# PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form ([see an example](#)) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below. Some articles will have been accepted based in part or entirely on reviews undertaken for other BMJ Group journals. These will be reproduced where possible.

## ARTICLE DETAILS

| TITLE (PROVISIONAL) | Helmet use in BIXI cyclists in Toronto, Canada: An observational study |
|---|---|
| AUTHORS | Marissa Bonyun, Andi Camden, Colin Macarthur and Andrew Howard |

## VERSION 1 - REVIEW

| REVIEWER | Aymery Constant, Phd, Mpsych<br>Senior Lecturer<br>EHESP School of Public Health<br>France<br><br>I have no competing interest to declare |
|---|---|
| REVIEW RETURNED | 06/03/2012 |

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<tr>
<td><strong>GENERAL COMMENTS</strong></td>
<td>Title : Helmet use in BIXI cyclits in Toronto<br><br>Strengths: This paper addresses an important issue, i.e. Helmet use in a bikesharing system. Data collection relies upon observed rather than self-reported helmet use. Many cyclists were observed (N=6732). Cyclists were observed in their environment at different locations, in a major city in North America.<br>Some points however need to be discussed:<br>My main concern is related to independence of statistical units (observations). It is not stated whether or not observations are independent. In others words, was it possible for the same cyclist to be observed more than once? Did authors take measures to ensure that each observation correspond to one individual? It seems that observed cyclists were identified by no means. Repeated observations are thus possible. This would constitute a bias. Maybe observations sites were distant enough to ensure a relative independence between observations? This point need to be clarified, or at least mentioned.<br><br>My others concerns are:<br>1) Page 3 line 10, Design: it seems to me that the term "prospective cohort" is not relevant, since participants were not recruited in the study before being observed. "Ecological" or "observational" study might be better terms.<br><br>2) Authors hypothesize that the proportion of helmet users using BIXI bikes would be significantly lower than those on personal bikes (page 2 line 13). Why? This hypothesis needs to be supported by data or previous observations. What are the (supposed) differences between cyclists using personal bikes and those using BIXI bikes? In my opinion, exposure, cycling habits and familiarity with road hazard might discriminate these two groups, as well as others variables potentially influencing helmet use. This point need to be further developed in the introduction.<br><br>3) Authors state that "this is the first study investigating helmet use in a</td>
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bikesharing system (page 2 line 34; page 5 line 39 and so on). This is no longer true since Februray 15th 2012 (http://www.plosone.org/article/info:doi/10.1371/journal.pone.0031651). But this is the first study, to my knowledge, investigating behavioral differences between cyclists using personal bikes and those using bike sharing system.

4) Authors present the 79 BIXI Bike docking stations locations in Figure 1. Observation points (25 out of 79) should be also indicated, preferably on the same map, or in a separate file.

5) Selection of observation periods: It is started that "a researcher observed cyclists during one hour during commuters' hours" (7-10; 15-18) (pages 5-6) . Authors should indicate why observation period lasted only one hour (and not two, or three) during each time-slot (fatigue, lack of vigilance after one hour of observation?). Also, authors seem to think that the different time-slots are similar as far as traffic or observed cyclists' profiles are concerned. May be its not true. For instance, cyclists observed at 9 am might be going to work, while those observed at 15pm might just go for a stroll. In fact, authors should present the number of observation by time-slots, and discuss whether or not they are equally distributed (they should be)

6) The Table 1 is rather confusing. Results are difficult to read. They should follow a logical sequence. First, give the proportion of helmet users in the whole study sample (and indicate whether or not this estimate is similar to helmet wearing rate in Toronto, if available. Computing 95% confidence intervals might be useful). Then, investigate helmet use according to gender, and BIXI use, separately. And then, investigate interaction effects (Helmet use = Gender X BIXI use). The "undetermined sex" cyclists should be excluded from the analyses.

7) Authors state in a key message that "more males than females are using the BIXI program". This might reflect the fact that more male than female cyclists were observed. The main result should be "more males than females ride a bicycle in Toronto " and consequently, "more males than females are using the BIXI program". The latter statement can be confirmed with a simple crosstab (Gender X BIXI use) and a chi square test. However, this is not the aim of the study. It is rather an ancillary result.

8) Page 8 line 32: Authors state that "in bixi bikes, females wore helmets more often than did males, thought this difference was not significant". This statement is not true. In the absence of a significant effect, there is no difference in helmet wearing rate between males and females using bixi bikes. Please correct.

9) Age is not assessed in the study (as stated in the "limitations"). An estimated age (e.g. youth, adult, senior) would have been a very interesting variable, though. In Toronto, helmet law applies to children only. The law was passed on October 1, 1995. Accordingly, young adults (aged 18-30 yrs, for instance) might be more likely to wear helmet than older people. Since they have been required to do it for years. Habit is a significant predictor of actual behavior. This should be mentioned in the discussion section. Moreover, authors state that "the majority of population observed consisted mainly of older youth and adults" (page 11 line 34). In the absence of an estimated age in collected data, such statement is not relevant.

