



Evaluating the management of non-communicable diseases of civil servants enrolled into the National Health Insurance Authority Formal Sector Social Health Insurance Programme in Abuja, Nigeria

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Abstract: The study aims to ascertain the prevalence and distribution of non-communicable diseases (NCDs) among Nigerian public service employees, the use of the National Health Insurance Scheme (NHIS) by those with NCDs, the factors that influence NHIS use, and the satisfaction of NCD patients with NHIS services. 350 civil officials from several ministries, departments, and parastatals in Abuja, Nigeria, were polled using a structured questionnaire to learn about their demographics, clinical information, NHIS service usage, and level of satisfaction. According to the study, 53.3% of individuals had NCDs, with hypertension being the most common (with 30.0%) of them. Only 16.0% of participants utilized NHIS services, with NHIS utilization being significantly higher among those aged ≤ 25 years and single individuals. Satisfaction with NHIS services was poor, with the lowest rating for the reliability of the health insurance scheme's service delivery in providing promised services (2.25 out of 5). The findings suggest a need for strategies to improve NHIS utilization and service delivery, especially among individuals with NCDs.

Keywords: Assessment, National Health Insurance Scheme, Non Communicable Diseases Abuja, Nigeria.

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Introduction

Background to the Study

Non-communicable diseases (NCDs) are chronic medical conditions that are not caused by infectious agents and cannot be transmitted from person to person. These diseases include cardiovascular diseases (such as heart attacks and stroke), cancer, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma), and diabetes (Motuma et al., 2021). NCDs are the leading cause of death globally, responsible for 71% of all deaths worldwide in 2019, and the burden of these diseases is increasing rapidly. The public health implications of NCDs are significant (Bigna & Noubiap, 2019; Motuma et al., 2021).

NCDs can cause considerable impairment, a decline in quality of life, and early mortality, and they have a profound effect on people, families, and communities (Motuma et al., 2021). Due to the high cost of medical care, lost productivity, and slowed economic growth, these diseases also have a major financial impact on both individuals and society (Motuma et al., 2021). The multifactorial

character of NCDs, which necessitates a multi-sectoral strategy, is one of the key obstacles in managing them. In addition to environmental variables including air pollution and exposure to carcinogens, risk factors for NCDs also include unhealthy food, physical inactivity, cigarette use, and hazardous alcohol consumption (Akubudike Alikor & Emem-Chioma, 2018; Bigna & Noubiap, 2019; Boateng et al., 2018).

In order to combat NCDs, it is important to encourage good eating habits and physical activity, cut back on alcohol and cigarette use, increase access to quality, affordable healthcare, and strengthen health systems (Budreviciute et al., 2020; Idris et al., 2020). In addition, environmental risk factors for NCDs such as air pollution and exposure to carcinogens need to be addressed in order to establish conditions that support physical activity and healthy lifestyles (Latif et al., 2019; Perehudoff, 2020). NCDs are a huge public health issue that have a considerable effect on people, families, communities, and society as a whole. As stated by Latif et al. (2019) and Montel et al. (2022): "Addressing this challenge requires a coordinated and multi-sectoral approach, with a focus on promoting healthy lifestyles, improving access to health care, and

addressing the social determinants of health that contribute to NCDs."

The Alma-Ata Declaration of 1978 strongly reiterates that having the best possible health is a fundamental human right and a major universal social objective (Gostin et al., 2019). The Alma-Ata Declaration of 1978, which was adopted at the International Conference on Primary Health Care, underlined the significance of primary health care (PHC) as a mechanism to attain this objective of "Health for All" by the year 2000 (Chen et al., 2020; Gude et al., 2019). The declaration acknowledged the importance of PHC in achieving universal health coverage, which entails ensuring that all people and communities may obtain the medical care they require without facing financial hardship (Ong et al., 2020; Wong et al., 2020). Contrarily, health insurance is a method of paying for medical services that helps to reduce the financial risk associated with disease or damage (Gill et al., 2015; May et al., 2011). It functions by combining individual resources and using them to pay for healthcare services as needed. Although the Alma-Ata Declaration did not specifically address health insurance, it did acknowledge that the concepts of social justice and equity should be applied when providing healthcare services (Desai et al., 2017; Morton et al., 2017; Patel & Webster, 2016). No matter their financial situation, everyone should be able to obtain the healthcare treatments they require thanks to health insurance (Morton et al., 2017; Motuma et al., 2021). By providing a means of financing PHC services and guaranteeing that they are available to everyone, the introduction of health insurance can be considered as accomplishing the goals of the Alma-Ata Declaration (Sacco et al., 2016; Sidiq et al., 2020).

Health insurance, a social security system that ensures the provision of needed health services to people by making certain contributions on a regular basis, is one common strategy adopted by governments of many countries towards improving access to affordable and essential health care services and achieving universal health coverage (Hernan et al., 2019; Luh et al., 2016). The goal of health systems is to raise the population's level of healthcare. Social stability results from better health system management and finance. The population's coverage is an obvious sign of how well the health system is working (Alawode & Adewole, 2021). The Federal Government of Nigeria officially launched the National Health Insurance Scheme (NHIS) in Nigeria in June 2005 with the goal of providing all Nigerians with quality healthcare that is accessible, affordable, and committed to securing universal coverage and enhancing Nigerians' health status (Amoo et al., 2017). In order to alleviate the suffering of its inhabitants through the National Health Insurance Scheme, the Nigerian government established a formal sector social health insurance program in 2005. Applying insurance concepts to the expense of predetermined medical benefit packages is what health insurance entails. Between those who will require the benefits and those who won't, there is a risk-sharing component (Akinyemi et al., 2021; Christina et al., 2014). In order for the insured to access services at any time without having to pay at the point of service delivery, the cost of healthcare services must also be distributed to the insured over time (Akinyemi et al., 2021).

The National Health Insurance Scheme's (NHIS) goal is to increase population coverage in Nigeria. The issue of how to pay for healthcare has become a global concern, and health insurance has emerged as a popular solution. The current concern over funding

and the interest in health insurance specifically is frequently the result of two parallel trends: on the one hand, the recognition of access to basic healthcare for all citizens as a fundamental human right, and on the other, the challenges governments face in creating and maintaining the resources necessary to provide healthcare through general taxation revenue (Bigna & Noubiap, 2019; Budreviciute et al., 2020; Christina et al., 2014).

