Community response to Road traffic noise in Hanoi - Part II: Dose-response relationships and the effects of the intervening variables on annoyance

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Road traffic noise, horn sound, dose-response relationships, intervening vatiable, ICBEN scale

1. Introduction

A social survey and noise measurement were conducted in Hanoi in September 2005 in order to investigate community response to road traffic noise and its characteristics in developing country and to contribute to global noise policy as well as Vietnamese noise policy. Following Part I which shows the outline of the survey and the primary results, Part II discusses dose-response relationships and the effects of the intervening variables on road traffic noise annoyance.

2. Overall dose-response relationships and the effect of the modifier

Since the method for vertical noise reduction calculation is being discussed only the results from row house data are discussed in this part. Social survey data of site No 03 (Tran Quang Khai Road) was not also discussed in this part because this site had only two row houses. When the results are plotted in Ldn - % Highly annoyed relationships together with Schultz's synthesized curve [4], there are several interesting points (See Figure 1). The rate of people who responded to top three from 11-point numeric scale was positioned in the middle of Schultz curve zone. Nevertheless, the rate of people who responded to top one from 5-point verbal scale and top two from 11-point numeric scale were positioned below the zone. This is quite different from the results obtained in Survey 2004. The points from the survey (both top one from 5-verbal scale and top three from 11-numeric scale) were in the middle of the zone. The gap between Survey 2004 and 2005 seemed to be due to the difference in the annoyance scale. The extreme modifier in 2004 was "Rat" but "Cuc" in 2005. "Cuc" was supposed to be a little more intense than "Rat". That is why % highly annoyed in 2005 is quite lower than that in 2004. Since the noise exposure range was very limited, just 7dB, data from quitter sites are necessary to draw a typical dose-response curve in Vietnam

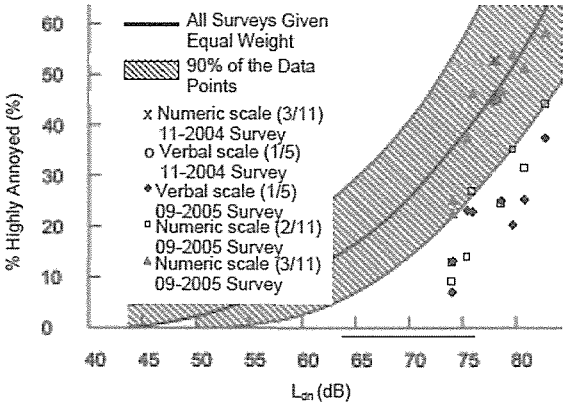

Figure 1: Hanoi Data on the Schultz's curve

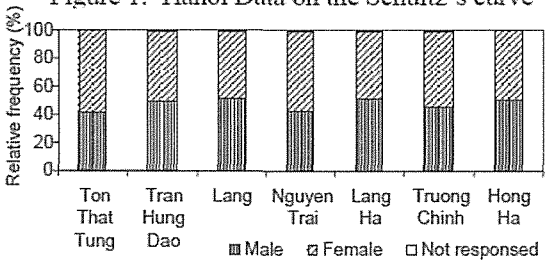

Figure 2: Sex distribution

3. The effects of the intervening variables on annoyance

3.1 The effects of demographic variables

The respondents were well balanced between male and female among all sites as shown in Figure 2, the average rate was 47% male and 52% female. Female annoyance was expected to be higher than male. However, Figure 3 shows that both are almost the same. Sex seemed not to influence community response to noise as well as former studies [5].

Figure 4 shows that younger generation was the majority at all sites. The respondents were divided into four groups: 20s, 30s, 40s and 50s or more.

