

# How important is air pollution in Lebanon?

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American University of Beirut

March 1, 2017

Courtesy of the AUB Collaborative for Inhaled and Atmospheric Aerosols (CARS)



The AUB Collaborative for the Study of Inhaled Atmospheric Aerosols (CARS)  
Cordially invites you to a public press conference on:

## Is Waste Incineration an Option For Lebanon?

### Agenda

- How important is air pollution in Lebanon? (FEA Dean Dr. Alan Shihadeh)
- What is incineration and waste to energy? (Dr. Joseph Zeaiter)
- Does it matter where in Beirut we put incinerators? (Dr. Issam Lakkis)
- What are the guidelines to install and monitor incinerator emissions around the world? (Dr. Najat A. Saliba)
- What are the economics of incineration? (Dr. Jad Chaaban)
- Q&A

Wednesday, March 1, 2017

10:00 AM – 12:00 PM

Issam Fares Institute – Auditorium

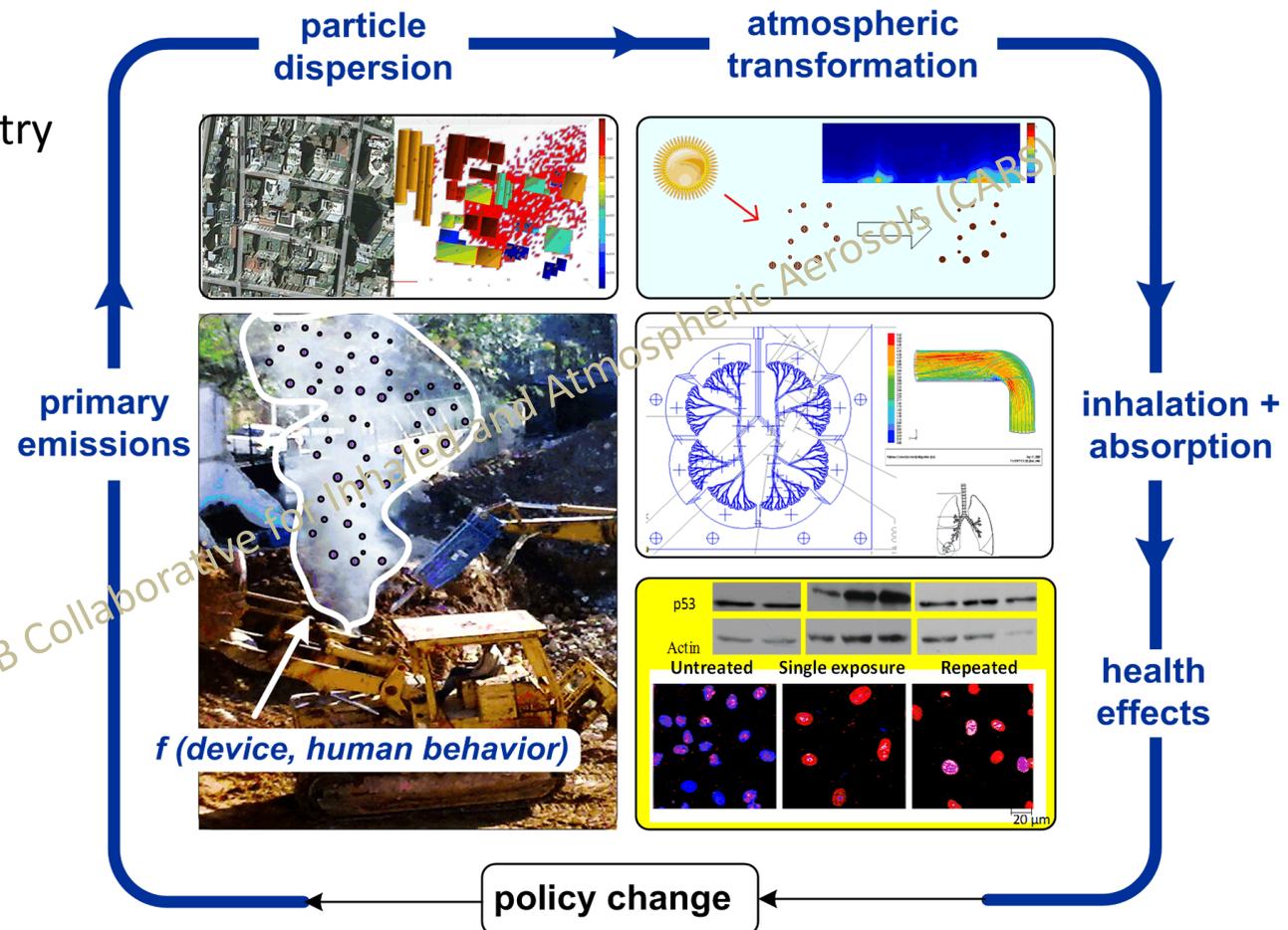