Statement of the Problem

Non-communicable diseases (NCDs) account for 41 million deaths yearly, or 71% of all fatalities worldwide (Gostin et al., 2019; Idris et al., 2020). NCDs are the major cause of death worldwide. Cardiovascular diseases (17.9 million deaths yearly), cancers (9.0 million), respiratory illnesses (3.9 million), and diabetes (1.6 million) are the leading four NCD killers, accounting for more than 80% of all premature NCD fatalities (Alawode & Adewole, 2021). Over the past two decades, the burden of NCDs has increased in sub-Saharan Africa, which can be attributed to an increase in cardiovascular risk factors like poor diets, low levels of physical activity, hypertension, obesity, diabetes, dyslipidemia, and air pollution. By 2030, NCDs are anticipated to surpass communicable, maternal, neonatal, and nutritional (CMNN) disorders as the primary cause of death in sub-Saharan Africa (Philips et al., 2021). Therefore, significant efforts are required to reduce the prevalence of NCDs in the area. The first step in this process is to provide accurate epidemiological estimates of NCDs and their causes in order to properly inform preventative and control measures (Ong et al., 2020).

A detailed analysis of the disability burden of NCDs in sub-Saharan Africa from 1990 to 2017 reveals a marked increase in disability-adjusted life-years (DALYs) due to NCDs in the region, from 90.6 million (95% confidence interval 81.0-101.9) DALYs in 1990 to 151.3 million (133.4-171.8) DALYs in 2017 (Alawode & Adewole, 2021). This 67.0% increase brings the age-standardized DALY rate of NCDs close to that of CMNN illnesses and is partially attributable to population growth and aging in sub-Saharan Africa. Similar to the leading causes of NCD-related mortality in sub-Saharan Africa and around the world, the leading causes of NCD burden in 2021 were cardiovascular diseases (22.9 million [95% uncertainty interval 21.5-24.3] DALYs), neoplasms (16.9 million [15.7-18.3]), mental disorders (13.6 million [9.9-17.7]), and diabetes (10.4 million [9.2-11.9]).

Health insurance usage is still low in low and middle-income countries (LMICs), despite the fact that it is becoming more widely available. For these nations to achieve universal health coverage and improve health outcomes, this poses a considerable obstacle (Akinyemi et al., 2021). There is a need to identify and comprehend the precise barriers that prevent the uptake and use of health insurance in these contexts, despite the fact that many factors, such as low awareness, limited coverage, high premiums, and inadequate infrastructure, may contribute to low health insurance utilization in LMICs. Alawode & Adewole, 2021; Idris et al., 2020; Akinyemi et al., 2021). This problem statement aims to explore the factors that influence the utilization of health insurance in LMICs and provide insights into potential strategies that can be employed to improve health insurance utilization and enhance access to health care services in these countries.

Aim and Objectives of the Study

The current study was carried out to assess the satisfaction of public servants with non-communicable diseases (NCD) enrolled in the National Health Insurance Scheme in the Federal Capital territory, Abuja. Specifically;

- To assess the prevalence and pattern of NCD among public servants in FCT Abuja.
- To assess the utilization of NHIS among public servants with NCD in FCT Abuja
- To identify factors associated with the utilization of NHIS services among civil servants in the FCT.
- To determine the satisfaction of the NHIS services among public servants with NCD in FCT Abuja

Scope of the Study

This study focused on the utilization and quality of services accessed in the NHIS scheme among civil servant diagnosed with non-communicable diseases in Abuja, Nigeria.

Methodology

Study Design

This was a descriptive cross-sectional study aimed at describing the pattern of non-communicable disease, utilization of National Health Insurance Scheme (NHIS) services and assessing the quality of the NHIS services among civil servants.

Area of Study

The area of study was Abuja Municipal Area Council (AMAC), the new capital of Nigeria (Federal Capital Territory). According to Abuja Geographic Information System (AGIS) (2010), Abuja came into existence by virtue of the Federal Capital Territory Act of 1976. The territory covers a total land area of approximately 8,000 square kilometers, while the city proper covers a total land area of 250 square kilometers. It is located at the centre of Nigeria, north of the confluence of the Niger and Benue rivers. It is bounded by the states of Niger to the west, Kaduna to the Northeast, Nassarawa to the east and south, and Kogi to the Southwest. Abuja (FCT) is comprised of six Area councils which include: Abuja Municipal Area Council (AMAC), Gwagwalada, Kwali, Abaji, Kuje, and Bwari Area Councils. Outskirts of Abuja include Madalla, Suleja, and Mararaba. The choice of AMAC in the study is due to its nature as the heart of Abuja as a cosmopolitan city where the concentration of people, especially civil servants are mainly found than in the other area councils. Other characteristics that favour AMAC as the choice of study is that most of the Ministries and Parastatals are located in 37 AMAC. It is one of the growing area councils in the FCT (Abuja Geographic Information System, 2002).

Population of the Study

The population of the study consisted of all the Federal Civil Servants from 30 establishments in Abuja Municipal Area Council (AMAC). The population was estimated at 5,250 Federal Civil Servants (National Salaries, Incomes and Wages Commission,

Abuja, 2011). The study participants were selected based on the following criteria:

Inclusion criteria- Full time employees of the federal Civil Service

Exclusion criteria-Persons not enrolled in the national health insurance scheme (NHIS)

Sample Size and Sampling Procedure

A total of 350 participants were selected for the study. The sample size was calculated with the Cochran formula (Kirkwood & Sterne, 2010) as shown below: $n = (Z^2pq)/d^2$

Where:

n = the minimum sample size

Z = the standard normal deviate corresponding to a level of significance of 0.05 is 1.96

p = 35.3% (0.353) the prevalence rate of non-communicable diseases

q = $1 - p = 1 - 0.353 = 0.647$

d = the desired precision: 5% = 0.05

Applying the formula, the minimum sample size is:

$n = (1.96)^2(0.353 \times 0.647) (0.05)^2 = 350$.

A multi-stage process was used to select the study participants as described below.

Stage 1: Random sampling of Ministries, departments and agencies (MDAs): the list of MDAs was obtained from the ministry of information. This consisted of 15 Core ministries, 9 Parastatals and 6 Extra Ministerial Departments. The name of each MDA was written on a piece of paper and placed in an unmarked opaque envelope for each MDA. The envelopes were compiled together and put in a bucket for a blind balloting process. Five (5) envelopes were selected to identify the MDAs where the study would be carried out.

Stage 2: Proportionate sampling of selected MDAs: the proportionate sampling involved the calculation of the appropriate number of persons to be selected for the study from each MDA based on the formula: $n/\text{total population} \times \text{population of the MDA}$.

Table 1: Proportionate sample of MDAs

MDA	Population	Sample to be selected
MDA 1	1500	55
MDA 2	600	22
MDA 3	1900	69
MDA 4	2500	91
MDA 5	3100	113
Total	9600	350

Table 2: Sampling intervals of MDAs

MDA	Population	Sampling interval (k)
MDA 1	1500	4
MDA 2	600	2
MDA 3	1900	5
MDA 4	2500	7
MDA 5	3100	9

Study Instrument

A structured questionnaire was used to collect data from the study participants. The questionnaire consisted of the following four (4) sections: Section A: Demographic information of participants; Section B: Clinical Diagnosis and related history; Section C: Utilization of Health Insurance; Section D: Service Quality Assessment.

