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Collision Data is Wrong. Here's Why That's Important

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Executive Summary

Very often, ambient light conditions are misreported, as human understanding of “dusk” and “dawn” is subjective and varies widely.

- More accurate ambient light condition data can help us to make better decisions about where to allocate resources (focusing on solutions in the places they are most effective) and how to design intentional, context-specific lighting to reduce nighttime collisions.
- Nighttime and daytime traffic collisions also happen in very different places.
- As recently as November 2021, the Federal Highway Administration (FHWA) listed street lighting as a proven safety countermeasure (PSC), with a collision reduction potential of up to 42%.

Using basic collision data, street lighting can be implemented anywhere in the world, filling the gap in our ability to effectively evaluate street lighting needs. However, NightScore is a full-service solution to this problem, allowing higher-accuracy after-the-fact reporting, aggregating data on a regional basis, and identifying priority corridors for improvements.



The issue of poor reporting

Ambient light conditions reporting is inaccurate and may ignore the most crucial times of day for traffic collisions. An analysis of active transportation collisions in the State of Tennessee found that nighttime collisions, correctly attributed, were five times more likely to result in a fatality than daytime collisions. According to the FHWA's Proven Safety Countermeasures



initiative (PSCi), over 50 percent of fatal collisions nationwide happen at night, even though far fewer people are driving, walking, or cycling at this time. That means the fatality rate is three times the daytime rate because only 25 percent of vehicle miles traveled (VMT) occur at night.¹

Despite the significance of the timing, it is often inaccurately reported. An analysis of active transportation collision data from across Tennessee, spanning 2017 to 2020, found that 88% of collisions occurring during dusk or dawn were misreported as either “night” or “day”. Overall, over 20% of all collision ambient light conditions are misreported. This problem is not just found in Tennessee but across the country.

This often occurs when collision reports are determined on-scene by police officers. One person’s definition of “dusk” or “dawn” will vary from another person’s, so the categorization is subjective. This means that the relevance of street lighting as an effective safety improvement is often undervalued too. Isolating nighttime from dusk/dawn collisions is important in order to identify locations that could benefit from the implementation of nighttime PSCs.

Nighttime PSCs may include:

- Lighting²
- Enhanced delineation treatments
- Retroreflective strips on signposts
- Enhanced conspicuity (larger, fluorescent, and/or retroreflective signs)³

Each of these PSCs should be proposed only in specific areas which are either forecasted or predicted to have high nighttime collision rates and should not be applied citywide.

Proven safety countermeasures

PSCs have different impacts depending on their use during the day or night. The FHWA PSCi was updated in November 2021 to include street lighting as an effective safety improvement (FHWA-SA-21-050). Improved street lighting can reduce collisions up to:

- 42% for nighttime injury pedestrian collisions at intersections
- 33-38% for nighttime collisions at rural and urban intersections
- 28% for nighttime injury collisions on rural and urban highways⁴

¹ <https://safety.fhwa.dot.gov/provencountermeasures/>

² <https://safety.fhwa.dot.gov/provencountermeasures/lighting.cfm>

³ https://safety.fhwa.dot.gov/provencountermeasures/enhanced_delineation.cfm

⁴ <https://safety.fhwa.dot.gov/provencountermeasures/lighting.cfm>



“The answer is not just more lighting, but improved lighting.”

- FHWA

The effectiveness of this safety improvement is relatively new in the mind of the transportation engineering community.

