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July 1, 2013

Acting Administrator Robert Perciasepe
U.S. Environmental Protection Agency
Air and Radiation Docket and Information Center (6102T)
1200 Pennsylvania Avenue NW
Washington, DC 20460

RE: EPA-HQ-OAR-0135-2011, Tier 3 Motor Vehicle Emission and Fuel Standards Program

Dear Administrator Perciasepe:

The American Lung Association submits these expanded comments in support of the U.S. Environmental Protection Agency's proposed Tier 3 Motor Vehicle Emission and Fuel Standards Program. These standards are urgently needed and will help protect the health of millions of Americans who continue to breathe unsafe air.

The American Lung Association urges EPA to adopt both the 10 parts per million low-sulfur gasoline standards and strong tailpipe emissions standards. Both are needed to achieve the greatest air quality benefits from existing and new vehicle technology. The comments below demonstrate the compelling case for EPA to adopt strong final Tier 3 Motor Vehicle Emission and Fuel Standards by December 31, 2013.

Cleaner Gasoline and Vehicle Standards are urgently needed

Millions of people live in parts of the nation that EPA has recognized as having air quality that is unhealthy to breathe. As of December 2012, 159 million people lived in areas where the air quality failed to meet official national air quality standards. Of those, 123 million lived in areas where ozone too frequently reached unhealthy levels. Over 74.3 million lived where year-round $PM_{2.5}$ levels were too high.[1] We need all the available tools to reduce emissions to clean up the air in their communities.

Tailpipe pollution is a major source of emissions that contribute to the widespread burden of ozone and particulate matter pollution. While individual cars now have far lower emissions than in years past, the entire fleet of vehicles currently on the road emit large quantities of particulate matter and gaseous pollution, including ozone precursors such as carbon monoxide, nitrogen oxides, and volatile organic compounds. Motor vehicles also emit other toxic air pollutants, including known carcinogens such as benzene, 1, 3-butadiene and formaldehyde.

Many groups face higher health risks from traffic-related air pollution

Near-roadway concentrations of vehicle emissions are higher than surrounding areas. About 17 percent of housing in America is located within 300 feet of a major roadway, railroad or airport where concentrations of harmful pollutants are likely higher than areas further away.[2] Over 18.2 million Americans meeting the federal poverty definition live in counties with high ozone pollution.[3] Evidence shows that people with low incomes may bear a greater burden from air pollution.[4]

Furthermore, individuals with pre-existing conditions such as asthma, chronic obstructive pulmonary disease (COPD), cardiovascular disease and diabetes face a greater burden from traffic related air pollution. There are 25.9 million Americans with asthma, including some 7.1 million children.[5] Ozone and particle pollution add to the burden they face every day. An estimated 83.6 million U.S. adults have some form of cardiovascular disease.[6] Short-term exposure to particulate matter or ozone pollution can trigger dangerous or fatal cardiac events in these populations, and longer-term exposure to particulate matter can decrease life expectancy by months or years.[7],[37] The 25.8 million Americans with diabetes may face an increased risk from particulate matter pollution due to its impact on their cardiovascular system. [8] Diabetics may face an increased risk from particulate matter pollution due to its impact on their cardiovascular system. African Americans, Mexican Americans and people living near a central city have higher rates of diabetes.[9]

Near-roadway exposures have emerged as a health threat affecting a large segment of the North American population, not just those that are economically disadvantaged. A 2010 review of existing research by the Health Effects Institute concluded that those living, working or going to school within 300-500 meters of a major roadway are exposed to higher concentrations of traffic related pollution. This includes 30-45 percent of the North American population living in urban areas. The report identifies a causal relationship between traffic pollution and asthma exacerbation in children, and 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.[10]

Studies since 2010 have added to the evidence showing harm to health associated with traffic-related air pollution. Rosenbloom et al, (2012) examined data from patients from 64 medical centers across the U.S. and found increased risk of death for people with cardiovascular disease who live near major roadways.[11] Chen et al., (2013) found that, even in Canada where pollution levels are much lower levels than in the U.S., long-term exposure to traffic pollution was associated with higher risk of death from cardiovascular disease.[12] Andersen et al, (2011) found that years of exposure to pollution from traffic in Denmark may have increased the risk of developing COPD, a risk that may have even been enhanced in people who already had asthma or diabetes.[13]

The evidence of long-term harm to children from near-roadway exposures has also continued to expand. Newman et al, (2013) studied data from children in the Cincinnati area who spent the first year of their lives near a major highway. They found those children were more likely to have high hyperactivity scores when they reached school age, a risk factor for attention deficit/hyperactivity

disorder (ADHD).[14] Grunzivea et al. (2013) found in a large study that Swedish children exposed to traffic in infancy were more likely to have asthma at age 12.[15]

Children face special risks from air pollution because their lungs continue to grow into adolescence and because they are more active outdoors than adults. According to the American Academy of Pediatrics in its policy statement recognizing the health hazards of outdoor air pollution, a child's developing lung is "highly susceptible to damage" from air pollution:[16]

> Children and infants are among the most susceptible to many of the air pollutants. In addition to associations between air pollution and respiratory symptoms, asthma exacerbations, and asthma hospitalizations, recent studies have found links between air pollution and preterm birth, infant mortality, deficits in lung growth, and possibly, development of asthma.[17]

Like children, older adults face a greater burden from air pollution. As the body ages it is less able to defend against the effects of air pollution. Adults age 65 and older are also more likely to have one or more of these diseases that are linked to higher risk.

In addition, healthy adults who work or exercise outdoors also may be at greater risk of harm from air pollution. Studies such as those of lifeguards in Texas,[18] hikers in New Hampshire,[19] and farm workers in California[20] indicate that being outdoors longer, with often greater physical exertion increases the amount of polluted air breathed.

Tailpipe emissions programs have improved air quality

Cleaning up tailpipe emissions improves air quality. The most recent evidence demonstrating that came in a just-published study that looked at ozone precursors in the Los Angeles basin. Scientists at the National Oceanic and Atmospheric Administration and the Cooperative Institute for Research in Environmental Sciences at the University of Colorado, Boulder found that these precursors have decreased largely due to emissions reductions from motor vehicles:

> "Although many factors have contributed to changes in ambient concentrations of NOx, CO and VOCs over the years, decreasing abundance in the [South Coast Air Basin] are predominantly attributed to decreasing emissions from motor vehicles due to increasingly strict emissions standards in California. Large decreases in motor vehicles emissions have occurred despite a factor of 2.4 increase in population and factor of three increase in fuel sales in the state of California since the 1960s."[21]

The study evaluated long-term trends of ozone precursors from 1960 to 2010 using data from surface monitoring stations, mobile roadside monitors, ground based field campaigns, and instrumental research aircraft. The study finds that ozone continues to be responsive to local emissions control strategies.

Cleaner gasoline and motor vehicles will save lives

In April, the American Lung Association released the attached report "*A Penny for Prevention: The Case for Cleaner Gasoline and Vehicles,"* that identified health benefits of cleaner gasoline and vehicles. The analysis used data drawn from a 2012 assessment of air quality in part of the Eastern United States[22] to estimate the benefits from having cleaner vehicles in 2030. The geographic scope of the 2012 study covered a large section of Eastern United States which included half the U.S. population and most major metropolitan areas currently suffering from air pollution.

The Lung Association report examined the public health benefits as they would be in 2030, when nearly all of the gasoline-powered vehicles would comply with the proposed tailpipe standards. That analysis provides a more complete and accurate representation of the benefits than the oil industry analyses that looked at the impacts only in 2022, when the fleet would be early in the transition.

Still, this analysis also underestimates the benefits nationwide because of the limited geographic area that the underlying study covered. That study, by Vijayarahavan et al (2012) with the Environ International Corporation, modeled the future benefits in only fifteen states and the District of Columbia. Uncounted in the analysis were the large urban centers in much of the nation, including the cities of Houston, Dallas-Fort Worth, Las Vegas, Salt Lake City, Seattle, Phoenix, and Denver.

BenMAP modeling shows that the lower ozone and particulate matter pollution that would result from cleaner gasoline and vehicles in place by 2030 would have important health benefits. This analysis estimated that the full implementation of cleaner gasoline and vehicles would prevent more than 2,500 premature deaths each year, avoid more than 15,000 asthma attacks each year, and avert more than 3.1 million missed work and school days each year. The monetized health and economic benefits would range between $8.5 billion and $22 billion annually. Health benefits of a nationwide Tier 3 program will likely be greater since the above benefits are only estimated for half the population.

The tables below provide more detailed estimates. Table 1 lists the estimated benefits from the reductions in particulate matter ($PM_{2.5}$) in 2030 from the full fleet turnover to meet the clean vehicles standards

Benefits from Reduced PM 2.5 in 2030	
Health Effects	**Avoided Cases Each Year**
Acute Bronchitis	1,342
Heart Attacks	1,488
Asthma Attacks	15,184
Emergency Room Visits, Respiratory	854
Days Missed from Work	115,416
Premature deaths[23]	874 to 2,233

Table 1 Estimated Health Benefits from $PM_{2.5}$ reductions resulting from Cleaner Gasoline and Vehicles standards in 2030 in selected Eastern States.

Table 2 below lists the estimated benefits from ozone reductions in 2030, when nearly the entire fleet in the defined region will meet the proposed standards.

Benefits from Reduced Ozone in 2030	
Health Effects	**Avoided Cases Each Year**
Acute Respiratory Symptoms	464,618
Emergency Room Visits, Respiratory	259
Hospital Admissions, Respiratory	658
Premature deaths[24]	102 to 320
Missed Work or School Days	3,192,155

Table 2 *Estimated Health Benefits from Ozone Reductions Resulting from Cleaner Gasoline and Vehicle standards in 2030 in selected Eastern States*

Cleaner gasoline and motor vehicles will help state and local air agencies meet clean air goals

On March 29, 2013, EPA proposed an implementation rule for the 2008 ozone National Ambient Air Quality Standards (NAAQS). EPA assumed a Tier 3 program with a strong low sulfur gasoline standards in its baseline analysis for attainment of the ozone NAAQS adopted in 2008. State and local governments are also preparing to meet NAAQS for particulate matter, nitrogen dioxide, and sulfur dioxide. Tier 3 will be a critical tool for local and state governments to meet these clean air goals. In absence of Federal Tier 3 standards, state and local governments will have to turn to other measures. In most areas, mobile sources comprise a large percentage of the emission inventory across the nation. Finding pollution reductions equal to those that would have come from a Federal Tier 3 program will be difficult.[25]

Motor vehicle pollution harms human health

Tailpipes emit many pollutants that EPA has long analyzed and found conclusive evidence of harm to human health. Three of them, carbon monoxide, nitrogen oxides and volatile organic compounds, have harmful human health impacts on their own but are also precursors to ozone and particulate matter. Tailpipes directly emit particulate matter as well as carcinogens and other air toxics. The adoption of cleaner gasoline and vehicle standards will reduce these tailpipe emissions significantly.

Ozone

In February, EPA completed the most recent review of the scientific evidence of the health effects from ozone pollution. EPA concluded that ozone pollution posed multiple, serious threats to health.[26]

This review confirmed that breathing ozone caused a "*broad range of respiratory effects, including altered development of the respiratory tract.*" (Italics in the original.) Ozone reduces lung function and increases wheezing and shortness of breath, triggers asthma attacks and increases the risk of hospital admissions and emergency department visits. This review also confirmed that ozone likely causes premature death.[27]

This latest review also identified several key new areas of concern. Breathing ozone likely causes cardiovascular harm, with evidence of systemic inflammation and oxidative stress and may cause harm to the central nervous system. Studies of long-term exposure to ozone suggest ozone may cause reproductive or developmental harm, particularly low birth weight.[28]

Strong evidence exists of the deadly impact of ozone in large studies conducted in cities across the U.S., in Europe and in Asia. Researchers have repeatedly found that the risk of premature death increased with higher levels of ozone.[29,30,31] Moreover, the evidence shows that ozone causes premature death independently from effects of other pollutants.

Nitrogen oxides (NOx)

The EPA's most recent review found that NO_x also often concentrates along heavy-trafficked roadways; some studies have found that in heavy traffic, NO_x can be over twice the outdoor levels in nearby residential areas.[32] NO_x may be a hazard for drivers, including commuters, as it is commonly concentrated inside vehicles. The EPA has determined that short-term NO_x exposure is likely to cause respiratory harm, including airway inflammation in children, increased susceptibility to allergens, asthma attacks, chest tightness and difficulty breathing, resulting in missed school and work days, emergency room visits and hospitalizations.[33] Long-term NO_2 exposure may stunt lung growth--which may be a risk factor for lung disease later in life. In adults there are respiratory effects but also evidence of cardiovascular effects from exposure to NO_x, with a robust association with cardiopulmonary mortality.[34]

Carbon monoxide (CO)

One of the long-recognized major pollutants in gasoline tailpipe emissions is carbon monoxide. Motor vehicles remain the dominant source of carbon monoxide in the air.[35] Carbon monoxide causes a range of harmful effects, particularly to the cardiovascular system. The growing evidence of harm to cardiovascular disease has shown in increased hospital admissions and emergency department visits for ischemic heart disease, heart attacks, and congestive heart failure.[36] In addition, carbon monoxide combines in the air with nitrogen oxides and volatile organic compounds to form ozone.[37]

Particulate matter

Tailpipes both directly emit particles and gases that form particles in the atmosphere: nitrogen oxides, sulfur dioxide and volatile organic compounds (VOCs). Because of their small size, particles can stay suspended in the atmosphere for days or weeks and be transported into nearby neighborhoods or over hundreds of miles, affecting people in neighboring cities and states. Once inhaled, fine and ultrafine particulate matter bypasses the body's clearance mechanisms and penetrates deep into the lungs and cardiovascular system carrying with it other toxic substances.[38]

First and foremost, exposure to particle pollution can kill. Breathing high levels of particulate matter pollution day in and day out can be deadly, as landmark studies in the 1990s conclusively showed.[39] Chronic exposure to particulate matter can shorten life by one to three years.[40]

Strong evidence warns that particulate matter exposure, especially coarse particulate matter (PM_{10}), increases the risk of death in infants. Glinianaia et al. (2004) in their review of research into infant deaths from particulate matter, found the strongest associations for post-neonatal mortality from respiratory causes and sudden infant death syndrome.[41] In a review of research on pregnancy outcomes, Šrám et al (2005) concluded that the evidence was "sufficient to infer a causal relationship between particulate air pollution and respiratory deaths in the post-neonatal period."[42]

The American Heart Association Scientific Statement reflects the growing evidence that fine particulate matter ($PM_{2.5}$) causes cardiovascular harm:

