

U.S. State CO Risk Assessment Report



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Executive Summary

Carbon monoxide (CO) poisoning is a pervasive yet preventable threat in the United States, causing significant harm each year. According to the U.S. Centers for Disease Control and Prevention, at least 430 Americans die annually from unintentional CO poisoning, and an estimated 50,000 people seek emergency care due to accidental exposure. These numbers may be conservative, as symptoms — which include headache, dizziness, nausea, vomiting, and confusion — are common and easily misdiagnosed.

These incident rates make CO one of the leading causes of non-drug-related poisoning deaths nationwide, particularly during colder months and in the aftermath of storms, when reliance on fuel-burning appliances and portable generators increases.

CO poisoning also imposes substantial economic burdens on Americans, with [one study](#) estimating annual medical costs ranging from \$33.6 million to \$37.7 million, with additional non-medical costs of \$3.7 million to \$4.4 million. [Another analysis](#) conservatively places the overall societal cost at over \$1.3 billion per year, encompassing direct hospital costs, lost earnings, and related expenses.

Recognizing the urgency of this “silent killer,” UL Standards & Engagement has developed the **CO Risk Assessment** to evaluate each U.S. state’s code and regulatory efforts, health outcomes, and public awareness. The assessment draws on multiple data sources across the last two decades to ensure a comprehensive assessment across public health outcomes, state-level mandates for indoor CO detector presence, and public awareness measures. These three pillars — weighted at 40%, 35%, and 25%, respectively — produce an overall weighted score out of 100 for each state. The weighting approach balances the diverse factors affecting CO safety, ensuring that the assessment reflects each component’s relative impact on public health.



Health Outcomes

data resulting from unintentional CO poisoning, including age-adjusted rates of fatalities, hospitalizations, and emergency department visits, were obtained from the CDC’s [Environmental Public Health Tracking Network](#), spanning 2000 to 2022.



Code & Regulatory Strength

is measured by indexing state-level fire code regulations regarding CO alarm installation requirements in new and existing buildings and structures using data from the National Fire Protection Association’s 2021 [Carbon Monoxide Detection and Alarm Requirements](#) publication.



Public Awareness & Behavior

scores are calculated using survey data from ULSE’s nationally representative surveys of U.S. adults between August 2023 and August 2024, capturing CO alarm ownership, safe generator usage, and general knowledge of CO risks.

Each state’s final weighted score is translated into a tier — from CO Safety Champion (the highest tier) to CO Safety Leader, CO Safety Advocate, or CO Safety Starter (the lowest tier) — highlighting how effectively it has addressed CO safety across the three pillars.

In ULSE’s inaugural CO Risk Assessment, six states stand out as CO Safety Champions, reflecting their strong public health outcomes, code and regulatory coverage, and public awareness: **New Jersey, Virginia, Vermont, California, Arkansas, and Alabama**. These CO Safety Champion states share several key attributes that contribute to their success. They have implemented uniform, statewide CO detector requirements across multiple building types, established regular inspection protocols, maintained consistent public awareness campaigns, and forged effective partnerships among public health departments, fire safety officials, and community organizations. Many have also implemented proactive measures during emergency situations, such as power outages, when CO poisoning risks typically increase due to improper generator use.

The assessment also reveals significant disparities in CO safety across states. While some, like New Jersey, Vermont, and New York, demonstrate robust regulatory frameworks and higher public awareness, others, such as Missouri and Nebraska, lag in key areas, including CO detector mandates. Public awareness also varies widely: while New Hampshire shows strong engagement in CO safety education, other states, such as Louisiana, report alarmingly low awareness scores, leaving millions of citizens vulnerable to preventable CO-related injuries and deaths.

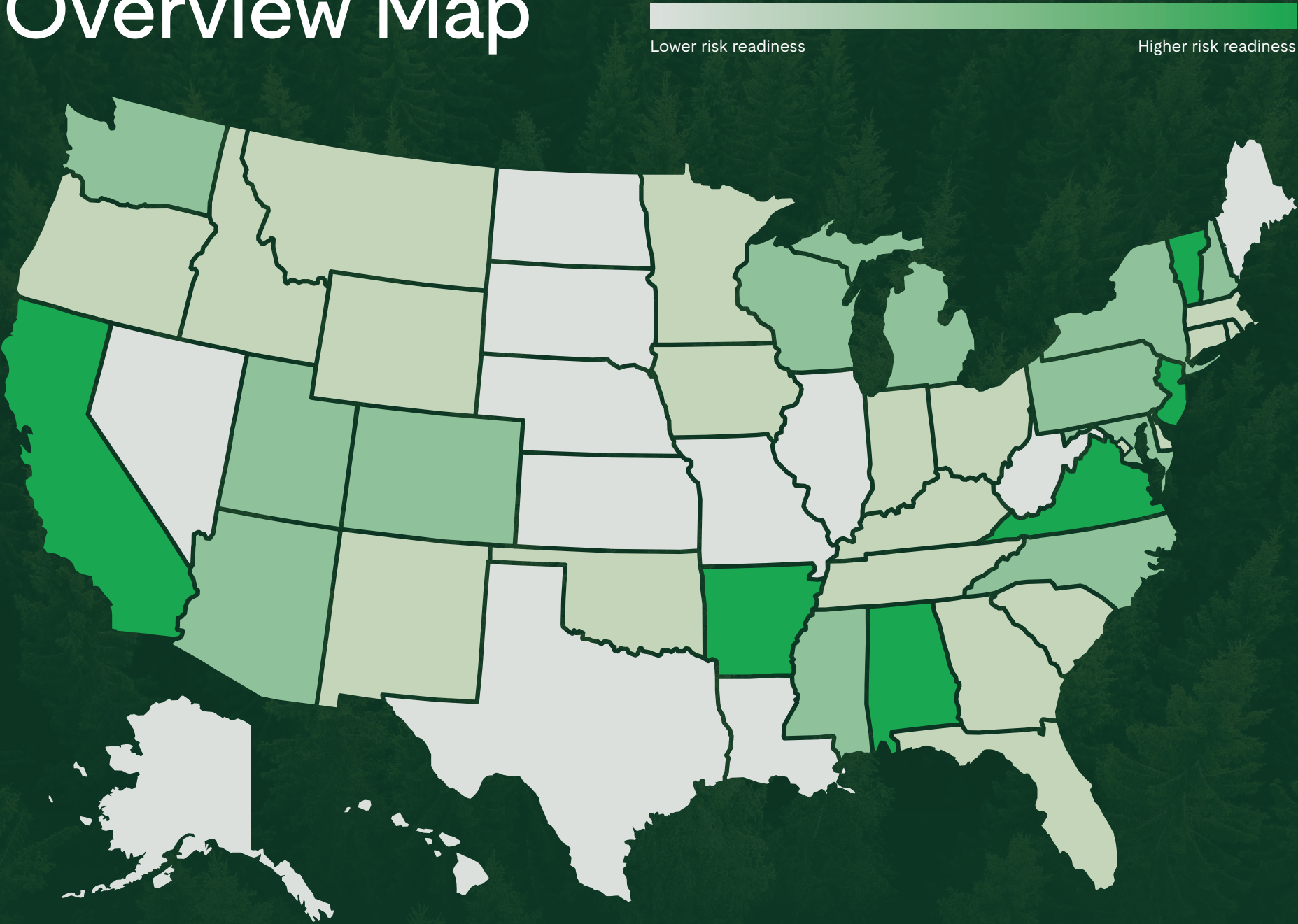
These gaps are amplified by the confusion many Americans have around CO detection. As noted in ULSE’s 2024 report, [Understanding the Silent Threat](#), 36% of U.S. adults (about 86 million people) have no means of detecting CO leaks in their homes, and nearly 3 in 10 mistakenly believe that having a smoke alarm means they do not need a separate CO alarm.

