

## Frailty Status Modifies the Association between Air Pollution Exposure and Post-MI Mortality: A 20-Year Follow-Up Study

Yariv Gerber<sup>1</sup>, Vicki Myers<sup>1</sup>, David Broday<sup>2</sup>, Yuval<sup>2</sup>, David Steinberg<sup>3</sup>, Yaacov Drory<sup>4</sup>

<sup>1</sup>*Epidemiology and Preventive Medicine, Tel Aviv University, Israel*

<sup>2</sup>*Environmental, Water and Agricultural Engineering, Technion, Israel*

<sup>3</sup>*Statistics and Operations Research, Tel Aviv University, Israel*

<sup>4</sup>*Rehabilitation, Tel Aviv University, Israel*

### **Background:**

Recent efforts in air pollution epidemiologic research have been directed toward the identification of susceptible subgroups. Myocardial infarction (MI) patients are a heterogeneous population exhibiting a wide range of risk profiles. Frailty, a non-specific, age-related syndrome of increasing vulnerability and decreasing resistance to stressors, has been demonstrated as an important determinant of post-MI risk.

### **Objective:**

To examine the association between cumulative exposure to fine particulate matter (PM<sub>2.5</sub>) and mortality according to frailty index, based on accumulation of deficits, in a geographically defined cohort of MI survivors.

### **Methods:**

Patients aged  $\leq 65$  years (n=1,120), admitted with first MI in 1992-1993 to the 8 hospitals serving the population of central Israel, were followed up for mortality through 2011. Extensive data were collected on socio-demographic, clinical, and environmental factors. Daily measures of PM<sub>2.5</sub> recorded at air quality monitoring stations were summarized, and cumulative exposure was estimated for each patient based on geo-coded residential location. A previously validated frailty index comprising 32 baseline variables was used, including self-rated health, functional limitations, comorbidity, weight loss and physical activity. Cox models were used to assess the hazard ratio (HR) for mortality associated with PM<sub>2.5</sub> exposure, overall and by frailty score.

### **Results:**

Cumulative PM<sub>2.5</sub> exposure estimates range from 17-29 (mean, 24)  $\mu\text{g}/\text{m}^3$ . Frailty score ranged from 0.00-0.44 (mean, 0.10). During 16,806 person-years of follow-up, 469 deaths occurred. After multivariable adjustment for potential confounding variables including socioeconomic and clinical factors, a modest, non-significant increase in mortality was associated with increasing PM<sub>2.5</sub> exposure (HR=1.10; 95% CI: 0.97-1.25; comparing the 75th vs. 25th percentiles). However, the relationship differed markedly by frailty status (p for interaction=0.005), with a stronger association observed among frailer patients (Table). The latter interaction appeared stronger for cardiac death.

### **Conclusion:**

Less robust MI patients might be more sensitive to air pollution effects, and may benefit most from preventive interventions.

| <b>Included in Analysis</b> | <b>Sample Size (No. of Deaths)</b> | <b>HR (95% CI)</b> |
|-----------------------------|------------------------------------|--------------------|
| No exclusion                | 1,120 (469)                        | 1.10 (0.97-1.25)   |
| Frailty score $\geq 0.05$   | 815 (396)                          | 1.10 (0.95-1.27)   |
| Frailty score $\geq 0.10$   | 462 (270)                          | 1.18 (0.99-1.40)   |
| Frailty score $\geq 0.15$   | 260 (180)                          | 1.30 (1.05-1.62)   |
| Frailty score $\geq 0.20$   | 137 (104)                          | 1.48 (1.09-2.02)   |
| Frailty score $\geq 0.25$   | 58 (44)                            | 1.76 (1.02-3.05)   |