Lung Cancer etiology?**
- **What is the relationship between multiple sclerosis relapses and PM$_{10}$ exposure?**
- **What's about the relationship between air pollution exposure and cause-specific hospital admission?**

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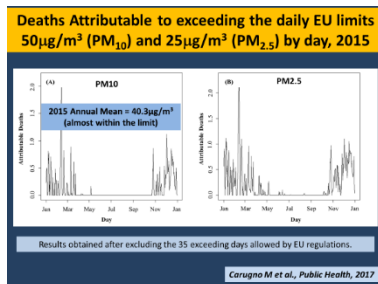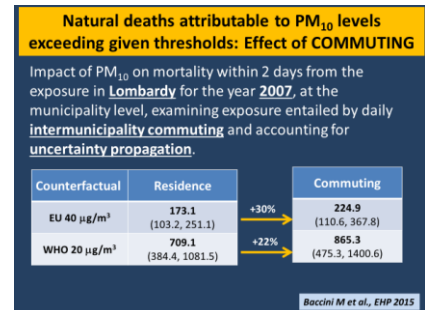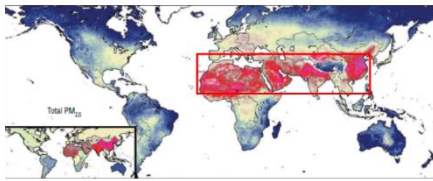
Ambient air pollution in China: health impact and interventions
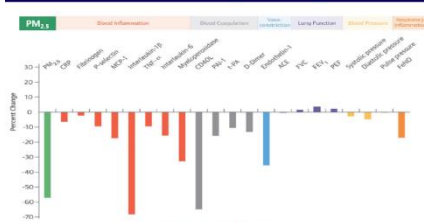

Satellite Global PM$_{2.5}$ concentrations

Donkelaar et al, *EHP*, 2015

The main topic at the core of Prof. Kan presentation, was the health impact of the air pollution in China. The speaker, coming from Fudan (China), presented very interesting data given by epidemiological and national monitoring network studies performed by his team of research. More in particular Prof. Kan talked about the short-term and the long-term effects of air pollution in China and about the intervention at the population and the individual levels. Going deeper in his lecture, the speaker presented very impressive data and pictures showing the PM high levels in the city of Bejing and Shenyang in 2016 and 2015 respectively and the correlation with premature mortality and economic losses linked with air pollution. In the main part of his lecture Prof. Kan presented a huge amount of data about the out-door and the in-door exposure to
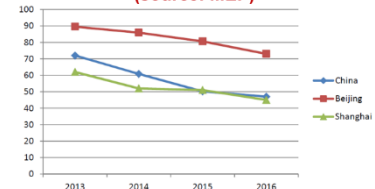

PM$_{2.5}$ levels in China (source: MEP)

fine particles and their effects on health. In the last part of his presentation. The speaker talked about the environmental intervention at the population level in Bejing and Nanjing and at the individual level through the application of masks and air purifiers and presented data on the cardiopulmonary benefits associated with these tools. In conclusion, Prof. Kan pointed out that there is a strong evidence that air pollution is associated with adverse health effects in the Chinese population.

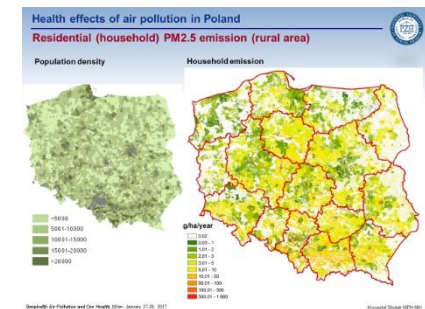Air Purifiers and Cardiopulmonary Benefits

Chen et al, JACC, 2015

- What's about the stress associated with mask use in the Chinese population?
- What is the correlation between air purifiers and cardiopulmonary benefits?
- What's about the air quality changes and biomarkers of systemic inflammation during the 2014 Nanjing Youth Olympics?
- What's about Chines Men's Study and the cardiovascular and respiratory mortality?
- What are the key points of the CNHS-air Study?
- What's about PM$_{2.5}$ components and daily mortality in Xi'an?
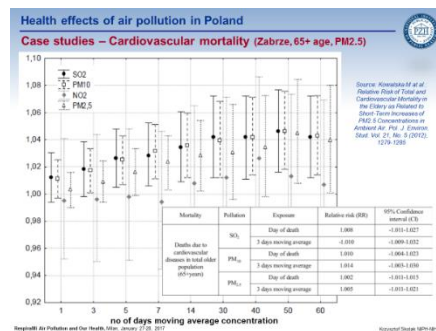- What is the correlation between particle sizes and daily mortality in Shenyang?

