CHAO (Comorbidities in HIV/AIDS Outpatients) study in Kenya

CHAO STUDY

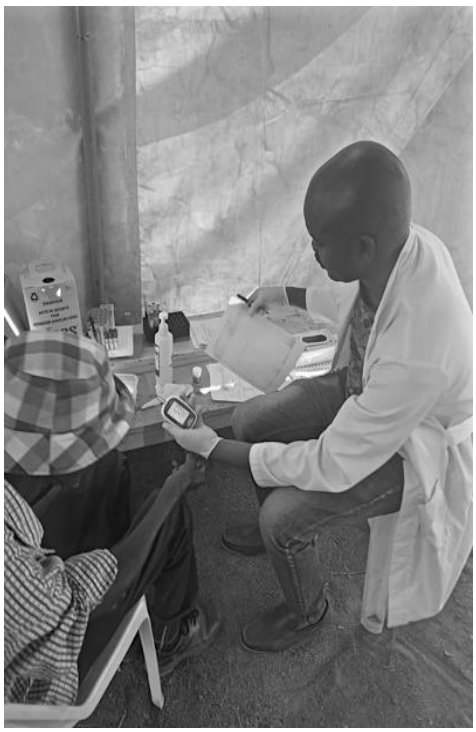
Comorbidities in HIV/AIDS Outpatients

INTERIM REPORT

05th of December 2023

TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

dream
SANT'EGIDIO



ITALIAN AGENCY FOR DEVELOPMENT COOPERATION

THE COUNTY GOVERNMENT OF MERU

CHAO Project is conducted by

- *Università degli Studi di Roma Tor Vergata (Italy), Department of Biomedicine and Prevention*
- *Community of Sant'Egidio, DREAM program*

in collaboration with:

- *County Government of Meru,Department of Health*

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EXECUTIVE SUMMARY

The CHAO Project in Kenya is an initiative focusing on the comorbidities in HIV/AIDS outpatients in Meru County. The CHAO Project seeks to increase knowledge about the comorbidities and major risk factors in patients living with HIV, addressing the urgent need for improved understanding and management of these conditions.

The results of the CHAO study reveal a significant prevalence of comorbidities and associate risk factors among HIV patients. The study involved 1,051 HIV+ patients in 25 clinics in Meru County. Notably, **55.4% of the screened patients were affected by other conditions**, with 36.9% handling one additional comorbidity and 18.5% dealing with more than one. This underscores the need for integrated care approaches. The study highlights that **non-communicable diseases (NCDs) and associated risk factors were markedly more prevalent (38.5%) than communicable diseases (14.9%)** among these patients. Particularly, dyslipidemia and hypertension were the most common conditions, found in 21.2% and 20% of the patients, respectively.

The study's multivariable analysis revealed that males are more likely to be underweight, age significantly increases the risk of syphilis, and is associated with higher risks of hypertension, diabetes, and dyslipidemia. Overweight individuals have an increased risk of hypertension. However, no significant link was found between tobacco and alcohol use and non-communicable diseases (NCDs), potentially due to a limited sample size. Contrary to expectations, being overweight increased hypertension risk but not diabetes or dyslipidemia.

The CHAO Project's recommendations emphasize the **critical need for integrated HIV services that encompass broader healthcare.** This approach is aligned with the Global Fund's objectives and policies, focusing on efficiently combining HIV care with the management of NCDs and other health conditions. The project advocates for comprehensive service packages that include various health checks and screenings, highlighting the urgency to enhance epidemiological data for effective healthcare planning.

INTRODUCTION

The Comorbidities in HIV/AIDS Outpatients (CHAO) Project in Kenya is an initiative aimed at increasing knowledge about comorbidities and major risk factors in patients living with HIV.

Africa remains the epicenter of the global HIV epidemic. As of recent UNAIDS data, in Kenya around 1.4 million people are living with HIV. The country's HIV prevalence rate stands at around 3.7%, highlighting a significant public health concern (UNAIDS, 2023).

Kenya's multifaceted response to HIV includes widespread public awareness campaigns, increased access to antiretroviral therapy (ART), and the integration of HIV services into the general health system. However, challenges remain, particularly in healthcare infrastructure and access, especially in rural and underserved areas. As of 2022, about 95% of adults and 85% of children living with HIV were accessing ART (UNAIDS, 2023).

With the large number of HIV patients, many of whom are on therapy and living longer thanks to treatment, new scenarios are emerging that combine infectious diseases (such as TB, malaria, viral hepatitis, syphilis, etc.) with chronic non-communicable diseases (NCDs).

Key national documents like the Kenya AIDS Strategic Framework (KASF) and the Kenya HIV & AIDS Research Agenda point out substantial gaps in understanding and managing these comorbidities. KASF 1 and KASF 2 have identified the need for improved screening, prophylaxis, and management of co-infections and comorbidities, recommending comprehensive service packages that include various health checks and screenings (National AIDS Control Council, 2013a, 2019). Moreover, the Kenya HIV & AIDS Research Agenda emphasizes the urgency of enhancing epidemiological data for effective healthcare planning, as current data on comorbidities in HIV patients is notably insufficient (National AIDS Control Council, 2013b).

The CHAO Project aligns closely with the policies and objectives of the Global Fund, particularly in integrating HIV services with broader health care for more efficient and effective delivery. This alignment is evident in the project's approach to combining HIV care with the management of NCDs and other health conditions, thus addressing the gaps highlighted in the Kenya AIDS Strategic Framework and the Kenya HIV & AIDS Research Agenda. By coordinating

with the Global Fund, the CHAO Project is well-positioned to receive support in funding, technical assistance, and policy guidance, contributing significantly to both national and global efforts in HIV/AIDS management.

The CHAO Project's focus on the knowledge gap in HIV comorbidities, particularly NCDs, is crucial for enhancing the quality of life and reducing mortality among HIV patients in Kenya. This initiative calls for an integrated approach in HIV services and a dedicated investment in research to gather reliable data, which is essential for informed decision-making and effective policy development in the realm of public health.

METHODOLOGY

CHAO study employed a cross-sectional design to evaluate the prevalence of comorbidities among HIV-positive patients across Meru County. This comprehensive assessment was aimed at providing critical insights into the intersection of HIV with a range of both non-communicable and infectious diseases.

Study Sites and Population

The study was conducted in 25 Comprehensive Care Clinics (CCC) providing HIV services within Meru County, randomly selected among 80 active CCC. This broad coverage ensured a representative sample of the HIV-positive population in the region, allowing for a thorough understanding of the comorbidity landscape within this demographic.

Participant Recruitment and Screening

The study adopted a convenience sampling method to recruit participants. This approach was operationalized through organizing "Health days" at each clinic involved in the study. On these designated days, we recruited all adult patients diagnosed with HIV who were present at the clinic and willing to participate. In addition to recruitment, these "Health days" also served as an opportunity to provide health education to patients on non-communicable diseases (NCDs) and other diseases under investigation in the study. Prior to their inclusion in the study, informed consent was obtained from each participant, adhering to ethical standards. Subsequently, participants underwent comprehensive screening for a range of comorbid conditions, including liver diseases, kidney diseases, dyslipidemia, hepatitis B and C, syphilis, diabetes, hypertension, and obesity/overweight. This strategy ensured the inclusion of a diverse cross-section of the HIV-positive population in Meru County while facilitating the collection of pertinent data on comorbidities.

Screening Procedures

The screening process involved a combination of clinical evaluations, laboratory tests, and patient interviews. Clinical evaluations included physical examinations and assessments of vital signs to identify signs of comorbid conditions. Laboratory tests were conducted to ascertain the presence of conditions such as hepatitis, syphilis, diabetes, and dyslipidemia. Patient interviews gathered data on lifestyle factors, medical history, and other relevant information that could influence the prevalence of comorbidities.