Reliability of Study Instrument

The questionnaire was administered to forty individuals purposively selected outside the target study population and their responses from each of the sections were collated and assessed for reliability using the Cronbach Alpha test. A Cronbach alpha coefficient of 0.75 was obtained indicating that the questionnaire was reliable.

Data Collection and Analysis

The study questionnaire was distributed to each participant and retrieved within 24 hours of distribution. Each participant was encouraged to provide an honest answer to the questions on the questionnaire and assured that their personal identifying information and clinical history would remain confidential.

The data collected was analyzed using the Statistical Package for Social Sciences software v25 (IBM, USA). All categorical data was summarized using the frequency and percentages, while continuous data was summarized using mean and standard deviations. The prevalence and pattern of NCDs among the participants were presented in frequencies and percentages. The utilization of NHIS services among the participants were also presented in frequencies and percentages. The association of demographic factors with the utilization of NHIS and the quality of NHIS services was assessed using logistic regression analysis (to identify factors associated with the utilization of NHIS among persons with NCDs). All analysis was done at a 95% confidence interval and a p-value less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Results

Demographic characteristics of Participants

Table 3: Demographic distribution of Respondents

Variables	Frequency (n=350)	Percent (%)
Age groups		
≤ 25 years	13	3.7
26 - 35 years	75	21.4
36 - 45 years	130	37.1
46 - 60 years	124	35.4
> 60 years	8	2.3
Gender		
Male	189	54.0
Female	161	46.0
Marital status		
Single	8	2.3
Married	318	90.9
Separated/Divorced	13	3.7
Widowed	11	3.1
Grade Level		
Junior Level	109	31.1
Mid-level	130	37.1
Senior Level	111	31.7
Monthly income (NGN)		
≤ 50,000	7	2.0
50,001 - 100,000	134	38.3
100,001 - 150,000	108	30.9
150,001 - 200,000	94	26.9
> 200,000	7	2.0

NGN: Nigerian Naira

The distribution of the participant's demographic traits is shown in Table 3. According to the age group distribution, 37.1% (130/350) of the population was between the ages of 36 and 45, 35.4% (124/350) was between the ages of 46 and 60, 21.4% (75/350) was between the ages of 26 and 35, and 3.7% (13/350) was under the age of 25. According to the gender split, there were 46.0% females and 54.0% males. 90.9% of people were married, 3.7% were separated or divorced, 3.1% were widowed, and 2.3% were single, according to the distribution of marital status. According to the distribution of salary grade levels, 37.1% of employees were in the mid-level cadre, compared to 31.1% in the junior cadre and 31.7% in the senior cadre. The distribution of the monthly income levels indicate that 38.3% earned between 50,001-100,000, 30.9% earned between 100,001-150,000, 26.9% earned between 150,001 – 200,000, 2.0% earned more than 200,000, while 2.0% earned less than 50,000.

Prevalence and Pattern of NCD among public servants

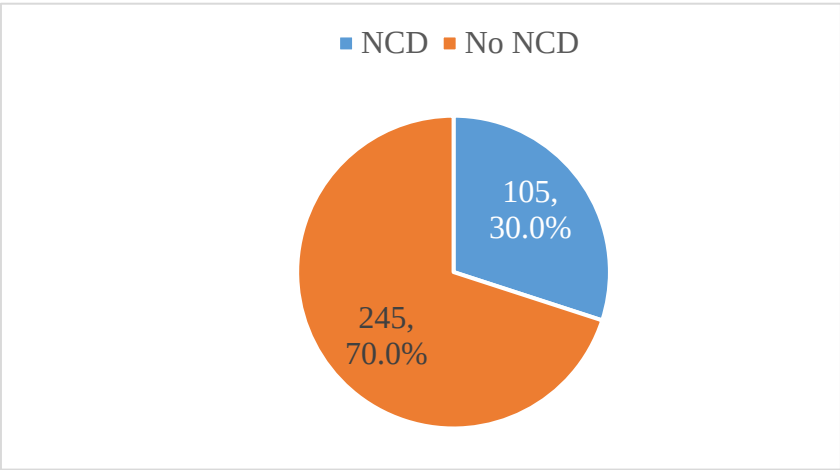


Figure 1: Prevalence of NCD in participants

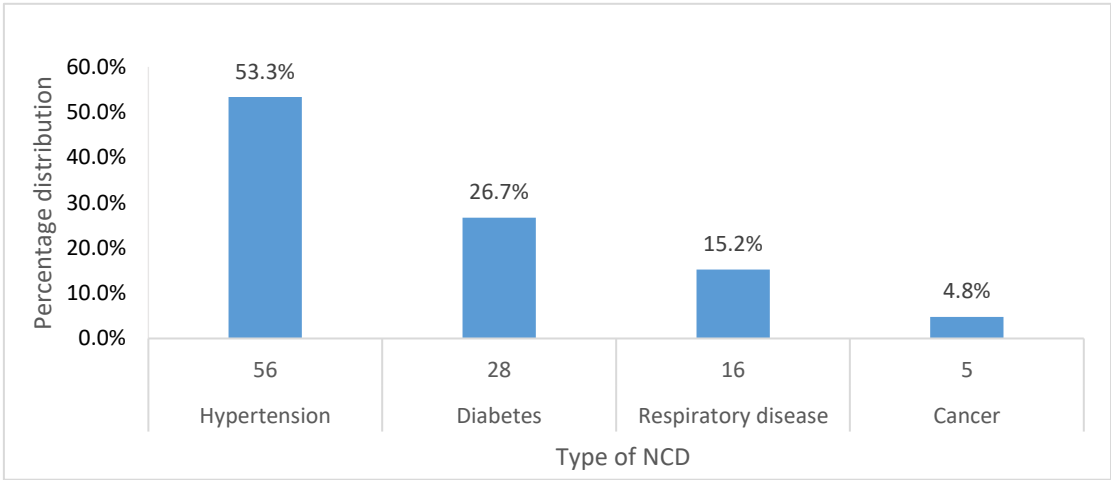


Figure 2: Pattern of NCD

Figure 1 shows a 30.0% (105/350) prevalence of NCD among the study participants. Figure 2 shows the pattern of the NCDs among the 105 participants with NCDs. The figure shows that 53.3% (56/105) had respiratory disease, 26.7% (28/105) had diabetes, 15.2% (16/105) had hypertension and 4.8% (5/105) had cancer

Table 4: History of NCDs among participants

Variable	Frequency (n=105)	Percent (%)
Duration of Diagnosis on NCD		
<1 year	24	22.9
1- 2 years	29	27.6
3 - 5 years	25	23.8
>5 years	27	25.7
Currently undergoing treatment for diagnosed NCD		
Yes	93	88.6
No	12	11.4
Type of Treatment for NCD (n=93)		
Medication	35	37.6
Lifestyle modification	33	35.5
Surgery	25	26.9

Frequency of visits to healthcare providers		
Every month	25	23.8
Every 3 months	8	7.6
Every 6 months	29	27.6
Once a year	17	16.2
< less than once a year	26	24.8

Table 4 shows that history of NCDs among participants with NCDs. The table showed that at the time of the study, 22.9% (24/105) had been diagnosed of NCD less than 1 year, 23.8% had been diagnosed between 3 – 5 years, 25.7% had been diagnosed for at least 5 years and 27.6% had been diagnosed between 1 – 2 years. The table also shows that 88.6% (93/105) of persons with NCDs had been undergoing treatment, with 37.6% receiving medication, 35.5% are treated via lifestyle modification and 26.9% underwent surgery. The frequency of visits to healthcare providers show that 27.6% visited every 6 months, 24.8% visited less than once a year, 23.8% visited every month, 16.2% visited once a years and 7.6% visited every 3 months.

