

## Original Contribution

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# Behavioral Risk Factors for Non-Communicable Diseases in Three Most Populous Nigerian Urban Slums

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## ABSTRACT

**Background:** Non-communicable diseases (NCDs) are rapidly emerging public health challenges to urban populations in developing countries. The Nigeria Demographic and Health Surveys of 1990 and 2003 portrayed a worrisome picture of the risk factors for NCDs in the country, and despite this, there is still paucity of current and reliable data on the burden of these risk factors to guide state and national control programs. This study aimed at understanding the prevalence of major common NCD risk factors and their distribution pattern in three most populous urban poor communities in Lagos, south-west Nigeria.

**Methods:** A study on the behavioral risk factors for NCDs was carried out between June 2010 and October 2012 using Step 1 of the WHO STEPwise approach. It was a cross-sectional quantitative survey that made use of a semi-structured questionnaire containing both open-ended and close-ended questions. The study included 2,434 subjects, 18 years and older, and residing in the three selected slums.

**Results:** The prevalence of behavioral risk factors reflected the interplay of underlying socio-economic driving forces such as low education attainment where 372 (15.9%) people had no formal education, 71 were unemployed (3%), and 595 were on low incomes (25.3%). Poor consumption of fruits and vegetables, high consumption of fat and alcohol, low levels of physical activity, active smoking, and illicit drug use were observed.

**Conclusions:** The socio-demographic characteristics of the inhabitants of the urban poor communities make them vulnerable to known major risk factors for NCDs, given that the communities also had low level of educational attainment and low socio-economic status.

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## INTRODUCTION

Non-communicable diseases (NCDs) refer to diseases or conditions that occur in, or are known to affect, individuals over an extended period of time, and for which there are no known causative agents that are transmitted from one affected individual to another [1]. NCDs such as cardiovascular diseases (CVD) including hypertension and heart failure, diabetes, lung diseases, chronic respiratory diseases, cancer, mental health problems, asthma, atherosclerosis, and allergy combined with intentional/unintentional injuries are rapidly emerging public health challenges as about 72% of the total global burden of disease in adults thirty years or older are due to these chronic diseases [2-5]. In 2005, the World Health Organization (WHO) estimated that 61% of deaths (35 million) and 49% of the global burden of disease were attributable to NCDs [6,7]. It stated that 80% of chronic disease deaths are occurring in low and middle income countries (LMICs) already, and if the current trends continue, by 2020 these figures are expected to rise to 73% and 60% respectively, while by 2030 chronic diseases will account for 70% of total global deaths and 56% of the global disease burden. In the past, NCDs were termed diseases of the rich in the developed countries [8]. However, over the past two decades, CVD deaths have been declining in the high-income countries but increasing significantly in the LMICs [9]. One of the reasons for this increase is the rising life expectancy which has led to shifting disease burden towards CVD [10] while at the same time; the trend of urbanization is drastically increasing in LMICs.

In 2008, half of the world's population lived in urban areas, and if this trend continues, 70 percent of the global population will be living in urban areas by 2050 resulting in changes in lifestyle of the people [11]. Many researchers have empirically identified the link between NCDs and globalization, urbanization, demographics, life style transition, socio-cultural factors and poverty [12-15]. They further stated that shifting lifestyle towards low physical activity and unhealthy diet leads to a rise in prevalence of obesity and NCDs among urban population, while other risk factors for NCDs such as high blood pressure are also found more commonly

among the urban communities compared to rural communities in LMICs. Other major contributors to the risks for NCDs have been clearly recognized as tobacco, alcohol and drug abuse, unhealthy diets (high consumption of sugar, salt, saturated fats, and trans fatty acids), indoor pollution, overweight and obesity and sedentary lifestyles [16]. Prevention and modification of these unhealthy lifestyle factors have positive effects on reduction in NCDs and their mortality [3].

In Nigeria, increasing westernization of the population has resulted in increased incidence and prevalence of NCDs thereby subjecting the country to a double burden of communicable and non-communicable diseases. Furthermore, political and economic instability has contributed greatly to increased internal migration from rural to urban cities. All these have put the people at a higher risk of NCDs as they adopt urban lifestyle and at the same time, lack of knowledge and information regarding health, poor access to healthcare, and poor economic status has worsened the situation for them [17]. According to the 2006 national census, about 50% of the total Nigerian population lives in urban areas [18]. Most disease burden or mortality information on NCDs in Nigeria is largely based on clinic, hospital, or national mortality registry data [19-23], and this type of information is not sufficient to plan health care expenditures, as it grossly underestimates or misdirects the health care resource allocation needs. Also, the formal health sector inevitably deals with the severe and end-stage complications of these diseases at a substantially greater cost.

