

# MEASURING GUN LETHALITY

## A GUIDE TO GUN RISK

**Introduction.** The purpose of this guide is to inform readers about the relative lethality of different firearms so that regulation strategies can be based on the risk, rather than just the ownership of guns. Every gun is lethal, the access to any gun creates risk, but some guns cause greater risk than others based on how they are designed and how they can be used.

Before we move to the specific measurement of gun lethality, we should first create the context for using lethality measurements is a way to understanding gun risk. Because if guns did not represent risk, there would be no reason to regulate guns. And if guns were not lethal, they would not represent risk.

Lethality is defined as how capable something is of causing death. And it is not the capability to cause death that is at issue; it's the capability of the bullet fired by the gun. And since different guns fire different types of bullets, and since every different bullet creates a different amount of damage, we can measure gun risk by combining the type of bullet delivered by a particular gun, plus how the gun is designed to deliver that particular bullet.

This guide contains lethality measurements on handguns, rifles and shotguns, which are the three categories or classes of firearms sold and owned in the United States today. For specific definitions and examples of these different types of firearms, please consult the companion volume, *Why Are Guns Lethal? What You Need To Know About What Guns Are And How They Work*. (TeeTee Press, 2016.)

**Section 1. Handguns.** We define handgun lethality based on five criteria:

1. Caliber. The caliber of ammunition determines the size of the bullet and the speed at which the bullet moves from the gun to its target. The larger the projectile and the faster its speed will determine the amount of damage to human tissue. For purposes of comparison, we do *not* include the following variables:
  - a. Bullet Design. This varies based on the materials used in the bullet (soft versus hard metals) and the external shape of the bullet (round-nose, flat tip, hollow point, etc.)
  - b. Distance From Gun To Target. As a bullet travels from the barrel, it loses speed. For purposes of comparison we compare bullet speed at point of exit from the barrel.
  - c. Environment. Bullets may travel faster or slower depending on climate, wind and other external factors.

Scoring Criteria: The faster and larger the bullet, the higher the score.

2. Capacity. Here we measure the number of cartridges that can be fired from a weapon without reloading, based on the manufacturer's specifications. We do not measure capacity modifications based on the owner's ability to modify the weapon either through mechanical means or the use of non-standard loading devices.

Scoring Criteria: The greater capacity, the higher the score.

3. Size. We are assuming that the closer a shooter can get to the target (or targets), the better chance that lethality will be increased due to proximity between weapon and target. Hence, the easier a gun can be concealed, the better chance it can be brought into closer proximity to the target(s).

Scoring Criteria: The shorter the overall length, the higher the score.

4. Flexibility. Certain design features make it easier or faster to deploy and discharge a weapon. These features include trigger mode (single action or double action,) magazine release location (pistols, semi-auto rifles) and cylinder release location (revolvers.)

Scoring Criteria: More flexibility of design features, the higher the score.

5. Target Acquisition. Increasingly manufacturers are making it easier for gun owners to quickly acquire their intended target by equipping weapons with either integral laser devices or mounts that hold such devices. A laser device enhances both the quality and speed of performance because the gun operator can immediately see where the gun is pointing without having to use the sights.

Scoring Criteria: Existence of integral or mounted lasers increases score.

Here are some examples of how the lethality of different handguns are measured:



S & W Model 351PD

Lethality Score: 22



S&W Model 637

Lethality Score: 18

These two revolvers are exactly the same size, approximately 6 inches in length. They are designed to be highly-concealable guns. They both hold 5 rounds of ammunition and they both shoot in double-action mode, which means that the trigger does not have to be cocked prior to firing the gun. The Model 351PD is chambered in 357 magnum caliber, the Model 637 is chambered in 38 caliber. The different lethality scores of these two guns reflects the one difference in lethality measurement, namely, that the ammunition used by the 351PD is 30% more powerful than the ammunition loaded in the Model 637.

We arrive at the lethality scores as follows:

<b><u>Criteria</u></b>	<b><u>351PD</u></b>	<b><u>637</u></b>
Caliber	9	5
Capacity	2	2
Length	7	7
Flexibility	4	4
<b>Lethality Score</b>	<b>22</b>	<b>18</b>

The manufacturer of these guns, Smith & Wesson, also offers them with an integral laser built into a gun grip. The 351PD with the laser grip would register a total lethality score of 25, the 637 would register a score of 21.

