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SUBJECTIVE STUDY OF THE NOISE IN SEVERAL HOSPITALS IN THE AUTONOMOUS CITY OF BUENOS AIRES

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Abstract

This paper analyses the results of the surveys to the hospitals' staff of the Autonomous City of Buenos Aires. Specific surveys were designed and distributed in several public and private hospitals. The area covered in the study is the town centre with 20 km^2. 121 valid surveys were obtained from the medical staff of the city, that allow obtaining medical and social useful conclusions to decrease the noise and enhance the life quality of the hospitals' staff, the sick people, and the families. Outstanding conclusions can be obtained from this research about the social consciousness, the subjective assessment of the noise, the effect of the noise on the people, and the proposals made by the doctors to reduce the noise in hospitals.

INTRODUCTION

The complete accomplishment of a noise map includes making a subjective study of the population. In order to achieve this objective, the most suitable tool is to carry out surveys to different sectors of society. A very important sector, due to the contributions they can make, is the medical-sanitary staff. In addition to obtaining useful conclusions, the survey campaigns are a tool to raise the public awareness to noise.

This subjective study complements the noise map of the town centre of the Autonomous City of Buenos Aires. The area under study covers a 20 km^2 zone, and four public and private hospitals were selected in order to avoid a bias in the population.

This research took into account several factors: sociological data, noise sources and inconveniences at hospitals, noise sources and inconveniences in general, subjective assessment of noise, noise effects, assessment of the noise problems, and questions to the medical staff.

SURVEY EXECUTION

For the subjective study on the medical-sanitary staff's noise perception in the hospitals of the selected area, a specific survey was carried out. The survey had 38 questions and 160 surveys were distributed in several hospitals in the town centre of the Autonomous City of Buenos Aires.

Determination of sample size

In the estimation of the proportions in the Simple Random Sampling (N, n), considering a normal distribution of the estimator, the sample's size is given by the expression:

$$n = \frac{Z^2_{1-\left(\frac{\alpha}{2}\right)} \cdot NPQ}{\partial^2 (N-1) + Z^2_{1-\left(\frac{\alpha}{2}\right)} PQ} \qquad (1)$$

where:

n	is the sample size.
$Z_{1-\left(\frac{\alpha}{2}\right)}$	is the percentile with 1-(α/2) order of the distribution N(0,1) or the signification value.
P	is the percentage with which the phenomenon under study is verified.
Q	is the complementary percentage.
N	is the size of the population under study.
∂	is the maximum absolute error tolerated in the estimation.

The suppositions for the calculus of the sample's size are:

- Population variance. The parameters "P" and "Q" are P = Q = 50%, obtaining a maximum product of them (and therefore a sample higher than necessary).
- Signification value or confidence level. In this case its 0.1, so that the confidence level is 90%.

The sample size, for a confidence level higher than 90%, is 96 surveys, and 121 valid surveys were obtained. 160 surveys were distributed, so the rejection percentage was 24.4%.

Sample's description

The selected population was formed with any hospital staff member within the area of interest. The sick people and the patients were rejected due to the internal policies of most of the hospitals not to bother them.

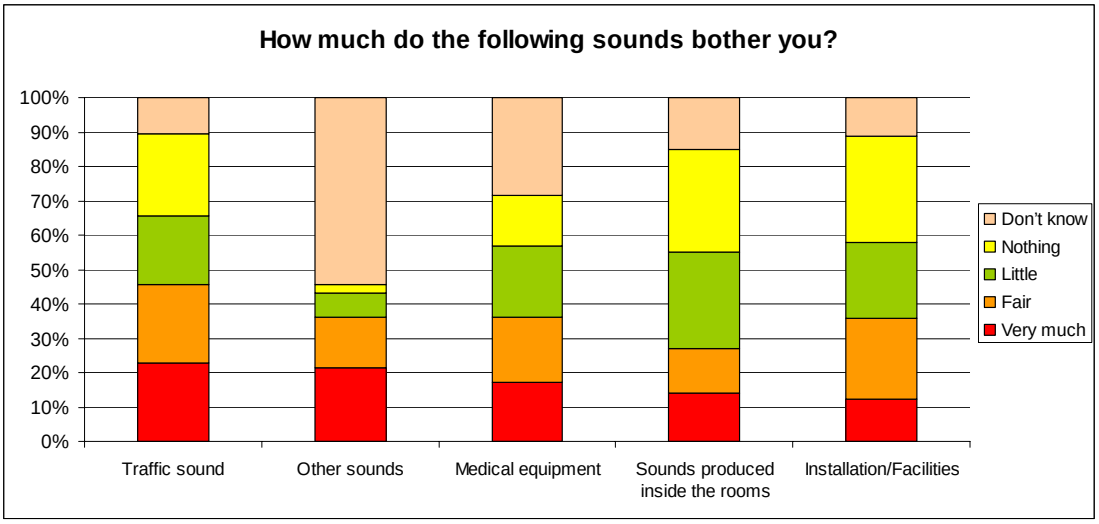
RESULTS

In this section several tables and graphs with the results are shown. The complete commentaries to the obtained data are in the conclusions section.

