



ENVIRONMENTAL POLLUTION AS HEALTH DEPRECIATOR: THE CASE OF HOUSEHOLD GENERATOR USE IN NIGERIA

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ABSTRACT

The peculiarities of poor electricity generation and distribution which has resulted in high reliance on generators is implicated in the profile of Nigeria's environmental pollution situation. Still, the consequences of the pervasive use of generators on health is yet to be optimally captured empirically, and macro-wise. Hence, this work was designed to examine correlations between generator use and some selected indices of health depreciator. Cross national, secondary data used were extracted from the 2018/19 Nigerian General Household Survey Panel Component (the 2018/19 GHS-Panel). Data on generator use and some selected indices of ill-health were subjected to descriptive and Spearman rank correlational analysis. Results indicated that generator is owned in 24.6% of Nigerian households. Only 55.4% of households have access to electricity; 11.3% and 12.4% of them primarily and secondarily rely on generators respectively. Male and female respondents reporting any health problem was 22.6% and 22.5% respectively, of which only 20.5% consulted a health practitioner. Respondents reporting drug purchase were 28.8%. Primary reliance on generator significantly and positively correlated with consultation with health practitioner ($r = .879$, $p < 0.05$), female health problems ($r = .862$, $p < 0.05$), drug purchase ($r = .700$, $p < 0.05$), cost of medication ($r = .700$, $p < 0.05$), male health problems ($r = .667$, $p = 0.05$) and cost of consultation ($r = .667$, $p = 0.05$). On the other hand, the use of generator as a secondary or other source of electricity is only significantly and positively related to cost of medication ($r = .733$, $p < 0.05$) and drug purchase ($r = .717$, $p < 0.05$). Generators are leading assets whose use is becoming a significant element of the Nigerian way of life. Marginal or zero reliance on generator for access to electricity would have kept the Nigerian people healthier than they are currently. Certainly, generator use is a vast sponsor of ill-health and a vicious depreciator of health in Nigeria.

KEYWORDS: Generator, Health, Health practitioner, Health problems, Drug purchase, Cost of medication.

INTRODUCTION

Apart from resource depletion, environmental pollution is another major threat of human activities against environmental sustainability. Environmental pollution is when "a substance occurs in a location ... at higher levels than normal" (Rieuwerts, 2017).

Pollution degrades environmental quality, and this occurs globally because the sources of pollutants are diverse and dependent on peculiarities.

In more advanced societies, environmental pollution has assumed a pivotal subject of concern. The same cannot be said of the situation in developing countries like Nigeria where concern over

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environmental pollution only became palpable in the last two decades (Asubiojo, 2016). This concern was hitherto limited to sanitation matters, showcasing ignorance in governmental quarters. An exemplification of this ignorance is the assumption that environmental pollution was a phenomenon arising from the manufacturing sector alone (Ibhadode, 2016).

In addition to poor concerted efforts against pollution in developing countries like Nigeria, infrastructural deficit creates huge gap in electricity supply (Azodo, Idama, Mezue, and Owoeye, 2018) Nigeria's poor electricity supply is indeed, critical (Giwa, Nwaokocha and Samuel, 2019). Being an important element of modern life, alternative to electricity supply is typically sought when the appropriate source of accessing it is not feasible. In Nigeria, only 55.4% of households have access to electricity. Out of these households, 85.4% and 11.3% rely on the national grid and generators as the primary source of electricity respectively (National Bureau of Statistics, 2019). Another 12.4% of households count on generators as secondary source of electricity (Ibhadode, 2016). Hence the ubiquity of generators in Nigeria. Adeleru-Balogun, (2019) asserted that there are between 22 and 60 million small, domestic-use generators in Nigeria. Similarly, Giwa, Nwaokocha and Samuel, (2019) asserted that there are over 50 million units of generating sets in Nigeria. Nigeria spent over N1.3 trillion in four years purchasing generators, and has become the biggest importer of generators in the world (Adesina, 2012). Akindede and Adejumbi (2017) reported that power outage is experienced by 81% of respondents in Ogbomoso, southwestern Nigeria, leading to widespread use (78.6%) of electric generators. Indeed, the use of generators is almost indispensable in the current Nigerian community. generators are powered using fossil fuels such as gasoline and diesel which are reputed for discharging pollutants such as carbon monoxide, oxides of nitrogen, oxides of sulphur, carbon dioxide, particulate matters (PM_{2.5} and PM₁₀) into the environment.