In public spaces, half of Americans assume CO detectors are required and do not worry about exposure, while 46% of travelers are unconcerned when staying in hotels or rentals because they believe every state mandates CO alarms. Generator-related incidents remain a pressing concern, as an estimated 29 million Americans own portable generators, yet 62% of these owners do not feel at risk of CO poisoning — often using the devices improperly and increasing the risk of CO buildup.

Overall, the CO Risk Assessment serves as both a benchmark and a call to action. These findings emphasize that effective CO safety requires a mix of well-enforced policies, targeted public outreach, and consistent adoption of safe practices. Even the highest scoring states have opportunities to strengthen detection requirements, expand public education, and ensure equitable enforcement. By identifying best practices and areas for improvement, ULSE seeks to foster greater collaboration among regulatory agencies, industry leaders, and public health advocates. States that prioritize stronger CO safety policies and widespread education will be better positioned to prevent future tragedies, saving lives and ensuring safer environments for all residents.



Overview Map



National Averages

Median Household Income

\$77,719

86%

of households own
fuel-burning appliances



Health Outcomes

National high: 79%
National low: 3%



Code & Regulatory Strength

National high: 100%
National low: 0%



Public Awareness & Behavior

National high: 96%
National low: 16%

865

HDD Average

HDD shows how cold a month was based on days below 65°F—higher values mean more heating needed

CO Safety Champions

CO Safety Champions are the highest scoring states in the country and lead the way in protecting their residents. These six states rank at the top in every category and are exemplary of the gold standard for CO safety. They generally mandate CO detectors in both new and existing buildings, run year-round public awareness efforts, and demonstrate strong interagency coordination to ensure compliance. Many have also instituted targeted emergency protocols to address higher CO risks during storms or power outages.

New Jersey
Virginia

Vermont
Alabama

California
Arkansas

CO Safety Leaders

These 12 states are strong performers with well-rounded efforts. There is still room for further improvement to reach the top tier. CO Safety Leaders perform well across most metrics but have a few gaps preventing them from reaching the CO Safety Champion tier. While they typically have broad CO alarm requirements and effective seasonal awareness drives, some states could benefit from more consistent enforcement or better coverage for older structures. With an added focus on uniform inspection protocols and year-round outreach, they could advance to the top tier.

Washington
New York
Maryland

Wisconsin
North Carolina
Utah

Arizona
New Hampshire
Mississippi

Pennsylvania
Michigan
Connecticut

CO Safety Advocates

CO Safety Advocate states, the largest group in the assessment, have basic code and regulatory frameworks in place and are improving in health outcomes, yet they often lack robust public awareness campaigns. Many states in this category require CO alarms only in newer buildings, leaving existing homes less protected. Strengthening CO detector mandates, along with educational efforts, would help them make the leap to CO Safety Leader status.

Washington, D.C.
Indiana
Oregon
Massachusetts
Colorado

Georgia
Ohio
Wyoming
Iowa
Minnesota

Tennessee
Idaho
Kentucky
Oklahoma
New Mexico

Maine
Florida
South Carolina
Rhode Island
Montana

CO Safety Starters

These 13 are at an early stage of implementing CO safety measures. Statewide regulations are limited or absent, relying heavily on local rules or voluntary adoption. Public education is minimal, with few resources dedicated to CO awareness. Adopting comprehensive codes, expanding inspection requirements, and allocating funds for consistent public engagement would significantly enhance safety in these areas.

Alaska
Nevada
Illinois
West Virginia

Delaware
North Dakota
South Dakota
Louisiana

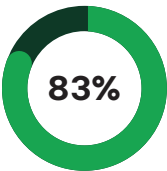
Hawaii
Texas
Nebraska
Kansas

Missouri

New Jersey

CO SAFETY CHAMPION

New Jersey stands out as a CO Safety Champion in carbon monoxide safety, achieving a robust 80% overall weighted score — the highest of any state in the assessment. With a 100% Code and Regulatory Strength score (compared to 72% U.S. average), the state enforces some of the most comprehensive CO detector requirements in the nation, helping to reduce risks associated with the widespread use of fuel-burning appliances (present in 92% of households).



Residential CO Alarm Use

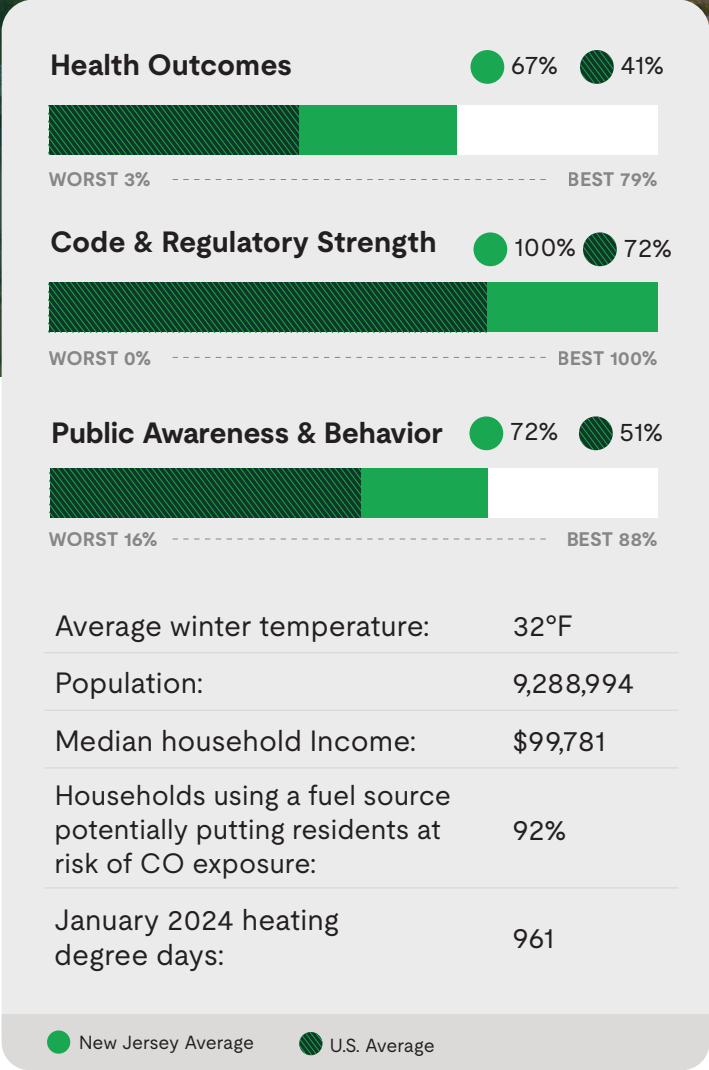
A vast majority of New Jersey homes have some type of CO alarm installed

Despite winter temperatures averaging 32°F and 961 heating degree days in January 2024, New Jersey’s relatively high 67% Health Outcomes score (compared to 41% U.S. average) indicates effective prevention measures and emergency response. Furthermore, a 72% Public Awareness and Behavior score (compared to 51% U.S. average) points to successful outreach efforts, although continued education and consistent detector maintenance remain crucial to further reduce CO-related incidents.