We now apply similar criteria to measure lethality of two small pistols:



S & W BG380

Lethality Score - 17



S & W SHIELD

Lethality Score - 20

These two pistols are highly-concealable, but the SHIELD is slightly longer than the BGA380. Both guns fire DA-SA, meaning the first trigger pull is longer (thus harder) than subsequent pulls. The BG380 pistol holds 6 rounds in the magazine plus 1 in the chamber, the capacity of the SHIELD is 7 + 1; the SHIELD holds 9mm or 40 S & W ammunition, the BGA380 is chambered 380acp, a less-powerful round. Both guns have side magazine release buttons, which reduces time required to drop empty magazines and reload.

We arrive at a lethality score as follows:

<u>Criteria</u>	<u>BG380</u>	<u>SHIELD</u>
Caliber	4	6
Capacity	4	6
Length	7	6
Flexibility	2	2
<b>Lethality Score</b>	17	20

Both guns are also offered with integral lasers. Even though the BG380 is chambered in a less-powerful caliber, it would achieve a lethality score of 20 if we were measuring the laser model. This would make the BG380 with a laser as lethal as the SHIELD without a laser; the aiming device in the BG380 compensating for the less-powerful ammunition.

Now let's compare two full-size handguns, in this case the Smith & Wesson M&P 40, which is a standard duty weapon carried by law enforcement and the Smith & Wesson Model 41, which is a highly-accurate target pistol used in competitive shooting matches and exhibitions.



S&W Model M&P 40

S&W Model 41

Lethality Score - 25

Lethality Score – 11

Neither of these were designed to be concealed. The M&P 40 is a standard police weapon and police on patrol carry their weapons in open view. The Model 41 could only be concealed with great difficulty because of its barrel length, which is designed to make the gun more accurate because it is more stable and the length between front and rear sights makes it easier for the operator to focus the sights while also retaining a clear picture of the downrange target. The S&W M&P has a side magazine release lever, the magazine release lever on the Model 41 is at the bottom of the grip (requiring more time to release and load a new magazine) and the police gun is double-action whereas the target gun is single-action which gives it a crisper and therefore more accurate shooting result.

We arrive at a lethality score as follows:

<u>Criteria</u>	<u>M&amp;P</u>	<u>41</u>
Caliber	7	2
Capacity	9	7

Length	5	0
Flexibility	4	2
<b>Lethality Score</b>	25	11

Note that the lethality score for the M&P 40 is the highest of any gun measured so far. Even though it is larger than either the 351PD or the SHIELD, hence less concealable, it also carries a much greater amount of ammunition. The SHIELD is also sold in the 40 S&W caliber, and had we rated that gun instead of the gun chambered in 9mm, the lethality score would have increased to 21. On the other hand, since the 40 S&W caliber is more powerful than the 9mm, the 40 S&W gun would also have greater recoil, given the gun's small size and weight, which would reduce effectiveness in terms of target acquisition for multiple shots. On the other hand, had we evaluated the M&P in its 9mm loading, the lethality score would have been reduced to 24, but since the M&P is a heavier, full-size gun, the issue of felt recoil is less evident; hence, most police carry the gun with the more powerful, 40 S&W caliber.

Note that the Model 41 registered a low lethality score by far. In fact, its score is the lowest of any gun manufactured by Smith & Wesson. This is because of all the guns evaluated, the Model 41 is the only gun that was not designed for lethal (i.e., self-defense) use at all. It was designed as a true 'sporting' gun, to be operated in environments that test only the accuracy and skill of the shooter, not his intent to utilize the firearm in a non-sporting manner.

Before we move to the lethality evaluation of rifles and shotguns, one basic point needs to be made. In crafting their marketing appeals to consumers, gun manufacturers invariably wrap much of their messaging around the nomenclature 'self-defense.' And this same nomenclature appears in messaging about licensing and regulating gun ownership and gun use by the various pro-gun organizations like the NRA and the NSSF.

Part of this self-defense messaging is designed to promote the idea that guns should be a normal part of the consumer fabric, no different from a droid, a keychain, or any other accouterment which consumers normally carry or wear. For that reason, the pro-gun community never refers to guns as 'self-offense' items which, in case you didn't know it, is exactly what they are.