Data Analysis

The data collected in this study were analyzed using R software (version 4.3.1). For the statistical analysis, we utilized the 'gtsummary' package. This included determining the prevalence rates of various comorbidities among the HIV-positive population in Meru County, summarizing the data using descriptive statistics, and identifying significant correlations or patterns through inferential statistics.

Furthermore, the geospatial analysis and the production of maps integral to this study were conducted using the 'sf' and 'tmap' packages.

This comprehensive approach to data analysis, combining both statistical and geospatial methodologies, was instrumental in identifying demographic or clinical factors associated with higher rates of specific comorbidities among the HIV-positive population. The detailed diagnostic criteria and cut-off values used in the study are systematically presented in ANNEX 1, providing a complete and thorough understanding of the analytical framework underpinning our findings.

Ethical Considerations

The study adhered to all ethical guidelines for research involving human subjects, including confidentiality, informed consent, and the right to withdraw from the study without any consequences. Ethical approval was obtained from AMREF ESRC(P1201.2022), licensed by NACOSTI (P/22/19204) and approved by the Department of Health, County Government of Meru.

RESULTS

In this chapter, we explore the underlying patterns and characteristics of the HIV-positive cohort under study, through a detailed descriptive epidemiological analysis.
The data unfolds the dimensions of concurrent health challenges, with a significant proportion of the cohort grappling with comorbidities alongside HIV.

Descriptive epidemiology

The cohort analysis of 1,051 HIV-positive individuals revealed a female predominance (75%, n=791), with males constituting a quarter (25%, n=260). Median age was 47 years, with a range from 38 to 54 years, signifying a middle-aged demographic. Lifestyle factors included 7.3% tobacco use (n=77) and 15% alcohol consumption (n=151).
The majority were on long-term ART (>12 months since diagnosis: 96%, n=1,000), predominantly incorporating Dolutegravir (DTG: 95%, n=998), with most on the first-line regimen (96%, n=1,003).

Table 1 - Descriptive analysis

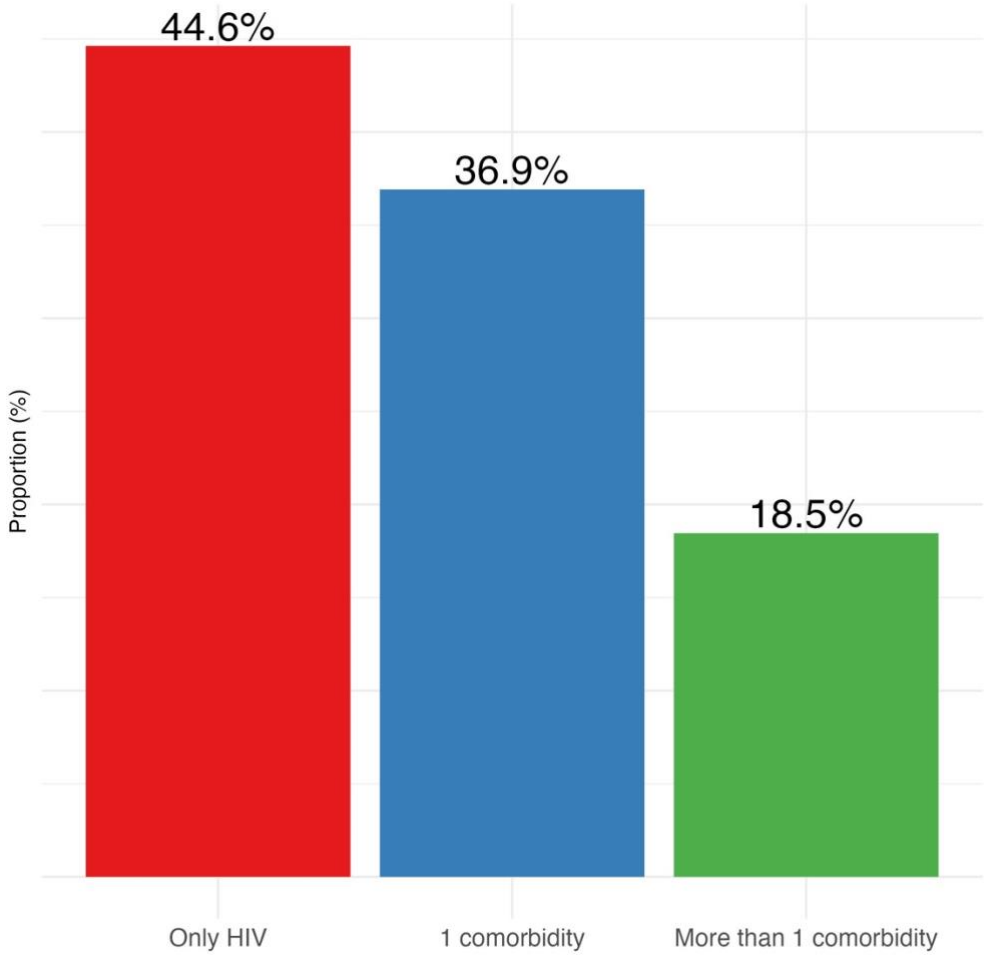
Characteristic	**N = 1,051**[1]
Sex	
Female	791 (75%)
Male	260 (25%)
Age (years)	47 (38, 54)
Unknown	2
Tobacco consumers	77 (7.3%)
Unknown	3
Alcohol consumers	151 (15%)
Unknown	67
Pregnant or lactating	
Lactating	16 (1.5%)
N/A	1,030 (98%)
Pregnant	4 (0.4%)
Unknown	1
Time from HIV diagnosis	
> 12 months	1,000 (96%)
6-12 months	18 (1.7%)
< 6 months	25 (2.4%)
Unknown	8
ART regimen	
With DTG	998 (95%)
Without DTG	49 (4.7%)
Unknown	4 (0.4%)

ART regimen line	
1st Line	1,003 (96%)
2nd Line	45 (4.3%)
Unknown	3
Nutritional status	
Underweight	167 (16%)
Normal weight	564 (54%)
Overweight	223 (21%)
Obese	97 (9.2%)
Blood pressure	
Optimal	355 (34%)
Normal	348 (33%)
High normal	182 (17%)
Grade 1 hypertension	120 (11%)
Grade 2 hypertension	27 (2.6%)
Grade 3 hypertension	13 (1.2%)
Unknown	6
Known hypertensive	
Newly diagnosed	2 (0.2%)
No	932 (89%)
Yes/Not on treatment	5 (0.5%)
Yes/On treatment	105 (10%)
Unknown	7
GPT class	
Normal	859 (82%)
Mild hypertransaminasemia	186 (18%)
Moderate hypertransaminasemia	1 (<0.1%)
Elevated hypertransaminasemia	0 (0%)
Unknown	5
GOT class	
Normal	571 (55%)
Mild hypertransaminasemia	473 (45%)
Moderate hypertransaminasemia	2 (0.2%)
Elevated hypertransaminasemia	0 (0%)
Unknown	5
Cholesterol	
Normal	932 (89%)
Borderline	85 (8.1%)
Elevated	34 (3.2%)
Triglycerides	
Normal	838 (80%)
Borderline	110 (10%)
Elevated	103 (9.8%)
Creatinine	
Normal	751 (71%)
Elevated	300 (29%)
eGFR Classification	

