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# Recreational noise: Impact and costs for annoyed residents in Milan and Turin☆

Elisabetta Ottoz[a,*], Lorenzo Rizzi[b], Francesco Nastasi[b]

[a] University of Turin, Italy
[b] Suono e Vita, Italy

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ABSTRACT

European cities are experiencing a particular type of noise pollution originated by recreational activities located in the city centers, both anthropic noise, created by the presence of hundreds of people in the "movida" streets at night, and outdoor music due to events or simply related to public places. In spite of the annoyance experienced by the people living in these areas, the phenomenon has been poorly investigated so far. The paper presents in the first part the results of a self-selected Italian sample obtained through a web based questionnaire aimed at threading some light on the nature of the problem, in particular: identification of the most concerned areas, characteristics of the people complaining and evaluation of economic, health and everyday life consequences. In the second part it shows the results of sound level measurements for environmental noise evaluation which have been carried out in critical areas of Turin and Milan in order to give a technical basis to the subjectively reported annoyance and for a numerical evaluation of the problem.

## 1. Introduction

Noise pollution adversely affects the lives of millions of people with serious consequences on their health. According to the World Health Organization in the Report "Burden of disease from environmental noise" [22]:"*One in three individuals is annoyed during the daytime and one in five has disturbed sleep at night because of traffic noise. Epidemiological evidence indicates that those chronically exposed to high levels of environmental noise have an increased risk of cardiovascular diseases such as myocardial infarction. Thus, noise pollution is considered not only an environmental nuisance but also a threat to public health. The results indicate that at least one million healthy life years are lost every year from traffic related noise in the western part of Europe. Sleep disturbance and annoyance, mostly related to road traffic noise, comprise the main burden of environmental noise*".

The most common sources of noise pollution, and consequently those which have been mainly investigated, are related to traffic and industrial activities [17]. However, in the last three decades European cities have been affected by a particular type of noise pollution stemming from recreational activities generally located in the city centers, the so-called "movida",[1] which is the heart of the night time economy, considered by the local authorities as a means of revitalizing urban areas. It is a very complex phenomenon carrying high potentials in terms of social and economic benefits, but also problems related to the impact of alcohol on crime and disorders, coupled with public nuisance caused by recreational noise pollution. See [1,8,23].

In spite of its importance, the phenomenon has been poorly investigated so far [15]: recreational noise is not even mentioned in the EEA Report, Noise in Europe 2014 [2], where environmental noise is defined as "unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic and from sites of industrial activity".

The paper intends to address the issue studying the impact on people living in the affected areas by using two different means of analysis.

The first one presents the preliminary results of an on-line questionnaire whose aim was to describe characteristics and problems experienced by the residents referring to be disturbed by recreational noise in Italian "movida" districts, especially in Milan and Turin. It consists of questions on living conditions, life quality in the area,

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* Corresponding author at: Department of Economics and Statistics Cognetti de Martiis, Lungo Dora, Siena 100A, 10153 Turin, Italy.
*E-mail addresses:* elisabetta.ottoz@unito.it (E. Ottoz), rizzi@suonoevita.it (L. Rizzi), nastasi@suonoevita.it (F. Nastasi).

[1] "Movida"is a Spanish term originally identifying the social and cultural climate that took place first in Madrid, and then in other spanish cities, during the transition after Francisco Franco's death in 1975. This hedonistic cultural wave was characterized by freedom of expression, transgression of the taboos imposed by the Franco regime and a new spirit of freedom on the streets. By extension it is now used to refer to recreational night activities.

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characteristics of noise annoyance (sources, time slots, intensity and frequency), self-reported health effects due to sleep disturbance, costs sustained by people in the attempt to mitigate or solve the problem, estate devaluation, attitudes, reactions and general information on the respondents.

The second part of the paper is aimed at giving a technical basis and a first numerical evaluation to the subjective annoyance reported by the questionnaire. Sound pressure level (SPL) measurements for environmental noise evaluation have been carried out in central areas resulting as particularly critical from the questionnaire, three in Milan (Navigli, Città Studi and Brera) and three in Turin (San Salvario, Vanchiglia, Piazza Vittorio).

A final section discusses some achievable urban planning actions to deal with the "movida" challenge.

## 2. Methodology

### 2.1. The structure of the questionnaire

The target population of this work is the group of residents annoyed by recreational noise. The paper presents the results of an unrestricted, self-selected survey, which gave rise to a convenience sample, obtained through an on-line questionnaire [5]. This methodology was used as the problem of "movida" annoyed residents is an example of hidden population: recreational noise presents, in fact, a very scattered situation which is difficult for researchers to access and the disturbance experienced by two neighbors may be very different [6].

