



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Center for Public Health and Environmental Effects
109 T.W. Alexander Drive, Research Triangle Park, NC 27711

OFFICE OF
RESEARCH AND DEVELOPMENT

October 28, 2020

MEMORANDUM

Subject: Short-Term Cardiovascular Morbidity and Mortality Studies Excluded from the Draft Ozone ISA Based on Location and Considered for Final Ozone ISA

From: Tom Luben, PhD
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To: The Integrated Science Assessment (ISA) for Ozone Docket, EPA-HQ-ORD-2018-0274

The attachment, transmitted to the Clean Air Scientific Advisory Committee in response to a request made during its review of the draft Integrated Science Assessment (ISA) for Ozone,¹ lists studies on (1) short-term ozone exposure and hospital admissions or emergency department (ED) visits for cardiovascular endpoints; (2) short-term ozone exposure and cardiovascular endpoints measured in panel studies; and (3) short-term ozone exposure and mortality that were excluded from the September 2019 Draft Ozone ISA due to the location where the study was conducted (consistent with the PECOS² tools described in Table 10-2 of the Draft ISA). As summarized in the attachment, in developing the draft ISA, these studies were:

- Identified by our literature search (January 1, 2011 – March 30, 2018)
- Deemed to be relevant to the ISA based on screening of the title and abstract
- Excluded from further consideration because the study did not fall within the scope of the ISA as defined by the PECOS tool (Table 10-2). In these cases, the studies were excluded due to the location where the study was conducted.

¹The attachment is also available in the Meeting Materials posted for the December 2019 CASAC meeting at <https://yosemite.epa.gov/sab/sabproduct.nsf/MeetingCal/A0D0F9D4C6BC36D88525848C00467771?OpenDocument>. The document is available at:

[https://yosemite.epa.gov/sab/sabproduct.nsf/F35EAC7EA95C2BCC852584CC00685FCF/\\$File/ST+CVD+and+mortality+studies+excluded+from+Draft+Ozone+ISA+based+on+location.pdf](https://yosemite.epa.gov/sab/sabproduct.nsf/F35EAC7EA95C2BCC852584CC00685FCF/$File/ST+CVD+and+mortality+studies+excluded+from+Draft+Ozone+ISA+based+on+location.pdf)

² PECOS: Population, Exposure, Comparator, Outcome, Study Design

In response to the CASAC recommendation that the causality determinations for short-term ozone exposure and mortality and short-term ozone exposure and cardiovascular effects be reconsidered with these additional studies as part of the literature set (Cox, 2020, p. 16 of Responses to Charge Questions), the EPA reviewed and considered each of these 114 unique epidemiologic studies in developing the Final ISA (see e.g., p. 4-3). When evaluating the short-term ozone exposure and cardiovascular morbidity studies listed below, staff determined that the additional studies do not provide evidence that would materially change the conclusions presented in the Draft ISA. That is, some of the additional epidemiologic studies report positive associations with cardiovascular morbidity outcomes, while others report null or negative associations. Together, these studies do not reduce any of the uncertainties inherent in the body of epidemiologic evidence included in the Draft ISA. As described in Section 4.1.17 of the final ISA, the change in the causality determination for short-term ozone exposure and cardiovascular effects was largely driven by the change in the nature of the evidence from controlled human exposure studies. Consistent with the conclusion that the additional epidemiologic studies from Asia and South America do not materially change the weight of evidence, the causality determination in the Final ISA was the same as that in the Draft ISA.

Similarly, when evaluating the short-term ozone exposure and mortality studies listed below, staff determined that the additional studies do not provide evidence that would materially change the conclusions presented in the Draft ISA. That is, the additional epidemiologic studies consistently observe positive associations with mortality, consistent with the body of epidemiologic evidence included in the Draft ISA. However, the change in the causality determination for short-term ozone exposure and mortality was largely driven by the change in the nature of the evidence from controlled human exposure studies evaluating cardiovascular morbidity, which call into question the biological plausibility of associations of short-term ozone exposure and total mortality, as described in Section 6.1.8 of the Final ISA, due to cardiovascular mortality comprising the largest percent of total mortality. Consistent with the conclusion that the additional epidemiologic studies from outside of North America do not materially change the weight of evidence, the causality determination in the Final ISA was the same as that in the Draft ISA.