# AUB Collaborative for the Study of Inhaled & Atmospheric Aerosols

Cross-disciplinary University Research Program

- Urban air pollution
- Tobacco smoke
- Atmospheric chemistry
- Health effects

For more info:  
Najat Saliba  
or Alan Shihadeh

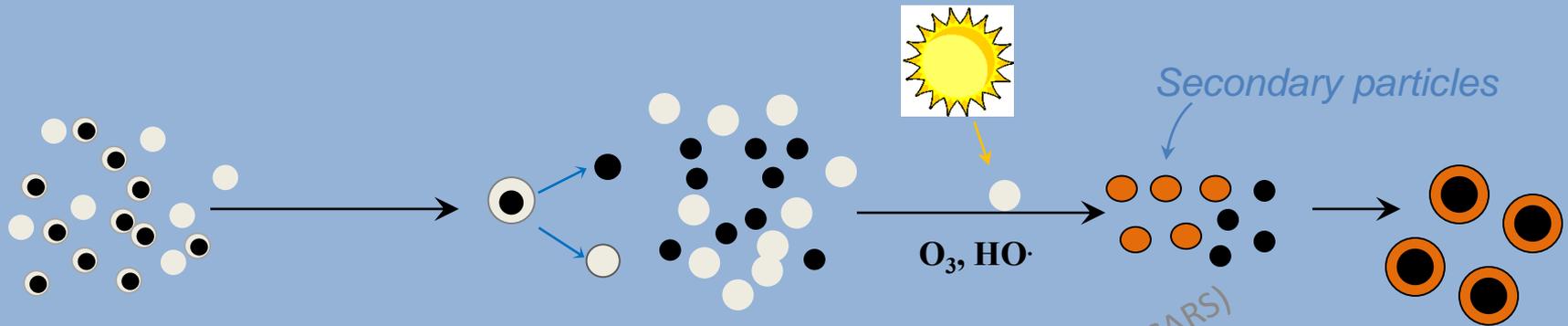


# Topics to cover

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- What is air pollution?
- Why does it matter?
- Does Beirut have an air pollution problem?

Courtesy of the AUB Collaborative for Inhaled and Atmospheric Aerosols (CARSA)



### 1. Primary Emissions

### 2. Atmospheric dilution & phase transformation

### 3. Atmospheric aging + photochemistry $\rightarrow$ Secondary aerosol formation



Courtesy of the AUB Collaborative for Inhaled and Atmospheric Aerosols (CARSI)

- Primary particles
- Non-volatile PM
- Semi-volatile PM species (SVOC) and Volatile Organics (VOC)
- Secondary particles

3/13/2012 (Courtesy of USJ AQRU)

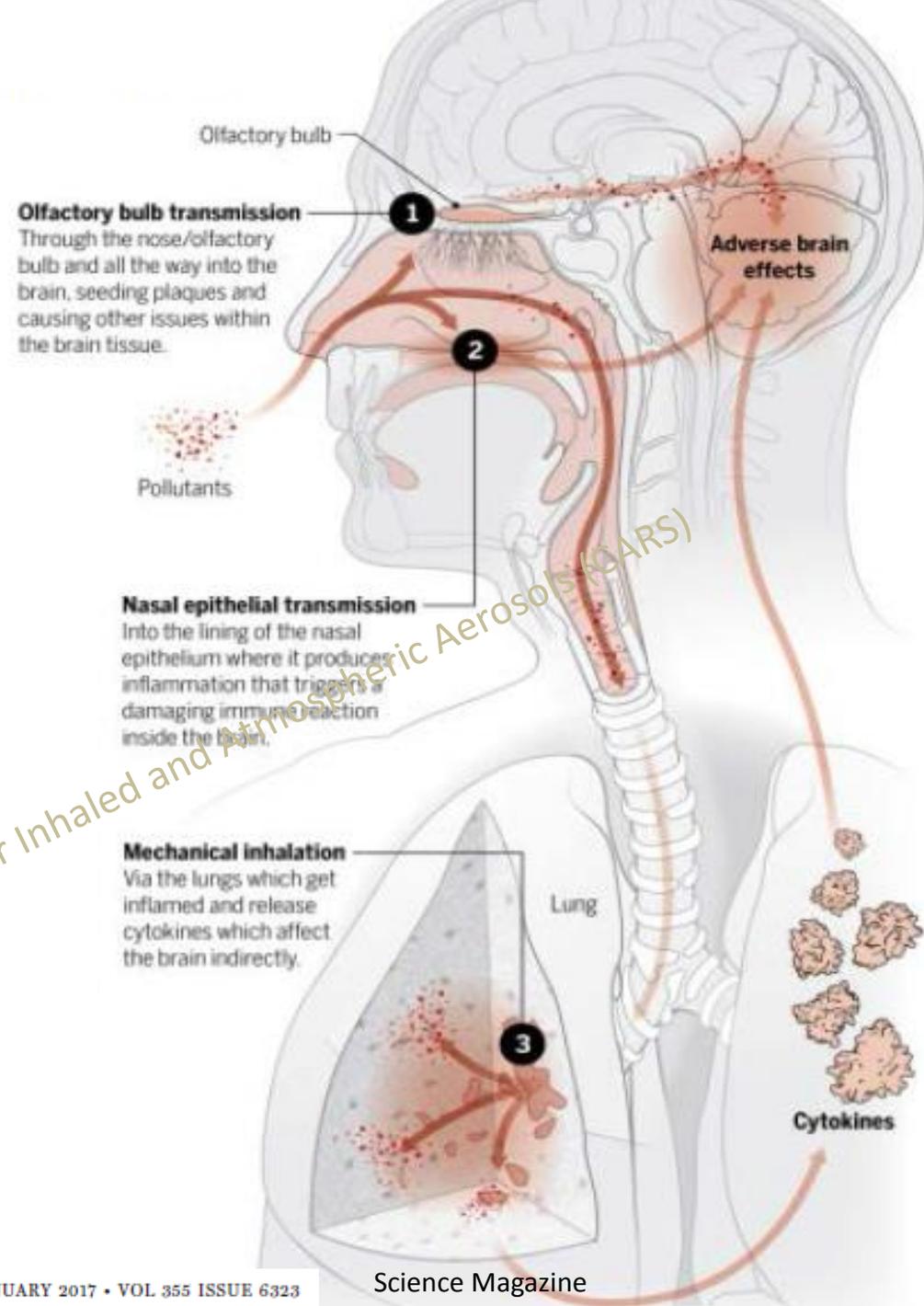
# Air pollution is: primary + secondary particles & gases