> Exposure to PM <2.5 μm in diameter ($PM_{2.5}$) over a few hours to weeks can trigger cardiovascular disease–related mortality and nonfatal events; longer-term exposure (e.g., a few years) increases the risk for cardiovascular mortality to an even greater extent than exposures over a few days and reduces life expectancy within more highly exposed segments of the population by several months to a few years; reductions in PM levels are associated with decreases in cardiovascular mortality within a time frame as short as a few years; and many credible pathological mechanisms have been elucidated that lend biological plausibility to these findings. It is the opinion of the writing group that the overall evidence is consistent with a causal relationship between $PM_{2.5}$ exposure and cardiovascular morbidity and mortality.[43]

In the 2009 review of the science, EPA concluded that particulate matter caused early death (both short-term and long-term exposure); cardiovascular harm (e.g. heart attacks, strokes, heart disease, congestive heart failure), was likely to cause respiratory harm (e.g. worsened asthma, worsened COPD, inflammation) and may cause cancer and reproductive and developmental harm.[44]

Air toxics

Air toxics include both PM and VOCs that come from both tailpipes and evaporative emissions of gasoline from vehicles in hot weather and while fueling. Some are gases; some are particles; and some adhere to particles. Benzene, a known carcinogen and a major component of the evaporative emissions from gasoline, is perhaps the most studied air toxic, but it is not the only carcinogen from gasoline emissions. Some traffic-generated carcinogens or probable carcinogens include 1, 3-butadiene, acetaldehyde and formaldehyde. Other air toxics include VOCs, such as toluene, xylenes, naphthalene, and acrolein; polycyclic aromatic hydrocarbons (PAHs), and some metals (chromium, nickel). However, other toxics in gasoline are also harmful to breathe. Not enough information is known about the human health impacts of air toxics from traffic exposure. The identified health effects are predominantly based on evidence from workplace exposure to healthy adults. Neither the concentrations nor the health impacts of the emissions in "hot spots" near busy highways are known. [45,46]

Other Analyses Support EPA's Findings that Standards Have Very Low Cost for Consumers

Two independent studies support EPA's conclusions that the refining cost associated with Tier 3 sulfur standards will be very low compared to the benefits. In 2011, MathPro, a consulting firm specializing in economic analysis of petroleum refining and related industries, commissioned by the International

Council for Clean Transportation, found that the per-gallon refining cost of a Tier 3 program with a 10 parts per million sulfur standard would be 1.4 cents.[47]

In 2012, Navigant Economics, commissioned by the Emissions Control Technology Association, estimated the cost of low sulfur gasoline standard would be about one cent per gallon. This estimate is closer to EPA's and MathPro's estimates rather than the higher cost claims from the oil industry.[48]

The Voting Public Is Willing To Pay the Extra Penny

An overwhelming majority of voters supports EPA setting stricter standards on gasoline and tighter emissions standards for cars, SUVs and trucks according to a survey the Lung Association conducted in January 2013.

This bipartisan telephone survey of 800 registered voters, conducted during January 13-16, 2013, found that nearly two-thirds of voters surveyed across the country support strengthening standards that limit sulfur in gasoline and tighten the limits on tailpipe emissions from new vehicles.
The majority of voters surveyed (53 percent) still favored setting stricter standards on gasoline, even after hearing opposing arguments that cars are already cleaner and allege that this proposal would cost families thousands of dollars, and would increase the cost of gas nine cents per gallon.

Key poll findings included:

- 69 percent of voters favored EPA generally updating standards with stricter limits on air pollution.
- A 2-to-1 majority (62 to 32 percent) supported EPA setting stricter standards on gasoline and tightening limits on tailpipe emissions from new vehicles.
- Only 17 percent of voters believed EPA was exceeding its legal mandate to ensure air quality.

Copies of the survey results and a presentation on them are attached.

EPA should chose these changes to strengthen the protections

Harmonize PM Standards with CARB now. We strongly urge EPA to harmonize the Federal Test Procedure (FTP) PM emissions standard with CARB to 1 mg/mile by 2025. Diesel vehicles and some gasoline-powered vehicles have the technology to meet a 1 mg/mile PM standard today.[49] According to the International Council on Clean Transportation (ICCT) in their comments to CARB on the Low Emissions Vehicle program III, certifying vehicles to a low standard can be challenging, but can be done. ICCT recommended focusing on the more precise solid particle number measurement such as in the United Nations Particle Measurement Programme as an alternative proxy, but not a replacement, for the gravimetric method.[50] Technology exists today to collect and report particle number emissions. Automakers in Europe currently do so, therefore, given the lead time, this issue should be resolved by 2017.

We believe the Supplemental FTP PM emissions standards are not sufficiently aggressive and are, in reality, a non-standard. EPA has proposed a Supplemental FTP PM emissions standard of 10 mg/mile which would allow far more PM emissions than existing vehicles currently emit. According to a memorandum describing EPA's own testing, no vehicles either above or below 6,000 pounds gross

vehicle weight rating emitted more than 3.5 mg/mile and most were well below that level.[51] We urge EPA to set the tightest feasible Supplemental FTP PM emissions standards, which would be no greater than 4 mg/mile.

Lower the sulfur caps. The American Lung Association supports lowering the per-gallon sulfur caps to 20 ppm at the refinery gate and 25 ppm downstream from the current 80 ppm per gallon refinery gate and 95 ppm per-gallon downstream caps in 2020. Although EPA is setting an average sulfur gasoline standard of 10 ppm, there will be refinery-by-refinery differences in the sulfur content of fuel due to operational differences. Additionally, fuel can be contaminated during transportation through pipelines to its final destination. As a result, the fuel quality available may differ by location exposing some populations to higher tailpipe emissions than others. EPA should set the refinery gate cap and downstream cap to 20 ppm per gallon and 25 ppm per gallon respectively to limit the exposure of vehicles in-use to sulfur levels that significantly degrade pollution control performance and to ensure all communities enjoy the benefits of cleaner air.

Update Certification fuel to in-use fuel. In separate decisions announced in October of 2010 and January in 2011, EPA granted a waiver request to major manufacturers of ethanol to increase the allowable limit of ethanol in gasoline to 15 percent starting for vehicle model years 2001 and after. Although EPA has increased the permissible amount of ethanol in gasoline to 15 percent, this fuel is still not widely available in the marketplace. Most gasoline sold today contains up to 10 percent ethanol by volume (E10). We believe that the certification fuel should match the fuel being sold in the market. Based on current gasoline sales, E10 should be the certification fuel. We urge EPA to adopt an approach that gives the agency the flexibility to update and match the certification fuel with the current market fuel without further rulemaking. Under such an approach, perhaps a triggering event such as the suggested 30 percent market share of gasoline sold with fifteen percent ethanol (E15), could prompt EPA to change the certification fuel. Two model years of lead time for such a switch should be sufficient time for the auto manufacturers to accommodate any such change. EPA should continue to have flexibility to make modifications to certification fuel specifications as appropriate.

We believe that if the Reid Vapor Pressure (RVP) of E10 in current in-use fuel is 10 psi, then the certification fuel should also be 10 psi.

EPA outlines a process whereby a manufacturer could design vehicles to operate on higher octane and higher ethanol content gasoline, i.e. E30 or higher. We support the approach that allows for a petition for certification on such fuels if demonstrated that such fuels will be readily available nationwide, will be used by the vehicle operators, vehicles would not operate appropriately on other available fuels, and such a fuel would result in equivalent emission performance. All confirmatory testing should be conducted on fuel that matches the certification fuel.

For Flexible Fueled Vehicles (FFV) test fuel, we support an approach that includes the standard certification fuel, E10 until such time as EPA revises to E15 if market conditions warrant, as discussed above, with additional denatured fuel ethanol to meet the 80-83 volume percent.

Conclusion: EPA Should Adopt Strong Standards in 2013

The motor vehicle emissions and fuel standards EPA has proposed will reduce dangerous pollution spewing out of tailpipes all across the nation. These standards will save lives and will help protect the health of millions of Americans who continue to breathe unsafe air. The American Lung Association urges EPA to adopt these standards as soon as possible and, certainly, before the end of this year.

Sincerely,

Paul G. Billings
Senior Vice President, Advocacy and Education
American Lung Association

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GREENBERG QUINLAN ROSNER RESEARCH

PUBLIC OPINION STRATEGIES

January 30, 2013

Voters Support Stricter Gasoline and Vehicle Standards

To: The American Lung Association

From: Andrew Baumann and Chloe Mullins, Greenberg Quinlan Rosner
Lori Weigel, Public Opinion Strategies

A new bipartisan national survey of 800 registered voters[1] finds that an overwhelming, bipartisan majority of American voters continue to support the efforts of the EPA to strengthen standards on harmful emissions and believes the EPA should be doing more, not less, to reduce air pollution.

On the specific issue of tighter emission standards for gasoline and tailpipe emissions from light duty vehicles, an overwhelming two-to-one majority enters the debate favoring updating standards with stricter limits. A solid majority continues to favor the standards after messaging from both sides of the issue.

Key Findings

- **The Clean Air Act and EPA remain much more popular than Congress, whose ratings continue to sink**

    - The EPA continues to earn positive favorability ratings, at 45 percent favorable, 28 percent unfavorable.
    - Feelings about the Clean Air Act remain very positive (43 favorable, 23 unfavorable) and see little change from our last survey in March 2012. The CAA gets strong ratings from all regions of the country and is viewed positively by independents.
    - Voter's feelings towards Congress continue to drop with 64 percent giving it an unfavorable rating, up 8 points since last March and 24 points since early 2011.
    - Oil companies are very unpopular (20 favorable, 53 unfavorable) across the political spectrum, while auto manufacturers are viewed favorably (44 favorable, 18 unfavorable). Voters are split in their views about gasoline refineries (30 favorable, 35 unfavorable).

[1] Memo based on a national survey of 800 registered voters reached via live telephone interviews on both landlines and cell phones. Conducted for the American Lung Association by Greenberg Quinlan Rosner and Public Opinion Strategies, January 13-16, 2013. Margin of error for the full national sample is 3.5%.

Table 1: Favorability of Key Actors

	Overall	Dems	Inds	Mod Reps	Cons Reps
EPA					
Favorable	45	61	41	42	20
Unfavorable	28	11	34	27	54
Net	+17	+50	+7	+15	-34
Clean Air Act					
Favorable	43	58	37	43	18
Unfavorable	23	9	29	22	43
Net	+20	+49	+8	+21	-25
U.S. Congress					
Favorable	18	26	11	19	12
Unfavorable	64	57	73	58	71
Net	-46	-31	-62	-39	-59
Auto Manufacturers					
Favorable	44	53	39	37	38
Unfavorable	18	14	18	25	23
Net	+26	+39	+21	+12	+15
Oil Companies					
Favorable	20	14	20	22	32
Unfavorable	53	63	51	38	40
Net	-33	-49	-31	-16	-8
Gasoline Refineries					
Favorable	30	21	28	33	45
Unfavorable	35	42	34	29	28
Net	-5	-21	-6	+4	+18

- **Voters rate clean air a higher priority than reducing regulations**
    - Not surprisingly, voters prioritize the economy and jobs over other areas. But protecting air quality is also very important to them as 78 percent rate it extremely or very important - a higher priority than reducing regulations on business. These results have remained remarkably consistent over the last two years.

Table 2: Priorities of voters – percent saying each issue is extremely or very important

	Overall	Dems	Inds	Mod Reps	Cons Reps
Economy/Jobs	94	96	90	95	97
Protecting Air Quality	78	93	72	72	56
Reducing Regulations	48	31	51	59	76

- **Voters across the country strongly believe EPA should be doing more, not less, to reduce air pollution**
    - Over two thirds of voters nationally favor the EPA placing stricter standards on air pollution, similar to what we have seen over the last two years. This includes a 54 percent majority of Republicans.

Table 3: Support for EPA updating standards with stricter limits on air pollution

	Fav	Opp	Net	Dems	Inds	Mod Rep	Cons Rep	NE	Mid-west	South	West
Jan 2013	69	26	+43	+79	+26	+25	-7	+60	+47	+31	+46

- Just 17 percent of voters believe the EPA is going further than the law allows in trying to protect air quality, relatively unchanged from our results over the last two years.

Table 4: EPA doing more than allowed or less than required by law to ensure air quality

	Total	Dems	Inds	Reps
Doing less than required	24	26	25	19
Meeting its goals	46	48	45	45
Going further than allowed	17	9	20	23
Doing less-going further	+7	+17	+5	-4

- Just 18 percent of voters believe that current laws and regulations that limit gasoline emission are too strict. Significantly more (30 percent) believe these laws and regulations are not strict enough.

- **An overwhelming majority of voters support stricter gasoline and vehicle standards. Solid majority support holds after balanced messaging**

    - Initially, voters overwhelmingly support stricter standards on gasoline and vehicles by a 2-to-1 margin with 62 percent of voters nationwide supporting the standards and only 32 percent opposed. This includes a strong majority of independents and moderate Republicans with only conservative Republicans opposed.[2]

Table 5: Initial Support for Cleaner Gasoline and Vehicle Standards

	Total	Dems	Inds	Mod Rep	Cons Rep
Favor	62	79	56	56	37
Oppose	32	15	37	41	58
Net	+30	+64	+18	+15	-21

- Notably, after a balanced debate with messages[3] in support and opposition, the updated standards maintain a solid majority with an eleven-point margin in favor (53 percent favor, 42 percent oppose).

[2] Please see the appendix for full text of question
[3] Please see the appendix for full text of messages

Appendix A — Text of Description of Standards

As you may know, the Environmental Protection Agency, or EPA, is considering a proposal that would implement stricter standards on gasoline, resulting in lower emissions from all cars, trucks and S.U.V.s. These standards would limit the amount of sulfur in gasoline and would tighten the limits on tailpipe emissions from new vehicles. Do you favor or oppose this proposal to have the EPA set stricter standards on gasoline and tighten limits on tailpipe emissions from new vehicles?

Appendix B — Text of Messaging

Now let me read you two more statements some people on both sides of the issue might make.

(Some/other) people say: Pollution from cars has a devastating effect on the health of families and children, worsening asthma, bronchitis and emphysema and even causing cancer. This proposal is the most effective smog-fighting tool available - it would be the equivalent of taking 33 million cars off the road immediately, and would prevent tens of thousands of asthma attacks and save thousands of lives every year. The proposal is supported by automakers, and independent economists say cleaner gas would cost less than a penny per gallon. American families would miss fewer days at work and would save billions of dollars in lower health care costs by keeping people healthier in the first place.

(Some/other) people say: This proposal would cost American families thousands of dollars. Economists predict that it would increase the cost of gas by up to 9 cents per gallon. It would be a hidden energy tax that drives energy prices up, raising costs for every American business. And they would pass the costs on to the rest of us, meaning higher prices for utilities, groceries, and everything we buy. Thanks to regulations we already have, cars today are already 90 percent cleaner than they were a couple of decades ago. The huge costs of this proposal just aren't worth the marginal benefits it would produce.

