California Air Resources Board

Co-benefit Assessment Methodology
Heart and Lung Health

California Climate Investments
Greenhouse Gas Reduction Fund

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Section A. Introduction

The goal of California Climate Investments is to reduce greenhouse gas (GHG) emissions and further the objectives of the California Global Warming Solutions Act of 2006, Assembly Bill (AB) 32. The California Air Resources Board (CARB) is responsible for providing guidance on reporting and quantification methods for all State agencies that receive appropriations from the Greenhouse Gas Reduction Fund (GGRF). Guidance includes developing methodologies for estimating GHG emission reductions and other economic, environmental, and public health benefits of projects, referred to as "co-benefits."

CARB staff will use the Heart and Lung Health Co-benefit Assessment Methodology (methodology) to estimate heart and lung health impacts for relevant California Climate Investments programs. Most co-benefit assessment methodologies are intended for use by administering agencies, project applicants, and/or funding recipients to estimate the outcomes of individual California Climate Investments projects. For this methodology, however, CARB will apply the methods described in this document at a larger scale across all California Climate Investments. In addition to this methodology, general guidance on assessing California Climate Investments co-benefits is available in CARB's Funding Guidelines for Agencies Administering California Climate Investments (Funding Guidelines) available at www.arb.ca.gov/cci-fundingguidelines.

Heart and Lung Health Co-benefit Description

Heart and lung health co-benefits refer to the expected change in the incidence of premature cardiopulmonary mortality, hospitalizations for cardiovascular and respiratory illness, and emergency room visits for asthma as a result of California Climate Investments. These health impacts occur because California Climate Investments projects change the emissions of air pollutants, including particulate matter ($PM_{2.5}$) and nitrogen oxides (NO_X). In addition, this co-benefit can also be measured as the cost savings associated with the avoided incidents.

Individual California Climate Investments projects may cause reductions or increases in air pollutants but, overall, it is expected that the suite of funded projects will reduce air pollutant emissions and result in positive heart and lung health co-benefits. These co-benefits may accrue directly (as a central objective of the project) or indirectly (as a consequence of project activities).

A ***positive*** heart and lung health co-benefit results when California Climate Investments projects within an air basin reduce emissions of $PM_{2.5}$ and/or NO_X.

A ***negative*** heart and lung health co-benefit results when California Climate Investments projects within an air basin increase emissions of $PM_{2.5}$ and/or NO_X.

Heart and lung health co-benefits refer to the expected change in the incidence of:

- premature cardiopulmonary mortality,
- hospitalizations for cardiovascular and respiratory illness, and
- emergency room visits for asthma.

Heart and lung health co-benefit valuation refers to the monetization of the health benefits.

This Heart and Lung Health Co-benefit Assessment Methodology applies to all California Climate Investments projects for which a change in $PM_{2.5}$ and/or NO_X is estimated using CARB GHG Quantification Methodologies and Benefit Calculator Tools.

California Climate Investments that result in a change in air pollutant emissions and heart and lung health co-benefits include projects in the transportation, energy, natural and working lands, and waste sectors.

Methodology

CARB will use this Heart and Lung Health Co-benefit Assessment Methodology, consistent with the guiding principles of California Climate Investments. The methodology will:

- Apply to the project types proposed for funding;
- Provide uniform methods that can be applied statewide and are accessible by all applicants and funding recipients;
- Use existing and proven tools or methods, where available;
- Include the expected period of time for when co-benefits will be achieved; and
- Identify the appropriate data needed to calculate co-benefits.

Previous Work

In April 2018, CARB released a Draft Asthma/Respiratory Disease Incidence Co-benefit Assessment Methodology, developed by the Center for Resource Efficient Communities at the University of California, Berkeley (UC Berkeley). UC Berkeley assessed peer-reviewed literature and consulted with experts, as needed, to identify:

- The direction and magnitude of the co-benefit;
- Project types to which the co-benefit is relevant;
- The limitations of existing empirical literature;
- Existing assessment methods and tools; and
- Knowledge gaps and other issues to consider in developing co-benefit assessment methods.

