

BERLIN: LIGHTING THE WAY TO SAFETY?



A GEOSPATIAL ANALYSIS OF STREET
INFRASTRUCTURE AND CRIME RATES

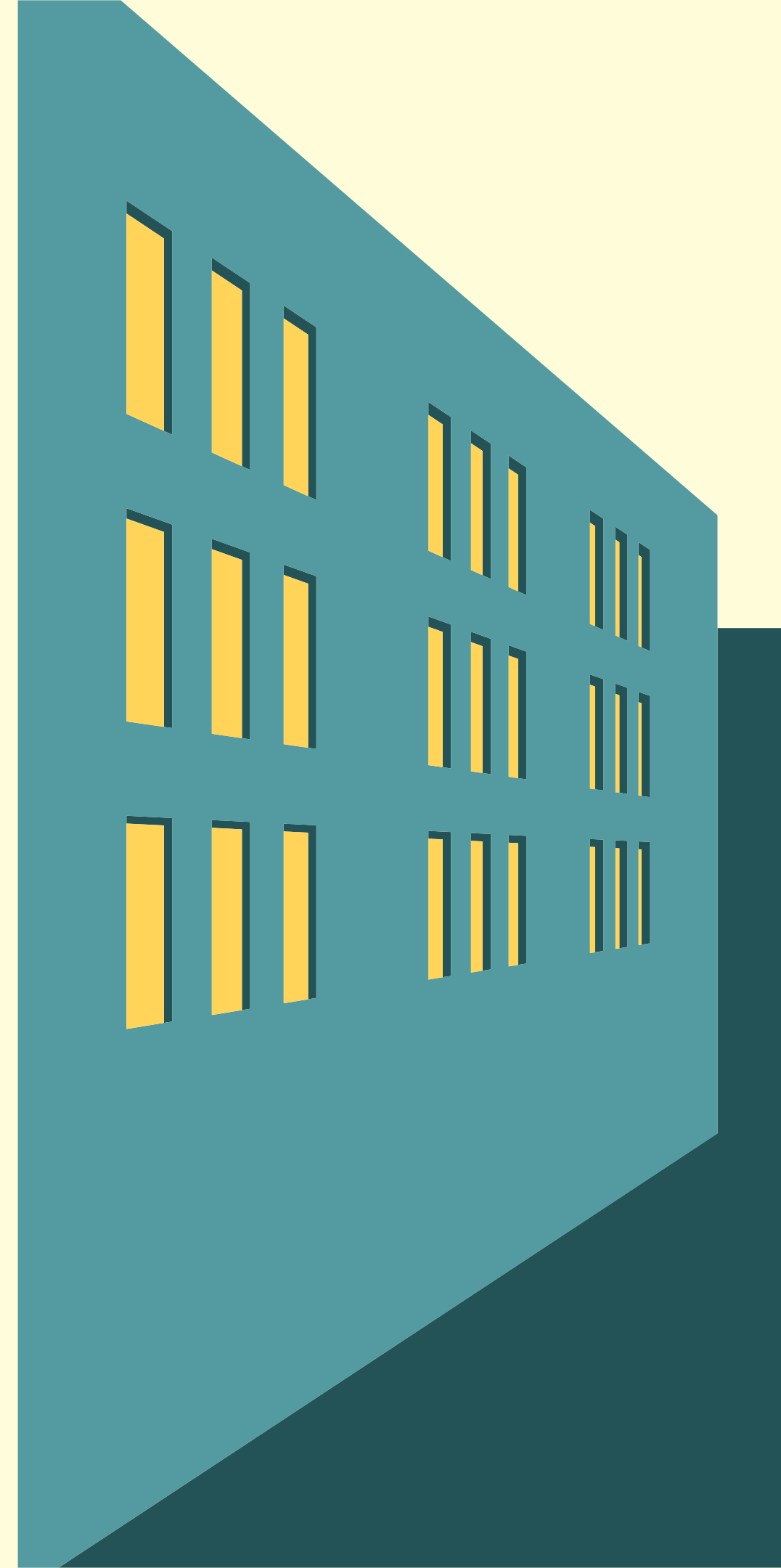
DOES DARKNESS EQUAL DANGER?

- Common belief is that "More streetlights make neighborhoods safer."
- The Reality is that cities are complex. Brighter areas often attract more people, which can attract more crime.

Objective: To analyze the spatial relationship between 2,200+ streetlights and Berlin's 2023 crime statistics.

Key Questions:

1. Do brighter districts actually have less crime?
2. Where are the city's "Dark Spots"?
3. Is public infrastructure distributed equitably?



METHODOLOGIES FOR ANALYSIS

Data Sources:

- **Berlin Open Data:** Administrative Boundaries (LOR).
- **Infrastructure:** Geospatial data of streetlight locations.
- **Police Reports:** 2023 Crime Statistics ("Fallzahlen").

