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Individual, socioeconomic and environmental predictors of STEMI mortality in Belgium: towards a holistic approach of the risk of cardiovascular death

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Background: Disparities in access to care and environmental exposures may contribute to differences in STEMI mortality. Impact of gender, socio-economic and environmental factors on STEMI outcomes remains underexplored.

Purpose: To examine independent associations between individuals characteristics, socio-economic status (SES), environmental exposure at living address and STEMI mortality. We hypothesize environmental exposures contributing to worse outcomes, particularly among socio-economically vulnerable populations.

Methods: We collected national health insurance data covering all STEMI admissions in Belgium in 2012-2014 and 2016-2021. We linked individual-level socio-economic variables (income categories, professional category and marital state), and environmental factors (air particle, gases, and noise pollution, temperature and green space) modelled at patients' living addresses. Logistic regression models were adjusted for key demographic, clinical, and temporal factors to assess determinants of in-hospital mortality.

Results: We recorded 51,544 STEMI admissions (mean age 68 years, 71% male) over nine years, equating to 50.8 annual cases per 100,000 inhabitants. First-time STEMI presentations (81.2%) declined significantly over time ($p=0.016$). National PM2.5, PM10, and NO2 levels increased, while O3 rose ($p<0.001$). In-hospital mortality was 11.4% overall and 6.1% in revascularized patients. Women were revascularized less often (66% vs. 82%, $p<0.001$) and had higher in-hospital mortality (17.3% vs. 9.4%, $p<0.001$). Multivariable analysis linked mortality risk to older age, diabetes, retirement, and unemployment. Lower income showed a stepwise increase in mortality risk. Higher NO_2 and PM2.5 exposure were linked to greater mortality, while O3, ambient temperature, and greater distance from main roads were associated with lower risk.

Conclusion: Our holistic approach of a large-scale dataset of STEMI reveals numerous non-traditional factors associated with in hospital mortality. While STEMI admission rate declined over time, significant gender and socio-economic disparities persist. Women were less likely to undergo revascularization, contributing to their higher unadjusted in-hospital mortality. Lower income and unemployment were independently associated with increased mortality risk, highlighting the impact of socio-economic inequities. Additionally, long-term exposure to NO_2 and PM2.5 was linked to higher in-hospital mortality, while O_3, ambient temperature, and greater residential distance from main roads were associated with lower risk. These findings emphasize the urgent need to target some "holistic evidence"-based interventions to reduce gender, socioeconomic and environmental disparities in STEMI outcomes.