Supplement

Evaluation of a meta-analysis of air quality and heart attacks, a case study

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**11 Pages, 1 Table**

Case Study Selection Strategy

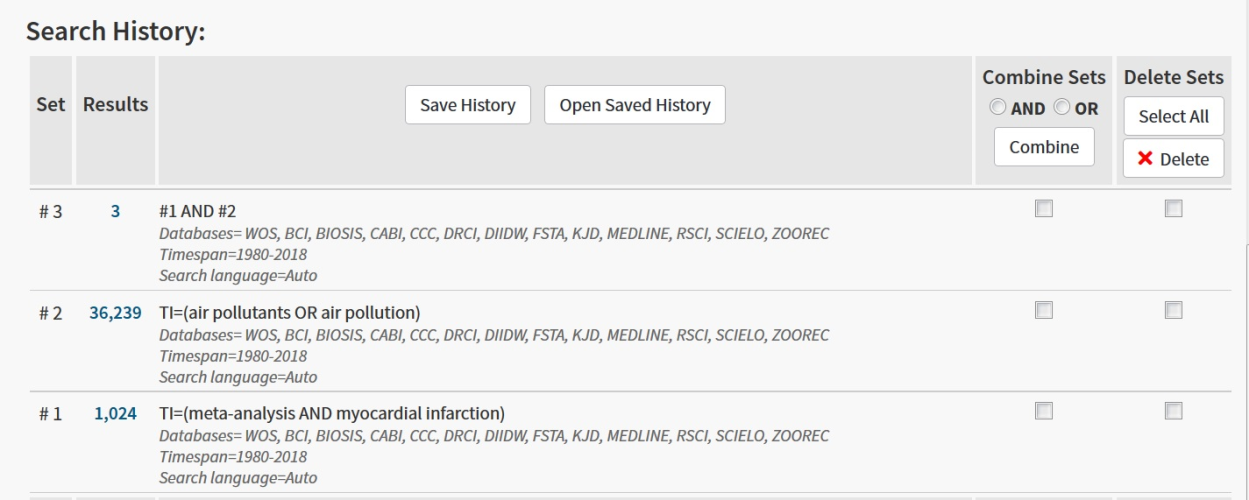
For the selection of our case study, we performed a search using the Web of Science electronic database (Clarivate Analytics, Philadelphia, PA) within the University of Alberta libraries system (www.library.ualberta.ca) on 28 June 2018.

Web of Science (formerly ISI Web of Knowledge) is an online subscription-based scientific citation indexing service of multiple databases that reference cross-disciplinary research. Web of Science includes over 50,000 scholarly books, 12,000 journals and 160,000 conference proceedings.

We searched the Web of Science records between the period 1 January 1980 and 28 June 2018 using the following strategy:

* An initial search was performed using the terms *meta-analysis* AND *myocardial infarction* within a record title. This search yielded 1,024 results.
* A second independent search was performed using the terms *air pollutants* OR *air pollution* within a record title. This search yielded 36,239 results.
* A combined search of initial and secondary results was then performed. This search yielded 3 results.

A screenshot image of the Web of Science search history results is shown below:



The Web of Science record for set #3 results was:

1. Main Air Pollutants and Myocardial Infarction A Systematic Review and Meta-analysis

By: Mustafic, Hazrije; Jabre, Patricia; Caussin, Christophe; et al.

JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

Volume: 307 Issue: 7 Pages: 713-721

Published: FEB 15 2012

Times Cited: 226 (from All Web of Science Databases)a

a Web of Science note – *As of March/April 2018, this highly cited paper received enough citations to place it in the top 1% of its academic field based on a highly cited threshold for the field and publication year*.

2. Short-term exposure to particulate air pollution and risk of myocardial infarction: a systematic review and meta-analysis

By: Luo, Chunmiao; Zhu, Xiaoxia; Yao, Cijiang; et al.

ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH

Volume: 22 Issue: 19 Pages: 14651-14662

Published: OCT 2015

Times Cited: 11 (from All Web of Science Databases)

3. Air Pollution and Myocardial Infarction: A Systematic Review and Meta-Analysis

By: Mustafic, Hazrije; Jabre, Patricia; Caussin, Christophe; et al.

CIRCULATION

Volume: 124 Issue: 21 Supplement: S Meeting Abstract: A11876

Published: NOV 22 2011

Times Cited: 0 (from All Web of Science Databases)

The 1st study (Main Air Pollutants and Myocardial Infarction A Systematic Review and Meta-analysis) had the highest citation record and was selected as the case study.