Public Awareness and Education Initiatives on CO Safety in New Jersey

Annual Smoke and CO Alarm Checks: Each year, coinciding with the start of Daylight Saving Time, the [New Jersey Division of Fire Safety](#) reminds residents to inspect their smoke and CO alarms, and offers guidance on maintenance and replacement.

"Close Before You Doze" Campaign: [East Orange](#) participated in this [UL Research Institutes educational campaign](#) to teach residents about the life-saving practice of closing bedroom doors before sleeping. Research indicates that closed doors can significantly reduce heat and CO levels during fires, increasing survival chances.



Utility Company Initiatives: [NJ Public Service Electric and Gas Company](#) provides comprehensive information on CO safety, including causes, symptoms, and prevention strategies.

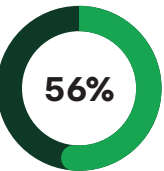
School-Based Programs: The [Fort Lee Fire Prevention Bureau](#) conducts educational programs in schools, utilizing tools like the Fire Safety House Trailer and the "After the Fire" program, which features testimonials from burn survivors to emphasize fire and CO safety.

Collaborative and Community Outreach Efforts: [New Jersey Education Association](#) works with stakeholders to improve indoor air quality in schools, while nonprofits like [Prevention Works NJ](#) educate the public on CO safety through newsletters.

Virginia

CO SAFETY CHAMPION

Virginia has established itself as a CO Safety Champion in the assessment, achieving an overall weighted score of 72%. The state’s robust Code and Regulatory Strength score of 80%, along with the state's Health Outcomes score of 79% — the highest in the nation — suggest that comprehensive legislation mandating CO alarms in various settings are helping effectively reduce CO exposure incidents.



Residential CO Alarm Use

More than half of Virginia homes have some type of CO alarm installed

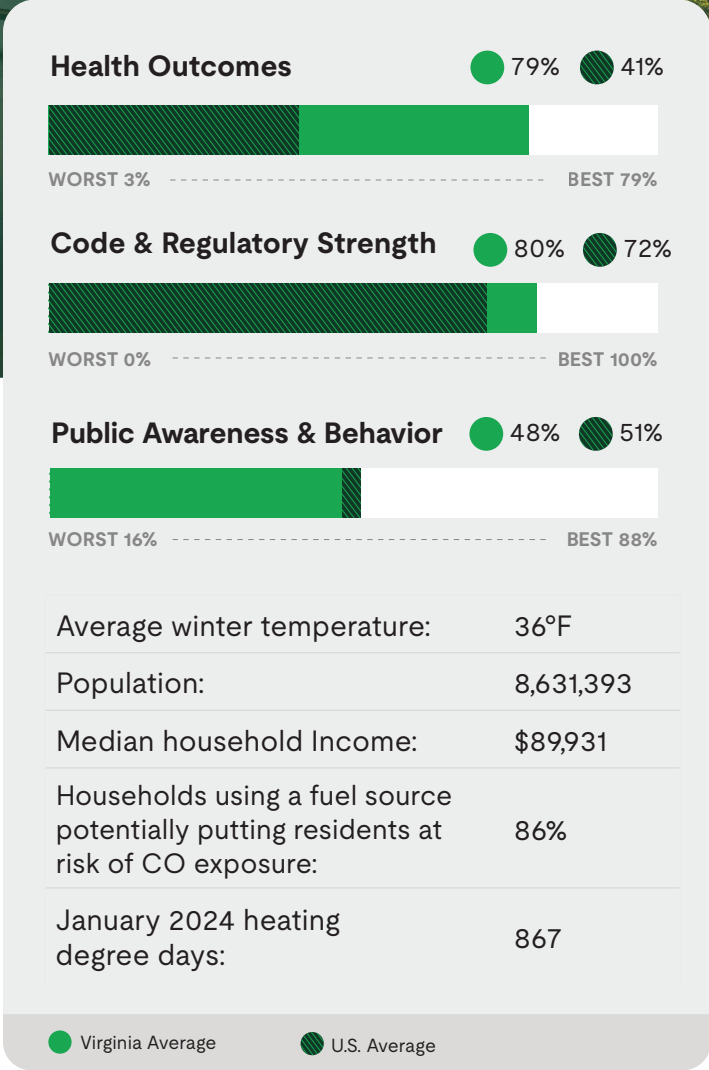
Notably, since 2021, Virginia requires CO detectors in public school buildings constructed before 2015 that house classrooms, as well as in child day programs operating in similar structures. Additionally, state regulations mandate CO alarms in newly constructed or renovated one- and two-family dwellings containing carbon-based-fueled appliances or attached garages, as well as in new and existing multi-family dwellings, dormitories, hotels, and motels with similar features.

Public Awareness and Education Initiatives on CO Safety in Virginia

Chesapeake Fire Department's CO Detector Program: The Chesapeake Fire Department offers a [Carbon Monoxide Detector Program](#) to educate residents about CO dangers and promote the installation of CO detectors in homes.

Arlington County CO Safety Guidelines: Arlington County provides [comprehensive guidelines on reducing CO exposure](#), including proper appliance maintenance and the importance of installing CO alarms near sleeping areas.

Fairfax County's CO Alarm Installation Program: Fairfax County's Fire and Rescue Department



[offers a program in which firefighters install](#) CO alarms in residents' homes, particularly targeting those who may lack functional detectors.

Hanover County's Senior Prevention and Awareness (SPARC) Program: The [SPARC program](#) educates seniors on fire-related risks, including CO poisoning, aiming to enhance their overall safety and quality of life through education and resources.

Virginia Department of Fire Programs' Public Education: The [Virginia Department of Fire Programs](#) provides technical assistance and public education materials to local fire departments and community organizations, focusing on fire and life safety, including CO awareness.

Vermont

CO SAFETY CHAMPION

Vermont has demonstrated a strong commitment to CO safety, achieving the CO Safety Champion status with an overall weighted score of 71%. The state's robust Code and Regulatory Strength score of 90% reflects comprehensive legislation mandating CO alarms in various settings. Since July 1, 2005, Vermont law requires CO alarms to be installed in the vicinity of any bedrooms for all new dwellings and those that are sold or transferred.

79%

Residential CO Alarm Use

A vast majority of Vermont homes have some type of CO alarm installed

Additionally, CO alarms are mandated in all buildings where people sleep, including rental accommodations, condominiums, and multiple-unit dwellings. Despite these strong policies, Vermont's Health Outcomes score of 52% is relatively low for the CO Safety Champion tier, indicating that CO poisoning incidents remain a concern. However, the state's Public Awareness and Behavior score is commendable at 76%, suggesting effective educational efforts to inform residents about CO risks and safety measures.

