Navigating vehicle safety

Finding

A guide to buying the safest vehicle you can afford

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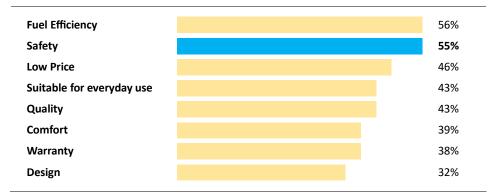


Introduction

Vehicle choices are more plentiful now than a few years ago. Manufacturing shutdowns, semiconductor scarcity, and supply chain issues are over. As usual, new sticker prices shock us, but the latest safety technology explains some of the cost. This is a guide to buying the safest vehicle you can afford.

Decision factors

Safety is virtually tied with fuel efficiency as the top decision factor for U.S. car buyers. Over half of us value safety over price, quality, and comfort.





Most consumers look at three top factors while car shopping.

(Source: Data and graph from <u>www.statista.com</u>. Statista. Martin Armstrong. September, 2022.)

Safety checklist

Fortunately, if we are serious about safety, we can find the information we need to make the best decision. Doing the homework takes time and effort, but it could turn out to be a lifesaver.

How to start? After brainstorming for some possible vehicle choices, we can create a simple worksheet for each vehicle, then fill in the items we want to compare. For example:

- Window sticker price and mpg
- Crash tests and safety scores
- Fatality rates
- Size vs. safety
- 🗸 Rear seat safety
- 🗸 Drivetrain
- Awards and reviews
- "Hidden" safety features
- ✓ Safety affordability

Finding safety information

Safety and the window sticker

Vehicle dealerships are a firsthand source of information. There, we can check window stickers and ask questions.

Some sticker information is mandated by law. For example, stickers must show the Manufacturer Suggested Retail Price (MSRP) as well as fuel efficiency (city, highway, and combined).

The window sticker shows the safety features, too, but those are not as easy to compare as numbers. For the best comparison, we can check objective, online resources for vehicle ratings and reviews.

Online resources for car shoppers

- Insurance Institute for Highway Safety (IIHS)
 An independent testing agency created by insurance companies. The agency conducts crash tests, evaluates safety, and publishes its findings.
 www.iihs.org/ratings
- National Highway Traffic Safety Administration (NHTSA)
 A U.S. government safety assessment program that crash tests for frontal, side, and rollover protection in a collision. The window sticker shows the results from the agency's five-star rating system.

 www.nhtsa.gov/ratings
- Consumer Reports

A non-profit, independent consumer agency that offers ratings based on vehicle testing and owner reviews. Ratings are for driving experience, comfort, value, and styling.

www.consumerreports.org

- J.D. Power and Associates
 A market research company that assigns point scores based on feedback from vehicle owners.
 www.jdpower.com/cars/rankings
- U.S. News & World Report

An online news magazine that awards "Best Of..." rankings for vehicles. <u>www.cars.usnews.com/cars-trucks</u>

Edmunds

A resource for information based on its vehicle testing and research. Owned by CarMax, the largest U.S. used-car retail sales company. www.edmunds.com



Unbiased information helps us make an informed choice.

Drilling into the data

Safety comparisons are complicated

Comparing vehicle safety challenges shoppers for many reasons:

- Safety technology is evolving faster than testing agencies can update their tests.
- Typically a heavier vehicle wins in a collision with a smaller one. However, the smaller vehicle may offer the manueverability to prevent a collision in the first place. That is difficult to test.
- Vehicle manufacturers list safety features by various names.
- Some safety features are standard because they are required by law; for example, air bags and seat belts. Some safety features are not mandated by law, yet are becoming standard.
- Safety options can vary among one manufacturer's models and even among trim levels of that model.
- Some safety features are "hidden" because they are also for comfort and convenience.

(Source: www.edmunds.com/car-safety. Written by Ronald Montoya. Updated February, 2017.)

General safety features to look for

Safety rankings and reviews are often based on these basics of protection.

Vehicle occupant protection		
Blind zones	Areas of the vehicle that interfere with the driver's line of sight.	
Accident avoidance	Vehicle's ability to avoid an impact.	
Rear impact protection	Vehicle's ability to prevent injuries to occupants during a rear impact.	
Rollover resistance	Vehicle's ability to prevent a rollover during an impact.	
Roof strength	Ability of the roof to prevent injury to occupants during a rollover.	