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**Short-Term Cardiovascular Morbidity and Mortality Studies Excluded
from the Draft Ozone ISA Based on Location**

Attached are lists of studies for transmittal to the Clean Air Scientific Advisory Committee in response to a request made during the December 4-5, 2019 meeting on the draft Integrated Science Assessment for Ozone.

The attached lists include studies on (1) short-term ozone exposure and hospital admissions or ED visits for cardiovascular endpoints; (2) short-term ozone exposure and cardiovascular endpoints measured in panel studies; and (3) short-term ozone exposure and mortality that were excluded from the Draft Ozone ISA due the location where the study was conducted (consistent with the PECOS tools described in Table 10-2 of the Draft ISA).

Specifically, these studies were:

- Identified by our literature search (January 1, 2011 – March 30, 2018)
- Deemed to be relevant to the ISA based on screening of the title and abstract
- Excluded from further consideration because the study did not fall in the scope of the ISA as defined by the PECOS tool (Table 10-2). In these cases, the studies were excluded due to the location where the study was conducted.

Please let me know if you have any questions or would like any additional information.

Thank you,

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Short-term Ozone Exposure and CVD Hospital Admission and ED Visit studies excluded from Draft Ozone ISA based on location (Outside of North America, Europe or Australia)

1. Javanmardi, P; Morovati, P; Farhadi, M; Geravandi, S; Khaniabadi, YO; Angali, KA; Taiwo, AM; Sicard, P; Goudarzi, G; Valipour, A; De Marco, A; Rastegarimehr, B; Mohammadi, MJ (2018) Monitoring the impact of ambient ozone on human health using time series analysis and air quality model approaches Fresenius Environmental Bulletin 27:533-544. [HERO ID: 4261889](#)
2. Akbarzadeh, MA; Khaheshi, I; Sharifi, A; Yousefi, N; Naderian, M; Namazi, MH; Safi, M; Vakili, H; Saadat, H; Alipour Parsa, S; Nickdoost, N (2018) The association between exposure to air pollutants including PM10, PM2.5, ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide concentration and the relative risk of developing STEMI: A case-crossover design Environmental Research 161:299-303. <http://dx.doi.org/10.1016/j.envres.2017.11.020> [HERO ID: 4165514](#)
3. Liu, H; Tian, Y; Song, J; Cao, Y; Xiang, X; Huang, C; Li, M; Hu, Y (2018) Effect of ambient air pollution on hospitalization for heart failure in 26 of China's largest cities The American Journal of Cardiology 121:628-633. <http://dx.doi.org/10.1016/j.amjcard.2017.11.039> [HERO ID: 4245494](#)
4. Guo, P; Feng, W; Zheng, M; Lv, J; Wang, L; Liu, J; Zhang, Y; Luo, G; Zhang, Y; Deng, C; Shi, T; Liu, P; Zhang, L (2018) Short-term associations of ambient air pollution and cause-specific emergency department visits in Guangzhou, China Science of the Total Environment 613-614:306-313. <http://dx.doi.org/10.1016/j.scitotenv.2017.09.102> [HERO ID: 4165709](#)
5. Yu, Y; Dong, H; Yao, S; Ji, M; Yao, X; Zhang, Z (2017) Protective Effects of Ambient Ozone on Incidence and Outcomes of Ischemic Stroke in Changzhou, China: A Time-Series Study International Journal of Environmental Research and Public Health 14. <http://dx.doi.org/10.3390/ijerph14121610> [HERO ID: 4167016](#)
6. Vahedian, M; Khanjani, N; Mirzaee, M; Koolivand, A (2017) Ambient air pollution and daily hospital admissions for cardiovascular diseases in Arak, Iran ARYA Atherosclerosis 13:117-134. <https://www.ncbi.nlm.nih.gov/pubmed/29147121> [HERO ID: 4245806](#)
7. Chen, CC; Yang, CY (2017) Association between gaseous air pollution and hospital admissions for hypertension in Taipei, Taiwan Journal of Toxicology and Environmental Health, Part A: Current Issues 1-7. <http://dx.doi.org/10.1080/15287394.2017.1395573> [HERO ID: 4166935](#)
8. Chung, JW; Bang, OY; Ahn, K; Park, SS; Park, TH; Kim, JG; Ko, Y; Lee, S; Lee, KB; Lee, J; Kang, K; Park, JM; Cho, YJ; Hong, KS; Nah, HW; Kim, DH; Cha, JK; Ryu, WS; Kim, DE; Kim, JT; Choi, JC; Oh, MS; Yu, KH; Lee, BC; Lee, JS; Lee, J; Park, HK; Kim, BJ; Han, MK; Bae, HJ (2017) Air Pollution Is Associated With Ischemic Stroke via Cardiogenic Embolism Stroke 48:17-23. <http://dx.doi.org/10.1161/strokeaha.116.015428> [HERO ID: 3455805](#)
9. Huang, F; Luo, Y; Tan, P; Xu, Q; Tao, L; Guo, J; Zhang, F; Xie, X; Guo, X (2017) Gaseous Air Pollution and the Risk for Stroke Admissions: A Case-Crossover Study in Beijing, China International Journal of Environmental Research and Public Health 14. <http://dx.doi.org/10.3390/ijerph14020189> [HERO ID: 3603207](#)
10. Chiu, HF; Weng, YH; Chiu, YW; Yang, CY (2017) Short-term effects of ozone air pollution on hospital admissions for myocardial infarction: A time-stratified case-crossover study in Taipei Journal of Toxicology and Environmental Health, Part A: Current Issues 80:251-257. <http://dx.doi.org/10.1080/15287394.2017.1321092> [HERO ID: 3862115](#)

