

February 4, 2020

HB 84 Background- Summary of Literature Relating to Police Occupational Hazards Prepared by Elise Sorum-Birk, Staff to Rep. Andy Josephson

Source:

Mona, Gift Gugu, Moses John Chimbari, and Charles Hongoro. "A systematic review on occupational hazards, injuries and diseases among police officers worldwide: Policy implications for the South African Police Service." *Journal of occupational medicine and toxicology* 14, no. 1 (2019): 2.v

<https://link.springer.com/article/10.1186/s12995-018-0221-x>

Summary of source/ findings:

A review of 36 peer reviewed studies of police occupational hazards worldwide conducted in South Africa. Included studies on police suggest that occupational hazards include the following: Respiratory Health Issues (most commonly in traffic cops who work in polluted areas), Cancer, Exposure to Chemical Hazards (Including chemical spills, asbestos, and tear gas), Biological Hazards (potential exposure to blood borne pathogens). Psychological and Ergonomic Hazards were identified as well.

Quotes of interest:

"Three studies on chemical hazards revealed that exposure to high concentrations of carbon dioxide and general air pollution was associated with cancer, while physical exposure to other chemical substances was linked to dermatitis." (p.1)

"This review has shown that police officers are at a higher risk of accident related hazards, which lead to injury, compared to non-police officers who work for the same department." (p.12)

"From our findings, it is evident that exposure to chemical hazards can lead to cancer, which is a major concern among police officers. Furthermore, exposure to CN (*2-chloracetophenone or tear gas*) has been shown to result in occupational dermatitis. Therefore, it is important for police officers to be screened for cancer annually." (p.12)

"Biological hazards can affect police officers due to contact with human beings, as part of routine work. The reports of NSIs (*needle stick injuries*) while on duty, demonstrated how important it is to manage biological hazards in the police force. There should be guidance on how police officers can deal with such hazards. It is often difficult to prove the association between biological hazards and medical conditions contracted while on duty. Hence, the policies should indicate how to report NSIs and other work-related incidents when they arise." (p.12)

Source:

Wirth, Michael, John E. Vena, Emily K. Smith, Sarah E. Bauer, John Violanti, and James Burch. "The epidemiology of cancer among police officers." *American journal of industrial medicine* 56, no. 4 (2013): 439-453.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3655699/pdf/nihms462516.pdf>

Summary of source/ findings:

"Summarizes peer-reviewed studies examining cancer risks among police officers..." ---"Results from three studies suggested possible increased mortality risks for all cancers, and cancers of the colon, kidney, digestive system, esophagus, male breast, and testis, as well as Hodgkin's disease. Few incidence studies have been performed, and results have been mixed, although some associations with police work have been observed for thyroid, skin, and male breast cancer." (p.1)

Quotes of Interest:

"Statistically significant increases in cancer incidence have been reported for all cancer combined, and for cancers of the prostate, bladder, and thyroid, as well as testicular cancer, Hodgkin's lymphoma, and melanoma" (Results Section, p.6)

"When duration of employment was examined, statistically significant increases in SMRs for digestive, lymphatic or hematopoietic tissues were observed for officers working 10–19 years or more than 40 years. Those working more than 40 years also had a fourfold increase in bladder cancer mortality, and brain cancer mortality was elevated among officers employed 20–29 years. This retrospective cohort mortality study was the only study out of the three cohort mortality studies to look at cancer mortality by years worked and latency." (p.3, *Referring to a study of police in Buffalo, New York*)

"Traffic police often spend at least several hours per day driving or directing traffic in congested areas. These activities may result in exposure to carcinogenic airborne pollutants derived from motor vehicle exhaust, such as benzene, polycyclic aromatic hydrocarbons (PAHs), and persistent organic pollutants, for example dioxin. Personal benzene exposures among police officers were three to five times higher than those observed among controls, and traffic police from Bangkok had estimated cancer risks of 1.8 per 100, 000 based on a benzene exposure model. Particulate matter (PM) is a major air pollution constituent that can induce inflammation, free radical formation, oxidative DNA damage, cytotoxicity, and mutagenesis within the respiratory tract... **Other chemical agents that officers may potentially be exposed to include those associated with clandestine methamphetamine manufacturing.** In 2004, there were 17, 033 methamphetamine lab-related seizures by US law enforcement agencies. Some chemicals involved in these activities are carcinogenic (e.g., benzene, methylene chloride)" (p.7)

