The University Of Sheffield.

Road brightness and cycling rates after-dark

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UWE Bristol, 6-7 Sep 2018

Importance of light for cycling

Transportation (2011) 38:153–168
DOI 10.1007/s11116-010-9284-y

Motivators and deterrents of bicycling: comparing influences on decisions to ride

Meghan Winters · Gavin Davidson · Diana Kao · Kay Teschke

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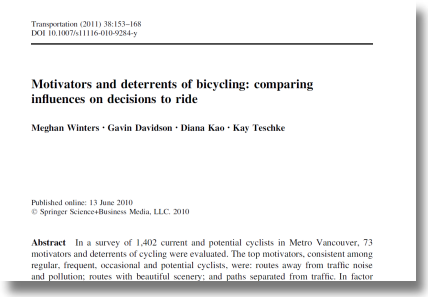
Importance of light for cycling



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Survey of potential and current cyclists (N = 1,402)

Ratings of 73 potential deterrents and motivators for cycling

-1 (“Much less likely to cycle”) to +1 (“Much more likely to cycle”)

I can make the trip in daylight hours

Mean rating = +0.50

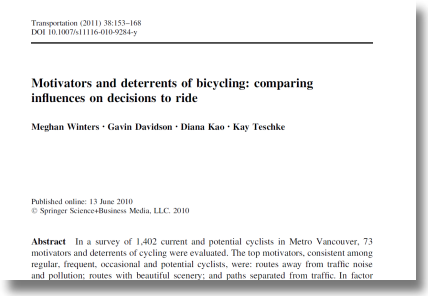
Ranked in top 10 biggest motivators

The route is not well lit after dark

Mean rating = -0.59

Ranked in top 10 biggest deterrents

Importance of light for cycling



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-1 (“Much less likely to cycle”) to +1 (“Much more likely to cycle”)

I can make the trip in daylight hours

Mean rating = +0.50

Ranked in top 10 biggest motivators

The route is not well lit after dark

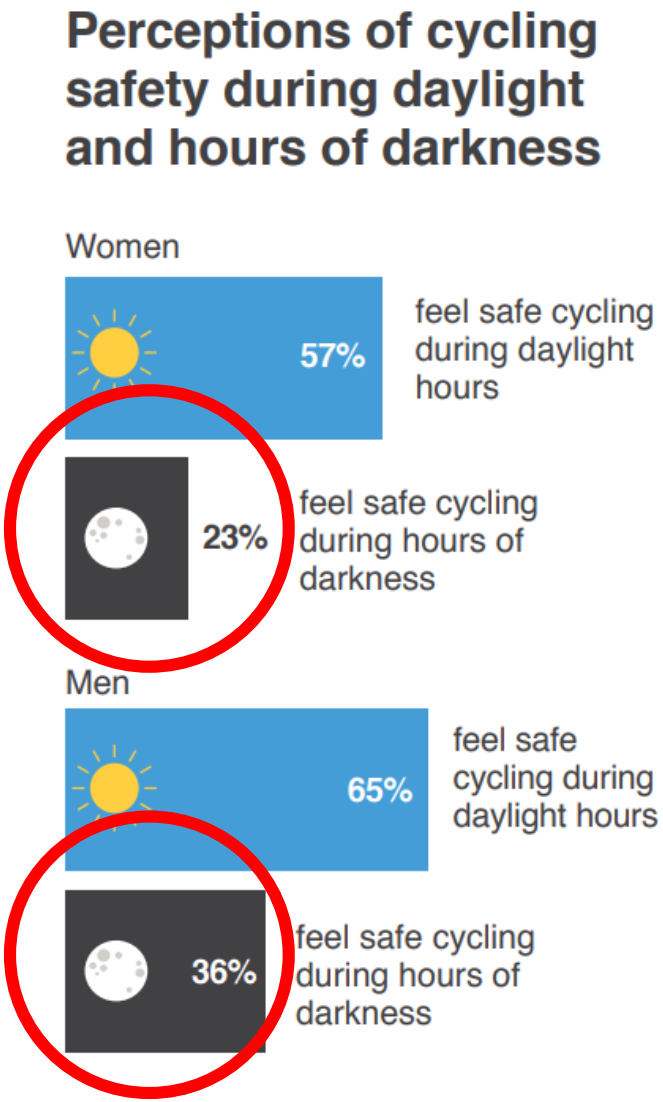
Mean rating for regular cyclists = -0.37

Mean rating for potential cyclists = -0.70

Importance of light for cycling

Perceptions of cycling safety during daylight and hours of darkness

Importance of light for cycling



Source: Sustrans (2018), "BIKElife All cities publication", p. 12

Importance of light for cycling

Observational data: Effect of darkness on cyclist numbers

Journal of Environmental Psychology 53 (2017) 1–10

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Using the daylight savings clock change to show ambient light conditions significantly influence active travel

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ABSTRACT

This article reports a novel procedure used to investigate whether ambient light conditions affect the number of people who choose to walk or cycle. Pedestrian and cyclist count data were analysed using the biannual daylight-saving clock changes to compare daylight and after-dark conditions whilst keeping seasonal and time-of-day factors constant. Changes in frequencies during a 1-h case period before and after a clock change, when light conditions varied significantly between daylight and darkness, were compared against control periods when the light condition did not change. Odds ratios indicated the numbers of pedestrians and cyclists during the case period were significantly higher during daylight conditions than after-dark, resulting in a 62% increase in pedestrians and a 38% increase in cyclists. These results show the importance of light conditions on the numbers of pedestrian and cyclists, and highlight the potential of road lighting as a policy measure to encourage active travel after-dark.