Though Miedema [6] showed the difference in annoyance between actively working age (30s and 40s) and the other age (20s and 50s and more), the

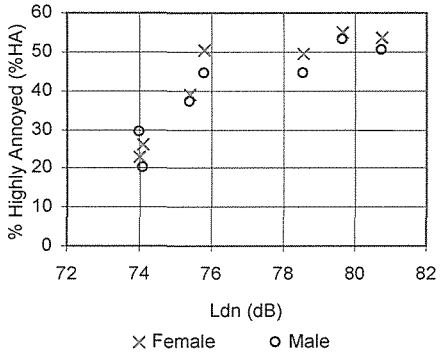

Figure 3: Comparison of %HA by road traffic noise between male and female

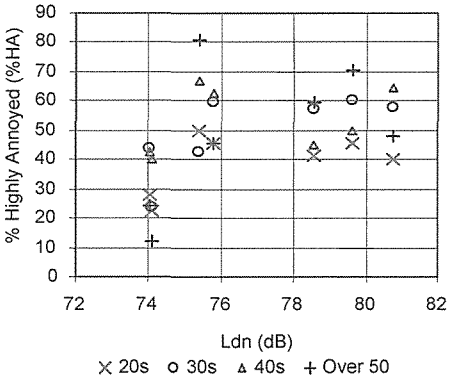

Figure 5: Comparison of %HA by road traffic noise among generations

older the respondents are in this survey, the more annoyed they are as shown in Figure 5.

3.2 The effects of special location

Figure 6 shows that people living in Hong Ha Road seem to be much more disturbed in sleeping than the other sites though $LAeq_{night}$ at Hong Ha Road (73dB) is not so high compared with the average one (70dB). Besides, Figure 7 shows that people living along Hong Ha Road were also much more annoyed by road traffic vibration than the others. It can be caused by the special characteristic of the road. Hong Ha Road is a high way and Tran Quang Khai Road is just a main road with the highest noise exposure in this survey. Both roads had high traffic volume, specially heavy vehicle volume. Moreover, they are close and parallel to each other. Thus people living there were more influenced by road traffic vibration than others and they were more annoyed at night.

3.3 The effects of attitude to noise source

The authors hypothesized from Survey 2004 that the frequent horn sounds from motorbikes might have

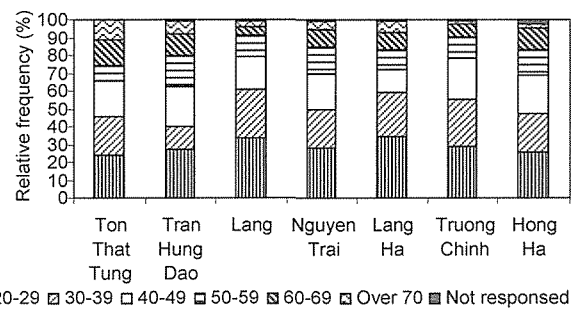

Figure 4: Generation distribution

some influences on community response to road traffic noise. Responses to the question "How do you evaluate the following transportations for the overall society?" were divided into two groups: the first group responding to first two categories of 5 point verbal-scale was the group of people who thought the usage of motorbikes would be better for society, the second responding to last two was the group of people who did not think so. Figure 8 compare % highly annoyed between two groups: the second group seemed to be more annoyed by road traffic noise than the first one at almost all sites and the difference was 20% HA at the maximum.

Other questions such as "How frequently do you use the following transportations?" and "How safe do you think the following transportations are?" were also investigated in relation to the attitude to motorbike by the same group dividing method. Figures 9 and 10 show the same trend as Figure 8. The groups of people who did not use motorbikes frequently and thought that motorbikes were dangerous seemed to be more annoyed by road traffic noise than the other groups at almost all sites.

Figure 11 shows the hourly change of traffic volume at site 07 as an example and Figure 12 shows the annoying period in a day at all sites. Though motorbike volume was highest at around 7am and 5pm, the respondents felt most annoyed by road traffic noise in late afternoon. 75% felt annoyed from 4pm to 7pm whereas around 58% felt annoyed from 6am to 8am. It seemed to be more tolerable to road traffic noise in the morning (from 6am to 8am) when people were going to work place than in late afternoon when they returned home to relax after a hard work.