11. Xia, R; Zhou, G; Zhu, T; Li, X; Wang, G (2017) Ambient Air Pollution and Out-of-Hospital Cardiac Arrest in Beijing, China International Journal of Environmental Research and Public Health 14. <http://dx.doi.org/10.3390/ijerph14040423> [HERO ID: 3863885](#)
12. Guo, P; Wang, Y; Feng, W; Wu, J; Fu, C; Deng, H; Huang, J; Wang, L; Zheng, M; Liu, H (2017) Ambient Air Pollution and Risk for Ischemic Stroke: A Short-Term Exposure Assessment in South China International Journal of Environmental Research and Public Health 14. <http://dx.doi.org/10.3390/ijerph14091091> [HERO ID: 4165147](#)
13. Ghaffari, S; Hajizadeh, R; Pourafkari, L; Shokouhi, B; Tajlil, A; Mazani, S; Kavandi, H; Ansari, H; Nader, ND (2017) Air pollution and admissions due to ST elevation myocardial infarction-a time-series study from northwest of Iran Environmental Science and Pollution Research 24:27469-27475. <http://dx.doi.org/10.1007/s11356-017-0343-1> [HERO ID: 4168792](#)
14. Liu, H; Tian, Y; Xiang, X; Sun, K; Juan, J; Song, J; Cao, Y; Xu, B; Hu, Y (2017) Air Pollution and Hospitalization for Acute Myocardial Infarction in China The American Journal of Cardiology 120:753-758. <http://dx.doi.org/10.1016/j.amjcard.2017.06.004> [HERO ID: 3861158](#)
15. Liu, H; Tian, Y; Xu, Y; Huang, Z; Huang, C; Hu, Y; Zhang, J (2017) Association between ambient air pollution and hospitalization for ischemic and hemorrhagic stroke in China: A multicity case-crossover study Environmental Pollution 230:234-241. <http://dx.doi.org/10.1016/j.envpol.2017.06.057> [HERO ID: 3861621](#)
16. Kang, SH; Heo, J; Oh, IY; Kim, J; Lim, WH; Cho, Y; Choi, EK; Yi, SM; Do Shin, S; Kim, H; Oh, S (2016) Ambient air pollution and out-of-hospital cardiac arrest International Journal of Cardiology 203:1086-1092. <http://dx.doi.org/10.1016/j.ijcard.2015.11.100> [HERO ID: 3070651](#)
17. Alimohammadi, H; Fakhri, S; Derakhshanfar, H; Hosseini-Zijoud, SM; Safari, S; Hatamabadi, HR (2016) The effects of air pollution on ischemic stroke admission rate Chonnam Medical Journal 52:53-58. <http://dx.doi.org/10.4068/cmj.2016.52.1.53> [HERO ID: 3224158](#)
18. Han, MH; Yi, HJ; Ko, Y; Kim, Y; Lee, Y (2016) Association between hemorrhagic stroke occurrence and meteorological factors and pollutants BMC Neurology 16. <http://dx.doi.org/10.1186/s12883-016-0579-2> [HERO ID: 3259720](#)
19. Michikawa, T; Okamura, T; Nitta, H; Nishiwaki, Y; Takebayashi, T; Ueda, K; Kadota, A; Fujiyoshi, A; Ohkubo, T; Ueshima, H; Okayama, A; Miura, K; NIPPON DATA2010 Research Group (2016) Cross-sectional association between exposure to particulate matter and inflammatory markers in the Japanese general population: NIPPON DATA2010 Environmental Pollution 213:460-467. <http://dx.doi.org/10.1016/j.envpol.2016.02.051> [HERO ID: 3360885](#)
20. Jung, CR; Chen, WT; Lin, YT; Hwang, BF (2016) Ambient Air Pollutant Exposures and Hospitalization for Kawasaki Disease in Taiwan: A Case-Crossover Study (2000-2010) Environmental Health Perspectives 125:670-676. <http://dx.doi.org/10.1289/ehp137> [HERO ID: 3418897](#)
21. Han, MH; Yi, HJ; Kim, Y; Ko, Y; Kim, Y (2016) Association between Diurnal Variation of Ozone Concentration and Stroke Occurrence: 24-Hour Time Series Study PLoS ONE 11:e0152433. <http://dx.doi.org/10.1371/journal.pone.0152433> [HERO ID: 3270534](#)
22. Phung, D; Hien, TT; Linh, HN; Luong, LM; Morawska, L; Chu, C; Binh, ND; Thai, PK (2016) Air pollution and risk of respiratory and cardiovascular hospitalizations in the most populous city in Vietnam Science