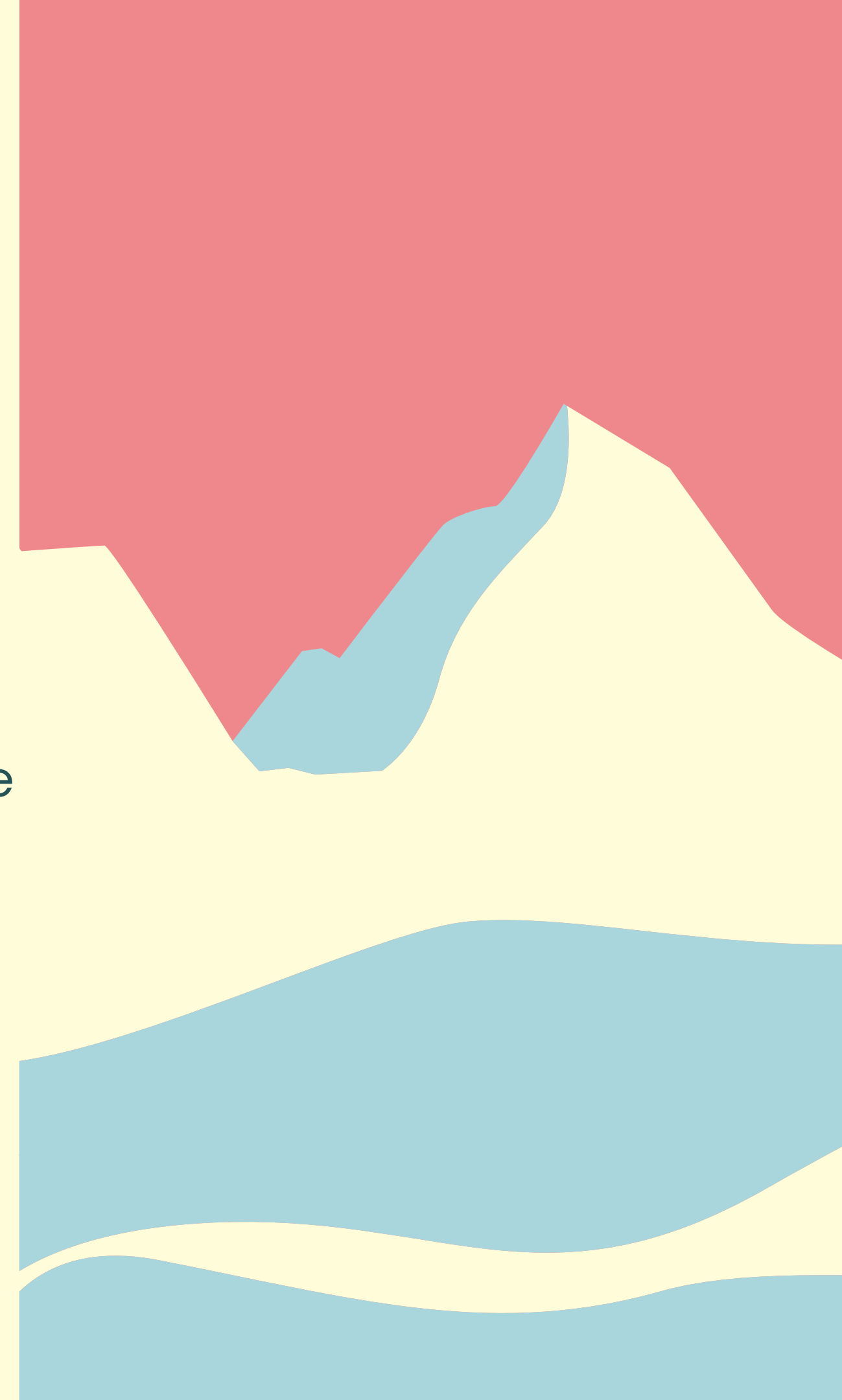
Tools Used:

- **Python & Pandas:** For data cleaning and statistical analysis.
- **GeoPandas:** For spatial operations (merging crime data with map shapes).
- **Folium:** For interactive map visualization.

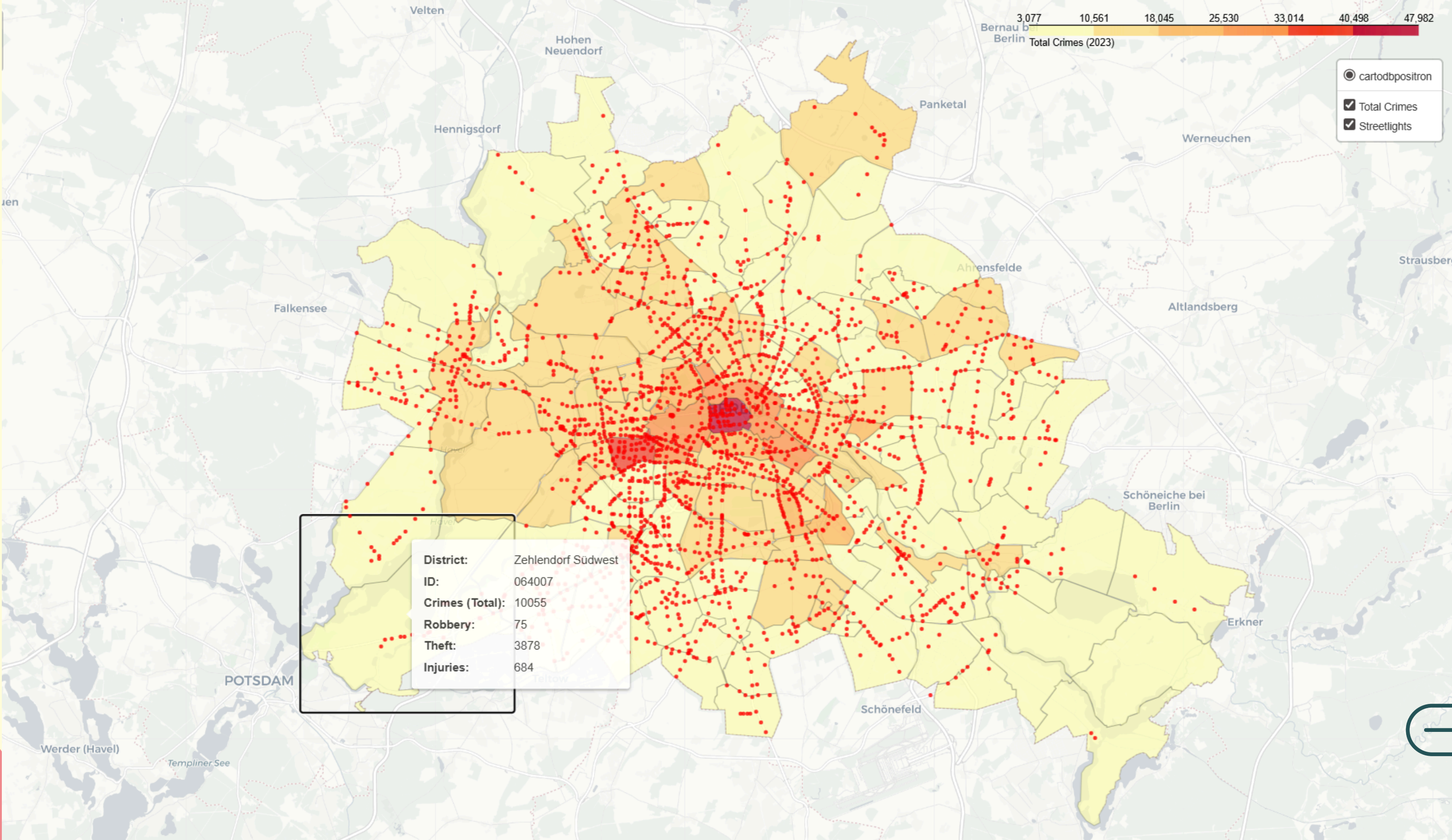


MAPPING THE CITY

- Built an interactive **Choropleth** Map visualizing crime density.
- **Layer 1 (Polygons)**: Districts colored by total crime (Red = High, Yellow = Low).
- **Layer 2 (Points)**: Individual streetlights plotted as interactive markers.
- **Feature**: Popups display detailed location info and specific crime breakdowns (Robbery, Theft, Injury) on click.