Safety technology is evolving faster than safety tests.

IIHS testing program

Crash tests and other safety scores

The IIHS, an unbiased, non-profit agency, is perhaps the most relied-upon resource for vehicle safety information. Consumers can find safety evaluations across makes, models, and vehicle size categories on the IIHS website (www.iihs.org/ratings).

The IIHS crash tests score specific criteria for each vehicle, such as:

- Damage to the vehicle's structure that could result in head and body injuries.
- Features that could help avoid a collision or lessen the impact to prevent injuries; for example, effective headlights.

The IIHS rates its crash test results as **Good**, **Acceptable**, **Marginal**, and **Poor**; a vehicle's preventative safety features are rated as **Basic**, **Advanced**, or **Superior**.

Safety tests continually evolve to keep up with technology and injury data. That means a vehicle could receive a high rating one year then a poor rating the next, simply due to changes to the test.

These are the crash tests currently performed by the IIHS.

IIHS crash tests	
Front, moderate overlap	With the vehicle traveling at 40 mph, 40% of its width hits a barrier on the driver side. The original test only evaluated the potential injury to the driver. In 2022 the test was updated to include rear occupants.
Front, driver-side small overlap	With the vehicle traveling at 40 mph, 25% of its width hits a barrier on the vehicle's front left corner. The test helps show potential injury to the driver's legs and feet in a collision.
Front, passenger-side small overlap	With the vehicle traveling at 40 mph, 25% of its width hits a barrier on the vehicle's front right side.
Side (updated)	Measures a side impact equivalent to an SUV traveling at 37 mph. The test was recently updated to rate the safety of rear seating, using dummies representing the driver and a rear passenger behind the driver.



Crash tests offer the best way to predict injuries in a collision.

IIHS award tiers

A vehicle's combined scores can earn the IIHS top tier rating, **Top Safety Pick+**, or the secondtier rating, **Top Safety Pick**. The agency also reports results for vehicles that do not win a place in either tier.

Scoring requirements: IIHS Top Safety Pick+

- Good ratings in the driver- and passenger-side small-overlap front crash test and original moderate-overlap front crash test
- Good rating in the updated side crash test.
- Good or Acceptable ratings for available headlights.
- Advanced or Superior rating for daytime vehicle-to-pedestrian front crash prevention.
- Advanced or Superior rating for nighttime vehicle-to-pedestrian front crash prevention.

Tests for strength, head restraint, and vehicle-to-vehicle front crash prevention warnings are not part of the IIHS criteria.

Some tests evaluate "sibling" models together. For example, the Subaru Crosstrek and Impreza share the same platform, engine, and AWD system. Some tests classify them as the same vehicle, although the Crosstrek's higher ground clearance gives it better visibility and better ability to clear objects in the road.

(Source: <u>www.consumerreports.org/cars</u>. Consumer Reports. Keith Barry. February, 2023.

Example of IIHS test scores

Here is an example of the IIHS test ratings for the Subaru Ascent, a 2023 IIHS **Top Safety Pick+**. These are only partial scores. Consumers can find more results on the IIHS website (www.iihs.org/ratings).

Crashworthiness G Small overlap front: driver-side G Small overlap front: passenger-side G Moderate overlap front: original test Moderate overlap front: updated test G Side: original test G Side: updated test G Roof strength G Head restraints & seats G **Crash avoidance & mitigation** G Headlights Front crash prevention: vehicle-to-pedestrian (day) Standard system Front crash prevention: vehicle-to-pedestrian (night) Standard system Seat belts & child restraints Seat belt reminders LATCH ease of use



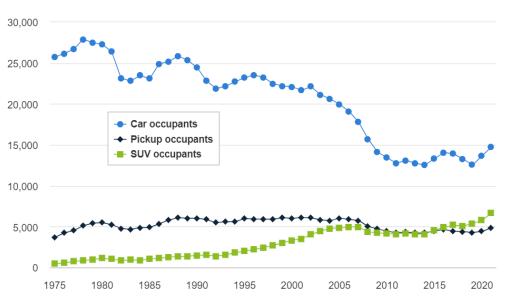
Looking at the IIHS award tiers is a quick way to identify the safest vehicles.