Table 1. Intensity of the inconvenience produced by the sounds in the hospital.

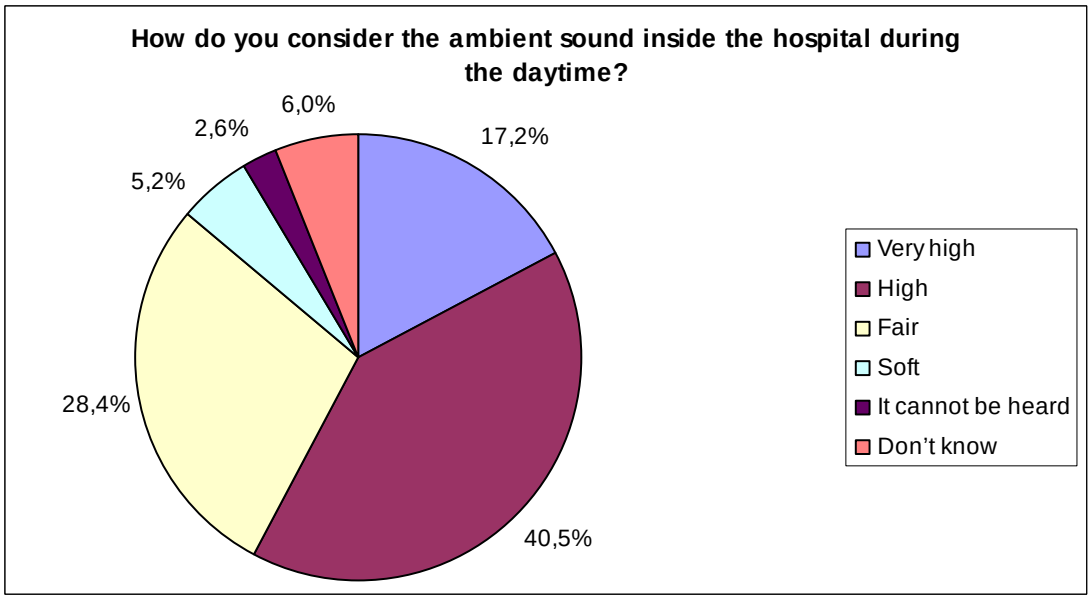
	It bothers you…				
	Very much	**Fair**	**Little**	**Nothing**	**Don't know**
Traffic sound	22,8%	22,8%	20,2%	23,7%	10,5%
Other sounds	21,6%	14,7%	6,9%	2,6%	54,3%
Sounds produced by the medical equipments	17,2%	19,0%	20,7%	14,7%	28,4%
Sounds produced inside the rooms	14,0%	13,2%	28,1%	29,8%	14,9%
Sounds produced by the installation/facilities inside the hospital	12,3%	23,7%	21,9%	30,7%	11,4%

The hearing grade and inconvenience produced by several noises in homes and inside the hospitals were analysed.