Utilization of NHIS among public servants with NCD

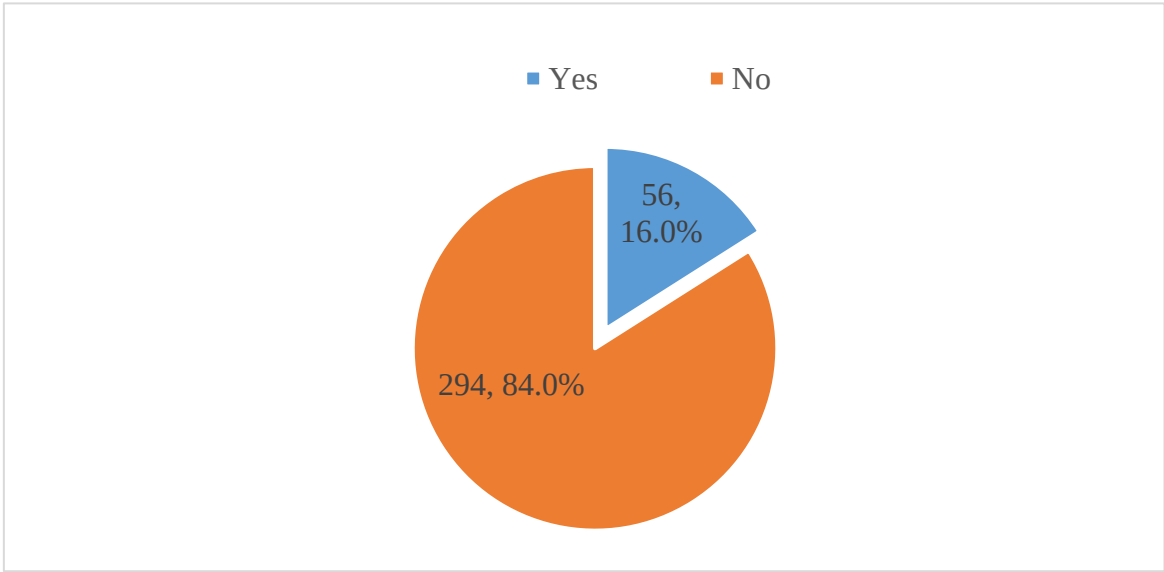


Figure 3: Distribution of NHIS Usage among participants

Figure 3 shows the proportion of the participants that utilize the NHIS Service. The data shows that 16.0% (56/350) utilized NHIS services, while 84% (294/350) did not utilize the NHIS service.

Table 5: Distribution of usage of NHIS by presence of NCDs

	Presence of NCD		Total	Chi-square	OR
	NCD	No NCD			
Usage of NHIS	n (%)	n (%)	n (%)	(p-value)	(95% C.I)
Yes	24(42.9)	32(57.1)	56(100.0)	5.24 (0.022)*	1.9 (1.1 -3.5)
No	81(27.6)	213(72.4)	294(100.0)		

*Statistically significant (p<0.05)

Table 5 shows the distribution of the usage of NHIS by the presence of NCDs among the participants. The table showed that 42.9% (24/56) of persons that utilize NHIS services had NCDs, while 27.6% (81/294) of persons that do not use NHIS services had NCD. The distribution of the usage of NHIS by the presence of NCDs was found to be statistically significant (chi-square = 5.24, p= 0.022). Logistic regression shows that the presence of NCDs increased the likelihood of using NHIS by 1.9 times (95% C.I: 1.1 – 3.5).

Factors associated with the utilization of NHIS

Table 6: Association of demographic factors and Utilization of NHIS

Variables	Use NHIS n (%)	Do not use NHIS. n (%)	Total n (%)	Chi-square (p-value)
Age groups				
≤ 25 years	7(53.8)	6(46.2)	13(100.0)	16.9 (0.002)*
26 - 35 years	9(12.0)	66(88.0)	75(100.0)	
36 - 45 years	23(17.7)	107(82.3)	130(100.0)	
46 - 60 years	15(12.1)	109(87.9)	124(100.0)	
>60 years	2(25.0)	6(75.0)	8(100.0)	
Gender				
Male	28(14.8)	161(85.2)	189(100.0)	0.42 (0.512)
Female	28(17.4)	133(82.6)	161(100.0)	
Marital status				
Single	5(62.5)	3(37.5)	8(100.0)	32.88 (0.001)*
Married	40(12.6)	278(87.4)	318(100.0)	
Separated/Divorced	7(53.8)	6(46.2)	13(100.0)	
Widowed	4(36.4)	7(63.6)	11(100.0)	
Grade Level				
Junior Level	21(19.3)	88(80.7)	109(100.0)	2.46 (0.291)
Mid-level	22(16.9)	108(83.1)	130(100.0)	
Senior Level	13(11.7)	98(88.3)	111(100.0)	
Monthly income (NGN)				
≤ 50,000	4(57.1)	3(42.9)	7(100.0)	29.53 (0.0001)*
50,001 - 100,000	30(22.4)	104(77.6)	134(100.0)	
100,001 - 150,000	11(10.2)	97(89.8)	108(100.0)	
150,001 - 200,000	7(7.4)	87(92.6)	94(100.0)	
> 200,000	4(57.1)	3(42.9)	7(100.0)	

*Statistically significant ($p < 0.05$)

Table 6 shows the distribution of demographic factors and utilization of NHIS among the study participants. The table showed that utilization of NHIS was significantly higher among persons that was at least ≤ 25years (53.8%), while the least utilization was observed among persons aged 26 – 35 years (12.0%) (chi-square = 16.9, $p = 0.002$). There was no significant difference in the association of gender and utilization of NHIS as 14.8% of male participants used NHIS services, while 17.4% of female participants utilized NHIS services (chi-square = 0.42, $p = 0.512$). The distribution of NHIS utilization by marital status showed that the highest utilization was observed among single persons (62.5%), followed by Separated/divorced persons (53.8%), while married persons were the group with the least utilization (12.6%). The distribution of NHIS utilization by marital status was found to be statistically significant (chi-square = 32.88, $p = 0.001$). The distribution of NHIS utilization by grade level of the participants showed that 19.3% of the junior level staff used NHIS, 16.9% of the mid-level staff utilized NHIS and only 11.7% of the senior level staff utilized NHIS. The distribution of NHIS utilization by the grade level of the staff was not statistically significant (chi-square = 2.46, $p = 0.291$). The distribution of NHIS utilization by monthly income showed that 57.1% of persons that earned less than 50,000 naira monthly utilized NHIS, also, 57.1% of persons earning more than 200,000 naira monthly utilized NHIS, this was followed by 22.4% of persons earning 50,001 – 100,000 naira, while persons earning between 150,001 – 200,000 had the least utilization of NHIS (7.4%). The distribution of NHIS utilization by monthly income was not found to be statistically significant (chi-square = 29.53, $p = 0.0001$).