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Courtesy of the AUB Collaborative for Inhaled and Atmospheric Aerosols (CARA)

# Why does this matter?

- Cardiovascular disease
- Pulmonary disease
- Lung cancer
- Mental health
  - Alzheimer's
  - Depression
  - Learning ability
  - IQ



# Prenatal Polycyclic Aromatic Hydrocarbon (PAH) Exposure and Child Behavior at Age 6–7 Years

Frederica P. Perera,<sup>1,2</sup> Deliang Tang,<sup>1,2</sup> Shuang Wang,<sup>2,3</sup> Julia Vishnevetsky,<sup>1,2</sup> Bingzhi Zhang,<sup>2,3</sup> Diurka Diaz,<sup>1,2</sup> David Camann,<sup>4</sup> and Virginia Rauh<sup>2,5</sup>

**BACKGROUND:** Airborne polycyclic aromatic hydrocarbons (PAH) are widespread urban air pollutants from fossil fuel burning and other combustion sources. We previously reported that

a broad spectrum of cognition problems at 6–7 years (CCCEH) longitudinal study

**OBJECTIVES:** We evaluate of prenatal exposure—by

**METHODS:** Children of (NYC) were followed from air monitoring of the mother specific to benzo[*a*]pyrene (1 child behavior was assessed models were used to test

**RESULTS:** In multivariate air monitoring (greater than the median of 2.27 ng/m<sup>3</sup>) or maternal and cord adducts (detectable or higher), was positively associated with symptoms of Anxious/Depressed and Attention Problems ( $p \leq 0.05$ ).

**CONCLUSION:** These results provide additional evidence that environmental levels of PAH encountered in NYC air can adversely affect child behavior.

**KEY WORDS:** air pollution, child behavior, PAH, prenatal. *Environ Health Perspect* 120:921–926 (2012). <http://dx.doi.org/10.1289/ehp.1104315> [Online 14 March 2012]

“High prenatal PAH exposure, whether characterized by air monitoring (>2.27 ng/m<sup>3</sup>) or maternal cord adducts (detectable or higher), was positively associated with symptoms Anxious/Depressed and Attention Problems”

Courtesy of the AUB Collaborative for Inhaled and Atmospheric Aerosols (CIARA)

## **Parental occupational exposure to engine exhausts and childhood brain tumors.**

[Peters S](#), [Glass DC](#), [Reid A](#), [de Klerk N](#), [Armstrong BK](#), [Kellie S](#), [Ashton LJ](#), [Milne E](#), [Fritschi L](#).

Western Australian Institute for Medical Research, University of Western Australia, Perth, WA, Australia. [susan.peters@uwa.edu.au](mailto:susan.peters@uwa.edu.au).

Childhood brain tumors (CBT) are the leading cause of cancer death in children; their risk factors are still largely unknown. Since most CBTs are diagnosed before five years of age, prenatal exposure and early postnatal factors may be involved in their etiology. We investigated the association between CBT and parental occupational exposure to engine exhausts in an Australian population-based case-control study. Parents of 306 cases and 950 controls completed detailed occupational histories. Odds ratios (OR) and 95% confidence intervals (CI) were estimated for both maternal and paternal exposure in key time periods. Increased risks were observed for maternal exposure to diesel exhaust any time before the child's birth (OR 2.03, 95% CI 1.09-3.81) and paternal exposure around the time of the child's conception (OR 1.62, 95% CI 1.12-2.34). No clear associations with other engine exhausts were found. Our results suggest that parental occupational exposure to diesel exhaust may increase the risk of CBT. © 2012 Wiley Periodicals, Inc.