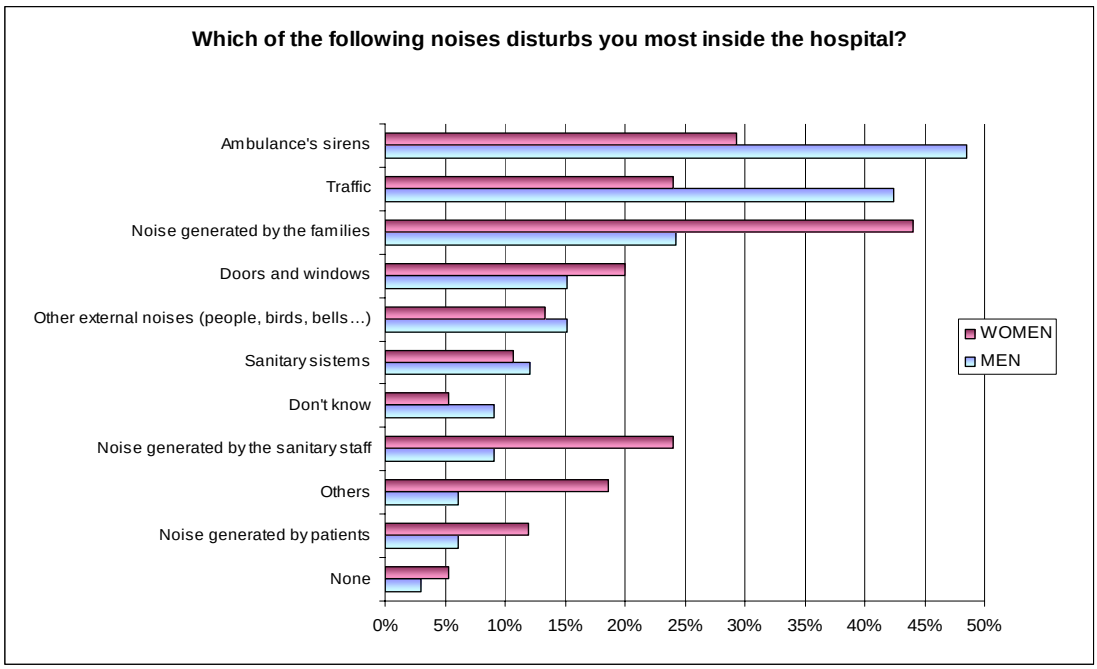
Graph 1. Grade of inconvenience produced by sounds inside the hospitals.

Several questions were done on the ambient sound inside the hospital, as shown in the next graph.



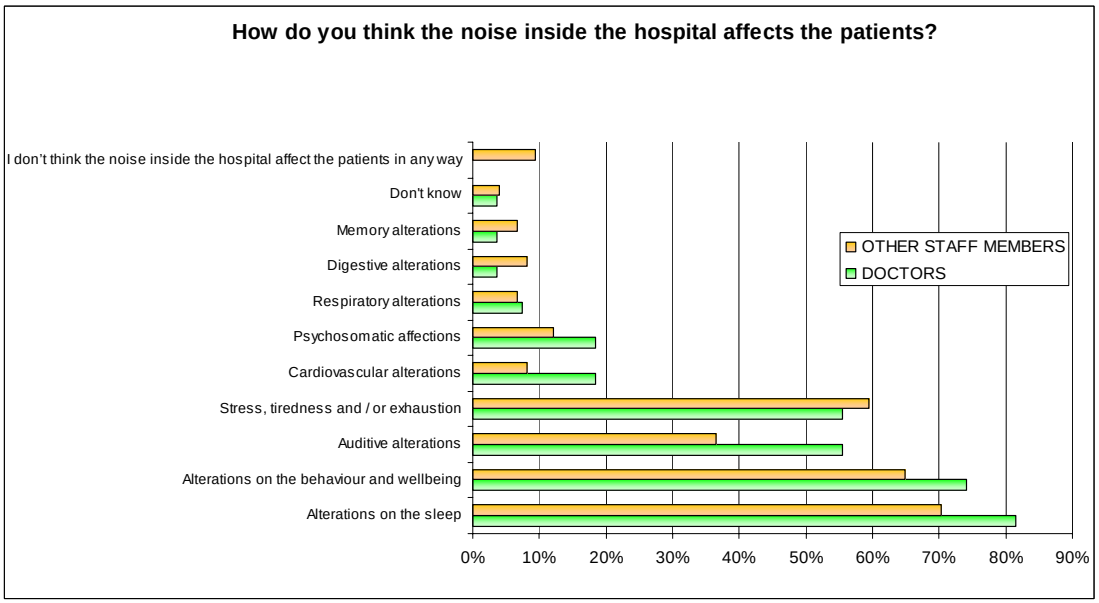
Graph 2. Ambient sound inside the hospital during day time.

Analyses by sex were done, as showed on the following example.



Graph 3. Annoying noises inside the hospital by sexes.

Analyses differentiating between doctors and other sanitary staff were done.



Graph 4. How does the hospital noise affect patients?

CONCLUSIONS

The most heard and most disturbing sound inside the hospitals is traffic, generated mainly by buses and the ambulances' sirens.

After the traffic, the second most disturbing noise is made by the families of the patients. In addition, the noises made by the cleaning and maintenance, carts and trolleys, telephones, and shouting in the halls also stand out.

Analysing the answers by sexes, the following results were obtained:

- Men are more disturbed than women by traffic and ambulances' sirens.
- Women are more disturbed than men by the noises produced by families and sanitary staff.

The areas more recommended to carry out an acoustical treatment are:

- Therapy areas.
- Refreshment rooms and bars.
- Magnetic Resonance, X-Rays, and Dialysis Rooms.