MAPPING THE CITY

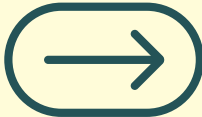
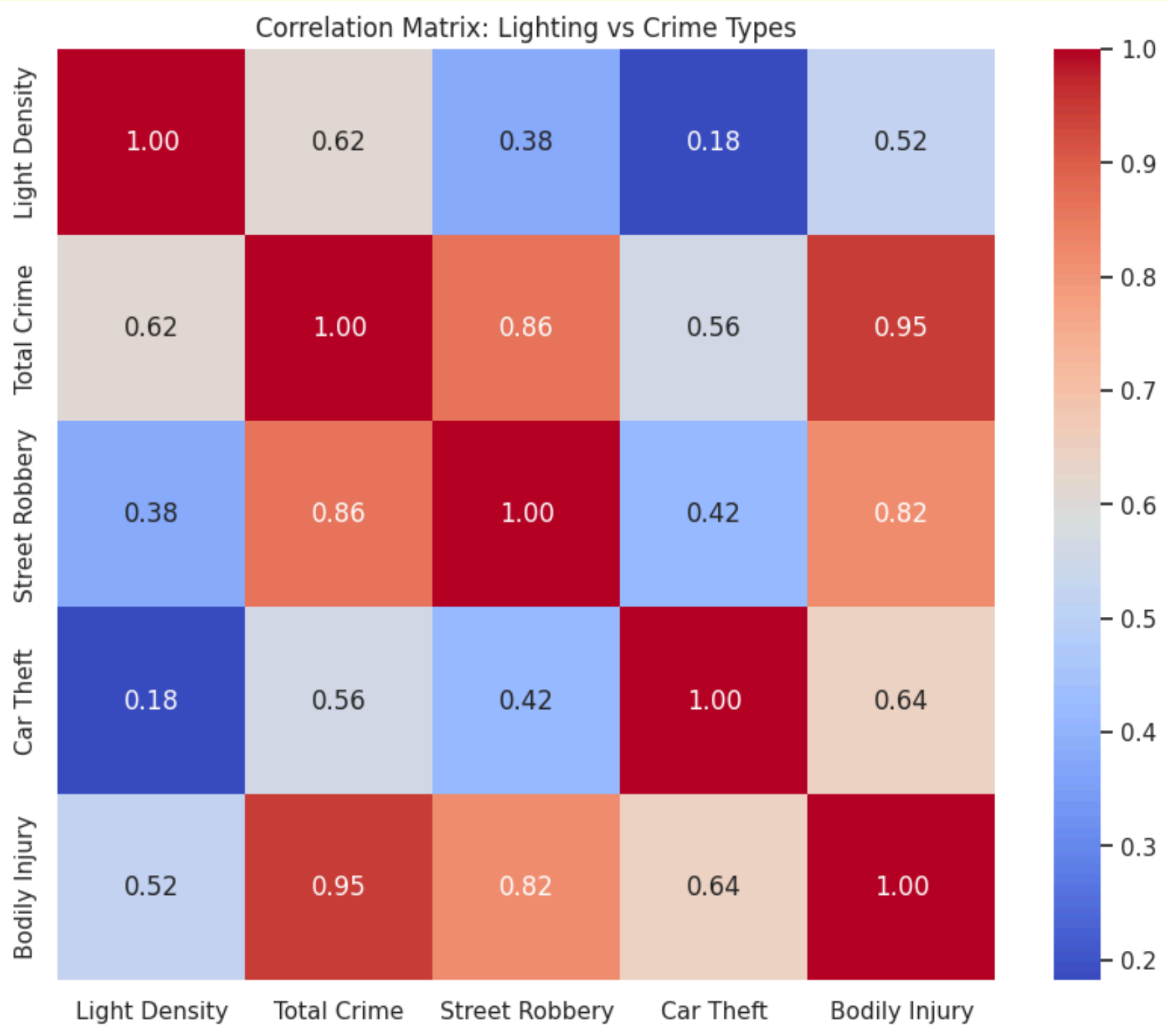