Source:

Patil, Rajan R., Satish Chetlapally, and Mapilliraju Bagavandas. "Global review of studies on traffic police with special focus on environmental health effects". *International Journal of Occupational Medicine and Environmental Health* 27 no. 4 (2014): 523-535. doi:10.2478/s13382-014-0285-5.

<http://ijomeh.eu/Global-review-of-studies-on-traffic-police-with-special-focus-on-environmental-health-effects,2008,0,2.html>

Summary of source/ findings:

Looking at studies related to respiratory health of traffic police in India and around the world. Found association between occupation and various respiratory health problems.

Quotes of Interest:

"In fact, deterioration of the lung function showed a strong association with the length of service in traffic police. Traffic police exhibited higher respiratory signs and symptoms such as cough, phlegm and rhinitis. A lower lung function was associated with non-use of protective masks among traffic policemen. Some studies have looked at the effect of air pollution on vascular inflammatory reactions in traffic policemen. The prevalence of nonspecific respiratory disease (NSRD) showed an association with a higher concentration of particulate matter in the air." (p.524)

"An association between testicular cancer and a hand-held radar has further been corroborated through a retrospective cohort study among traffic police officers, which showed an increased incidence of testicular cancer and melanoma skin cancer." (p.527)

"There is enough epidemiological evidence to show that vehicular pollution can cause increased morbidity and mortality. Some health effects may result from short-term exposure, while others are related to long-term exposure. Traffic police have been the natural choice as the subjects for studying adverse health effects from vehicular pollution due to their occupation requiring them to be in the middle of heavy traffic." (p.529)

Source:

Ross, G. H., & Sternquist, M. C. (2012). Methamphetamine exposure and chronic illness in police officers: significant improvement with sauna-based detoxification therapy. *Toxicology and industrial health*, 28(8), 758-768.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3573677/pdf/10.1177_0748233711425070.pdf

Summary of source/ findings:

This study looks at a cohort of Utah police officers who developed chronic illnesses due to exposure to methamphetamine labs and specifically explores options of detoxification options after these exposures. Though this study is focused primarily on the treatment of police after exposure, it also provides the reader a case study of that exposure to clandestine methamphetamine labs have on police health.

Quotes of Interest:

“An estimated half of the approximately 300 Utah officers involved in methamphetamines lab-related activities later developed varying degrees of chronic illness and symptoms that were sometimes incapacitating” (p.758)

“Aerosolized methamphetamine and associated toxic substances permeate carpets, walls and surfaces, and even wood construction...The capture, arrest, and transport of suspects and toxic materials can pollute officers’ clothing and vehicles. These hazards were not well understood during the 1990’s upsurge of methamphetamine manufacture and lab raids. Officers often lacked personal protective equipment, including respiratory protection.” (p. 759)

“Of concern in clandestine meth labs are chemicals including phosphine, iodine, hydrogen chloride and solvents (acetone, toluene, charcoal lighter fluid, and Coleman fuel), as well as methamphetamine and its precursors. Each has the potential for adverse symptoms, even at low exposure levels. Persons exposed to illegal methamphetamine production commonly experience headaches, respiratory and eye irritation, nausea, and vomiting. Prolonged methamphetamine exposure is also associated with neurotoxic effects...” (p.764)

Source:

Gu, J. K., Charles, L. E., Burchfiel, C. M., Andrew, M. E., & Violanti, J. M. (2011). Cancer incidence among police officers in a US northeast region: 1976–2006. *International journal of emergency mental health*, 13(4), 279.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4681507/pdf/nihms743228.pdf>

Summary of source/ findings:

This study examined the incidence of cancer in a cohort of over 2000 police officers from Buffalo, New York. Between 1976 and 2006 18.2% of the officers developed cancer. Though the general risk of cancer was found to be comparable to that of the general population, elevated risks were observed for Hodgkin's lymphoma and brain cancer.

