REQUEST FOR APPLICATIONS 17-1: ASSESSING ADVERSE HEALTH EFFECTS OF EXPOSURE TO TRAFFIC-RELATED AIR POLLUTION, NOISE, AND THEIR INTERACTIONS WITH SOCIO-ECONOMIC STATUS

INTRODUCTION

The Health Effects Institute (HEI) is seeking to fund health studies to assess adverse health effects of short and/or long term exposure to traffic-related air pollution. The studies should consider spatially correlated factors that may either confound or modify the health effects of traffic-related air pollution, most notably, traffic noise, socioeconomic status (SES), and factors related to the built environment, such as presence of green space. New research to assess adverse health effects of traffic-related air pollution was identified as one of the priority areas in HEI's Strategic Plan 2015-2020 (HEI, 2015).

The application process consists of two stages. In stage 1, interested applicants are asked to submit a preliminary application, which will be reviewed by the HEI Research Committee. The Committee will select those with the most promising study designs for a full application. Details can be found in the section Application Process, Deadlines, and Evaluation.

STUDY DURATION AND BUDGET GUIDELINES

HEI encourages interested applicants to submit preliminary applications for projects that can be fully completed within a maximum of 4 years. Preparation of the final report should be included in the budget and timeline of the final year of the study. The funding cap for each study will be $1,000,000 (total budget) and HEI expects to fund up to five studies from this RFA.

BACKGROUND

Traffic emissions are an important source of urban air pollution. Emissions from motor vehicles and ambient concentrations of most monitored traffic-related pollutants have decreased steadily over the last several decades in most high-income countries as a result of air quality regulations and related improvements in vehicular emission control technologies, and this trend is likely to continue. However, these positive developments have not been able to fully compensate for the rapid growth of the motor vehicle fleet due to population growth and economic improvement, increased vehicular congestion, as well as well as the presence of older vehicles on the roads. Consequently traffic-related air pollution continues to be of public health interest.

In 2010, HEI published Special Report 17, *Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects*. This Report, developed by the HEI Panel on the Health Effects of Traffic-Related Air Pollution ("Panel"), summarized and synthesized research on emissions, exposure, and health effects from traffic-related air pollution and drew conclusions about whether the associations between exposure and health outcomes were causal. Among its conclusions, the Panel concluded that exposure to traffic-related air pollution was causally linked to worsening asthma symptoms. It also found suggestive evidence of a causal relationship with onset of childhood asthma, non-asthma respiratory symptoms, impaired lung function, total and cardiovascular mortality, and cardiovascular morbidity (HEI, 2010).

The literature on traffic-related air pollution and health effects has expanded significantly since HEI's published its review in 2010. Thus, as described in HEI's Strategic Plan 2015-2020, HEI will update its traffic review within the next few years (HEI, 2015). Subsequent new evidence suggests causal relationships between exposure to traffic-related air pollution and incident asthma (e.g., Anderson et al. 2013). There is also emerging evidence suggesting links between traffic-related air pollution and adverse birth- and pregnancy outcomes (e.g., Pedersen et al. 2014; Stieb et al. 2012) and neurocognitive effects (e.g., Clifford et al. 2016; Power et al. 2016; Tzivian et al. 2015). The evidence for effects of NO_2, which originates largely from motor vehicles in cities, has also strengthened. This knowledge was recently summarized in the 2016 EPA Integrated Science Assessment for oxides of nitrogen, which serves as the scientific foundation for the review of the National Ambient Air Quality Standards for NO_2 (US EPA, 2016). For example, EPA has concluded that the relationships between short and long-term respiratory effects and NO_2 are now classified as 'causal' or 'likely to be causal', respectively. In addition, the evidence for the relationships between long-term NO_2 exposure and health effects has been upgraded to 'suggestive' evidence for mortality, cancer, cardiovascular effects and diabetes, and some reproductive effects. The UK Committee on the medical effects of air pollutants and Health Canada have reached similar conclusions regarding the effects of NO_2 (COMEAP, 2015; Health Canada 2016).