Now that you've heard more about this issue let me ask you again, do you favor or oppose this proposal to set stricter standards on gasoline and tighten limits on tailpipe emissions from new vehicles?

PUBLIC OPINION STRATEGIES

AMERICAN LUNG ASSOCIATION®
Fighting for Air

GREENBERG QUINLAN ROSNER RESEARCH

American Lung Association

Cleaner Gasoline and Vehicle Standards Survey Findings

January 30, 2013

Methodology

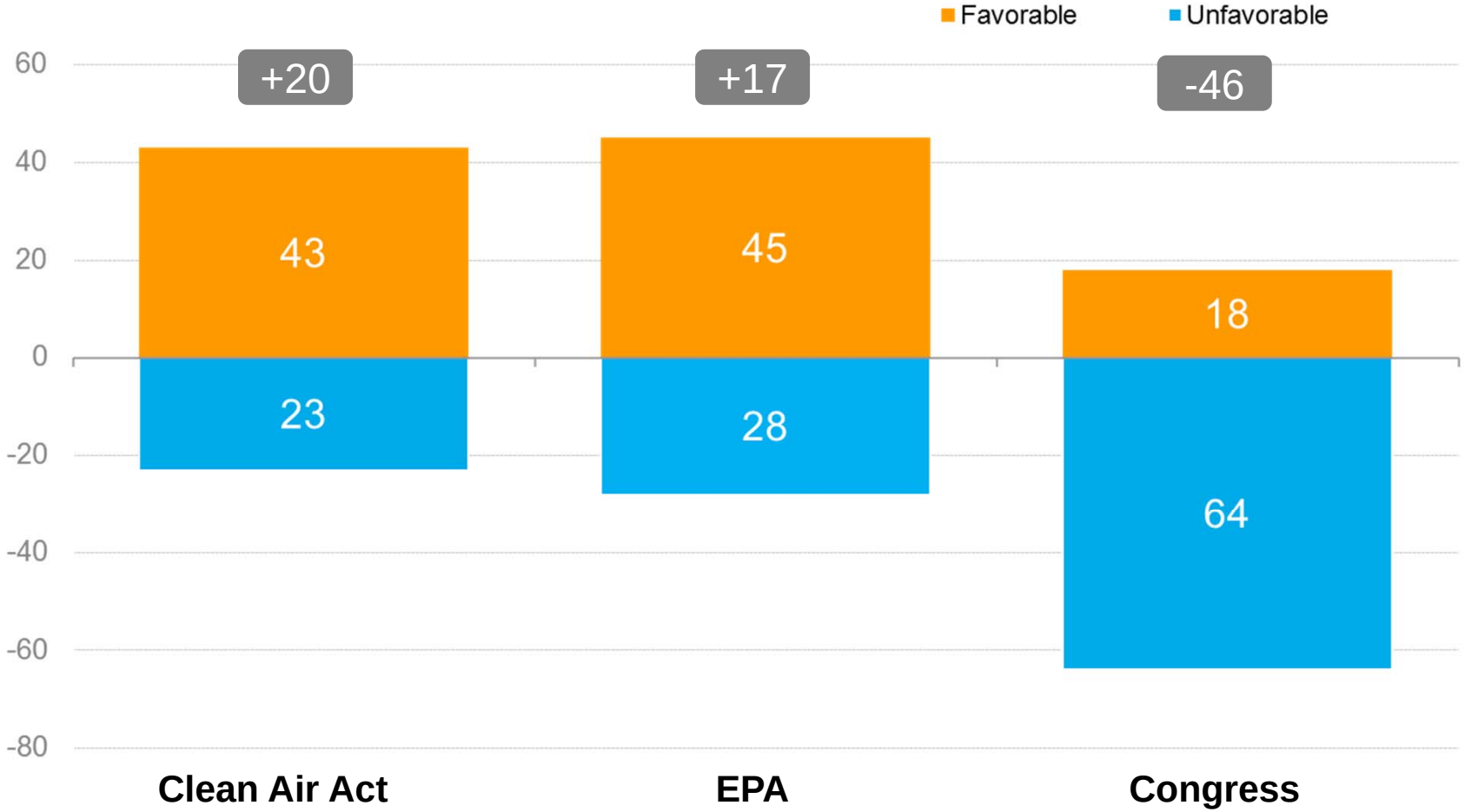
On behalf of the American Lung Association, Greenberg Quinlan Rosner Research and Public Opinion Strategies conducted a national survey of 800 registered voters. The survey was conducted by live interviewers among voters reached on landline and cell phones from January 13-16, 2013. The margin of error for the full sample is +/- 3.5 percentage points.

Key Findings

- **The Clean Air Act and EPA remain much more popular than Congress, whose ratings continue to sink**
- **Voters rate clean air a higher priority than reducing regulations**
- **Voters across the country strongly believe EPA should be doing more, not less, to reduce air pollution**
- **An overwhelming majority of voters support for stricter gasoline and vehicles standards. Solid majority support holds after balanced messaging**
- **Conservative Republicans are one of the few sub-groups that oppose EPA stronger environmental protections**

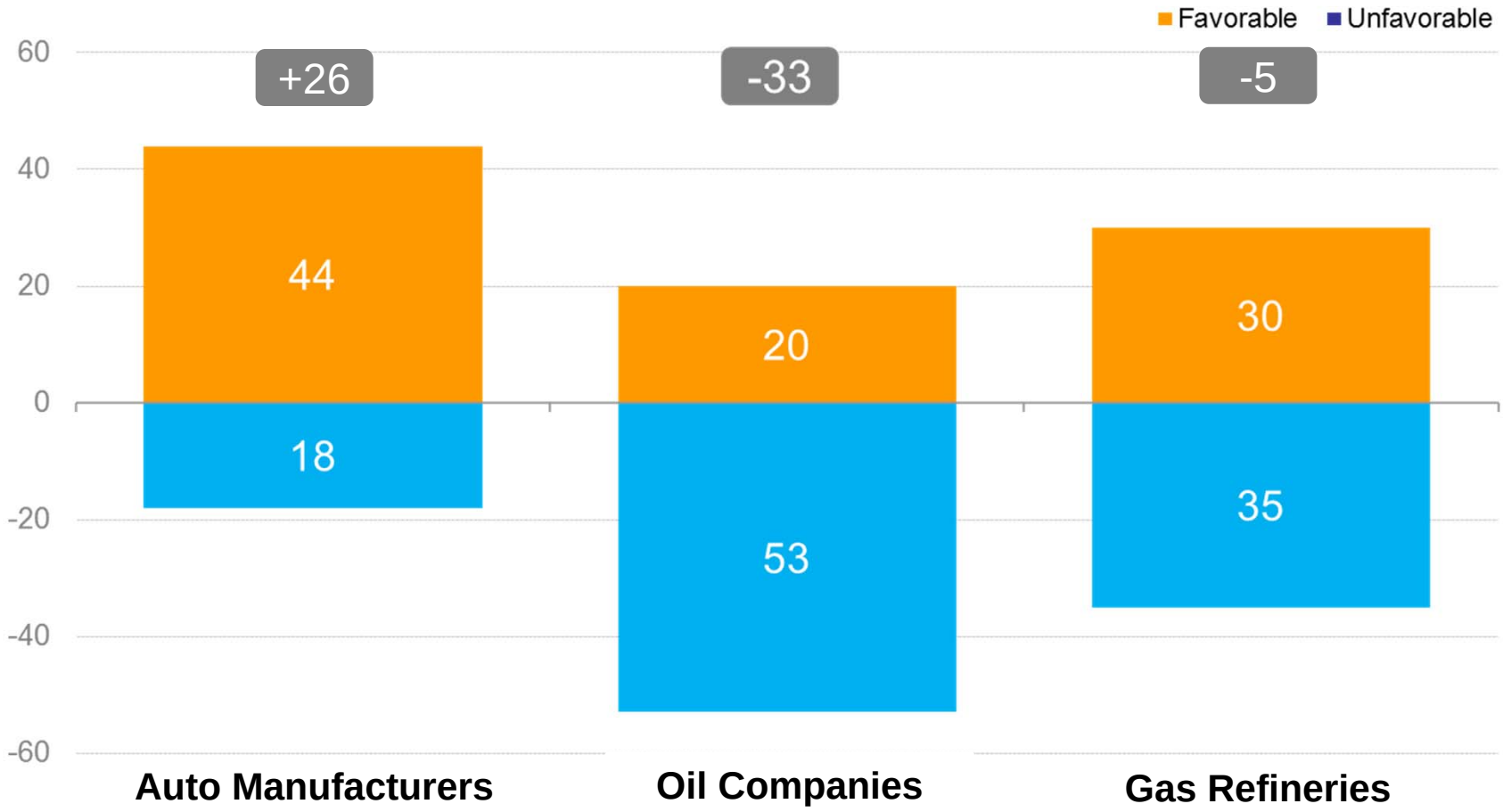
EPA, Clean Air Act Remain More Popular than Congress

Now, I'd like you to rate your feelings toward some people and organizations, with one hundred meaning a VERY WARM, FAVORABLE feeling; zero meaning a VERY COLD, UNFAVORABLE feeling; and fifty meaning not particularly warm or cold.



Voters Positive on Auto Manufacturers, Negative on Oil Companies and Split on Gas Refineries

Now, I'd like you to rate your feelings toward some people and organizations, with one hundred meaning a VERY WARM, FAVORABLE feeling; zero meaning a VERY COLD, UNFAVORABLE feeling; and fifty meaning not particularly warm or cold.



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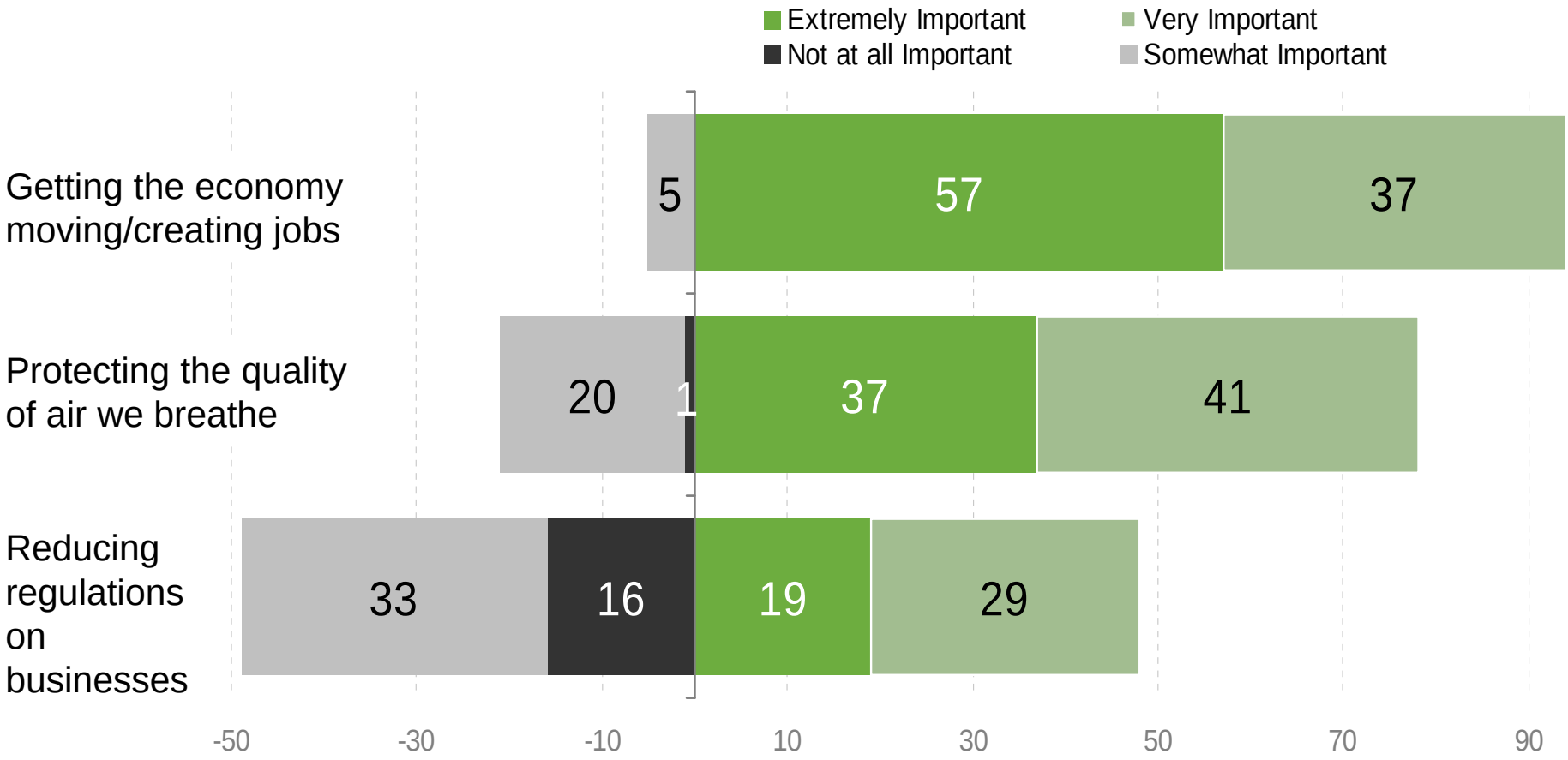
Protecting Air Quality Continues to Be More Important to Voters than Reducing Regulations

Now I'm going to read you a list of issues facing the country. For each one, please tell me how important you find that issue to be. Is it EXTREMELY important, VERY important, just SOMEWHAT important, or NOT AT ALL important?