1. STATISTICAL RELATIONSHIP BETWEEN STREET LIGHTING AND CRIME RATE

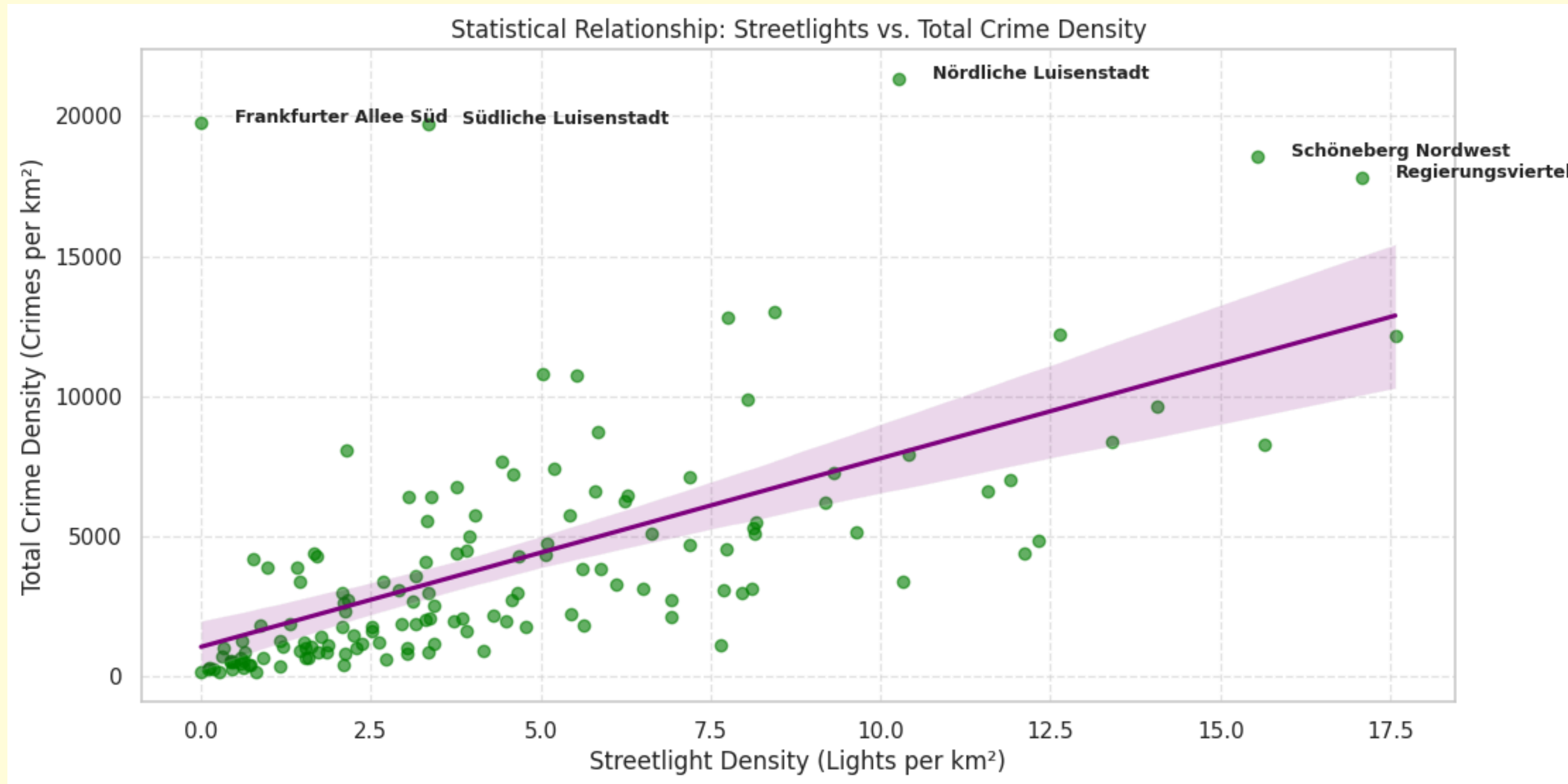
- **The Question:** Is there a statistical relationship between street lighting and crime rates?
- **The Answer:** Yes, there is a strong positive correlation.
- **The Surprise:** Contrary to the expectation that "More Lights = Less Crime," the data shows that brighter districts actually have higher crime rates.
- **The Reason:** This is the **Urban Density Paradox**. Streetlights track human activity. The city center has the most people, the most shops, and the most tourists, which attracts both infrastructure (lights) and criminal opportunity (crime).



1. VISUALIZATIONS



1. VISUALIZATIONS



- The upward-sloping red regression line shows that districts with more streetlights tend to have higher robbery rates, with the top-right cluster highlighting well-lit city-center areas like Mitte or Tiergarten as clear “danger zones.”
- In contrast, the bottom-left cluster represents darker but safer suburban districts such as Zehlendorf, challenging the assumption that darkness alone leads to crime.