of the Total Environment 557-558:322-330. <http://dx.doi.org/10.1016/j.scitotenv.2016.03.070> [HERO ID: 3224071](#)

23. Dai, X; He, X; Zhou, Z; Chen, J; Wei, S; Chen, R; Yang, B; Feng, W; Shan, A; Wu, T; Guo, H (2015) Short-term effects of air pollution on out-of-hospital cardiac arrest in Shenzhen, China International Journal of Cardiology 192:56-60. [Letter] <http://dx.doi.org/10.1016/j.ijcard.2015.05.016> [HERO ID: 3021562](#)
24. Shakerkhatibi, M; Dianat, I; Jafarabadi, MA; Azak, R; Kousha, A (2015) Air pollution and hospital admissions for cardiorespiratory diseases in Iran: artificial neural network versus conditional logistic regression <http://dx.doi.org/10.1007/s13762-015-0884-0> [HERO ID: 3019591](#)
25. Bravo, MA; Son, J; de Freitas, CU; Gouveia, N; Bell, ML (2015) Air pollution and mortality in São Paulo, Brazil: Effects of multiple pollutants and analysis of susceptible populations Journal of Exposure Science and Environmental Epidemiology 26:150-161. <http://dx.doi.org/10.1038/jes.2014.90> [HERO ID: 2826843](#)
26. Zahari, M; Zinibrahim, WZW; Ismail, N; Ni, TH (2014) Association between air pollution and hospital admission: Case study at three monitoring stations in Malaysia AIP Conference Proceedings 1602:1178-1184. <http://dx.doi.org/10.1063/1.4882633> [HERO ID: 2638966](#)
27. Yorifuji, T; Suzuki, E; Kashima, S (2014) Outdoor air pollution and out-of-hospital cardiac arrest in Okayama, Japan Journal of Occupational and Environmental Medicine 56:1019-1023. <http://dx.doi.org/10.1097/jom.0000000000000274> [HERO ID: 2534628](#)
28. Franck, U; Leitte, AM; Suppan, P (2014) Multiple exposures to airborne pollutants and hospital admissions due to diseases of the circulatory system in Santiago de Chile Science of the Total Environment 468-469:746-756. <http://dx.doi.org/10.1016/j.scitotenv.2013.08.088> [HERO ID: 2234073](#)
29. Shahi, AM; Omraninava, A; Goli, M; Soheilarezoomand, HR; Mirzaei, N (2014) The Effects of Air Pollution on Cardiovascular and Respiratory Causes of Emergency Admission 2:107-114. <https://www.ncbi.nlm.nih.gov/pubmed/26495360> [HERO ID: 4252373](#)
30. Zhao, Y; Qian, Z; Wang, J; Vaughn, MG; Liu, Y; Ren, W; Dong, G (2013) Does obesity amplify the association between ambient air pollution and increased blood pressure and hypertension in adults? Findings from the 33 Communities Chinese Health Study International Journal of Cardiology 168:E148-E150. [Letter] <http://dx.doi.org/10.1016/j.ijcard.2013.08.071> [HERO ID: 2334545](#)
