Author's response to reviews

Title: The Regional Differences in Prevalence, Medical Expenditures and Risk Factors for Injury in Taiwanese Teenagers

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Author's response to reviews: see over
Reviewer 1:

This is an interesting paper and one which it has been a pleasure to read. As the authors state, injury is the leading cause of morbidity and mortality in young people. This paper goes some way to analyze on a regional basis why differences may occur and provide the basis for injury prevention to be implemented. The question posed by the authors is not necessarily new in so far as injury is well known to be the cause of morbidity and mortality. However, in the context of the study and its regional context it is new and very well defined. The rationale for the study is well established.

The Methods are very interesting and are definitely appropriately and well described. There are sufficient details provided to replicate the work. The data appears to be sound and well controlled. Efforts to look at confounding variables and collect additional data have been well established. The manuscript appears to adhere to the relevant standards for reporting and data deposition. The Discussion and Conclusion are well balanced and are adequately supported by the data. In my view the Title and the Abstract accurately convey what has been found. The writing is acceptable although there would need to be some minor revision during the copy editing stage but this is insignificant. The work is well referenced and there is a comprehensive bibliography provided. There is extensive statistical manipulation carried out. Some of this is beyond my expertise and therefore I would welcome this paper reviewed by a statistician to check for validity of the statistical procedures used. I am also not familiar with the statistical software package used and therefore this would need to be evaluated as well.

Ans: We are grateful for the comments. Thanks.
Reviewer 2:

This study provides useful information regarding regional differences in the prevalence of injury and associated risk factors among Taiwanese teenagers. In terms of the public health response to the problem of injury the contribution of this paper is to provide broad, essentially descriptive information about the nature and extent of the problem within a circumscribed population. It does not make an important addition to the identification of risk factors, inform the development of interventions, nor facilitate the development of effective public health programs. It is difficult to see how the relatively low level of detail available to the researchers in the data base, could have lead to anything but relatively non-specific findings. Furthermore, the generalizability of the findings of this research beyond the study population is somewhat limited.

However, the paper however is well conceived within the limits of its aims and methods. The methodology is strong and the presentation is clear, well structured and informative.

Major Compulsory Revisions

The researchers note that 80% of residents in mountainous areas are aboriginal. Is the finding that there is an increased prevalence of injury in mountainous regions (and a difference in outcome and cost) simply a statement about the distribution of injury (and other health conditions) in aboriginal populations? If so then this is a finding consistent with most indigenous communities throughout the world and is a product of complex social circumstances not covered by the variables that were examined in this study. The ability of the data/methods chosen (given the inherent limitations in this data) to adequately address the chosen research question needs further justification.

Ans: We totally agreed that the complex social and culture factors play important roles in the prevalence of injury in aboriginal population. In one of the studies, researchers found that aborigines settled in metropolitan areas had similar life expectancy as their counterparts in the same area, whereas those lived in the mountainous area still had shorter life span. We felt that regional difference implied the socio-economical difference. However, the limitation of analyzing second hand data existed in this study. That is the data did not contain all the necessary variables to test the hypothesis. After controlling the region variable, the significant differences from the predisposing factors, socioeconomic factors, and health behaviors were strongly associated with injury. Some behaviors were related to culture, which has
been very difficult to discuss. For example, people start drinking alcohol at early age. We have strengthened our discussion on socioeconomic status and behaviors.

The paper really needs to concentrate more on what it is adding to the literature. This focus should begin with a stronger rationale for doing the research, drive the analysis and presentation of results and strongly determine the content of the discussion. The current vague discussion highlights the difficulty the researchers have in identifying what the paper adds to knowledge. The discussion goes beyond the data to conjecture explanations to support general recommendations. A clearer link between rationale for the study, study results and study conclusions is vital.

Ans: According to the literature reviews, we found that Taiwanese live in mountainous areas have shorter life expectancy and accidental injury is the leading cause among worldwide teenagers. We assumed that teenagers’ injury was a key factor causing the short life span of mountainous people. The main purpose of this study was to compare the prevalence of teenager injury in different regions of Taiwan. Most of the literature discussed the injury for children or specific groups of people. Little has been done in teenagers, especially using a national representative sample. We examined the prevalence and medical expenditure in outpatient service of injury of teenagers in different regions using national representative samples. Furthermore, we explored the factors associated with injury in teenagers. In addition to gender, age, and socioeconomic factors, we also added teenagers’ health behaviors, such as substance abuse, protective device use. The results not only proved that geographic location of teens was one of the major risk factors, but also confirmed results of other studies from other countries. For example, the risk behaviors were a major factor for teenagers’ injury. All findings of this study showed that people with risk propensity were subject to injury, such as male, older teens, and those with risk behaviors after adjusting the regional differences. All these were added to the discussion section.
Reviewer 3:
Opinion:
This study is based on a thoroughly designed health survey, with response rates in excess of 90%.
Little comment is made on the bias that may be included when surveying by household or by individual. I think this is a valuable dataset and hope that I will see a number of publications emerge from its careful analysis.