Normal	287 (28%)
Mild renal impairment	407 (39%)
Moderate renal impairment	338 (32%)
Severe renal impairment	10 (1.0%)
Unknown	9
Transaminasemia	2 (0.2%)
High blood sugar	
False	1,024 (98%)
True	18 (1.7%)
Unknown	9
Known diabetic	
No	1,018 (100%)
Yes/Not on treatment	2 (0.2%)
Unknown	31
HBS ag	
Negative	1,023 (98%)
Positive	23 (2.2%)
Unknown	5
HCV ag	
Negative	1,042 (100%)
Positive	3 (0.3%)
Unknown	6
Syphilis	
Negative	992 (95%)
Positive	55 (5.3%)
Unknown	4
HBG	
Normal	707 (69%)
Mild anemia	244 (24%)
Moderate anemia	47 (4.6%)
Severe anemia	26 (2.5%)
Unknown	27
[1]n (%); Median (IQR)	

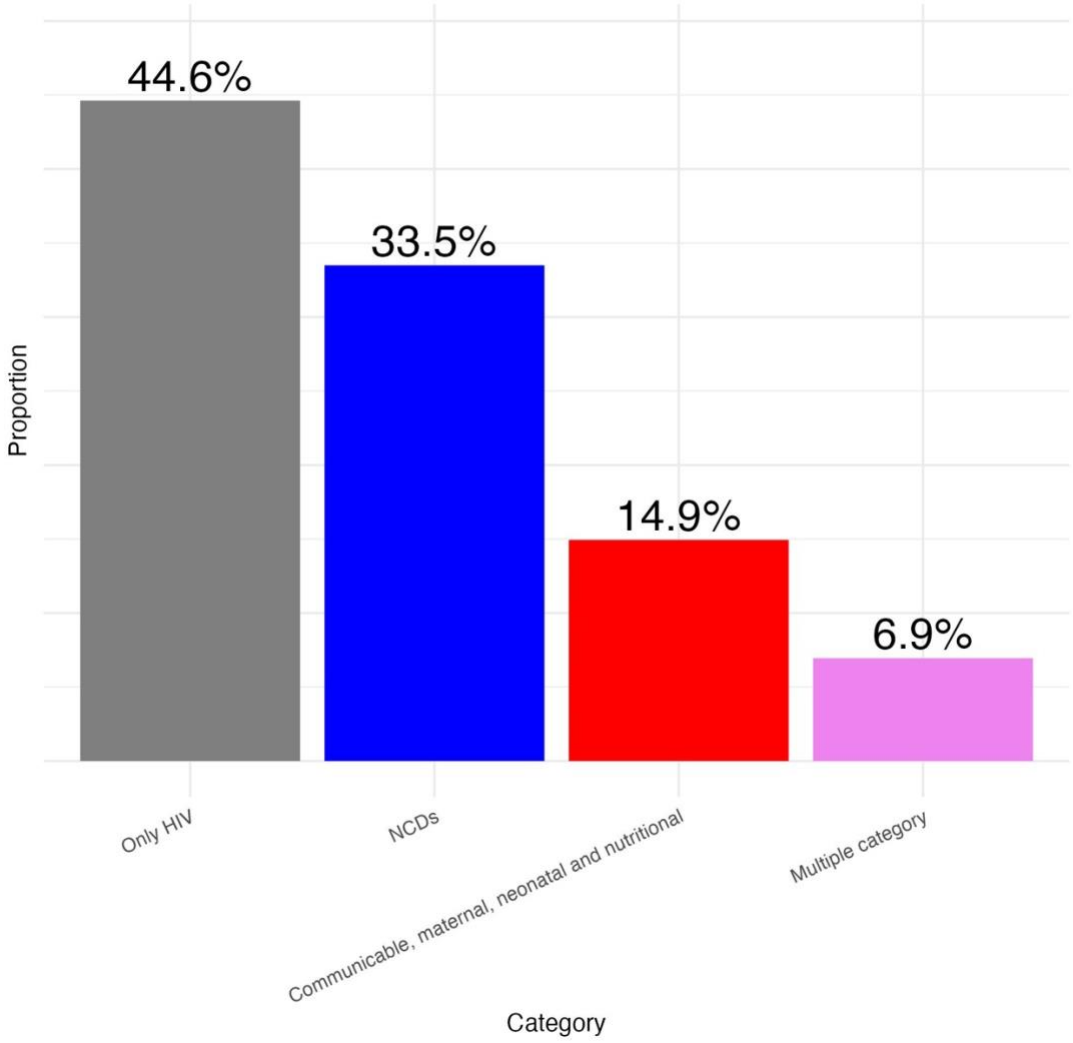
As reported in Figure 1, only 44.6% of the study participants were contending with HIV alone, while a significant 55.4% of the patients were managing additional comorbidities or predisposing factors. Among these, 36.9% were managing one additional comorbidity, and 18.5% faced the complexity of more than one comorbidity in addition to HIV infection. This data underscores the necessity for integrated care approaches to address the multifaceted health demands of these patients.

Figure 1 - Proportion of HIV-positive patients with single and multiple comorbidities



The study delineated the prevalence of diseases among the participants.
The comparison of disease categories was stark; NCDs were markedly more prevalent (38.5%) than communicable diseases (14.9%), reflecting an epidemiological transition in the burden of disease amongst individuals living with HIV.