1. Introduction

that road lighting was positively associated with increased walking.

Lighting Res. Technol. 2017; **0**: 1–10

A whole-year approach showing that ambient light level influences walking and cycling

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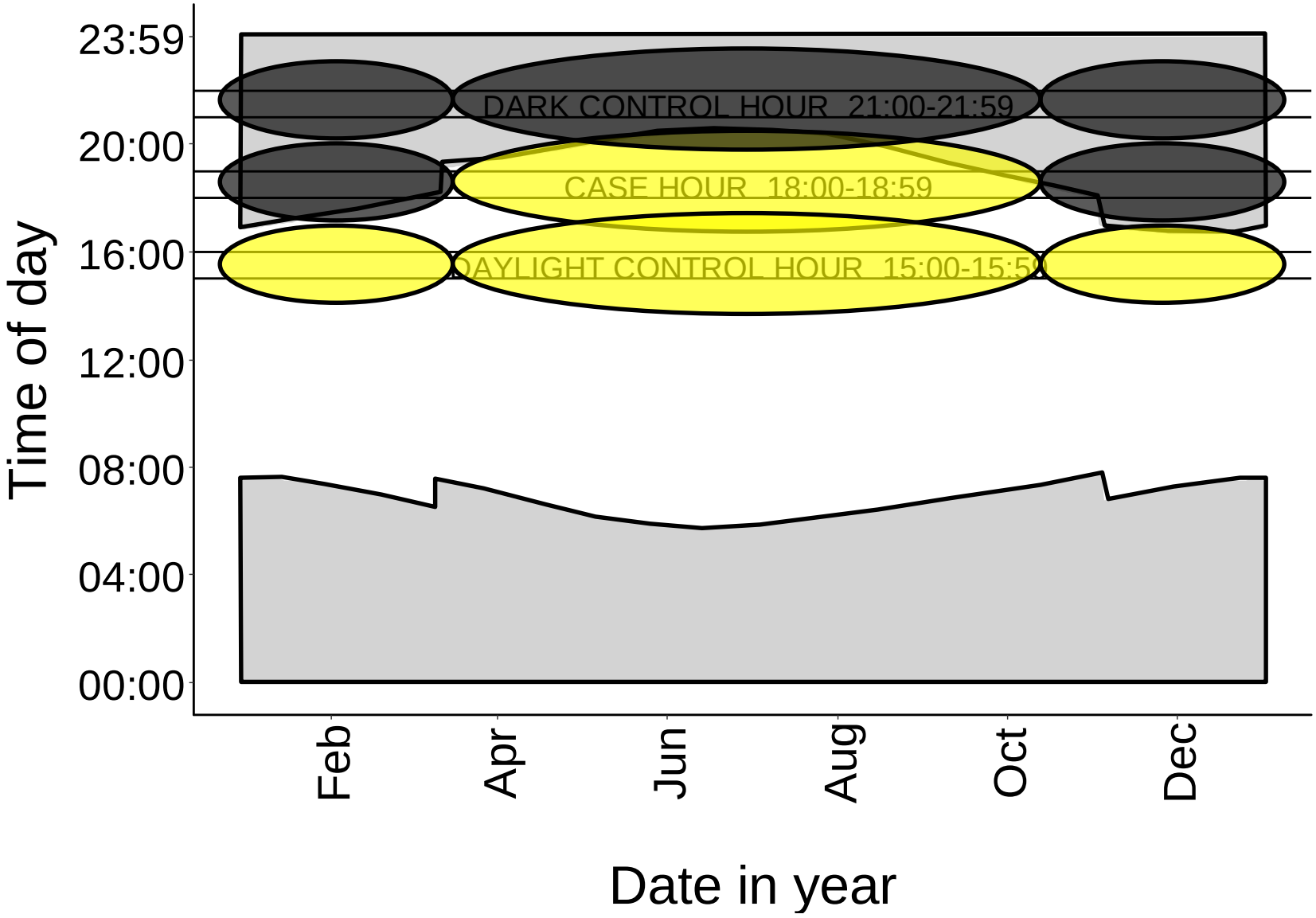
Many studies have used surveys to investigate the reactions to changes in lighting from people who walk or cycle. An alternative approach is to use objective data, specifically the number of pedestrians and cyclists present under different lighting conditions. Such data have been reported previously using a daylight savings transition approach. This paper presents a different method for analysing the effect of ambient light conditions in which data from the whole year are examined, rather than only the two weeks either side of the biannual daylight savings clock changes. The results confirm that ambient light has a significant impact: For a given time of day, more people walk or cycle when it is daylight than after dark and more people cycle on cycle trails and walk on foot paths after dark when they are lit than when they are unlit. While both methods use an odds ratio approach, which should account for environmental changes other than lighting, the results suggest the daylight savings method of analysis better isolates changes in weather from the effects of ambient light on travel choice than does the whole-year method.

