

## Original Research Article

### **Measurement and Analysis of Noise Levels: A study of Selected Pubs in Calabar, Nigeria**

#### **Abstract**

This research involves the assessment of noise levels in pubs operating in Calabar, Nigeria, to investigate their compliance with the permissible noise level recommended by the National Environmental Standards and Regulations Enforcement Agency, Nigeria. A Bam and Kom (BK) Precision 732 digital sound level meter placed on a tripod was used for noise level measurement of noise levels for three consecutive months, from 6:00pm to 10:00pm. The measured data were subjected to descriptive statistics and the results were presented in graphs, bar chart and in a tabular form. Average equivalent noise level obtained for pubs A, B, C, D and E were 86.5dBA, 75.7dBA, 75.9dBA, 90.0dBA and 81.9dBA, respectively. Results show that all the pubs under study were in excess of the permissible noise level recommended by NESREA.

**Keywords:** Noise, Noise levels, Noise pollution, Calabar, Pubs

#### **Introduction**

Noise pollution is the elevation of natural ambient noise levels due to sound-generating human activities, which may have detrimental consequences to humans and animals. It is an unwanted sound that constitutes nuisance to the environment [1] and ranks third as the most hazardous form of pollution behind air and water pollution [2]. The Environmental and epidemiological consequences of noise pollution are chronic and has widespread complications in the long run [3]. It has been suggested that 12% or more of the global population is at risk of hearing loss from noise, which equates to well over 600 million people [4].

Road traffic and industrial noise has been studied extensively [5-15], but only a few researchers have looked into leisure noise. For instance, in [16], the authors conducted a prospective cross-sectional study, measuring noise levels in 43 bars, restaurants, and music clubs in Mekelle, Ethiopia. The measurements

were done between 10:00 pm and 12:00am in each of the selected houses. The study showed mean loudness of 97dB for 10:00 pm and 101dB for 12:00am, with a standard deviation of 3 dB and 7 dB, respectively. The maximum loudness measured was 107 dB and 108 dB, respectively. The authors suggested that regional and national regulations be placed to limit noise exposure during leisure in Ethiopia.

In [17], the researchers analyzed long term noise indicators and time based patterns of noise in different areas, trying to establish conclusions that can be helpful to other areas of the city and testing the applicability of previous leisure noise models for the city of Málaga. The results showed that the noise levels in the leisure areas in Málaga are quite high at night ( $L_n$  over 60 dBA in almost every location), especially during weekend nights, where they observed locations with noise levels over 75–80 dBA until late hours of the night. They also made an analysis of the leisure noise models proposed in previous investigations and their performance in the case of Málaga, Spain.

The authors in [18] worked on an exploratory large-scale noise survey of sound levels of 2376 restaurants and bars in New York city using a novel smart-phone application and categorized them based on how quiet or loud they were. The results suggested that a significant number of venues have high sound levels that are not conducive to conversation and may be endangering the health of patrons and employees. Furthermore, the reported sound levels by the venue managers on their online public business pages underestimated the actual sound levels and the average sound levels in restaurants and bars were correlated by neighbourhood and type of cuisine.

Noise pollution has been an issue of concern globally. In Nigeria, the Federal Ministry of Environment, through the National Environmental Standards and Regulations Enforcement Agency (NESREA), had put up the National Environmental (Noise Standard and Control) regulations. The purpose of these

regulations is to ensure maintenance of a healthy environment for everyone in Nigeria, the tranquility of their surroundings and their psychological well-being by regulating noise levels and generally, to elevate the standard of living of the people by - prescribing the maximum permissible noise levels a facility or activity to which a person may be exposed; providing for the control of noise and for mitigating measures for the reduction of noise [19].

This research work measures and analyzes noise levels in five pubs in Calabar, Nigeria. The results of the analysis are compared with the recommended noise threshold for leisure noise, as stipulated by the National Environmental Standards and Regulations Enforcement Agency. The result of the study will serve as a guide for the control of noise pollution in pubs operating in Calabar, Nigeria.