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Health effects of air pollution in Poland

Prof. Skotak presented very interesting data on the Health effects of air pollution in Poland. The speaker coming from Warszawa (Poland) talked about the population exposure to $PM_{2.5}$ and PM_{10} particles, the related causes of mortality, the life expectancy, the estimated health effects due to PM long-term concentrations and finally about the air quality information system running in Poland. Going deeper in his lecture, Prof. Skotak presented very interesting data given by epidemiological and cases studies on mortality related to air pollution and more in particular on cardiovascular mortality and lung obstruction. Speaking about $PM_{2.5}$ emission, the speaker highlighted that Poland is located at the third level of the ranking only after France and Italy. Finally, Prof. Skotak spoke about the improving air quality measures implemented by the Government and the related regulation.
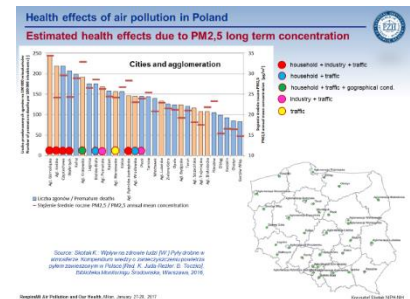
- What's about the air quality information system running in Poland?
- What's about the cardiovascular mortality in Poland from the data presented by the speaker?
- What are the estimated health effects due to PM_{10} long term concentration?
- What's about the air quality and the estimated health effects presented by the speaker?
- What's about the residential $PM_{2.5}$ emission in the rural area?
- What's about the Health inequality index in Europe?
- What are the main causes of mortality and restricted activity days in Poland?

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The economic consequences of air pollution

The main topics at the core of Prof. Croci presentation, were the economic consequences of air pollution. The speaker, coming from Milan (IT), presented very interesting data, starting from the consideration that while health costs studies are growing in number, non-health related studies are in their infancy. Going deeper in his lecture, Prof. Croci pointed out that the annual economic costs for air pollution in Europe are about 730 billion $ and


3.160 billion $ in all the world. Concerning on the estimation of premature deaths due to air pollution, they are about 3.7 million in all the world in 2012, the speaker highlighted. In the main part of his lecture, Prof. Croci spoke about air pollution damages in Europe and the related market and non-market costs, by presenting very impressive data on the increase of mortality and morbidity and on other impacts like ecosystem damages, agriculture losses, damage to buildings and monuments, reduction of real estate value, reduction of tourism and

contribution to climate change. In the last part of his presentation, the speaker talked about policy responses and more in particular about industry, transport, agriculture, energy supply and demand, urban planning and about waste managements. In conclusion, Prof. Croci pointed out that the costs of air pollution significantly affect our welfare and the Policy makers have to tackle this issue following cost-effective solutions and evidence based policies through targeted measures.
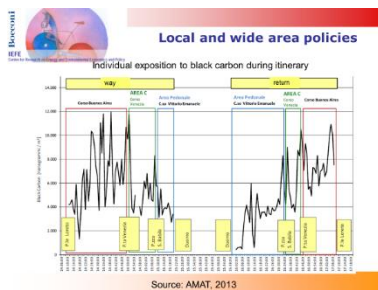
- What are the literature results about health and other impact presented by the speaker?
- What are the main valuation methods of externalities presented by the speaker?
- What about the Welfare cost of premature mortality projections?
- What are the annual economic costs for air pollution presented by the speaker?
- What's about the local and wide area policies presented by the speaker?