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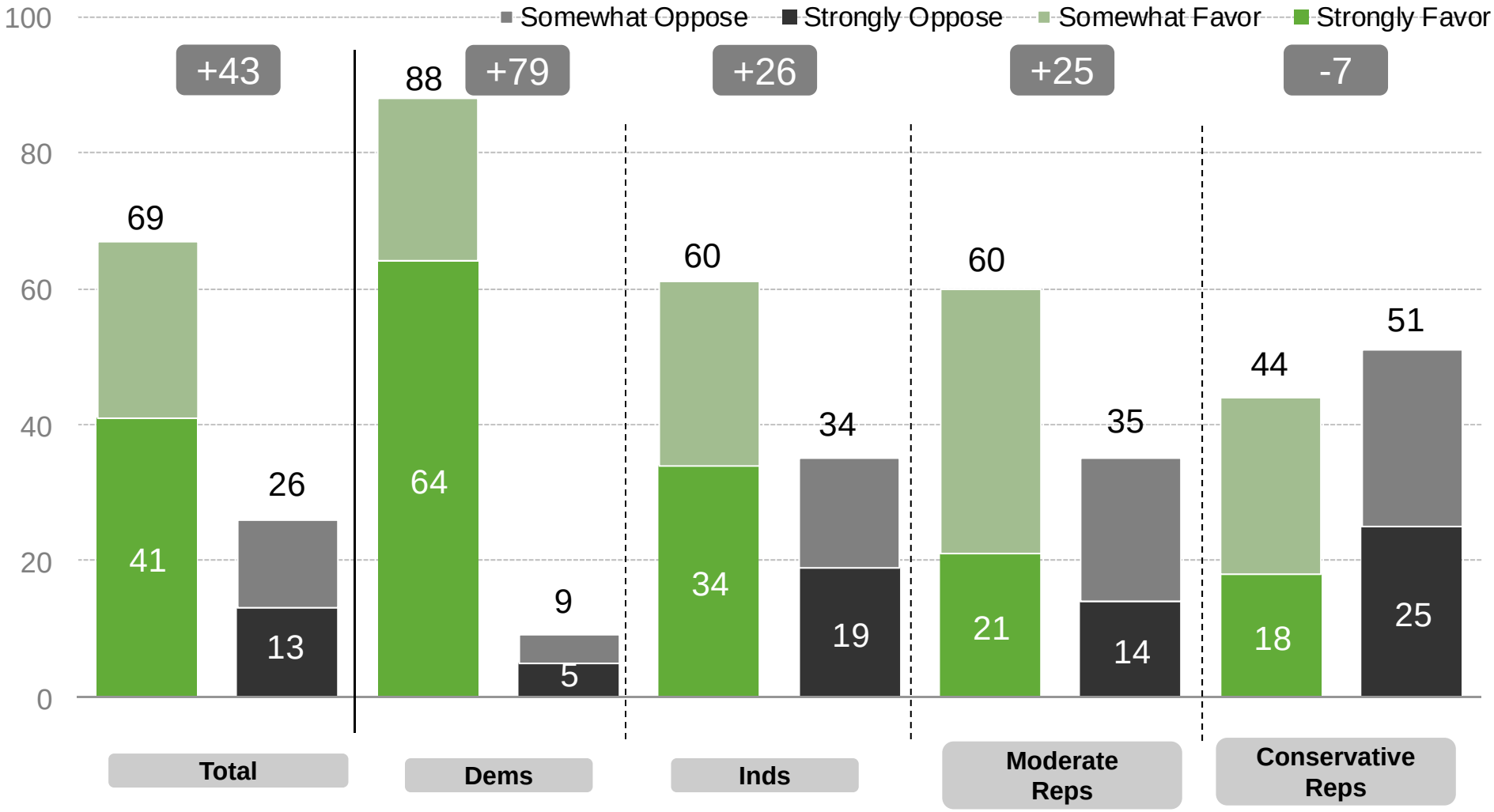
Over Two-Thirds of Voters Strongly Favor Updating Stricter Standards on Air Pollution

Generally speaking, do you favor or oppose the Environmental Protection Agency, or EPA, updating standards with stricter limits on air pollution?



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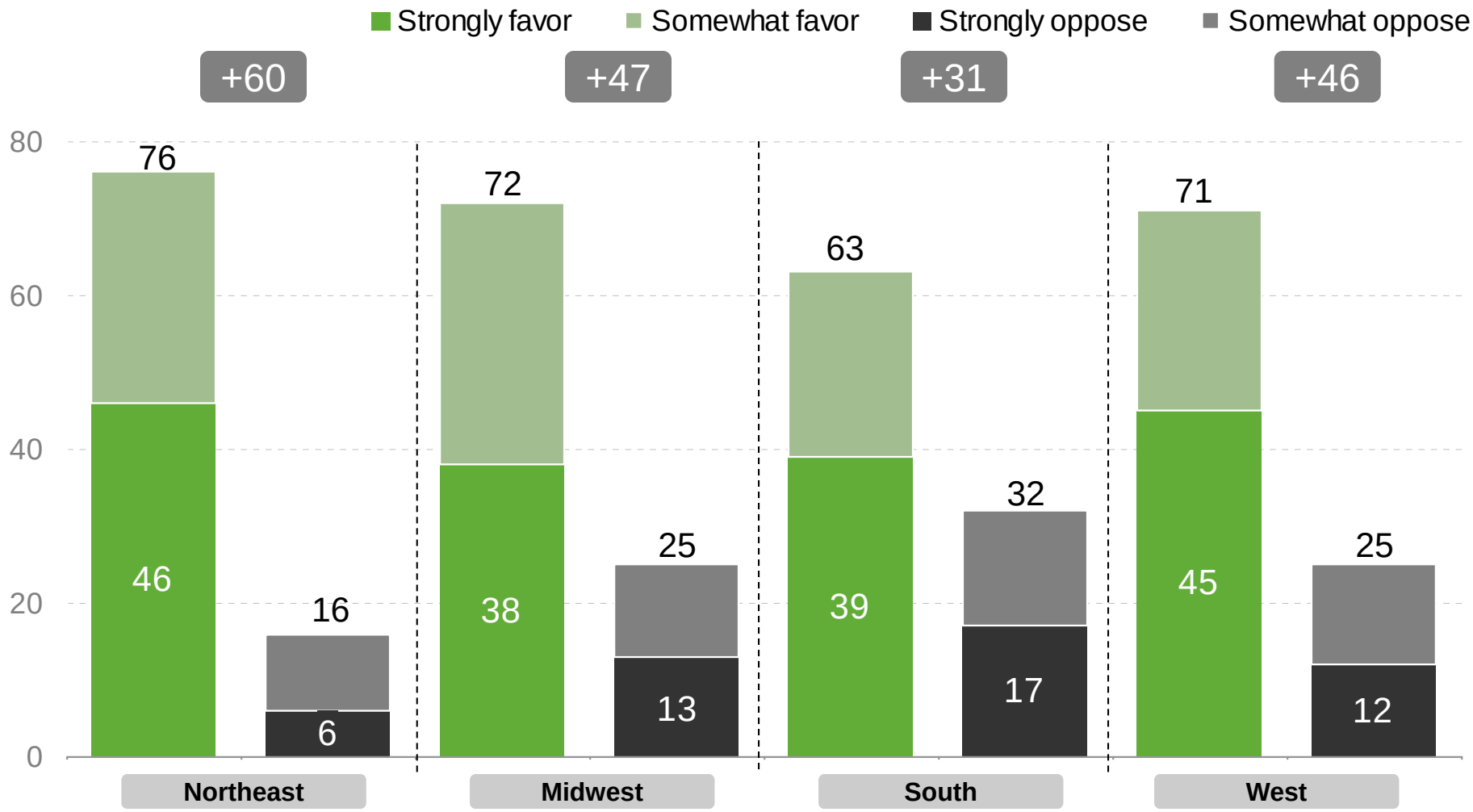
Strong Support Across the Country as Well

Generally speaking, do you favor or oppose the Environmental Protection Agency, or EPA, updating standards with stricter limits on air pollution?



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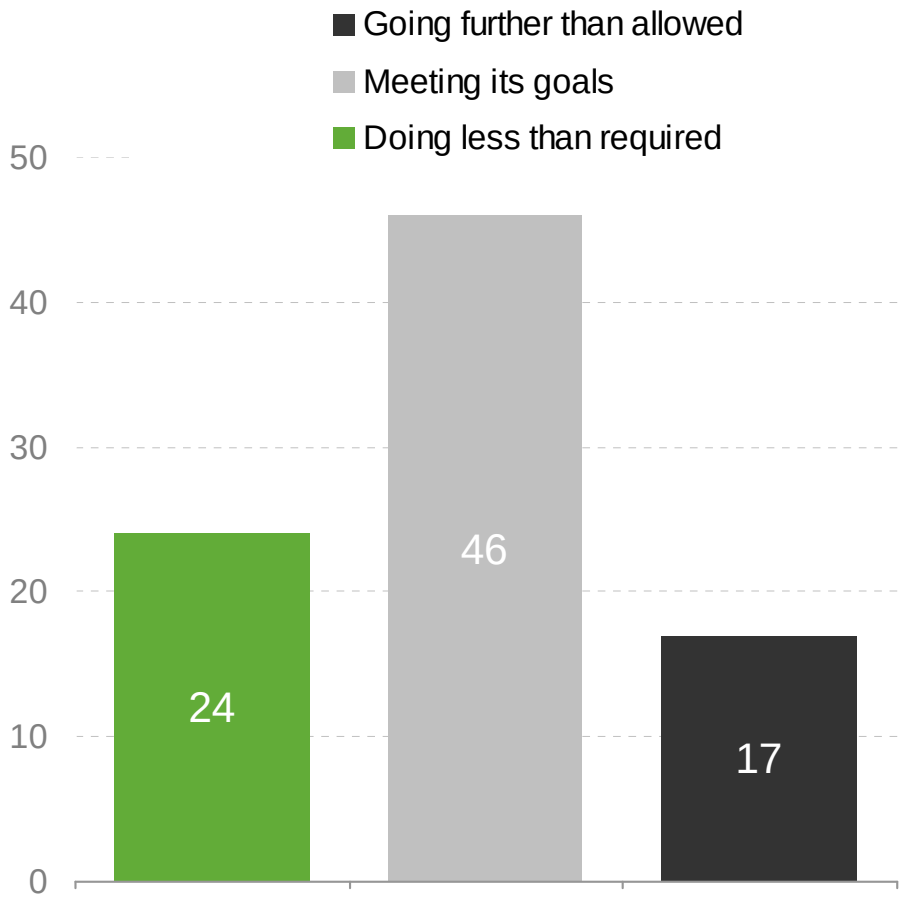
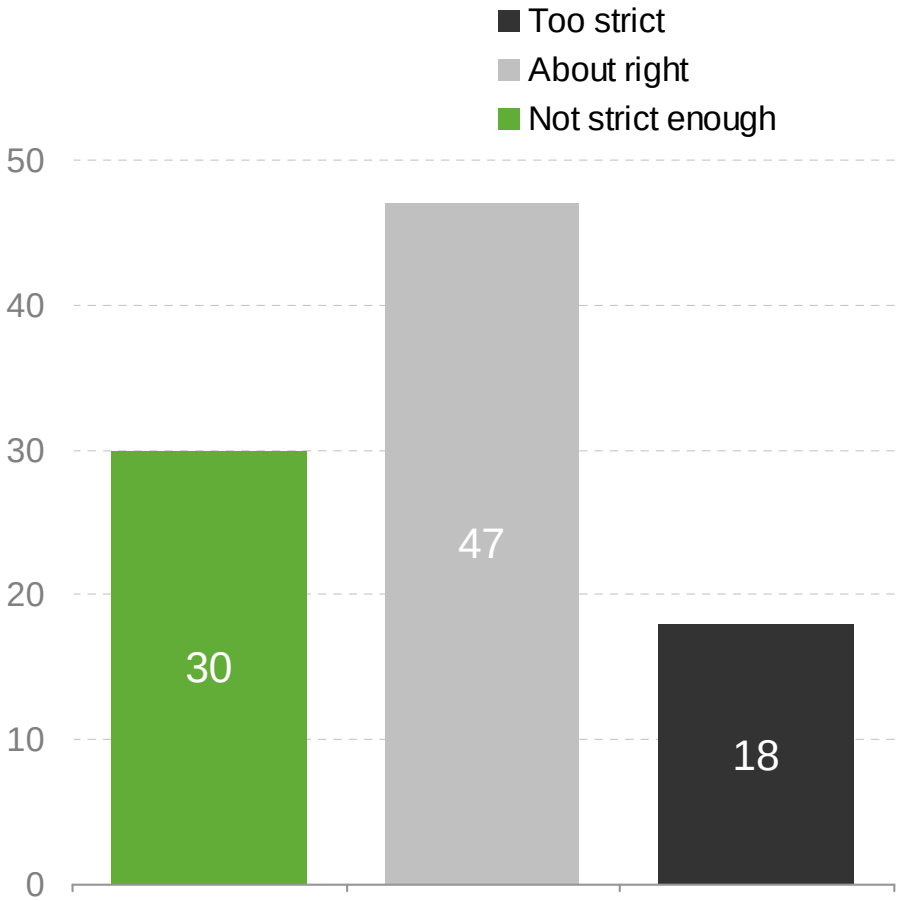
Voters Reject Notion that Current Regulations are Too Strict, or that EPA is Doing Too Much

Do you think the EPA is doing less to ensure air quality than is required of it by law, going further to ensure air quality than is allowed by law, or is generally meeting its goals for air quality as required by law?



Do you feel that current laws and regulations that limit emissions from gasoline are too strict, about right, or not strict enough?