This work is summarized in a literature review on this co-benefit, which can be found at: www.arb.ca.gov/cci-methodologies. UC Berkeley also considered ease of use, specifically the availability of project-level inputs from users for the applicable California Climate Investments programs and recommended use of the United States Environmental Protection Agency (U.S. EPA) CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA)[1].

After posting the Draft Asthma/Respiratory Disease Incidence Co-benefit Assessment Methodology[2] and receiving public comments, CARB decided to revisit the approach and scope of the method to align the methodology with the approach used for CARB Standardized Regulatory Impact Assessments (SRIAs) and the climate change scoping plan. CARB then released a Draft Heart and Lung Health Co-benefit Assessment Methodology for public comment in October 2018, prior to release of a Final Heart and Lung Health Co-benefit Assessment Methodology in November 2018.[3] CARB released the Heart and Lung Health Co-benefit Assessment Methodology for public comment in February 2022. This Final Heart and Lung Health Co-benefit Assessment Methodology has been updated to address public comments, where appropriate.

Updates

CARB staff periodically review each methodology to evaluate its effectiveness and update methodologies to make them more robust, user-friendly, and appropriate to the projects being quantified.

CARB has released this updated Draft Heart and Lung Health Co-benefit Assessment Methodology for public comment to provide updates from the previous version[3] to:

- enhance the analysis by including cost savings associated with the avoided incidents,
- and to further clarify the health analysis methodology utilized.

Program Assistance

For assistance with this Co-benefit Assessment Methodology, send questions to: GGRFProgram@arb.ca.gov. For more information on CARB's efforts to support implementation of California Climate Investments, see: https://www.arb.ca.gov/our-work/programs/california-climate-investments.

[1] US EPA (2021). CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA). Available at: https://www.epa.gov/cobra

[2] Center for Resource Efficient Communities, University of California, Berkeley (2018). Asthma/Respiratory Disease Incidence Draft Co-benefit Assessment Methodology. Available at: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/UCB_draft_asthma_am_042018.pdf

[3] CARB (2018). Heart and Lung Health Co-benefit Assessment Methodology. Available at: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/CARB_heartlunghealth_am_110118.pdf