31. Qiu, H; Yu, IT; Wang, X; Tian, L; Tse, LA; Wong, TW (2013) Cool and dry weather enhances the effects of air pollution on emergency IHD hospital admissions International Journal of Cardiology 168:500-505. <http://dx.doi.org/10.1016/j.ijcard.2012.09.199> [HERO ID: 1527571](#)
32. Costa Nascimento, LF; Francisco, JB (2013) Particulate matter and hospital admission due to arterial hypertension in a medium-sized Brazilian city Cadernos de Saúde Pública 29:1565-1571. <http://dx.doi.org/10.1590/0102-311x00127612> [HERO ID: 2292035](#)
33. Son, JY; Lee, JT; Park, YH; Bell, ML (2013) Short-term effects of air pollution on hospital admissions in Korea Epidemiology 24:545-554. <http://dx.doi.org/10.1097/ede.0b013e3182953244> [HERO ID: 1600028](#)
34. Nascimento, LF; Francisco, JB (2013) Particulate matter and hospital admission due to arterial hypertension in a medium-sized Brazilian city Cadernos de Saúde Pública 29:1565-1571. <https://www.ncbi.nlm.nih.gov/pubmed/24005922> [HERO ID: 2348315](#)

35. Nabavi, SM; Jafari, B; Jalali, MS; Nedjat, S; Ashrafi, K; Salahesh, A (2012) Environmental air pollution and acute cerebrovascular complications: An ecologic study in Tehran, Iran *International Journal of Preventive Medicine* 3:723-729. <https://www.ncbi.nlm.nih.gov/pubmed/23112900> [HERO ID: 1526870](#)
36. Costa Nascimento, LF; Francisco, JB; Patto, MBR; Antunes, AM (2012) Environmental pollutants and stroke-related hospital admissions *Cadernos de Saúde Pública* 28:1319-1324. <http://dx.doi.org/10.1590/s0102-311x2012000700010> [HERO ID: 1707906](#)
37. Lai, L (2012) Effect of photochemical smog associated with synoptic weather patterns on cardiovascular and respiratory hospital admissions in metropolitan Taipei *International Journal of Environmental Health Research* 22:287-304. <http://dx.doi.org/10.1080/09603123.2011.634390> [HERO ID: 2082953](#)
38. Yang, CX; Yang, HB; Guo, S; Wang, ZS; Xu, XH; Duan, XL; Kan, HD (2012) Alternative ozone metrics and daily mortality in Suzhou: The China Air Pollution and Health Effects Study (CAPES) *Science of the Total Environment* 426:83-89. <http://dx.doi.org/10.1016/j.scitotenv.2012.03.036> [HERO ID: 1255125](#)
39. Nascimento, LF (2011) Air pollution and cardiovascular hospital admissions in a medium-sized city in São Paulo State, Brazil *Brazilian Journal of Medical and Biological Research* 44:720-724. <http://dx.doi.org/10.1590/s0100-879x2011007500079> [HERO ID: 1074225](#)
40. Vera, J (2011) Cerebrovascular disease hospitalizations are associated with increased levels of ozone, and modified by socioeconomic status in Santiago, Chile *Epidemiology* 22:S202-S202. [Abstract] [HERO ID: 4246998](#)