Satisfaction of the NHIS services among public servants

Table 7: Satisfaction Rating of NHIS services among persons with NCD

Items	1 - Very Poor	2 - Poor	3 - Neutral	4 - Good	5 - Excellent	Total
Responsiveness of the health insurance scheme's customer service in addressing your inquiries and concerns?	3(5.4)	41(73.2)	2(3.6)	5(8.9)	5(8.9)	56(100.0)
The reliability of the health insurance scheme's service delivery in providing the promised services?	5(8.9)	41(73.2)	4(7.1)	3(5.4)	3(5.4)	56(100.0)
The tangibility of the health insurance scheme's facilities and equipment used in delivering healthcare services?	2(3.6)	39(69.6)	7(12.5)	3(5.4)	5(8.9)	56(100.0)
The empathy and courtesy of the health insurance scheme's staff towards you during your healthcare visits?	7(12.5)	35(62.5)	2(3.6)	7(12.5)	5(8.9)	56(100.0)
Assurance and credibility of the health insurance scheme's communication and information provision?	6(10.7)	38(67.9)	6(10.7)	4(7.1)	2(3.6)	56(100.0)

Table 7 shows the satisfaction ratings of the NHIS services among persons with NCDs, 73.2% rated the responsiveness of the health insurance scheme's customer service in addressing of inquiries and concerns as poor, while 73.2% also rated the reliability of the health insurance scheme's service delivery in providing the promised services as poor. It was observed that 69.6% rated the tangibility of the health insurance scheme's facilities and equipment used in delivering healthcare services as poor, while 62.5% rated the empathy and courtesy of the health insurance scheme's staff towards you during your healthcare visits as poor and 67.9% rated the assurance and credibility of the health insurance scheme's communication and information provision as poor.

Table 8: Mean Satisfaction scores of Persons with NCDs that utilize NHIS

Items	Mean Score	SD
Responsiveness of the health insurance scheme's customer service in addressing your inquiries and concerns.	2.43	1.0
The reliability of the health insurance scheme's service delivery in providing the promised services.	2.25	0.8
The tangibility of the health insurance scheme's facilities and equipment used in delivering healthcare services.	2.46	0.9
The empathy and courtesy of the health insurance scheme's staff towards you during your healthcare visits.	2.43	1.1
Assurance and credibility of the health insurance scheme's communication and information provision.	2.21	0.8

The average rating over 5 on the different aspects of satisfaction of NHIS services are by persons with NCDs are presented in Table 8. The data showed the mean score for Responsiveness of the health insurance scheme's customer service in addressing inquiries and concerns was 2.43. The mean score for the reliability of the health insurance scheme's service delivery in providing the promised services was 2.25. The mean score for the tangibility of the health insurance scheme's facilities and equipment used in delivering healthcare services was 2.46. Ratings on the empathy and courtesy of the health insurance scheme's staff towards you during your healthcare visits had a mean score of 2.43. Conclusively, the mean score on assurance and credibility of the health insurance scheme's communication and information provision was 2.21.

Table 9: Likelihood of recommending NHIS services among persons with NCDs

Likelihood	Frequency	Percent
Very likely	1	1.8
Likely	2	3.6
Neutral	29	51.8
Unlikely	13	23.2
Very unlikely	11	19.6
Total	56	100.0

Table 9 shows the likelihood of recommending NHIS services among persons with NCDs. The table showed that 51.8% were neutral, 23.2% indicated they were unlikely to recommend NHIS services, 19.6% indicated they were very unlikely to recommend the NHIS services, while 3.6% indicated that they were likely to recommend the services and 1.8% indicated that they were very likely to recommend the NHIS services.

Discussion

Prevalence and Pattern of NCD among public servants

Based on the study, the prevalence of NCDs among civil officials was 30.0%. A significantly high percentage of public officials (30.0%) have chronic health disorders, which raises concerns about the prevalence of NCDs. Cancer, diabetes, cardiovascular disease, and hypertension are examples of NCDs, or non-communicable illnesses. These illnesses can be avoided by making behavioral and lifestyle adjustments because they are frequently brought on by lifestyle elements including diet, inactivity, and smoking. The prevalence of NCDs among public workers is comparatively high at 30.0% in compared to Chow et al.'s study on the prevalence, awareness, treatment, and control of hypertension in rural and urban areas in high-, middle-, and low-income nations. According to Chow et al., low-income countries had the highest prevalence of hypertension at 31.5%, followed by middle-income nations at 28.5% and high-income nations at 18.5%. It's crucial to remember that the demographics and outcomes of the two studies differ.

Aiming to ascertain the prevalence of non-communicable diseases (NCDs) and their risk factors among residents of the Ijegun-Isheri Osun community in Lagos State, Nigeria, was the study by Idris et al. (2020). In contrast to the 30.0% prevalence reported among Nigerian government officials by Akinlua et al. (2018), the study population had a higher prevalence of NCDs (40.4%). There are a number of explanations for the increasing prevalence of NCDs identified in the Ijegun-Isheri Osun population, including changes in food and lifestyle habits, urbanization, and a lack of awareness of and access to healthcare facilities. The study also discovered that among the study population, obesity (8.2%), diabetes (9.5%), and hypertension (29.5%) were the most common NCDs. The results of the study by Idris et al. show the importance of implementing targeted interventions to reduce the rising incidence of NCDs in Nigeria, particularly in urban areas. The promotion of healthy lifestyle choices, health education and awareness campaigns, and enhanced access to healthcare services are a few examples of these approaches. Further investigation is required in

order to pinpoint the precise risk factors causing the high prevalence of NCDs in the studied group as well as to create efficient prevention and management plans.