Public Awareness and Education Initiatives on CO Safety in Vermont

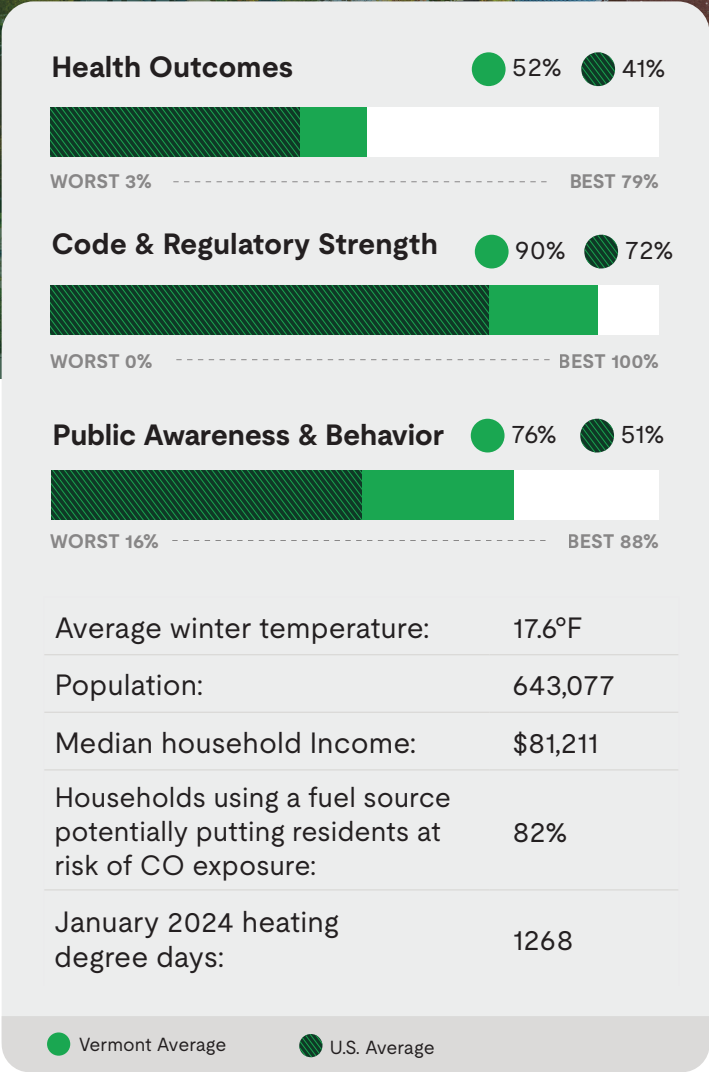
CO Alarm Requirements and Education: Vermont law mandates the installation of CO alarms in all buildings where people sleep. The [Division of Fire Safety provides guidelines](#) on CO alarm installation, emphasizing the importance of working alarms to provide early warnings of CO presence.

Health Department CO Safety Information: The [Vermont Department of Health](#) educates residents about CO dangers, highlighting that 36% of Vermont homes did not have a working or unexpired CO alarm as of a 2018 survey. The agency provides

information on selecting, installing, and maintaining CO alarms to ensure home safety.

Burlington CO Safety Tips: The [City of Burlington](#) offers safety tips on CO alarm installation, including placing alarms outside sleeping areas and on every home level, testing alarms monthly, and ensuring alarms meet recognized testing laboratory standards.

CPSC CO Poisoning Prevention Grant: The [U.S. Consumer Product Safety Commission awarded grants](#) to state and local governments, including Vermont, to fund efforts aimed at reducing deaths and injuries from CO poisoning.



California

CO SAFETY CHAMPION

With its progressive approach to carbon monoxide safety, California stands among the nation's CO Safety Champions in this year's assessment, posting an impressive overall weighted score of 66%. The Golden State's regulatory framework earned a strong Code and Regulatory Strength score of 85%, while its Health Outcomes score of 74% places it firmly among the top performers nationwide.

72%

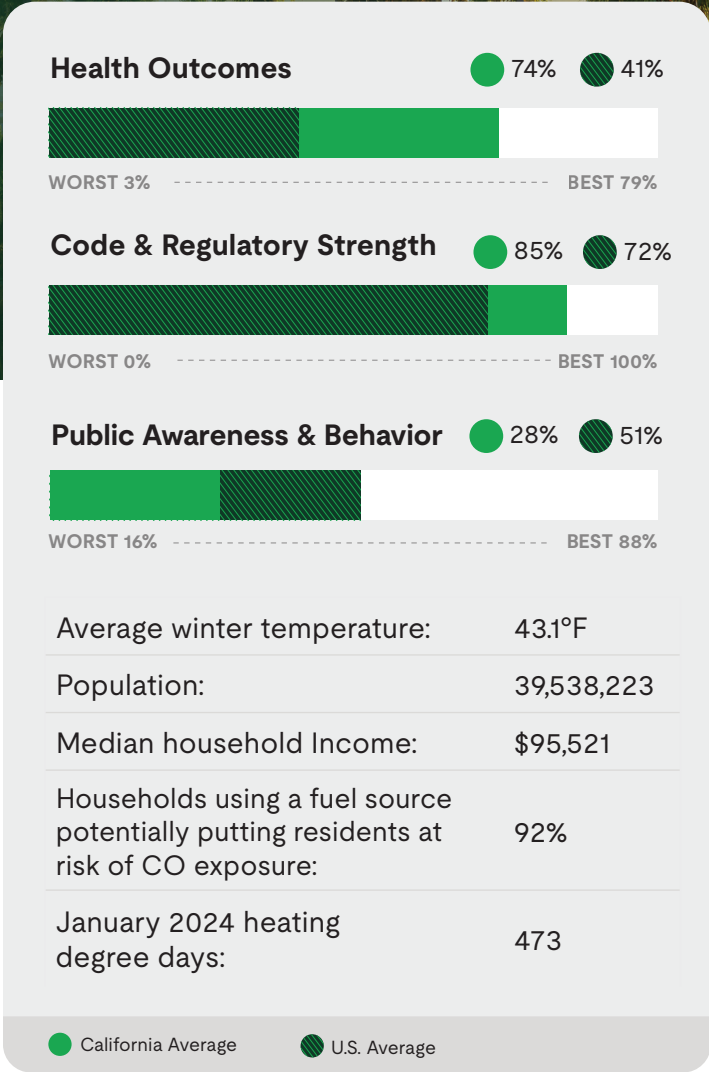
Residential CO Alarm Use

Nearly three-quarters of California homes have some type of CO alarm installed

These strong results reflect California's sustained commitment to protective legislation designed to shield residents from the invisible threat of carbon monoxide poisoning. California maintains stringent requirements for CO alarms in residential settings, including both new construction and existing dwellings with fossil fuel-burning appliances or attached garages. The state's regulations cover single-family homes, multi-family residences, hotels, motels, and dormitories. Despite these strong regulatory measures, the state shows room for improvement in Public Awareness and Behavior, which scored just 28%, suggesting an opportunity to enhance education initiatives about CO dangers.