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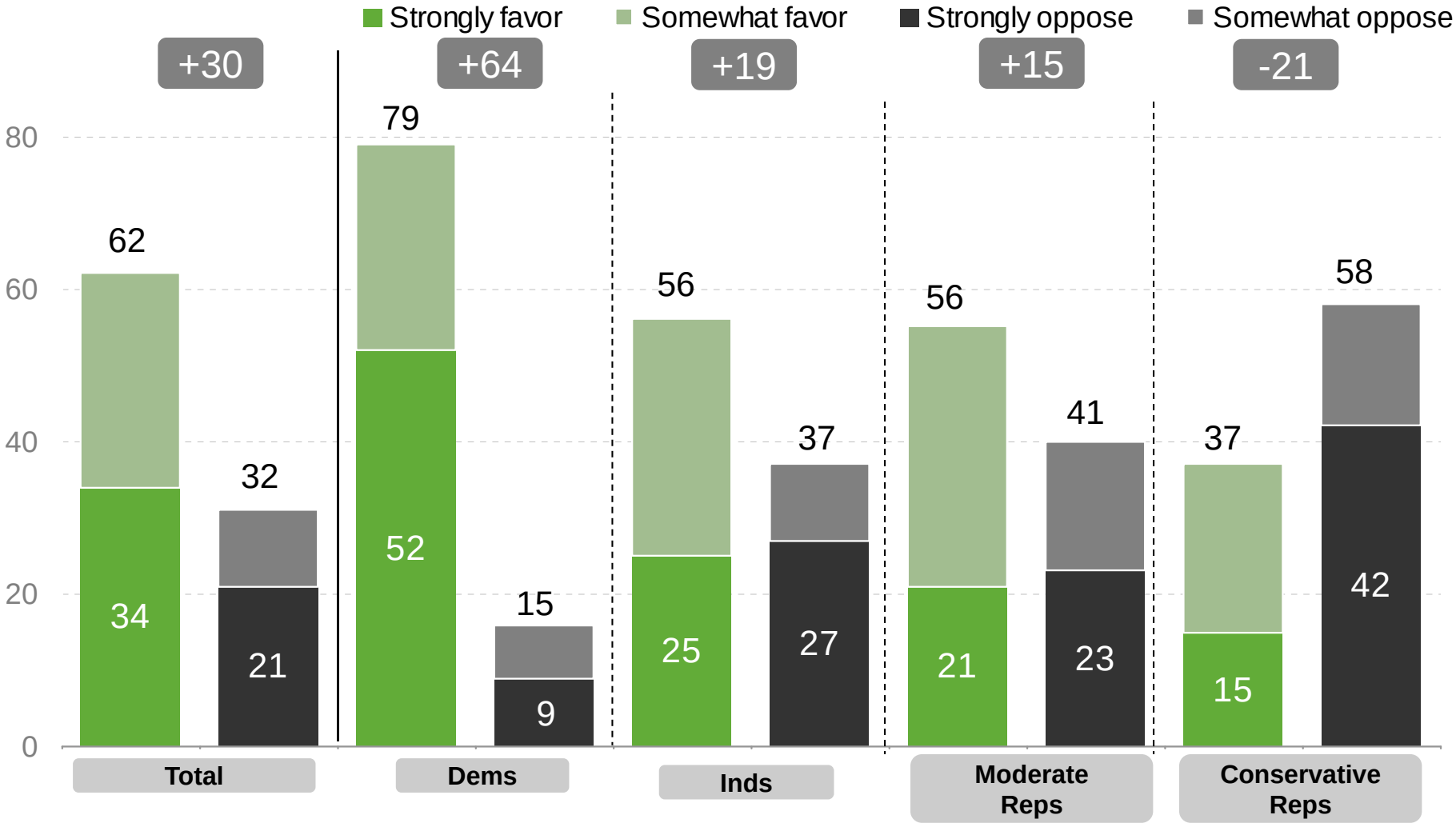
Overwhelming Support for Stricter Gasoline and Vehicle Standards

As you may know, the Environmental Protection Agency, or EPA, is considering a proposal that would implement stricter standards on gasoline, resulting in lower emissions from all cars, trucks and S.U.V.s. These standards would limit the amount of sulfur in gasoline and would tighten the limits on tailpipe emissions from new vehicles. Do you favor or oppose this proposal to have the EPA set stricter standards on gasoline and tighten limits on tailpipe emissions from new vehicles?



Debate Plays Out

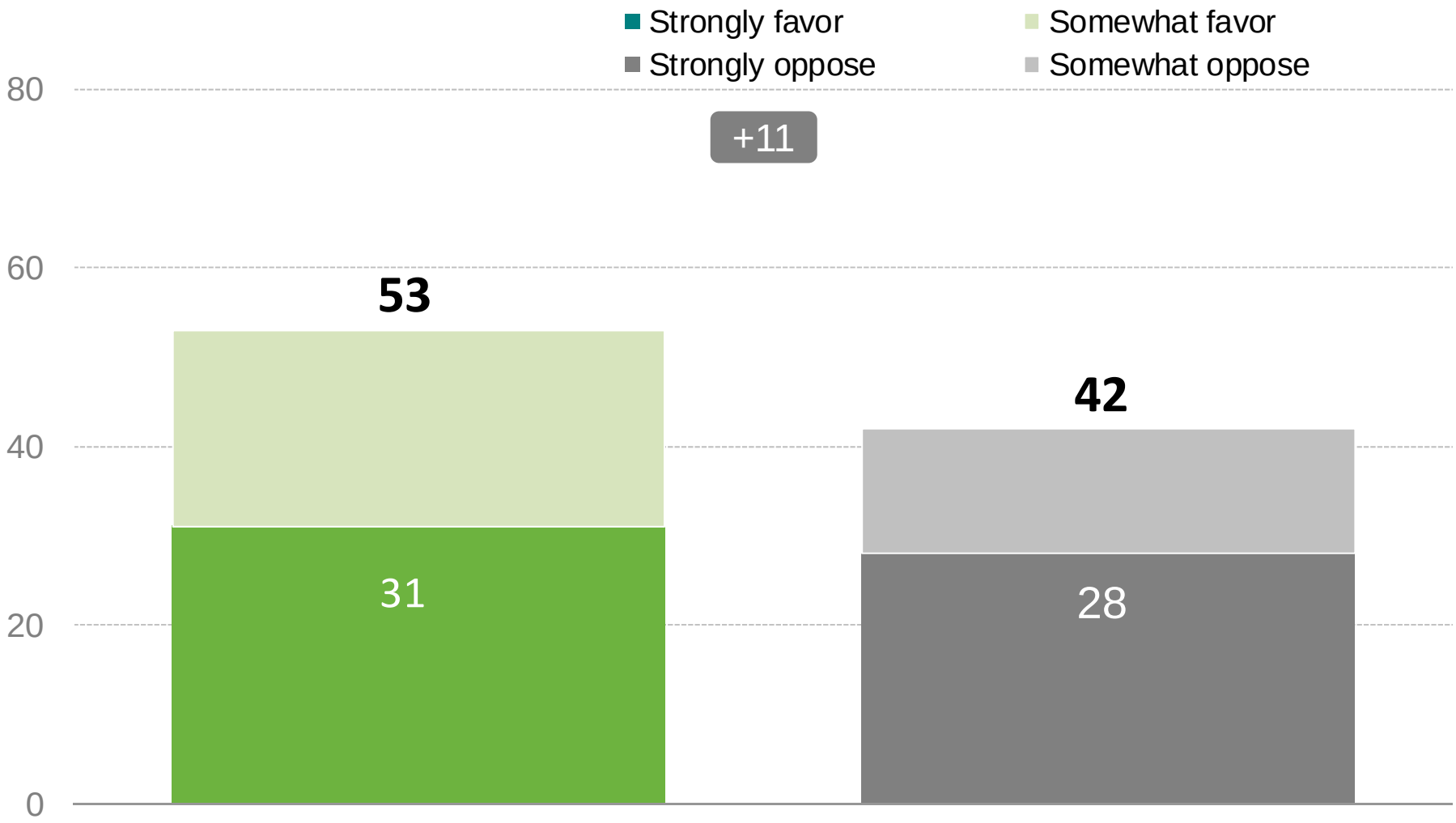
Now let me read you two more statements some people on both sides of the issue might make.

(Some/other) people say: Pollution from cars has a devastating effect on the health of families and children, worsening asthma, bronchitis and emphysema and even causing cancer. This proposal is the most effective smog-fighting tool available - it would be the equivalent of taking 33 million cars off the road immediately, and would prevent tens of thousands of asthma attacks and save thousands of lives every year. The proposal is supported by automakers, and independent economists say cleaner gas would cost less than a penny per gallon. American families would miss fewer days at work and would save billions of dollars in lower health care costs by keeping people healthier in the first place.

(Some/other) people say: This proposal would cost American families thousands of dollars. Economists predict that it would increase the cost of gas by up to 9 cents per gallon. It would be a hidden energy tax that drives energy prices up, raising costs for every American business. And they would pass the costs on to the rest of us, meaning higher prices for utilities, groceries, and everything we buy. Thanks to regulations we already have, cars today are already 90 percent cleaner than they were a couple of decades ago. The huge costs of this proposal just aren't worth the marginal benefits it would produce.

Solid Majority Support After Messaging From Both Sides

Now that you've heard more about this issue let me ask you again, do you favor or oppose this proposal to set stricter standards on gasoline and tighten limits on tailpipe emissions from new vehicles?



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January 2013

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A Penny for Prevention:

The Case for Cleaner Gasoline and Vehicle Standards

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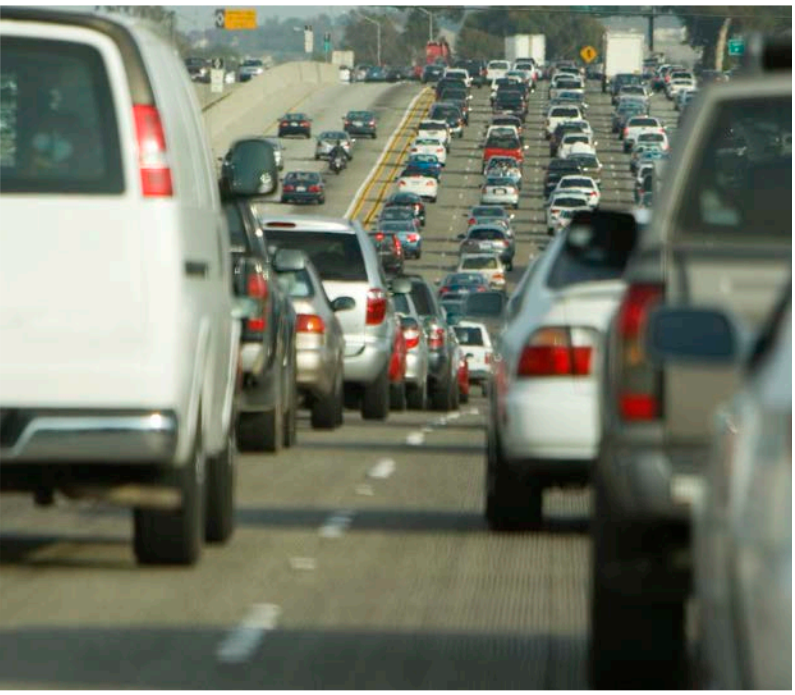


By 2030, cleaner gasoline and cleaner vehicle standards could prevent more than 2,500 premature deaths annually because of less ozone and particle pollution.

Now is the time to clean up gasoline and vehicle emissions

Motor vehicles are a major source of some of the most widespread air pollution in the U.S. As the number of vehicles on the road and driving distances remain near a 25-year peak,[1] millions of Americans continue to suffer the harmful impacts of toxic vehicle emissions.

This year, the U.S. Environmental Protection Agency (EPA) can take action to cut emissions from cars, light trucks and SUVS by setting cleaner gasoline and vehicle standards.[2] These standards will reduce nitrogen oxides, carbon monoxide and volatile organic compounds, all harmful pollutants and important precursors of ozone pollution and particle pollution. These standards will bring relief to the millions of Americans suffering from asthma and other lung diseases, as well as those suffering from cardiovascular diseases. They will also save lives.

The American Lung Association sought to quantify the benefits of the reductions in ozone and particle pollution on human health with the assistance of technical analysis completed by the Clean Air Task Force. The analysis builds on data from a previously published assessment of air quality in part of the eastern United States[3] to reflect the benefits from having cleaner

vehicles in 2030. This analysis focuses on the same region that the original study examined and assumes a nearly complete fleet turnover to cleaner vehicles by 2030. But because the area examined only constitutes about half the nation, this new analysis actually underestimates the full benefits to health in 2030: they do not include the benefits from having cleaner vehicles and gasoline all across the nation.

This analysis estimated that, when fully implemented in 2030, cleaner gasoline and cleaner vehicle standards in those areas would annually prevent:

- More than 2,200 premature deaths and 15,000 asthma attacks from particle pollution ($PM_{2.5}$);
- More than 320 premature deaths and 650 respiratory hospital admissions from ozone pollution; and
- More than 3.3 million days missed at work or school.

The estimated economic and health benefits would total between $8.5 billion and $22 billion annually in 2030.

The best news is that the benefits begin as soon as the gasoline is cleaned up, even before cleaner vehicles are in place. Using cleaner gasoline will reduce emissions as much as removing 33 million cars from the road. This would remove the equivalent of the emissions from more than all the cars registered in the states of Maryland, New York, Ohio, Pennsylvania, Texas, and Washington combined.

Stronger standards for tailpipe emissions would reduce emissions even more. Cleaner cars, pickup trucks, SUVs and other light-duty vehicles[4] could be in place as early as the 2017 model year.

The cost to clean up the air and save these lives is minimal. Independent economists peg the cost of cleaning up gasoline at about 1 cent per gallon.[5] Current estimated cost of cleaning up vehicles would add less than $150 to the price of a new vehicle, in part because the necessary technology is already in use.[6]

A Penny for Prevention: The Case for Cleaner Gasoline and Vehicle Standards demonstrates the urgent need, affordability and clear voter support for these standards to bring healthier air across the nation.

The American Lung Association urges the U.S. Environmental Protection Agency (EPA) to act now to reduce the toll of death and disease from cars and light trucks: adopt nationwide emissions standards for gasoline and vehicles.

Cleaner gasoline will reduce emissions as much as removing 33 million cars from the road for about 1 cent per gallon.

The Environmental Protection Agency should act now to reduce the toll of death and disease from cars and light trucks: adopt national emissions standards for gasoline and vehicles.

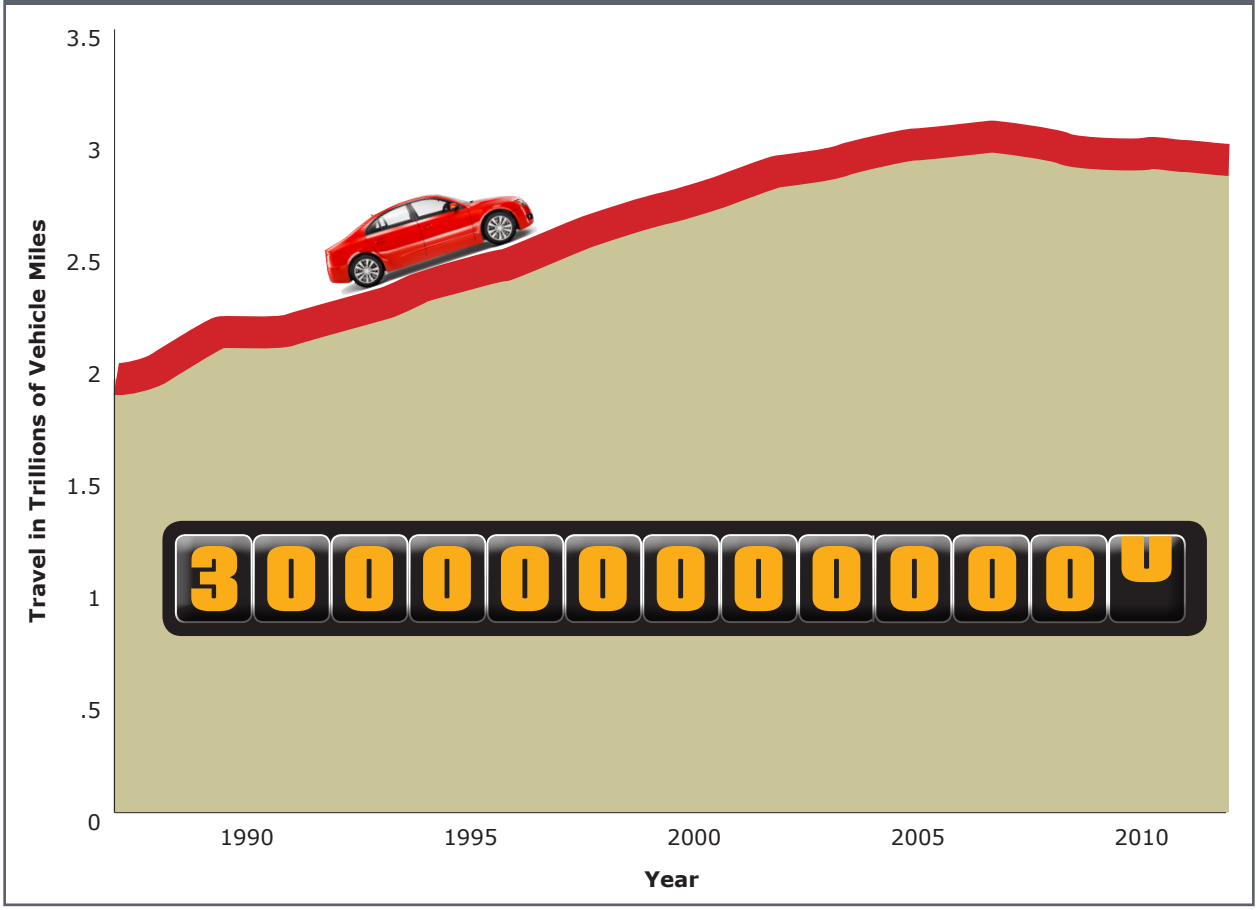
Cars are a major source of air pollutants that make people sick

Pollution from cars and light trucks has been reduced dramatically over the past four decades; however, the job is far from done. The ever-increasing appetite for mobility along with a car-oriented environment have driven a steady climb in the miles these vehicles travel in a year.