# References of 34 Base Papers used in Case Study (number indicated on the left is the reference number in Mustafic et al. (2012))

7. Braga AL, Zanobetti A, Schwartz J. 2001. The lag structure between particulate air pollution and respiratory and cardiovascular deaths in 10 US cities. J Occup Environ Med. 43(11):927−933.

8. Koken PJ, Piver WT, Ye F, et al. 2003. Temperature, air pollution, and hospitalization for cardiovascular diseases among elderly people in Denver. Environ Health Perspect. 111(10):1312−1317.

9. Barnett AG, Williams GM, Schwartz J, et al. 2006. The effects of air pollution on hospitalizations for cardiovascular disease in elderly people in Australian and New Zealand cities. Environ Health Perspect. 114(7):1018−1023.

10. Berglind N, Ljungman P, Moller J, et al. 2010. Air pollution exposure: a trigger for myocardial infarction? Int J Environ Res Public Health. 7(4):1486−1499.

11. Cendon S, Pereira LA, Braga AL, et al. 2006. Air pollution effects on myocardial infarction. Rev Saude Publica. 40(3):414−419.

12. Linn WS, Szlachcic Y, Gong H Jr, et al. 2000. Air pollution and daily hospital admissions in metropolitan Los Angeles. Environ Health Perspect. 108(5):427−434.

19. Ye F, Piver WT, Ando M, et al. 2001. Effects of temperature and air pollutants on cardiovascular and respiratory diseases for males and females older than 65 years of age in Tokyo, July and August 1980-1995. Environ Health Perspect. 109(4):355−359.

20. Peters A, Dockery DW, Muller JE, et al. 2001. Increased particulate air pollution and the triggering of myocardial infarction. Circulation. 103(23):2810−2815.

21. Rich DQ, Kipen HM, Zhang J, et al. 2010. Triggering of transmural infarctions, but not nontransmural infarctions, by ambient fine particles. Environ Health Perspect. 118(9):1229−1234.

22. Sullivan J, Sheppard L, Schreuder A, et al. 2005. Relation between short-term fine-particulate matter exposure and onset of myocardial infarction. Epidemiology. 16(1):41−48.

23. Eilstein D, Quenel P, Hedelin G, et al. 2001. Air pollution and myocardial infarction: Strasbourg France, 1984-89 [in French]. Rev Epidemiol Sante Publique. 49(1):13−25.

24. Lanki T, Pekkanen J, Aalto P, et al. 2006. Associations of traffic related air pollutants with hospitalisation for first acute myocardial infarction: the HEAPSS study. Occup Environ Med. 63(12):844−851.

25. Mate T, Guaita R, Pichiule M, et al. 2010. Short-term effect of fine particulate matter (PM2.5) on daily mortality due to diseases of the circulatory system in Madrid (Spain). Sci Total Environ. 408(23):5750−5757.

26. Medina S, Le Tertre A, Quenel P, et al. 1997. Air pollution and doctors’ house calls: results from the ERPURS system for monitoring the effects of air pollution on public health in Greater Paris, France, 1991-1995: Evaluation des Risques de la Pollution Urbaine pour la Sante´. Environ Res. 75(1):73−84.

27. Poloniecki JD, Atkinson RW, de Leon AP, et al. 1997. Daily time series for cardiovascular hospital admissions and previous day’s air pollution in London, UK. Occup Environ Med. 54(8):535−540.

28. Stieb DM, Szyszkowicz M, Rowe BH, et al. 2009. Air pollution and emergency department visits for cardiac and respiratory conditions: a multi-city time-series analysis. Environ Health. 8:25. doi:org/10.1186/1476-069X-8-25.

29. Zanobetti A, Schwartz J. 2005. The effect of particulate air pollution on emergency admissions for myocardial infarction: a multicity case-crossover analysis. Environ Health Perspect. 113(8):978−982.

30. Zanobetti A, Franklin M, Koutrakis P, et al. 2009. Fine particulate air pollution and its components in association with cause-specific emergency admissions. Environ Health. 8:58. doi:org/10.1186/1476-069X-8-58.

31. Zanobetti A, Schwartz J. 2009. The effect of fine and coarse particulate air pollution on mortality: a national analysis. Environ Health Perspect. 117(6):898−903.

32. Hoek G, Brunekreef B, Verhoeff A, et al. 2000. Daily mortality and air pollution in The Netherlands. J Air Waste Manag Assoc. 50(8):1380−1389.

33. Cheng MF, Tsai SS, Yang CY. 2009. Air pollution and hospital admissions for myocardial infarction in a tropical city: Kaohsiung, Taiwan. J Toxicol Environ Health A. 72(19):1135−1140.

34. Hsieh YL, Yang YH, Wu TN, et al. 2010. Air pollution and hospital admissions for myocardial infarction in a subtropical city: Taipei, Taiwan. J Toxicol Environ Health A. 73(11):757−765.