1. Introduction

Road lighting in subsidiary roads is intended

cyclists,[12] although one study has suggested that pedestrians' estimates of the threshold distance at which they are recognisable as a

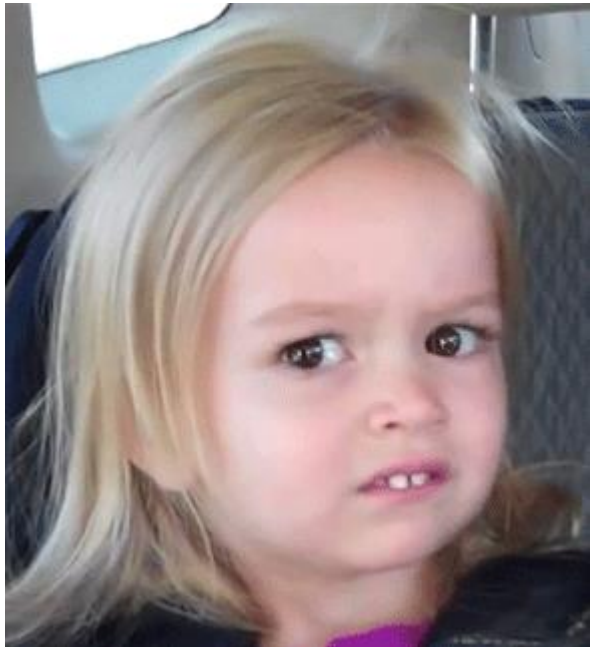
Quantifying effect of darkness



Quantifying effect of darkness – odds ratio

$$\frac{\text{Case hour in daylight} \div \text{Case hour in darkness}}{\text{Control hour when case hour in daylight} \div \text{Control hour when case hour in darkness}}$$