“Results suggest that parental occupational exposure to diesel exhaust may increase the risk of childhood brain tumors.”

Courtesy of the AUB Collaborative for Inhaled and Atmospheric Aerosols (CAR5)

# BMJ Open Association between neighbourhood air pollution concentrations and dispensed medication for psychiatric disorders in a large longitudinal cohort of Swedish children and adolescents

To cite: Oudin A, Bråbäck L, Åström DO, *et al.* Association between neighbourhood air pollution concentrations and dispensed medication for psychiatric disorders in a large longitudinal cohort of Swedish children and adolescents. *BMJ Open* 2016;6:e010004. doi:10.1136/bmjopen-2015-010004

Anna Oudin,<sup>1</sup> Lennart Bråbäck,<sup>1</sup> Daniel Oudin Åström,<sup>1</sup> Magnus Strömgren,<sup>2</sup> Bertil Forsberg<sup>1</sup>

“Children and adolescents living in areas with higher air pollution concentrations were more likely to have a dispensed medication for a psychiatric disorder”

## ABSTRACT

**Objective:** To investigate associations between exposure to air pollution and child and adolescent mental health.

**Design:** Observational study.

**Setting:** Swedish National Register data on dispensed medications for a broad range of psychiatric disorders, including sedative medications, sleeping pills and antipsychotic medications, together with socioeconomic and demographic data and a national land use regression model for air pollution concentrations for NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>.

**Participants:** The entire population under 18 years of age in 4 major counties. We excluded cohort members whose parents had dispensed a medication in the same medication group since the start date of the register. The cohort size was 552 221.

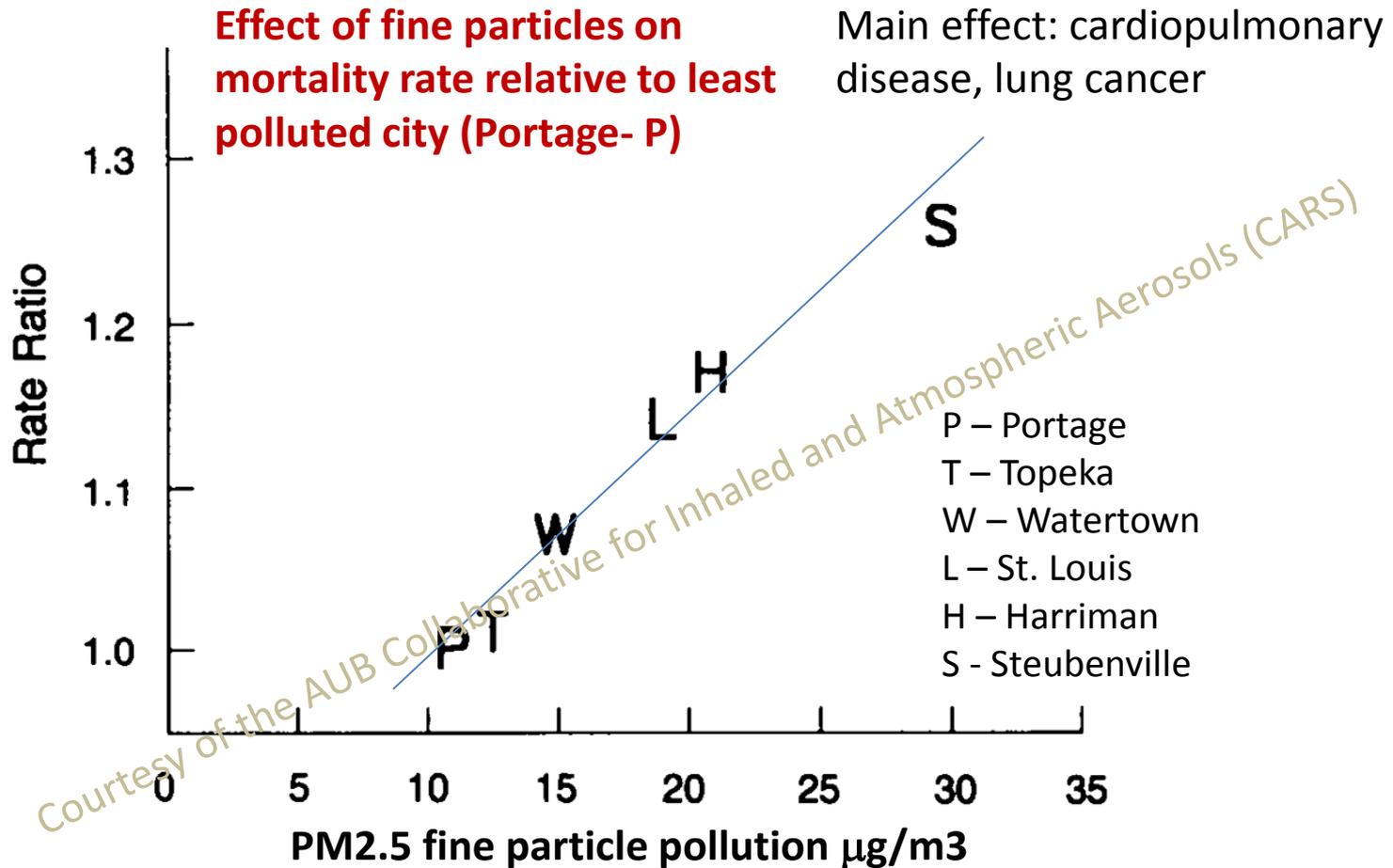
**Main outcome measures:** Cox proportional hazards models to estimate HRs and their 95% CIs for the outcomes, adjusted for individual-level and group-level characteristics.