Traffic–related air pollution

Exposure assessment of traffic-related air pollution is challenging; traffic-related air pollution is a complex mixture of many particulate and gaseous pollutants, and is characterized by high spatial and temporal variability. The highest traffic-related air pollution concentrations occur at or close to major roads up to a few hundred meters away depending on the pollutant, geographic and land-use characteristics, and meteorologic conditions. Identifying an appropriate exposure metric that uniquely indicates traffic-related air pollution has been difficult, because many of the pollutants are emitted by other sources of air pollution in urban areas, such as airports and (sea)ports (Masiol and Harrison, 2014; Mueller et al. 2011) and other combustion processes. The most commonly used exposure metrics are measured or modeled concentrations of individual pollutants considered to be indicators of traffic-related air pollution (such as NO_2 or BC) and simple indicators of traffic (such as distance of the residence from busy roads or traffic density near the residence). Ultrafine particles (UFP) is another indicator of traffic-related air pollution in various recent studies, especially in studies of short-term effects.

A range of models, such as dispersion, land use regression, and hybrid models have been developed to estimate exposure and some attempts to account for infiltration and time activity have been considered. Each of these exposure estimation approaches has limitations discussed before (HEI, 2010), and subsequently, HEI issued RFA 13-1, *Improving Assessment of Near-Road Exposure to Traffic Related Pollution,* in 2013 seeking studies to improve exposure assessment of traffic-related air pollution for use in health studies. In addition, HEI issued RFPA 14-1, *Enhancing Near-Road Exposure Assessment Through Characterization of Non-tailpipe and Tailpipe Emissions Near Urban Roads and in Tunnels,* to obtain data on the characteristics of and contribution from non-tailpipe emissions and tailpipe emissions near urban roads and in tunnels. The contribution of non-tailpipe emissions such as brake and tire wear and road dust, to near road concentrations may be substantial and remains a concern at least partly because of its metallic content (Thorpe et al. 2008). As the HEI exposure studies near completion, valuable lessons learned may be integrated in new research.

Because traffic-related air pollution is a complex mixture, a key question that remains largely unresolved is whether NO_2 is a 'causal' agent or only an indicator of traffic-related air pollution, given that correlation in space and time between concentrations of NO_2 and other traffic-related air pollutants are often high. Although there have been fewer studies so far, a similar issue likely arises in epidemiologic studies that use other traffic-related air pollutants, particularly UFP and BC, as the main exposure indicator. Therefore, it remains difficult to determine whether there are specific components, including un-measured or rarely-measured pollutants, in traffic-related air pollution that are disproportionately more responsible for adverse health effects and whether this varies with the health outcome studied.

Both UFP and BC have attracted significant attention, and national and local air quality authorities in the United States, Europe and in other regions of the world continue to assess the need for specific action on them in reviews of ambient air quality standards and other regulatory programs (e.g., Bond et al. 2013; Janssen et al. 2011). Reduction in BC also has potential for large co-benefits through short-term mitigation of climate change. UFP emissions are not specifically regulated in the United States, but the current US EPA PM mass-based emission regulations have been found to reduce both mass and number. UFP emissions are regulated in Europe under a particulate number mandate. On the other hand, the introduction of gasoline direct injection vehicles may offset some of these benefits due to their higher emissions of UFP relative to conventional gasoline vehicles (Badshah et al. 2015; Storey et al. 2010). UFP were the subject of HEI's 2013 Perspective *Understanding the Health Effects of Ambient Ultrafine Particles*, which found from the current literature that 'the evidence does not support a conclusion that exposures to UFP alone can account in substantial ways for the adverse effects that have been associated with other ambient pollutants, such as $PM_{2.5}$ (HEI, 2013) However, exposure assessment is more challenging for UFP than for the more regionally dispersed and routinely monitored pollutants, such as $PM_{2.5}$, and reliance on measurements at fixed-site monitors to estimate exposure — a common approach in epidemiologic studies of long-term exposures to $PM_{2.5}$ —is suspected to lead to substantial errors in estimates of exposure to UFP. For this and other reasons, the HEI Perspective found a lack of epidemiologic studies investigating long-term exposure of UFP.