Quotes of Interest:

"This study revealed elevated risk in some analyses for brain cancer and Hodgkin's lymphoma...Brain cancer was significantly elevated among those with 30 year or more of service." (pp. 4-5)

"Police officers are also likely to be exposed to several kinds of chemicals through cleaning firearms, using fingerprinting powder for forensic work, and being exposed to toxic chemicals such as carbon monoxide, lead, benzene, sulfur dioxide, particulate matter, and nitrogen dioxide in highway and street duties..."(p.5)

"Police officers may frequently come in contact with the persons who might be infected with a virus. Epstein-Barr virus is a common contagious virus and, in some cases, could result in the development of Hodgkin's lymphoma, Burkitt's lymphoma, and nasopharyngeal cancer." (p. 5)

"In recent years, shiftwork has been shown to be a potential cause of breast cancer, colorectal cancer and endometrial cancer for women, and prostate cancer for men, since it disrupts the body's biological clock." (p.6)

Source:

Watanabe-Galloway, S., Ryan, S., Hansen, K., Hullsiek, B., Muli, V., & Malone, A. C. (2009). Effects of methamphetamine abuse beyond individual users. *Journal of psychoactive drugs*, 41(3), 241-248.

<http://resolver.ebscohost.com.sled.idm.oclc.org/openurl?sid=google&auinit=S&aualast=Watanabe-Galloway&atitle=Effects+of+methamphetamine+abuse+beyond+individual+users&id=doi%3a10.1080%2f02791072.2009.10400534&title=Journal+of+Psychoactive+Drugs&volume=41&issue=3&date=2009&spage=241&site=ftf-live>

Summary of source/ findings:

Using a lens of public health, this study looks at consequences of the use and manufacture of methamphetamine, outside the direct health impacts on the direct user. One area examined in this study were the adverse impacts meth production has on law enforcement personnel and emergency responders.

Quotes of Interest:

“From 1996 to 1999...In the 112 meth related events, 155 persons were injured, with 79 (51%) or them being first responders. Of these first responders 55 (70%) were police officers, nine (11%) were EMTs, eight (10%) were firefighters and seven (9%) were hospital employees. Personal protective equipment (PPE)status at time of injury was known for 85% of the 79 injured first responders; 57 (85%) had not worn PPE at the time of exposure... Most police officers’ injuries occurred because the officers were present during and immediately after a release. Most EMTs’ injuries were from on-site exposure or direct contact with skin or clothing of contaminated victims.” (p.244)

“Respiratory protection for the officers may be limited because of the need for speed and surprise as well as the possibility of hostile actions.” (p. 244-245)

“Recent research suggests the potential long-term health effects of exposure to toxic chemicals among first responders.” (p. 246)

Source:

Peluso, M., Merlo, F., Munnia, A., Valerio, F., Perrotta, A., Puntoni, R., & Parodi, S. (1998). 32P-postlabeling detection of aromatic adducts in the white blood cell DNA of nonsmoking police officers. *Cancer Epidemiology and Prevention Biomarkers*, 7(1), 3-11.

<https://cebp.aacrjournals.org/content/cebp/7/1/3.full.pdf>

Summary of source/ findings:

This bio-monitoring study, conducted in Genoa, Italy, compared a group of 34 non-smoking police with a control group of 36 office workers. This study used bulky DNA adducts (markers of exposure to genotoxic aromatic compounds linked to and individual's ability to repair DNA damage from carcinogens). The study showed that these biomarkers were significantly higher in police than in the office worker control group meaning that they had a higher level of exposure to toxins in the air.