= Odds ratio – effect of darkness on cyclist numbers

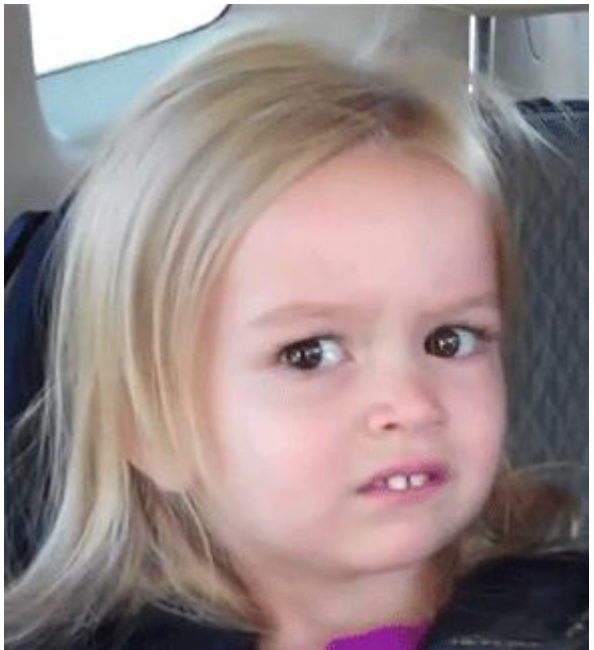


Quantifying effect of darkness – odds ratio

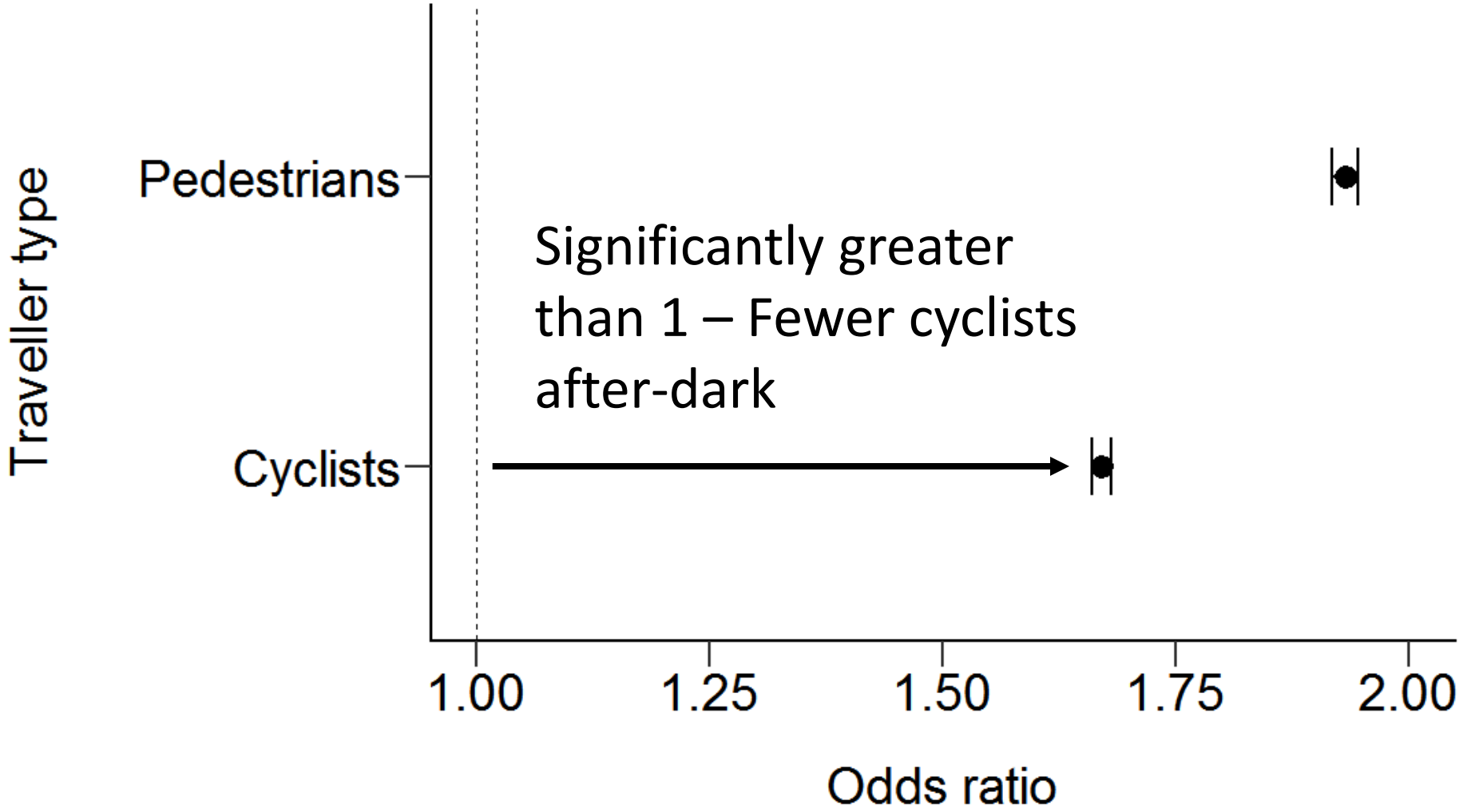
$$\frac{\text{Case hour in daylight} \div \text{Case hour in darkness}}{\text{Control hour when case hour in daylight} \div \text{Control hour when case hour in darkness}}$$

= Odds ratio – effect of darkness on cyclist numbers

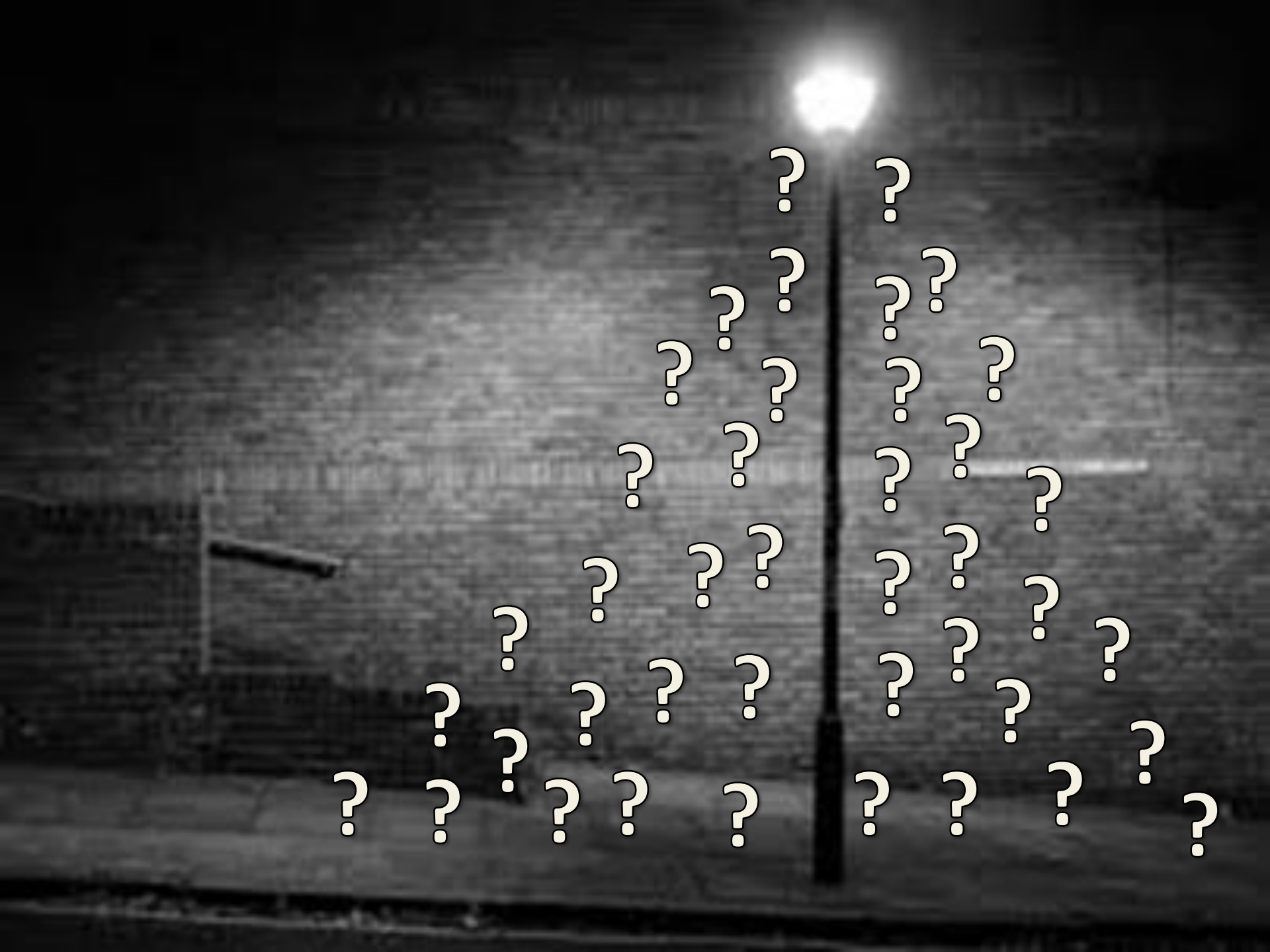
Odds ratio > 1 indicates darkness causes decrease in cyclists