The whole point of this little manual and the agenda that lies behind it is to start a conversation that will hopefully lead to a cultural change in the way we think and talk about guns. Because to the extent that the continued death and injury due to firearms directly impacts more than 30,000 Americans each year (along with their families, friends, neighbors, communities, et. al.,) the debate over how to regulate firearms in order to reduce this human toll will continue as well.

The author of this manual strongly believes that guns must be understood not as consumer items that are used in self-defense, but are used in self-offense; hence, guns need to be evaluated in terms of their lethality, leading to a clearer understanding of their risk and a more rational strategy for regulating that could lead to fewer gun injuries and deaths.

## 2. Rifles. We define rifle lethality based on five criteria:

1. Caliber. The caliber of ammunition determines the size of the bullet and the speed at which the bullet moves from the gun to its target. The larger the projectile and the faster its speed will determine the amount of damage to human tissue. For purposes of comparison, we do *not* include the following variables:
  - a. Bullet Design. This varies based on the materials used in the bullet (soft versus hard metals) and the external shape of the bullet (round-nose, flat tip, hollow point, etc.)
  - b. Distance From Gun To Target. As a bullet travels from the barrel, it loses speed. For purposes of comparison we compare bullet speed at point of exit from the barrel.
  - c. Environment. Bullets may travel faster or slower depending on climate, wind and other external factors.

Scoring Criteria: The faster and larger the bullet, the higher the score.

2. Capacity. Here we measure the number of cartridges that can be fired from a weapon without reloading, based on the manufacturer's specifications. We do not measure capacity modifications based on the owner's ability to modify the weapon either through mechanical means or the use of non-standard loading devices.

Scoring Criteria: The greater capacity, the higher the score.

3. Loading Mechanism. This measurement captures the speed at which a rifle can be reloaded. For purposes of comparison, we do not measure devices that can be used to increase reloading speed, unless the device is integral to the design of the rifle. Many magazine-fed rifles, for example, can be fitted with devices that hold additional magazines adjacent to where such magazines are placed when reloading the gun but we do not measure such devices.

Scoring Criteria: Less time required for reloading, higher the score.

4. Action. This measurement is based on the time required to fire a single cartridge and bring the next cartridge into the breech. This is a significant lethality difference between handguns and rifles since handguns – pistols and revolvers – do not require the manipulation of any mechanical part of the gun beyond pulling the trigger in order to make ready the next round.

Scoring Criteria: Less time to work the action, higher the lethality score.

5. Design Flexibility. Since rifles have much longer stocks and barrels than handguns, they can be outfitted with more and different accessory items, some of which increase lethality, e.g., lasers, lights, electronic aiming devices, hand grips, fore grips, etc.

Scoring Criteria. More rails and mounts, higher the score.

Let's measure the lethality of two rifles, in this case an AR-15 and a Browning BAR. The latter weapon is a true hunting rifle, and is chambered in various calibers used for medium and large game. The AR -15, on the other hand, shoots a military round known as the .223 or 5x56. The AR was designed as a military weapon and is currently carried by troops both in semi-automatic and full-automatic mode. Here are the lethality scores for both guns. In this comparison, the BAR is chambered for 7mmRemington Magnum, a standard load for medium and large game.



AR-15

Lethality Score - 19



Browning BAR

Lethality Score – 15

Criteria	AR-15	BAR
Caliber	4	8
Capacity	5	1
Loading Mech.	3	2
Action	4	4
Design	3	0
<b>Lethality Score</b>	19	15

Note that the AR-15's lethality is scored higher than the BAR, even though the caliber of the BAR is twice as lethal as the caliber of the AR-15. The reason for this disparity, of course, is due not only to the greater capacity of the AR-15 feeding device, but the greater speed with which additional feeding devices can be inserted into the AR-15, along with the design flexibility which creates opportunities for increasing lethality through the use of lasers, aiming devices, etc.

### 3. Shotguns.

We define shotgun lethality based on five criteria:

1. Caliber. The caliber (gauge) of ammunition determines the number and size of pellets and the speed at which the pellets move from the gun to its target.