Quotes of Interest:

“The analysis of the PEM data clearly indicates that the police officers were exposed to higher levels of genotoxic pollutants during their working hours in the urban traffic of downtown Genoa than were referents.” (p.5)

Source:

Mayhew, C. (2001). *Occupational health and safety risks faced by police officers*. Canberra: Australian Institute of Criminology.

<https://aic.gov.au/publications/tandi/tandi196>

Summary of source/ findings:

This Australian paper seeks to explore and detail the varied and elevated occupational risks which police officers are exposed to daily.

Quotes of Interest:

“The ill effects of shiftwork have been well documented, including gastrointestinal upsets, psychosomatic disorders, weight gain and serious long-term disorders such as coronary heart disease.” (p. 3)

“Officers involved in arson, bomb and fraud investigations may be exposed to poisonous chemicals and vapors (with acute and long-term health effects), [and] insecure buildings (for example from letter bombs)...An escalating risk stems from clandestine laboratories established to manufacture illicit drugs such as methylamphetamine. Police can be exposed to toxic chemicals, by-products that are flammable or explosive, large concentrations of corrosives and life-threatening concentrations of toxic vapors.” (p.4)

Source:

Violanti, J. M. (2009). Stress, A Police Health Problem. *The Badge of Life*.

http://policesuicide.spcollege.edu/assets/Violanti_StressHealth_IHW.pdf

Summary of source/ findings:

A summary of the adverse impacts of stress in the workplace on police officers.

Quotes of Interest:

“...there are over 863,000 police officers in the United States. This is a large working population which is negatively affected by stress and traumatic events at work...Police mortality studies have demonstrated that officers are afflicted with stress-related disease at a higher rate than the general population.” (p.2)

“Rates for policemen, sheriffs and marshals are significantly elevated for arteriosclerotic heart disease, cancer, suicide and homicide.” (p.2)

“...police officers either suffered from disease or died at a much earlier age than reference groups like municipal workers of the general US population. Results from the state University of NY Buffalo police mortality study found the average age of death for police officers was 66 years compared to the general population average of 75 years. This is unusual for a presumably healthy working population.” (p.2)

Source:

Violanti, J. M. (2014). "Police Work May be Hazardous to Your Health: An Examination of Harmful Physical Work Exposures" in *Dying for the Job: Police Work Exposure and Health*. Springfield, Illinois: Charles C Thomas.

<https://search-ebshost.com.akstatelibrary.idm.oclc.org/login.aspx?direct=true&db=nlebk&AN=698180&site=ehost-live&scope=site>

Summary of source/ findings:

This is the introductory chapter in a book detailing and exploring the occupational hazards of police work. This chapter summarizes the different types of occupational hazards faced by those in law enforcement including the following: chemical exposures, clandestine methamphetamine labs, lead exposure from firearms, fingerprint powders, dead bodies, blood borne pathogens, air pollution, radar, noise, and hazardous materials.

Quotes of Interest:

"Surveys suggest work-related disease accounts for 20 to 50 percent of early retirements." (p. 3)

"Inhalation is the most common route of entry for chemical hazards, although chemicals may be ingested..." (p.5)

"Research has found that there are health hazards associated with breathing in trichloroethylene found in meth labs...The International Agency for Research of Cancer (IARC) has concluded that there is some evidence for the carcinogenicity of trichloroethylene in humans... Three well-designed studies of people with occupational exposure to higher levels of trichloroethylene showed higher levels of liver and biliary tract cancers and non-Hodgkin's lymphoma." (p.6)

"Lead and mercury appear to be common ingredients currently used in fingerprint powders, and additional subsequent analyses of fingerprint powders have identified the presence of polycyclic aromatic hydrocarbons. Many of these chemicals are known cancer causing agents, and therefore the use of such powders has been discontinued. Individuals who use this powder are typically unaware of the harmful constituents because material safety sheets supplied by the manufacturer are lacking necessary detail." (p. 8)

"The potential for law enforcement exposure to hazardous materials in the United States is significant. Officers are often called upon to investigate traffic accidents involving hazardous materials or handle disaster situations where chemicals are released in the air. More than 60,000 chemicals are produced annually in the United States, approximately 2000 of which the U.S. Department of Transportation consider hazardous. More than 4 billion tons of chemicals are transported yearly by surface, air, or water routes." (p. 13-14)

Source:

Burch, James, Michael Wirth and John Vena, "Risk of Cancer Incidence and Cancer Mortality Among Police Officers" in Violanti, J. M. (2014). *Dying for the Job: Police Work Exposure and Health*. Springfield, Illinois: Charles C Thomas.