35. Pope CA III, Muhlestein JB, May HT, et al. 2006. Ischemic heart disease events triggered by short-term exposure to fine particulate air pollution. Circulation. 114(23):2443−2448.

36. D’Ippoliti D, Forastiere F, Ancona C, et al. Air pollution and myocardial infarction in Rome: a casecrossover analysis. Epidemiology. 14(5):528−535.

37. Henrotin JB, Zeller M, Lorgis L, et al. 2010. Evidence of the role of short-term exposure to ozone on ischaemic cerebral and cardiac events: the Dijon Vascular Project (DIVA). Heart. 96(24):1990−1996.

38. Ueda K, Nitta H, Ono M. 2009. Effects of fine particulate matter on daily mortality for specific heart diseases in Japan. Circ J. 73(7):1248−1254.

39. Mann JK, Tager IB, Lurmann F, et al. 2002. Air pollution and hospital admissions for ischemic heart disease in persons with congestive heart failure or arrhythmia. Environ Health Perspect. 110(12):1247−1252.

40. Sharovsky R, Ce´ sar LA, Ramires JA. 2004. Temperature, air pollution, and mortality from myocardial infarction in Sao Paulo, Brazil. Braz J Med Biol Res. 37(11):1651−1657.

41. Belleudi V, Faustini A, Stafoggia M, et al. 2010. Impact of fine and ultrafine particles on emergency hospital admissions for cardiac and respiratory diseases. Epidemiology. 21(3):414−423.

42. Nuvolone D, Balzi D, Chini M, et al. 2011. Short-term association between ambient air pollution and risk of hospitalization for acute myocardial infarction: results of the cardiovascular risk and air pollution in Tuscany (RISCAT) study. Am J Epidemiol. 174(1):63−71.

43. Peters A, von Klot S, Heier M, et al. 2005. Particulate air pollution and nonfatal cardiac events, part I: air pollution, personal activities, and onset of myocardial infarction in a case-crossover study. Res Rep Health Eff Inst. (124):1−66.

44. Ruidavets JB, Cournot M, Cassadou S, et al. 2005. Ozone air pollution is associated with acute myocardial infarction. Circulation. 111(5):563−569.

45. Zanobetti A, Schwartz J. 2006. Air pollution and emergency admissions in Boston, MA. J Epidemiol Community Health. 60(10):890−895.

46. Bhaskaran K, Hajat S, Armstrong B, et al. 2011. The effects of hourly differences in air pollution on the risk of myocardial infarction: case crossover analysis of the MINAP database. BMJ. 343:d5531.

**Table S1 Summary description of Mustafic et al. (2012) base studies.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Cit #1** | **Location** | **Time period** | **Data source** | **MI events** | **Air pollutants** | **Study type** | **Model type** | **Study quality2** |
| 7 | 10 US  cities | 1986−1993 | Death registry | Not given | PM10 | Time-series | Mono-pollutant | Good |
| 8 | Denver,  US | 1993−1997 | MI hospital admissions | 1,576 | O3, CO, NO2, SO2, PM10 | Time-series | Mono-pollutant | Low |
| 9 | Australia (5 cities), New Zealand (2 cities) | 1998−2001 | MI hospital admissions | Not given | O3, CO, NO2, PM10, PM2.5 | Case crossover | Mono-pollutant & multi-pollutant | Good |
| 10 | Stockholm, Sweden | 2001−2007 | MI registry | 660 | O3, CO, NO2, PM10 | Case crossover | Mono-pollutant | Intermediate |
| 11 | Sao Paulo, Brazil | 1998−1999 | MI hospital admissions | 19,272 | O3, CO, NO2, SO2, PM10 | Time-series | Mono-pollutant | Low |
| 12 | Los Angeles, US | 1988−1994 | MI hospital admissions | Not given | O3, CO, NO2, PM10 | Time-series | Mono-pollutant | Intermediate |
| 19 | Tokyo, Japan | 1980−1995 | MI emergency hospital admissions | Not given | O3, CO, NO2, SO2, PM10 | Time-series | Mono-pollutant | Low |
| 20 | Boston,  US | 1999−2001 | MI registry | 772 | O3, CO,  NO2, SO2, PM10, PM2.5 | Case crossover | Mono-pollutant | Low |
| 21 | New Jersey, US | 2004−2006 | MI hospital admissions | 5,864 | PM2.5 | Case crossover | Multi-pollutant | Intermediate |
| 22 | Washington, DC | 1988−1994 | MI hospital admissions | 5,793 | CO, NO2, PM2.5 | Case crossover | Mono-pollutant | Intermediate |
| 23 | Strasbourg, France | 1984−1989 | MI registry | Not given | O3, CO,  NO2, SO2 | Time-series | Mono-pollutant | Good |

