

Considerations for Public Health and Safety: Crude by Rail

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More than 800,000 barrels of crude oil were shipped on U.S. railroads per day in 2013, which represents a 70-fold increase from 2005.¹

"The known risks associated with oil-by-rail transport, oil tank storage, and oil export by vessel pose an unacceptable threat to human health and safety."²

Public health risks from transport

- Air pollution from train exhaust (including diesel emissions)
 - Impaired pulmonary development and increased risk of lung disease in infants,³ children,^{4,5} and adolescents³
 - Increased risks of acute cardiovascular and cerebrovascular events⁶
- Air pollution from evaporation
 - "Crude Shrinkage" – during transit, crude oil loses up to 3% of its volume, including benzene and volatile organic compounds, due to evaporation⁷
 - Benzene exposure can lead to health effects ranging from dizziness and headache to anemia and leukemia, depending on the length of exposure
- Drinking water contamination
 - Cancer, digestive, and reproductive health risks associated with oil-contaminated drinking water sources^{8,9}
- Noise pollution
 - Sleep disturbance¹⁰
 - Increased cardiovascular events including myocardial infarction and arrhythmia are associated with nighttime noise and noise exposure greater than 90 decibels (in the range of train horns)^{11,12}
 - Adverse cognitive performance and increased psychiatric illness have been observed in children exposed to noise¹³

¹ "Health Impact Assessment: Crude Oil Transport" student lecture presented by Kastleman, et al. Johns Hopkins University School of Public Health. May 12, 2015.

² "Position Statement on Crude Oil Transport and Storage." Concerned Washington & Oregon Health Professionals. Available from <http://www.psr.org/chapters/washington/enviro-health/climate-change/position-statement-on-crude-oil-transport.html>. Accessed June 30, 2015.

³ Karr C., Demer P., Koehoorn M., Lencar C., Tamburic L., & Brauer M. (2009). Influence of ambient air pollutant sources on clinical encounters for infant bronchiolitis. *American Journal of Respiratory Critical Care Medicine*, 180(10): 995–1000. doi: 10.1164/rccm.200901-01170C

⁴ Clark N., Demers P., Karr C., Koehoorn M., Lencar C., Tamburic L., & Brauer M. (2010). Effect of early life exposure to air pollution on development of childhood asthma. *Environmental Health Perspectives*, 118(2): 284-290. doi: 10.1289/ehp.0900916

⁵ Gauderman, W., Avol, E., Gilliland, F., Vora, H., Thomas, D., Berhane, K., McConnell, R., Kuenzli, N., Lurmann, F., Rappaport, E., Margolis, H., Bates, D., & Peters, J. (2004). The effect of air pollution on lung development from 10 to 18 years of age. *New England Journal of Medicine*, 351(11): 1057-1067. doi: 10.1056/NEJMoa040610

⁶ Qian, Y., Zhu, M., Cai, B., Yang, Q., Kan, H., Song, G., Jin, W., Han, M., & Wang, C. (2013). Epidemiological evidence on association between ambient air pollution and stroke mortality. *Journal of Epidemiology and Community Health*, 67: 635-640. doi: 10.1136/jech-2012-201096

⁷ Alan Mazaud, Exergy Resources, Pennsylvania Rail Freight Seminar, May 23, 2013, p. 17. Available at: <http://www.parailseminar.com/site/Portals/3/docs/Alan%20Mazaud%20Presentation%20-%20AM.pptx>.

⁸ Armstrong, B., Sebastián, M., & Stephens, C. (2002). Outcomes of pregnancy among women living in the proximity of oil fields in the Amazon basin of Ecuador. *International Journal of Occupational and Environmental Health*, 8(4): 312-319. Retrieved online: <http://www.ncbi.nlm.nih.gov/pubmed/12412848>

⁹ Armstrong, B., Cordoba, J., & Stephens, C. (2001). Exposure and cancer incidence near oil fields in the Amazon basin of Ecuador. *Journal of Occupational and Environmental Medicine*, 58(8): 517-522. doi: 10.1136/oem.58.8.517

¹⁰ Aasvang, G., Øverland, B., Ursin, R., & Torbjørn, M. (2011). A field study of effects of road traffic and railway noise on polysomnographic sleep parameters. *Journal of the Acoustic Society of America*, 129(6): 3716–26. <http://dx.doi.org/10.1121/1.3583547>

¹¹ Selander, J., Nilsson, M., Bluhm, G., Rosenlund, M., Lindqvist, M., Nise, G., & Pershagen, G. (2009). Long-term exposure to road traffic noise and myocardial infarction. *Epidemiology*, 20(2): 272-279. doi: 10.1097/EDE.0b013e31819463bd