Although Lagos State is the smallest state in Nigeria in terms of land mass, it has the highest population size, which is over five percent of the national estimate. The state, located in the southwestern region of the country has a population of about 17 million out of a national estimate of 150 million. However, the actual population total is disputed by the official Nigerian Census of 2006, which gave the population of the state as a little over nine million [24]. Of this population, Metropolitan Lagos, an area covering 37% of the land area of Lagos state is home to over 85% of the state population and 36.8% of Nigeria's urban population [25-26]. The high population growth rate of Lagos has

been largely attributed to rural-urban migration which accounts for up to 75% of the population increase, and as the inhabitants adopt an urbanized lifestyle, they are at a higher risk of NCD, while lack of knowledge about the complications and control contributes to a large percentage of undetected and untreated cases [27].

In year 2000, WHO proposed a set of core indicators - tobacco use, alcohol use, diet and physical inactivity as well as body mass index (BMI), blood pressure (BP), fasting blood glucose and blood cholesterol - for monitoring NCD risk factors nationally and globally. It was observed that these core indicators are practical and easily obtainable by countries at all levels of technical capacity [28,29]. Also, recognizing a global need for chronic disease risk factor data on these key NCD risk factors, WHO in the same year initiated the STEPwise approach to NCD risk factor surveillance [30-32]. This approach, which was designed particularly for use in LMICs, focuses on obtaining core data on the established risk factors that determine the major burden of NCDs. The STEPS instrument is a chronological process that covers three different levels of "steps" of risk factors assessment, starting with gathering questionnaire-based data on key risk factors (Step 1), then moving on to taking simple physical measurements (Step 2), followed by biomedical measurements (Step 3) [33], and it has been used in many studies globally [13,15,34-38].

The present study was a questionnaire based survey (Step 1) that formed a part of a larger study [39,40], which made use of the three steps of the WHO STEPwise approach. The study was motivated by the general lack of documented information concerning the prevalence of major common NCD risk factors and their distribution pattern among people living in three most populous urban poor communities located within Lagos metropolis, south-west Nigeria. The information provided here would provide the baseline data for a future extensive study, and inform better decision-making and effective interventions among the public health policy planners and health care personnel in the country.

## MATERIALS AND METHODS

### Study Population

The study population consisted of individuals who were 18 years and above living permanently in Ajegunle in Ajeromifelodun Local Government Area (LGA), Ijora Oloye in Apapa LGA and Makoko in Mainland LGA as shown in Figure 1. The current populations (Ajegunle - 429,381; Ijora Oloye - 18,278; Makoko - 141,277) were calculated based on the projected growth rate of 7.5% using the 2006 national census figures as baseline [41]. Sample size of single proportion method [42] using EPI Info version 6 was used to calculate the sample size ( $n = 2,434$ ), confidence level ( $1 - \alpha = 0.95$ ) and (power =  $1 - \beta$ ).



Figure 1: Map of Lagos State Showing the Study Local Government Areas

## **Ethical Consideration and Consent Documentation**

Ethical clearance was obtained from the Institutional Review Board of the Nigerian Institute of Medical Research, while informed consent of the community leaders and stakeholders was sought and received. Permission to carry out the project in the selected communities was obtained from the three LGA authorities overseeing the study communities.

## **Research Design and Sampling Techniques**

A multi-stage sampling method was used to sample household members across different socioeconomic background in the three study locations. The first stage involved stratification of each community into two groups on the basis of geographical closeness. The second stage was the clustering of each of the two groups into different enumeration areas (EAs) on the basis of existing delineation by the National Population Commission of Lagos State in the 2006 population census exercise [24]. The third stage involved random selection of four EAs from each of the three selected communities. The fourth stage involved systematic random sampling by numbering houses in each of the selected EAs, and randomly selecting houses from the numbered ones within each of the strata. The final stage was the random sampling of households from each of the sampled houses. A simple random technique was also used to select eligible households within a sampled building, which was proportional to the population size of the community, while a household sample was drawn randomly to allow for degree of representativeness.