Americans drive a lot

According to the U.S. Department of Transportation (DOT), the number of miles traveled by all vehicles has increased by 50 percent since 1987, and has only begun to slow in recent years.[7] In 2009, Americans reported having more than 210.7 million vehicles (primarily personal cars, SUVs, pickup trucks) in their households, roughly a 30 percent growth in vehicles since 1990. According to the U.S. Department of Transportation, the annual growth in the number of these vehicles through 2009 outpaced the *annual growth* in the number of drivers by 50 percent as shown in Figure 2 on the next page.[8]

Figure 1: We're driving nearly 3 trillion miles each year

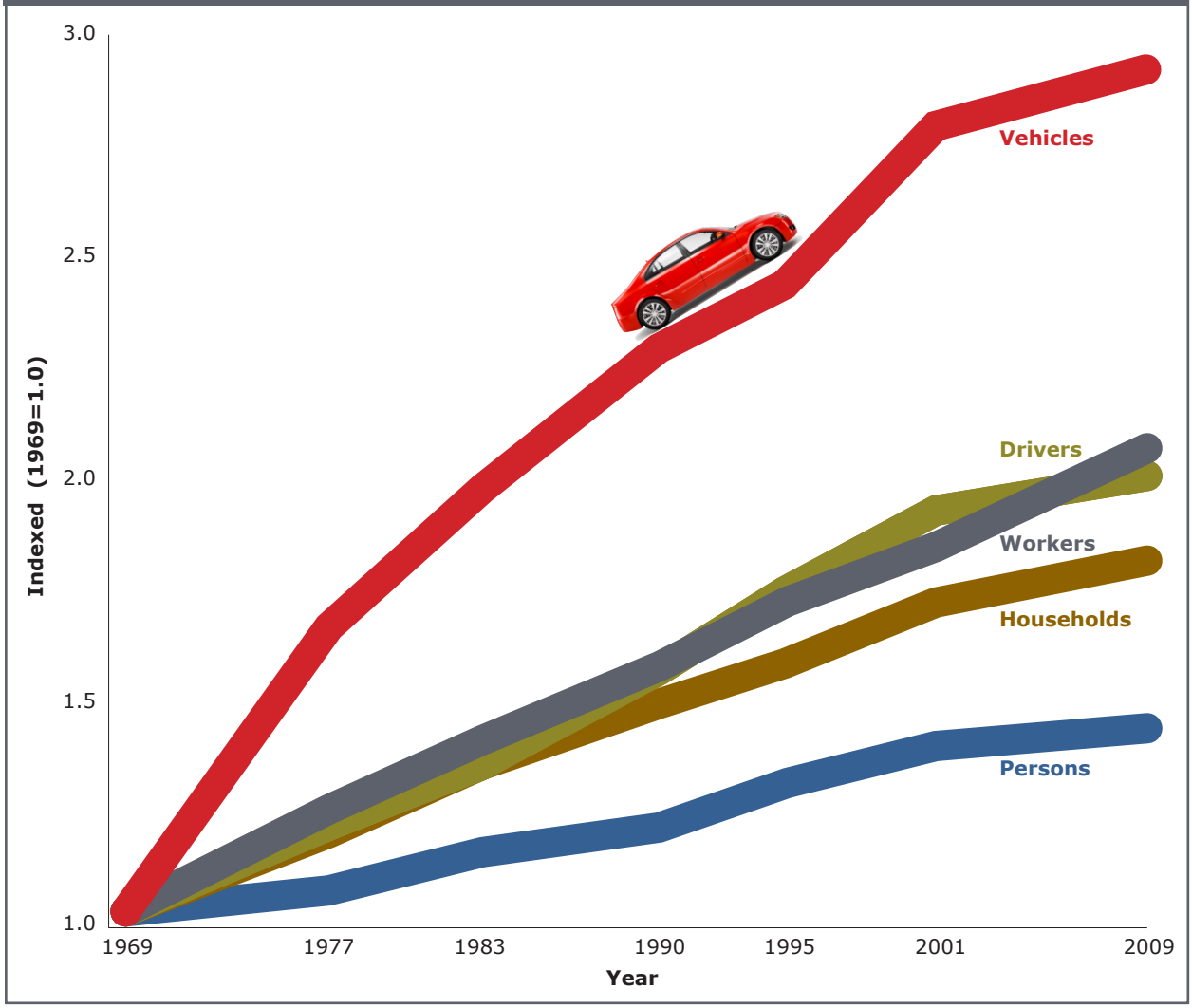


U.S. Department of Transportation, Federal Highway Administration. Traffic Volume Trends, December 2012.

Despite the climb in number of vehicles and the miles they are driven, vehicle emissions have dropped significantly over that same period.[9] For example, between 1990 (the year of the most recent Clean Air Act amendments) and 2007, transportation-related emissions of nitrogen oxides have dropped by 27 percent, and fine particulate matter ($PM_{2.5}$) emissions have dropped by 48 percent.[10] Still, there is more work to do to reduce emissions from mobile sources.

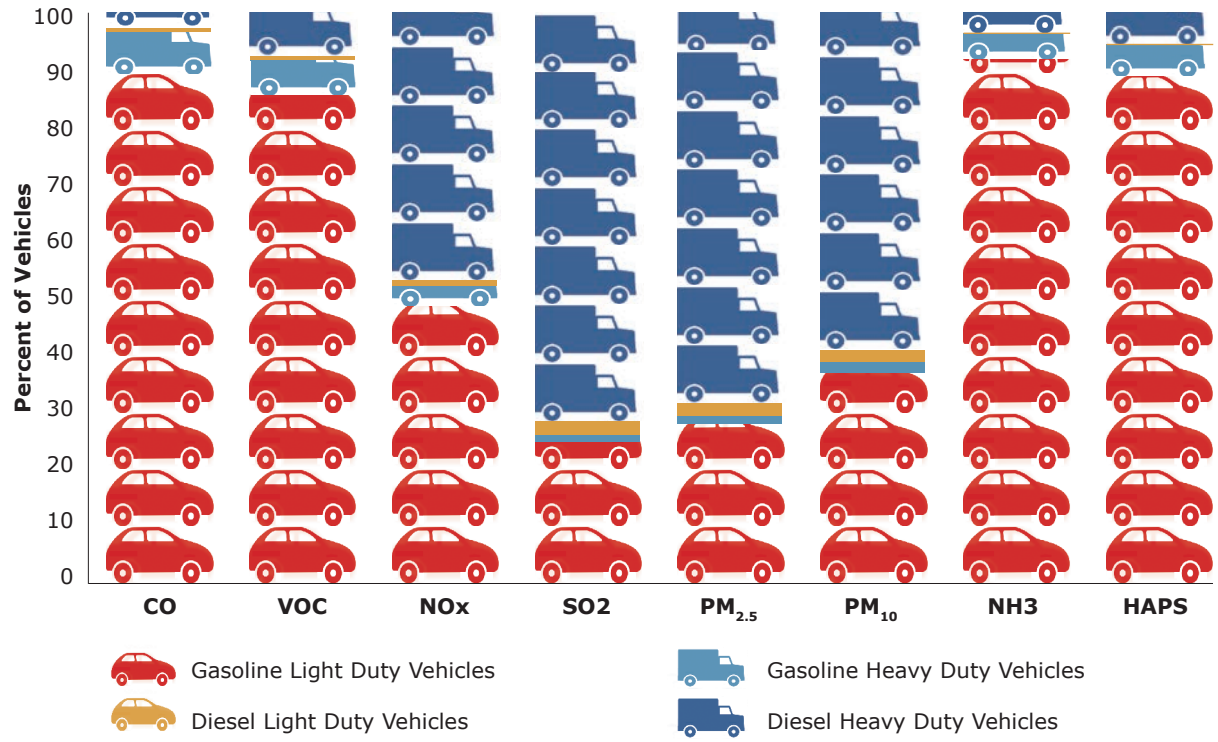
The chart opposite, taken from the 2008 National Emissions Inventory, shows that light-duty gasoline-powered highway vehicles—cars, trucks and SUVs—produce a significant percentage of key emissions from highways.

Figure 2: During the past four decades, the growth in the number of vehicles has outpaced the growth in the number of drivers, households, workers and people.



US Department of Transportation, Federal Highway Administration. National Household Travel Survey Data: 1969, 1977, 1983, 1990, 1995, 2001 and 2009. Note: The 1969 Survey did not include pickup trucks as household vehicles, therefore the growth between 1969 and 1977 is exaggerated, according to DOT.

Figure 3: Gasoline cars, trucks and SUVs generate much of the total highway pollution



U.S. EPA. 2008 National Emissions Inventory, version 2. Technical Support Document. June 2012-Draft. Accessed at http://www.epa.gov/ttn/chief/net/2008inventory.html. CO- Carbon Monoxide; VOC –Volatile Organic Compounds; NOx-Nitrogen Oxides; SO2- Sulfur Dioxide; $PM_{2.5}$-Fine Particulate Matter; PM 10-Coarse Particulate Matter; NH3 – Ammonia; HAPs-Hazardous Air Pollutants.

While individual cars have now far lower emissions than in years past, taken together, motor vehicles still emit large quantities of gaseous and particulate pollution including carbon monoxide, nitrogen oxides and volatile organic compounds (VOCs) such as benzene, butadiene and formaldehyde.[11,12]

The transportation sector (including both on-road vehicles and non-road vehicles and equipment) is responsible for 61 percent of carbon monoxide emissions, nearly 51 percent of nitrogen oxide emissions and nearly 30 percent of volatile organic compounds. Gasoline powered cars and light trucks are the major contributors to these transportation sector emissions.[13]

In addition, mobile sources emit 31 percent of all U.S. carbon dioxide (CO_2), a potent greenhouse gas.[14]

The burden of air pollution is not equal

Nea-roadway concentrations of vehicle emissions are higher than surrounding areas. About 17 percent of housing in America is located within 300 feet of a major roadway, railroad or airport, where concentrations of harmful pollutants are likely higher than areas farther away.[15]

More than 16.9 million Americans meeting the federal poverty definition live in areas with high ozone pollution.[16] Evidence shows that people with low incomes may bear a greater burden from air pollution.[17]

Furthermore, individuals with pre-existing conditions such as asthma, chronic obstructive pulmonary disease, cardiovascular disease and

diabetes face a greater burden from traffic-related air pollution. There are 25.9 million Americans with asthma, including 7.1 million children.[18] Ozone and particle pollution add to the burden they face every day.

Research shows that diabetics are already at a higher risk for developing cardiovascular disease. They may face an increased risk from particle matter pollution due to its impact on their cardiovascular system. African Americans, Mexican Americans and people living near a central city have higher rates of diabetes.[19]

Near-roadway exposures have emerged as a health threat affecting a large segment of the North American population, not just those who are economically disadvantaged. A 2010 review by the Health Effects Institute of existing research concluded that people living, working or going to school within 300–500 meters of a major roadway are exposed to higher concentrations of traffic-related pollution. This includes 30–45 percent of the North American population living in urban areas. The study further concludes that traffic-related pollution may cause the onset of asthma in children.[20]

Children face special risks from air pollution because their lungs continue to grow into adolescence and because they are more active outdoors than adults. According to the American Academy of Pediatrics in their policy statement recognizing the health hazards of outdoor air pollution, a child's developing lung is "highly susceptible to damage" from air pollution.[21]

Like children, older adults face a greater burden from air pollution. As the body ages, it is less able to defend against the effects of air pollution. Ozone and particle pollution pose the greatest threats from outdoor air pollution.

The health effects from vehicle emissions

Air pollution remains a threat to millions of Americans across the nation. As of December 2012, 159 million people lived in areas where the air quality failed to meet official national air quality standards, according to the EPA. Of those, 123 million lived in areas where ozone too frequently reached unhealthy levels. More than 74.3 million lived where year-round $PM_{2.5}$ levels were too high.[22]

Fine particulate matter ($PM_{2.5}$)

Particulate matter (PM) emitted from motor vehicles is a complex mixture of solid particles and liquid droplets. Researchers categorize particles according to size. Fine particles are 2.5 microns in diameter or smaller and are called $PM_{2.5}$.[23]

Tailpipes directly emit both particles, also called soot, as well as gases that form particles in the atmosphere: nitrogen oxides, sulfur dioxide and VOCs. Because of their small size, particles can stay suspended in the atmosphere for days or weeks and be transported into nearby neighborhoods or even hundreds of miles, affecting people in neighboring cities and states. Once inhaled, fine and ultrafine particulate matter penetrates deep into the lung, despite the body's defense mechanisms, and crosses into the cardiovascular system, carrying with it other toxic substances.

