CALIFORNIA AIR RESOURCES BOARD

Research Screening Committee Meeting
Cal/EPA Headquarters Building
1001 I Street
Training Room 5, 5th Floor
Sacramento, California 95814
(916) 445-0753

July 18, 2019
9:00 a.m.

ADVANCE AGENDA

I. Approval of Minutes of Previous Meeting:

March 15, 2019 meeting

II. Discussion of New Research Proposals:

1. "PM2.5 Acute Health Impacts on Work Loss Days," University of California, Los Angeles, $396,522, Proposal No. 2823-292

   CARB applies health impact functions to calculate estimates of the health protectiveness of regulations and policies. While premature mortality and morbidity risks (e.g., cardiopulmonary mortality, hospitalizations for cardiovascular and respiratory illnesses, and emergency room visits for respiratory illness and asthma) from particulate matter (PM) 2.5 exposure have been extensively documented for the use of calculating health benefits, certain health endpoints such as work loss days have not been studied widely in the field. CARB seeks to increase the number of available health endpoints associated with PM2.5 exposure, and specifically seeks data on the impacts of PM2.5 on work loss days. The objective of this research is to examine associations between short-term PM2.5 exposure and adverse health outcomes, specifically work loss days and asthma exacerbations. In addition, the increasing risk of wildfires in California warrants research on wildfire's impact on PM2.5 levels and consequent health outcomes. This study will examine regions before, during, and after wildfire to study not just the health impact of the particulates in wildfire smoke but also the other components and factors that influence the effect that the exposure may have on work loss days. The University of California, Los Angeles (UCLA) investigators propose to use the California Health Interview Survey (CHIS) 2015-2018 data and existing government monitoring data for PM2.5, meteorology data, and wildfire data to investigate the health impacts of PM2.5. The UCLA investigators will conduct advanced statistical analyses and will develop concentration-response curves after adjusting for confounding factors, and then will compute the economic impacts using estimated work loss days and daily wages. The results of this project will inform CARB's health benefits calculations of work loss days from PM2.5 exposure related to regulation development and also from wildfire smoke exposure.

2. “Sources of On-Road Vehicle Emissions and their Impacts on Respiratory Disease Symptoms in California,” University of California, Berkeley, $500,000, Proposal No. 2824-292

   Regulations and technological upgrades have resulted in a steady decline in vehicle tailpipe emissions in California. However, despite the recent reductions in tailpipe emissions, some communities continue to be disproportionately exposed due to their proximity to heavily trafficked freeways and vehicular congestion, as well as their proximity to area-based traffic related exposure such as shopping centers, parking lots and distribution centers. Several studies have been published showing that communities exposed to these on-road emissions are at greater risk for respiratory disease exacerbations. Another important on-road source is non-exhaust emissions from tire and brake wear, which will become increasingly important as the benefits of implementation of tailpipe emission regulations become more widespread. The objective of this research is to quantify the relationship between on-road vehicle emissions including on-road non-exhaust pollutants and sub-acute respiratory disease symptoms. The health endpoint studied, sub-acute respiratory disease symptoms, is represented in this project by the use of short-acting beta agonist (referred to as SABA) for the acute relief of respiratory disease symptoms, such as asthma and chronic obstructive pulmonary disease (COPD). Health data was collected from June 2012 to May 2019 for 2,870 patients, in the major metropolitan areas of California. The number of SABA uses per person per day will be used as the analysis outcome. Daily Land use regression models for pollutants and trace metals will be developed and analyzed with the health data using traditional environmental epidemiology models (e.g., linear mixed models) compared with advanced machine learning models (e.g., random forest models). The results can help the California Air Resources Board (CARB) identify communities with disproportionate exposures and identify sources of these exposures for possible mitigations strategies. In addition, this information will be used to add respiratory disease symptoms as a health endpoint in CARB’s quantitative health impacts analysis.