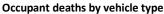
Other ways to compare

Assumptions about size, safety, and affordability

Does a large vehicle have a safety advantage that justifies the higher upfront and long-term costs? There is not a simple answer. Although a larger vehicle has more weight and a larger crumple zone, its size may make it more top heavy and prone to roll over in a crash. A smaller vehicle with the newest safety features might protect its occupants better than a larger vehicle without them.

Overall, deaths in cars are trending downward, while deaths in SUVs are creeping upward.







Fatality rates vary widely, even among vehicles in the same size class.

(Source: www.iihs.org/topics/fatality-statistics.)

As for the size-related costs, what are we talking about for a larger vehicle? **Edmunds** rates the 2023 Chevy Suburban and the 2023 GMC Yukon as tied for best large SUV, with MSRPs of \$56,900 and \$57,400, respectively.

Using regular gasoline, the Suburban's 4WD V8 automatic, has an estimated 16 mpg, combined city and highway. The GMC Yukon 4WD V8 automatic has an estimated combined 17 mpg.

(Sources: <u>www.edmunds.com/car-comparisons</u> and <u>www.fueleconomy.gov</u>, a U.S. federal website using data from the Environmental Protection Agency (EPA)). (Additional source: <u>www.motorbiscuit.com</u>. Compiled by digital editors. February, 2022.)

Checking a vehicle's driver fatality rates

Accidents claimed the lives of 42,939 U.S. drivers in 2021 alone. The IIHS website (<u>www.iihs.org</u>) shows driver fatality rates based on 10 years of data collected by the NHSTA. The fatalities vary by state, time of day, vehicle size, make, and model. Driver deaths are measured per million registered drivers (one vehicle registered for one year).

For example, for recent model years, the overall driver fatality rate was 38. However, the Subaru Outback AWD had an estimated five.

In the midsize SUV category, the Subaru Ascent AWD had an estimated six. The Kia Sorento 4WD had 36, and the Jeep Wrangler 4-door AWD had 54.

(Source: <u>www.iihs.org/ratings/driver-death-rates-by-make-and-model</u>. IIHS periodically calculates driver death rates for individual models. Information on deaths is from the National Highway Traffic Safety Administration's Fatality Analysis Reporting System. Data on vehicle registrations come from IHS Markit. These federal statistics recorded driver fatalities from a total population of 331,893,745, with a total of 61,332 crashes.)

Rear passenger safety in small cars

Recently the NHSTA updated its moderate front overlap test. Of the first five small cars rated with the new test, none received a **Good** rating. In testing, the rear seat test dummies slid downward under the seat belt, increasing the chance of internal injuries. All five cars provided good protection for the front seat passengers. Until manufacturers respond to the new test results and adjust vehicle designs, consumers with children should pay special attention to this test score.

(Source: www.iihs.org/ratings.)



Rear passenger safety for small cars still needs improvement.

Drivetrain

Dealing with poor road conditions is a fact of life for most of us. Rain, snow, mud, and even dust, can cause a vehicle to slide. Most consumers care about good traction.

There are several ways to get that. Combining these maximizes traction for traveling in a straight line, braking, and turning. For example, we can choose the right tires for the driving conditions, and we can choose a drivetrain that fits our usual driving habits.

All-season tires are effective down to 45° F. At lower than that, winter tires provide better traction for braking and turning. Some types of drivetrain can provide extra traction for slippery surfaces or difficult terrain, too.

Here are the most common drivetrain configurations.

FWD (Front Wheel Drive)

The engine powers the front wheels only. This is the most common drivetrain for U.S. vehicles.

RWD (Rear Wheel Drive)

The engine powers the rear wheels only. This drivetrain is common for trucks, which makes sense for carrying heavy loads.

4WD (Four Wheel Drive)

This heavy-duty drivetrain equips a vehicle for deep snow or off-roading on steep hills and loose gravel. 4WD is good for towing or carrying heavy loads. There are two types: full-time or part-time. With full-time 4WD, the system stays engaged all the time and switches automatically to 2WD if road conditions do not require 4WD. With part-time 4WD, the driver may need to switch modes manually.