## **Methodology**

### **Equipment used for data collection**

A Bam and Kom (BK) Precision 732 digital sound level meter equipped with 4 digits Liquid Crystal Display (LCD), a condenser microphone and an octave filter was used in the recording of noise levels. It has a resolution of 0.1 dB and an update cycle of 0.5 second. The system provides 30 to 130dB capability in three convenient measurement ranges. The ranges are low (30 to 80 dB), medium (50 to 100 dB) and high (80 to 130 dB), with an accuracy of  $\pm 1.5$  dB. The meter meets the International Electrotechnical Commission (IEC) 651 Type II standard and includes frequency weighting of A and C and fast and slow time weighting. The A-weighting was used because of its recommendation for environmental and industrial studies [14, 20]. A digital stop clock was used in the measurement of the time at which the noise levels were taken while a tripod stand was used in placing the sound level meter.

### **Data Collection**

Five major pubs were considered in this study, based on its peculiarity. The five Pubs were assigned the alphabets A to E for ease of identification. Pub A was Potomas, pub B was Success Villa, pub C was Paladium, pub D was Delve while pub E was Suya park. The noise meter was placed on a tripod stand at

a height of 1.5m. During measurements, the microphone was positioned in such a way that it is not in acoustic shadow with any obstacle in the field of the reflected waves. Maximum and minimum noise levels were collected from 6pm to 10pm at an interval of 5 minutes. Measurement was taken for three months, from October to December 2022.

### Data Analysis

For each pub, measured maximum and minimum values were averaged for each time interval for the period of 3 months. The average values for each time interval are analyzed in the form of tables, graph plots and bar chart. The average equivalent A- weighted continuous sound energy (dBA) of the pubs during the study period is then compared with the threshold for entertainment noise as stipulated by the National Environmental Standards and Regulations Enforcement Agency.

### RESULTS AND DISCUSSION

The results of this study are based on data collected in 5 pubs in the city of Calabar, Nigeria, over a period of 3 months. The data were subjected to descriptive statistics as displayed in the table, graphs and bar charts below.

TIME (HOURS)	PUB A	PUB B	PUB C	PUB D	PUB E
7:05PM	81.7	75.9	74.5	89.6	81.4
7:10PM	72.2	75.0	72.3	88.8	81.7
7:15PM	85.5	75.6	75.6	85.4	80.7
7:20PM	86.6	74.7	71.3	88.8	77.4
7:25PM	89.0	75.2	76.7	87.8	81.9
7:30PM	89.2	75.8	73.6	86.9	80.1
7:35PM	90.1	73.0	75.9	91.7	79.6
7:40PM	89.1	77.3	76.6	98.7	82.1
7:45PM	85.4	72.7	78.5	89.4	77.9
7:50PM	86.6	73.8	77.1	89.4	76.4
7:55PM	83.2	74.2	76.5	92.5	79.2
8:00PM	84.8	76.8	76.1	90.4	76.9
8:05PM	86.1	75.7	79.0	87.8	79.9
8:10PM	89.9	74.6	76.5	89.1	77.6
8:15PM	84.7	76.0	78.7	89.4	78.5
8:20PM	84.5	75.8	74.9	88.6	79.4
8:25PM	87.6	76.3	77.6	89.6	77.1
8:30PM	88.9	75.4	78.7	89.1	78.1
8:35PM	87.9	78.1	79.6	89.8	77.6
8:40PM	86.9	76.5	77.2	91.4	80.1

8:45PM	91.6	76.5	76.5	89.5	76.7
8:50PM	89.5	74.1	77.5	90.2	83.5
8:55PM	79.5	73.3	78.4	90.0	87.4
9:00PM	87.7	75.5	77.5	91.4	85.9
9:05PM	87.0	74.2	78.8	89.9	84.6
9:10PM	89.1	74.6	74.9	88.9	86.2
9:15PM	85.6	75.6	73.8	89.7	86.7
9:20PM	87.4	75.7	77.0	90.4	85.5
9:25PM	88.4	74.4	76.2	89.7	86.1
9:30PM	84.8	78.1	61.1	91.2	85.3
9:35PM	87.6	79.0	69.3	92.7	84.4
9:40PM	89.7	79.1	77.2	89.6	87.2
9:45PM	87.2	78.3	76.1	90.6	88.7
9:50PM	84.9	74.1	77.1	89.3	84.2
9:55PM	86.1	75.3	77.5	89.5	87.2
10:00PM	87.1	79.6	76.9	92.9	83.4