3. “A Scenario Tool for Assessing the Health Benefits of Conserving, Restoring and Managing Natural Working Lands in California,” University of California, Los Angeles, $400,000, Proposal No. 2825-292

   In CA, landmass is comprised of biologically diverse landscapes including forests, woodlands, rangelands, farmlands, riparian areas, grasslands, scrublands, wetlands and urban green space. Together these lands are known as Natural and Working Lands (NWL). These NWL are potentially a major source of carbon sequestration by capturing carbon via soils, plants, and trees. To understand more completely the benefits of actions undertaken in CA to reduce emissions and increase carbon sequestration in NWL, it is critical to measure the potential impacts of these actions on human, wildlife, and ecosystem health. This project aims to create a scenario tool that quantitatively assesses the direct human health impacts resulting from the activities that impact NWL outlined within the Draft CA 2030 NWL Implementation Plan and in other policies and programs. To develop the tool, the Contractor will conduct an in-depth review of the NWL policies, programs, and activities. The Contractor will also conduct a comprehensive literature review of health studies in areas where NWL may have an impact on health, including wildfires, urban green space, rural green space and benefits of forests in reducing PM and improving

health. The Contractor will use the literature review and review of existing NWL models to form the foundation of the NWL Health Scenario Tool. Variables included in the model will depend on the strength and certainty of the evidence on associations between NWL and direct health impacts identified within the literature. It is anticipated that the results of the NWL Health Scenario Tool will fill critical gaps in knowledge about potential human health impacts of various activities related to the conservation, management, and restoration of NWL in CA.

4. "Improving Indoor Air Quality, Energy Efficiency, and Greenhouse Gas Reductions through Multifamily Unit Compartmentalization," University of California, Davis, $399,860, Proposal No. 2826-292

   Outdoor air supply rates and indoor air/pollutant transport between units have been a long standing problem in multifamily buildings. In medium and high-rise buildings, ventilation is often provided by vertical-stack exhaust ventilation systems, with make-up air coming from hallways and/or from the outdoors (through designed openings or leaks). The two major problems in these buildings have been: 1) significant exchange of air and pollutants between units; and 2) inadequate, time-varying ventilation rates of units. This study will investigate the impact of compartmentalization of multifamily units (e.g. apartments) on IAQ, energy usage and GHG emissions. Compartmentalization in this project means the process of air sealing all boundary walls of a multifamily unit (shared walls, floor, ceiling, and exterior walls). Unlike single-family homes, multifamily units have many shared walls with neighboring units. Reducing leakage between units can dramatically reduce smoke transfer, cooking odors, and even noise transfer. Units in three new multifamily buildings will be tested by measuring total air leakage and exhaust-flow variations across units. Two buildings will have some units receive different degrees of air sealing to produce three tightness levels, ranging from as-built to very tight (~0.15 cfm/ft2). Guarded blower-door air leakage testing will be conducted for a subset of units to distinguish outdoor air leakage from air leakage to neighboring units. For this project, air/pollutant transfer rates between units will be measured at different levels of compartmentalization using tracer-gas and PM2.5 sources. Airflow modeling will then be conducted to help generalize the field-test results. Modeling will be used to assess air exchange rates, inter-unit pollutant transfer, pollutant exposures, energy savings, and GHG reduction potential for different levels of compartmentalization in CA multifamily buildings. The modeling results will also be compared with field-test results for a subset of monitored apartments. These results will provide critical information to the CARB and the California Energy Commission (CEC) regarding the impacts of current and suggested future building standards on health protection, energy efficiency, and GHG emissions, in support of improving CA's Title 24 Building Energy Efficiency Standards (Energy Code).

5. "Determinants of Medium and Heavy Duty Truck Fleet Turnover," University of California, Davis, $500,000, Proposal No. 2827-292

   To attain air quality goals, GHG reduction targets, and clean energy requirements, CA's trucking fleet must transition to low-NOX technologies, alternative fuels, and zero emission vehicles wherever possible. To enhance the effectiveness of its incentive programs and the predictive accuracy of its transportation emissions modeling, CARB seeks to better understand the factors

that determine medium and heavy-duty truck fleet turnover, and how their influence varies by fleet type, location and industry. Direct communication with industry sources will be used to identify the determinants of fleet vehicle turnover for trucks operating in CA, and to characterize their application to decisions affecting high-priority vocations, industries and vehicle classifications.

6. "Examining Entitlement to Inform Policy and Process in California: Advancing Social Equity in Housing Development Patterns"
   University of California, Berkeley, $399,702, Proposal No. 2828-292

   California's land use law and environmental regulations governing housing development must facilitate access to quality transit and employment opportunities with the intention to advance equitable infill development, minimize environmental impacts, and achieve GHG emission reduction targets. Research is needed to explore whether existing land use law and environmental regulations are unintentionally facilitating sprawl or contributing to the state's housing and homelessness crisis. The main objective of this research project is to understand what elements of local and state land use regulations may constrain housing production, generally, and infill development, specifically. Research methods will join mixed method social science research and legal research methods, employ overlapping phases of data collection and sequenced analysis. Results will help policymakers to gain a better understanding of whether or not land use laws and environmental regulations increase or decrease equitable access to transit-rich neighborhoods and/or housing supply while achieving California's climate and equity goals.