Traffic noise

Since the 2010 Traffic Review, there is now a better appreciation that, in addition to air pollution, many other factors are associated with traffic exposure – most notably traffic noise; these may either confound or modify the health effect of traffic-related air pollution. To date, noise ranks second only after air pollution as the most important environmental exposure according to the WHO in an assessment of six European countries (Hanninen et al. 2014). In the US, it has been estimated that at least 146 million people (46% of the population) were at potential risk of hypertension due to noise in 2013, though the data of noise exposure are dated and inadequate (Hammer et al. 2014).

Historically, noise has received much higher priority in Europe than in the United States. Unlike air quality regulations, the responsibility of noise regulations lies primarily with the state and local governments in the United States since 1982. Since the 1970s, successive Europe-wide directives have laid down specific noise emissions limits for road vehicles, airplanes and many types of outdoor equipment, and EU Directive 2002/49/EC harmonized noise assessment and mandated EU member states to produce strategic noise maps in large cities, near the main transport infrastructures and near industrial sites.

Traffic noise has been associated with various adverse health outcomes, most notably cardiovascular morbidity and mortality including hypertension and ischemic heart disease (Babisch et al. 2014; van Kempen et al. 2012), but also neurocognitive development and function in children and adults (Standfeld et al. 2005; Tzivian et al. 2015), adverse birth outcomes (Ristovska et al. 2014), and possible metabolic outcomes such as diabetes mellitus (Dzhambov 2015); all of these outcomes are linked to exposure to air pollution as well. Yet, few studies have sought to quantitatively disentangle the possible effects of traffic-related air pollution and traffic noise (e.g., Münzel et al. 2016; Stansfeld 2015; Tetrault et al. 2013; Tzivian et al. 2015). Therefore, the questions of whether, or to what extent, the reported associations of traffic-related air pollution are confounded by traffic noise are still largely open, and potentially relevant to implementing adequate abatement policies.

Moreover, it is unclear how simultaneous exposure to traffic-related air pollution and traffic noise might interact and even possibly enhance each other´s effect.

A challenge that may hamper such analyses is the correlation between exposure estimates for traffic-related air pollution and traffic noise. In a recent systematic review, the correlations between long-term traffic noise and air pollution were reported to cover a wide range: from 0.16 to 0.72 (Tetreault et al. 2013). However, in a recent study in London, Fecht and colleagues (2016) found low correlations near major roads, suggesting that it may be possible to determine the independent effects of traffic-related air pollution and traffic noise. Some other studies have observed decreasing correlations between exposure to traffic-related air pollution and traffic noise when noise is modeled with greater detail such as accounting for bedroom orientation, type of windows and ventilation patterns in the traffic noise exposure assessment (Foraster et al. 2014).

Green space and other factors associated with the built environment

There is also evidence that factors related to the built environment, such as the presence of green space, may either confound or modify the health effects of traffic-related air pollution (Dadvand et al. 2014, Hystad et al. 2014; James et al. 2015). Mechanisms by which green space may influence health outcomes are not yet clear, but may include a reduction in stress, enhancing social cohesion, an increase in physical activity, or a buffering for other exposures, such as air pollution and noise. Regarding green space and air pollution, green space can have both beneficial and detrimental impacts on air quality depending on the setting, scale, air pollutant, and vegetation type and their allergenicity. For example at street level, presence of many trees may trap the air pollution, and thus reduce dispersion in certain canyon type of streets (Janhall 2015). For other types of roads, roadside vegetation barriers may improve near-road air quality (Gallagher et al. 2015). At the neighborhood level, green space is usually associated with lower air pollution concentrations (e.g., Al-Dabbous et al. 2014; Baldauf et al. 2009; Brantley et al. 2014; Nowak et al 2014).