3.4 The effects of sensitivities

The groups of people who were sensitive (last two categories of 5 verbal-scale) and insensitive (first two categories of 5 verbal-scale) to hot weather and to air-pollution also were compared. Visually, it is very clear that the sensitive group were more

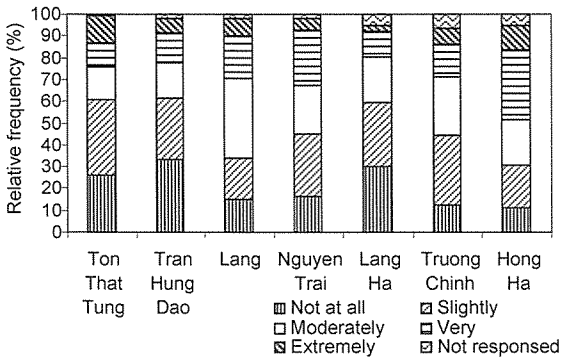

Figure 6: How annoyed by road traffic noise are you while sleeping at night

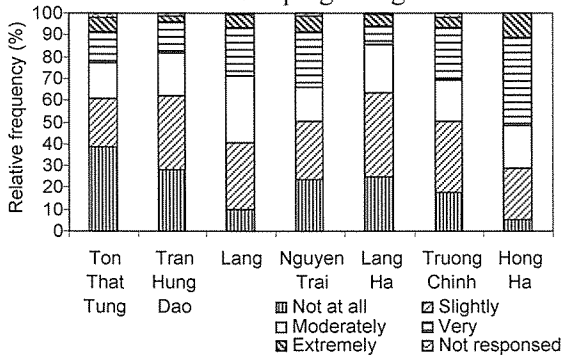

Figure 7: How annoyed by road traffic vibration are you

annoyed than the insensitive group at all sites, specially for group sensitive to air-pollution and the maximum difference reached nearly 35%HA (See Figure 13 and 14).

Generally, there is a high correlation between noise sensitivity and community response to noise [6]. Figure 15 compares % HA between groups sensitive and insensitive to noise. The sensitive group is clearly more annoyed than insensitive group.

4. Summary

On the whole, Part I has brought an overview of the social survey and characteristics of road traffic noise in Hanoi and Part II has brought some interesting properties of community response to noise in Hanoi. However, more hypothesis tests should be conducted in further research in order to give more steady statistical proofs for results and conclusions. Further surveys are necessary to establish the dose-response curve for road traffic noise in Vietnam.

5. Acknowledgemant

This study was financially supported by Grant in Aid for Scientific Research (No. 17560533). The authors highly appreciate the assistance in social survey and noise measurements to P.T. Hai Anh, Sojo University and P. Hai Yen, Hanoi University of Technology and the academic contributions in planning social survey and noise measurement to Prof. P.N. Dang, P.D. Nguyen and L.V. Nai, Hanoi University of Civil Engineering.

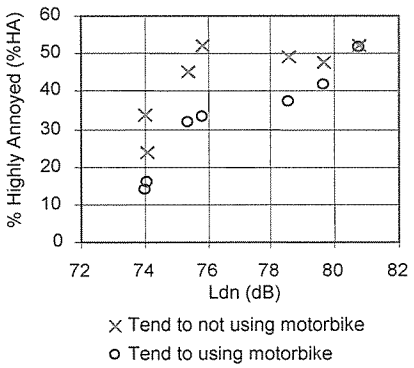

Figure 8: How advantageous do you think using motorbikes will be for the society?

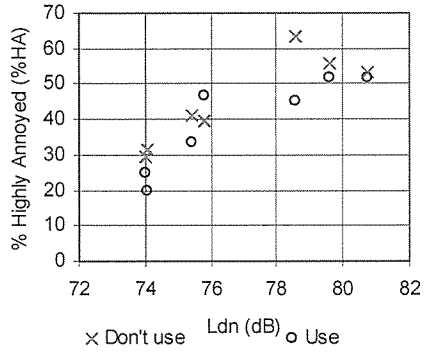

Figure 9: How frequently do you use motorbikes?