## **Survey using WHO STEPwise Approach (Step 1)**

A cross-sectional quantitative survey was carried out using a modified WHO STEPwise tool (Step 1) to elicit data on socio-demographic status, tobacco and alcohol use, dietary habits and physical activities of the respondents. Units of analysis for the survey were households and the survey tool was a pre-tested semi-structured questionnaire. Through open-ended and close-ended questions, the questionnaire required participants to give information on both

quantifiable and non-quantifiable factors including socio-demographics, tobacco use, alcohol consumption, physical activities and diet (Step 1). The survey was conducted between June 2010 and October 2012.

## **Data Quality Control and Analysis**

Before the survey took place, training was provided on a one to one basis to all research assistants that participated in the study, with the aim of enhancing their understanding of the research protocols and competence in administering the questionnaire. The training helped to avoid biases or errors in the procedures employed and ensured their understanding and unified interpretation of basic terminologies that were used in the study. After the training, there was a pilot study which helped the team to have a preview of problems that might be encountered during the main survey and also to test the reliability, validity and applicability of the research instruments. Data was entered in MS-Excel and analyzed using SPSS version 16 (IBM, NY, USA).

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## **RESULTS**

A sample of 2,434 respondents was interviewed from Ijora Oloye (805), Ajegunle (814) and Makoko (815) communities using a direct personal interview method in order to avoid incomplete information. Various languages were used to interview respondents as shown in Table 1. This depicted flexibility in the course of administering the research tools as respondents answered in languages that suited them best.

## **Demographic Characteristics of the Respondents**

The respondents consisted largely of migrants from all parts of the country with the dominant groups being the Ijaw, Ilaje, Hausa, Ibo, Ur-hobo and Yoruba ethnicity (Table 2). Many respondents from Ijora Oloye (55%) and Makoko (51%) were born in the slum areas, compared to Ajegunle where the proportion of respondents born there was 43.4%. Thus, those that migrated from outside Lagos were 56.6% in Ajegunle, 45% in Ijora Oloye and 49% in Makoko. Reasons given for migration were poverty (52%),

lack of job (42%), lack of shelter (34%) and family conflicts (19%). While 35% and 22% of respondents in Makoko and Ajegunle respectively had been living in the communities between five and ten years, over 45% of respondents in Ijora Oloye have lived in the community for more than fifteen years. Many respondents from Ijora Oloye, n=458 (56.9%) earned less than N50,000 (USD320) per annum compared with 109 (13.4%) and 28 (3.4%) from Ajegunle and Makoko, respectively. Very few, one (0.1%), three (0.4%) and two (0.2%) in Ijora Oloye, Ajegunle and Makoko earned close to

USD 5,120 per annum, respectively. However, many respondents from the three communities refused to disclose their income. Most respondents (92.0%) from the three communities had residential accommodation. About 2.5% of those who did not have accommodation slept in mosques, 3.2% slept in churches, while 1.2% slept in other places such as market stalls and motor parks. Those that had accommodation (32%) lived in one-room apartment with an average of 5 people per room, even as 52% of those that had accommodation had over 6 individuals living in a single room.

**Table 1. Languages of Interviews**

| Languages | Number (%) Interviewed |                     |                   | Total |
|-----------|------------------------|---------------------|-------------------|-------|
|           | Ijora Oloye<br>(n=805) | Ajegunle<br>(n=814) | Makoko<br>(n=815) |       |
| English   | 77 (9.6%)              | 277 (34%)           | 192 (23.6%)       | 546   |
| Yoruba    | 650 (80.7%)            | 247 (30.3%)         | 562 (69%)         | 145   |
| Igbo      | 1 (0.1%)               | 2 (0.2%)            | 7 (0.9%)          | 10    |
| Hausa     | 2 (0.2%)               | 12 (1.5%)           | 1 (0.1%)          | 15    |
| Pidgin    | 67 (8.3%)              | 234 (28.7%)         | 38 (4.7%)         | 339   |
| Others    | 8 (1.0%)               | 42 (5.1%)           | 15 (1.8%)         | 65    |
| Total     | 805 (100.0%)           | 814 (100.0%)        | 815 (100.0%)      | 2,434 |

## Behavioral Measurements

Many of the respondents were school certificate holders and low income earners. These factors were found to affect the people's mode of living and lifestyle. It was also observed that many participants were unemployed and some were petty traders and only few had good income to live large in the communities. Many respondents particularly from Makoko, a fishing community built on water, said they usually drink a strong local alcoholic home brew for breakfast and then set off in their boats across the trash-filled lagoon to the Atlantic in order to fortify themselves against the early morning cold. Some of the smokers admitted that they smoke marijuana and hand rolled tobacco. The trend of those who currently use smokeless tobacco in the three communities was almost the same (Table 3). Respondents explained that they used smokeless tobacco between 1 to 10 times daily.