Green space in epidemiologic studies is generally measured using satellite-based vegetation indices or land use databases linked to participants' residential addresses. While standard measures in the green space literature, they typically do not distinguish different types of vegetation, quality of green space, accessibility and green space usage patterns, which may be important depending on the mechanisms linking green space to health outcomes. Other measures of the built environment, such as walkability, may be also useful. Walkability, which is hypothesized to enhance levels of physical activity and its health benefits, may be associated with green space, but these relationships require further investigation (e.g., Creatore et al. 2016; Durand et al. 2011; Gascon et al 2016).

Socioeconomic status

Another important factor to consider in traffic-related air pollution epidemiologic studies is SES (O'Neill et al. 2003). The effects of individual and neighborhood SES on health are now widely accepted; and it is understood that there are relationships between traffic-related air pollution and SES. In many settings, low-SES communities reside in the vicinity of roads and transportation corridors, and therefore are disproportionately exposed to air pollution; such communities may also be more susceptible to air pollution owing to other underlying disparities (Clark et al. 2014; Hajat et al. 2015; O'Neill et al. 2003). However, some studies have reported opposite associations between SES and air pollution exposure, for example in New York and Rome, highlighting the importance of investigating the SES–air pollution associations in a specific setting (Hajat et al. 2013; Cesaroni et al. 2010). Most cohort studies assessing air pollution, have reported somewhat higher effect estimates for those with the lowest SES (Hoek et al. 2013). However, it has been difficult so far to disentangle whether differences in susceptibility, exposure, or other factors contribute to these observations. For example, multiple life style related factors, including diet, physical inactivity, preexisting diseases, and obesity may play a role. In addition, higher actual exposures than assumed in the studies, lack of air conditioning and possibly interaction with other risk factors such as poor housing conditions and other factors related to the built environment may contribute.

Typically, air pollution studies treat SES as an effect modifier by stratifying the analyses, or as a confounder and adjust for it in a fairly simple way with the use of an individual and/or neighborhood SES indicator, and treating this as a fixed or random covariate effect in the health model (Hoek et al. 2013). Somewhat more complex methods are sometimes used to combine different SES indicators, such as principal component or factor analysis (Cesaroni et al. 2010; Shmool et al. 2014). Most studies use SES information obtained at a single point in time, although some researchers note the importance of examining the cumulative effects of SES factors when investigating vulnerable and susceptible populations (O'Neill et al. 2003). Other researchers note the importance of psychosocial factors and stress in air pollution and health studies (e.g., Clougherty et al. 2009). Overall, there is no consensus yet of how to best measure and account for individual and neighborhood level SES in air pollution epidemiologic studies, although researchers agree that both are important to assess. Also whether SES should be treated as a confounder and/or an effect modifier is far from clear, as shown in a recent study using MESA data (Hicken et al. 2016).

Summary

Traffic noise, SES, and green space, as well as other spatially correlated factors that may either confound or modify the health effects of traffic-related air pollution, need to be considered to advance our understanding of the health effects of traffic-related air pollution and to obtain important information for more targeted and/or more effective abatement policies aimed at protecting public health.

The objectives of this RFA have been developed taking into account the research needs discussed above.

RFA 17-1 OBJECTIVES

The main goal of the RFA is to assess adverse health effects of short and/or long term exposure to traffic-related air pollution. Studies should propose novel or improved methods and approaches to evaluate the role of spatially correlated factors that may either confound and/or modify the health effects of traffic-related air pollution, most notably traffic noise, socioeconomic status (SES), and factors related to the built environment, such as presence of green space.

Specific objectives include:

1. In the proposed health studies, develop, validate, and apply improved exposure assessment methods and models suitable for estimating exposure to traffic-related air pollution, which take into account other air pollution sources in urban areas (such as airports and (sea)ports, industries and other local point sources) and that would be able to distinguish between tailpipe and non-tailpipe traffic emissions.
2. Propose ways in these studies to disentangle the relationship of adverse health effects of traffic-related air pollution and traffic noise.
3. Develop, evaluate, and apply indicators of SES at the individual and community level in the proposed health studies; if such indicators are novel, compare with SES indicators commonly used in the literature.
4. Explore the role of other factors that may confound or modify the health effects of traffic-related air pollution at the individual (e.g., age, smoking status, diet, physical activity, health status) and community level (e.g., presence of green space, other factors related to the built environment, walkability).