Section B. Co-benefit Assessment Method

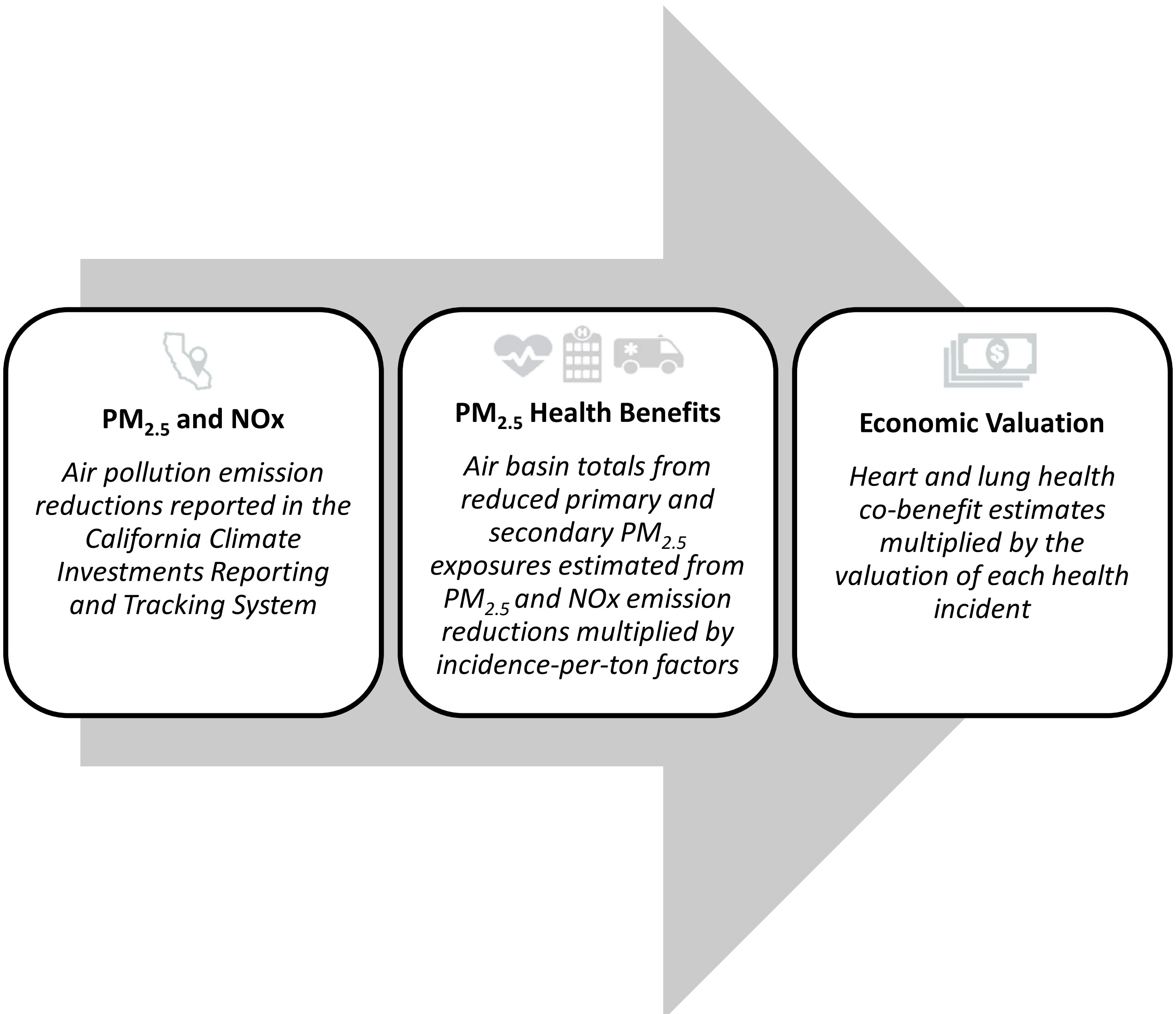
Introduction

This section describes in detail how CARB will estimate the heart and lung health co-benefits and valuation. CARB uses existing, well-established methodologies for calculating health impacts to estimate the combined heart and lung health co-benefits of California Climate Investments. The methods for assessing the reduction in heart and lung health incidents are quantitative, using the estimated changes in $PM_{2.5}$ and NO_X emissions during the project quantification period[4] compared to a no-project scenario, as reported in the California Climate Investments Reporting and Tracking System (CCIRTS).

CARB estimates premature death and other health effects related to $PM_{2.5}$ exposure based on a peer-reviewed methodology developed by the U.S. EPA[5] and used by CARB to estimate the health benefits of proposed regulations. The methodology is used to estimate the reduction in premature deaths and other health effects associated with emission reductions of $PM_{2.5}$ emitted directly from emission sources and secondary $PM_{2.5}$ formed in the atmosphere from chemical precursors.[6]

The methods used to monetize the estimated health impacts described here are the same as those used by CARB's Office of Economic & Policy Analysis (OEPA) for statutorily required economic impact analyses of proposed regulations. To monetize the health benefits, the number of health incidents avoided is multiplied by the economic valuation of each health incident, which are standard values derived from economic studies, consistent with U.S. EPA practice.[7]

[4] The project quantification period varies for the different programs and is defined in each of CARB's GHG Quantification Methodologies and Benefit Calculator Tools.
[5] U.S. EPA (2010). Quantitative Health Risk Assessment for Particulate Matter. Available at: https://www3.epa.gov/ttn/naaqs/standards/pm/data/PM_RA_FINAL_June_2010.pdf
[6] CARB (2019). CARB's Methodology for Estimating the Health Effects of Air Pollution. Available at: https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution
[7] U.S. EPA (2010). Appendix B: Mortality Risk Valuation Estimates, Guidelines for Preparing Economic Analyses (240-R-10-001) Available at: https://www.epa.gov/sites/default/files/2017-09/documents/ee-0568-22.pdf



Heart and Lung Health Analysis

CARB estimates health benefits associated with California Climate Investments using four health outcomes: cardiopulmonary mortality, hospitalizations for cardiovascular illness, hospitalizations for respiratory illness, and emergency room (ER) visits for asthma.[8]

