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Review and Assessment of the National League of Cities' *Assessing State Firefighter Cancer Presumption Laws and Current Firefighter Cancer Research*

The IAFC Safety, Health and Survival Section, on behalf of the full membership of the IAFC, convened a panel of academic, medical and fire and emergency service health experts to review the National League of Cities' *Assessing State Firefighter Cancer Presumption Laws and Current Firefighter Cancer Research*. The following is an assessment of the report provided by the panel.

Finding 1.

The NLC report uses a subjective and highly questionable methodology to review the literature on cancer among firefighters. They "hand select" which articles to review and rely on narrative review methods to draw their conclusions. Narrative reviews are particularly prone to bias and are widely considered inferior to quantitative review methods.

- Narrative reviews describe the existing literature using subjective narrative descriptions without the benefit of quantitative synthesis. They use "box score" or "vote counting methods" for the synthesis of results. These methods can result in inaccurate conclusions.
- Narrative reviews are not precise in their description of study results. As the number of studies included in a narrative review increases, the difficulty of accurately describing overall effects and potential moderators of study outcomes increases.
- It has been demonstrated that the methods used in narrative reviews can lead to inaccurate conclusions that are at odds with quantitative reviews and more recent well-designed trials (Bent et al., 2004; Schmidt et al., 2005; Mulrow et al., 1997).
- High quality quantitative reviews, like the LeMasters et al. (2006) meta-analysis cited in the report, have more safeguards against bias in inclusion or interpretation (Cook et al., 1997).
- LeMasters et al. (2006) reviewed 32 studies evaluating the occupational risk of firefighting with cancer using appropriate statistical procedures and concluded that firefighters have an elevated risk of several types of cancer.

Finding 2.

The inclusion criteria for studies used in the NLC report are questionable and were not consistently followed.

- Although they state that they would not use studies published prior to 1995, they note in the appendix that they included some studies prior to 1995 that they considered to be "classic" studies with no definitive justification for what qualifies as a 'classic' study (see page A-3).

- The authors include two large review articles (Howe et al., 1990 and LeMasters et al. 2006) as if they were single or primary studies. It should be noted that the LeMasters et al. (2006) was a meta-analysis/quantitative synthesis that derived substantially different conclusions than the NLC report.
- While LeMaster's et al. (2006) systematic review quantitatively evaluates 32 articles, the NLC review only cites 17.
- The NLC review states that only articles after 1995 are included because this year range, "allowed for the most recent research studies and documents to be collected and evaluated. Using recently published research studies provides the most accurate representation of the current status and scope of the problem under study" (p.32). No explanation is provided about why the 18 studies published prior to 1995 or the 4 published in 1995 or later included in the Le Masters et al. (2006) meta-analysis were not deemed relevant.
- The NLC report excludes a number of studies with large and statistically significant associations between firefighting and various cancers that were included in LeMaster et al. (2006) including:
 - Testicular cancer, risk ratio (RR) = 2.5 – Aronson et al. (1994)
 - Malignant melanoma, RR = 2.25 – Peterson et al. (1980); Milham et al. (1976)
 - Esophageal cancer, RR = 2.03 – Beaumont et al. (1991)
 - Skin cancer, RR = 1.71 – Beaumont et al. (1991)
 - Stomach cancer, RR = 1.58 – Tornling et al. (1994)
 - Non-Hodgkins Lymphoma, RR = 1.82 – Giles et al. (1993)
- Thus, they exclude 6 studies with 50% or greater Relative Risk (RR = 1.50 or more) and 4 studies with a 100% or greater.
 - 100% greater risk for esophagus, testis, malignant melanoma
 - 50% greater risk for skin, larynx, stomach, non-Hodgkin's lymphoma

Finding 3.

While the report authors note that the 17 included studies met their definition of a Class I study (i.e., study in a peer-reviewed, refereed journal whose research design, methods, and results have lead to findings that achieved statistical significance), it is telling that some excluded studies could have met this definition if the beginning inclusion date was not arbitrarily started at 1995.

- In addition, some studies cited in LeMasters et al. (2006) dated after 1995 also were not included and we could find no rationale for their exclusion:
 - Ma et al. (1998), case-control study
 - Figgs et al. (1995) case-control study
 - Deschamps et al. (1995) cohort mortality study
 - Delahunt et al. (1995) case-control study
- We suggest that this report would have been of higher quality and greater use if it had been conducted as a systematic review or meta-analysis. Study quality or rigor could have been a coded variable and the effect of study quality on outcomes could have been assessed directly.

Finding 4.

The information reported about the study quality rating system used by the authors (i.e., Class I –Class IV) suggested that the investigators often could not reliably classify the studies they reviewed (percent agreement of 73%, see page pp. A-7). The investigators disagreed on the quality of a study nearly 30% of the time.

- For the 30% of articles where the two investigators disagreed on the quality of the study, a third of investigators solely determined the category of the study without any check on their judgment.
- It is unclear why, given the simple nature of their quality classification system, nearly 1/3 of the studies could not be reliably classified by the investigators. Given the discrete nature of the classifications and the basic levels at which they were classified, the low agreement rate is particularly troubling.
- The authors inappropriately use a statistical procedure used for ordinal data (Mann Whitney U) to test reliability of assignment to nominal categories.
- It is unclear why they did not use the more commonly accepted method of calculating inter-rater agreement called the Kappa coefficient, which corrects for agreement by chance alone (see Posner et al., 1990). Thus, it likely that the NLC report actually overestimates the reliability of their classification system.