The growing middle class in the Nigerian society amplifies the demand for generators. Discourses on generator use have typically acknowledged its negative health consequences. Adesina, (2012) contended that the use of generator is typically prolonged in Nigeria and affords noise and air pollution. Moreover, several lives have been lost as a result of inhaling generator's fumes or experiencing electric shocks as a result of it use. Besides, the domestic storage of diesel and petrol to power generators as a result of/ during scarcity of the products sometime makes people vulnerable to fire disasters. The pervasive use of generators adds to the various other sources of pollution from industries and transport systems, to catalyze the deterioration of ambient air quality (Giwa, Nwaokocha and Samuel, 2019). Okedere and Elehinafe, (2016) examined the emissions from diesel fueled generators used at base transceiver stations (BTS) of

telecommunication industries in Lagos, Nigeria and reported that the potential health impact of mean ambient concentration of total suspended particulate (TSP) ranged from 1.5% – 20.4% for all causes of death and from 7.1% – 98.9% for deaths resulting from respiratory diseases. In their study in Sango, Ogun State, Southwestern Nigeria, Giwa, Nwaokocha and Samuel (2019) found that average concentrations of CO and PM_{2.5} at 0.3–0.5 meters from the exhaust pipe of gasoline-powered household generators were 230.00% and 231.76% higher than the recommendations of the World Health Organization respectively. These discourses and findings lack macro-coverage and empirical character in some instances. Analysis of nationally representative information is sine-qua-non in designating the menace of generator use and broadened indices of health in Nigeria. This work attempts to fill the lacuna in the literature by examining correlations between generator use and some selected indices of health, using some of the findings of the 2018/19 Nigerian General Household Survey panel component (National Bureau of Statistics, 2019). The following research questions were answered:

1. What is the degree of ownership of generator in Nigerian households?
2. To what extent does generator serve as a source of household electricity in Nigeria?
3. What is the pattern of some selected ill-health indicators (reportage of any health problems, consultation with health practitioner, drug purchase and health expenditure) in Nigeria?
4. Are there significant relationships between household reliance on generator as primary or secondary source of electricity and ill-health indicators?

METHODOLOGY

This study is essentially an analysis of secondary data obtained from the report of the 2018/19 Nigeria General Household Survey panel component (the 2018/19GHS-Panel). This national survey was geared towards improving general household and agricultural statistics. It was conducted in conjunction with National Bureau of Statistics, the Federal Ministry of Agriculture and Rural Development, the National Food Reserve Agency, the Bill and Melinda Gates Foundation and the World Bank. Purposive sampling was used to draw approximately 5000 households across Nigeria's six geo political zones from GHS- Panel. The 2018/19 GHS-Pane is the fourth in the series of these surveys, the previous editions were conducted in 2010/11, 2012/13, and 2015/16. Spearman rank correlation coefficient was used to assess relationship between pairs of variables, using Statistical Package for the Social Sciences (SPSS) version 22.0.

RESULTS AND DISCUSSIONS

Ownership of generator in Nigeria

Information presented in table 1 shows that generator is owned in about a quarter (24.6%) of Nigerian households. The report of the 2018 Nigeria Demographic and Health Survey (NDHS) similarly shows that generator is owned in 28.5% of Nigerian households. Generators are mostly owned in households of the south-south (38.8%) and the south-east regions (37.8%). In these regions, generator is owned in up to 4 out of every 10 households. The degree of generator ownership is comparable in the north-central (25.3%) and the south-west (26.5%) regions, where generator is owned in up to 3 of every 10 households. Ownership

of generator is lowest in the north-east (9.5%) and the north-west (9.9%) regions, where generator is owned in 1 of 10 households. Generator ownership in rural Nigeria (20.1%) is strongly noticeable, showcasing that one can count on 2 of 10 households to use generator in rural communities. Expectedly, more generators are owned in urban households (34.4%). These distributions of generator ownership are about households only but generator ownership is beyond households. Oguntoke and Adeyemi (2017) asserted that generators are owned by over 90% of businesses in Nigeria. Certainly, generators are becoming frontline assets whose use is becoming culturally engrained in Nigeria.

Table 1: Ownership of generator in Nigerian households by geopolitical regions

Region	Percentage of households owning generator
North Central	25.3
North East	9.5
North West	9.9
South East	37.8
South South	38.8
South West	26.5
Urban	34.4
Rural	20.1
Nigeria	24.6

Source: Extracted from the report of the 2018/19 GHS-Panel (National Bureau of Statistics, 2019).