5. Investigate - to the extent that the measurements and patterns of a range of different indicators of traffic-related air pollution allow it (e.g., NO_2, UFP, BC, and indicators of non-tailpipe emissions) - whether one or more of these can be shown to have health effects independent of the other pollutants.

Given the budget constraints and practical considerations, HEI does not expect that any application will meet *all* these objectives; however, proposals that aim to address multiple objectives specified above will be deemed most responsive to this RFA.

CRITICAL STUDY DESIGN CONSIDERATIONS

To inform the development of RFA 17-1, the HEI Research Committee held a workshop in May 2016 with selected participants from the research and regulatory communities and the private sector. A number of considerations pertinent to study design issues discussed during the workshop are summarized below. Applicants are strongly encouraged to address and integrate these considerations in their proposals.

Study populations and designs

Various study designs, including panel studies, case control studies, and cohort studies may be considered for these investigations.

As part of this RFA, HEI welcomes accountability studies to empirically assess the effects of regulatory actions, interventions, or 'natural' experiments on traffic-related air pollution (and/or noise) and health. If such studies are proposed, the applicant should ensure that substantial exposure reductions are expected, and — where appropriate — should include proper control groups. Please refer to a discussion of critical design considerations for accountability studies in HEI Communication 14 (HEI 2009) and Communication 15 (van Erp et al 2010).

In designing their study, applicants should find ways to exploit exposure contrasts and settings where correlated factors can be quantified and potentially separated. For example, this may relate to different traffic-related air pollutants (e.g., areas with high UFP and low NO_2, vs. areas with low UFP and high NO_2), different types of exposures (e.g., traffic-related air pollution vs. traffic noise), different sources of exposure (e.g., communities also impacted by airports vs. communities further away), or areas with and without specific policy or other actions taken.

Geographic location

Studies in North America and, Western Europe countries, and other countries where conditions such as fleet composition and air pollution sources are comparable to those in North America and Europe will be considered responsive.

Traffic-related air pollution exposure assessment

Studies should focus on current or more recent exposures (e.g., the past 10 years) to reflect the changes in concentrations and composition of traffic-related air pollution associated with the recent implementation of stricter emission standards and air quality regulations.

Studies should include multiple pollutants as indicators of traffic-related air pollution. Air pollutants to consider include NO_2, BC, UFP, and markers of non-tailpipe emissions. Studies should also include $PM_{2.5}$ because it is regulated, though it is known to be a suboptimal surrogate. Inclusion of novel indicators and biomarkers of traffic-related air pollution is encouraged. Inclusion of oxidative potential is discouraged. Traffic indicators that may be considered include fleet volume and composition, traffic type (flow/congestion/idling, and type of roadways. Single-pollutant studies and studies assessing traffic indicators only will not be considered responsive.

Studies should develop and evaluate improved exposure assessment methods suitable to estimate exposure to traffic-related air pollution at various relevant spatial and temporal scales for use in epidemiologic studies. Improved hybrid exposure models that combine measurements, chemical transport models, land use variables and traffic data show promise. Exposure assessment methods and models and their requisite level of complexity need to be chosen with regard to its ultimate effect on the accuracy and precision of the health effect estimates (e.g., Szpiro et al. 2011; 2013). Substudies to evaluate exposure measurement error (for example by accounting for indoor infiltration, indoor sources, time activity patterns and/or residential mobility) may be proposed.

Applicants should take into account other air pollution sources in urban areas, such as airports and (sea)ports in the exposure assessment methods. Local emissions, for example from restaurants and other point sources, are important when using fine-grid exposure models. In addition, in many urban areas transported pollution from industrial and electric power sources can be significant contributors, and should be considered. How urban background concentrations are accounted for will be carefully evaluated.

If measurement campaigns are proposed, studies should preferably use standardized and routine sampling methods. However, some studies may offer the opportunity of including new instruments, low-cost sensors, or wearable devices. If such approaches are proposed, applicants should provide a rationale for their inclusion, evidence regarding the performance and quality of the data, and a detailed QA/QC plan.