Many of them said they were not using smokeless tobacco in the past even though some of them claimed to be using it as at the time of the interview. Although some that did not engage in smoking reported that other people smoked daily in their homes and in closed areas in their work places. Those who consumed alcoholic drinks did so virtually all the days of the week and consumed more on weekends. In addition, data revealed that 81.3% of participants were not doing vigorous activities that caused large increase in breathing or heart rates. However, 60.4% of the respondents stated that their work involved moderate intensity that caused small increase in breathing or heart rates, such as brisk walking or carrying light loads for at least 10 minutes continuously. This simply means that some of the respondents engaged in moderate activities but not more than 10 minutes at a time. Respondents who engaged in moderate activities declared that

| Table 2. Socio-demographic Information of the Study Participants |                        |                     |                   |
|------------------------------------------------------------------|------------------------|---------------------|-------------------|
| Characteristics                                                  | Ijora Oloye<br>(n=805) | Ajegunle<br>(n=814) | Makoko<br>(n=815) |
| <b>Sex</b>                                                       |                        |                     |                   |
| Male                                                             | 348 (43.2%)            | 387 (47.5%)         | 417 (51.2%)       |
| Female                                                           | 457 (56.8%)            | 427 (52.5%)         | 398 (48.8%)       |
| <b>Ethnic groups</b>                                             |                        |                     |                   |
| Yoruba                                                           | 746 (92.7%)            | 337 (41.4%)         | 634 (77.8%)       |
| Igbo                                                             | 17 (2.1%)              | 227 (27.9%)         | 125 (15.3%)       |
| Hausa                                                            | 19 (2.4%)              | 8 (1%)              | 4 (0.5%)          |
| Others                                                           | 23(2.8%)               | 242 (29.8%)         | 52 (6.4%)         |
| <b>Educational status</b>                                        |                        |                     |                   |
| No formal schooling                                              | 179 (22.2%)            | 86 (10.6%)          | 107 (13.1%)       |
| Less than Primary school                                         | 33 (4.1%)              | 32 (3.9%)           | 33 (4%)           |
| Primary school completed                                         | 224 (27.8%)            | 194 (23.8%)         | 201 (24.7%)       |
| Secondary school completed                                       | 276 (34.3%)            | 417 (51.2%)         | 377 (46.3%)       |
| Post-secondary completed                                         | 51 (6.3%)              | 70 (8.6%)           | 70 (8.7%)         |
| Postgraduate degree                                              | 6 (0.7%)               | 9 (1.1%)            | 11 (1.3%)         |
| Quranic                                                          | 28 (3.5%)              | 0                   | 8 (1%)            |
| No response                                                      | 8 (1.0%)               | 6 (0.7%)            | 8 (1%)            |
| <b>Annual household income</b>                                   |                        |                     |                   |
| <N50,000 (USD 320)                                               | 458 (56.9%)            | 109 (13.4%)         | 28 (3.4%)         |
| N50,000-N100,000 (USD 640)                                       | 48 (6.0%)              | 23 (2.8%)           | 19 (2.3%)         |
| N100,000-N200,000 (USD 1,280)                                    | 6 (0.7%)               | 8 (1.0%)            | 7 (0.9%)          |
| N200,000-N300,000 (USD 2,560)                                    | 3 (0.4%)               | 2 (0.2%)            | 4 (0.5%)          |
| N300,000-N400,000 (USD 5,120)                                    | 1 (0.1%)               | 3 (0.4%)            | 2 (0.2%)          |
| Don't know                                                       | 9 (1.1%)               | 45 (5.5%)           | 16 (2%)           |
| No response                                                      | 280 (34.8%)            | 624 (76.7%)         | 739 (90.7%)       |
| <b>Religion</b>                                                  |                        |                     |                   |
| Christianity                                                     | 77 (9.6%)              | 564 (69.3%)         | 526 (64.5%)       |
| Islam                                                            | 715 (88.8%)            | 245 (30.1%)         | 276 (33.9%)       |
| Traditional                                                      | 11 (1.4%)              | 3 (0.4%)            | 11 (1.3%)         |
| Others                                                           | 1 (0.1%)               | 1 (0.1%)            | -                 |
| No response                                                      | 1 (0.1%)               | 1 (0.1%)            | 2 (0.2%)          |