**Results:** The average length of follow-up was 3.5 years, with an average number of events per 1000 cohort members of ~21. The mean annual level of NO<sub>2</sub> was 9.8 µg/m<sup>3</sup>. Children and adolescents living in areas with higher air pollution concentrations were more likely to have a dispensed medication for a psychiatric disorder during follow-up (HR=1.09, 95% CI 1.06 to 1.12, associated with a 10 µg/m<sup>3</sup> increase in NO<sub>2</sub>). The association with NO<sub>2</sub> was clearly present in 3 out of 4 counties in the study area; however, no statistically significant heterogeneity was detected.

**Conclusion:** There may be a link between exposure to air pollution and dispensed medications for certain psychiatric disorders in children and adolescents even

Courtesy of the NUB Collaborative for Inhaled and Atmospheric Particles (CARIS)

# “Harvard Six Cities Study” (Dockery, Pope, et al 2003)

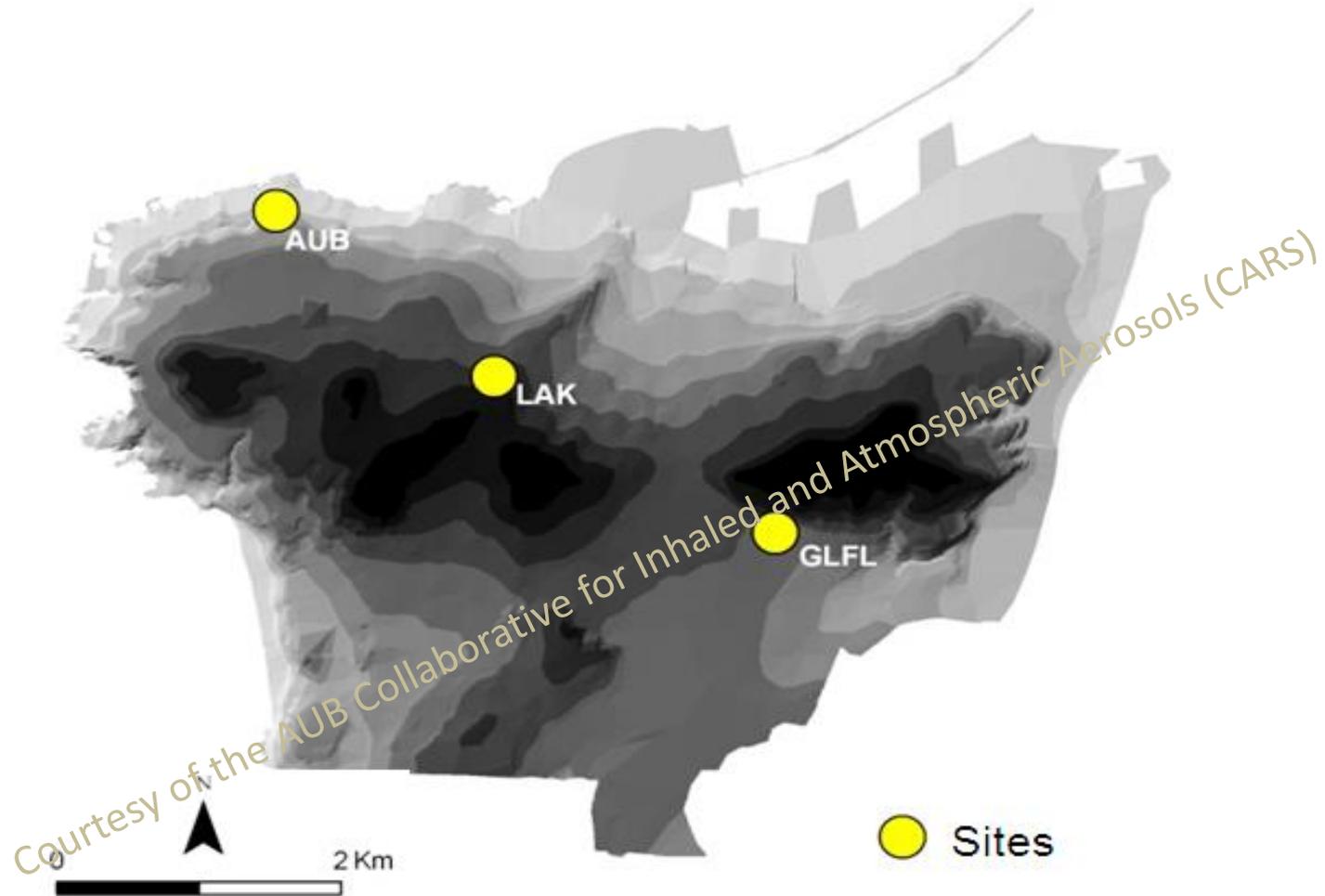


# Does Beirut have an air pollution problem?

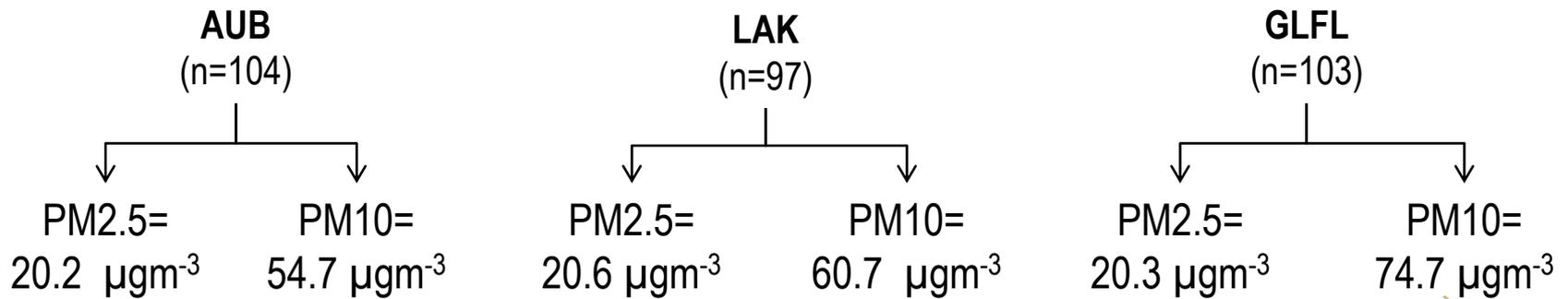
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Courtesy of the AUB Collaborative for Inhaled and Atmospheric Aerosols (CARSA)

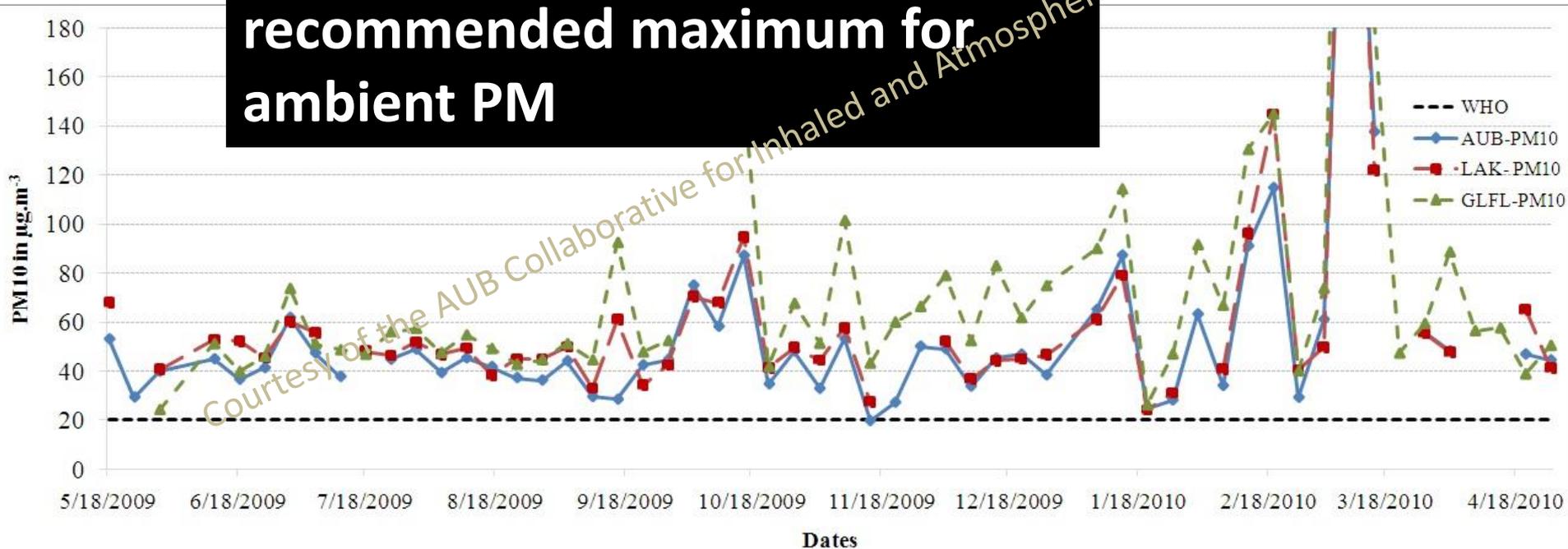
# Ambient Particulate Matter Observations in Beirut by AQRU