The larger number of pellets, the larger their size and the faster their speed will determine the amount of damage to human tissue. For purposes of comparison, we do *not* include the following variables:

- a. Barrel Choke. This will determine the spread of the pellets as they move away from the barrel.

Scoring Criteria. The lower the gauge number, the higher the score.

2. Capacity. Here we measure the number of cartridges that can be fired from a weapon without reloading, based on the manufacturer's specifications. We do not measure capacity modifications based on the owner's ability to modify the weapon either through mechanical means or the use of non-standard loading devices.

Scoring Criteria. The greater capacity, the higher the score.

3. Shell Load. Here we measure size of shotshell; i.e., standard, magnum or super-magnum which affects both the number of pellets and the strength of the charge.

Scoring Criteria. The larger the shell, the higher the score.

4. Action. Here we measure how the gun feeds ammunition into the breech. Shotguns use either a pump, semi-automatic or manual feeding procedure.

Scoring Criteria. Faster the loading procedure, higher the score.

5. Design Flexibility. This measures whether the weapon can accept accessories such as lasers or other aiming devices, as well as equipped with pistol grips or thumb holes for greater stability.

Scoring Criteria. The greater flexibility, the higher the score.

Let's measure the lethality of two shotguns, in this case the Beretta 690 Field shotgun and the Mark I Tactical Shotgun from FN. The FN gun was designed to support tactical missions of law enforcement and military units, the Beretta Field gun is one of the most popular over-and-under shotguns ever manufactured, found both in the field as well as on trap and skeet ranges.





Beretta 690 Field

Lethality Score - 11



FN Mark I

Lethality Score – 22

Criteria	690	MK I
Caliber	6	6
Capacity	1	3
Load	4	7
Action	1	3
Design	0	4
<b>Lethality Total</b>	<b>12</b>	<b>23</b>

Although both guns are chambered for the same caliber – 12 gauge – the capabilities of the two guns to deliver lethal force ends at that point. The Beretta is a field and competition gun, with a premium on the shooter’s ability to deliver a minimum number of shots in a very accurate pattern, primarily for use in overhead birds, or trap and skeet, the latter basically replicating much of the same requirements as taking birds but without live targets. The FN gun, with its much shorter barrel and higher capacity, is designed for flexible use in situations where mobility and quick response is much more important than downrange aim.

**4. Additional Considerations.** The lethality comparisons are based on the mechanical design of all current gun models (with the exception of a few esoteric gun designs that do not generate any degree of consumer interest or sales.) In order to make the scoring as comparatively valid as possible, it was necessary to compare the design of guns, not the manner in which they are necessarily used.

What these scores cannot convey is the degree to which the lethality of any gun is dependent not only on the design and mechanics of the weapon itself, but the decisions that shooters make as to when and how they are going to use any particular gun. Thus, for example, the reader will note that a small revolver like the Smith & Wesson 351PD receives a lethality score of 22, whereas an AR-15 rifle receives a lethality score of 19. Yet one could argue that an AR-15 is much more lethal than a 5-shot revolver because the rifle’s capacity plus the ease of reloading means that it can be used to injure scores of people in the same time that the 351PD revolver might only injure a handful of folks.

But the fact that the 351PD and many of the other handguns scored higher than the AR-15 on the lethality scale still validates the relative measurements of both guns because in the totality of gun violence, many more people are injured and killed with ammunition shot from small handguns than with the bullets that are shot from AR-15s.

One issue that this lethality scale does not address, a purposeful omission, is the skill and training of the owner/user of the gun himself. This is because it would be impossible to design any kind of valid comparison between different guns if we were to try and construct a measurement that would capture how much time would be required to become proficient in using any particular gun. On the other hand, the design of every gun covered in this study requires the gun's user not to become proficient with the weapon, but to figure out the circumstances and environment in which each particular gun can be used to its most lethal effect.

Of the 95 guns that were evaluated for this lethality manual, the gun which received the fewest lethality points, 4 points, was the Savage Mark I in 22LR caliber. This is a very popular gun because it is small, light, and is often a young man's 'first' gun put under the Christmas tree. In addition to being chambered in a relatively not-so-lethal caliber, it must be reloaded after every, single shot and the reloading process requires five different movements of the arm and the hand in order to open and then re-set the bolt.