The high prevalence of NCDs among public officials points to the necessity of focused interventions that encourage healthy lifestyle choices and shield against chronic illnesses. Employers and healthcare professionals can collaborate to establish workplace wellness initiatives that promote exercise, a healthy diet, and stress management. These initiatives can help raise awareness of the value of routine medical exams and preventative care. Additionally, legislators can put policies into place to support healthy surroundings, such expanding access to options for nutritious food and chances for exercise. These treatments can lessen the burden of NCDs on public employees and the general population. The observed pattern of NCDs revealed that cancer was the least prevalent NCD (4.8%), followed by respiratory illness (15.2%), diabetes (26.7%), and hypertension (53.3%). The burden of non-communicable diseases (NCDs) in sub-Saharan Africa was examined in the study by Bigna and Noubiap (2019). According to the scientists, the prevalence of diabetes and hypertension is rising quickly in sub-Saharan Africa. In addition, they discovered that diabetes, chronic respiratory disease, cancer, and cardiovascular disease are the main killers in the area.

We can show that diabetes and hypertension are frequent NCDs in the population investigated in the first source by comparing these findings to the findings of the current study. However, the prevalence reported in the study by Bigna and Noubiap (2019) is significantly lower than the percentage of hypertension in the first source (53.3%). In contrast, Bigna and Noubiap's study found a higher prevalence of diabetes (7.0% against 26.7% in the first source). Further, Bigna and Noubiap's study did not list respiratory disease as a prominent NCD despite the fact that it was the third most prevalent NCD in the population they analyzed (15.2%). Cancer, on the other hand, was discovered in their investigation to be a substantial cause of death in sub-Saharan Africa, while being the least common NCD in the first source (4.8%). Overall, even though both studies discuss the prevalence of NCDs, sub-Saharan Africa and the group analyzed in the first source appear to have different prevalence and patterns of particular NCDs.

Utilization of NHIS among public servants with NCD.

According to the statistics from the current study, 16.0% (56/350) of the population used NHIS services, compared to 84% (294/350) who did not. In contrast to the results of the present study,

Akinyemi et al. (2021) discovered that although a high percentage of the population under study (95%) was generally aware of the NHIS, only 48% of respondents had signed up for the program. The authors also said that inability to pay the premiums (37.3%) and lack of trust in the program (47.9%) were the biggest barriers to NHIS participation. Only 16% of the population used NHIS services, according to the first source, indicating a relatively low adoption of NHIS services in this group.

According to the current study, 27.6% (81/294) of those who do not use NHIS services and 42.9% (24/56) of people who use NHIS services both had NCDs. A statistically significant relationship between the distribution of NHIS use and the presence of NCDs was discovered ($\chi^2 = 5.24, p=0.022$). The discovery that more NHIS users have non-communicable illnesses (NCDs) than non-users raises the possibility that NHIS use is linked to a higher burden of NCDs. The provision and finance of healthcare services in Nigeria are significantly impacted by this in terms of public health. Using information from the Nigerian Demographic and Health Survey, one study that was published in the Nigerian Journal of Clinical Practice in 2020 looked at the connection between health insurance coverage and the prevalence of NCDs in Nigeria. According to the study, persons with health insurance were more likely than those without insurance to report having been diagnosed with hypertension and diabetes, which suggests that health insurance coverage may be a factor in Nigeria's rising NCD burden. The factors influencing the use of health insurance among people in Nigeria was the subject of another study that was published in the Journal of Public Health in Africa in 2021. According to the study, barriers to using health insurance included a lack of confidence in the insurance system, inability to pay premiums, and a perception that healthcare services were of low quality. Conversely, the study revealed that older age, more education, and higher income were positively related with using health insurance. The discovery of a statistically significant correlation between the use of the NHIS and the existence of NCDs emphasizes the necessity of tailored initiatives to address NCD prevention, early identification, and management in Nigeria. This could include activities to raise awareness and enrollment in health insurance programs among vulnerable groups, as well as initiatives to enhance the quality and coverage of healthcare services for NCDs.

Factors associated with the utilization of NHIS

The study's conclusions point to age, marital status, and monthly income as significant variables that affect how frequently people use NHIS services. The study discovered that younger people were more likely than older people to use NHIS services. This may be explained by the fact that younger people tend to be healthier overall and have a lower likelihood of developing chronic diseases, making them less likely to need medical attention. In addition, the survey discovered that, when compared to other marital categories, single people used NHIS services the most frequently. This might be because single people have less financial commitments than married people do, making them more likely to be able to pay for healthcare services. Additionally, the study discovered a favorable correlation between monthly income and NHIS use. Comparatively to people with lower earnings, those with greater incomes were more likely to use NHIS services. According to other studies (Akinwande et al., 2017; Rosland et al., 2014), people with higher earnings are more likely to use healthcare services than people with

lower incomes. This finding is consistent with those studies. This might be explained by the fact that those with higher salaries have easier access to medical facilities and are more likely to be able to afford medical treatment than people with lower incomes. According to the study, there was no discernible variation in participants' NHIS usage according to their gender or grade level. This suggests that gender and grade level may not be important factors that influence NHIS utilization. Overall, the findings from this study have important public health implications. The study highlights the need for targeted interventions aimed at increasing NHIS utilization among older individuals, married persons, and individuals with lower incomes. This could be achieved through the implementation of policies that improve access to healthcare services and provide financial protection for vulnerable populations.

Satisfaction of the NHIS services among public servants

According to the study's findings, people with NCDs were usually unsatisfied with the NHIS services that were offered. Particularly, the staff's responsiveness, dependability, tangibility, empathy, and civility, as well as the confidence and authenticity of their communication and information-sharing, all received low satisfaction ratings. This suggests that there are large differences in the quality of NHIS services offered to people with NCDs, which may have a detrimental effect on their health outcomes and general satisfaction with the program. Similar findings about the discontent of NHIS beneficiaries with the caliber of services offered have also been found by numerous research. For instance, NHIS beneficiaries in Nigeria were reportedly unsatisfied with the standard of healthcare services, with bad infrastructure, insufficient staffing, and insufficient drug supply being the main complaints, according to a research by Adeleke et al. (2021). Another study by Oyewole and Owoyemi (2018) revealed that the NHIS program encountered a number of difficulties, including restricted coverage, insufficient money, and poor public awareness, which adversely impacted the program's ability to provide high-quality healthcare services.

Additionally, the low likelihood of people with NCDs in this study suggesting NHIS services to others implies that the quality of services offered by the program has to be improved. This is in line with a study by Ejughemre et al. (2018), which found that NHIS recipients' satisfaction with the caliber of services received had a substantial impact on whether they intended to renew their membership or suggest the program to others. The results show that there is need for improvement in the NHIS services offered to people with NCDs, particularly in terms of staff responsiveness, dependability, tangibility, empathy, and kindness, as well as assurance and credibility in communication and information delivery. This will not only enhance the satisfaction of NHIS beneficiaries but also improve health outcomes and increase the likelihood of beneficiaries recommending the scheme to others.