First and foremost, exposure to particle pollution can kill. Breathing high levels of particle pollution day in and day out can be deadly, as landmark studies in the 1990s conclusively showed.[24] Chronic exposure to particle pollution can shorten life by one to three years.[25] Particle levels can increase during peaks or spikes that can last for hours to days. Deaths can occur on the very day that particle levels are high, or within one to two months afterward. Particle pollution does not just make people die a few days earlier than they might otherwise—these are deaths that would not have occurred if the air were cleaner.[26]

Particle pollution also diminishes lung function and causes greater use of asthma medications and increased rates of school absenteeism, emergency room visits and hospital admissions. According to the findings from some of the latest studies, particle pollution has been linked to:

- death from respiratory and cardiovascular causes, including strokes;[27,28,29,30]
- increased mortality in infants and young children;[31]
- increased numbers of heart attacks, especially among the elderly and in people with heart conditions;[32]
- increased hospitalization for cardiovascular disease, including strokes and congestive heart failure;[33,34,35]
- increased emergency room visits for patients suffering from acute respiratory ailments;[36]
- increased hospitalization for asthma among children;[37,38,39] and
- increased severity of asthma attacks in children.[40]

Year-round exposure to particle pollution has also been linked to:

- increased hospitalization for asthma attacks for children living near roads with heavy truck or trailer traffic;[41,42]
- increased risk of dying from lung cancer;[43]
- increased risk of death from cardiovascular disease;[44] and
- increased risk of lower birth weight and infant mortality.[45]

The EPA released their most recent review of the current research on particle pollution in December 2009.[46] The EPA engaged a panel of expert scientists, the Clean Air Scientific Advisory Committee, to help them assess the evidence, in particular, research published between 2002 and May 2009. The EPA concluded that particle pollution caused multiple, serious threats to health. Their findings are highlighted in the box below.

EPA Concludes Fine Particle Pollution Poses Serious Health Threats

- **Causes early death (from both short-term and long-term exposure)**
- **Causes cardiovascular harm (e.g., heart attacks, strokes, heart disease, congestive heart failure)**
- **Likely to cause respiratory harm (e.g., worsened asthma, worsened COPD, inflammation)**
- **May cause cancer**
- **May cause reproductive and developmental harm**

—*U.S. Environmental Protection Agency,* Integrated Science Assessment for Particulate Matter*, December 2009. EPA 600/R-08/139F.*

Ozone

Ozone is a gaseous pollutant that is formed when nitrogen oxides (NOx), volatile organic compounds (VOCs) and carbon monoxide (CO) react in the presence of sunlight. The EPA has found that short-term exposure (hours to weeks) to ozone is likely to cause cardiovascular effects including cardiovascular mortality.

Ozone can shorten life. Strong evidence exists of the deadly impact of ozone in large studies conducted in cities across the U.S., in Europe and in Asia. Researchers repeatedly found that the risk of premature death increased with higher levels of ozone.[47,48,49] Moreover, the evidence now shows that ozone causes premature death independently from the effects of other pollutants.

Immediate problems—in addition to increased risk of premature death—include:

- shortness of breath, wheezing and coughing;
- asthma attacks;
- increased risk of respiratory infections;
- increased susceptibility to pulmonary inflammation; and
- increased need for people with lung diseases, like asthma or chronic obstructive pulmonary disease (COPD), to receive medical treatment and to go to the hospital.[50]

The EPA released their most recent review of the current research on ozone pollution in February 2013.[51] The EPA engaged a panel of expert scientists, the Clean Air Scientific Advisory Committee, to help them assess the evidence, in particular research published between 2006 and 2012. EPA concluded that ozone pollution poses multiple, serious threats to health. Their findings are highlighted in the box below.

While most at risk are children, seniors, and people with chronic lung and cardiovascular disease, ozone pollution increases risk of harm to healthy adults and children who are active outdoors, including outdoor workers. Ozone is also a major contributor to climate change.[52]

EPA Concludes Ozone Pollution Poses Serious Health Threats

- **Causes respiratory harm (e.g., worsened asthma, worsened COPD, inflammation)**
- **Likely to cause early death (from both short-term and long-term exposure)**
- **Likely to cause cardiovascular harm (e.g., heart attacks, strokes, heart disease, congestive heart failure)**
- **May cause harm to the central nervous system**
- **May cause reproductive and developmental harm**

—*U.S. Environmental Protection Agency,* Integrated Science Assessment for Ozone and Related Photochemical Oxidants, 2013. *EPA/600/R-10/076F.*

Nitrogen oxides (NOx)

Nitrogen oxides (NOx) are a family of pollutants, including nitric oxide (NO) and nitrogen dioxide (NO_2). Not only does NOx directly harm human health, but it also combines in the air to form two harmful pollutants—ozone and particulate matter. NOx is a key ingredient required for the formation of ozone pollution. NO_2 can trigger respiratory distress, especially asthma attacks. NO_2 also often concentrates along heavy-trafficked roadways; some studies have found that in heavy traffic, NO_2 can be more than twice the outdoor levels in nearby residential areas.[53] NO_2 may be a hazard for drivers, including commuters, as it is commonly concentrated inside vehicles. The EPA has determined that short-term NO_2 exposure is likely to cause respiratory harm, including airway inflammation in children, increased susceptibility to allergens, asthma attacks, chest tightness and difficulty breathing, resulting in missed school and work days, emergency room visits and hospitalizations.[54] Long-term NO_2 exposure may stunt lung growth—which may be a risk factor for lung disease later in life. In adults there are respiratory effects but also evidence of cardiovascular effects from exposure to NO_2, with a robust association with cardiopulmonary mortality.[55] Because so much of the exposure to NO_2 studied in the research comes while people are on and near roadways, researchers have not yet been able to determine whether the NO_2 is the primary agent causing these health problems or if the agent is some other part of traffic pollution.[56]

Figure 4: Living Near Traffic

Thirty to forty-five percent of people in North American cities live in traffic emissions hotspots that lie within 300–500 meters (roughly 1,000 to 1,600 feet) of a major roadway according to a recent review of available research by the Health Effects Institute.[57] Living near busy roads means exposure to a toxic brew of traffic-related air pollutants including NOx, particulate matter, carbon monoxide and hazardous air pollutants, such as benzene. Pollution from those busy roads causes asthma attacks and may even cause asthma in children. Moreover, traffic emissions have been linked to with cardiovascular harm and premature death.[58]

Carbon monoxide (CO)

One of the long-recognized major pollutants in gasoline tailpipe emissions is carbon monoxide. Motor vehicles remain the dominant source of carbon monoxide in the air.[59] Carbon monoxide causes a range of harmful effects, particularly to the cardiovascular system. The growing evidence of harm on cardiovascular disease has been shown in increased hospital admissions and emergency department visits for ischemic heart disease, heart attacks and congestive heart failure.[60] In addition, carbon monoxide combines in the air with nitrogen oxides and volatile organic compounds to form ozone.[61]

Air toxics

Air toxics include both PM and VOCs that come from both tailpipes and evaporative emissions of gasoline from vehicles in hot weather and while fueling. Some are gases, some are particles, and some adhere to particles. Benzene, a known carcinogen and a major component of the evaporative emissions from gasoline, is perhaps the most studied air toxic, but it is not the only carcinogen from gasoline emissions. Some traffic-generated carcinogens or probable carcinogens include 1,3-butadiene, acetaldehyde and formaldehyde. Other air toxics include VOCs, such as toluene, xylenes, naphthalene and acrolein, polycyclic aromatic hydrocarbons (PAHs) and some metals (chromium, nickel). However, other toxics in gasoline are also harmful to breathe. While not enough information is known about the human health impacts of air toxics from traffic exposure, the air toxics below are the primary ones from mobile sources. The health effects listed below are predominantly based on evidence from workplace exposure to healthy adults. Neither the concentrations nor the health impacts of the emissions in "hot spots" near busy highways are known.[62,63]

Table 1: Health Effects from Mobile Source Air Toxics

Air Toxic	Carcinogenicity	Cancer Health Effects	Non-Cancer Health Effects
Benzene	Known human carcinogen	Leukemia	Blood disorders and immunotoxicity
Toluene	Inadequate data	N/A	Fatigue, sleepiness, headaches and nausea
Xylenes	Inadequate data	N/A	Headache, nausea, fatigue and also eye and nose irritation and sore throat
Napthalene	Under assessment	N/A	Hyperplasia and metaplasia in nasal tissue
1,3-Butadiene	Known human carcinogen	Leukemia	Possible reproductive and developmental impacts
Acetaldehyde	Probable human carcinogen	N/A	Irritation of the eyes, skin and respiratory tract
Formaldehyde	Known human carcinogen	Leukemia	Irritation to eye, nose and throat tissues
Acrolein	Inadequate data	N/A	Upper respiratory tract irritation

Sources: U.S. Environmental Protection Agency, Control of Hazardous Air Pollutants from Mobile Sources, Assessment and Standards Division Office of Transportation and Air Quality, EPA420-R-07-002 February 2007; U.S. EPA Integrated Risk Information System. Available at http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showSubstanceList; U.S. Agency for Toxic Substances and Disease Registry. Available at http://www.atsdr.cdc.gov/

EPA should set protective standards for cleaner gasoline and vehicles

Cleaner gasoline can have immediate benefits

Sulfur is naturally present in gasoline. However, unless removed during the refining process, sulfur can poison emissions reduction equipment, reducing its efficiency and leaving pollution in the emissions that could otherwise be removed. Sulfur can also decrease the useful life of these technologies, aging them much faster.

Cleaner gasoline enables three-way catalysts in existing vehicles to work better, making today's vehicles a lot cleaner.

Newer vehicles currently on the road are equipped with three-way catalysts that reduce emissions of nitrogen oxides, carbon monoxide and hydrocarbons. Cleaner gasoline will enable three-way catalysts in existing vehicles to work better, making vehicles on the road a lot cleaner. The National Association of Clean Air Agencies estimates the nitrogen reductions from the cleaner gasoline alone would be equivalent to removing 33 million cars off the road.[64] These clean air benefits can be reaped as soon as the cleaner gasoline is made available.

Additionally, cleaner gasoline will help pave the way for more fuel-efficient engine designs.

Table 2: Many technologies already in use can cut emissions from vehicles

Technology	Description, Examples of Technology
Secondary air (SAI)	Allowing rich fuel-air mix during cold-start conditions, conversion of hydrocarbon and carbon monoxide emissions
Engine management	Preheating cylinder head; lean stratified start-up; ignition retard
Turbocharging system design	For turbocharged engines, use of low thermal mass to reduce warm-up time
Engine design modification	Integration of catalyst into exhaust manifold for fast catalyst warm-up
Three-way catalyst upgrade	Increased catalyst volume, loading, and substrate cell density for increased pollutant conversion
Closed-coupled catalyst upgrade	Lower thermal mass system to reduce warm-up time
Heated catalyst	Electric heating of three-way catalyst during warm-up
Direct ozone reduction (e.g., PremAir®)	Radiator treatment to facilitate oxidation of atmospheric pollutants; Emission reductions are "real world" not on emission test cycle; emissions reduction credits must be modeled/estimated
HC adsorber or trap catalyst	Trap HC emissions temporarily before three-way catalyst is warm; includes adsorber brick, exhaust diverter valve, and catalyst
Advanced exhaust gas recirculation (EGR)	Variable valve actuation and injection controls for EGR for recirculated exhaust gases for reentry at the engine intake; reduction in combustion temperatures reduces NOx formation.
Lean-NOx aftertreatment	Aftertreatment for diesel and future lean gasoline engines; lean NOx trap; urea-based selective catalytic reduction (SCR)

Source: State of California Air Resources Board. Preliminary Discussion Paper- Amendments to California's Low Emissions Vehicle Regulations for Criteria Pollutants- LEV III. 2010

If the cleaner gasoline and vehicle standards are made final this year, automakers can better incorporate the changes needed for these standards with the landmark fuel efficiency standards that were finalized last year.

Cleaner vehicle standards would reduce emissions

In addition to cleaner gasoline standards, the EPA needs set tighter tailpipe emissions standards to reduce NOx, CO, and VOC emissions. If EPA adopts the final standards by December 2013, they could apply to cars, light trucks and SUVs sold starting as early as model year 2017. However, any delay past December 2013 will delay the cleaner vehicles until the next model year. The EPA should adopt a program similar to or stronger than California's Low Emissions Vehicle III program.

Making the cleanup of new vehicles easier is the availability of technology to reduce tailpipe emissions. See the chart below that shows a wide array of systems in use or soon to be in use in California to reduce emissions from these vehicles.

Table 2 on page 13 describes many of the technologies that are already commercially available that will help meet a cleaner vehicle standard. Some technologies will be available for use in the next few years.

Voters support EPA setting stricter standards on gasoline and tightening limits on tailpipe emissions by 2 to 1.

One penny a gallon: The public supports the cost

Independent economists peg the cost of removing sulfur from gasoline at about 1 cent per gallon of gasoline at the refinery. Two independent studies, one by MathPro for the International Council for Clean Transportation[65] and another by Navigant Economics for the Emissions Control Technology Association,[66] found that Americans can enjoy the benefits of cleaner air and reduced death and disease, all at the cost of about a penny per gallon of gasoline.

Even the cost for cleaning up vehicles is modest. The National Association of Clean Air Agencies (NACAA) estimates cleaner vehicle standards would add $150 to the price of a new vehicle.[67] That estimate is similar to, but slightly higher than, the estimate from the California Air Resources Board, using existing technology for similar results.[68]

In a poll conducted in January 2013,[69] American voters clearly demonstrated strong support for the need for cleaner gasoline and vehicles, even with additional costs. The majority of voters surveyed (53 percent) still favored setting stricter standards on gasoline, even after hearing opposing arguments that cars are already cleaner and allegations that this proposal would cost families thousands of dollars and would increase the cost of gas 9 cents per gallon.

Key poll findings include:

- 69 percent of voters favor EPA generally updating standards with stricter limits on air pollution.
- A 2-to-1 majority (62 to 32 percent) support EPA setting stricter standards on gasoline and tightening limits on tailpipe emissions from new vehicles.
- Only 17 percent of voters believe EPA is exceeding its legal mandate to ensure air quality.

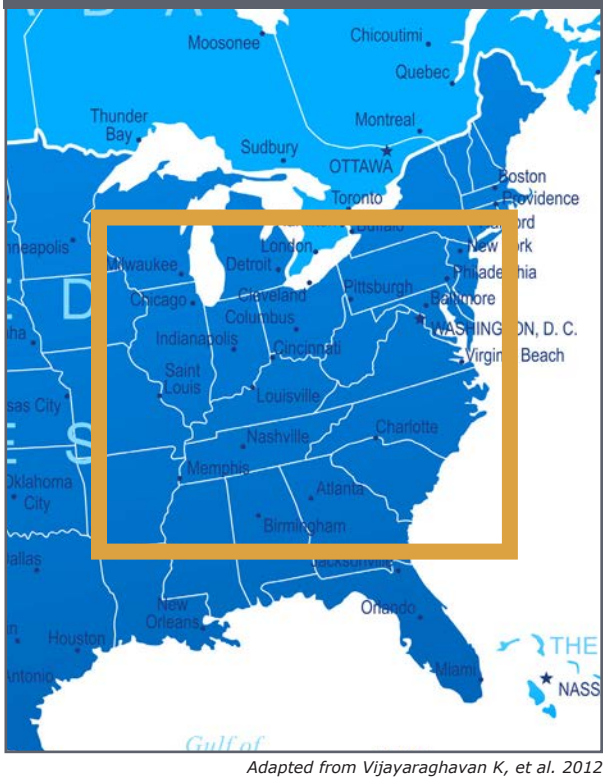
Emissions control manufacturers, labor and environmental organizations,[70] clean air agencies,[71] governors,[72] senators[73] and health groups[74] support these standards.