*Adam Lanza used a Savage Mark I rifle to murder his mother, Nancy Lanza, before he then drove to the elementary school in Sandy Hook. Once he arrived at the school, he then proceeded to murder 26 adults and children with an AR-15 which he was able to reload with another 30-shot magazine in a matter of seconds. Obviously, this 20-year old understood the lethality differential between the Savage Mark I and the AR-15, and his choice of when and how to use both guns represented a clear understanding of relative lethality based on what he intended to accomplish with those two guns.*

## 5. Appendix I: Handgun Lethality Measurements.

Manufacturer-Model	Length	Caliber	Action	Cap	Release	Reload	Laser	Lethality
<b><u>Smith &amp; Wesson</u></b>								
M&P 22 compact	5	1	2	6	2	0	0	16
M&P SHIELD cpt 9mm	7	6	2	3	2	0	0	20
M&P SHIELD cpt 40	7	7	2	3	2	0	0	21
BG380	8	4	2	3	2	0	0	19
40SD	5	7	2	6	2	0	0	22
9SD	5	6	2	6	2	0	0	21
1911Pro 9	3	8	1	5	2	0	0	19
41 Std	2	2	1	8	1	0	0	14
41LB	1	2	1	8	1	0	0	13
M&P9	5	6	2	7	2	0	0	22
BG380CT	8	4	2	3	2	0	4	23
M&P45	5	8	2	7	2	0	0	24

1911 45	3	8	1	5	2	0	0	19
M&P40cptCT	5	7	2	5	2	0	2	23
1911cpt	5	8	1	4	2	0	0	20
M&P9cptCT	6	6	2	4	2	0	2	22
M&P9cpt	6	6	2	4	2	0	0	20
M&P40CT	4	7	2	4	2	0	2	21
M&P40	4	7	2	4	2	0	0	19
1911CT	3	8	1	4	2	0	2	20
637 LM	6	5	2	2	0	2	2	19
638 LM	6	5	2	2	0	2	2	19
637	6	5	2	2	0	2	0	17
638	6	5	2	2	0	2	0	17
986-4	3	9	2	3	0	2	0	19
629	1	10	2	2	0	2	0	17
460VXR	1	10	2	2	0	2	0	17
460V	1	10	2	2	0	2	0	17
586	2	9	2	2	0	2	0	17
Governor	2	10	2	1	0	2	0	17
GovernorCT	2	10	2	1	0	2	4	21
629 Hunter	1	10	2	1	0	2	0	16
66-4	3	9	2	1	0	2	0	17
69-4	3	10	2	1	0	2	0	18
686-4	3	9	2	1	0	2	0	17
27-4	2	9	2	2	0	2	0	17
617-6	2	2	2	2	0	2	0	10
351PD	7	9	2	2	0	2	0	22
625-6	3	7	2	2	0	2	0	16
60-2	7	9	2	2	0	2	0	22
500-4	2	10	2	2	0	2	0	18
686+-2	5	9	2	2	0	2	0	20
686-6	2	9	2	2	0	2	0	17
329PD	3	10	2	2	0	2	0	19
M&P R8	4	6	2	2	0	2	2	18
17-6	2	2	2	2	0	2	0	10
63-3	3	2	2	2	0	2	0	11
<b>Glock</b>	<b>Length</b>	<b>Caliber</b>	<b>Action</b>	<b>Cap</b>	<b>Release</b>	<b>Reload</b>	<b>Laser</b>	<b>Lethality</b>
G17	4	6	2	9	2	0	0	23
G19	5	6	2	8	2	0	0	23
G26	6	6	2	7	2	0	0	23
G43	6	6	2	3	2	0	0	19
G34	2	6	2	9	2	0	0	21
G17L	2	6	2	9	2	0	0	21
G22	4	7	2	8	2	0	0	23
G23	5	7	2	8	2	0	0	24
G27	6	7	2	6	2	0	0	23