| Table 2 (cont). Socio-demographic Information of the Study Participants |                        |                     |                   |
|-------------------------------------------------------------------------|------------------------|---------------------|-------------------|
| Characteristics                                                         | Ijora Oloye<br>(n=805) | Ajegunle<br>(n=814) | Makoko<br>(n=815) |
| <b>Marital status</b>                                                   |                        |                     |                   |
| Single                                                                  | 170 (21.1%)            | 226 (27.8%)         | 246 (30.2%)       |
| Married                                                                 | 559 (69.4%)            | 518 (63.6%)         | 496 (60.6%)       |
| Separated                                                               | 6 (0.7%)               | 13 (1.6%)           | 9 (1.1%)          |
| Divorced                                                                | 2 (0.2%)               | 9 (1.1%)            | 10 (1.2%)         |
| Widowed                                                                 | 66 (8.2%)              | 45 (5.5%)           | 49 (6%)           |
| Cohabiting                                                              | 1 (0.1%)               | 3 (0.4%)            | 4 (0.5%)          |
| No response                                                             | 1 (0.1%)               | 3 (0.4%)            | -                 |
| <b>Occupational status</b>                                              |                        |                     |                   |
| Civil servant                                                           | 34 (4.2%)              | 36 (4.4%)           | 32 (3.9%)         |
| Private sector employee                                                 | 46 (5.7%)              | 67 (8.2%)           | 85 (10.4%)        |
| Trading                                                                 | 367 (45.6%)            | 362 (44.5%)         | 342 (42%)         |
| Farming                                                                 | 14 (1.7%)              | 5 (0.6%)            | 2 (0.1%)          |
| Artisan                                                                 | 133 (16.5%)            | 161 (19.8%)         | 130 (16%)         |
| Fisherman                                                               | 1 (0.1%)               | 1 (0.1%)            | 8 (1.0%)          |
| Student                                                                 | 81 (10.1%)             | 54 (6.6%)           | 74 (9.1%)         |
| Housewife                                                               | 11 (1.4%)              | 25 (3.1%)           | 14 (1.7%)         |
| Retiree                                                                 | 30 (3.7%)              | 26 (3.2%)           | 25 (3.1%)         |
| Unemployed                                                              | 22 (2.7%)              | 30 (3.7%)           | 19 (2.3%)         |
| Others                                                                  | 63 (7.8%)              | 41 (5.0%)           | 83 (10.2%)        |
| No response                                                             | 3 (0.4%)               | 6 (0.7%)            | 2 (0.2%)          |

they did so all days of the week. In addition, very few were involved in some sort of vigorous sporting exercises spending between 5 minutes and 1 hour, while many said they were simply not interested in engaging in sports. Most of the respondents who did not engage in vigorous-intensity activities like jogging, running, climbing stairs or walking uphill claimed that their work led to increase in breathing because they engaged in activities like offloading bags of cement or rice from trucks and carrying them to ware houses. According to respondents in the three communities, days of vigorous activities ranged from 1 to 7 days in a week and the duration of each activity varied from 10 minutes to 12 hours. The study revealed that few respondents were

involved in sports such as soccer, running or long distance walking. Time used for vigorous sports by those who engaged in them ranged from 5 minutes to 4 hours and the sporting activities were carried out once a week or on daily basis. However, when probed further on the type of sports they engaged in mostly, it was discovered that many preferred to walk to their various places of occupation due to lack of money for transportation and they regarded this as a sort of sport or exercise. Many stated that they ate fruits and vegetables at least 1 to 5 times in a week, while few respondents said they rarely ate fruits in particular because they were expensive and out of their reach.