Public Awareness and Education Initiatives on CO Safety in California

California Department of Public Health CO Poisoning Prevention: The [CDPH provides comprehensive information on CO poisoning](#), including symptoms, prevention strategies, and safety tips. The department emphasizes the importance of installing CO alarms, regular maintenance of fuel-burning appliances, and proper use of generators.



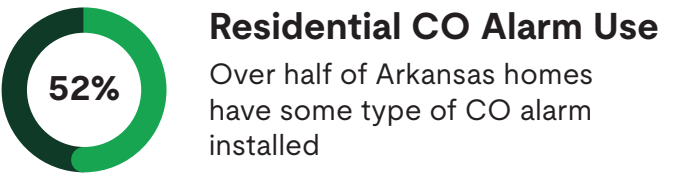
MySafe:California Initiative: This [program, led by the California Fire Prevention Organization, focuses on fire prevention and safety education](#), including CO awareness. The organization collaborates with local fire agencies to support at-risk communities by providing resources and education on CO dangers and prevention methods.

Operation 7: Save A Life Campaign: In partnership with [ABC 7, Kidde, and The Home Depot](#), this community service program distributes free smoke alarms and CO detectors to low-income and elderly households. The initiative aims to increase CO safety awareness and ensure that vulnerable populations have access to essential safety devices.

Arkansas

CO SAFETY CHAMPION

Arkansas has earned CO Safety Champion status in the assessment, reflecting its robust regulatory coverage and relatively high public awareness. With an 80% Code and Regulatory Strength score, Arkansas mandates CO detectors in key settings such as residential dwellings, hotels, and daycares, establishing a strong foundation for preventing CO-related incidents.

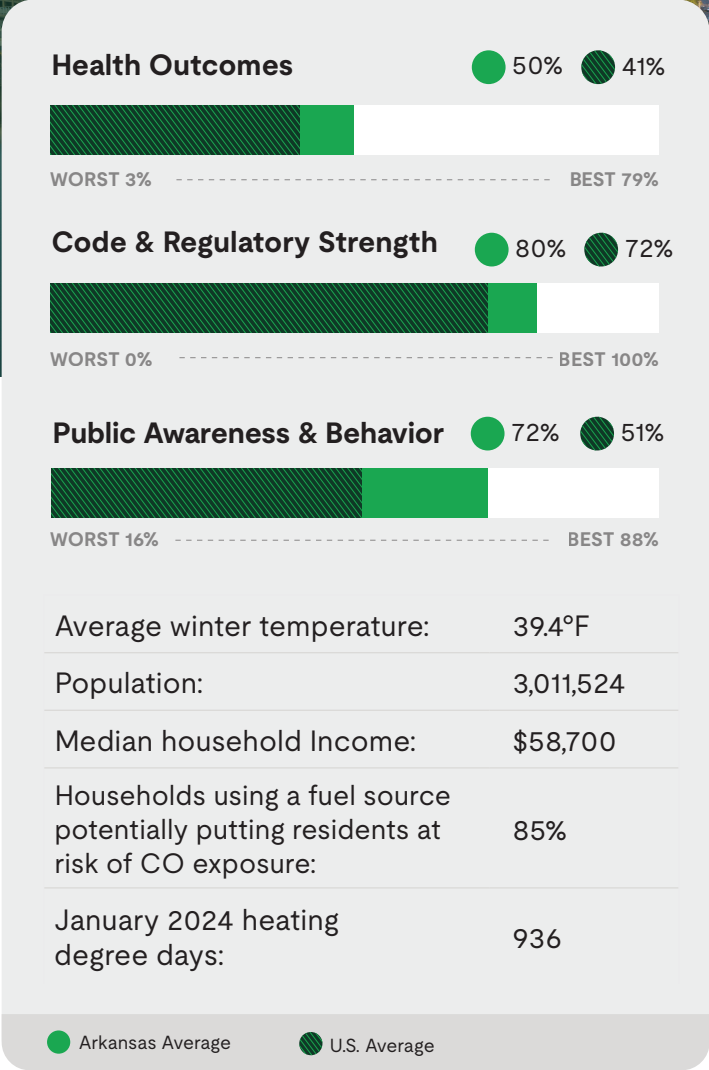


The state’s 72% Public Awareness and Behavior score indicates ongoing efforts to educate residents about CO risks, though some knowledge gaps remain.

Despite these strengths, Arkansas’ Health Outcomes score stands at 50%, signaling that further improvements in prevention, detection (48% of residents in ULSE surveys indicate they do not have an active CO alarm in their home), and emergency response are needed to minimize CO-related fatalities and injuries. Given an average winter temperature of 39.4°F and a high reliance on fuel-burning appliances (85% of households), the risk of CO exposure increases during colder months, pointing to the need for sustained targeted public education.

Public Awareness and Education Initiatives on CO Safety in Arkansas

Carbon Monoxide Detector Guidance by Arkansas Oklahoma Gas: [Arkansas Oklahoma Gas](#) provides educational resources on CO detectors, guiding residents on proper installation, maintenance, and the importance of educating family members about CO safety.



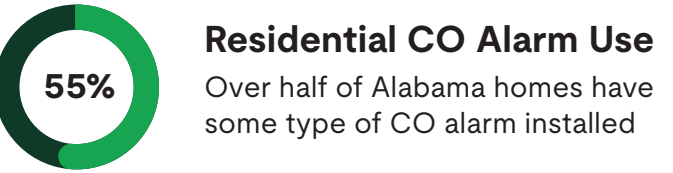
Carbon Monoxide Poisoning Prevention by Arkansas Department of Health: The [Arkansas Department of Health](#) provides educational materials on carbon monoxide poisoning prevention strategies, as well as common signs of CO poisoning.

Bentonville, AR Carbon Monoxide Public Safety Education: The [Bentonville Fire Department](#) has compiled an easy-to-read, one-page guide that provides an overview of what carbon monoxide is, what the symptoms of CO poisoning are at both low and high levels, what do in case of a CO emergency, and how to prevent CO poisoning.

Alabama

CO SAFETY CHAMPION

Alabama ranks as a Champion in the scorecard, achieving an overall weighted score of 66%. The state's high Policy Strength Score of 85% reflects strong regulations mandating CO alarms across various settings. Alabama law requires that functioning carbon monoxide detectors be installed in every newly constructed or renovated one- or two-family dwelling, townhomes, multi-family residences, and hotels.