Figure 2 - Distribution of patients by HIV-only and multiple disease category

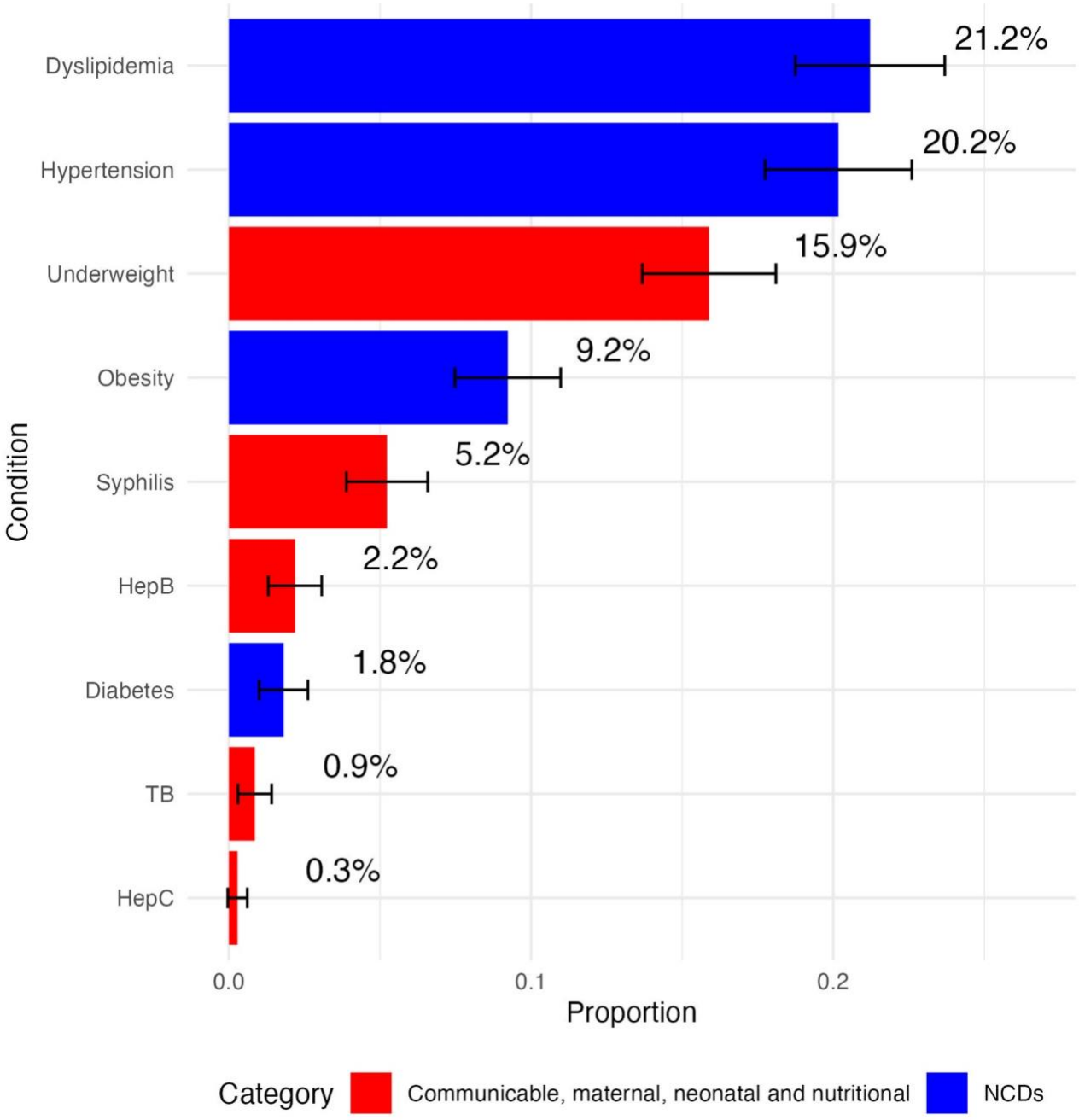


In the figure below we report the prevalence of the tested diseases and conditions in the whole sample.

Dyslipidemia (21.2%) and hypertension (20.2%) were the most common conditions. Underweight was a significant concern, affecting 15.9% of the cohort. The prevalence of communicable diseases such as syphilis (5.2%), hepatitis B (2.2%), and hepatitis C (0.3%) illustrated the concurrent burden of communicable conditions alongside NCDs within the HIV-positive population.

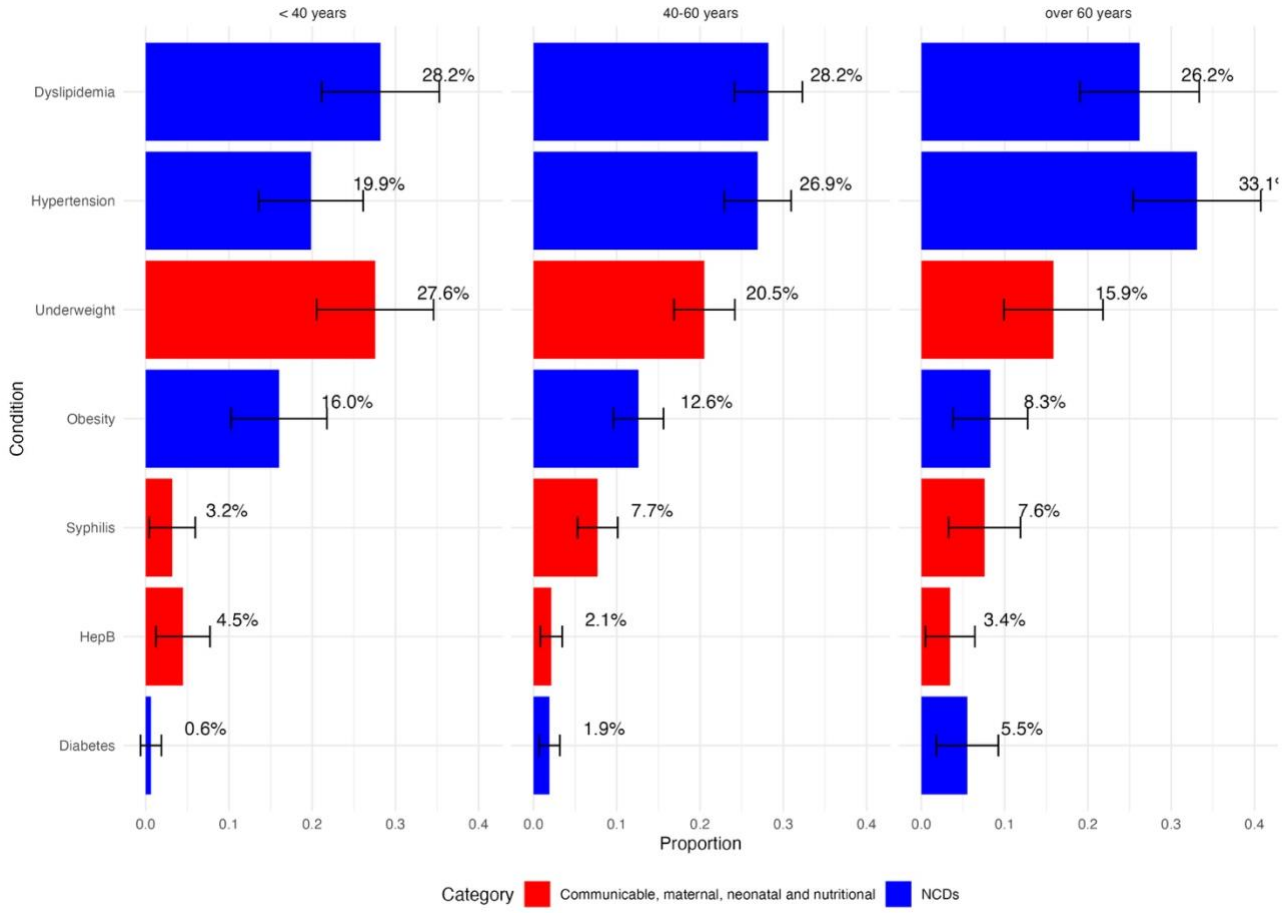
112 patients were previously diagnosed with hypertension, 60 (53%) were still hypertensive at the time of screening.

Figure 3 - Prevalence of comorbid conditions in HIV-positive patients



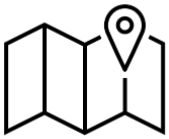
The age-related distribution of comorbidities showed some interesting insights. Hypertension exhibited significant variability, ranging from 19.9% among patients under 40 years of age to more than 33.1% in those aged 60 and above. Overweight individuals (including obesity) saw their prevalence decrease by nearly half, from 16.0% in the under-40 group to 8.3% in the 60 and older group. Underweight patients accounted for 27.6% among those under 40, compared to 15.9% in those over 60. Diabetes, on the other hand, showed an increase from 0.6% to 5.5% within the same age brackets.

Figure 4 - Age-related prevalence of comorbid conditions in HIV-positive patients



Geospatial Descriptive Epidemiology: Analysis of Prevalence by Clinical Center

In the course of our research, distinct variations in the prevalence of various diseases across the different clinical facilities involved in the study were observed. The data, offers detailed insights for each clinical center.



For comprehensive details on the Geospatial Descriptive Epidemiology of the study, please refer to the map provided at the link https://bit.ly/chao_map

Table 2 reports the comorbidities by administrative ward and clinical facility, providing a comprehensive overview of the health landscape across these centers.