AWD (All Wheel Drive)

AWD is a good choice for consumers who want increased traction for slippery surfaces and light off-roading. Typical AWD sends power to all four wheels continuously and automatically sends power to either the front or rear wheels, depending on where the vehicle starts to slip. However, AWD systems are not all alike; for example, Subaru's AWD system operates each of the four wheels independently.

(Source: https://www.caranddriver.com/features. Warren Clark. April, 2019.)

Consumers Reports finds AWD and 4WD are better overall for traction than FWD or RWD. However, drivetrain configuration and tires cannot compensate for traveling too fast for the road conditions. In fact, 4WD or AWD may give drivers overconfidence. They may not realize that enough traction to get started, or travel in a straight line, does not equate to enough traction for stopping and cornering.

(Source: https://www.consumerreports.org/automotive-technology/2wd-vs-awd-vs-4wd. July, 2021.



The right tires and drivetrain make a difference on slippery surfaces.

Subaru safety and affordability

Top safety rankings for under \$25K

When checking for safety combined with affordability, Subaru emerges as an obvious choice. Subaru routinely wins an avalanche of positive safety rankings and reviews, yet often a Subaru has one of the lowest prices in its class.

For example, only one vehicle with an MSRP under \$25,000 earned the top IIHS ratings in all safety categories tested: the 2023 Legacy midsize sedan.

Subaru designs its vehicles to be family-friendly; comfortable yet good for utility; and above all, safe. By specializing in enhanced safety, Subaru holds down its cost.

(Source: <u>www.motorbiscuit.com</u>. This Car is the Only Car with the Best IIHS Safety Ratings for Under \$25,000. Marc Wiley. February, 2023.)

IIHS size categories for Subaru models

For accurate comparisons of safety between vehicles makes and models, we need to look at a manufacturer's lineup alongside the testing agency's size categories. Here is a list of the IIHS size categories for Subaru models.

Models by IIHS size	
Ascent	Midsize SUV/4-Door SUV
Impreza	Small Car/4-Door Sedan
Legacy	Midsize Car/4-Door Sedan
Outback	Midsize Car/4-Door Wagon
Forester	Small SUV/4-Door SUV
Crosstrek	Small Car, 4 Door Wagon
BRZ	Small Car, 2-Door Hatchback
WRX	Small Car, 4-Door Sedan
Solterra	Small SUV/4-Door SUV

(Source: <u>www.iihs.org/ratings</u>. These size categories are assigned by the IIHS, but other publishers or testing agencies may classify size categories differently. For example, the Crosstrek may be categorized as a crossover SUV, a subcompact SUV, a small SUV, or a Small Car.)



The verdict: Subaru stands out for affordable safety.

Subaru and IIHS safety ratings

The highest IIHS safety rankings are **TOP SAFETY PICK+** and **TOP SAFETY PICK**. Vehicles are ranked by crashworthiness, crash avoidance, and crash mitigation.

Those top tiers include ten Subaru models for 2023 and 2022.

IIHS top tier awards, 2022-2023		
Ascent	2022-2023	
Forester	2022-2023	
Solterra Cars built after October 2022	2023	
Legacy	2022-2023	
Outback	2022-2023	
Crosstrek With front-crash prevention option and specific headlights	2022-2023	
Crosstrek Hybrid	2022-2023	
Impreza With front-crash prevention option and specific headlights	2022-2023	
BRZ With front-crash prevention option	2022-2023	
WRX With front-crash prevention option	2022	

Nine Subaru models have won recent IIHS top tier awards.

The IIHS **TOP SAFETY PICK**+ is currently the top tier of rankings. (**Top Safety Pick** was the top tier from 2006 to 2013). Rankings can be found at <u>www.iihs.org/ratings</u>. Rankings are updated to keep up with advances in vehicle safety technology. Among other standards, vehicles ranked as **TOP SAFETY PICK**+ must score as **Good** in the driver-and passenger-side small overlap front tests as well as the original IIHS moderate overlap front test, and **Good** in the IIHS updated side test.