These health outcomes and others have been identified by U.S. EPA as having a *causal* or *likely causal* relationship with exposure to $PM_{2.5}$ based on a substantial body of

[8] CARB uses this method to estimate health impacts of CARB regulatory decisions, for example, the recent Proposed Heavy-Duty Inspection and Maintenance Regulation SRIA, released on July 28, 2021, which is available at: https://www.dof.ca.gov/forecasting/economics/major_regulations/major_regulations_table/documents/Heavy-Duty-Inspection-and-Maintenance-SRIA.pdf

scientific evidence.[9] U.S. EPA has determined that both long-term and short-term exposure to $PM_{2.5}$ plays a *causal* role in premature mortality, meaning that a substantial body of scientific evidence shows a relationship between $PM_{2.5}$ exposure and increased risk of death.[9] This relationship persists when other risk factors such as smoking rates, poverty, and other factors are taken into account.[9] U.S. EPA has also determined a *causal* relationship between non-mortality cardiovascular effects and short- and long-term exposure to $PM_{2.5}$, and a *likely causal* relationship between non-mortality respiratory effects (including worsening asthma) and short- and long-term $PM_{2.5}$ exposure.[9] These outcomes lead to hospitalizations and ER visits.

CARB evaluates a limited number of statewide non-cancer health impacts associated with exposure to $PM_{2.5}$ and NOx emissions avoided by California Climate Investments. NOx includes nitrogen dioxide, a potent lung irritant, which can aggravate lung diseases such as asthma when inhaled.[10] Health impacts from NOx quantified in this methodology occur from the conversion of NOx into fine particles of ammonium nitrate through atmospheric chemical processes to form secondary $PM_{2.5}$. Both directly emitted (primary) $PM_{2.5}$ and secondary $PM_{2.5}$ are associated with adverse health outcomes, such as cardiopulmonary mortality, hospitalizations for cardiovascular illness and respiratory illness, and ER visits for asthma. As a result, reductions in $PM_{2.5}$ and NOx emissions are associated with reductions in these health outcomes.

Incidence-Per-Ton Methodology

CARB uses the incidence-per-ton (IPT) methodology to quantify the health benefits of emission reductions in cases where dispersion modeling results are not available, as is the case for California Climate Investments. A description of this method is included on CARB's website.[11]

[9] U.S. EPA. (2019). Integrated Science Assessment for Particulate Matter, EPA/600/R-19/188). Available at: https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=347534

[10] U.S. EPA. (2016). Integrated Science Assessment for Oxides of Nitrogen – Health Criteria, EPA/600/R-15/068. Available at: https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=310879

[11] CARB. CARB's Methodology for Estimating the Health Effects of Air Pollution. Retrieved February 9, 2022, from https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution

CARB (2019). Estimating Health Benefits Associated with Reductions in PM and NOx Emissions: Detailed Description. https://ww2.arb.ca.gov/sites/default/files/2019-08/Estimating%20the%20Health%20Benefits%20Associated%20with%20Reductions%20in%20PM%20and%20NOX%20Emissions%20-%20Detailed%20Description_0.pdf

CARB's IPT methodology is based on a methodology developed by U.S. EPA.[12,13,14]

Under the IPT methodology, changes in emissions are approximately proportional to changes in health outcomes. IPT factors are derived by calculating the number of health outcomes associated with exposure to $PM_{2.5}$ for a baseline scenario using measured ambient concentrations and dividing by the emissions of $PM_{2.5}$ or a precursor. The calculation is performed separately for each air basin using the following equation:

$$IPT = \frac{number\ of\ health\ outcomes\ in\ air\ basin}{annual\ emissions\ in\ air\ basin}$$

Calculation of the health outcomes used to establish air basin-specific IPTs to estimate changes in health incidents associated with changes in $PM_{2.5}$ exposure requires population data, baseline incidence rates, the change in concentration of $PM_{2.5}$, and concentration-response functions (CRFs)[15]:

- Population was estimated by taking 2010 Census data for total population by age bracket[16] and projecting to future years using total county population projections from the California Department of Finance.[17]
- Age-specific baseline incidence rates for premature cardiopulmonary mortality were taken from the Centers for Disease Control and Prevention Wonder online database.[18] Incidence data for hospitalizations for