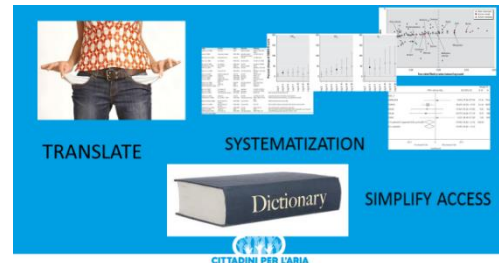To follow the presentations of this congress, click on the link below:
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The interactions between scientists and the community: how to make them more impactful for less air pollution

Dr. Gerometta from Milan (IT) spoke about the interactions between scientists and the community, by highlighting the role of scientists in order to make visible, understandable and correctly perceived by the public and the policy makers the information about air pollution and its consequences.

Going deeper in her presentation Dr. Gerometta pointed out the rights of citizens for a better communication, translation, systematization and a simplified access to the news. More in particular the speaker spoke about children attending schools highly exposed to traffic compared to children attending schools not exposed to traffic and the differences in cognitive development per year. In the second part of her presentation, Dr. Gerometta talked about AQI catalogue,

webinars initiatives able to meet the scientists for a better communication with citizens and about "witness for the air" a program leading to a better monitoring of the NO_2 air levels through the involvement of the citizens. In conclusion, the speaker pointed out that coalition is the only way to carry on every day in order to improve communication.

- What's about AQI Catalogue?
- What's about "vedetta per l'aria" project?
- What's about communication from the speaker point of view?
- What's about webinars form the speaker point of view?

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Is more health research needed to cope with air pollution?

Strength of evidence on health effects of PM2.5, NO2 and O3

Systematic reviews:
for PM: US EPA 2009 / HC 2013
for NO2: US EPA 2016 / HC 2016
for O3: US EPA 2013 / HC 2013

C – causal
L – likely causal
S – suggestive for causal

Outcome	PM2.5		NO2		O3	
	Long	Short	Long	Short	Long	Short
Total mortality	C / C	C / C	S / S	S / L	S / S	L / L
CV mortality	C / C	C / C				- / L
Respiratory mortality	C / -	C / C				- / L
Lung cancer	- / L / C[1]					
Respiratory effects	L / L	L / C	L / L	C / C	L / S	C / C
CV effects		C / C				L / S

[1] IARC 2013 (Group 1)

RESPIRAMI, 27-28 Jan 2017

The health research needs for coping with air pollution was the topic at the core of Prof. Krzyzanowski presentation. The speaker coming from London (UK), at the beginning of his presentation talked about the strength of evidence on health effects of $PM_{2.5}$, NO_2 and O_3 and the main levels of these elements in the air. Going deeper in his lecture, Prof. Krzyzanowski presented a huge amount of data on the health risk assessment, the reason for reducing the health risk of air pollution and on the research able to improve exposure-response functions. Finally, the speaker presented data on the accountability research and the pathways for the accountability assessment. In conclusion Prof. Krzyzanowski pointed out that the only need for more research on air pollution is justified by the observation that the provision of new information increases the effectiveness of the actions and reduces the health effects of the exposure, also if the existing evidence is sufficient for planning and implementing new strategies for a significative exposure reduction to air pollution.

Health-based reason to reduce the health risk of air pollution

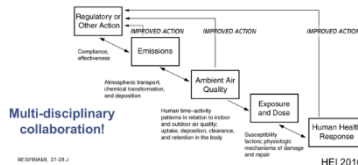✓ Causality of exposure
✓ Burden of disease / risk assessment

ACT NOW!!!
The evidence is sufficient!

Driving forces (economy)
Pressures (emissions)
State (concentrations)
Exposure
Effects
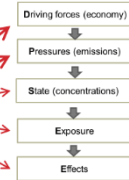
RESPIRAMI, 27-28 Jan 2017

Accountability research

- Monitoring of effects of intervention (changes in emissions, AQ, exposure and health);
- Identification of conditions of effective interventions;
- Optimization of interventions from health point of view;
- Information / policy support for effective intervention.

Multi-disciplinary collaboration!

RESPIRAMI, 27-28 J

HEI 2016

- What are the main causal pathways for an accountability assessment?
- What's about accountability research from the speaker point of view?
- What are the other health outcomes affected by air pollution presented by the speaker?
- What's about the research for improving the exposure-response functions from the speaker point of view?
- What are the possible types of local cost-effective studies presented by the speaker?

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