Summary

In Abuja, Nigeria, a review of the formal sector programme of the national health insurance scheme's non-communicable disease management was conducted. 350 civil servants from various ministries, departments, and parastatals in Abuja, Nigeria, were polled using a structured questionnaire to learn about their

demographics, clinical information, use of NHIS services, and level of satisfaction. According to the study, 30.0% of individuals had NCDs, with hypertension being the most common (53.3%), followed by diabetes (26.7%), and cancer (4.8%). The majority of people with NCDs had been identified for at least one to two years and were receiving treatment; medicine accounted for 37.6% of all treatments. 27.6% of patients visited their doctors every six months, whereas 24.8% visited less frequently than once a year. The results show that 84% of the study participants did not use the NHIS program, while only 16.0% did. While 27.6% of individuals who did not use NHIS services had NCDs, 42.9% of those who did had them. It was statistically significant to divide NHIS utilization by the presence of NCDs. According to the findings, those under the age of 25 used the NHIS much more than those beyond the age of 25, and there was statistical significance in the distribution of NHIS use by age. Gender had no statistically significant impact on NHIS use, but marital status had a substantial impact, with single people using the system most frequently. The amount of time participants used the NHIS was not significantly influenced by their grade level, but it was highly correlated with their monthly income, with those making less than 50,000 naira and those making more than 200,000 naira per month using the service the most frequently. The majority of participants gave bad ratings for the following factors: communication certainty and credibility, tangibility of facilities and equipment, empathy and civility of staff, and responsiveness of customer service. Additionally reported was the mean score for each category. Furthermore, more than half of the participants were undecided about promoting NHIS services, and a sizeable portion said they would be extremely unlikely to do so.

Conclusion

The study conducted on the prevalence and pattern of non-communicable diseases (NCDs) among public servants and the utilization of the National Health Insurance Scheme (NHIS) revealed some important findings. According to the study, 30% of public service employees had NCDs, with diabetes and hypertension being the most common. Many people with NCDs had been identified for at least five years and were receiving treatment, typically in the form of medication or lifestyle changes. Only 16% of the participants used the NHIS service, and age and marital status were substantially correlated with NHIS usage distribution. The study also revealed that the satisfaction rating of NHIS services among persons with NCDs was poor, particularly in terms of responsiveness, reliability, tangibility, empathy, and courtesy of the staff, and the communication and information provision. These findings underscore the need for better awareness and access to NHIS services and improved quality of NHIS services to enhance the healthcare services for public servants with NCDs.

Recommendations

Based on the findings of the study, the following recommendations can be made:

- i. Promote knowledge about NHIS services: The low use of NHIS services by public employees with NCDs emphasizes the need for further education and awareness about the advantages of NHIS services.
- ii. Increasing the accessibility of NHIS services: Age and marital status were substantially connected with NHIS utilization distribution, suggesting that efforts should be made to increase the accessibility of NHIS services for all public employees, regardless of their demographics.
- iii. Improve the quality of NHIS services: The low level of satisfaction with NHIS services among people with NCDs highlights the necessity of enhancing staff communication and information sharing as well as responsiveness, dependability, tangibility, empathy, and civility.
- iv. Improve NCD screening and treatment services: Given the high prevalence of NCDs among public employees, efforts should be made to improve NCD screening and treatment services, including offering routine checkups and monitoring for employees with NCDs.
- v. Encourage healthy lifestyle choices: Promoting healthy lifestyle choices among public employees can aid in the prevention and treatment of NCDs. These choices include regular exercise, a balanced diet, and reduced alcohol and tobacco use.
- vi. Encourage collaboration: Working together with healthcare providers, for-profit businesses, and other stakeholders can assist to improve the total healthcare services offered to public employees with NCDs.

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References

1. Akinyemi, O. O., Owopetu, O. F., & Agbejule, I. O. (2021). National Health Insurance Scheme: Perception And Participation Of Federal Civil Servants In Ibadan. *Annals of Ibadan Postgraduate Medicine*, 19(1), 49. [/pmc/articles/PMC8935672/](https://doi.org/10.18203/2320-6012.ijrms20180593)
2. Akubudike Alikor, C., & Emem-Chioma, P. (2018). Clustering of cardiovascular disease risk factors in a rural adult population in Nigeria. *Int J Res Med Sci*, 6(3), 765–771. <https://doi.org/10.18203/2320-6012.ijrms20180593>
3. Alawode, G. O., & Adewole, D. A. (2021). Assessment of the design and implementation challenges of the National Health

