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Exploring the Relationship Between Mandatory Helmet Use Regulations and Adult Cyclists' Behavior in California Using Hybrid Machine Learning Models

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In 2019, the National Transportation Safety Board recommended the introduction of all-ages helmet law, to reduce fatalities involving cyclists. Although the benefits of wearing helmets in protecting cyclists against trauma has been documented, their use is still limited, and there is opposition against mandatory helmet use, particularly for adults. Exploring perceptions of adult cyclists regarding mandatory helmet use is a key element to understand cyclists' behavior, and determine the impact of mandatory helmet use on cycling rates. The objective of this research is to identify sociodemographic characteristics and cycling behaviors associated with the use and non-use of bicycle helmets among adults and to assess if a bicycle helmet law will impact cycling rates. The project addresses the lack of empirical data regarding helmet use and non-use in California.

Study Methods

This project collected data regarding cycling behavior and beliefs and socio-demographic aspects of the population in California by distributing a survey to the population. The collected data is analyzed with a three-tier statistical approach that identifies relationships between mandatory helmet usage, sociodemographic factors and cycling trends. The first tier of data analysis is based on descriptive statistics; it identifies what type of cyclists responded to the survey and which participants are more likely to wear a helmet, in presence or not of mandatory helmet regulations. The second step of analysis establishes a statistical relationship between key participant characteristics and the likelihood of changing their biking habits due to a bicycle helmet law using a logistic regression method. Key participants characteristics included in the analysis are gender, age, education, race, income level, frequency of bicycle use and frequency of helmet use. The third step of analysis automatically identifies groups of participants with similar socio-demographic features that also share common perception about a helmet mandate. The analysis determines two clusters of participants with similar beliefs regarding a helmet law and, within each group, what are the barriers to wearing a helmet. This knowledge supports

the definition of incentives and educational measures to improve helmet usage among adults. The mathematical methods used in this step are the latent class analysis in conjunction with optimized decision tree classifiers.

Findings

The major takeaways from the data analysis are:

- 70% of respondents do not support implementation of a mandatory bicycle helmet law in California.
- The cyclists with the highest frequency of bicycle use constitute the highest proportion of opposers to mandatory bicycle helmet law.
- Perception of helmet use benefits and cycling risks, as well as group norms are among encouraging factors for using helmet while cycling.
- Aesthetic, comfort of helmets, peer conceptions as well as riding situations are among the barriers of wearing helmets.
- Frequency of helmet use, education level, gender, marital status, as well as beliefs about helmet use and age are the most significant predictors of a change in cycling rate should a bicycle helmet law be implemented.

Most of the respondents oppose a bicycle helmet law and highlight a likely decrease in cycling frequency should a law be passed in California.

Policy/Practice Recommendations

Based on the findings of this study, the implementation of a bicycle helmet law is not recommended. The main objections against a bicycle helmet law are: (1) it discourages ridership creating public health and environmental concerns, (2) it favors inequality and increases costs associated with biking, (3) it violates people's rights and freedom of choice, (4) its enforcement will deplete police resources.

Public service campaigns and investments in public infrastructure supporting the biking community are recommended as a better tool to increase cyclists' safety as well as helmet usage. The public service campaigns should address the benefits and risk reduction implied by wearing a helmet, and should address the factors considered as barriers (aesthetic belief, inconvenience and discomfort) as well as social perception and norms of wearing a helmet.

Most important factors associated with opposition to bicycle helmet law	No. of Parameters	p value
Education	5	0.0011*
Race	8	0.0046*
Frequency of Helmet Use	1	0.0051*
Gender	2	0.0312*
Perception of benefits and risk reduction	1	0.0481*
Bicycle Type	4	0.0938*
Frequency of Bicycle Use	1	<.0001*

*: Statistically significant at α=0.10.

The safety of the biking community will also be improved by investments in public infrastructures, such as safer road designs and separated bike paths from other vehicles, as well as in car-driver education on how to safely operate around cyclists and in promoting less distracted car-driving.

About the Authors

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To Learn More

For more details about the study, download the full report at **transweb.sjsu.edu/research/2024**

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