Quantifying effect of darkness



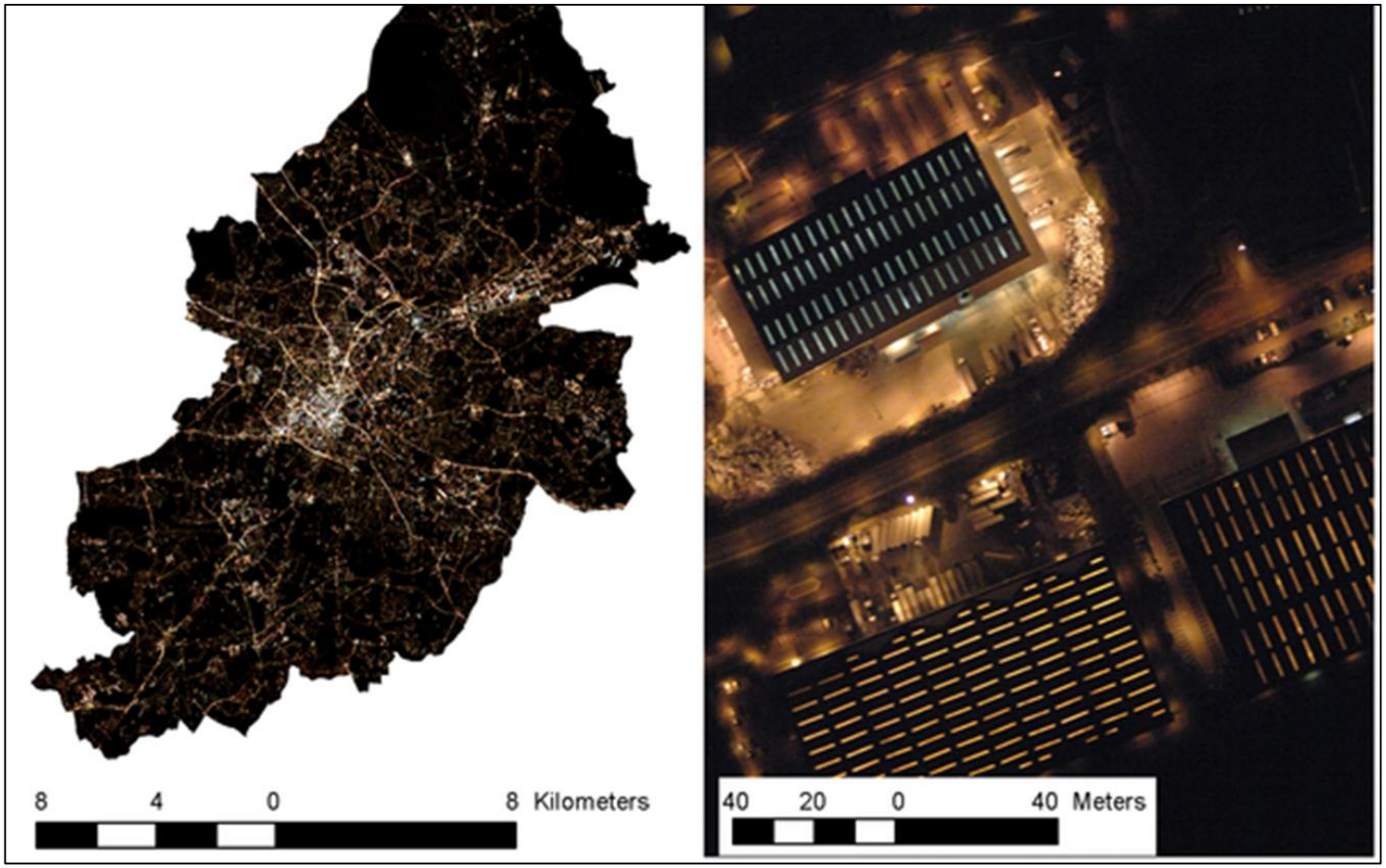
Source: Fotios, Uttley & Fox (2017), “A whole-year approach showing that ambient light level influences walking and cycling”