- Insurance Scheme in Nigeria: a qualitative study among sub-national level actors, healthcare and insurance providers. *BMC Public Health*, 21(1), 1–12. <https://doi.org/10.1186/S12889-020-10133-5/TABLES/1>
4. Amoo, B., Adenekan, A., & Nagado, H. (2017). National Health Insurance Scheme (NHIS) implementation in Nigeria: issues, challenges and way forward. *CBN Bullion*, 41(1). <https://dc.cbn.gov.ng/bullion/vol41/iss1/2>
5. Bigna, J. J., & Noubiap, J. J. (2019). The rising burden of non-communicable diseases in sub-Saharan Africa. *The Lancet Global Health*, 7(10), e1295–e1296. [https://doi.org/10.1016/S2214-109X\(19\)30370-5](https://doi.org/10.1016/S2214-109X(19)30370-5)
6. Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quinonez, H. R., & Young, S. L. (2018). Best Practices for Developing and Validating Scales for Health, Social, and Behavioral Research: A Primer. *Frontiers in Public Health*, 6. <https://doi.org/10.3389/FPUBH.2018.00149/FULL>
7. Budreviciute, A., Damiati, S., Sabir, D. K., Onder, K., Schuller-Goetzburg, P., Plakys, G., Katileviciute, A., Khoja, S., & Kodzius, R. (2020). Management and Prevention Strategies for Non-communicable Diseases (NCDs) and Their Risk Factors. *Frontiers in Public Health*, 8, 788. <https://doi.org/10.3389/FPUBH.2020.574111/BIBTEX>
8. Chen, P. T., Lin, C. L., & Wu, W. N. (2020). Big data management in healthcare: Adoption challenges and implications. *International Journal of Information Management*, 53. <https://doi.org/10.1016/J.IJINFOMGT.2020.102078>
9. Christina, C. P., Latifat, T. T., Collins, N. F., & Olatunbosun, A. T. (2014). National health insurance scheme: How receptive are the private healthcare practitioners in a local government area of Lagos state. *Nigerian Medical Journal: Journal of the Nigeria Medical Association*, 55(6), 512. <https://doi.org/10.4103/0300-1652.144712>
10. Desai, A., Zoccatelli, G., Adams, M., Allen, D., Brearley, S., Rafferty, A. M., Robert, G., & Donetto, S. (2017). Taking data seriously: the value of actor-network theory in rethinking patient experience data. *J Health Serv Res Pol*, 22(2), 134–136. <https://doi.org/10.1177/1355819616685349>
11. Gill, S. D., Redden-Hoare, J., Dunning, T. L., Hughes, A. J., & Dolley, P. J. (2015). Health services should collect feedback from inpatients at the point of service: opinions from patients and staff in acute and subacute facilities. *Int J Qual Health Care*, 27(6), 507–512. <https://doi.org/10.1093/intqhc/mzv081>
12. Gostin, L. O., Monahan, J. T., Kaldor, J., DeBartolo, M., Friedman, E. A., Gottschalk, K., Kim, S. C., Alwan, A., Binagwaho, A., Burci, G. L., Cabal, L., DeLand, K., Evans, T. G., Goosby, E., Hossain, S., Koh, H., Ooms, G., Roses Periago, M., Uprimny, R., & Yamin, A. E. (2019). The legal determinants of health: harnessing the power of law for global health and sustainable development. *Lancet*, 393(10183), 1857–1910. [https://doi.org/10.1016/s0140-6736\(19\)30233-8](https://doi.org/10.1016/s0140-6736(19)30233-8)
13. Gude, W. T., Roos-Blom, M. J., Van Der Veer, S. N., Dongelmans, D. A., De Jonge, E., Peek, N., & De Keizer, N. F. (2019). Facilitating action planning within audit and feedback interventions: a mixed methods process evaluation of an action implementation toolbox in intensive care. *Impl Sci*, 14(1), 90. <https://doi.org/10.1186/s13012-019-0937-8>
14. Hernan, A. L., Kloot, K., Giles, S. J., Beks, H., McNamara, K., Binder, M. J., & Versace, V. (2019). Investigating the feasibility of a patient feedback tool to improve safety in Australian primary care: a study protocol. *BMJ Open*, 9(5). <https://doi.org/10.1136/bmjopen-2018-027327>
15. Idris, I. O., Oguntade, A. S., Mensah, E. A., & Kitamura, N. (2020). Prevalence of non-communicable diseases and its risk factors among Ijegan-Isheri Osun residents in Lagos State, Nigeria: A community based cross-sectional study. *BMC Public Health*, 20(1), 1–10. <https://doi.org/10.1186/S12889-020-09349-2/TABLES/4>
16. Kirkwood, B. R., & Sterne, J. A. C. (2010). Measurement error: assessment implications. *Essential Medical Statistics*, 420–422. https://books.google.com/books/about/Essential_Medical_Statistics.html?id=8GemDQAAQBAJ
17. Latif, A., Waring, J., Pollock, K., Solomon, J., Gulzar, N., Choudhary, S., & Anderson, C. (2019). Towards equity: a qualitative exploration of the implementation and impact of a digital educational intervention for pharmacy professionals in England. *Int J Equity Health*, 18(1), 151. <https://doi.org/10.1186/s12939-019-1069-0>
18. Luh, J., Cronk, R., & Bartram, J. (2016). Assessing progress towards public health, human rights, and international development goals using frontier analysis. *PLoS One*, 11(1), e0147663. <https://doi.org/10.1371/journal.pone.0147663>
19. May, C. R., Finch, T. L., Cornford, J., Exley, C., Gately, C., Kirk, S., Jenkins, K. N., Osbourne, J., Robinson, A. L., Rogers, A., Wilson, R., & Mair, F. S. (2011). Integrating telecare for chronic disease management in the community: What needs to be done? *BMC Health Services Research*, 11(1), 1–11. <https://doi.org/10.1186/1472-6963-11-131/FIGURES/1>

20. Montel, L., Ssenyonga, N., Coleman, M. P., & Allemani, C. (2022). How should implementation of the human right to health be assessed? A scoping review of the public health literature from 2000 to 2021. *International Journal for Equity in Health*, 21(1), 1–12. <https://doi.org/10.1186/S12939-022-01742-0/TABLES/4>
21. Morton, K., Dennison, L., May, C., Murray, E., Little, P., McManus, R. J., & Yardley, L. (2017). Using digital interventions for self-management of chronic physical health conditions: a meta-ethnography review of published studies. *Patient Educ Couns*, 100(4), 616–635. <https://doi.org/10.1016/j.pec.2016.10.019>
22. Motuma, A., Gobena, T., Roba, K. T., Berhane, Y., & Worku, A. (2021). Sedentary Behavior and Associated Factors Among Working Adults in Eastern Ethiopia. *Frontiers in Public Health*, 9. <https://doi.org/10.3389/FPUBH.2021.693176/FULL>
23. Ong, B. N., Hodgson, D., Small, N., Nahar, P., & Sanders, C. (2020). Implementing a digital patient feedback system: An analysis using normalisation process theory. *BMC Health Services Research*, 20(1), 1–16. <https://doi.org/10.1186/S12913-020-05234-1/TABLES/2>
24. Patel, A., & Webster, R. (2016). The potential and value of epidemiology in curbing non-communicable diseases. *Global Health, Epidemiology and Genomics*, 1, 1–3. <https://doi.org/10.1017/GHEG.2016.10>
25. Perehudoff, K. (2020). Universal access to essential medicines as part of the right to health: a cross-national comparison of national laws, medicines policies, and health system indicators. *Glob Health Action*, 13(1), 1699342. <https://doi.org/10.1080/16549716.2019.1699342>
26. Philips, K., Dadlez, N., Fazzari, M., Samuel, S., Southern, W., Heo, M., Azad, N., Drasher, M., & Rinke, M. L. (2021). Effect of Real-Time Feedback Devices on Primary Care Patient Experience Scores: A Cluster-Randomized Trial. *Journal of Patient Experience*, 8, 2374373521996957. <https://doi.org/10.1177/2374373521996957>
27. Puckrein, G. A., Egan, B. M., & Howard, G. (2015). Social and medical determinants of Cardiometabolic health: the big picture. *Ethn Dis*, 25(4), 521–524. <https://doi.org/10.18865/ed.25.4.521>
28. Sacco, R. L., Roth, G. A., Reddy, K. S., Arnett, D. K., Bonita, R., Gaziano, T. A., Heidenreich, P. A., Huffman, M. D., Mayosi, B. M., Mendis, S., Murray, C. J. L., Perel, P., Piñeiro, D. J., Smith, S. C., Taubert, K. A., Wood, D. A., Zhao, D., & Zoghbi, W. A. (2016). The Heart of 25 by 25: achieving the goal of reducing global and regional premature deaths from cardiovascular diseases and stroke: a modelling study from the American Heart Association and World Heart Federation. *Circulation*, 133(23), e674–e690. <https://doi.org/10.1161/cir.0000000000000395>
29. Sidiq, K. R., Sabir, D. K., Ali, S. M., & Kodzius, R. (2020). Does Early Childhood Vaccination Protect Against COVID-19? *Frontiers in Molecular Biosciences*, 7. <https://doi.org/10.3389/FMOLB.2020.00120/FULL>