**Table 3. Lifestyle Characteristics of the Study Participants**

| <b>Characteristics</b>                                                               | <b>Ijora Oloye<br/>(n=805)</b> | <b>Ajgunle<br/>(n=814)</b> | <b>Makoko<br/>(n=815)</b> |
|--------------------------------------------------------------------------------------|--------------------------------|----------------------------|---------------------------|
| <b>Smoking</b>                                                                       |                                |                            |                           |
| Yes                                                                                  | 67 (8.3%)                      | 47 (5.8%)                  | 81 (9.9%)                 |
| No                                                                                   | 734 (91.2%)                    | 763 (93.7%)                | 729 (89.4%)               |
| No response                                                                          | 4 (0.5%)                       | 4 (0.5%)                   | 5 (0.6%)                  |
| <b>Use of smokeless tobacco</b>                                                      |                                |                            |                           |
| Yes                                                                                  | 15 (1.9%)                      | 15 (1.8%)                  | 15 (1.8%)                 |
| No                                                                                   | 640 (91.2%)                    | 635 (91.2%)                | 263 (32.3%)               |
| No response                                                                          | 150 (18.6%)                    | 164 (20.1%)                | 537 (65.9%)               |
| <b>Consumption of alcoholic drinks</b>                                               |                                |                            |                           |
| Yes                                                                                  | 43 (5.3%)                      | 123 (15.1%)                | 470 (57.7%)               |
| No                                                                                   | 653 (81.1%)                    | 466 (57.2%)                | 25 (3.1%)                 |
| No response                                                                          | 805 (100%)                     | 814 (100%)                 | 815 (100%)                |
| <b>Eating of fruits</b>                                                              |                                |                            |                           |
| Yes                                                                                  | 782 (97.1%)                    | 766 (94.1%)                | 782 (96.0%)               |
| No                                                                                   | 19 (2.4%)                      | 32 (3.9%)                  | 28 (3.4%)                 |
| No response                                                                          | 4 (0.5%)                       | 16 (2.0%)                  | 5 (0.6%)                  |
| <b>Eating of vegetables</b>                                                          |                                |                            |                           |
| Yes                                                                                  | 745 (92.5%)                    | 757 (93.0%)                | 773 (94.8%)               |
| No                                                                                   | 40 (5.0%)                      | 24 (2.9%)                  | 36 (4.4%)                 |
| No response                                                                          | 20 (2.5%)                      | 33 (4.1%)                  | 6 (0.7%)                  |
| <b>Vigorous activities (e.g., carrying heavy loads, playing soccer)</b>              |                                |                            |                           |
| Yes                                                                                  | 63 (7.8%)                      | 94 (11.5%)                 | 151 (18.5%)               |
| No                                                                                   | 733 (91.1%)                    | 703 (86.4%)                | 648 (79.5%)               |
| No response                                                                          | 9 (1.1%)                       | 17 (2.1%)                  | 16 (2.0%)                 |
| <b>Moderate–intensity activities (e.g., brisk walking, mopping, washing clothes)</b> |                                |                            |                           |
| Yes                                                                                  | 211 (26.2%)                    | 300 (36.9%)                | 350 (42.9%)               |
| No                                                                                   | 573 (71.2%)                    | 497 (61.1%)                | 435 (53.4%)               |
| No response                                                                          | 21 (2.6%)                      | 17 (2.1%)                  | 30 (3.7%)                 |
| <b>Walking for ten minutes continuously</b>                                          |                                |                            |                           |
| Yes                                                                                  | 688 (85.5%)                    | 699 (85.8%)                | 724 (88.8%)               |
| No                                                                                   | 109 (13.5%)                    | 107 (13.1%)                | 70 (8.6%)                 |
| No response                                                                          | 8 (1.0%)                       | 8 (1.4%)                   | 21 (2.6%)                 |

**Table 3 (cont). Lifestyle Characteristics of the Study Participants**

| Characteristics                                                  | Ijora Oloye<br>(n=805) | Ajgunle<br>(n=814) | Makoko<br>(n=815) |
|------------------------------------------------------------------|------------------------|--------------------|-------------------|
| <b>Vigorous-intensity (e.g., tennis, soccer, fast bicycling)</b> |                        |                    |                   |
| Yes                                                              | 164 (20.4%)            | 116 (14.3%)        | 130 (16.0%)       |
| No                                                               | 628 (78.0%)            | 693 (85.1%)        | 654 (80.5%)       |
| No response                                                      | 13 (1.6%)              | 5 (0.6%)           | 29 (3.6%)         |
| <b>Moderate-intensity (e.g., slow bicycling, walking)</b>        |                        |                    |                   |
| Yes                                                              | 106 (13.2%)            | 111 (13.6%)        | 84 (10.3%)        |
| No                                                               | 672 (83.5%)            | 607 (74.6%)        | 604 (74.1%)       |
| No response                                                      | 27 (3.4%)              | 96 (11.8%)         | 127 (15.6%)       |