Ruger	Length	Caliber	Action	Cap	Release	Reload	Laser	Lethality
G29	6	9	2	7	2	0	0	26
G36	3	7	2	9	2	0	0	23
G24	2	7	2	9	2	0	0	22
G20	4	9	2	9	2	0	0	26
G40	2	9	2	9	2	0	0	24
G30	6	8	2	7	2	0	0	25
G36	3	8	2	3	2	0	0	18
G41	2	8	2	8	2	0	0	22
LCP	7	4	2	3	2	0	4	22
LC9	6	6	2	4	2	0	0	20
LC380	6	4	2	4	2	0	4	22
SR9	5	6	2	9	2	0	0	24
SR40	5	7	2	9	2	0	0	25
SR40c	6	7	2	9	2	0	0	26
SR45	4	8	2	7	2	0	0	23
SR1911	4	8	1	5	2	0	0	20
SR22	6	2	2	7	2	0	0	19
Mark III	3	2	1	7	1	0	0	14
22/45	4	2	1	7	2	0	0	16
GP100-4	3	9	2	3	0	2	0	19
SP101	5	9	2	3	0	2	0	21
Blackhawk	3	9	1	3	0	1	0	17
Single Six	2	2	1	4	0	1	0	10
Vaquero	4	9	1	3	0	1	0	18

## 6. Appendix I: Rifle Lethality Measurements.

Manufacturer-Model	Caliber	Loading	Action	Stock	Capacity	Grips	Laser	Lethality
AR-15 (S&W, Bushmaster, Stag)	4	4	4	2	4	2	3	23
Ruger 10-22	2	4	4	1	2	0	0	13
Ruger Mini-14	4	4	4	1	2	0	0	15
Ruger 77 - 270 Win.	5	4	1	1	1	0	0	12
Savage Mark I	2	0	1	1	0	0	0	4
Savage 93	2	4	1	1	2	0	0	10
Marlin 336 (30-30)	5	1	2	1	2	0	0	11
Browning BAR	8	2	3	0	1	0	0	14
AK-47	6	4	4	2	4	1	0	21

## 7. Appendix I: Shotgun Lethality Measurements.

Manufacturer-Model	Caliber	Load	Length	Action	Laser	Stock	Capacity	Lethality
Mossberg 500	6	5	2	2	0	2	2	19
Mossberg ATI	6	5	2	2	2	2	2	21

Mossberg 590A1	6	5	2	2	2	0	3	20
Remington 1187	6	3	2	3	0	0	2	16
FN MK I Tactical	6	5	2	3	2	2	3	23
Beretta 690 Field	6	3	1	1	0	0	0	11

**8. Notes To Lethality Tables.** This study is based on the evaluation of 95 different gun models, which more or less represent virtually every type of gun model available on the commercial market. Guns from manufacturers that were not evaluated are, for the most part, copies of guns that were evaluated. Hence, the lethality score for each gun on our list would be the same as the lethality score for guns that are not found on this list. An AR-15 rifle, for example, is basically the same gun whether it is assembled by Smith & Wesson, Stag Arms, Bushmaster, etc. This would also be true for concealable revolvers manufactured by Smith & Wesson, Charter Arms, etc.

We are somewhat arbitrarily defining degrees of lethality as follows:

1. Lethal – Scores between 4 and 16.
2. Highly lethal – Scores between 17 and 22.
3. Extremely highly lethal – Scores between 23 and above.

In these three categories, lethal guns count for 21% of the total, highly lethal count for 62% of the total, and extremely highly lethal guns count for 32% of the total. The overall lethality average score for all guns is 18.9. It should also be noted that 29 of the 31 extremely highly lethal guns are handguns, owing to a combination of small size, powerful caliber and integral laser devices. The two highest-scoring guns, the Glock G29 and the Ruger SR40c, are extremely small weapons that are chambered for very powerful ammunition.

Again, we advise that such lethality measurements cannot take into account the most important factor influencing lethality, namely, the skill of the gun's operator, but that is a factor which needs to be evaluated beyond the issue of lethality in terms of function and design.

## 9. Further Reading.

American National Standards Institute, *Voluntary Industry Performance Standards of Pressure and Velocity of Center Fire Rifle Ammunition for the Use of Commercial Manufacturers* (New York, NY) 2015.

Sporting Arms and Ammunition Manufacturers' Institute (SAAMI), *Velocity and Piezoelectric Transducer Pressure: Centerfire Pistol and Revolver*.

Peter Rhee, et. al., "Gunshot wounds: A review of ballistics, bullets, weapons, and myths," *Journal of Trauma and Acute Care Surgery* 80, 6 (June, 2016), 853-867.