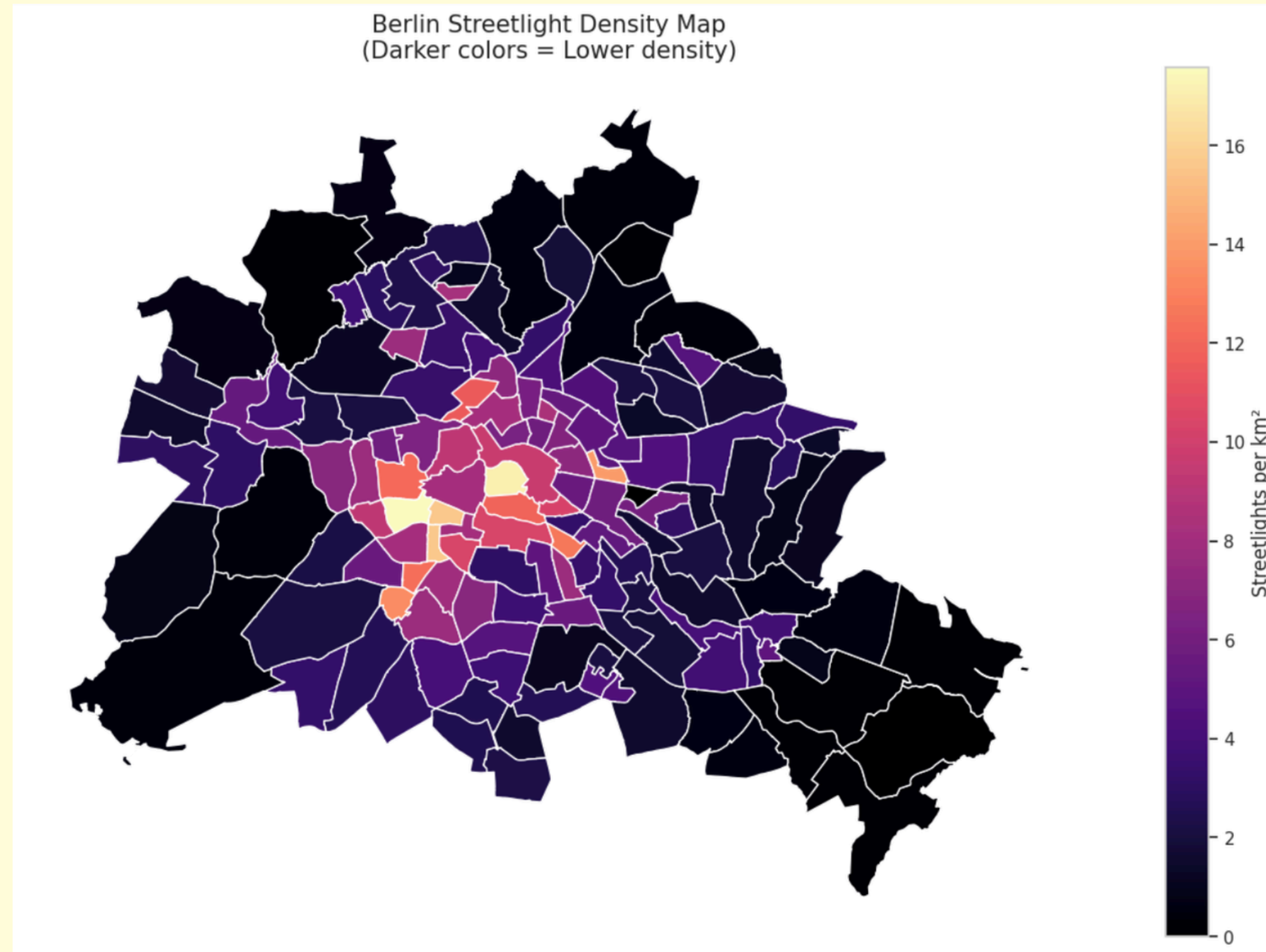


2. DARK SPOTS OF BERLIN

- **The Question:** Are there any dark spots in the Berlin?
- **The Answer:** The "Dark Spots" are exclusively located on the city's outskirts, specifically in districts like Müggelheim, Rahnsdorf, and Gatow/Kladow.
- **The Surprise:** These are statistically the safest parts of Berlin. Despite having almost zero streetlights per km², their crime rates are significantly lower than the city average.
- **The Reason:** This debunks the "Darkness = Danger" myth for Berlin. These areas are low-density suburbs or forest-adjacent zones. The lack of lighting reflects a lack of human traffic and commercial targets, which naturally results in lower crime.



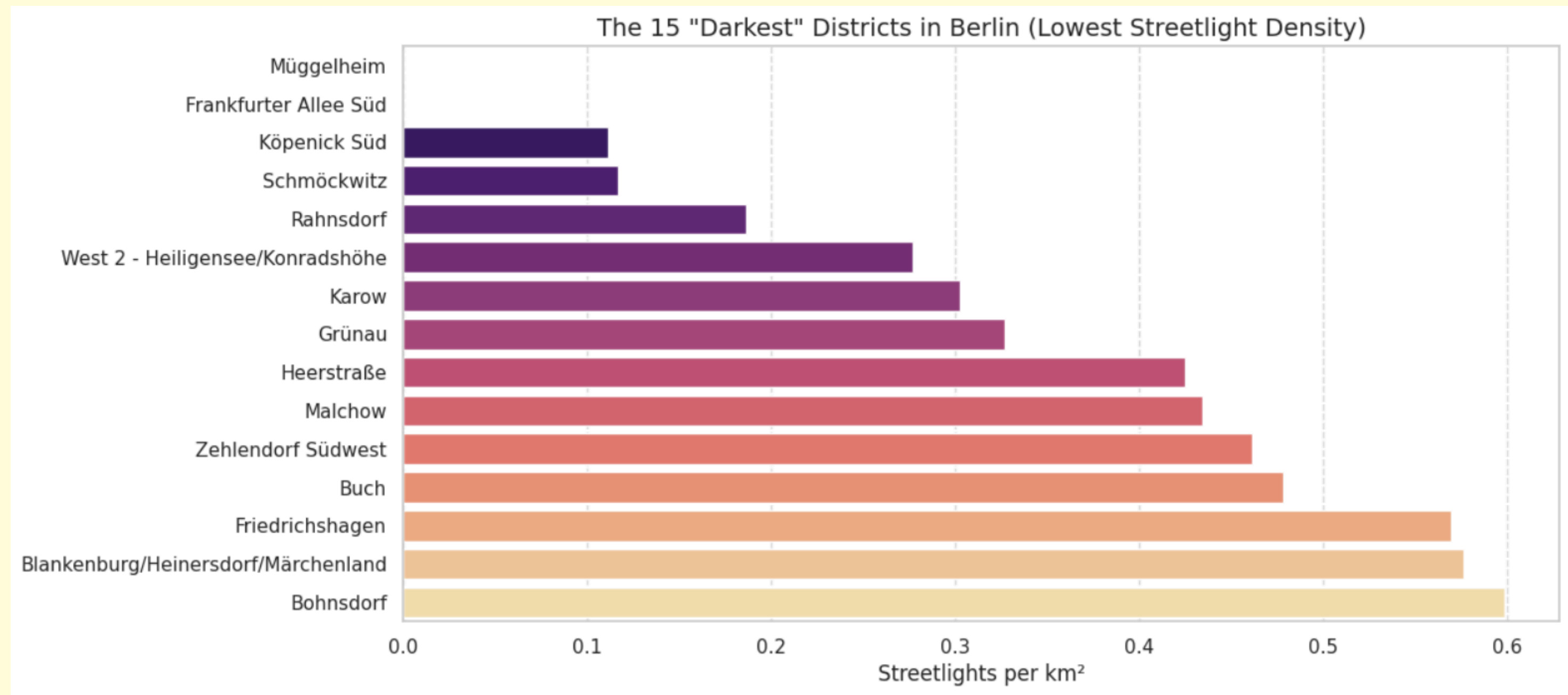
2. VISUALIZATIONS



- The visualizations highlight a clear spatial pattern where the city center is brightly lit while the outskirts remain dark.