[12] Fann, N., Fulcher, C.M., and Hubbell, B.J. (2009). The influence of location, source, and emission type in estimates of the human health benefits of reducing a ton of air pollution, Air Quality, Atmosphere & Health, 2:169-176. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2770129/
[13] Fann, N., Baker, K.R., and Fulcher, C.M. (2012). Characterizing the PM2.5-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S. Environ Int.; 49:141-51. Available at: https://www.sciencedirect.com/science/article/pii/S0160412012001985
[14] Fann, N., Baker, K., Chan, E., Eyth, A., Macpherson, A., Miller, E., and Snyder, J. (2018). Assessing Human Health PM2.5 and Ozone Impacts from U.S. Oil and Natural Gas Sector Emissions in 2025, Environ. Sci. Technol. 52 (15), pp 8095–8103. Available at: https://pubs.acs.org/doi/abs/10.1021/acs.est.8b02050
[15] CARB (2010). Truck and Bus Initial Statement of Reasons: Appendix J. Available at: https://www.arb.ca.gov/regact/2010/truckbus10/correctedappj.pdf
[16] CARB will use 5-year age brackets from ages 30 to 80, and an 85+ age bracket. Calculations are performed separately for each age bracket by 2010 US Census tract, then aggregated to totals by air basin.
[17] This accounts for overall population growth in a county but does not reflect shifts in the spatial distribution of the population such as new housing developments built on previously undeveloped land.
[18] Centers for Disease Control. CDC WONDER. Available at: https://wonder.cdc.gov/

cardiovascular and respiratory causes, and emergency room visits for asthma were taken from U.S. EPA BenMAP benefits mapping software.[19]

- The change in concentration of $PM_{2.5}$ were determined using $PM_{2.5}$ emission reductions reported for California Climate Investments projects. This analysis interprets changes in emissions as proportional to changes in ambient concentrations, allowing a straightforward analysis of the effects of projected emissions reductions attributed to California Climate Investments.[11]
- Concentration-response functions (CRFs) describe the relationship between a given health endpoint and concentration of the pollutant of interest. For this co-benefit assessment, CARB applied a CRF for premature death from Krewski et al.,[20] CRFs for hospital admissions from Bell et al.,[21] and a CRF for emergency room visits for asthma by Ito et al.[22] These references are selected in accordance with recent U.S. EPA practice. The concentration-response functions fit specific population parameters:

  1) Premature mortality incidence applies to the population of adults who are 30 years and older, [20]
  2) Hospitalization incidence applies to the population 65 years and older,[21]and
  3) The incidence of emergency room visits applies to the population between 0 and 99 years of age. [22]

After the IPT factor is calculated, it can be used to estimate health outcomes from emissions reduction data. For example, multiplying the estimated emission reductions in an air basin by the IPT factor then yields an estimate of the reduction in health outcomes achieved. For future years, the number of outcomes is adjusted to account for population growth. CARB's current IPT factors are based on a 2014-2016 baseline scenario, which represents the most recent data available at the time the current IPT factors were computed. IPT factors are computed for the two types of $PM_{2.5}$: primary

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[19] U.S. EPA BenMAP. Benefits Mapping and Analysis Software. https://www.epa.gov/benmap/benmap-downloads

[20] Krewski et al. (2009). Extended Follow-Up and Spatial Analysis of the American Cancer Society Study Linking Particulate Air Pollution and Mortality. Health Effects Institute Research Report 140. Available at: https://ephtracking.cdc.gov/docs/RR140-Krewski.pdf

[21] Bell et al. (2008). Seasonal and Regional Short-term Effects of Fine Particles on Hospital Admissions in 202 US Counties, 1999–2005. American Journal of Epidemiology. 2008 December 1; 168(11): 1301–1310. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2732959/

[22] Ito et al. (2007). Characterization of PM2.5, gaseous pollutants, and meteorological interactions in the context of time-series health effects models. Journal of Exposure Science and Environmental Epidemiology. Vol. 17 Suppl 2: S45-60. Available at: http://www.nature.com/jes/journal/v17/n2s/full/7500627a.html

$PM_{2.5}$ and secondary $PM_{2.5}$ of ammonium nitrate aerosol formed from precursors. However, current methods do not capture benefits from all of the secondary pollutants involved in $PM_{2.5}$ formation.