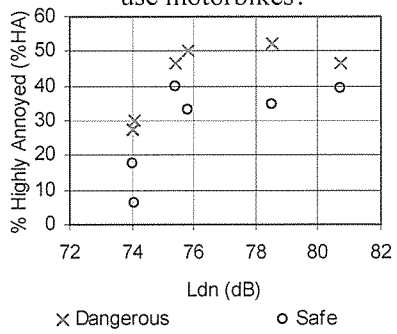

Figure 10: How safe do you think motorbikes are?

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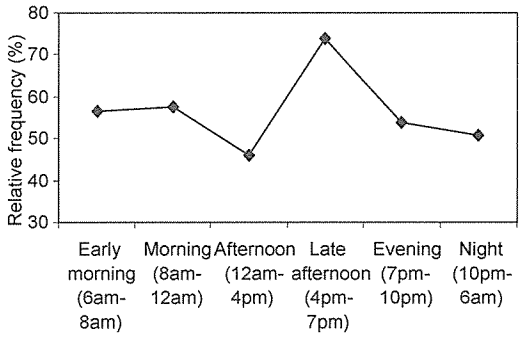

Figure 12: Annoyance period in day

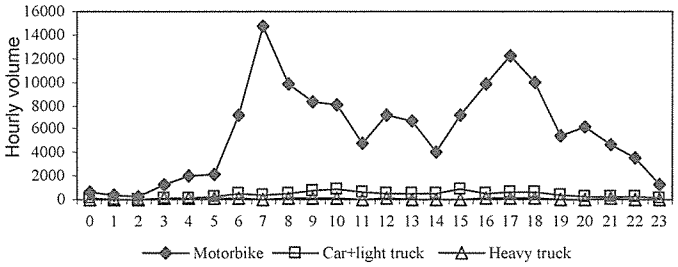

Figure 11: Truong Chinh road traffic volume (Site No7)

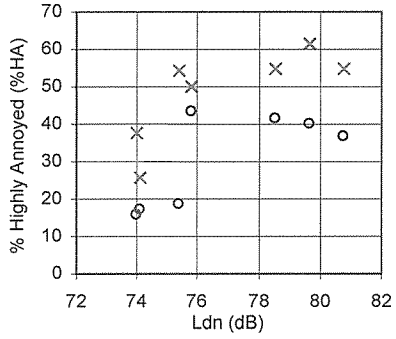

Figure 13: Comparison of %HA by road noise between groups sensitive and non-sensitive to hot weather

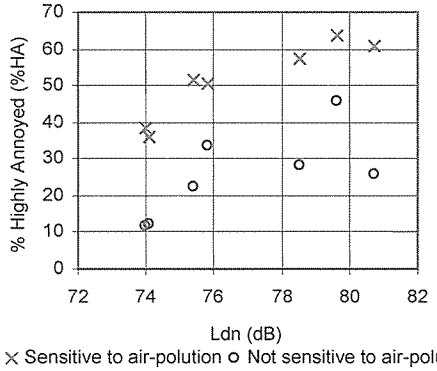

Figure 14: Comparison of % HA by road traffic noise between groups sensitive and not sensitive to air-pollution

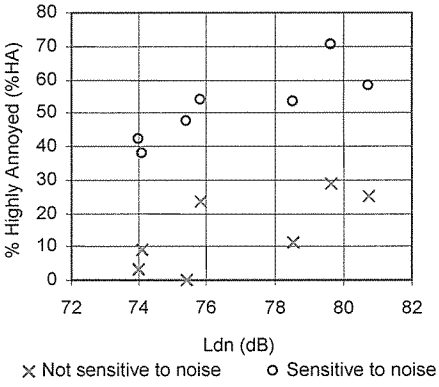

Figure 15: Comparison of %HA by road traffic noise between groups sensitive and insensitive to noise

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