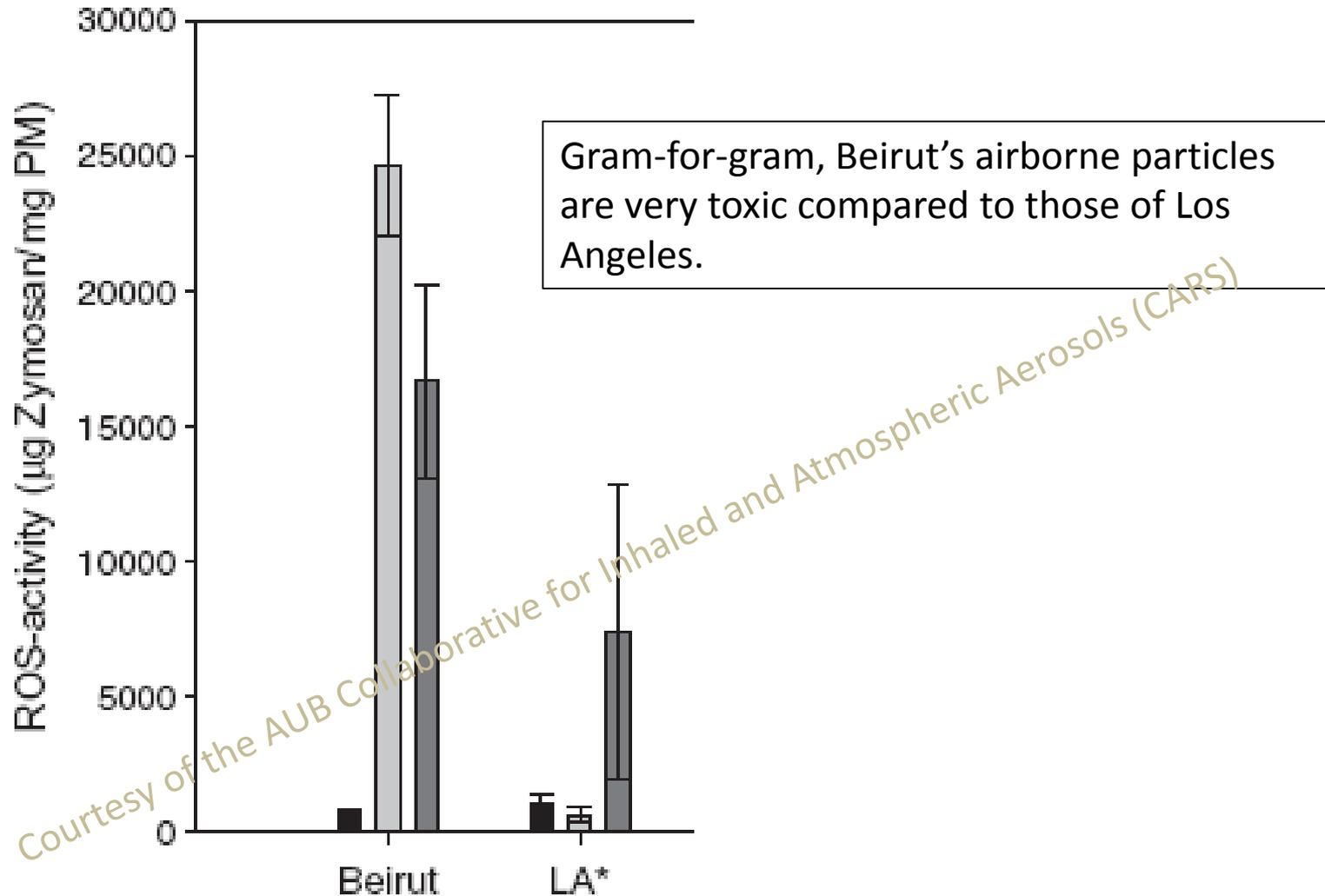
# Does Beirut have an air pollution problem?



**100%-200% greater than WHO recommended maximum for ambient PM**

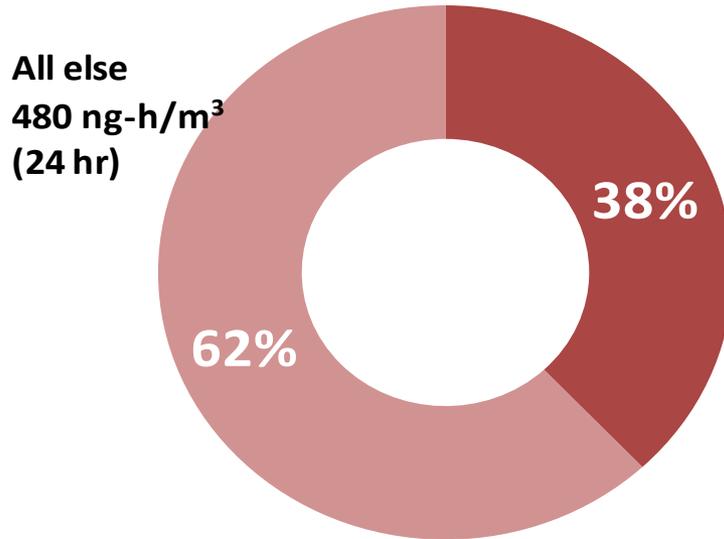


# Does Beirut have an air pollution problem?



# Diesel generators are an important, unnecessary pollutant source

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All else  
480 ng-h/m<sup>3</sup>  
(24 hr)