Implications and Limitations of the Heart & Lung Health Analysis

While funding recipients and/or administering agencies typically carry out project-level assessments of co-benefits from California Climate Investments, projected changes in health impacts from air pollutant emissions are generally not large enough to quantify at the project level. Therefore, CARB estimates the combined heart and lung health co-benefits of all California Climate Investments.

CARB performs the analysis of the overall heart and lung health co-benefits associated with changes in emissions from California Climate Investments projects, by air basin. The heart and lung health co-benefits in each air basin are estimated for 2015 through 2060, relative to the no-project baseline scenario. The results include the cumulative statewide number of avoided incidents for projected years, showing the estimated reductions in each incident (i.e., premature cardiopulmonary mortality, hospitalizations for cardiovascular and respiratory illness, and emergency room visits for asthma) resulting from California Climate Investments.

Note that because CARB staff evaluate a limited number of health impacts and pollutants, the heart and lung health benefits of California Climate Investments that are provided by this co-benefit assessment methodology are a conservative estimate. An expansion of the assessment of outcomes – including but not limited to, reduction of additional cardiovascular and respiratory illnesses, nonfatal/fatal cancers, and lost work days – would provide a more complete picture of the benefits from reduced exposure to air pollution. Additionally, CARB's mortality and illness assessment is only calculated for a portion of secondary $PM_{2.5}$ emissions. There are also other pollutants in addition to primary and secondary $PM_{2.5}$ that are known to cause health issues. For example, while NOx can lead to the formation of secondary $PM_{2.5}$ particles, NOx can also react with other compounds to form ozone, which can cause respiratory problems. Toxic air contaminants (TACs) present in emissions reduced by California Climate Investments projects can also cause cancer, which is not assessed by this methodology. Finally, California Climate Investments projects can improve health in ways other than by reducing air pollution, such as by preventing pedestrian injuries or deaths, increasing physical activity, reducing heat stress through urban greening, helping to prevent or reduce the spread of wildfire, and more. Altogether, CARB's current $PM_{2.5}$ mortality and illness evaluation represents only a portion of the health benefits of the California Climate Investments.

The Heart and Lung Health Co-benefit results are estimated at a regional scale, at the air basin level. However, it is important to consider that the California Climate Investments may decrease the exposure to pollution of those who live near emission sources. These individuals are likely at higher risks of developing cardiovascular and respiratory issues as a result of $PM_{2.5}$ and NOx emissions, compared to those who live further away from emission sources. Although CARB staff cannot quantify the potential effect of near-source exposures, California Climate Investments is expected to provide greater health benefits for these individuals who live and work closest to emission sources.

It is important to note that there is uncertainty inherent in these mortality and morbidity estimates. Uncertainty is reflected using a 95% confidence interval in the final health benefit estimates. These confidence intervals take into account uncertainties in translating air quality changes into health outcomes.

Other sources of uncertainty include the following:

- The relationship between changes in pollutant concentrations and changes in pollutant or precursor emissions is assumed to be proportional, although this is an approximation.
- Air quality data is subject to natural variability from meteorological conditions, local activity, etc.
- Emissions are reported at an air basin resolution, and do not capture local variations.
- Future population estimates are subject to increasing uncertainty as they are projected further into the future.
- Baseline incidence rates can experience year-to-year variation.