Ans: Thanks for the encouragement. We are analyzing the data for many issues, and hope to get more publications.

Major Compulsory Revisions
I feel that the first set of results (reported in Table 1) should be examined by means of a log-linear model. There is considerable scope for Yule's / Simpson's paradox within these data; for example whilst it might be unlikely, if the gender mix differs by age group the effect of age may be different to that suggested by table 1. I also think the table ought to be set out slightly differently to distinguish "response" and "stimulus" variables. As a byproduct of this work, the injury prevalence can be reported with a confidence interval.

Ans: According to your pearly opinions, we not only revised table 1 by “response” and “stimulus” variables, but also used the log-linear model to show the relations between response and stimulus variables. The 95% confidence interval for injury prevalence was presented in the same table too.

I am always a little nervous about uncritical use of stepwise selection methods (see for example Frank Harrel, Regression Modelling Strategies, Springer for a good discussion). As a result, I wonder what to make of smoking not selected and drinking being selected. In many countries these two behaviours tend be very closely associated, and I have a small worry that stepwise selection has rejected one of two essentially collinear variables. Whilst we have a well fitting model, we may be losing an important piece of information regarding lifestyle and injury risk. I would be a lot more comfortable either if the results of the stepwise selection were triangulated against other findings in the literature OR if more judicious information was presented on variable selection.

Ans: We did find the high correlations among the risk behaviors, like smoking, drinking, and betel nut chewing in our study. Considering your suggestion, we
decided to group those risk habits into one variable to avoid co-linearity in the model. The new variable contained three categories which were teens with no risk behavior, one risk behavior, two or more risk behaviors. The similar way was used in protective advices using. We grouped the helmet and seatbelt use to one variable. The details were described in the section of method (page 8). All variables in our hypothesis were put into model instead of using stepwise selection. The new results were shown in Table 2.

Finally, I feel that the modelling work on costs needs reworking. I think it is reasonably obvious that there will be different costs associated with different injury types (open wounds, bone fractures). The two aims of an analysis are to see whether males / females or young / medium / old differ in their risk of receiving different types of injury (which can be examined by a log-linear model, as well as emerging as a byproduct of this analysis). The second aim would be to see whether males / females, young / medium / old with the same injury have different costs associated - and I suppose by implication more or less severe injuries for the same cause. There is some serious confounding in this analysis which needs attending to. When you state that "females in remote areas spent less money" is this because they are less seriously injured, more likely to have those injuries that are dealt with cheaply or because they have less money spent on them?

Ans: Thanks for pointing out the two aims of the study. The analysis was similar to the two part model in econometrics. Regarding the gender difference in types of injury, we analyzed the gender difference in types of injury. The results showed that females and males were not different in types of injury in mountainous areas or in general areas of Taiwan. The gender difference in offshore islands was significant (p=0.0052). In offshore island, females had higher percentage of contusions than males (42% vs. 21%), whereas they had less open wounds than males (13% vs. 26%). We added the information in the section of discussion.

On page 7, you stated "Because of few hospitalisations, we did not include those in the study"; this sounds like a potential study bias. At the very least I would like some information presented to reassure me that it is a small bias (how many hospitalizations (male / female, offshore / mountainous) and how much cost did these accrue.

Ans: When linked to the inpatient in NHI, only 140 records met our criteria for hospitalization during study period. There were 61 boys and 79 girls hospitalized. Only 7 and 16 people were hospitalized in offshore and mountainous areas.
respectively. We were afraid that no enough cases in each category of interests. The information was added in the section of Method.

Minor Essential Revisions

The statement "education levels were removed because of close correlation to age" needs expanding. What do you mean by "education levels" in this context? There might be a close correlation to age, but if those relatively less well educated at the same age had an increased injury risk we would want to know.

Ans: In Taiwan, it is the obligation and right for everyone to get education up to junior high school. That is true in this survey. Over 95% of teenagers in our survey attended school for at least 9 years. Based on the 12-19 years old self-administrated questionnaire, the percentage of teens in mountainous areas working full time or part-time increased after 15 years old. Nevertheless, the year of education was strongly associated with teens’ age ($\chi^2<0.0001$). Therefore, we excluded education in the analysis to avoid co-linearity. We have elaborated this in the text (page 8).

Thanks.

The use of English needs some attention, for example "The logarithm of cost was used in mixed model to make the expenditure distribute normally" needs to be reworded; there are many more examples.

Ans: This manuscript was edited by a professional editor and was revised again before resubmitting to the BMC Journal.