<https://search-ebshost.com.akstatelibrary.idm.oclc.org/login.aspx?direct=true&db=nlebk&AN=698180&site=ehost-live&scope=site>

Summary of source/ findings:

This chapter summarizes the base of knowledge surrounding prevalence of and risks for police developing cancers. The authors catalogue the possible risk factors for development of cancer in police including shift work, chronic stress, lifestyle impacts and exposure to an array of known carcinogens in the line of duty. This chapter also summarized the findings of various studies that investigated cancer risks for police and notes both an increased mortality among police with cancer and overall elevated levels of various types of cancer observed among the law enforcement work force. Types of cancer reported to be significant by one or more studies include cancers of the esophagus, colon, kidney, bladder, brain, endocrine gland, lymphatic and hematopoietic tissue, breast, testicular, melanoma and Hodgkin's disease. The authors also emphasize the interrelationship of all potential carcinogenic exposures in police work and urge further study in this area.

Quotes of Interest:

Relating to a study of police mortality in Buffalo, NY- "Mortality from all malignant neoplasms, cancers of the digestive organs and peritoneum, esophagus and colon were statically significantly elevated. After 10 to 19 years of employment significant. Vena and associates also examined the impact of duration of employment as a police officer on mortality. After 10 to 19 years of employment, significant increases in standardized mortality ratios for digestive and lymphatic or hematopoietic tissues were observed." (p. 60)

Relating to a study of police mortality in Rome- "Of note was a statistically significant increase in male breast cancer mortality. Subject with 20 to 29 years of employment had increased mortality risks from colon, breast, and endocrine gland cancers" (p. 61)

Relating to a Portland/Vancouver area study of leukemia by occupation - "There was a statistically significant increase in leukemia incidence among police officers compared to the general population." (p.64)

Relating to a British Columbia study of police cancer- "The total number of male cancer cases was 2.3 times higher than expected in the general British Columbia population. Specifically, excess cases of testicular, cervical, and colon cancer were identified, along with melanoma, leukemia, and lymphoma, although not all achieved statistical significance." (p. 65)

Source:

Li, Jiehui, James E. Cone, Amy R. Kahn, Robert M. Brackbill, Mark R. Farfel, Carolyn M. Greene, James L. Hadler, Leslie T. Stayner, and Steven D. Stellman. "Association between World Trade Center exposure and excess cancer risk." *Jama* 308, no. 23 (2012): 2479-2488.

https://jamanetwork.com/journals/jama/articlepdf/1486831/joc120129_2479_2488.pdf

Summary of source/ findings:

Study specifically focused on cancer among individuals who had been residents near or emergency workers during the World Trade Center attacks of September 11th 2001. Among the emergency workers in this group, risks for thyroid cancer, prostate cancer and melanoma were all found to be elevated. The study notes that these findings are limited and based on a small group and suggests that a longer term follow up would be beneficial to determining more clearly the impacts of this event.

Quotes of Interest:

"Of the 23 cancer sites investigated. 3 had significantly elevated incidence during the later period: prostate, thyroid, and multiple myeloma. Of these 3, thyroid cancer was also significantly elevated during the early period. Ovarian cancer was significantly elevated during the early period but not during the later period." (p.2482)

"Dust, debris, and fumes from the WTC contained known and suspected carcinogens, including polycyclic aromatic hydrocarbons, asbestos, benzene and dioxins." (p.2486)

"Lung cancer with its typically long latency period will remain a concern given WTC exposures to asbestos, silica and other carcinogens." (p. 2486)