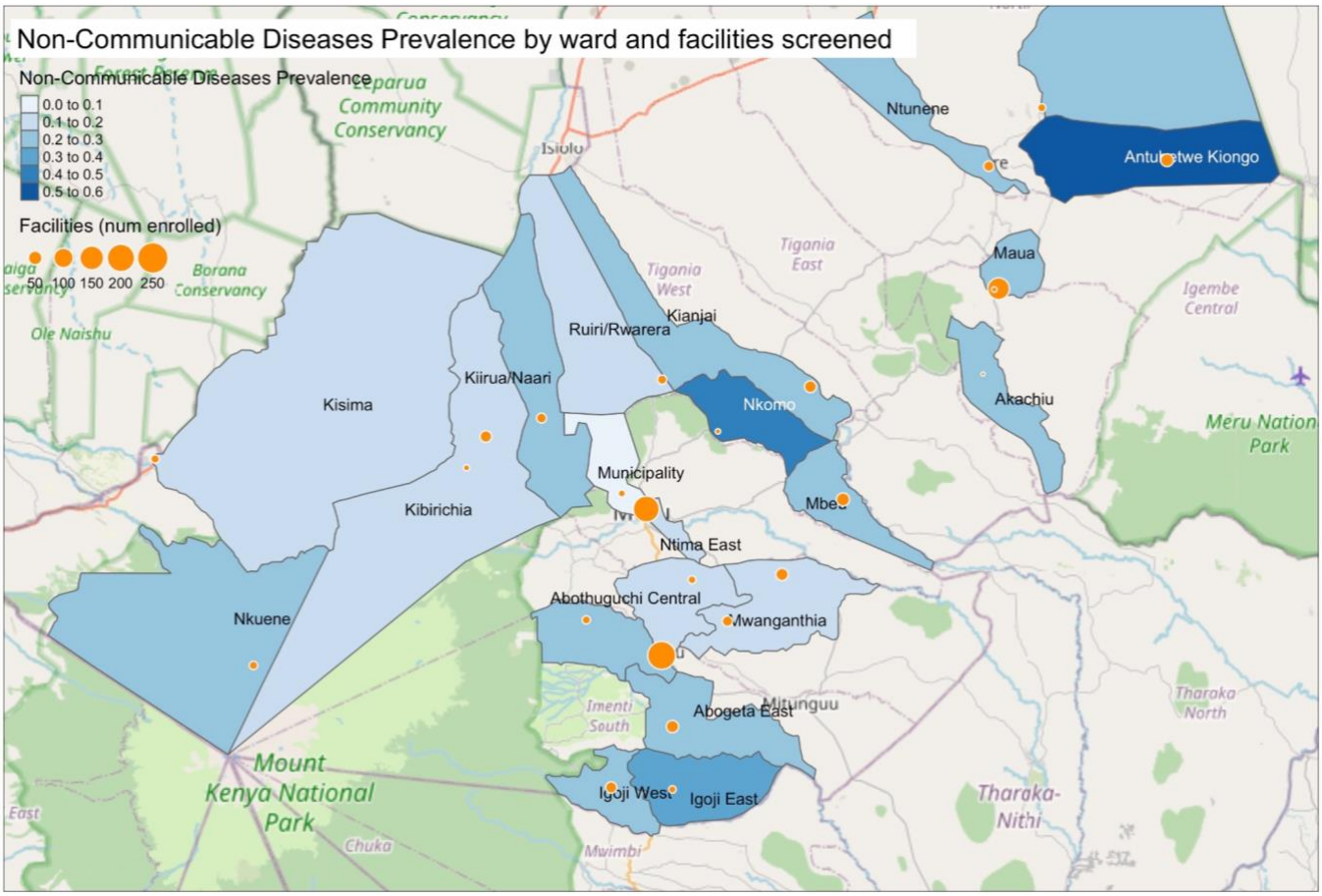
Additionally, the figures included in the report illustrate the prevalence of different pathologies within the county aggregated by ward. These visual representations serve as a critical tool for understanding the geographical distribution and intensity of various health conditions. This geospatial analysis not only aids in identifying areas with higher disease burden but also helps in strategizing targeted public health interventions.

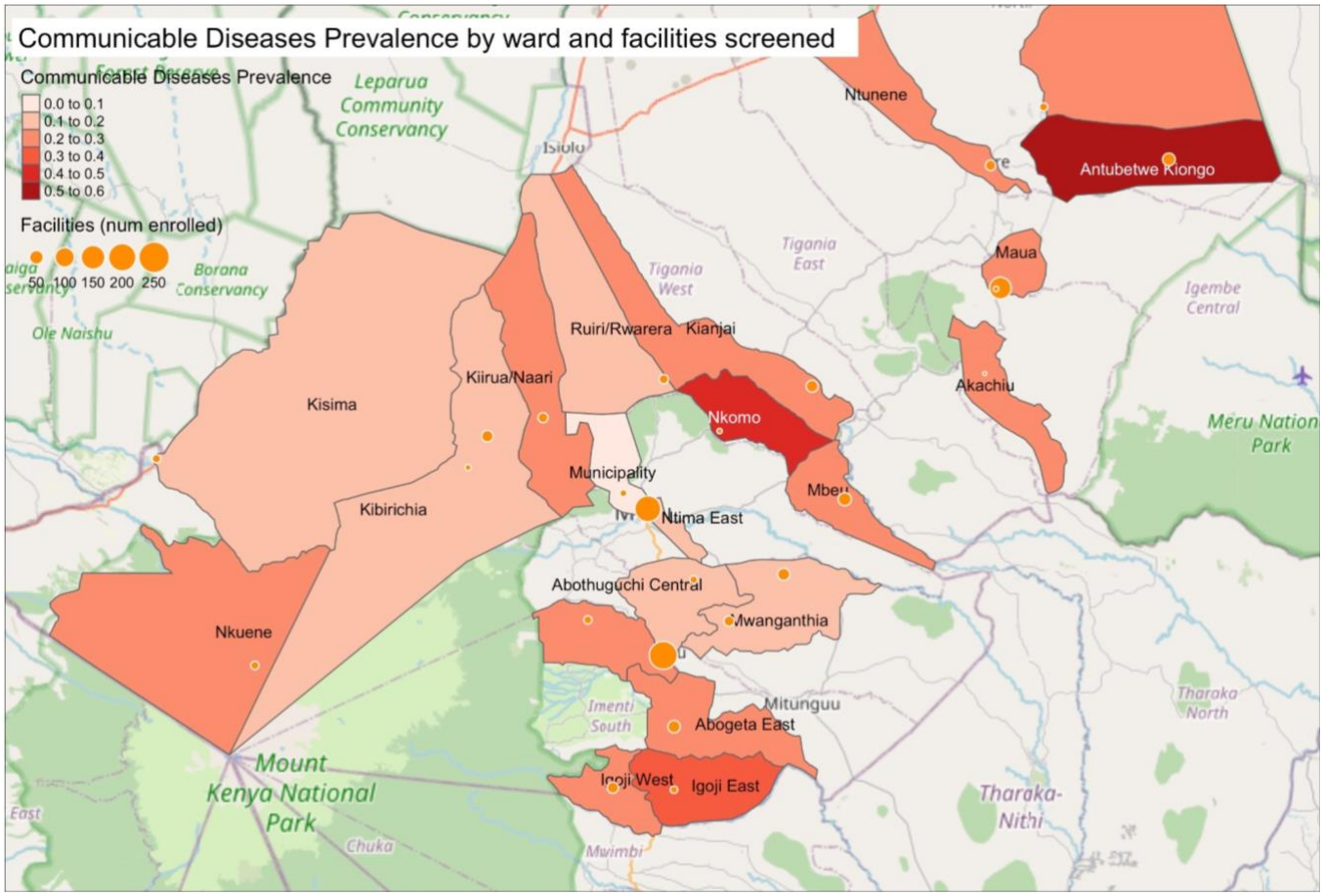
The integration of tabulated data and geospatial figures thus forms the cornerstone of our epidemiological analysis, offering a multi-dimensional perspective on the health challenges faced by the population in the Meru County. This approach enables a more nuanced understanding of the local health needs, paving the way for effective public health strategies and interventions.