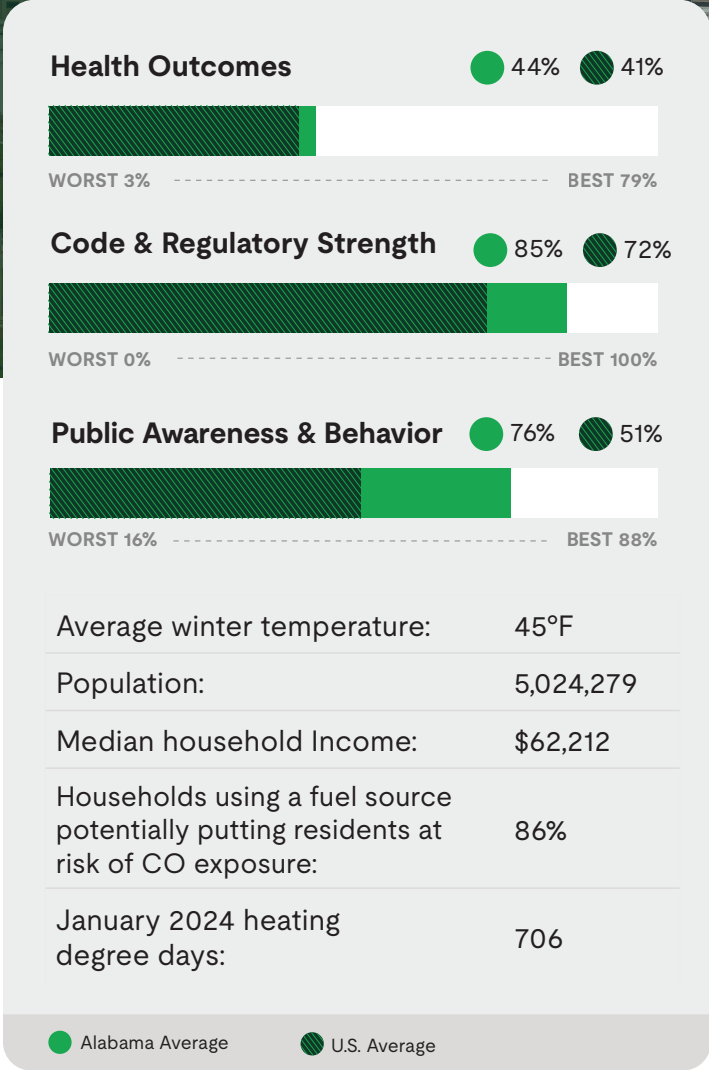


Despite these robust policies, Alabama’s Health Outcomes Score is relatively low at 44%, indicating that CO poisoning incidents remain a significant concern. The state's Public Awareness Score is on the higher end at 76%, suggesting the existence of educational efforts that inform residents about CO risks and safety measures.

Public Awareness and Education Initiatives on CO Safety in Washington

Protecting Patients from Future Incidents: [Springhill's Center for Wound Care and Hyperbaric Medicine](#) received carbon monoxide alarms from The Jenkins Foundation to distribute to patients who have undergone emergency hyperbaric treatment for CO poisoning.

Emphasizing Using Safe Products: The Alabama Department of Economic and Community Affairs (ADECA) provides educational materials on energy safety, including information on the risks of CO from improper use of heating appliances and the importance of using ENERGY STAR-rated equipment.



CO Safety Education: The North Alabama Gas District provides [comprehensive information](#) on carbon monoxide, including its sources, symptoms of poisoning, and preventive measures. They emphasize the importance of installing CO detectors and regular inspection of fuel-burning appliances.

Safety During Hurricane Season: The Alabama Department of Health offers guidance on CO safety, especially during emergencies like hurricanes when alternative fuel sources are used. They advise against using generators or grills indoors and recommend the use of battery-operated or battery backup CO detectors.

Recommendations

CO Safety Champion



Sustain and Evolve Public Awareness Campaigns:

Continue public education on CO risks, symptoms, and prevention measures via social media, schools, community events, and regular public service announcements during high-risk times for your state, updating content as new risks and technologies emerge.



Expand Technology Integration:

Promote the adoption of smart CO alarms that integrate with home automation systems, enabling real-time alerts and remote monitoring.



Conduct Regular Regulation Reviews:

Periodically assess CO safety regulations to incorporate emerging technologies, address identified gaps, and align with evolving industry standards.



Advance Data Collection: Study CO poisonings that otherwise are missed by standard tracking techniques.

CO Safety Leader



Mandate Regular Alarm Maintenance:

Require periodic inspections and maintenance of CO alarms by landlords, property owners, or certified technicians to ensure ongoing functionality.



Broaden Stakeholder Involvement:

Engage local governments, community organizations, and industry stakeholders in regular training and awareness sessions to further integrate CO safety into everyday practices.



Confirm Alarm Longevity/Reliability:

Promote adoption of CO alarms that adhere to safety standards.



Expand Tracking and Information:

Increase tracked details of CO poisonings and publish reports for public use (sources, severity, other determinants).

CO Safety Advocate



Build on Mandatory Installations:

Continue enforcing basic alarm requirements as established at the Starter level.



Enhance Public Outreach:

Launch targeted campaigns to educate vulnerable populations (e.g., renters, elderly, and low-income households) and stakeholders (doctors, HVAC technicians, construction, firefighters) and establish statewide CO awareness programs.



Encourage Alarm Installation:

Offer financial incentives for low-income or vulnerable households to install CO alarms that adhere to safety standards.



Strengthen Enforcement Mechanisms:

Implement penalties for non-compliance with CO safety regulations to ensure accountability.

CO Safety Starter



Mandate Basic CO Alarm Requirements:

Require CO alarms that adhere to safety standards in all new and existing commercial, mixed-use, and residential buildings.



Launch Initial Public Outreach:

Launch targeted campaigns to educate vulnerable populations (e.g., renters, elderly, and low-income households) and establish statewide CO awareness programs.



Develop Emergency Response Programs:

Train first responders and healthcare professionals to handle CO poisoning cases effectively.



Collaborate with Federal Agencies:

Seek guidance and resources from organizations like the CDC to develop robust CO safety initiatives.



Monitor and Evaluate Progress:

Establish systems to track CO-related incidents and measure the effectiveness of new policies.

Complete Scorecard

In this analysis, all raw scores were transformed to a common metric via standardization. Each standardized value was then assigned a percentile rank within the full sample, calculated to two decimal places to preserve precision. Percentiles were grouped into discrete performance tiers based on their relative standing (e.g., 0–25th percentile, etc.). For clarity in presentation, these percentile values have been rounded to the nearest whole number.