Lighting data

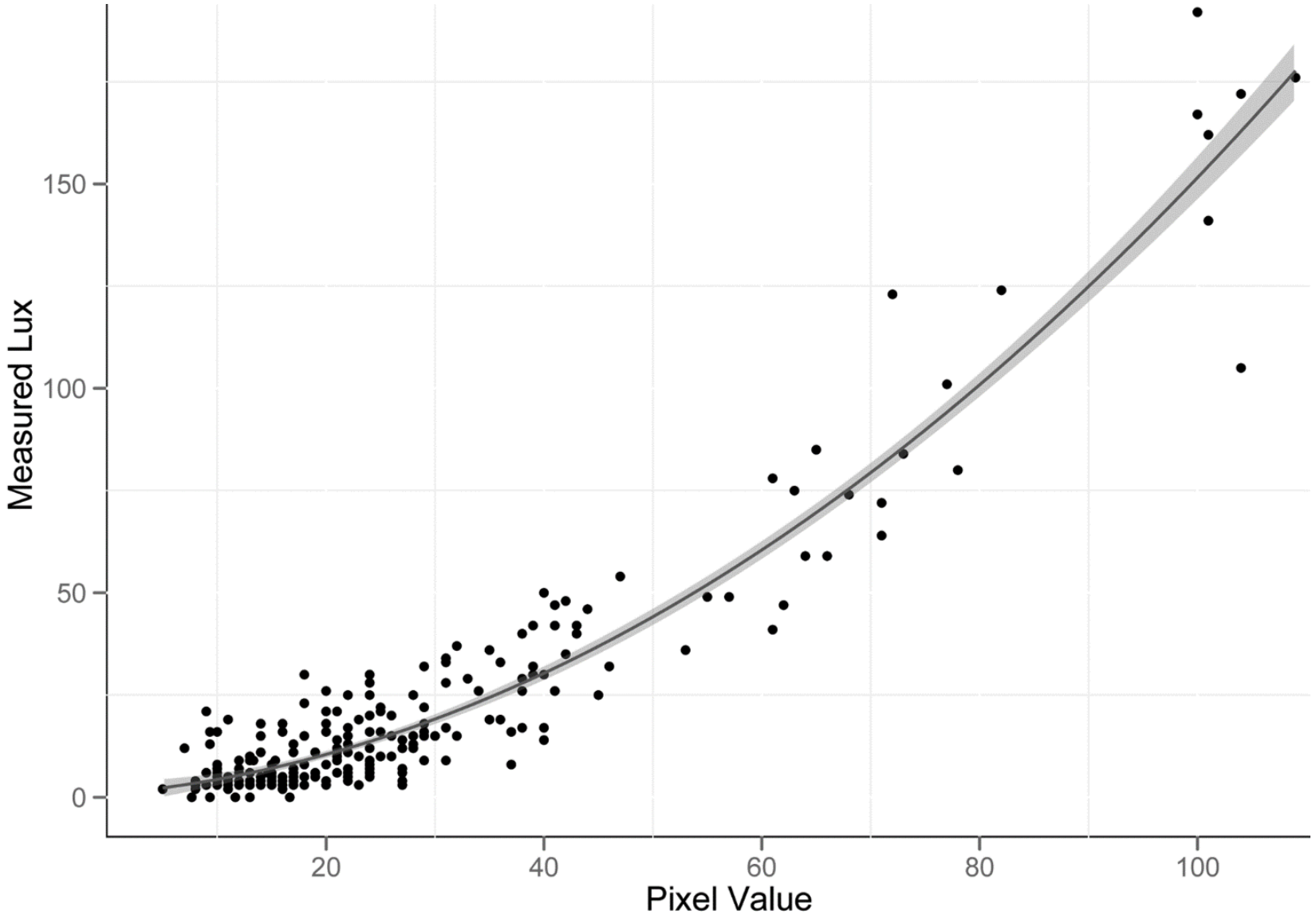
Night-time aerial photography for Birmingham – UK Environment Agency

Pixel intensities provide information about brightness and colour of lighting



Source: Hale et al (2013), “Mapping Lightscapes: Spatial patterning of artificial lighting in an urban landscape”

Lighting data



Source: Hale et al (2013), “Mapping Lightscapes: Spatial patterning of artificial lighting in an urban landscape”