Nearly half the staff of the hospital considers that their work is especially noisy. This fact is significant since a hospital should be an especially quiet area. There are more doctors than nurses or administrative staff that consider their work especially noisy (59.3% compared to 39.7%). It is a matter of great seriousness that only 7.8% of the staff considers that the ambient sound is soft or cannot be heard. Moreover, it is predominantly more disturbing during day than night.

It is outstanding the difference that exists between the quantity of general population that believes that can get used to noise (50.1%) compared to the medical population (33.3%). This difference is due, mainly, to the knowledge of the effects of noise. This fact demonstrates, once again, the necessity of educating and increasing the general population's awareness about the noise effects.

Noise is of great importance for the population, but even among the medical population there is still a big ignorance of the problems it causes, how to act, its effects, the current legislation, and the immediate solutions, as the following data demonstrate:

- Practically all the polled population (96.5%) considers noise an important problem for the life quality, as well as the non-medical population (95.2%). In other researches of other social groups, this ratio is in the range 80% to 85%.
- The majority of those polled (89.2%) has never presented a claim to any authority or institution related to bothering noises. However, a higher number of doctors than other staff members have presented claims related to noise (18.5% compared to 5.9%).

- 80% of the population believes that the competent authorities do not fight adequately the noise problem, while 87% ignores the current legislation on environmental noise, which is a contradiction. These data suggest that a bigger spreading of the current legislation needs to be done. The doctors who claim to know the law on environmental noise is higher than the rest of the staff (15.4% compared to 2.7%).
- 57% of those polled would be willing to work far from their homes if the work place was less noisy. 63.3% of men prefer a quite work although it is not close to their homes, while only 54.8% of women do. There is not a big difference between doctors and the rest of the staff.
- The majority of those polled (71.3%) believes that population should be educated to develop their activities without producing annoying noises.

According to the polled population, the most effective policies to fight against noise are:

- To educate workers, patients, and families to develop their activities without generating an excessive noise.
- To inform periodically the citizenry of the noise levels it is exposed to.

The concrete measures that outstand in order to reduce the noise level in hospitals are:

- To fine those vehicles that produce high noise levels. This measure is erroneously generalized because the optimal solution is to inform and increase the awareness of citizens.
- To divert heavy traffic. It is outstanding the difference between women and men (34.2% compared to 6.1%) that propose to divert the circulation of heavy vehicles to other less sensible areas.
- To regulate the families' visits.
- To restrict the visits time.

The hospital staff, excepting the doctors, would be stricter with the visiting regimen, in order to reduce the noise.

The noise effects suffered sometime by those polled, are the following:

- Decrease of concentration and performance.
- Agitation.
- Difficulty to fall asleep.
- Increase of aggressiveness.
- Decrease of the sleeping hours.

Another important fact is the knowledge of someone's own illnesses or auditive damages is only 4.5% of those polled. This fact is quite distant of the 15% - 20% population generally affected by those illnesses declared by the World's Health Organisation. However, the more common illnesses or auditive damages among those polled are:

- Deafness (Hipoacusias).
- Tinnitus.
- Otoacoustic Emissions.

Due to the fact that only 18.6% of those polled were administrative staff, the immense majority of the staff is medical-sanitary staff. This together with the fact that 80% has been working in the hospital more than 4 years, gives the opinions of the noise effects, a medical nature. According to the medical staff, the noise affects the hospital patients in several ways:

- Alterations on the sleep.
- Alterations on the behaviour and wellbeing.
- Stress, tiredness, and exhaustion.
- Auditive alterations.
- Psychosomatic conditions.
- Cardiovascular alterations.
- Other alterations.

REFERENCES

J.M. Fields. "Effects of personal and situational variables on noise annoyance in residential areas". Journal of the Acoustical Society of America, 93, 2753-2763 (1993)

J. Katz. *Handbook of Clinical Audiology*. Baltimore, ML: Williams & Wilkings, 4th ed. (1994)

C. Martimportugués Goyenechea, J.M. Canto Ortiz. "Creencias ambientales y coste social del ruido de ocio". Revista de Acústica. Vol. 36 Nos 3 y 4.

G. Sommerhoff Hyde. M. Recuero López. "Community Noise Survey of the City of Valdivia". Applied Acoustics Vol. 5, 1-6, (2004). Elsevier, England.

Others:

Guidelines for Community Noise. Geneva, Switzerland: World Health Organization (WHO, 1999)

ISO/TS 15666:2003, *Acoustics-Assessment of noise annoyance by means of social and socio-acoustic surveys*. Group Assessment of Exposure to Noise (WG-AEN, 2003).