Traffic noise assessment

If traffic noise is included, consideration should be given to estimate traffic noise at relevant and, ideally similar, spatial and temporal scales as the traffic-related air pollution estimates. Regarding relevant noise indicators, L_{den} (day-evening-night equivalent sound level) and L_{night} (night equivalent sound level) seems to be appropriate for studies assessing long-term effects. Peak indicators such as LA_{max} (equivalent maximum sound level) or number of noise events may be considered as well. In addition, novel noise indicators may be proposed, if there is a good justification for their use.

Traffic noise should be assessed using standardized noise assessment methods and models. Substudies to evaluate exposure measurement error (for example by accounting for indoor noise exposure, orientation of the bedroom, type of windows, ventilation behavior, and other sources of outdoor noise) may be proposed.

SES assessment

Assessment of SES should include individual and community level indicators that capture different domains (e.g., income, wealth, education, occupation, race/ethnicity, safety). Inclusion of direct or indirect measures of stress will be a plus.

Green space assessment

If green space is included, it will be important to demonstrate that the selected metric is adequate for the study design, and this would depend on the hypothesized mechanisms linking green space to health outcomes. Other measures of the built environment, such as walkability measures, may be considered.

A detailed evaluation of appropriate metrics for green space or an evaluation of all potential mechanisms is considered beyond the scope of this RFA.

Statistical methods

Applicants should propose appropriate statistical and analytical methods. Because model selection can have an impact on the outcome, sensitivity analyses of the key modeling choices should be included.

To address the objectives of the RFA improved statistical approaches may be developed. Examples of areas where new and improved methods are needed include:

- Multipollutant modeling approaches to estimate effects of traffic-related air pollution and other exposures (e.g., traffic noise, green space) that may be highly correlated.
- Causal methods and models for application in such studies.
- Statistical methods to quantify and correct for exposure measurement error in health effect estimates. In particular, development of those methodologies for spatially-varying pollutants in the context of multipollutant research.
- Development and/or application of statistical approaches for assessing air quality regulatory or other actions.

HEI requires applicants to include sufficient statistical expertise on the study team and strongly recommends his/her involvement during design of the study.

Health outcomes

This RFA does not target specific health outcomes to assess adverse health effects of short and/or long term exposure to traffic-related air pollution. However, applicants should give a clear rationale regarding the choice of health outcomes in relation to the research questions being addressed and the relevance of such questions for policy. Preference will be given to health outcomes that are well-justified and for which evidence has been considered recently in authoritative reviews such as the EPA's 2016 NO_2 Integrated Science Assessment or HEI's 2010 review of Traffic-Related Air Pollution (Special Report 17). Inclusion of well-established clinical and subclinical markers of disease will be considered responsive.

Control for important potential confounders

Applicants should pay particular attention to control traffic-related air pollution and traffic noise risk estimates for major potential confounders (e.g., age, smoking status, SES) either by restriction or by direct or indirect adjustment approaches. Regarding SES, studies should consider a composite index or several indicators that capture different aspects of SES rather than a single indicator, including at least an individual and a community level indicator.

POLICY ON DATA ACCESS

Providing access to data is an important element in ensuring scientific credibility, and is particularly valuable when studies are of regulatory interest. HEI has developed a policy to provide access to data for studies that it has funded in a manner that facilitates the review and validation of the work. The policy also protects the confidentiality of any subjects who may have participated in the study and respects the intellectual interests of the investigators who conducted the study. Please refer to our website for the HEI Policy on the Provision of Access to Data Underlying HEI-Funded Studies (pdf).

Applicants selected to submit full applications will be expected to include a plan for data sharing and accessibility at the end of the study. Where data are provided by a third party, a process for other investigators to obtain and work with the data should be outlined.

LEVERAGING EXISTING DATA

HEI encourages applicants to maximize the use of existing data from stationary and mobile monitoring networks and from ongoing or recent past exposure and health studies, as appropriate. The NO_x roadside monitoring network implemented in recent years across the US could be of interest to consider should these data effectively support the study design proposed.