Industry recognition

- The NHSTA (<u>www.nhtsa.gov/ratings</u>) awarded five out of five stars for safety to the 2023 Outback, Legacy, and Crosstrek. All of these had zero recalls and zero investigations.
- Parents online magazine (<u>www.parents.com</u>) publishes its "Best of..." rankings after checking safety ratings and test-driving vehicles. Here are some Parents rankings for 2022 Subaru models.
 - Best for Road Trips
 - Forester AWD SUV; estimated base trim MSRP, \$27,070; 82 hp,
 4-cylinder engine; estimated 29 mpg.
 - Ascent, 3-row AWD SUV; estimated base trim MSRP, \$33,970+;
 260 hp, 4-cylinder turbo engine; estimated 22 mpg.
 - Best Compact Hybrid SUV
 - Crosstrek Hybrid AWD small SUV; estimated base trim MSRP, \$24,320+, before tax incentives; 137 hp, 4-cylinder engine; 17 miles of electric range and 35 mpg.
 - o Best All-Weather
 - Legacy midsize AWD sedan; estimated base trim MSRP, \$24,490+; 182 hp,
 4-cylinder engine; estimated 30 mpg.
- U.S. News & World Report ranked the 2022 Ascent as #2 in safety among midsize SUVs, with an overall score of 9.8 of 10. (For that same model year, the IIHS ranked the Ascent as a TOP SAFETY PICK+). The 2023 Crosstrek Plug-in Hybrid, a small car/crossover SUV, was ranked as #2 on that list of safest SUVs. The Crosstrek Hybrid seats five and comes with a base MSRP of \$36,845 and an estimated 36 mpg, combined city and highway.
- Edmunds reports that 84% of consumer reviewers gave the 2023 Forester 4.7 of 5 stars overall. By comparison, the 2023 Honda CR-V received 4.3 of 5 stars overall. Comparing price at similar trim levels, the 2023 Forester starting MSRP was \$6,605 less than the CR-V.



Consumer Reports ranks the 2023 Forester as #1 among the top 20 small SUVs.

Subaru safety terminology

The growing list of available vehicle safety features leads to a growing list of terms. Ten safety organizations, including the IIHS and the National Safety Council, have agreed on shared terminology for some safety features, but every manufacturer still uses some of its own terms. Consumers should check the window sticker and talk with a dealership salesperson to learn which safety features are standard or available options. Here are terms for Subaru safety features.

Subaru safety terms and description

Adaptive Cruise Control	Allows the driver to preset the following distance while using cruise control.
Automatic Vehicle Hold	Keeps the vehicle from rolling when the driver's foot is off the brake pedal; for example, while at a traffic light.
Blind-Spot Detection	Flashes a warning light on the side mirror if another vehicle approaches nearby.
Driver Focus	Uses facial recognition sensors to monitor for signs of drowsiness.
Forward Collision Warning	Detects a potential collision and alerts the driver.
Lane Change Assist	Flashes an alert when other vehicles are approaching rapidly in neighboring lanes.
Lane Keep Assist	Actively assists with keeping the vehicle centered in its lane.
Lane Centering	Assists the driver with keeping the vehicle within the lane markings on highways while using Adaptive Cruise Control.
Lane Departure Warning	Warns the driver if the vehicle may drift off the road.
Lane Departure Prevention	Prevents the vehicle from drifting out of its lane on the highway.
Lane Sway Warning	Warns the driver that the vehicle may drift out of its lane.
Lead Vehicle Start Alert	Notifies the driver when the stopped vehicle in front begins to move forward.
Pre-Collision Braking	After a pre-collision throttle warning and deceleration, Pre- Collision Braking (PCB) applies full force braking to mitigate or avoid a frontal impact.
Pre-Collision Throttle Management	Reduces accidental acceleration if the gas pedal is pressed accidentally or too forcefully.
Rear Cross Traffic Alert	While the vehicle is in reverse, alerts the driver that another vehicle is approaching the rear of the vehicle from the side.
Rear Vision Camera	Displays the vehicle's backward path while in reverse.
Reverse Automatic Braking	Applies the brakes automatically if the driver fails to heed alerts of an object behind the vehicle while in reverse.
Steering Responsive Headlights	Allows the beam to move with the steering angle to left or right; helpful with curves or turns.



Understanding safety terminology helps with comparisons.

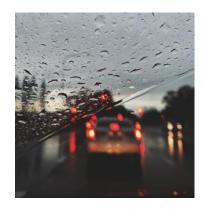
"Hidden" safety features

Some comfort and convenience features are often overlooked for their contribution to safety. For example, **Consumer Reports** highlights the Forester's windows, with their wide-view outward visibility.