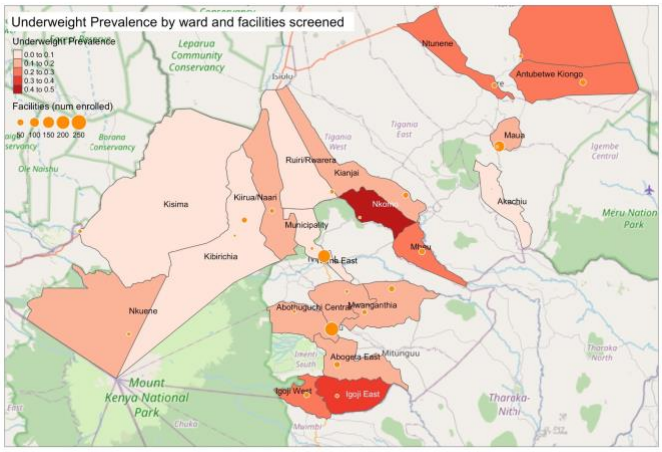
Table 2 - Comorbidities by administrative ward and clinical facility

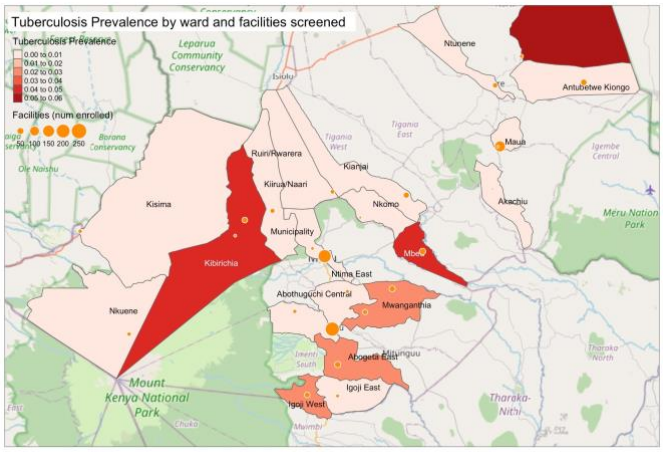
Ward name	Clinical facility	Total screened	TB	HepB	HepC	Syphilis	Underweight	Overweight	Hypertension	Diabetes	Dyslipidemia	Commun. Dis.	NCDs
Abogeta East	Kanyakine Sub County Hospital	41	1 (2.4%)	0 (0.0%)	0 (0.0%)	1 (2.4%)	7 (17.1%)	2 (4.9%)	7 (17.1%)	1 (2.4%)	7 (17.1%)	9 (22.0%)	9 (22.0%)
Abothuguchi Central	Gatimbi Health Centre	16	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (18.8%)	2 (12.5%)	3 (18.8%)	0 (0.0%)	7 (43.8%)	3 (18.8%)	3 (18.8%)
Akachiu	Mutiokiama Health Centre	4	0 (0.0%)	1 (25.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (25.0%)	1 (25.0%)
Amwathi	Mutuati Sub County Hospital	18	1 (5.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (22.2%)	2 (11.1%)	2 (11.1%)	1 (5.6%)	6 (33.3%)	4 (22.2%)	4 (22.2%)
Antubetwe Kiongo	Theera Health Center	44	0 (0.0%)	4 (9.1%)	2 (4.5%)	8 (18.2%)	12 (27.3%)	0 (0.0%)	9 (20.5%)	0 (0.0%)	3 (6.8%)	23 (52.3%)	23 (52.3%)
Igoji East	St.Ann Mission Hospital	15	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (33.3%)	1 (6.7%)	3 (20.0%)	2 (13.3%)	5 (33.3%)	5 (33.3%)	5 (33.3%)
Igoji West	Kinoro Sub County Hospital	34	1 (2.9%)	0 (0.0%)	0 (0.0%)	1 (2.9%)	7 (20.6%)	4 (11.8%)	11 (32.4%)	1 (2.9%)	11 (32.4%)	8 (23.5%)	8 (23.5%)
Kianjai	Miathene Sub County Hospital	38	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (10.5%)	7 (18.4%)	4 (10.5%)	8 (21.1%)	0 (0.0%)	6 (15.8%)	10 (26.3%)	10 (26.3%)
Kibirichia	Githongo Sub County Hospital	36	2 (5.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (8.3%)	4 (11.1%)	10 (27.8%)	0 (0.0%)	13 (36.1%)	4 (11.1%)	4 (11.1%)
	Kibirichia Sub County Hospital	10	0 (0.0%)	1 (10.0%)	0 (0.0%)	0 (0.0%)	1 (10.0%)	1 (10.0%)	3 (30.0%)	0 (0.0%)	1 (10.0%)	2 (20.0%)	2 (20.0%)
Kiirua/Naari	St.Theresa Mission Hospital	26	0 (0.0%)	1 (3.8%)	1 (3.8%)	1 (3.8%)	4 (15.4%)	2 (7.7%)	7 (26.9%)	1 (3.8%)	3 (11.5%)	6 (23.1%)	6 (23.1%)
Kisima	Timau Sub County Hospital	19	0 (0.0%)	2 (10.5%)	0 (0.0%)	0 (0.0%)	1 (5.3%)	2 (10.5%)	2 (10.5%)	0 (0.0%)	5 (26.3%)	3 (15.8%)	3 (15.8%)
Maua	MAUA DICE	8	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (25.0%)	0 (0.0%)	2 (25.0%)	0 (0.0%)	0 (0.0%)	3 (37.5%)	2 (25.0%)	2 (25.0%)
	Nyambene Sub County Hospital	126	0 (0.0%)	6 (4.8%)	0 (0.0%)	7 (5.6%)	18 (14.3%)	8 (6.3%)	19 (15.1%)	1 (0.8%)	7 (5.6%)	28 (22.2%)	28 (22.2%)