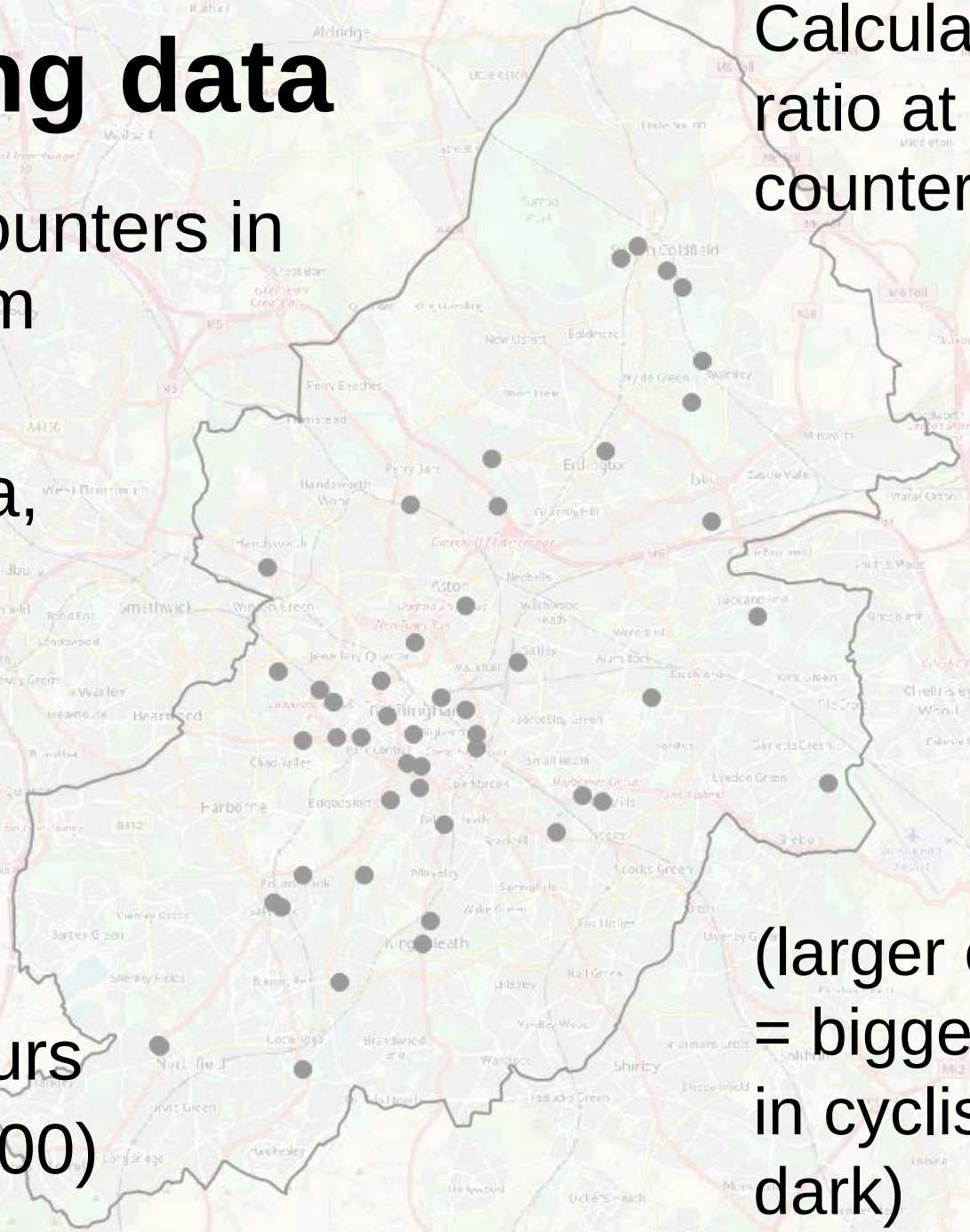
Cycling data

48 cycle counters in Birmingham

Hourly data, 2012-2015

Case hour (18:00)

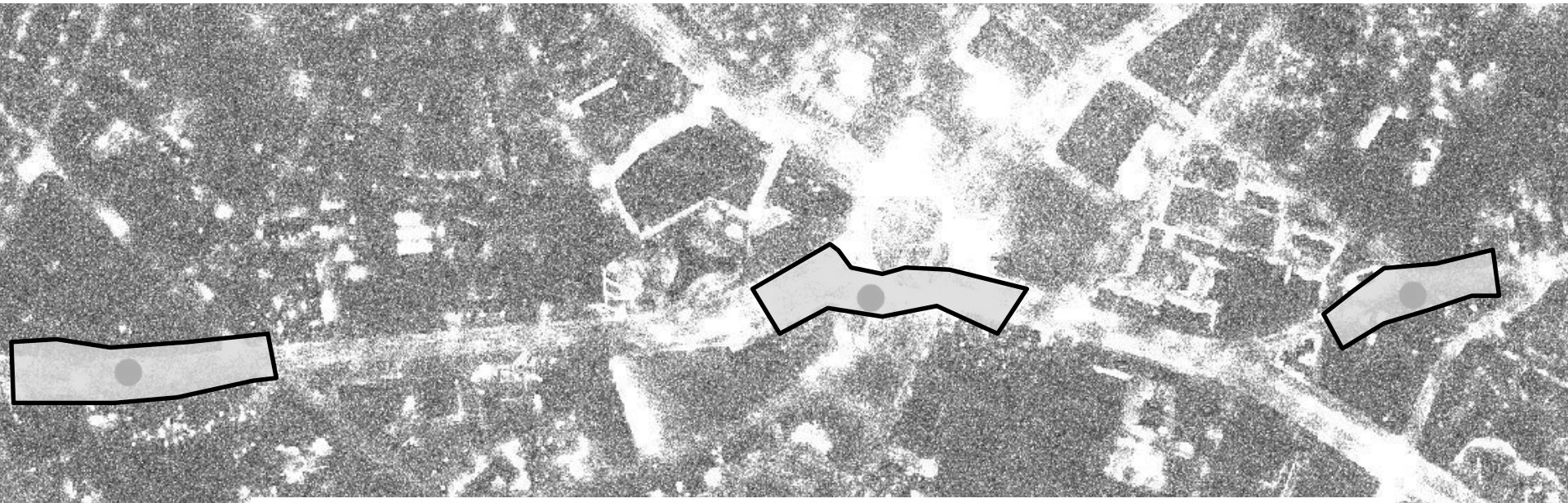
Control hours (14:00, 22:00)