Short-term Ozone Exposure and CVD Panel Studies Excluded from Draft Ozone ISA based on Location (Outside of North America, Europe or Australia)

1. Li, H; Wu, S; Pan, L; Xu, J; Shan, J; Yang, X; Dong, W; Deng, F; Chen, Y; Shima, M; Guo, X (2018) Short-term effects of various ozone metrics on cardiopulmonary function in chronic obstructive pulmonary disease patients: Results from a panel study in Beijing, China Environmental Pollution 232:358-366. <http://dx.doi.org/10.1016/j.envpol.2017.09.030> [HERO ID: 4168722](#)
2. Zeng, XW; Qian, ZM; Vaughn, MG; Nelson, EJ; Dharmage, SC; Bowatte, G; Perret, J; Chen, DH; Ma, H; Lin, S; de Foy, B; Hu, LW; Yang, BY; Xu, SL; Zhang, C; Tian, YP; Nian, M; Wang, J; Xiao, X; Bao, WW; Zhang, YZ; Dong, GH (2017) Positive association between short-term ambient air pollution exposure and children blood pressure in China-Result from the Seven Northeast Cities (SNEC) study Environmental Pollution 224:698-705. <http://dx.doi.org/10.1016/j.envpol.2017.02.054> [HERO ID: 3602794](#)
3. Day, DB; Xiang, J; Mo, J; Li, F; Chung, M; Gong, J; Weschler, CJ; Ohman-Strickland, PA; Sundell, J; Weng, W; Zhang, Y; Zhang, JJ (2017) Association of Ozone Exposure With Cardiorespiratory Pathophysiologic Mechanisms in Healthy Adults JAMA Internal Medicine 177:1344-1353. <http://dx.doi.org/10.1001/jamainternmed.2017.2842> [HERO ID: 3861057](#)
4. Lee, MW; Choi, BG; Kim, SW; Rha, SW; Shim, MS; Kim, DJ; Seo, HS; Oh, DJ; Jeong, MH (2017) Air pollution and short-term clinical outcomes of patients with acute myocardial infarction Clinical and Experimental Pharmacology and Physiology 44:631-638. <http://dx.doi.org/10.1111/1440-1681.12755> [HERO ID: 3864654](#)
5. Cheng, HC; Pan, RH; Yeh, HJ; Lai, KR; Yen, MY; Chan, CL; Wang, AG (2016) Ambient air pollution and the risk of central retinal artery occlusion Ophthalmology 123:2603-2609. <http://dx.doi.org/10.1016/j.optha.2016.08.046> [HERO ID: 3423848](#)
6. Novack, L; Yitshak-Sade, M; Landau, D; Kloog, I; Sarov, B; Karakis, I (2016) Association between ambient air pollution and proliferation of umbilical cord blood cells Environmental Research 151:783-788. <http://dx.doi.org/10.1016/j.envres.2016.09.009> [HERO ID: 3455177](#)
7. Wiwatanadate, P (2014) Acute air pollution-related symptoms among residents in Chiang Mai, Thailand Journal of Environmental Health 76:76-84. <https://www.ncbi.nlm.nih.gov/pubmed/24645417> [HERO ID: 2348639](#)
8. Elkadhi, H; Ben Hamida, R (2014) The short-term effects of air pollution on health in Sfax (Tunisia): An ardl cointegration procedure In Proceedings of the 2014 international conference & utility exhibition on green energy for sustainable development (ICUE): Jomtien Palm Beach Hotel and Resort, Pattaya City, Thailand, 19-21 March 2014. Pathum Thani, Thailand: Asian Institute of Technology. [HERO ID: 2971340](#)
9. Shields, KN; Cavallari, JM; Hunt, MJ; Lazo, M; Molina, M; Molina, L; Holguin, F (2013) Traffic-related air pollution exposures and changes in heart rate variability in Mexico City: A panel study Environmental Health: A Global Access Science Source 12:7. <http://dx.doi.org/10.1186/1476-069x-12-7> [HERO ID: 1521393](#)
10. Zhang, J; Zhu, T; Kipen, H; Wang, G; Huang, W; Rich, D; Zhu, P; Wang, Y; Lu, SE; Ohman-Strickland, P; Diehl, S; Hu, M; Tong, J; Gong, J; Thomas, D (2013) Cardiorespiratory biomarker responses in healthy young adults to drastic air quality changes surrounding the 2008 Beijing Olympics Research report (Health Effects Institute) 174:5-174. <https://www.ncbi.nlm.nih.gov/pubmed/23646463> [HERO ID: 1640392](#)