Generators  
295 ng-h/m<sup>3</sup>  
(3 hr/day)

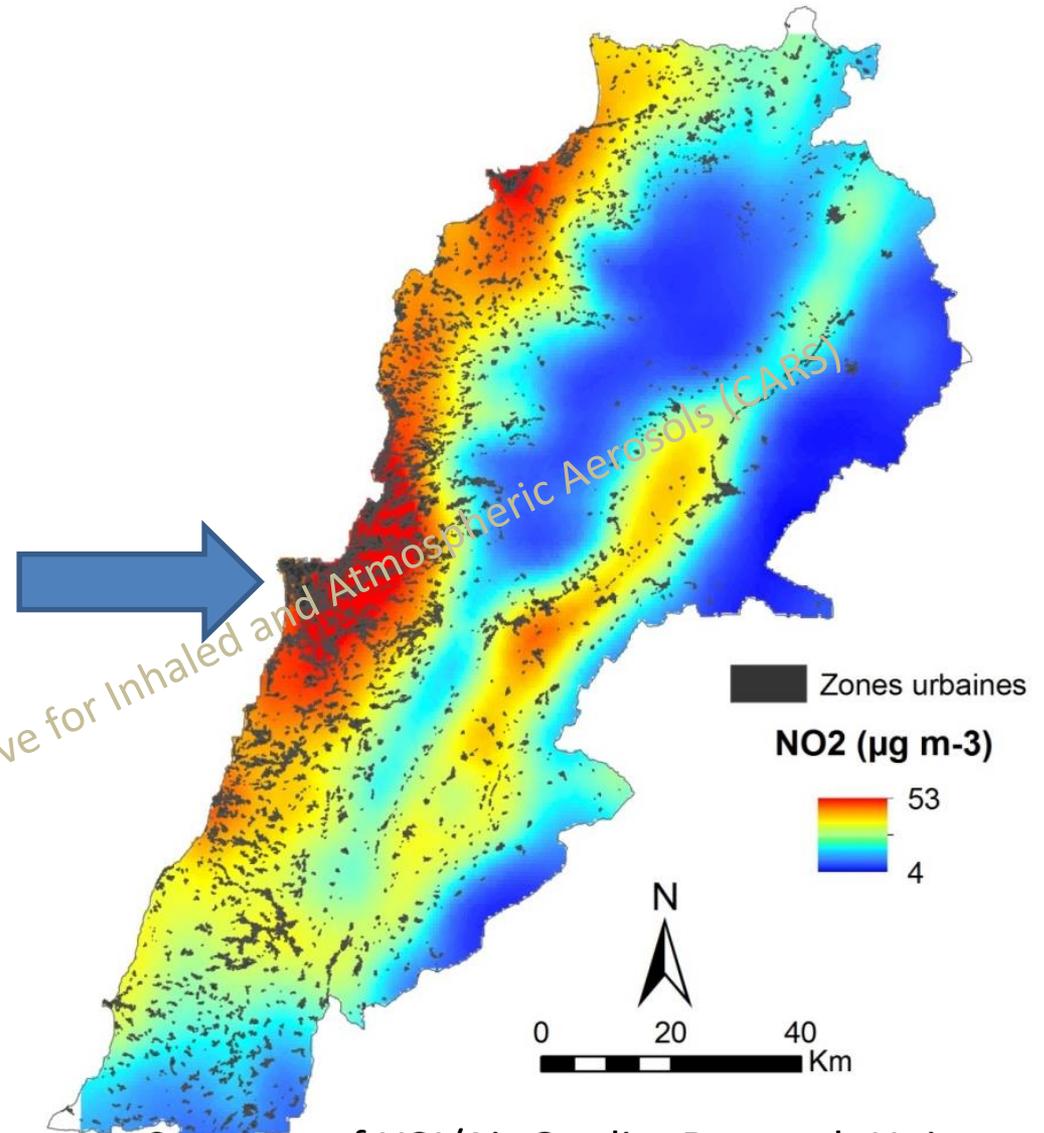
**Equivalent benzo(a)pyrene  
exposure to 1-2 cigarettes/day**

Courtesy of the AUB Collaborative for Inhaled and Atmospheric Aerosols (CAIAS)



# Lebanon is very sensitive to pollutant emissions

- Geography
- Weather



Courtesy of USJ/Air Quality Research Unit

Thank you for  
listening

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