The role of generator in accessing electricity in Nigeria

The percentages presented on table 2 show the degree of reliance on generator in households reporting access to electricity. These households were only 55.4% of the total number of households interviewed. So, among the electricity-accessing households, 11.3% and 12.4% primarily and secondarily rely on generators respectively. Even in urban Nigeria, 6.3% of electricity-accessing households rely primarily on generators. Primary reliance on generators is highest in the south-south

(24.10%) and the south-east (20.70%) regions where generator is central to about a quarter and a fifth of electricity-accessing households. This reliance is lowest in the north-east (1.50%) and the north west (1.60%) regions. The south-east region (20.30%) is topmost in terms of secondary reliance on generator for access to electricity. Secondary use of generator, like the primary use of generator, is lowest in the north-east (4.20%) and the north-west (5.80%) regions. No wonder Nigeria has been said to be "running a generator economy" (Olayemi, 2012: 16).

Table 2: Generator as source of household electricity in Nigeria

Region	Percentage of households reporting generator as their primary source of electricity	Percentage of households reporting generator as 'other' source of electricity
North Central	4.50	11.00
North East	1.50	4.20
North West	1.60	5.80
South East	20.70	20.30
South South	24.10	14.70
South West	2.40	10.20
Urban	6.30	16.30
Rural	15.80	9.00
Nigeria	11.30	12.40

Source: Extracted from the report of the 2018/19 GHS-Panel (National Bureau of Statistics, 2019).

Pattern of selected health problem associated with use of generator in Nigeria

Reportage of any health problems

Male and female respondents reporting any health problem in the previous four weeks before the survey was 22.6% and 22.5% respectively. This reported health problem was highest in the south-east among males (30.6%) and females (38.9%) where roughly 3 and 4 of 10 individuals were said to have reported health problems respectively. Lowest proportion of reported health problems were recorded in the north-central among 14.6% of male and 17.1% of female respondents. It is also strongly noticeable that more women as opposed to men reported health problems. The proportion of reported health problems among males in the north-east (22.3%), north-west (22.0%), south-west (21.8%), and even in

urban (21.6%) as well as rural areas (22.9%) are very comparable. Similarly, the proportion of reported health problems among females in the north-east (22.3%), north-west (20.0%), south-west (23.1%), and in urban (24.4%) as well as rural areas (24.5%) are not so distant. These proportions generally indicate that about 1 in 5 persons (1 in every 4 in some instances) report one health problem or the other within a period of four weeks. Even in the north-central where the lowest proportion of reported health problems was recorded, more than a tenth of males and close to 2 of 10 females present with health challenge with four weeks. There is a high incidence of health challenges in Nigeria as a whole. The summary of the proportion of reported health problems is shown on table 3.

Table 3: Reportage of any health problems

Region	Percentage of male respondents reporting any health problems in the previous 4 weeks before the survey	Percentage of female respondents reporting any health problems in the previous 4 weeks before the survey
North Central	14.6	17.1
North East	22.3	22.3
North West	22.0	20.0
South East	30.6	38.9
South South	26.7	31.8
South West	21.8	23.1
Urban	21.6	24.4
Rural	22.9	24.5
Nigeria	22.6	24.5

Source: Extracted from the report of the 2018/19 GHS-Panel (National Bureau of Statistics, 2019).

Consultation with any health practitioner and drug purchase in Nigeria

The information contained on table 4 indicates that out of the 22.6% and 22.5% of male and female respondents reporting any health problem as discussed in the previous section, 20.5% consulted with a health practitioner (doctors, traditional healer, patent medicine vendor, etc.). Invariably, only about 2 of 10 persons reporting any health problem actually went ahead to seek professional help. This imply a poor level of health seeking behaviour in Nigeria. The highest proportion of consultation with health practitioner was recorded in the south-east (29.4%) and then the south-south (23.7%) while the lowest proportion was recorded in the north-central region (14.1%). Consultation with health practitioner is comparable in the north-east (19.4%), the north-west (19.4%) and the south-west (19.7%).

Table 4 also indicates that respondents reporting drug purchase of those reporting any health problem

were 28.8%. The highest proportion of drug purchase was recorded in the south-south (39.4%), followed by the south-east (39.0%) and then the south-west (38.3%). Drug purchasers were more in urban (31.3%) as opposed to rural (27.9%) areas. Although, the proportion of individuals who consulted health practitioner is the same in the north-east (19.4%) and the north-west (19.4%), the proportion of individuals who purchased drug is noticeably higher in the north-east (25.5%) than in the north-west (20.6%). Generally, people are more inclined to drug purchase when compared with their inclination to consult health practitioner. This is grossly a reflection of the Nigerian situation where community pharmacies have become settings of public health services (Enwelunta et al., 2019). Nigerians seeking care for malaria have also typically and largely patronized drug vendors (Isiguzo et al., 2014).