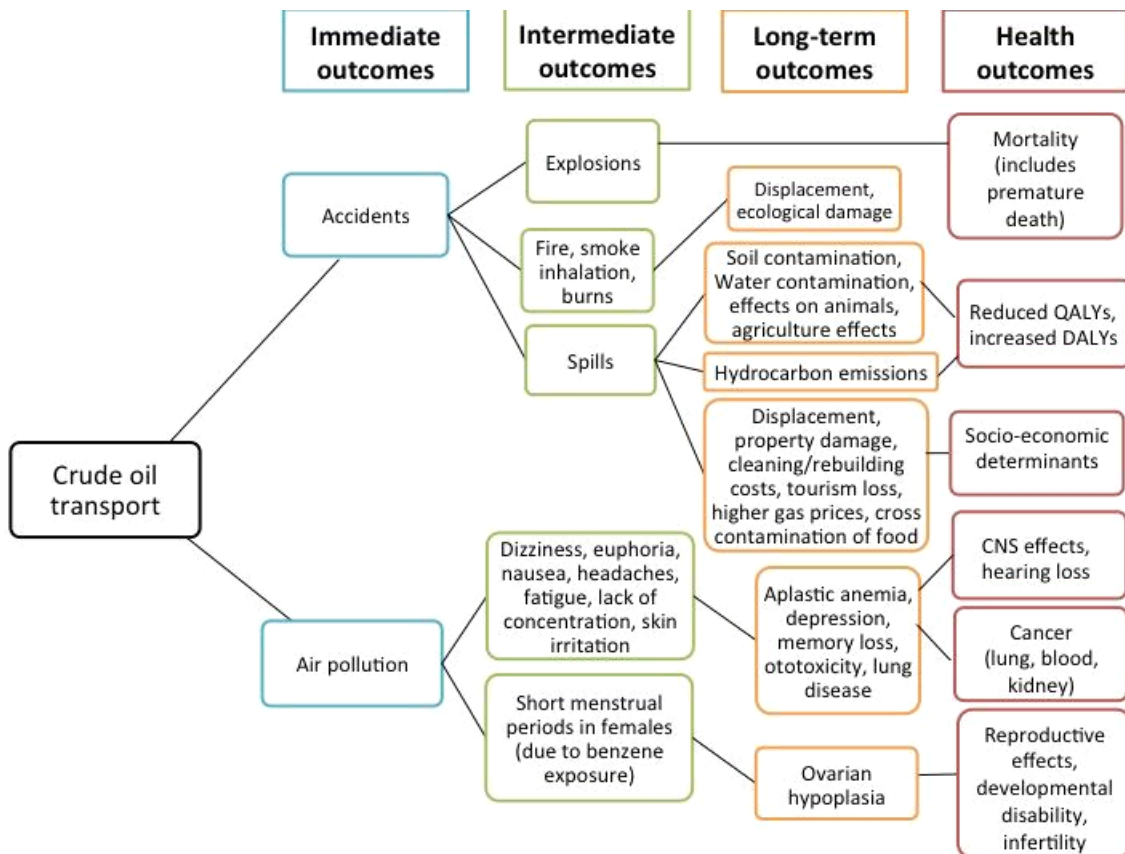
¹² Sørensen, M., Andersen, J., Nordsborg, R., Jensen, S., Lillelund, K., Beelen, R., Schmidt, E., Tjønneland, A., Overvad, K., & Raaschou-Nielsen, O. (2012). Road traffic noise and incident myocardial infarction: a prospective cohort study. *PLoS ONE*, 7(6): e39283. doi:10.1371/journal.pone.0039283

¹³ Haines, M., Stansfeld, S., Job, R., Berglund, B., & Head, J. (2001). Chronic aircraft noise exposure, stress responses, mental health and cognitive performance in school children. *Psychological Medicine*, 31(2): 265-277. doi: <http://dx.doi.org/10.1017/S0033291701003282>

Public health risks from explosions

- Mortality
 - Oil train crash in Quebec killed 47 people¹
- Evacuation/displacement
 - Crude oil train derails and crashes and causes over 1,000 people to evacuate in North Dakota¹
 - Mental health – Expected PTSD prevalence of 15-75% in the affected population¹⁴
- Greenhouse emissions
 - Respiratory illness – Expected increase in both acute and long-term respiratory systems¹³
- Odor
- Risk to first responders
 - Adequate personal protective equipment
 - Severe burning of the lungs

Example of a Pathway Diagram, as part of a Health Impact Assessment on Crude by Rail
 Presented by Kastleman, et al. Johns Hopkins University School of Public Health – May 2015



¹⁴ "Crude Oil Transport in Baltimore" student lecture presented by Shibata, et al. Johns Hopkins University School of Public Health. May 12, 2015.