State	Health Outcomes	Health Outcomes Fatalities	Health Outcomes Hospitalizations	Health Outcomes ER	Code & Regulatory Strength	Public Awareness	Public Awareness Awareness Score	Public Awareness Ownership and Maintenance Score	Public Awareness Safe Practices Score	Weighted Score	Grade
Alabama	44%	44%	N/A	N/A	85%	76%	60%	80%	76%	66%	Champion
Alaska	10%	0%	25%	13%	80%	72%	80%	80%	70%	50%	Starter
Arizona	77%	69%	88%	81%	80%	16%	40%	0%	18%	63%	Leader
Arkansas	50%	50%	N/A	N/A	80%	72%	80%	80%	62%	66%	Champion
California	74%	78%	65%	78%	85%	28%	20%	60%	6%	66%	Champion
Colorado	28%	25%	28%	38%	85%	64%	40%	60%	88%	57%	Advocate
Connecticut	71%	81%	69%	46%	55%	44%	20%	60%	48%	58%	Leader
Delaware	46%	46%	N/A	N/A	55%	36%	60%	40%	12%	47%	Starter
Florida	64%	69%	44%	81%	55%	28%	20%	20%	36%	52%	Advocate
Georgia	50%	50%	N/A	N/A	85%	28%	20%	20%	30%	57%	Advocate
Hawaii	59%	59%	N/A	N/A	20%	16%	0%	0%	44%	35%	Starter
Idaho	34%	34%	N/A	N/A	85%	40%	40%	40%	46%	53%	Advocate
Illinois	33%	33%	N/A	N/A	55%	60%	60%	80%	32%	47%	Starter
Indiana	31%	31%	N/A	N/A	80%	68%	60%	80%	74%	58%	Advocate
Iowa	25%	15%	56%	3%	85%	64%	80%	80%	28%	56%	Advocate
Kansas	19%	11%	15%	44%	10%	64%	0%	100%	60%	27%	Starter
Kentucky	41%	53%	25%	38%	85%	28%	20%	40%	18%	53%	Advocate
Louisiana	34%	31%	31%	44%	55%	20%	20%	40%	2%	38%	Starter
Maine	25%	25%	31%	18%	65%	76%	100%	80%	52%	52%	Advocate
Maryland	64%	81%	50%	40%	65%	64%	0%	60%	96%	64%	Leader
Massachusetts	57%	78%	44%	28%	55%	60%	60%	40%	82%	57%	Advocate
Michigan	33%	44%	19%	28%	85%	68%	100%	60%	56%	60%	Leader
Minnesota	19%	18%	24%	18%	85%	68%	100%	40%	84%	55%	Advocate
Mississippi	56%	56%	N/A	N/A	85%	36%	60%	40%	8%	61%	Leader
Missouri	23%	20%	6%	56%	0%	56%	40%	60%	56%	23%	Starter
Montana	13%	13%	N/A	N/A	80%	72%	80%	40%	94%	51%	Advocate
Nebraska	28%	30%	25%	28%	15%	44%	100%	40%	22%	27%	Starter
Nevada	38%	38%	N/A	N/A	85%	16%	0%	20%	24%	49%	Starter
New Hampshire	54%	63%	50%	38%	55%	84%	100%	60%	100%	62%	Leader
New Jersey	67%	65%	81%	50%	100%	72%	80%	100%	42%	80%	Outright Champion
New Mexico	25%	31%	14%	24%	85%	52%	20%	100%	10%	53%	Advocate
New York	47%	63%	26%	38%	100%	48%	40%	100%	4%	66%	Leader
North Carolina	63%	56%	69%	69%	85%	36%	60%	20%	26%	64%	Leader
North Dakota	3%	3%	N/A	N/A	85%	60%	100%	20%	78%	46%	Starter
Ohio	20%	20%	N/A	N/A	90%	68%	60%	80%	50%	57%	Advocate
Oklahoma	25%	25%	N/A	N/A	85%	52%	60%	20%	80%	53%	Advocate
Oregon	51%	31%	81%	56%	80%	36%	60%	0%	64%	58%	Advocate
Pennsylvania	41%	38%	34%	59%	85%	56%	40%	80%	40%	60%	Leader
Rhode Island	52%	69%	31%	40%	50%	52%	20%	100%	16%	51%	Advocate
South Carolina	40%	25%	50%	63%	85%	24%	40%	0%	34%	52%	Advocate
South Dakota	8%	8%	N/A	N/A	85%	40%	80%	20%	38%	43%	Starter
Tennessee	30%	25%	20%	56%	80%	56%	40%	60%	72%	54%	Advocate
Texas	44%	44%	N/A	N/A	10%	32%	0%	80%	0%	29%	Starter
Utah	50%	69%	31%	31%	90%	48%	40%	0%	90%	64%	Leader
Vermont	52%	50%	69%	30%	90%	76%	60%	60%	98%	71%	Champion
Virginia	79%	81%	75%	N/A	80%	48%	40%	40%	54%	72%	Champion
Washington	55%	40%	81%	N/A	85%	56%	40%	60%	66%	66%	Leader
Washington D.C.	N/A	N/A	N/A	N/A	80%	28%	60%	20%	14%	58%	Advocate
West Virginia	10%	14%	3%	N/A	55%	96%	80%	100%	92%	47%	Starter
Wisconsin	46%	50%	56%	20%	85%	64%	40%	60%	86%	64%	Leader
Wyoming	34%	34%	N/A	N/A	85%	52%	60%	40%	68%	56%	Advocate
U.S. Average	41%	42%	43%	42%	72%	51%	51%	52%	50%	54%	

Methodology

Data Sources

Our 100-point scoring system assesses states across three key dimensions:



Health Outcomes (40 points)

Evaluating CO-related fatalities, hospitalizations, and ED visits.



Code & Regulatory Strength (35 points)

Assessing the comprehensiveness of state CO detector policies.



Public Awareness & Behavior (25 points)

Measuring public knowledge and practices related to CO safety.

Note: The Health Outcomes source dataset does not report statistics from the District of Columbia. As such, D.C. health outcomes scores are omitted from weighted score totals.

1. Health Outcomes:

Data (2000-2022) from the Centers for Disease Control and Prevention/Environmental Public Health Tracking Network. Accessed From: [National Environmental Public Health Tracking Network](#). Accessed on 03/25/2024. For all, rates were age-adjusted by the direct methods using the 2000 U.S. Standard Population.

Mortality From CO Poisoning — Age-Adjusted Death Rate From CO Poisoning per 100,000 Population Over a 5-Year Period:

Rates in this report are mortality rates presented per 100,000 estimated population in a specified group. Rates are reported in overlapping 5-year periods (e.g., 2000-2004, 2001-2005, etc.). Mortality data from the National Vital Statistics System from National Center for Health Statistics.

Hospitalizations for CO Poisoning — Age-Adjusted Rate of Hospitalizations for CO Poisoning per 100,000 Population:

Rates in this report are hospital admission rates presented per 100,000 estimated population in a specified group. Data represent number of admissions rather than number of individuals admitted to the hospital. For example, a person admitted twice in one year would count as two admissions. Hospital data shown here are provided by state and/or local public health departments to the Tracking Network.

Emergency Department (ED) Visits for CO Poisoning — Age-Adjusted Rate of ED Visits for CO Poisoning per 100,000 Population:

Rates in this report are ED visit rates presented per 100,000 estimated population in a specified group. Data represent number of emergency department visits rather than number of individuals. For example, a person visiting the emergency department twice in one year would count as two visits. Emergency department visits data shown here are provided by state and/or local public health departments to the Tracking Network.

2. Code & Regulatory Strength:

Summary of state-level fire code regulations regarding CO alarm installation Pg. 12-17. [NFPA Carbon Monoxide Detection and Alarm Requirements: Literature Review](#) (2021):

Lists all the states and includes Washington D.C. on the left column, with the different occupancy types along the top.

An “x” indicated that state has regulation to some degree for that occupancy. There are occupancy types that are not included as they aren’t regulated by any state, and certain occupancy types, such as assembly occupancies, that have had documented incidents and deaths, are shown to have very little regulation.

There is also an important caveat that while some states have a statewide fire code use, it does not necessarily mean it’s enforced statewide; some states allow local jurisdictions to make amendments or have their own regulations to be enforced.