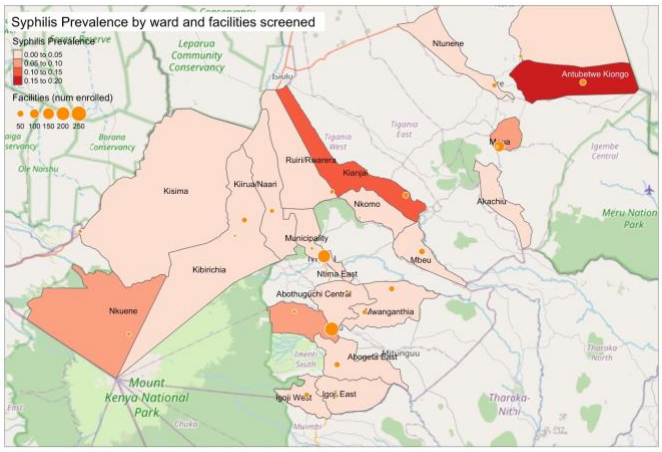
Mbeu	Mbeu Sub County Hospital	46	2 (4.3%)	0 (0.0%)	0 (0.0%)	2 (4.3%)	12 (26.1%)	2 (4.3%)	8 (17.4%)	1 (2.2%)	15 (32.6%)	13 (28.3%)	13 (28.3%)
Municipality	Gitoro Mission Hospital	13	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (7.7%)	2 (15.4%)	1 (7.7%)	0 (0.0%)	4 (30.8%)	1 (7.7%)	1 (7.7%)
Mwanganthia	Cottolengo Mission Hospital Chaaria	40	1 (2.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (7.5%)	4 (10.0%)	11 (27.5%)	0 (0.0%)	13 (32.5%)	4 (10.0%)	4 (10.0%)
	Kaongo Health Centre	29	1 (3.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (17.2%)	1 (3.4%)	5 (17.2%)	0 (0.0%)	10 (34.5%)	6 (20.7%)	6 (20.7%)
Nkomo	Aina Dispensary	8	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (50.0%)	2 (25.0%)	2 (25.0%)	0 (0.0%)	3 (37.5%)	4 (50.0%)	4 (50.0%)
Nkuene	Consolata Hospital Nkubu	210	0 (0.0%)	6 (2.9%)	0 (0.0%)	17 (8.1%)	41 (19.5%)	27 (12.9%)	42 (20.0%)	2 (1.0%)	18 (8.6%)	57 (27.1%)	57 (27.1%)
	Mikumbune Sub County Hospital	19	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (10.5%)	1 (5.3%)	4 (21.1%)	2 (10.5%)	6 (31.6%)	2 (10.5%)	2 (10.5%)
	Uruku H/C	18	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (11.1%)	1 (5.6%)	2 (11.1%)	6 (33.3%)	0 (0.0%)	8 (44.4%)	3 (16.7%)	3 (16.7%)
Ntima East	MeTRH	181	0 (0.0%)	0 (0.0%)	0 (0.0%)	9 (5.0%)	18 (9.9%)	19 (10.5%)	41 (22.7%)	6 (3.3%)	64 (35.4%)	23 (12.7%)	23 (12.7%)
Ntunene	LAARE HEALTH CENTRE	29	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	6 (20.7%)	1 (3.4%)	4 (13.8%)	0(0.0%)	4 (13.8%)	6 (20.7%)	6 (20.7%)
Ruiri/Rwarera	Ruiri Health Centre	23	0 (0.0%)	2 (8.7%)	0 (0.0%)	1 (4.3%)	2 (8.7%)	2 (8.7%)	4 (17.4%)	1 (4.3%)	1 (4.3%)	3 (13.0%)	3 (13.0%)

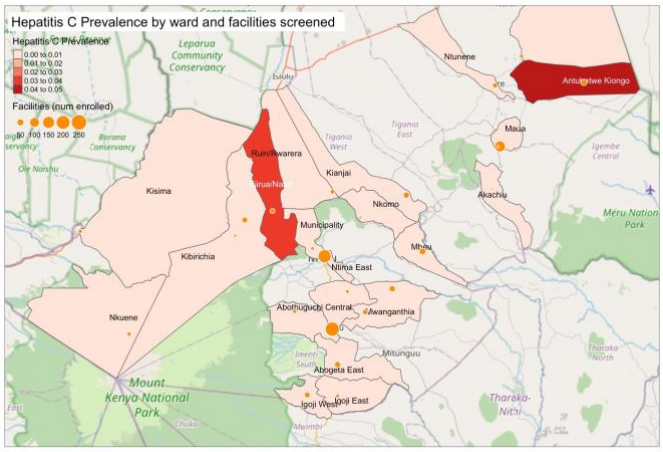

Non-Communicable Diseases Prevalence by ward and facilities screened
Non-Communicable Diseases Prevalence
0.0 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
0.5 to 0.6
Facilities (num enrolled)
50 100 150 200 250
Leparua Community Conservancy
Borana Conservancy
Ole Naishu
Ntunene
Antubetwe Kiongo
Tigania East
Tigania West
Maua
Igembe Central
Kianjai
Ruiri/Rwarera
Kiirua/Naari
Kisima
Nkomo
Akachiu
Meru National Park
Municipality
Kibirichia
Mbeu
Ntima East
Abothuguchi Central
Nkuene
Mwanganthia
Imenti South
Abogeta East
Mitunguu
Tharaka North
Mount Kenya National Park
Igoji West
Igoji East
Tharaka-Nithi
East
Chuka
Mwimbi

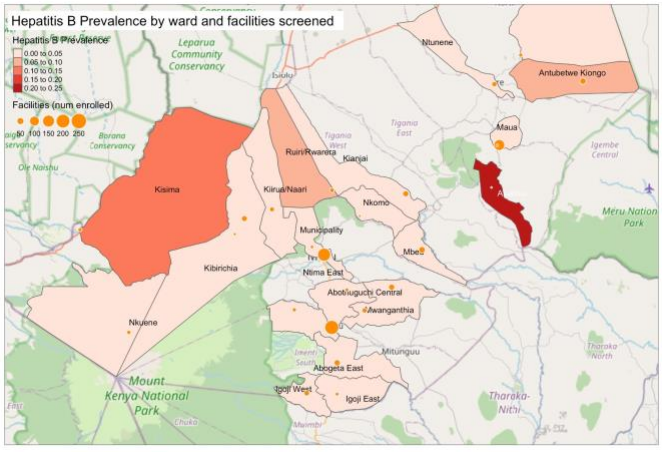

Communicable Diseases Prevalence by ward and facilities screened
Communicable Diseases Prevalence
0.0 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
0.5 to 0.6
Facilities (num enrolled)
50 100 150 200 250
Leparua Community Conservancy
Borana Conservancy
Ole Naishu
Ntunene
Antubetwe Kiongo
Tigania East
Tigania West
Maua
Igembe Central
Kianjai
Ruiri/Rwarera
Kiirua/Naari
Kisima
Nkomo
Akachiu
Meru National Park
Municipality
Kibirichia
Mbeu
Ntima East
Abothuguchi Central
Nkuene
Mwanganthia
Imenti South
Abogeta East
Mitunguu
Tharaka North
Mount Kenya National Park
Igoji West
Igoji East
Tharaka-Nithi
East
Chuka
Mwimbi

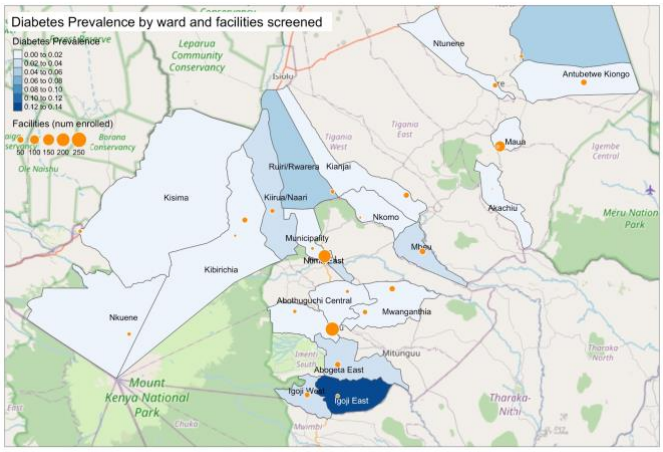

Underweight Prevalence by ward and facilities screened
Underweight Prevalence
0.0 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
Facilities (num enrolled)
50 100 150 200 250
Ntunene
Antubetwe Kiongo
Maua
Ruiri/Rwarera
Kianjai
Kisima
Kiirua/Naari
Nkomo
Akachiu
Municipality
Mbeu
Kibirichia
Ntima East
Nkuene
Abothuguchi Central
Awanganthia
Abogeta East
Mituinguu
Igoji West
Igoji East
Leparua Community Conservancy
Mount Kenya National Park
Tharaka-Nithi
Meru National Park