Distracted driving is a leading cause of accidents. Subaru provides as standard Bluetooth[®] phone pairing and its subscription-based service, STARLINK[®], which works with Apple CarPlay and Android Auto apps. These features are convenient but also allow drivers to keep hands on the wheel while using voice recognition for calls and to get directions. Here are other "hidden" features. These vary by model and trim level.

Multipurpose features Allows maximum visibility and helps prevent occupant Adequate headroom roof contact in a collision. All season tires Provide grip in wet or slick road conditions above 45° F. Comes with heated exterior mirrors and windshield **All Weather Package** wiper deicer, improving visibility in bad weather. Allows the driver to use the remote start to control the iPhone remote start windshield defroster, door locks, and lights. Prevents glass from shattering on impact, keeping glass Laminated windshield fragments from injuring occupants. Opens the tailgate to a preset height every time, to avoid the tailgate hitting a low ceiling or open garage **Memory tailgate** door. Allows the driver to use the windshield washer to clean Rear camera wash the rear backup camera lens. Allows drivers with a STARLINK[®] subscription to use a Smartphone paired navigation smartphone app to pull up a map on the vehicle display and hear audio instructions. Subscription-based service that provides automatic collision notifications, diagnostic alerts, roadside STARLINK[®] and mySubaru app assistance, and an SOS button to summon help in an emergency. Helps detect pressure differences with individual tires, Tire pressure monitoring system including those caused by seasonal outdoor (TPMS) temperatures.

(Sources include: <u>www.torquenews.com</u>. Denis Flierl. With information from Alex Prestiagiacomo at Bachman Subaru. October, 2022.)



Comfort and convenience can also contribute to safety.

Subaru Symmetrical AWD

Unlike 4WD and some AWD systems, Subaru's Symmetrical AWD can direct power to either the front or back wheels, and also from left to right. Along with its AWD, Subaru uses an active safety system, Vehicle Dynamics Control (VDC). VDC monitors wheel speed, steering, and side-to-side movement. Together these systems can apply brakes or power to individual wheels and reduce fuel flow to the engine. The system operates continuously without waiting for the wheels to slip before engaging. Subaru Symmetrical AWD is standard equipment on all its models except the BRZ sports coupe.

Safety and the "boxer" engine

Subaru is known for its boxer engine. Its pistons reciprocate horizontally, not vertically. The engine is comparatively flat and mounted low in the chassis, which lowers the vehicle's center of gravity. That means Subaru's taller vehicles have a safety advantage over same-size competitors with vertically mounted engines.

Mounting the boxer engine low contributes to safety in a collision because the engine is pushed under the vehicle, rather than into the cabin.

X-Mode[®] for sticky situations

Some Subaru models with Symmetrical AWD have an additional safety feature: the X-Mode[®] switch. In a difficult situation, the driver can activate X-Mode[®] to help get unstuck or descend a slippery hill. The X-Mode[®] system manages the AWD together with the throttle and brakes to maximize traction for the situation. This system is designed for low speeds and temporary use.



A flat engine, mounted low in the chassis, is less likely to push into the cabin in a collision.

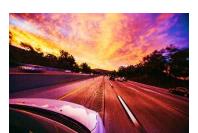
Conclusion

Superior safety does come at a price we can afford

We all know that no matter how carefully we drive, accidents happen. All of us want the safest car for the money we have to spend. The good news: Subaru checks the boxes for safety, yet we can find a Subaru in our price range. By specializing in enhanced safety technology, AWD, and the boxer engine, Subaru keeps safety affordable.

Subaru's newest awards and safety features are always found on <u>www.subaru.com</u> or at a local dealership.

This guide was authored by Karen Pentecost, a technical writer, copywriter, and graphic designer in Shawnee, Kansas, a suburb of Kansas City. Drivers in the Kansas City area navigate the most freelane miles per capita among large U.S. metro areas. Over the years, her family of three has driven one Hyundai, two Nissans, three Toyotas, four Hondas, and eight Subarus. She starts car shopping with an open mind and a blank spreadsheet.



Buying the safest vehicle we can afford is a great place to start our next journey.