Finding 5.

The NLC report adopts strategies used by the tobacco industry for questioning the link between occupational exposures and cancer in firefighters.

- Despite a large body of epidemiological data which demonstrates an increased risk of cancer in firefighters, the NLC report claims “a lack of substantive evidence” exists to conclude an increased risk of cancer among firefighters.
- The tobacco industry claimed that research was inconclusive and new studies needed to be conducted even while a large body of evidence demonstrated a link between smoking and health and that nicotine was addictive.
- The NLC report suggests that a new, large, longitudinal study of firefighters be conducted that tracks cancer risk over time. Given that longitudinal cohort studies take many years to complete, this delay strategy both ignores a large body of existing evidence and threatens the health and healthcare of the current generation of firefighters.
- The NLC does not offer to fund a new, large, longitudinal cohort study of cancer risk among firefighters.

References

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Panel Participants

Sara Pyle, Ph.D. Dr. Pyle is an Assistant Professor in the Departments of Family Medicine and the Preventive Medicine and Kansas City University of Medicine and Biosciences. She completed her doctoral training in psychology with a health emphasis at the University of Missouri – Kansas City. She has published nearly 30 peer-reviewed journal articles and book chapters in the area of health behavior research. She recently completed the American Heart Association's Fellowship training on the Epidemiology and Prevention of Cardiovascular Disease. She serves as the Principal Investigator on a grant from the American Heart Association and one from FEMA on firefighter health and wellness. She is a member of the International Association of Fire Chiefs' Safety, Health and Survival Section.

Walker S.C. Poston, Ph.D., MPH. Dr. Poston is a Senior Scientist and CFO of the HOPE Health Research Institute. He has graduate degrees in the behavioral sciences (University of California, Santa Barbara) and in community health and epidemiology (University of Texas Houston Health Science Center, School of Public Health). Dr. Poston completed postdoctoral fellowships in Clinical Health Psychology (Wilford Hall Medical Center) and in Cardiovascular Health (American Hospital Association Health Forum). He has published over 160 peer-reviewed scientific journal articles, book chapters, and books on a variety of health related topics. Dr. Poston is an elected Fellow in the following scientific organizations; 1) the American College of Epidemiology, 2) the American Heart Association's (AHA) Council on Epidemiology and Prevention, and 3) The Obesity Society (the North American Association for the Study of Obesity). He serves or has served as the principal investigator, co-investigator and/or consultant on a number of extramurally-funded grants from agencies such as the National Institutes of Health, Department of Defense, American Legacy Foundation, the Department of Homeland Security, and the American Heart Association. He also has taught graduate courses in epidemiology, research design, and clinical trials. Dr. Poston is a Co-Investigator on both firefighter health studies the team is currently conducting.

C. Keith Haddock, Ph.D. Dr. Haddock is a Senior Scientist and the CEO of the HOPE Health Research Institute. He completed the Statistics and Research Design and the Clinical Psychology doctoral programs at the University of Memphis. He also completed postdoctoral fellowships in Health Psychology with the U.S. Air Force and Cardiovascular Disease with the American Hospital Association's Health Forum. He is a full member of the American Statistical Association and belongs to the following divisions: Biometrics, Statistics in Epidemiology, Health Policy Statistics, Social Statistics, Statistical Consulting, Survey Research Methods, and Teaching Statistics in the Health Sciences. He is a Fellow of The Obesity Society. Dr. Haddock has served as the methodologist/statistician on a host of National Institutes of

Health and Department of Defense research grants and has published over 130 peer reviewed papers in scientific journals. One of Dr. Haddock's most highly cited statistical articles involved the development of methods to meta-analyze primary studies which have binary outcomes and was published in *Psychological Methods*. Dr. Haddock has taught graduate statistics and research methodology, including courses on epidemiology and clinical trials, multivariate statistical methods, psychometrics, and statistical programming. He has been honored in Who's Who in America, Who's Who in Medicine and Health Care, and Who's Who Among America's Teachers. Dr. Haddock is a Co-Investigator on both firefighter health studies the team is currently conducting.

Richard Suminski, Ph.D., M.P.H. Dr. Suminski completed his doctorate in Exercise Physiology and his masters degree in Public Health Epidemiology from the University of Pittsburgh. He is currently an Associate Professor in the department of physiology and Kansas City University of Medicine and Biosciences in Kansas City, MO. Dr. Suminski is a Fellow in the American College of Sports Medicine and a member of the Obesity Society (North American Association for the Study of Obesity) and has nearly 50 publications in peer-reviewed journals to his credit on health related topics. Dr. Suminski has been funded by the Centers for Disease Control and Prevention, the National Institutes of Health and the Robert Wood Johnson Foundation to complete his research on physical activity. Dr. Suminski is a Co-Investigator on both firefighter health studies the team is currently conducting.