The results highlighted in this paper do not, then, describe the overall situation in "movida" districts, but are intended to explore the relevant issues for annoyed residents. The questionnaire, promoted through Anti-Noise sites, associations of residents and word of mouth advertising, is available in Italian at https://is.gd/rumore.

It is divided in seven sections:

(1) basic demographic information;
(2) respondents' houses characteristics and district conditions in terms of safety, sanitary conditions, facilities, transportation, leisure as referred by interviewees;
(3) night environmental noise annoyance explored through questions investigating the most frequent causes, the frequency and intensity of the phenomenon;
(4) every-day life consequences such as forced week-ends or house renovation;
(5) self-reported health consequences of sleep deprivation;
(6) economic and social consequences;
(7) solutions' attempts.

In the paper the following data were utilized from the questionnaire.

Data stemming from Sections 1 and 2 constitute the socio-demographic variables including gender, age, education level, working activity, geographical distribution, as well as the presence of bedrooms exposed to, either street or courtyard, noise at night and the number of late night bars and pubs (closing time after two o' clock a.m.) around the residents' home within 20, 50 and 100 m, which are suitable indicators of recreational noise impact.

In Section 3 data were filtered by an item of the questionnaire asking: "In the last twelve months your night rest has been disturbed by recreational noise?" If the respondent answered "No", the questionnaire was over: the "yes" answers gave access to the subsequent sections. Noise annoyance in the previous twelve months has been investigated for four different time slots: daytime, (07–19 h), evening, (19–23 h), night, (23–03 h) and late night, (03–07 h). The annoyance scale ranges from 1 to 5, where 1 means no disturbance and 5 maximum disturbance, which heavily interferes with current activities.

Section 5[2] has been devoted to the relationship between sleep deprivation due to night noise pollution and perceived health effects. In particular, the consequences on cardiovascular diseases are considered by asking if the respondent or some other member of the family were affected by tachycardia and hypertension. In the same way stress related problems are inquired by asking if somebody in the family had experienced concentration problems such as insomnia, irritability or anxiety. In case of affirmative answer a question checked for prescriptions by a doctor.

In Section 6 the feeling of a negative impact of a depreciation of real-estate value has been investigated by asking if the respondent considered the possibility to move house, requested an appraisal or tried to list it.

Costs sustained by respondents, such as soundproofing, double-glazing, house renovation, forced week-ends, legal actions and sound level measurements, are then analyzed. Sound proofing and double-glazing are rather self-explanatory; renovation usually refers to the attempt to mitigate the problem by moving the bedroom in the quietest part of the apartment, usually in the kitchen. The climax gained by movida on Friday and Saturday nights justifies the item concerning the need for forced weekends. Sound level measurements are a means to prove noise disturbance in case of legal actions.

The negative impact of recreational noise on residents' welfare has been tested[3] in terms of willingness to pay by asking: "if the local authorities proposed a credible and costly plan to reduce "movida" noise, would you agree to contribute?"

All items of Section 7 enumerating the various strategies used by residents to react to the noise disturbance have been reported. They concern: contacts with customers, managers, local police, police, local authorities, media, legal actions and citizens' Associations.

### 2.2. The noise paths in the buildings

Three typical noise paths can be picked out: noise entering through the building façade from the street, noise coming directly through the building structure because of poor sound insulation and poor limitation of the audio system and noise coming from the back of the building where often the service machinery is installed. In the case of "movida" or outdoor music, the first case is the most frequent and has been worsened by smoking prohibition inside the premises. The other two paths are also present depending on many factors (geometry, local noise permit rules, type and age of building, etc.); low frequencies diffusion through the building structure is particularly serious when discos or late night pubs are located in the building itself.

### 2.3. The sound measurement settings

Sound pressure level (SPL) sample measurements for environmental noise evaluation have been carried out between 2015 and 2016 in the apartments of a few families who had answered the questionnaire. The apartments are located in central areas resulting as particularly affected by recreational noise, three in Milan (Navigli, Città Studi and Brera) and three in Turin (San Salvario, Vanchiglia, Piazza Vittorio).

The SPL measurements started at 23.30 up to late night in order to

[2] Section 4 has not been used in the paper

[3] The negative impact of recreational noise on residents' welfare, both on physic and psychological wellbeing, is quantified by the means of two approaches: the revealed preferences and stated preferences.In particular, to evaluate the impact of noise in monetary terms, the starting point in environmental economics is the notion that welfare variations may be interpreted as utility variations. Two measures to read utility variations in monetary terms are used in economics: compensatory and equivalent variations. Quantitative variations may be expressed as the willingness to pay (WTP) or as the willingness to accept compensation (WTA). The WTP is the highest price an individual is willing to pay for some good or service, which, in our case could be represented by a marginal reduction in decibel level. The WTA is the lowest sum an individual is willing to accept in order to bear a cost, in our case an increase in the noise level [9,18].