1 Citation number of Mustafic et al. (2012) base study.

2 General quality rating of study assigned by Mustafic et al. (2012).

**Table S1 Summary description of Mustafic et al. (2012) base studies (con’t).**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Cit #1** | **Location** | **Time period** | **Data source** | **MI events** | **Air pollutants** | **Study type** | **Model type** | **Study quality2** |
| 24 | Europe  (5 cities) | 1992−2000 | MI registry & MI hospital admissions | 26,854 | O3, CO, NO2, PM10 | Time-series | Mono-pollutant | Good |
| 25 | Madrid,  Spain | 2003−2005 | Death registry | 1,096 | PM2.5 | Time-series | Mono-pollutant | Good |
| 26 | Paris,  France | 1991−1995 | Registry  of doctor’s house calls | Not given | O3, NO2,  SO2, PM10 | Time-series | Mono-pollutant | Low |
| 27 | London, UK | 1987−1994 | MI hospital admissions | 68,300 | O3, CO,  NO2, SO2 | Time-series | Mono-pollutant & multi-pollutant | Good |
| 28 | 14 cities  in Canada | 1992−2003 | MI emergency hospital admissions | 63,184 | O3, CO,  NO2, SO2, PM10, PM2.5 | Time-series | Mono-pollutant | Low |
| 29 | 21 US cities | 1986−1999 | MI hospital admissions | 302,245 | PM10 | Case crossover | Mono-pollutant | Intermediate |
| 30 | 112 US  cities | 1999−2005 | Death registry | 397,894 | PM2.5 | Time-series | Mono-pollutant | Intermediate |
| 31 | 26 US cities | 2000−2003 | MEDICARE registry & MI hospital admissions | 121,652 | PM2.5 | Time-series | Mono-pollutant | Intermediate |
| 32 | Netherlands | 1986−1994 | Death registry | 62 per day | O3, CO, NO2, SO2, PM10 | Time-series | Mono-pollutant | Good |
| 33 | Kaohsiung, Taiwan | 1996−2006 | MI hospital admissions | Not given | O3, NO2, SO2, PM10 | Case crossover | Mono-pollutant & multi-pollutant | Low |
| 34 | Taipei, Taiwan | 1996−2006 | MI hospital admissions | 23,420 | O3, CO, NO2, SO2, PM10 | Case crossover | Mono-pollutant | Low |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Cit #1** | **Location** | **Time period** | **Data source** | **MI events** | **Air pollutants** | **Study type** | **Model type** | **Study quality2** |
| 35 | Utah,  US | 1991−2001 | Angiographic registry | 3,910 | PM2.5 | Case crossover | Mono-pollutant | Intermediate |
| 36 | Roma,  Italy | 1995−1997 | MI hospital admissions | 6,531 | CO, NO2 | Case crossover | Mono-pollutant | Good |
| 37 | Dijon,  France | 2001−2007 | MI registry | 771 | O3 | Case crossover | Multi-pollutant | Good |
| 38 | 9 cities  in Japan | 2002−2004 | Death registry | 67,897 | PM2.5 | Time-series | Mono-pollutant | Low |
| 39 | California,  US | 1988−1995 | Insurance registry | 19,690 | O3, CO, NO2, PM10 | Time-series | Mono-pollutant | Intermediate |
| 40 | Sao Paulo, Brazil | 1996−1998 | Death registry | 12,007 | CO, SO2, PM10 | Time-series | Mono-pollutant | Good |
| 41 | Roma,  Italy | 2001−2005 | MI emergency hospital admissions | 22,659 | PM10, PM2.5 | Case crossover | Mono-pollutant | Intermediate |
| 42 | Tuscany, Italy | 2002−2005 | MI registry | 11,450 | CO, NO2, PM10 | Case crossover | Mono-pollutant & multi-pollutant | Intermediate |
| 43 | Augsburg, Germany | 1999−2001 | MI registry | 851 | O3, CO,  NO2, SO2, PM10, PM2.5 | Case crossover | Mono-pollutant | Low |
| 44 | Toulouse, France | 1997−1999 | MI registry | 399 | O3, NO2, SO2 | Case crossover | Mono-pollutant | Good |
| 45 | Boston,  US | 1995−1999 | MI hospital admissions | 15,578 | O3, CO, NO2, PM2.5 | Case crossover | Mono-pollutant | Good |
| 46 | England & Wales | 2003−2006 | MI registry | 79,288 | O3, CO, NO2, PM2.5 | Case crossover | Mono-pollutant & multi-pollutant | Good |

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