Heart and Lung Health Co-benefit Valuation

Methods of Analysis

To monetize the health benefits, the number of health incidents avoided is multiplied by the economic valuation of each health incident, which are standard values derived from economic studies. Specifically, the valuation per health incident is described in many of CARB's SRIAs.[8]

Consistent with U.S. EPA practice, health outcomes are monetized by multiplying each incident by a standard value derived from health economics studies.[7] The value for avoided premature mortality is based on the value of statistical life (VSL),[23] which provides a dollar estimate of benefits for an avoided premature death. The VSL is a statistical construct based on the aggregated dollar amount that a large group of people would be willing to pay for a reduction in their individual risks, such that one death would be avoided in the year across the population. This estimate does not explicitly consider any specific costs associated with mortality such as hospital expenditures. Discounting is not used for estimating the direct costs in regulatory

[23] U.S. EPA, An SAB Report on EPA's White Paper Valuing the Benefits of Fatal Cancer Risk Reduction (EPA-SAB-EEAC-00-013, released July 27, 2000) Available at: https://scholar.harvard.edu/files/stavins/files/sab_report_on_fatal_cancer.pdf

analysis, so it is also not used for estimating health benefits to maintain consistent methodology.[24]

Unlike premature mortality valuation, the valuation for avoided hospitalizations and ER visits are based on a combination of typical costs associated with hospitalization and the willingness of surveyed individuals to pay to avoid adverse outcomes that occur when hospitalized.[25] These include hospital charges, post-hospitalization medical care, out-of-pocket expenses, lost earnings of both individuals and family members, lost recreation value, and lost household production (e.g., valuation of time-losses from inability to maintain the household or provide childcare).[25] These costs are most closely associated with specific cost savings to individuals and costs to the California healthcare system.

The valuation per avoided health incident that is currently used by OEPA for regulatory analyses[8] is given in Table 1.

Table 1: Valuation per Incident for Avoided Health Outcomes

Outcome	Value per incident (2020$)
Avoided Premature Mortality	$10,030,076
Avoided Cardiovascular Hospitalizations	$59,247
Avoided Acute Respiratory Hospitalizations	$51,678
Avoided Emergency Room Visits	$848

An inflation adjustment is applied to these valuations where necessary, such that they are reported in the same dollar years as the estimates of other co-benefits and costs of projects. Inflation adjustments are based on the California Consumer Price Index for all urban consumers (CPI-U) as published by the Department of Industrial Relations.[26] The adjustment is applied as shown in the equation below:

$$20XX\$ = \frac{CPI_{20XX}}{CPI_{2020}} \times 2020\$$$

The equation above is used to adjust the values in Table 1 to some future year dollars (20XX$), by multiplying the current values by the rate of inflation that has occurred since 2020.

[24] Discounting is a mathematical procedure for adjusting future costs and benefits to "present value;" essentially this means adjusting for differences in the timing of project costs compared to health benefits.

[25] Chestnut et al. (2006). The Economic Value of Preventing Respiratory and Cardiovascular Hospitalizations. Contemporary Economic Policy, 24: 127–143. Available at: http://onlinelibrary.wiley.com/doi/10.1093/cep/byj007/full

[26] California Department of Industrial Relations. California Consumer Price Index. Available at: https://www.dir.ca.gov/OPRL/capriceindex.htm.

Heart & Lung Health Co-benefit Valuation Results

CARB will apply the valuation per incident values to the results of the heart and lung health incidents analysis. The results will include the cumulative statewide monetized health benefits for projected years, showing the estimated monetized health benefits from each incident (i.e., premature cardiopulmonary mortality, hospitalizations for cardiovascular and respiratory illness, and emergency room visits for asthma) resulting from California Climate Investments.

Section C. Data Requirements

This section describes the data requirements for the Heart and Lung Health Co-benefit Assessment Methodology that need to be provided to the Research Division to estimate the heart and lung health co-benefits. The project-level data that CARB will need to estimate the heart and lung health impacts include the following:

- **Change in $PM_{2.5}$ and NO_X Emissions:** The emission reductions or increases provided as an output from a CARB Benefit Calculator Tool.
- **Project Location:** Air basin where emission reductions or increases are expected.

  CARB staff annualize the project-level emissions data over the project quantification period, categorize by source type (i.e., on-road mobile sources, off-road mobile sources, and stationary sources), aggregate by air basin and provide to the Research Division in tons of each pollutant reduced per day, for the years 2015 through 2060, to summarize the cumulative reported emission reductions estimated from implemented projects.

When inputs required to estimate the heart and lung health co-benefits are inputs to, or outputs from, a CARB GHG Quantification Methodology or Benefit Calculator Tool (e.g., air pollutant emissions), the values used in estimation of GHGs and co-benefits must be identical.

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