7. "Understanding and Mitigating Wildfire Risk in California,"
   University of California, Berkeley, $700,000, Proposal No. 2829-292

   CA wildfires are becoming larger and more frequent and the 2018 fire season was record-breaking in terms of monetary damage, area burned, and human casualties. Fine PM2.5 and ozone formed from fires are two of the deadliest components of fire smoke. Climate change has increased the area burned by wildfire in the Western US, particularly by drying forests and making them more susceptible to burning, leading to an increasing impact on local and regional air quality. Quantifying the chemical composition and properties of biomass burning (BB) emissions is needed to improve modeling of their impact on human health, visibility, and climate. This project will provide emission profiles from a representative set of controlled burns in a mixed conifer forest, and wildfires, in CA. Measured emission factors (EFs) will be used in collaboration with CARB staff to improve the First Order Fire Effects Model (FOFEM) estimates of short-lived climate pollutants (SLCPs) and other air pollutants. Outcomes would include improved emissions factors from controlled burns of managed and previously unmanaged forest; and comparison to EFs from wildfires, including recently measured and published values. The results of this research project along with its unique database will be a valuable resource for the community for identifying specific chemicals in air masses impacted by BB plumes and understanding the dominant source materials burned, fire characteristics, atmospheric transformations, and health implications.

8. "Health Impacts of California Wildfire PM2.5 Across the Lifespan"
   University of California, Davis, $452,812, Proposal No. 2830-292

Although wildfires in CA are predicted to increase in frequency and intensity in the coming years, lifelong health effects from acute wildfire smoke exposure in sensitive groups such as children are currently unknown. To address this gap in knowledge, previous CARB funded research by Dr. Lisa A. Miller investigated immune and lung function parameters following exposure to ambient PM2.5 from the 2008 Trinity and Humboldt County wildfires in a cohort of rhesus monkeys housed in outdoor colonies at the California National Primate Research Center (CNPRC) in Davis, CA. Results showed that monkeys acutely exposed to wildfire smoke during infancy showed deficits in immune and lung parameters, both in adolescence and in early adulthood. In this proposed study, the UCD research team will continue to assess the 2008 wildfire smoke-exposed female animals at 11 years of age, with an emphasis on non-invasive health measures linked to chronic lung diseases such as pulmonary fibrosis. Specifically, the UCD research team proposes to perform the following for the 2008 wildfire smoke-exposed rhesus monkey cohort: 1) determine whether wildfire smoke exposure can result in persistent dysregulation of immune function; 2) determine whether parameters of respiratory health including lung volume and remodeling have been persistently compromised; and 3) assess whether parameters of respiratory function correlate with activity levels. The possibility that early environmental exposures can lead to detrimental health effects throughout an individual's lifespan has significant public health and air quality management implications. The findings from this study will therefore be invaluable to CARB in the development of more health-protective ambient air quality standards.

9. "Strategies for Incentivizing High-Occupancy, Zero Emission, New Mobility Options," University of California, Berkeley, $700,000, Proposal No. 2831-292

   CA needs to reduce criteria pollutants and GHG emissions from motor vehicles in order to meet its air quality and climate goals. This will require increasing high-occupancy, zero emission new mobility options and multi-modal transportation choices. This project will examine new mobility strategies in CA, and how they interact with land use to influence travel behavior. The project has two objectives: 1) to identify barriers to adoption of new shared mobility and multi-modal transportation choices, as well as strategies to overcome those barriers; and 2) to construct scenarios that illustrate pathways to deep reduction of transportation emissions through wider adoption of new shared and multi-modal transportation options. A critical part of this project is to understand barriers to adoption of new mobility options in vulnerable populations, including low-income, disadvantaged community residents, rural communities and travelers with physical impairments. The contractor will identify implementation barriers by conducting: 1) focus groups targeting demographically representative travelers; 2) expert interviews with stakeholders; and 3) a general population survey across five major regions in CA. The contractors will utilize these results to construct three or four policy scenarios to model impacts of alternative policies and incentives on travel demand. Scenarios will be modeled out to 2050 to better understand the possible impacts of potential policy options and strategies on vehicle travel miles and emissions. The results will guide future programs affecting land use and transportation in the hopes of lowering emissions and vehicle miles traveled (VMT) to meet air quality and climate goals.