10) Overall, most legislative and non-legislative interventions to promote helmet use in Canada were oriented towards children only. This study suggests that prevention initiatives are required towards adult cyclists also. Especially those using bikesharing programs, who might be less familiar with road hazard than others cyclists.

| REVIEWER | Emmanuel LAGARDE |
| | INSERM U897 Bordeaux, France |
| REVIEW RETURNED | 13/03/2011 |

| GENERAL COMMENTS | General comment |
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| | This is a very-well conducted study on the prevalence of helmet use among BIXI bicycle users showing a 21% rate of use, lower than the 52% rate for personal bike riders. These estimates are based on the observations of a total of 6706. While these results are of interest and are worth to be mentioned in a journal like BMJ, my opinion is that it does not deserve a short report and should be published as a research letter. |
| | |
| | Specific comments |
| | |
| | Introduction: cautions should be exercise when citing a 85% protection of helmet from Thompson 1989 study. Since that time, this has been criticized and more recent studies seemed to provide lower protection rate estimates. Please see Elvik' 2011 paper (Acc Anal Prev 2011;43:1245-1251). |
| | Addition information would be of interest to understand why some users are using BIXI with and without a helmet. My guess would be that those with a helmet are those who are also personnel bike riders and who, for some reason, were using BIXI this time. Incidentally, I must say that I am very much impressed by these overall rates of use. In Bordeaux, we just conducted a similar study (but with automatic video observation) and found a rate of 0.8% (N=1455) for our BIXI-like system users and 3.2% (N=3162) for other bike riders. The main reason for non-users are the helmet inconvenience. |
| | Finally, given the very simple study design, I see no particular methodological problem. In particular, I am not concerned with the non-blind nature of the observer which unlikely to have biased the results. |
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| | I'm left unconfortable to recommend this manuscript as a full report, even in a journal that I understand to be of the kind of Plos One. The |
| | research is well conducted but what we learn is not worth a full paper. |

| REVIEWER | Don Voaklander |
| | Professor, University of Alberta |
| | Canada |
| REVIEW RETURNED | 16/03/2012 |

| GENERAL COMMENTS | This is not a prospective cohort study. It is a cross-sectional study. |

Reviewer: Aymery Constant, Phd, Mpsych
Senior Lecturer

EHESP School of Public Health
France

I have no competing interest to declare

Strengths: This paper addresses an important issue, i.e. Helmet use in a bikesharing system. Data collection relies upon observed rather than self-reported helmet use. Many cyclists were observed (N=6732). Cyclists were observed in their environment at different locations, in a major city in North America.

Thank you.

Some points however need to be discussed:

My main concern is related to independence of statistical units (observations). It is not stated whether or not observations are independent. In others words, was it possible for the same cyclist to be observed more than once? Did authors take measures to ensure that each observation corresponds to one individual? It seems that observed cyclists were identified by no means. Repeated observations are thus possible. This would constitute a bias. Maybe observations sites were distant enough to ensure a relative independence between observations? This point needs to be clarified, or at least mentioned.

Observations were made at physically separate sites on different days by the same observer. A small fraction of the total number of cyclists in Toronto was sampled, but there was no systematic way to identify individuals. We mention this in the limitations. "Finally, individual cyclists were not identified so may have been observed more than once."

My others concerns are:
1) Page 3 line 10, Design: it seems to me that the term "prospective cohort" is not relevant, since participants were not recruited in the study before being observed. "Ecological" or "observational" study might be better terms.
Agree. We have changed the term to 'cross sectional study per Don Voaklander's review below also.

2) Authors hypothesize that the proportion of helmet users using BIXI bikes would be significantly lower than those on personal bikes (page 2 line 13). Why? This hypothesis needs to be supported by data or previous observations. What are the (supposed) differences between cyclists using personal bikes and those using BIXI bikes? In my opinion, exposure, cycling habits and familiarity with road hazard might discriminate these two groups, as well as others variables potentially influencing helmet use. This point need to be further developed in the introduction.

Agree. We have substantiated our hypothesis and added a reference to Constant.

3) Authors state that "this is the first study investigating helmet use in a bikesharing system (page 2 line 34; page 5 line 39 and so on). This is no longer true since Februray 15th 2012 (http://www.plosone.org/article/info:doi/10.1371/journal.pone.0031651). But this is the first study, to my knowledge, investigating behavioral differences between cyclists using personal bikes and those using bike sharing system.

Agree. We have cited the Constant paper and thank the reviewer for bringing it to our attention.

4) Authors present the 79 BIXI Bike docking stations locations in Figure 1. Observation points (25 out of 79) should be also indicated, preferably on the same map, or in a separate file.

We did not map the observation locations. I have omitted the figures for the second revision.

5) Selection of observation periods: It is started that "a researcher observed cyclists during one hour during commuters' hours" (7-10; 15-18) (pages 5-6) . Authors should indicate why observation period lasted only one hour (and not two, or three) during each time-slot (fatigue, lack of vigilance after one hour of observation?). Also, authors seem to think that the different time-slots are similar as far as traffic or observed cyclists' profiles are concerned. May be its not true. For instance, cyclists observed at 9 am might be going to work, while those observed at 15pm might just go for a stroll. In fact, authors should present the number of observation by time-slots, and discuss whether or not they are equally distributed (they should be)

Response: we calculated a sample size based on observing sufficient bikes to determine whether a difference in helmet wearing rate was present. While we understand that cycle use differs at different hours of the day, we did not have the resources to study this aspect in detail.