Important to note that CO detector requirements may be required by other state statutes and mandates, which are not included here.

3. Public Awareness & Behavior:

A ULSE quantitative U.S. consumer survey on behaviors, perceptions, attitudes at the state level between Aug 2023 - Aug 2024:

- CO alarm ownership and maintenance
- Safe practices regarding fuel-burning appliances and generators
- Awareness of CO risks

Standards Highlight

For new construction, the model International Residential Code (IRC) requires CO alarms listed to UL 2034 to be installed outside of each separate sleeping area in the immediate vicinity of the bedrooms in dwelling units within which fuel-fired appliances are installed and in dwelling units with attached garages. However, local authorities and states are not automatically required to follow the International Residential Code (IRC); states and local jurisdictions have the authority to adopt, amend, or reject the IRC.



Methodology

Assessment Components



A balanced approach ensures that the assessment effectively captures the multifaceted nature of CO safety and prevention efforts in residential and commercial buildings. The assessment's design aligns with the scope of current statewide CO safety mandates, ensuring that it assesses and compares policies on a consistent basis across states.

The focus on residential and commercial buildings is directly tied to the available regulatory data, which is limited to buildings. State CO detector requirements, which form the basis for measuring "regulatory strength" in the assessment, are specifically designed for and applicable to buildings only.

External support for methodology:

[Prüss-Üstün, A., & Corvalán, C. \(2006\)](#) (related more to public/ environmental health vs. directly related to CO) emphasizes the importance of measuring the environmental burden of disease, which aligns with our focus on *health outcomes*, discusses the critical role of environmental health *policies* in reducing that disease burden, and acknowledges the role of individual *behaviors* and community *awareness* in environmental health.

- 1 This weighting scheme prioritizes **Health Outcomes (40%)**, as they are the most direct measures of success in CO safety. [Frieden \(2010\)](#) emphasizes the critical importance of measuring health outcomes in evaluating public health interventions.
- 2 **Code and Regulatory Strength (35%)** is also heavily weighted, reflecting the importance of regulatory measures in preventing CO incidents. [Mott et al. \(2002\)](#) demonstrate how robust policies as part of the 1970 Clean Air Act and the subsequent introduction of catalytic converters in 1975 led to a decline in CO-related mortality, supporting the high weighting of regulatory strength.
- 3 **Public Awareness and Behavior (25%)**, while essential, are given a slightly lower weight as they often enhance the effectiveness of the other two categories. [Damon et al. \(2013\)](#) emphasize the role of public awareness/education in preventing CO poisoning and how it complements other measures.



A. Health Outcomes (40% of total score):

Health outcomes are the most direct and significant indicators of the impact of CO safety measures. The higher weight is assigned to health outcomes (40%) to emphasize the importance of reducing fatalities, hospitalizations, and ED visits due to CO exposure.

- Fatalities represent the most severe outcome and have the highest societal cost per case; [Hampson, N. B. \(2016\)](#)
- Hospitalizations indicate severe cases requiring intensive care and have significant health system impacts; [Ghosh, R. E., et al. \(2016\)](#)
- ED visits, while less severe, represent a broader public health burden and early intervention opportunities; [Hampson, N. B., & Weaver, L. K. \(2007\)](#)

This scoring strategy prioritizes severity over frequency, which is consistent with public health approaches to high-impact, low-frequency events. The 50%-30%-20% ratio (Fatalities-Hospitalizations-ED Visits) aligns with the relative severity and impact found in literature.

Indicator	Points (Sums to 40)
CO-related fatalities per 100,000 population (Data presented in multiple overlapping 5-year ranges, e.g., 2000-2004) <i>Rationale: Highest severity, societal impact, and cost per case</i>	20
CO-related hospitalizations per 100,000 population (Data presented annually) <i>Rationale: Significant healthcare resource utilization and indicator of severe cases</i>	12
CO-related ED visits per 100,000 population (Data presented annually) <i>Rationale: Broader public health impact and early intervention opportunity.</i>	8

Within these outcomes, the assessment uses three types of indicators that are well-established in time series analysis and regulatory evaluation to evaluate health outcomes dynamics: **recent performance** (data from the most recent five-year period available; worth 50% of CO fatalities score), **long-term performance** (simple average rate across all periods for each state; worth 25% of CO fatalities score), and **overall trend** (slope of the trend line across all periods; worth 25% of CO fatalities score):

Methodology

Assessment Components

Missing Data/Exceptions:

Due to the small population and the risk of individual identification, Washington, D.C. did not report any health outcome data. Additionally, hospitalization data was not reported by Alabama, Arizona, Delaware, Georgia, Hawaii, Idaho, Illinois, Indiana, Mississippi, Montana, Nevada, South Dakota, Texas, and Wyoming. Furthermore, emergency department visit data was not reported by Alabama, Arizona, Delaware, Georgia, Hawaii, Idaho, Illinois, Indiana, Mississippi, Montana, Nevada, South Dakota, Texas, Virginia, Washington, West Virginia, and Wyoming. To account for these discrepancies, score calculations were adjusted so that states were only evaluated based on the available data.



B. Code and Regulatory Strength (35% of total score):

Strong state-level policies mandating CO detector installation across various types of buildings are critical in preventing CO-related incidents — whether new or existing.

The 35% weight highlights the importance of regulatory frameworks in promoting safety.

Mandatory State-Level Laws Requiring CO Detector Installation in... (New/Existing)	Points (Sums to 35)
Residential Home (7%)	7
Apartment Buildings (3.5%)	3.5
Hotels/Dorms (3.5%)	3.5
Assembly/Commercial Buildings (3.5%)	3.5
Education (3.5%)	3.5
Daycare (3.5%)	3.5
Healthcare (3.5%)	3.5
Board & Care (3.5%)	3.5
Lodging/Rooming (3.5%)	3.5

Missing Data/Exceptions:

The NFPA literature review did not report any data for Hawaii, Kansas, and Missouri. However, independent secondary research conducted by the ULSE Insights and Policy Analysis team found that in Hawaii, carbon monoxide alarms are required in newly constructed or renovated dwellings that contain a carbon-based-fueled appliance or device that produces by-products of combustion or have an attached garage. Similarly, this research found that in Kansas, CO alarms are required in lodging establishments, such as boarding houses and bed and breakfasts, if they contain a carbon-based-fueled appliance or device that produces by-products of combustion, or if they have an attached garage. Texas requires CO alarms in all daycare and childcare facilities; other regulations are maintained at the local level. In contrast, Missouri does not have statewide CO alarm requirements, although some regulations have been adopted at the local level.



C. Public Awareness and Behavior (25% of total score):

Public awareness and safe behaviors are essential in preventing CO incidents, complementing the impact of policies and health outcomes. The 25% weight reflects its importance but acknowledges that it often works in tandem with strong policies and health outcomes.

Indicator	Points (Sums to 25)
CO Alarm Ownership and Maintenance	10
Safe Practices Regarding Fuel-Burning Appliances and Generators	10
Awareness of CO Risks <i>Rationale: Public knowledge of CO risks is foundational, but without action, it does not directly prevent incidents, justifying a lower weight.</i>	5