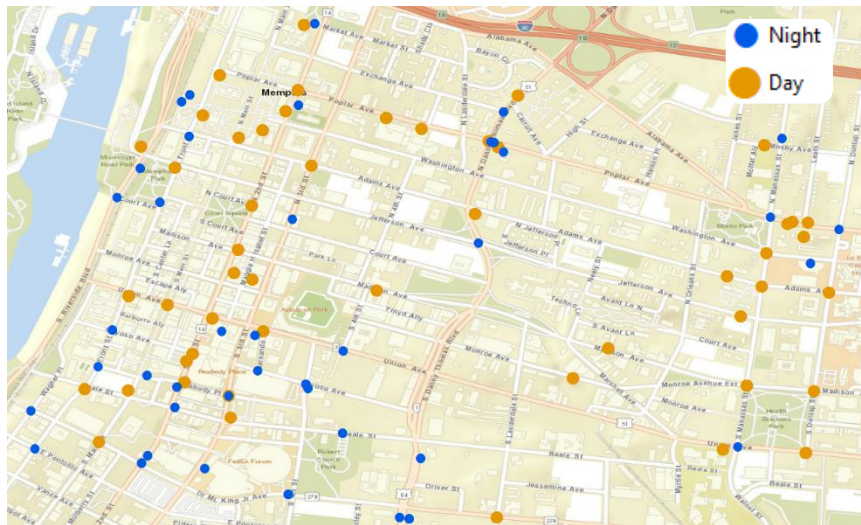
The most vulnerable transportation network users (pedestrians and cyclists) are also most at risk of collision during nighttime hours, by a wide margin. Consequently, the safety improvements employed should parallel reality to meet the needs of the community in both time and place. Street lighting is categorically a nighttime solution and should be considered a primary means of achieving Vision Zero.

Nighttime and daytime collisions occur in distinct locations

A closer look at Memphis, TN, found that only 13% of nighttime active transportation collisions occur within 100 feet of daytime collisions. If this is expanded to 300 feet, the length of a football field, this metric only increases to 27%. This proves that nighttime and daytime collisions happen in distinctly different places. The deployment of nighttime PSCs should therefore consider this. Understanding what areas would benefit most from street lighting should be prioritized. This will be made easier with the availability of higher accuracy data and, in turn, increased confidence in the data.

National impact and urgency

Traffic collisions are rising across the country. At least 50% of all nighttime pedestrian or cyclist-involved collisions occur during low ambient light conditions⁵, and in distinct locations when compared to daytime collisions.



Vision Zero has encouraged active transportation, but unfortunately in many cases has led to increased collisions. It is also important to note that BIPOC groups are found to experience greater relative pedestrian danger, up to 42-76% higher, than the average person in the United States.⁶

Despite this growing and complex problem, street lighting is the single biggest collision reduction instrument that has not been used in common practice at scale. This is largely due to

⁵ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2564438/>

⁶ <http://smartgrowth.org/wp-content/uploads/2022/04/2022-0412-Angie-Schmitt-Slides.pdf>



a decoupling of the transportation industry and the lighting design industry over time. Even though traffic volumes are far lower at nighttime, a national, systemic change in how we target street light improvements can reduce collisions everywhere.

By using collision data across a region, with a specific focus on injury severity and ambient light conditions, priority locations can be easily identified. From this, inadequate and unsafe lighting design can be fixed, or other safety measures deployed. A safer transportation system with fewer collisions can also lead to a reduction in traffic congestion, particularly during winter rush hour periods that coincide with low ambient light conditions.

NightScore: a game changer

Historically, street lighting has been left to the lighting industry and done entirely by typical designs, without a specific focus on how each light is placed and how it impacts the transportation network.

Recent FHWA publications, such as the “Research Report: Lighting for Pedestrian Safety”, have now proposed lighting guidelines for improving the lighting conditions for pedestrians and cyclists within the right of way, particularly within intersections. The research and technology have reached critical mass, such that we now have the data to understand what constitutes poor and good lighting design.

Modern lighting technology gives precise control with minimal light trespass affecting the nighttime sky or illuminating adjacent properties. Agencies can equitably engage with underserved communities to determine where and how new and improved lighting can most benefit the community by considering their priorities, including eliminating collision disparities, connecting to essential neighborhood services, improving active transportation routes, and promoting personal safety.⁷

However, locating areas of insufficient lighting or inappropriate design within a local or regional transportation network is difficult, particularly when there may be over 100,000 street lights in a system. That’s where NightScore comes in.