Table 4: Consultation with any health practitioner and drug purchase in Nigeria

Region	Individuals reporting consultation with any health practitioner (% of individuals reporting any illness)	Individuals reporting drug purchase (% of individuals reporting any illness)
North Central	14.1	23.2
North East	19.4	25.5
North West	19.4	20.6
South East	29.4	39.0
South South	23.7	39.4
South West	19.7	38.3
Urban	20.3	31.3
Rural	20.6	27.9
Nigeria	20.5	28.8

Source: Extracted from the report of the 2018/19 GHS-Panel (National Bureau of Statistics, 2019).

Health expenditure

The average cost of consultation among individuals who reported consultation with any health practitioner was ₦1,228 (70.2% reported that their consultation was cost-free). The highest cost of consultation was recorded in the south-south (₦1,715) while the lowest was in the north-central (₦990). Incidentally, rural dwellers spend more on consultation (₦1,258) when compared with urban dwellers (₦1,140). Generally, the average cost of medication was ₦1,677. Highest and lowest cost of medication was

recorded in the south-east (₦2,184) and the north-central (₦1,357) respectively. This is quite similar to the findings of Onwujekwe, Hanson and Uzochukwu (2012). that total household health expenditure per month was ₦2,354, but average monthly expenditure for outpatient services was ₦1,809. Considering that poverty is high in Nigeria and that cash unavailability is a barrier to accessing healthcare (Lagarde and Palmer, 2008), these costs of healthcare limits people enjoyment of health.

Table 5: Health expenditure

Region	Average cost of consultation (₦)	Average cost of medication (₦)
North Central	990	1357
North East	1015	1533
North West	1016	1594
South East	1479	2184
South South	1715	1760
South West	1590	1510
Urban	1140	1763
Rural	1258	1642
Nigeria	1228	1677

Source: Extracted from the report of the 2018/19 GHS-Panel (National Bureau of Statistics, 2019).

Relationships between household reliance on generator as primary or secondary source of electricity and ill-health indicators

The Spearman's r in table 6 showcase varying degrees of significant and positive correlation between primary reliance on generator and all the selected ill-health indicators across regions and sectors. The strongest correlation was with consultation with health practitioner ($r = .879$, $p < 0.05$) and this was closely followed by female health problems ($r = .862$, $p < 0.05$). Drug purchase and cost of medication yielded the same degree of correlation ($r = .700$, $p < 0.05$) with primary reliance on generator. Male health problems and cost of consultation also yielded the same degree of significant positive correlation ($r = .667$, $p = 0.05$).

Hence, the greater the primary reliance on generator for access to electricity, the greater the consultation with health practitioner, female health problems, drug purchase, cost of medication, male health problems and cost of consultation.

On the other hand, the use of generator as a secondary or other source of electricity is only significantly and positively related with cost of medication ($r = .733$, $p < 0.05$) and drug purchase ($r = .717$, $p < 0.05$). Therefore, the greater the secondary reliance on generator, the greater the cost of medication and the greater the drug purchase. These correlation coefficients have strongly impressed the idea that the status of human health would have been better with minimal or zero reliance, particularly primary reliance on generator for access to

electricity. Reports indicated that generator users strongly agreed that generator use was related to air-pollution (50.9%); noise-pollution (48.8%); sleep-disturbance (84.6%); hearing loss (67.1%); ophthalmic problems (45.0%) and difficulty in mental-concentration (88.8%). Akindele and Adejumobi

(2017) also reported that generator use significantly and strongly reduced residents' livability ($r=-.811$, $p=.000$). Indeed, generator use is a huge contributor to ill-health and a wanton depreciator of health in Nigeria.

Table 6: Relationship between pairs of generator-use and ill-health indicators

Ill-health indicators		Generator as primary source of electricity	Ill-health indicators		Generator as other source of electricity
Male health problems	Spearman's r p value	.667* .050	Male health problems	Spearman's r p value	.250 .516
Female health problems	Spearman's r p value	.862* .003	Female health problems	Spearman's r p value	.644 .061
Consultation with health practitioner	Spearman's r p value	.879* .002	Consultation with health practitioner	Spearman's r p value	.628 .070
Drug purchase	Spearman's r p value	.700* .036	Drug purchase	Spearman's r p value	.717* .030
Cost of consultation	Spearman's r p value	.667* .050	Cost of consultation	Spearman's r p value	.433 .244
Cost of medication	Spearman's r p value	.700* .036	Cost of medication	Spearman's r p value	.733* .025

Source: Computed from data extracted from the report of 2018/19 GHS-Panel (National Bureau of Statistics, 2019)

CONCLUSIONS

Generators are ubiquitous in Nigerian households and their use is becoming a way of Nigerian social life. Incidentally, there is a high commonness of health challenges in the Nigerian populace while health seeking behaviour is poor. Purchasing drugs is preferred to consulting with health practitioner, making community pharmacies to be an integral part of the health-seeking centers in Nigeria. The more Nigerians rely primarily on generator for access to electricity, the more people will record generator induced health problems, the more they will consult with health practitioner, the more will people purchase drugs, the more is the cost of medication as well as consultation. However, greater secondary reliance on generator will only increase cost of medication and drug purchase in Nigeria.