Table 1: Mean values of Noise Levels from October to December 2022

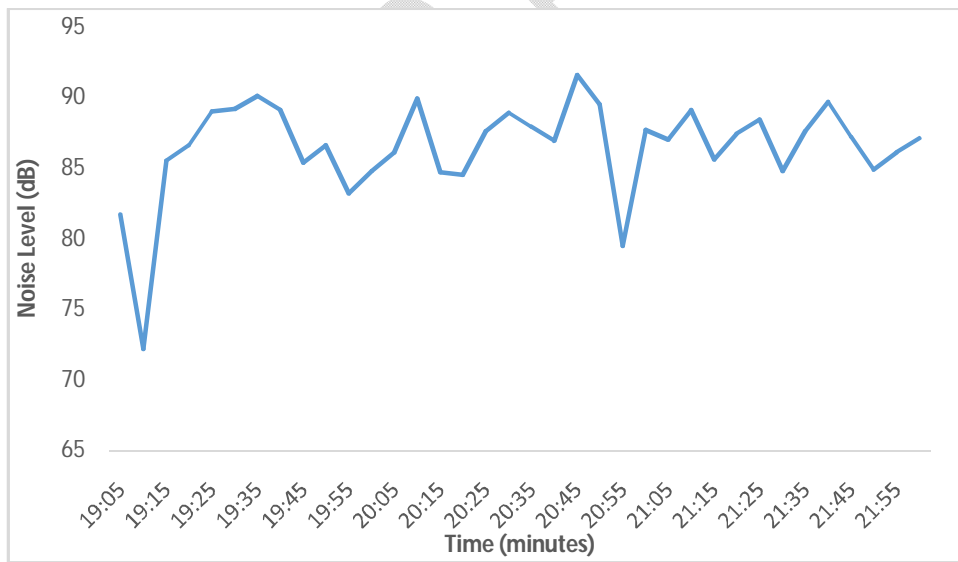


Figure 1: Plot of Average Noise Level against Time for Pub A

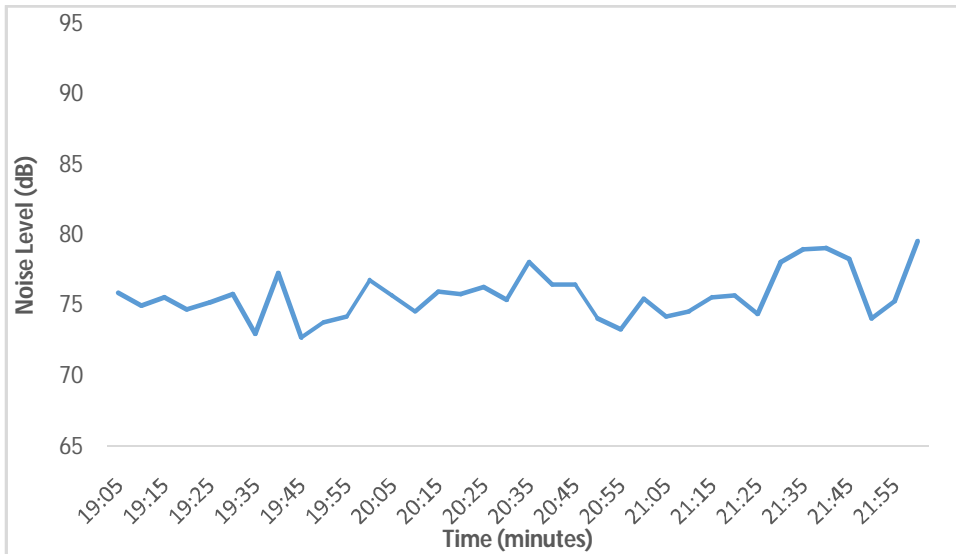


Figure 2 . Plot of Average Noise Level against Time for Pub B

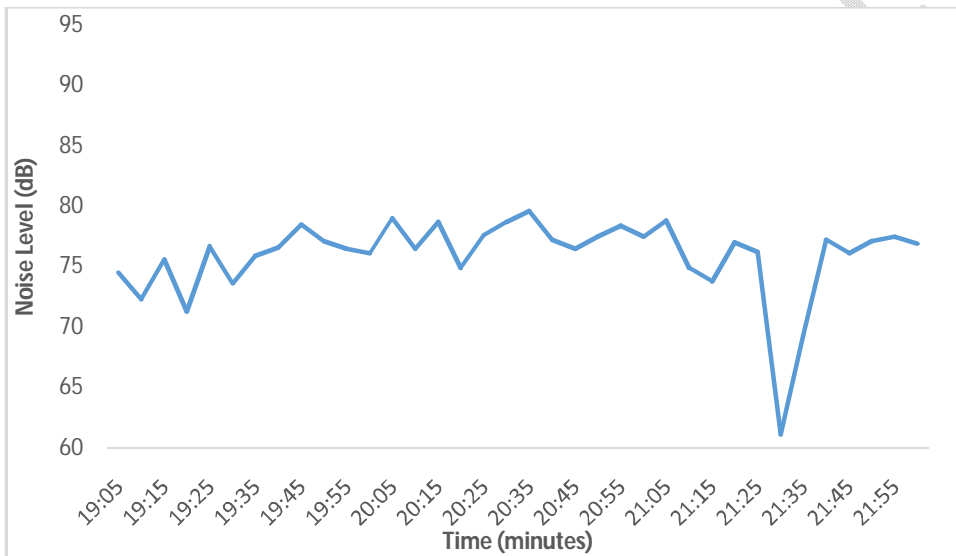


Figure 3: Plot of Average Noise Level against Time for Pub C

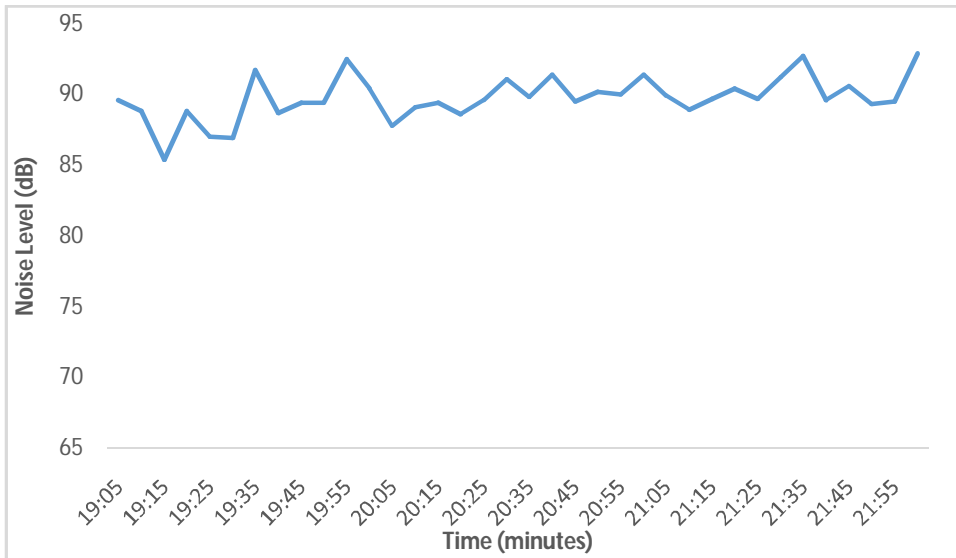


Figure 4: Plot of Average Noise Level against Time for Pub D

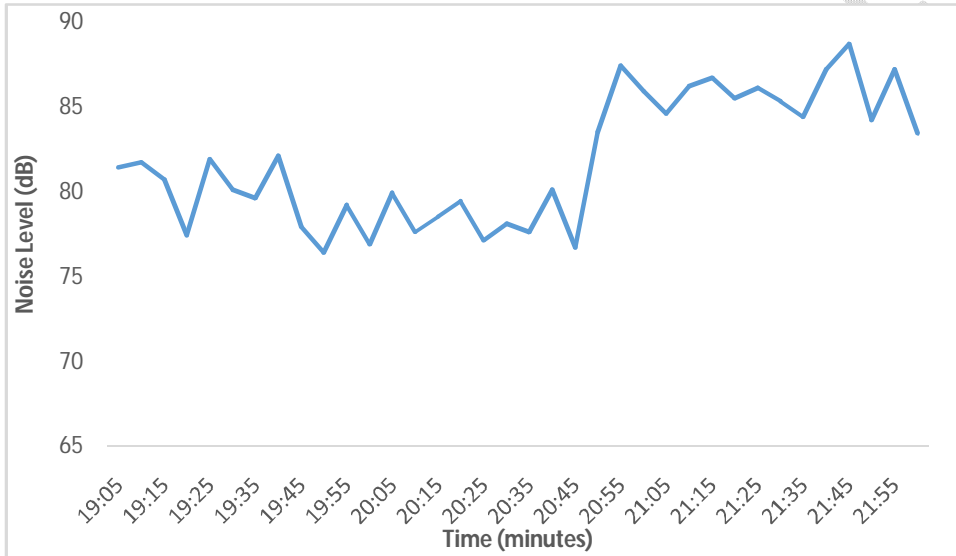


Figure 5: Plot of Average Noise Level against Time for Pub E

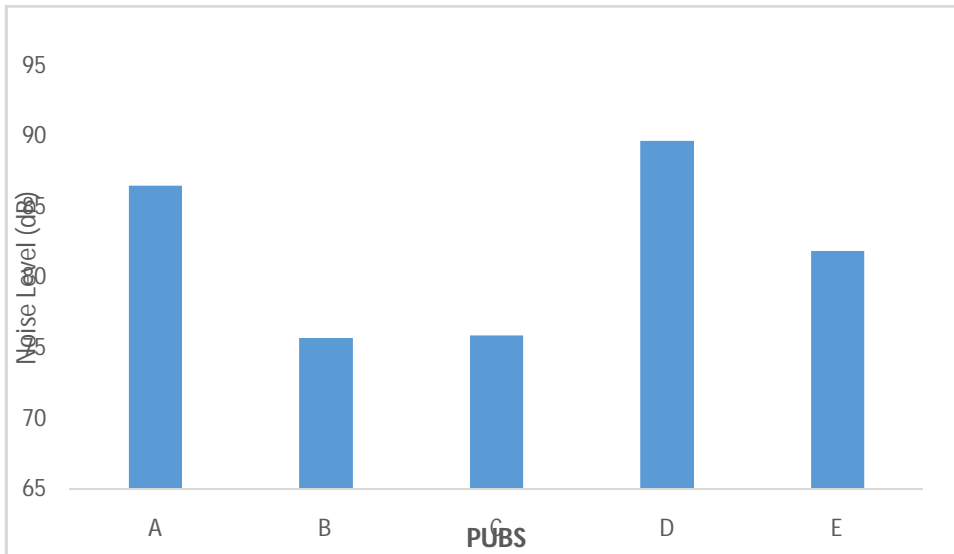


Figure 6: Average value of Noise Levels for the five Pubs under study

In pub A, noise sources were from the generator, interactions, music, car horns and stage entertainment. The average noise trend is shown in figure 1. The minimum average noise level was 72.2dB at 7:10pm while the average maximum noise level was 91.6dB at 8:45pm.