2. VISUALIZATIONS



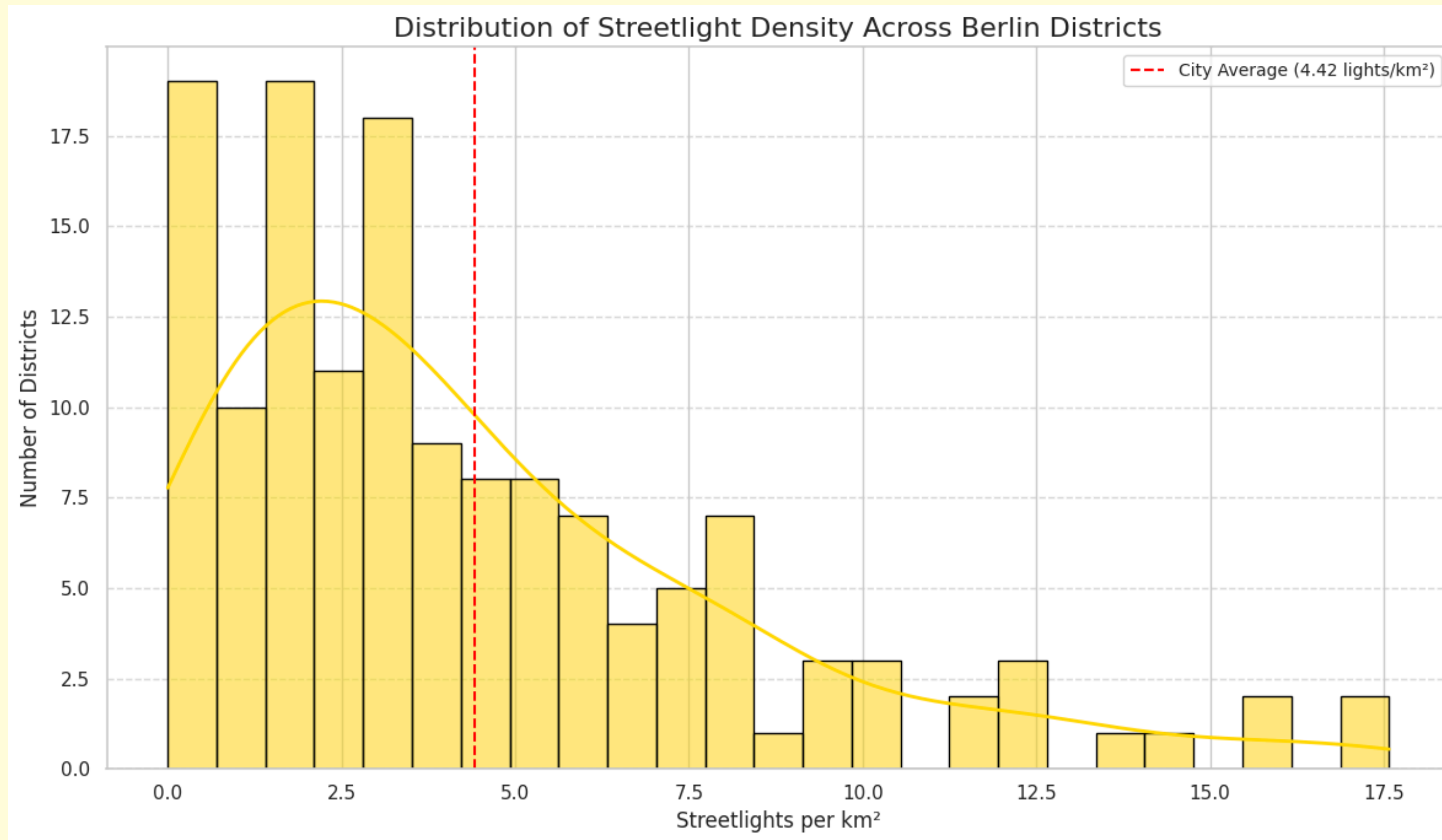
- The bar chart confirms that the 15 darkest districts consistently fall well below the "City Average" crime line, proving that in Berlin, low lighting is an indicator of a quiet, safe residential area rather than a dangerous zone that requires intervention.



3. INFRASTRUCTURE DISTRIBUTED EQUITABLY?

- **The Question:** Is lighting infrastructure distributed equitably?
- **The Answer:** No, the distribution is highly **inequitable**.
- **The Surprise:** **Average** lighting is a myth. The vast majority of Berlin's districts have very low lighting density, while a tiny minority of "privileged" districts hoard the infrastructure.
- **The Reason:** This pattern (a long tail) is typical of unequal systems. It suggests that high-quality lighting is treated as a luxury for specific zones (city centers/wealthy areas) rather than a standard utility guaranteed for all districts.