⁷ <https://safety.fhwa.dot.gov/provencountermeasures/lighting.cfm>



NightScore is a GIS-based tool that dynamically evaluates ambient light conditions based on collision location, the time of day, and date. Additional considerations are made for injury severity, with a greater impetus on higher severity collisions. NightScore visually demonstrates where gaps in nighttime safety exist within a local transportation network, and where a greater focus on intentional, context-specific lighting design could improve safety conditions.



One added benefit to this approach is the ability to focus improvements on limited areas of interest, such as underfunded and underserved neighborhoods. NightScore also analyzes active transportation collisions and areas included in CDC's Social Vulnerability Index⁸, in order to prioritize equity concerns.

⁸ <https://svi.cdc.gov/A%20Social%20Vulnerability%20Index%20for%20Disaster%20Management.pdf>



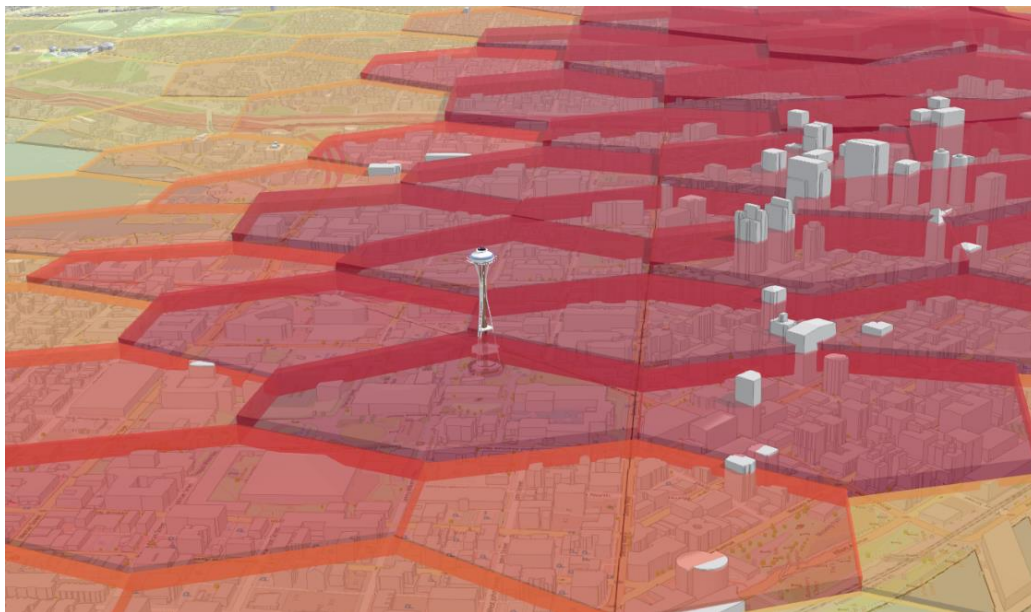
Conclusion - NightScore is the solution

Targeting the incidence of nighttime collisions on a citywide or even statewide basis can pinpoint where improved street lighting will have the greatest impact. New data shows that improved street lighting can reduce collisions by up to 42%, but because lighting design and implementation are expensive, having the ability to identify these priority locations can help optimize resource allocation.

An accurate, data-driven approach to identifying nighttime collision incidence can help in determining where street lighting and other nighttime PSCs will have the greatest positive impact.

NightScore is an adaptable GIS tool that can be applied in any area (city, region, state, etc). This process is at the intersection of big data and geospatial information technology that exists to support decision-makers to make informed and empowered decisions about nighttime safety improvements.

GIS is the appropriate tool to understand overall collision statistics, active transportation, and equity as a method of filtering data on a spatial platform.



To see NightScore in action in Seattle, visit [NightScore.com](https://www.nightscore.com)

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