Calculate odds ratio at each counter

(larger odds ratio = bigger reduction in cyclists afer-dark)

Road brightness at cycle counters



Calculate average pixel brightness of road segment around counter

Convert average pixel brightness to ‘Brightness Factor’ – standardised to average brightness across whole of Birmingham

Brightness and cycling after-dark

Conclusion

Cycling should be viable and inclusive option at **all** times of day

Darkness puts people off cycling

Only small amount of lighting may be needed to encourage cycling after-dark

Thanks for listening

j.uttley@sheffield.ac.uk @AJ_Uttley

Any questions, if you've not fallen asleep?

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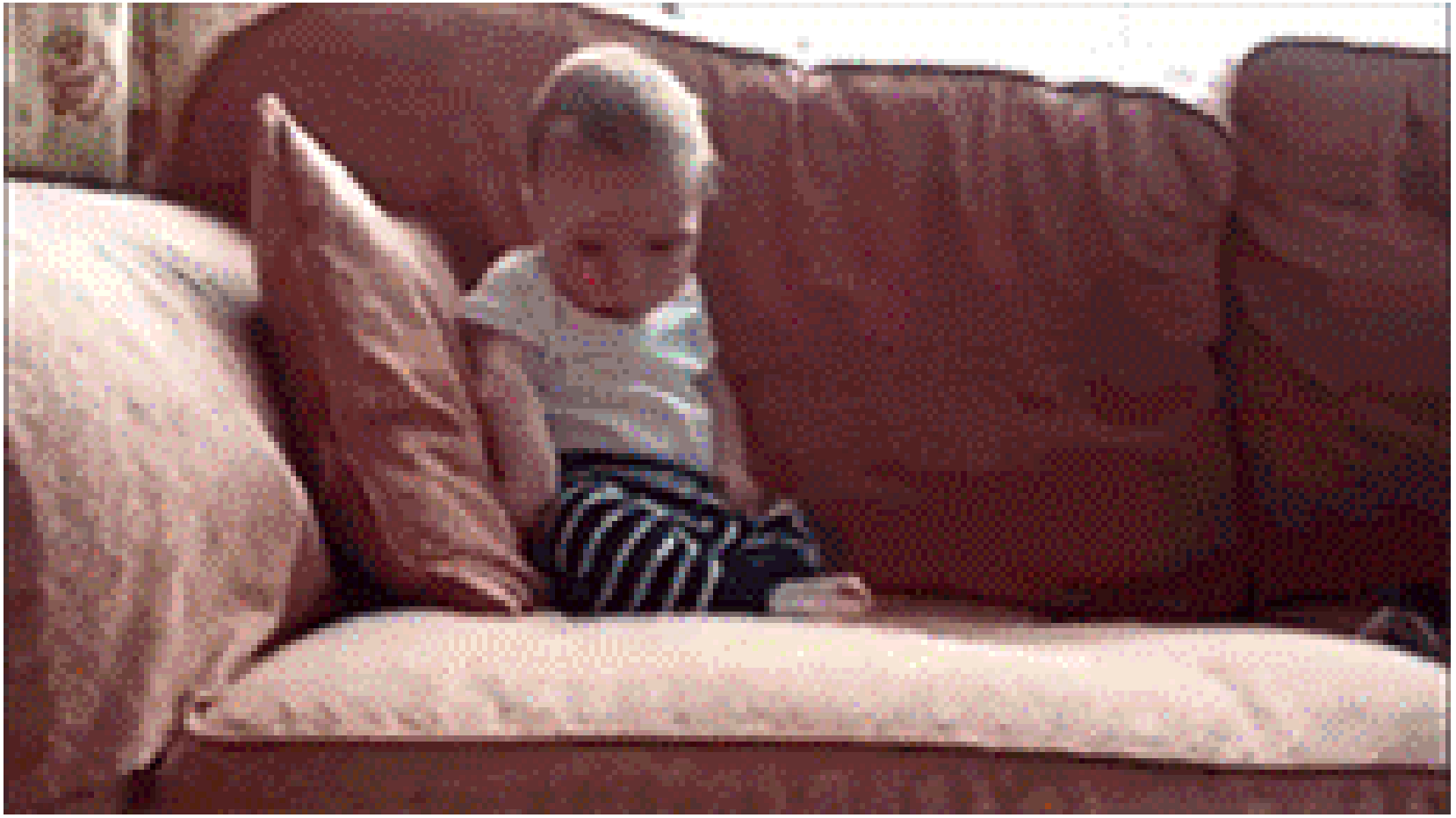

Street light density

Street light density category	Number of cycle counters	Median street light density (lights per 100 m)
None	8	0
Low	20	2.0
High	20	3.5

Larger odds ratio = greater reduction after-dark