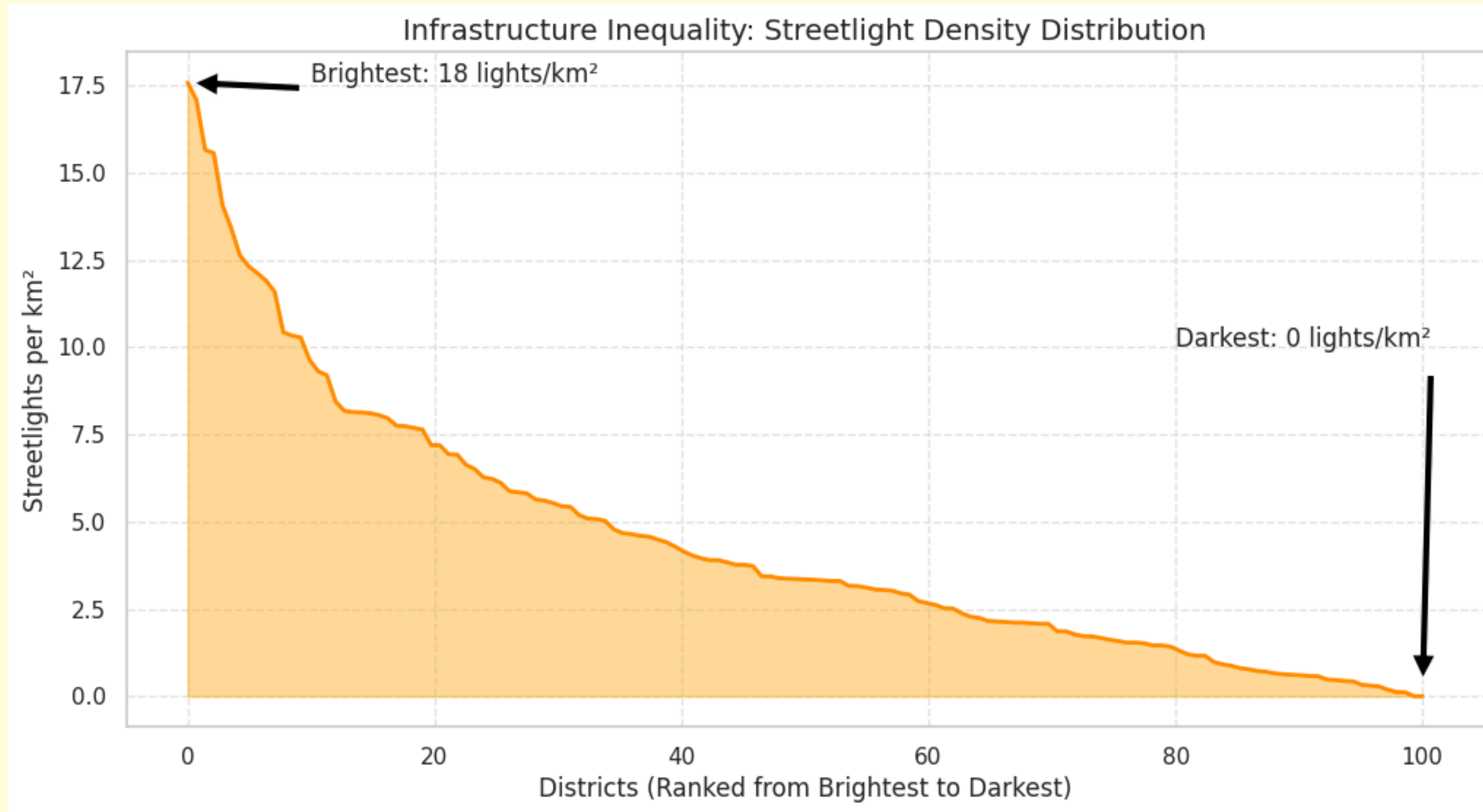
3. VISUALIZATIONS



- Infrastructure is not standardized. The city doesn't have a consistent "baseline" of lighting; it has a baseline of darkness with a few bright spots.



3. VISUALIZATIONS



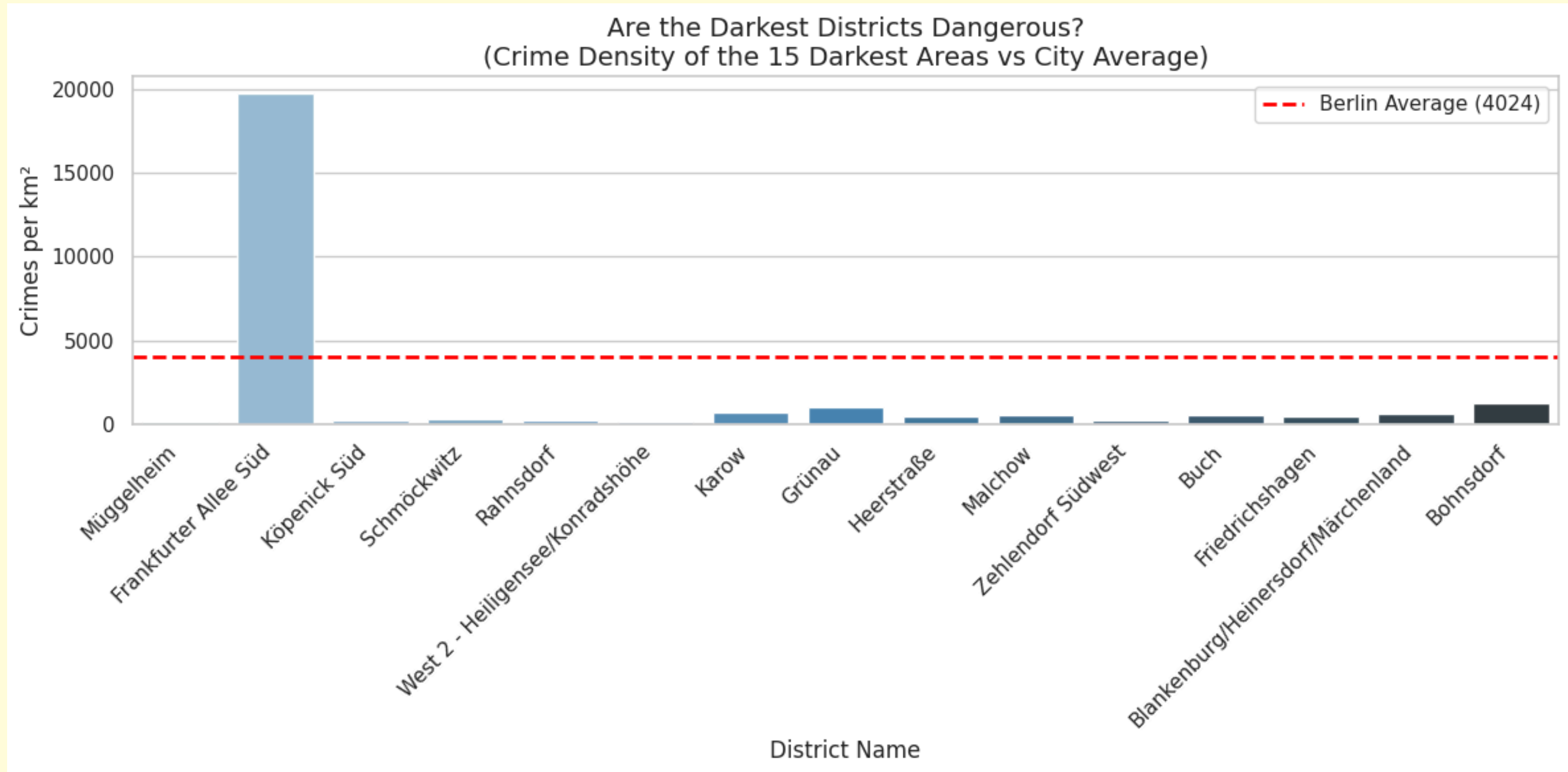
- This curve visualizes the Gap Ratio we calculated. It proves that the "brightest" districts are not just slightly better, they are fundamentally different environments compared to the rest of the city



4. DANGEROUS PARTS OF BERLIN

- **The Question:** Are the darkest parts of Berlin dangerous?
- **The Answer: No.** Darkness is not a reliable predictor of danger. In fact, for 93% of the districts on this list, darkness correlates with extreme safety.
- **The Surprise:** The "Dangerous Dark Alley" trope is statistically false here. Excluding one massive outlier, the "darkest" districts are actually among the safest places in the city.
- **The Reason:** This pattern reveals that "darkness" in Berlin's geography usually signifies low-density suburbs or nature areas (like Müggelheim or Rahnsdorf) rather than neglected urban zones. The single outlier (Frankfurter Allee Süd) proves that high crime is driven by other factors like high transit traffic or urban density regardless of lighting conditions.

4. VISUALIZATIONS



- If you are in one of Berlin's "darkest" districts, you are statistically likely to be in one of its safest areas unless you are in Frankfurter Allee Süd, which is significantly more dangerous than the city average.