REFERENCES

- Adeleru-Balogun, T., 2019. 17/10/2019. Nigeria's ever-present hum (of generators). Daily Maverick. Accessed 15th March 2020 at: <https://www.dailymaverick.co.za/article/2019-10-17-nigerias-ever-present-hum-of-generators/>
- Adesina, O. S., 2012. The Negative Impact of Globalization on Nigeria. International Journal of Humanities and Social Science 2 (15):193-201.
- Akindele, O. A. and Adejumobi, D. O., 2017. Domestic Electric Power Generator Usage and Residents Livability Milieu in Ogbomoso, Nigeria. Environmental Management and Sustainable Development 6(1): 91-104.

- Asubiojo, O. I., 2016. Pollution Sources in the Nigerian Environment and their Health Implications. *Ife Journal of Science* 18(4): 973-980.
- Azodo, A. P.; Idama, O.; Mezue, T. C. and Owoeye, F. T., 2018. Evaluation and Analysis of Environmental Noise from Petrol Fuelled Portable Power Generators Used in Commercial Areas, *Journal of Experimental Research* 6 (1): 8-13.
- Enwelunta, I. G. D., Ogbonna, B. O., Odili, V. U., and Oparah, A. C., 2019. Health Promotion Activities by Community Pharmacists in Nigeria: A Narrative Review. *World Journal of Pharmacy and Pharmaceutical Sciences* 9(1): 20-47.
- Giwa, S. O.; Nwaokocha, C. N. and Samuel, D. O., 2019. Off-grid Gasoline-powered Generators: Pollutants' Footprints and Health Risk Assessment in Nigeria, *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, DOI: 10.1080/15567036.2019.1671555
- Ibhadode O.; Ibhadode P.; Okougba, A. F.; Umanah, I. I.; Aitanke, F. O.; Fiyebo, S. A. B., 2016. Hazards Assessment Analyses of Fossil-fuel Generators: Holistic-study of Human Experiences and Perceptions in South-Southern Nigeria. *Journal of Sustainable Development Studies* 9(2): 153-242.
- Isiguzo, C., Anyanti, J., Ujuju, C., Nwokolo, E., De La Cruz, A., Schatzkin, E., ... and Liu, J., 2014. Presumptive Treatment of Malaria from Formal and Informal Drug Vendors in Nigeria. *PLoS one*, 9(10): e110361.
- Lagarde, M. and Palmer, N., 2008. The Impact of User Fees on Health Service Utilization in Low Income Countries: How Strong is the Evidence? *Bulletin of World Health Organization* 86(11): 839–848.
- National Bureau of Statistics, 2019. LSMS Integrated Surveys on Agriculture: Nigeria General Household Survey Panel, Wave 4, 2019. Accessed 6th January 2020 from <https://www.nigerianstat.gov.ng/download/1030>
- National Population Commission NPC [Nigeria] and ICF. 2019. Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF.
- Oguntoke, O. and Adeyemi, A., 2017. Degradation of Urban Environment and Human Health by Emissions from Fossil-fuel Combusting Electricity Generators in Abeokuta Metropolis, Nigeria. *Indoor and Built Environment* 26(4), 538-550.
- Okedere O. B. and Elehinafe F., 2016. Particulate Pollution from Diesel Generators of Mobile Telecommunication Industries in Lagos Nigeria. *UNIOSUN Journal of Sciences* 1(1): 37- 40.
- Olayemi, S. O., 2012. Electricity Crisis and Manufacturing Productivity in Nigeria. *Developing Country Studies*, 2(4), 16-21.
- Onwujekwe O., Hanson, K. and Uzochukwu, B., 2012. Examining Inequities in Incidence of Catastrophic Health Expenditures on different Healthcare Services and Health Facilities in Nigeria. *PLoS ONE* 7(7): e40811. doi:10.1371/journal.pone.0040811
- Rieuwerts, J., 2017. *The Elements of Environmental Pollution*. Routledge.