11. Steinvil, A; Shmueli, H; Ben-Assa, E; Leshem-Rubinow, E; Shapira, I; Berliner, S; Kordova-Biezuner, L; Rogowski, O (2013) Environmental exposure to combustion-derived air pollution is associated with reduced functional capacity in apparently healthy individuals *Clinical Research in Cardiology* 102:583-591. <http://dx.doi.org/10.1007/s00392-013-0569-y> [HERO ID: 1640396](#)
12. Huang, W; Zhu, T; Pan, X; Hu, M; Lu, SE; Lin, Y; Wang, T; Zhang, Y; Tang, X (2012) Air pollution and autonomic and vascular dysfunction in patients with cardiovascular disease: Interactions of systemic inflammation, overweight, and gender *American Journal of Epidemiology* 176:117-126. <http://dx.doi.org/10.1093/aje/kwr511> [HERO ID: 1255463](#)
13. Jia, X; Song, X; Shima, M; Tamura, K; Deng, F; Guo, X (2011) Acute effect of ambient ozone on heart rate variability in healthy elderly subjects *Journal of Exposure Science and Environmental Epidemiology* 21:541-547. <http://dx.doi.org/10.1038/jes.2011.18> [HERO ID: 839873](#)
14. Poursafa, P; Kelishadi, R; Lahijanzadeh, A; Modaresi, M; Javanmard, SH; Assari, R; Amin, MM; Moattar, F; Amini, A; Sadeghian, B (2011) The relationship of air pollution and surrogate markers of endothelial dysfunction in a population-based sample of children *BMC Public Health* 11:115. <http://dx.doi.org/10.1186/1471-2458-11-115> [HERO ID: 1255306](#)
15. Sérgio Chiarelli, P; Amador Pereira, LA; Nascimento Saldiva, P; Ferreira Filho, C; Bueno Garcia, ML; Ferreira Braga, AL; Conceição Martins, L (2011) The association between air pollution and blood pressure in traffic controllers in Santo André, São Paulo, Brazil *Environmental Research* 111:650-655. <http://dx.doi.org/10.1016/j.envres.2011.04.007> [HERO ID: 785805](#)

Short-term Ozone Exposure and Mortality Studies Excluded from Draft Ozone ISA Based on Location (Outside of North America)

1. Javanmardi, P; Morovati, P; Farhadi, M; Geravandi, S; Khaniabadi, YO; Angali, KA; Taiwo, AM; Sicard, P; Goudarzi, G; Valipour, A; De Marco, A; Rastegarimehr, B; Mohammadi, MJ (2018) Monitoring the impact of ambient ozone on human health using time series analysis and air quality model approaches Fresenius Environmental Bulletin 27:533-544. [HERO ID: 4261889](#)
2. Mo, Z; Fu, Q; Zhang, L; Lyu, D; Mao, G; Wu, L; Xu, P; Wang, Z; Pan, X; Chen, Z; Wang, X; Lou, X (2018) Acute effects of air pollution on respiratory disease mortalities and outpatients in Southeastern China Scientific Reports 8:3461. <http://dx.doi.org/10.1038/s41598-018-19939-1> [HERO ID: 4245155](#)
3. Xue, X; Chen, J; Sun, B; Zhou, B; Li, X (2018) Temporal trends in respiratory mortality and short-term effects of air pollutants in Shenyang, China Environmental Science and Pollution Research. <http://dx.doi.org/10.1007/s11356-018-1270-5> [HERO ID: 4245349](#)
4. Zhao, L; Liang, HR; Chen, FY; Chen, Z; Guan, WJ; Li, JH (2017) Association between air pollution and cardiovascular mortality in China: a systematic review and meta-analysis Oncotarget 8:66438-66448. <http://dx.doi.org/10.18632/oncotarget.20090> [HERO ID: 4166686](#)
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