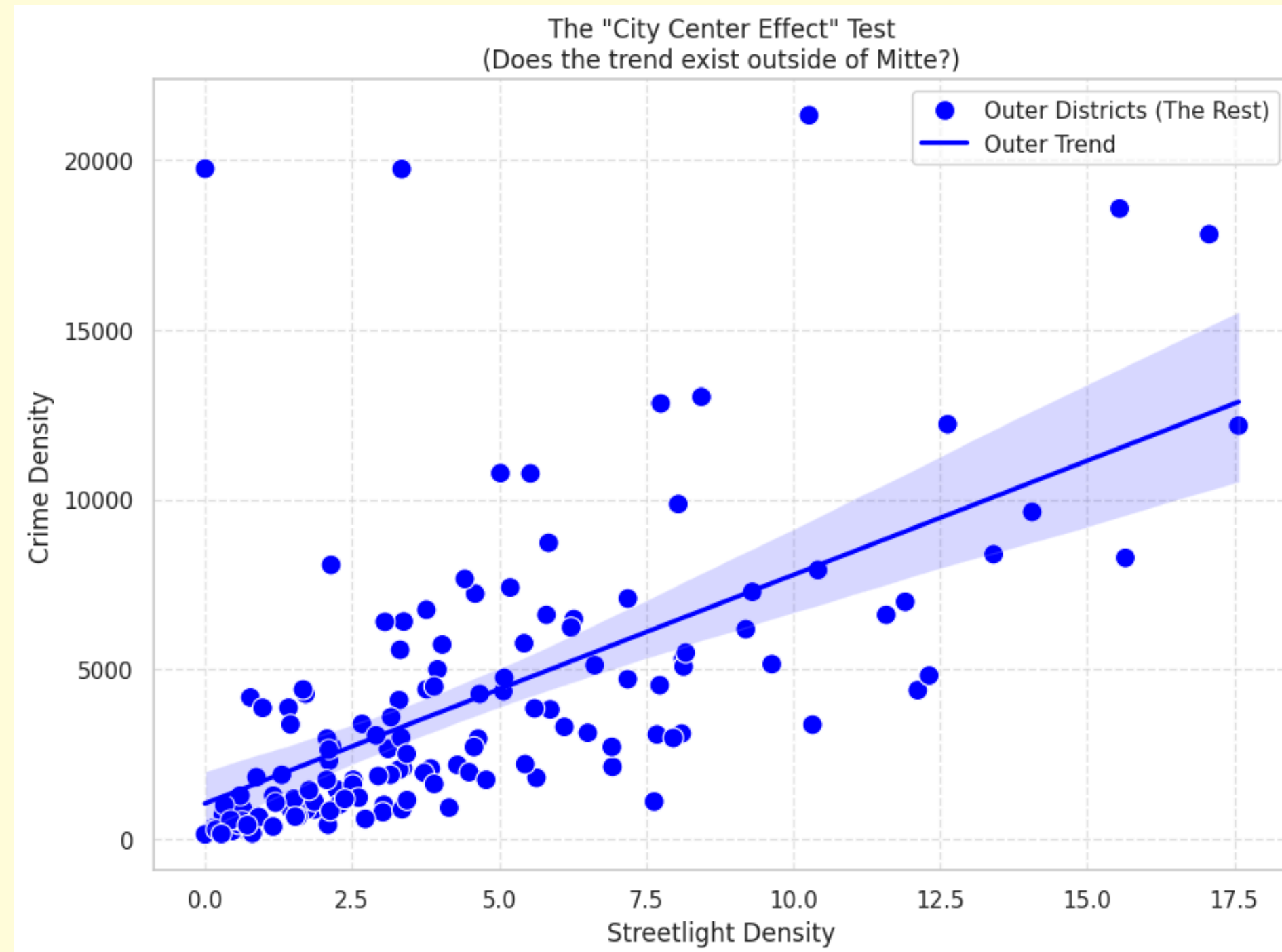


5. LIGHTS AND CITY CENTER

- **The Question:** Is the relationship between lights and crime just because of the city center?
- **The Answer: No.** The relationship between streetlights and crime is not driven solely by the city center. Even after excluding central districts, the upward trend between lighting density and crime clearly persists across outer districts.
- **The Surprise:** The correlation does not disappear once the obvious **city-core effect** is removed. Many non-central districts with higher streetlight density still experience higher crime rates.
- **The Reason:** Streetlight density acts as a proxy for urban intensity, areas with more infrastructure, population density, transit hubs, and commercial activity naturally require more lighting and also generate more crime opportunities.



5. VISUALIZATIONS

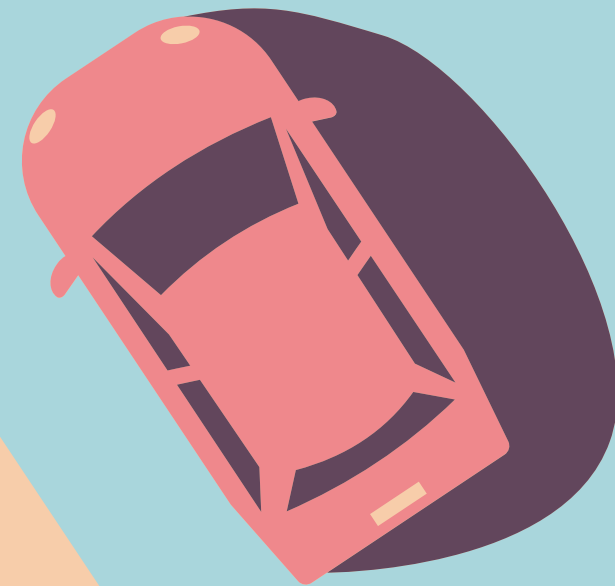


- Even after excluding the city center, the positive relationship between streetlight density and crime clearly remains.
- This shows the trend is not a **city-center** effect but a broader pattern driven by urban density and activity, not darkness.



FINAL VERDICT: DOES LIGHT EQUAL SAFETY?

- **Myth Busted:** The data refutes the idea that darkness is a primary driver of crime in Berlin.
- **Context is King:** The **Darkest** areas are safe not because they are dark, but because they are low-density residential/suburban zones.
- **The "Activity" Factor:** Crime follows human activity (foot traffic, transit hubs, shops), which coincides with where streetlights are installed. Therefore, light often signals higher crime risk zones, not lower.
- **The Exception:** Frankfurter Allee Süd proves that if you have high urban activity (transit/density), the area will be dangerous regardless of lighting conditions.



THANKS FOR YOUR ATTENTION!

Any Questions?