There is limited routine data on noise in North America. In the United States, the Federal Highway Administration (FHWA) established regulation 23 CFR772 in 1973 that requires assessment and abatement of noise in areas affected by highway traffic and construction only. As a result, a FHWA Traffic Noise Model (TNM) was developed in 1998 to comply with 23 CFR 772. Because most of the work on traffic noise so far has been conducted in Europe, international collaborations are encouraged to include traffic noise in North American studies or elsewhere.

EU countries have been required to produce strategic noise maps in large cities, near the main transport infrastructures and near industrial sites using standard protocols and models. Therefore, existing noise data may be available for studies in Europe.

USEFUL WEBSITES

EPA Ambient Air Monitoring Networks:
https://www.epa.gov/amtic/amtic-ambient-air-monitoring-networks

EPA Citizen Science for Environmental Protection: https://www.epa.gov/citizen-science

EPA EnviroAtlas: https://www.epa.gov/enviroatlas

EPA Smart Location Mapping: https://www.epa.gov/smartgrowth/smart-location-mapping

FHWA The Highway Performance Monitoring System (HPMS) database:
http://www.fhwa.dot.gov/policyinformation/hpms/shapefiles.cfm

FHWA Traffic Noise Model: http://www.fhwa.dot.gov/environment/noise/traffic_noise_model/

Health Effects institute: https://www.healtheffects.org/accountability

Noise Observations and Information Service for Europe – Noise: http://noise.eionet.europa.eu/

US Department of Transportation Research and Technology:
https://www.transportation.gov/research-technology

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RFA 17-1: APPLICATION PROCESS, DEADLINES, AND EVALUATION

The submission and review of applications for RFA 17-1 will entail a two-stage process: a preliminary application followed by a full application (upon request only). Full applications without pre-submission of a preliminary application will not be considered.

PRELIMINARY APPLICATION

The goal of the primary applications (PA) is to provide a brief, but comprehensive description of the objectives and design of the study. In addition to a description of design features (e.g., study population, locations, exposure assessment, and health assessment), applicants should provide a preliminary assessment of expected precision and power to support the proposed study. In addition, a brief description of the scientific rationale, study aims, statistical analyses, and anticipated results should be included.

HEI will select a subset of PAs with the most promising study designs for a full application.

Applicants should use the RFA 17-1 Preliminary Application Form, which can be downloaded from *www.healtheffects.org/funding*. The PA should be a maximum of 4 pages in length (using 11-point font size and 1-inch margins; excluding references and CVs) and include an estimated total budget and study duration. In addition, brief curricula vitae (CVs; maximum 2 pages per person) of the principal investigator and co-investigators should be provided.

Deadline for Preliminary Applications

Preliminary applications should be submitted by e-mail in PDF format to *funding@healtheffects.org* (subject line: *[PI last name] RFA 17-1 Preliminary Application*) no later than **MARCH 1, 2017**, with a copy to Ms. Sharman Andersen (*sandersen@healtheffects.org*). HEI will acknowledge receipt of the preliminary application.

Preliminary Application Evaluation Process

Preliminary applications will be reviewed by the HEI Research Committee. They will decide whether to request a full application. Applicants will be informed whether or not to submit a full application within 6 weeks after the submission date.

For questions contact: Dr. Hanna Boogaard (*jboogaard@healtheffects.org*) or Dr. Maria Costantini (*mcostantini@healtheffects.org*).

FULL APPLICATION

Invited full applications should provide in-depth information on aspects presented in the preliminary application: the study aims, design, rationale, methods, and statistical analyses. If data from other studies are going to be used, information on the type of data available (including the period, location, and frequency of when the measurements were taken) and quality assurance should be included. Applicants should also discuss whether they will need to obtain IRB approval. A letter from the investigator who owns the data should be submitted, stating his or her willingness to share the data with the applicant and with HEI, if requested (see HEI Policy on the Provision of Access to Data Underlying HEI-funded Studies). In addition, the full application should include a plan for data sharing and accessibility at the end of the study.