Calculating the health and economic benefits of cleaner gasoline and vehicles

Extensive research in studies around the world continue to show that cleaner air protects the health of children, older adults, people with chronic lung and cardiovascular diseases or diabetes, people with low incomes and people who work or exercise outdoors. Those studies can provide a basis for estimating some specific benefits that will result from reducing emissions.

For this report, the American Lung Association engaged specialists with the Clean Air Task Force (CATF) to take established studies and develop estimates of the health impacts of cleaner gasoline and cleaner vehicles. The Clean Air Task Force began with the modeling data developed in a peer-reviewed report by Environ International Corporation, which analyzed the future air quality impacts of cleaner vehicles.[75]

Analysis covered much of the eastern USA



Adapted from Vijayaraghavan K, et al. 2012

In 2012, with support from the Coordinating Research Council, Inc., a nonprofit corporation supported by the petroleum and automotive equipment industries, researchers from Environ International Corporation modeled the air quality impacts of light-duty gasoline vehicles in the eastern United States.[76] The study focused on future benefits (in 2022) attributable to various motor vehicle emissions standards and estimated the ozone and fine particle ($PM_{2.5}$) pollution resulting from light-duty gasoline vehicles under each sceario.

Environ's original analysis looked at only a segment of the eastern United States that contained most of the large population centers. Fifteen states and the District of Columbia were included in the analysis: Connecticut, Delaware, Kentucky, Illinois, Indiana, Maryland, New Jersey, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia and West Virginia. Portions of 10 other states were also included: Alabama, Arkansas, Georgia, Iowa, Massachusetts, Michigan, Minnesota, Missouri, New York and Wisconsin.

CATF used Environ's modeled air quality changes to estimate the (year 2030) future health and economic benefits in that same area using these future changes, which were originally recommended in the NACAA report in 2011. In this analysis, nearly all of the gasoline-powered vehicles met the same standards as California's low emission vehicle standards (LEV III).[77]

The health effects impacts were developed from BenMAP, the standard modeling tool for such estimates, for a unit change of pollution (ozone or $PM_{2.5}$) at the county level.

A detailed discussion of that process is included in the Methodology. The following discussion explains the health benefits estimated from having stronger vehicle emissions standards in place in 2030 in this area. If the standards were in place across the nation, the total benefits would be even greater.

Fine particulate matter ($PM_{2.5}$)

New gasoline and vehicles standards would reduce emissions of direct particle pollution from light-duty vehicles. This analysis relied on estimates by NACAA of approximately 30 percent reduction in precursor emissions. We applied that same level of reduction of direct PM emissions, although we expect the actual standards to reduce direct PM by an even greater percentage. Table 3 displays the health benefits anticipated from reductions in particulate pollution due to these standards. This analysis estimated that nearly 900 to more than 2,200 premature deaths could be avoided annually. The estimated annual economic benefit from these avoided health hazards ranges from more than $7.5 billion to more than $19 billion.

Table 3: Estimated health benefits from $pm_{2.5}$ Reductions resulting from cleaner gasoline and vehicles standards in 2030 in selected eastern states

Health Effects	Avoided Cases Each Year
Acute Bronchitis	1,342
Heart Attacks	1,488
Asthma Attacks	15,184
Emergency Room Visits, Respiratory	854
Missed Work Days	115,416
Premature Deaths	874 to 2,233

Ozone

Health benefits from cleaner air under stronger standards for gasoline and vehicles are estimated in Table 4. Thanks to less ozone, approximately 100 to 300 fewer premature deaths would occur each year. The economic benefits range from approximately $1 billion to $3 billion depending on which mortality study is used to calculate the benefits.

Table 4: Estimated health benefits from ozone reductions resulting from cleaner gasoline and vehicle standards in 2030 in selected eastern states

Health Effects	Avoided Cases Each Year
Acute Respiratory Symptoms	464,618
Emergency Room Visits, Respiratory	259
Hospital Admissions, Respiratory	658
Premature deaths	102 to 320
Missed Work or School Days	3,192,155

Air toxics

In 2011, the EPA released its fourth National-Scale Air Toxics Assessment, based on estimated emissions from 2005.[80] Using that data, on-road mobile sources contributed appreciably to national cancer risk, representing 15 percent of the modeled risk (more than 7 out of 50 in a million cancer risk). Although the modeling does not explicitly separate gasoline versus diesel mobile source impacts, relative emissions from these fuel sources indicate nearly 90 percent of the air toxic impact of on-road mobile comes from gasoline vehicles.

With stronger clean vehicle and gasoline standards, emissions of VOCs should be reduced by approximately 25 percent based on this analysis. Such a substantial reduction should also reduce the exposure risk from air toxics from mobile source emissions.

Methodology

Background on the Environ study

In 2012, researchers from Environ International Corporation published a study in *Atmospheric Environment* on the air quality impacts of light-duty gasoline standards in the United States.[81] The paper details current and future emissions for several scenarios, highlighting the benefits of the Tier 2 standard relative to Tier 1, LEV III standards relative to Tier 2 and a zero emissions case. They reported air quality model results for daily maximum 8-hour ozone and 24-hour average $PM_{2.5}$. The geographic scope of the study covers a large section of the eastern United States, encompassing half the population and most major metropolitan areas currently suffering from high levels of air pollution.

Method for evaluating ozone and $PM_{2.5}$ benefits from cleaner gasoline and vehicle standards

Gridded air quality modeling results were obtained from Environ for ozone and $PM_{2.5}$. Results were imported to ArcGIS and the centroid of each cell was joined with county shapefiles to assign each gridded result to a county. Model data were available for the month of July for ozone and for February and July for $PM_{2.5}$. Those outputs were used to approximate the summertime change in 8-hour ozone and the annual change in $PM_{2.5}$ for the eastern United States. County averages of pollution change were calculated for any county that had multiple air quality modeling grids. Based on the proposal recommended by NACAA[82], the new gasoline standards with a sulfur content of 10 ppb and new vehicle standards comparable to California's LEV III standards would result in reductions of 26 percent of VOCs, 38 percent of CO and 29 percent of NOx. A 29 percent multiplier was applied to the zero-emissions case to estimate the future air quality benefit of a fully implemented rule in 2030. Since reductions in both precursors are of a similar magnitude, regional NOx/VOC budgets due to full implementation ofcleaner gasoline and vehicle standards are likely to remain similar to the full zero-out case, avoiding major errors due to nonlinearities in atmospheric chemistry. Linearity of results is also supported by the results of the modeled LEV III case; the change in NOx emissions was 4 percent for LEV III and the zeroed-out air quality results were approximately 25 times greater than the LEV III case.

The county level air quality estimates were then used to estimate the associated health benefits from a revised mobile source emissions scenario. Each county change in air quality was multiplied by the corresponding county result from EPA's (Environmental Benefits Mapping and Analysis Program) BenMAP estimates for unit changes in ozone and $PM_{2.5}$. A number of health endpoints were estimated, including avoided premature mortality, hospital admissions, acute myocardial infarctions and lost work days. These avoided health consequences were then monetized using existing results from EPA and the *Sick of Soot* report by American Lung Association, Clean Air Task Force and Earthjustice (which was based on McCubbin, 2011) to provide an approximate valuation in dollars of avoided health expenditures.[83]

Limitations of the approach include assumptions about future emissions reductions of precursors, linearity of air quality modeling results with respect to emissions reductions, no threshold assumption on health effects for $PM_{2.5}$ and that modeled ozone changes occur above the levels of observed health effects. The results reported here are meant to illustrate the magnitude of benefits associated with further reductions in light-duty vehicle emissions.

Table 5: Estimated health impacts from all light-duty vehicle $PM_{2.5}$ emissions ("zeroed out" scenario)

Health Endpoint/Study	Avoided cases	Economic Impact (millions of $)
Acute Bronchitis	4,628	$ 2.1
Acute Myocardial Infarction	5,130	$ 590.0
Acute Respiratory Symptoms	2,368,224	N/A
Asthma Exacerbation Total	52,357	$2.9
Emergency Room Visits, Respiratory	2,946	$1.2
Work Loss Days	397,985	$55.3
Mortality, Pope (2002)	3,013	$25,901.7
Mortality, Laden (2006)	7,701	$66,179.9

The table below shows additional details about the modeled health and economic benefits from reduced $PM_{2.5}$ by meeting standards similar to California's LEV III in 2030.

Table 6: Estimated health benefits from $PM_{2.5}$ reductions resulting from cleaner gasoline and vehicles standards

Health Endpoint/Study	Avoided cases	Economic Impact (millions of $)
Acute Bronchitis	1,342	$ 0.6
Acute Myocardial Infarction	1,488	$ 171.1
Acute Respiratory Symptoms	686,785	N/A
Asthma Exacerbation Total	15,184	$ 0.8
Emergency Room Visits, Respiratory	854	$ 0.3
Work Loss Days	115,416	$ 16.0
Mortality, Pope (2002)	874	$ 7,511.5
Mortality, Laden (2006)	2,233	$ 19,192.2

Table 7: Estimated health impacts from all light-duty vehicle-related ozone pollution ("zeroed out" scenario)

Health Endpoint/Study	Avoided cases	Economic Impact (millions of $)
Acute Respiratory Symptoms	1,602,132	N/A
Emergency Room Visits, Respiratory	892	$ 0.3
Hospital Admissions, Respiratory	2,269	$ 56.1
Mortality (Bell et al.)	1,023	$ 9,097.7
Mortality (Huang)	353	$ 3,174.6
Mortality (Ito et al.)	1,079	$ 9,895.1
Mortality (Levy et al.)	1,104	$ 9,337.7
Mortality (Schwartz)	368	$ 3,239.7
School Loss Days	504,908	$ 46.7
Worker Productivity	10,502,525	$ 656.4

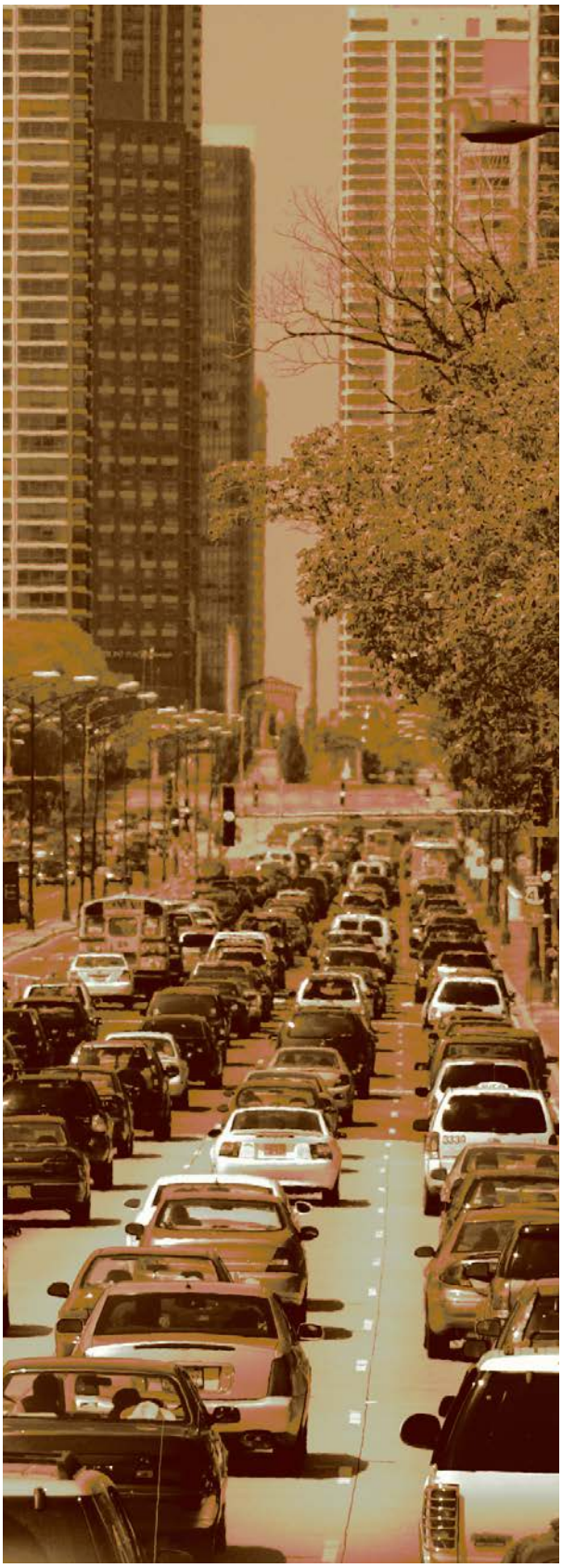
Table 8 below shows additional details about the modeled health and economic benefits from reduced ozone by meeting standards similar to California's LEV III in 2030.

Table 8: Estimated health benefits from ozone smog reductions resulting from cleaner gasoline and vehicle standards

Health Endpoint/Study	Avoided cases	Economic Impact (millions of $)
Acute Respiratory Symptoms	464,618	N/A
Emergency Room Visits, Respiratory	259	$ 0.1
Hospital Admissions, Respiratory	658	$ 16.3
Mortality (Bell et al.)	297	$ 2,638.3
Mortality (Huang)	102	$ 920.6
Mortality (Ito et al.)	313	$ 2,869.6
Mortality (Levy et al.)	320	$ 2,707.9
Mortality (Schwartz)	107	$ 939.5
School Loss Days	146,423	$ 13.5
Worker Productivity	3,045,732	$ 190.4

Methods for apportioning on-road mobile cancer risk from National-scale Air Toxics Assessment:

The EPA reports county-based cancer risk for on-road sources. In addition, compound-specific risk is reported for each county. To apportion the on-road risk to gasoline and diesel sources, first we calculated the relative contribution of gasoline sources at the county level from emissions estimates for mobile source air toxics (MSAT) species (1,3-butadiene, acetaldehyde, benzene, formaldehyde and naphthalene). These percentages were multiplied by the emissions totals and the compound-specific cancer potency to approximate the weighted cancer risk from gasoline MSATs. A similar approach was used for respiratory risk from MSATs (acetaldehyde, acrolein, formaldehyde and naphthalene). However, only 14 counties had hazard quotients over 1 for respiratory risk due to gasoline MSATs.



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