6) The Table 1 is rather confusing. Results are difficult to read. They should follow a logical sequence. First, give the proportion of helmet users in the whole study sample (and indicate whether or not this estimate is similar to helmet wearing rate in Toronto, if available. Computing 95% confidence intervals might be useful). Then, investigate helmet use according to gender, and BIXI use, separately. And then, investigate interaction effects (Helmet use = Gender X BIXI use). The "undetermined sex" cyclists should be excluded from the analyses.

Response: The undetermined sex cyclists are excluded from the analyses. They are small in number and are listed in the table. With respect to the reviewer, we prefer to present a number and proportion of helmet users comparing BIXI to personal bikes as that conforms to the specific research question.

7) Authors state in a key message that "more males than females are using the BIXI program". This might reflect the fact that more male than female cyclists were observed. The main result should be "more males than females ride a bicycle in Toronto " and consequently, "more males than females are using the BIXI program". The latter statement can be confirmed with a simple crosstab (Gender X BIXI use) and a chi square test. However, this is not the aim of the study. It is rather an ancillary result.

Agree. We have changed the key message to more males than females ride bicycles in Toronto.

8) Page 8 line 32: Authors state that "in bixi bikes, females wore helmets more often than did males, thought this difference was not significant". This statement is not true. In the absence of a significant effect, there is no difference in helmet wearing rate between males and females using bixi bikes. Please correct.

Agree. We have changed the statement to "On BIXI bikes, gender differences in helmet use were not statistically significant (23.6% of females versus 20.1% of males, respectively; $X2 = 0.41$, $p<0.5201$)."

9) Age is not assessed in the study (as stated in the "limitations"). An estimated age (e.g. youth, adult, senior) would have been a very interesting variable, though. In Toronto, helmet law applies to children only. The law was passed on October 1, 1995. Accordingly, young adults (aged 18-30 years, for instance) might be more likely to wear helmet than older people. Since they have been required to do it for years. Habit is a significant predictor of actual behavior. This should be mentioned in the discussion section. Moreover, authors state "the majority of population observed consisted mainly of older youth and adults" (page 11 line 34). In the absence of an estimated age in collected data, such

statement is not relevant.

Agree. We have removed the statement about our impression of the ages. We have replaced it with a statement that BIXI bikes are available only to adults.

10) Overall, most legislative and non-legislative interventions to promote helmet use in Canada were oriented towards children only. This study suggests that prevention initiatives are required towards adult cyclists also. Especially those using bikesharing programs, who might be less familiar with road hazard than others cyclists.

Agree. We hope to publish the observations to contribute to this necessary dialogue.

Reviewer: Emmanuel LAGARDE
INSERM U897 Bordeaux, France

General comment

This is a very-well conducted study on the prevalence of helmet use among BIXI bicycle users showing a 21% rate of use, lower than the 52% rate for personal bike riders. These estimates are based on the observations of a total of 6706. While these results are of interest and are worth to be mentioned in a journal like BMJ, my opinion is that it does not deserve a short report and should be published as a research letter.

Thank You.

Specific comments

Introduction: cautions should be exercise when citing a 85% protection of helmet from Thompson 1989 study. Since that time, this has been criticized and more recent studies seemed to provide lower protection rate estimates. Please see Elvik' 2011 paper (Acc Anal Prev 2011;43:1245-1251).

Agree. We have cited Elvik also and modified the statement in the introduction.

Addition information would be of interest to understand why some users are using BIXI with and without a helmet. My guess would be that those with a helmet are those who are also personnel bike riders and who, for some reason, were using BIXI this time. Incidentally, I must say that I am very much impressed by these overall rates of use. In Bordeaux, we just conducted a similar study (but with automatic video observation) and found a rate of 0.8% (N=1455) for our BIXI-like system users and 3.2% (N=3162) for other bike riders. The main reason for non-users is the helmet inconvenience.

Agree. We cannot provide additional information on users decisions from this type of study, though.

Finally, given the very simple study design, I see no particular methodological problem. In particular, I am not concerned with the non-blind nature of the observer which unlikely to have biased the results.

Agree

Reviewer: Don Voaklander
Professor, University of Alberta
Canada

This is not a prospective cohort study. It is a cross-sectional study.

Agree. We have changed the abstract and methods.

**VERSION 2 – REVIEW**

| REVIEWER | Aymery Constant, PhD, Senior Lecturer<br>EHESP School of Public Health, France<br><br>I have no competing interest to declare |
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| **REVIEW RETURNED** | 10/05/2012 |

| **THE STUDY** | the cross sectional design of the study has some limitations, but these are now mentioned in the manuscript.<br>Some errors have been corrected according to sugesstions. |
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