Investigators invited to submit a full application should use forms F-1 to F-12 and consult the Instructions for Completing the Application. Application forms can be downloaded from *www.healtheffects.org/funding*. Please note that the required font size is 11 point with 1-inch margins. Form F12 is optional. The application forms should be turned into a PDF with appropriate bookmarks before submitting.

Deadline for Full Applications

Full applications should be submitted to *funding@healtheffects.org* no later than **JULY 15, 2017**. The application should be in PDF format with a maximum file size of 20 MB.

After submission, please notify Ms. Sharman Andersen (*sandersen@healtheffects.org*) of your submission; do not attach the PDF documents to this email. HEI will acknowledge receipt of the full application.

Full Application Evaluation Process

Full applications will be evaluated in a two-stage process: an external review followed by an internal review.

EXTERNAL REVIEW

Applications undergo a competitive evaluation of their scientific merit by an ad hoc panel of scientists selected for their expertise in relevant areas. Applications may also be sent to external scientists for additional evaluation. The panel will evaluate applications according to the following criteria:

- Relevance of the proposed research to the objectives of the RFA.
- Scientific merit of the hypothesis to be tested, the study design, exposures and outcomes to be evaluated.
- Accessibility to existing databases of ambient air, meteorological monitoring, registries, health care utilization or other resources as appropriate.
- Proposed methods of data collection, validation, and analysis, including adjustment for potential confounding factors, such as smoking, and development of innovative analytic methods of data analysis.
- Personnel and facilities, including:
  - Experience and competence of principal investigator, scientific staff, and collaborating investigators.
  - Extent of collaboration among investigators in pertinent fields who will contribute to the conduct of the study.
  - Adequacy of effort on the project by scientific and technical staff.
  - Adequacy and validity of existing data and data to be collected.
  - Adequacy of facilities.
- Reasonableness of the proposed cost.

The applications ranked highly by the review panel may be additionally reviewed by a statistician regarding the experimental design and analytical methods.

INTERNAL REVIEW

The internal review is conducted by the HEI Research Committee and generally focuses on the applications ranked highly by the external review panel. The review is intended to ensure that studies funded are meritorious and also constitute a coherent program addressing the objectives of the Institute. The Research Committee makes recommendations regarding funding of studies to the Institute's Board of Directors, which makes the final decision.

CONFLICTS OF INTEREST

HEI's procedures for conflicts of interest are similar to the guidelines set forth by NIH. Members of HEI's sponsor community are excluded from participating in RFA development, applying for support, application review, and funding decisions.

HEI invites external reviewers (or in the case of a major RFA, Review Panel members) who are unlikely to have a conflict of interest with the proposal(s) they are asked to review. A conflict occurs when the reviewer is named on the application in a major professional role; the reviewer (or close family member) would receive a direct financial benefit if the application is funded; the PI or others on the application with a major role are from the reviewer's institution or institutional component (e.g., department); during the past three years the reviewer has been a collaborator or has had other professional relationships (e.g., served as a mentor) with any person on the application who has a major role; the application includes a letter of support or reference letter from the reviewer; or the reviewer is identified as having an advisory role for the project under review. In addition, HEI Staff screen external reviewers for potential conflicts of interest with other applicants who have submitted a proposal under the same RFA.

For Review Panel members and Research Committee members, in some situations it may not be possible to avoid all possible conflicts of interest as outlined above. In such cases, Review Panel and Research Committee members who have a conflict of interest will not be assigned to review the application(s) in question and will be asked to leave the room during the discussion of those application(s). They will also not score or vote on the application(s) at issue and refrain from commenting on them during the overall discussion, and in the case of the Research Committee, from all deliberations regarding recommendation of applications for funding. If several Research Committee members are recused from the overall discussion of applications for such reasons, HEI will invite external consultants to join the Committee to fill in the missing expertise.

This peer review system relies on the professionalism of each reviewer, Review Panel member, and Research Committee member to declare to HEI the existence of any real or apparent conflict of interest. If a reviewer feels unable to provide objective advice for any other reason, he/she is expected to recuse him/herself from the review of the application(s) at issue.

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