In figure 2, the noise levels in pub B has been plotted. The minimum average noise level was 72.7dB and was observed at every 7:45pm. The maximum average noise level was 79.6dB at 10:00pm. The sources of noise in this pub were from interactions, generator and road traffic noise due to the proximity of the pub to the highway.

Pub C had its noise source from a nearby pub that shared the same fence with it. The maximum average noise level was 79.6dB at 8:35pm. It was observed that at every 9:30pm, when the nearby pub stopped its music momentarily, the noise level was minimum at this time. Hence, at 9:30pm, minimum average noise level was 61.1dB. This is described in figure 3 above.

Noise levels in pub D is displayed in figure 4. The minimum and maximum average noise levels were 87.0dB and 92.9dB at 7:25pm and 10:00pm, respectively. The noise level from the music source was so loud that one could loudly hear conversations with each other.

In pub E, noise sources were from suya buyers, interactions, and music. As displayed in graph E, maximum noise level was 88.7dB and 76.4dB at 9:45pm and 7:50pm, respectively.

Furthermore, figure 6 represent averages of noise levels measured in for each pub under study. Noise level was found to be highest at pub D, then pub A, followed by pub E, C and B. The mean noise level at pub A was 86.5dB, 75.7 for pub B, 75.9 for pub C, 90.0 for pub D and 81.9 for pub E. Values of standard deviation computed to check the spread of data points around the mean were low. This means that the set of data clustered around the mean. The standard deviation values obtained for the pubs under study were 3.47dB for pub A, 1.71dB for pub B, 3.35dB for pub C, 2.12dB for pub D and 3.75dB for pub E.

## CONCLUSION

The purpose of this study was to identify if pubs operating in Calabar, Nigeria, comply with the permissible noise level recommended by the National Environmental Standards and Regulations Enforcement Agency. Results shows that pubs A, D and E were in excess of the permissible noise level while pubs B and C were slightly in excess of the permissible noise level.

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