## DISCUSSION

Our study presents the burden of major NCDs behavioral risk factors in three urban slums using modified WHO STEPwise approach. The choice of the three communities for this study was informed by their official classification as urban poor communities, their diversity in terms of various ethnic groups and their locations within Lagos metropolis. Our previous findings revealed that the three communities were indeed slums with limited social facilities, while many children of school-age did not go to school [40]. In addition, many of the respondents were school certificate holders and low income earners. These factors also affect the people's mode of living and lifestyle. It was also observed that many participants were unemployed and some were petty traders and only few had good income to live large in the communities. Living conditions were very poor, many inhabitants had no access to quality health care services, there were lots of stray domestic animals such as dogs, cats, goats and chickens while open defecation was practiced by these animals and some inhabitants [40]. Personal hygiene habits were poor and garbage littered the streets.

The level of education and income of the respondents in this study reflected their socio-economic positions. Thus, the represented populations might then be expected to engage in life styles that would thus adversely expose them to the development of NCD. This was in

agreement with previous reports [43,44] that populations with low socio-economic status, determined either by income or level of education, were relatively at higher risk of developing NCD. The study revealed a substantially high existence of some behavioral risk factors among the participants. This could be attributed to the low level of education, low socio-economic status and lack of awareness about the bad effects of these risk factors on health. There is explicit data that NCDs are instigated by unhealthy lifestyle [5,34,35], and tobacco, alcohol and drugs abuse, unhealthy diet, indoor pollution, overweight/obesity and physical inactivity are lifestyle risk factors for NCD [36]. However, it has been noted well that these risk factors are modifiable, while a significant portion of the NCDs are preventable and controllable. These are cardiovascular diseases, cancer, diabetes and chronic respiratory diseases and their risk factors, which are tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol.

Non-communicable diseases can impose large health, financial and economic costs on countries, particularly developing countries like Nigeria where government alone cannot provide the bulk of health services for the people. In addition, behavioral risk factors in such countries are leading to potentially expensive to treat NCDs, including diabetes and heart disease. However, many of their health and financial costs can at least be postponed through good

primary and secondary prevention. Thus, effective prevention of NCD is possible through identification of the major common risk factors and their prevention and control. In addition, information on the prevalence of NCD risk factors in the population is crucial for program monitoring and planning, and can also assist in predicting the future burden of disease.

The study was intended to measure the burden of NCD behavioral risk factors in the slums so that appropriate recommendations could be made to improve any prevalent risk factors. We applied a modified WHO STEPwise approach to surveillance which is a standardized method for collecting, analyzing, and disseminating data in WHO member countries. During the survey, needy participants were referred to the nearest health centers for further management, thus ensuring that socio-ethical values were incorporated into the study. Besides, findings obtained from this study can assist policy makers to develop a strategy for appropriate control and prevention of NCD in Nigeria. However, the self-report of behavioral risk factors is likely to be an underestimate of the actual prevalence of these factors. This under-reporting of unhealthy behaviors such as smoking and alcohol abuse may be due to social prejudices.

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## CONCLUSIONS

The inhabitants of the study communities were not living healthy life styles, which might result in increased number of them suffering from diseases such as obesity, diabetes and hypertension. As revealed in our current study, behavioral risk factors for NCD, mainly physical inactivity, smoking and alcohol use were common in there. We, therefore, recommend that the government should take the lead in developing a comprehensive promotional campaign to highlight the dangers of these known lifestyles and behaviors.

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## AUTHORS' CONTRIBUTIONS

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. AOP

obtained funding for the study. AOP, AAK, OJO and APE developed the concept and design. AOP, AAK, OJO, APE, MZA, OKSO, SMA and AAA carried out data collection, analysis and interpretation while AOP prepared the manuscript. All authors have read and approved the final manuscript.

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## CONFLICT OF INTEREST

Authors have declared that no competing interests exist.

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