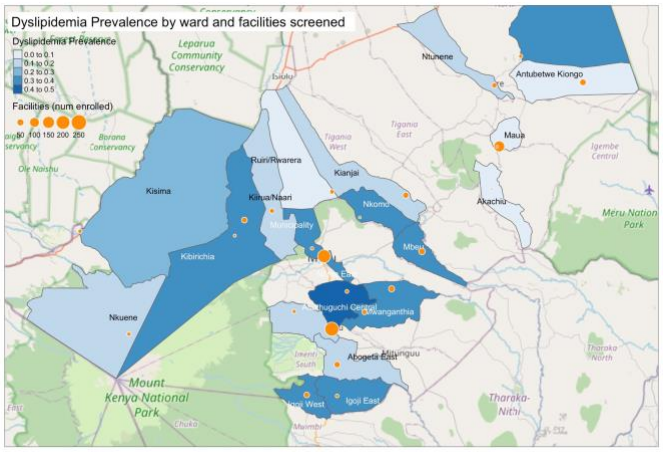

Tuberculosis Prevalence by ward and facilities screened
Tuberculosis Prevalence
0.00 to 0.01
0.01 to 0.02
0.02 to 0.03
0.03 to 0.04
0.04 to 0.05
0.05 to 0.06
Facilities (num enrolled)
50 100 150 200 250
Ntunene
Antubetwe Kiongo
Maua
Ruiri/Rwarera
Kianjai
Kisima
Kiirua/Naari
Nkomo
Akachiu
Municipality
Mbeu
Kibirichia
Ntima East
Nkuene
Abothuguchi Central
Mwanganthia
Abogeta East
Mituinguu
Igoji East
Igoji West
Leparua Community Conservancy
Mount Kenya National Park
Tharaka-Nithi
Meru National Park

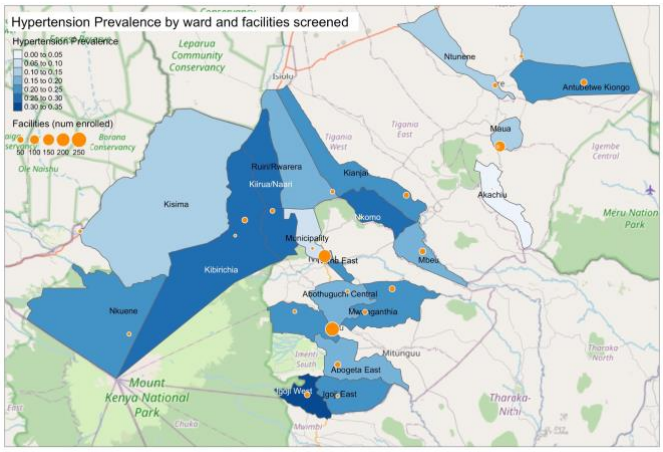

Syphilis Prevalence by ward and facilities screened
Syphilis Prevalence
0.00 to 0.05
0.05 to 0.10
0.10 to 0.15
0.15 to 0.20
Facilities (num enrolled)
50 100 150 200 250
Ntunene
Antubetwe Kiongo
Maua
Ruiri/Rwarera
Kianjai
Kisima
Kiirua/Naari
Nkomo
Akachiu
Municipality
Mbeu
Kibirichia
Ntima East
Nkuene
Abothuguchi Central
Awanganthia
Abogeta East
Mituinguu
Igoji West
Igoji East
Leparua Community Conservancy
Mount Kenya National Park
Tharaka-Nithi
Meru National Park

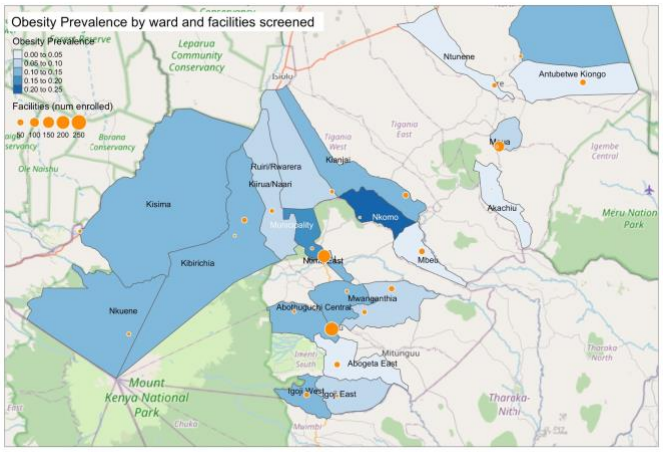

Hepatitis C Prevalence by ward and facilities screened
Hepatitis C Prevalence
0.00 to 0.01
0.01 to 0.02
0.02 to 0.03
0.03 to 0.04
0.04 to 0.05
Facilities (num enrolled)
50 100 150 200 250
Ntunene
Antubetwe Kiongo
Maua
Ruiri/Rwarera
Kianjai
Kisima
Nkomo
Akachiu
Municipality
Mbeu
Kibirichia
Ntima East
Nkuene
Abothuguchi Central
Awanganthia
Mituinguu
Abogeta East
Igoji West
Igoji East
Leparua Community Conservancy
Mount Kenya National Park
Tharaka-Nithi
Meru National Park


Hepatitis B Prevalence by ward and facilities screened
Hepatitis B Prevalence
0.00 to 0.05
0.05 to 0.10
0.10 to 0.15
0.15 to 0.20
0.20 to 0.25
Facilities (num enrolled)
50 100 150 200 250
Ntunene
Antubetwe Kiongo
Maua
Ruiri/Rwarera
Kianjai
Kisima
Kiirua/Naari
Nkomo
Municipality
Mbeu
Kibirichia
Ntima East
Nkuene
Abothuguchi Central
Awanganthia
Mituinguu
Abogeta East
Igoji West
Igoji East
Leparua Community Conservancy
Mount Kenya National Park
Tharaka-Nithi
Meru National Park


Diabetes Prevalence by ward and facilities screened
Diabetes Prevalence
0.00 to 0.02
0.02 to 0.04
0.04 to 0.06
0.06 to 0.08
0.08 to 0.10
0.10 to 0.12
0.12 to 0.14
Facilities (num enrolled)
50 100 150 200 250
Leparua Community Conservancy
Ntunene
Antubetwe Kiongo
Maua
Ruiri/Rwarera
Kianjai
Kisima
Kirua/Naari
Nkomo
Akachiu
Municipality
Mbeu
Kibirichia
Nkuene
Abothuguchi Central
Mwanganthia
Mitunguu
Abogeta East
Igoji West
Igoji East
Mount Kenya National Park
Tharaka-Nithi
Meru National Park
Igembe Central
Tigania East
Tigania West
Imenti South
Chuka
Muimbi


Dyslipidemia Prevalence by ward and facilities screened
Dyslipidemia Prevalence
0.0 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
Facilities (num enrolled)
50 100 150 200 250
Leparua Community Conservancy
Ntunene
Antubetwe Kiongo
Maua
Ruiri/Rwarera
Kianjai
Kisima
Kirua/Naari
Nkomo
Akachiu
Municipality
Mbeu
Kibirichia
Nkuene
Abothuguchi Central
Mwanganthia
Mitunguu
Abogeta East
Igoji West
Igoji East
Mount Kenya National Park
Tharaka-Nithi
Meru National Park
Igembe Central
Tigania East
Tigania West
Imenti South
Chuka
Muimbi


Hypertension Prevalence by ward and facilities screened
Hypertension Prevalence
0.00 to 0.05
0.05 to 0.10
0.10 to 0.15
0.15 to 0.20
0.20 to 0.25
0.25 to 0.30
0.30 to 0.35
Facilities (num enrolled)
50 100 150 200 250
Leparua Community Conservancy
Ntunene
Antubetwe Kiongo
Maua
Ruiri/Rwarera
Kianjai
Kisima
Kirua/Naari
Nkomo
Akachiu
Municipality
Mbeu
Kibirichia
Nkuene
Abothuguchi Central
Mwanganthia
Mitunguu
Abogeta East
Igoji West
Igoji East
Mount Kenya National Park
Tharaka-Nithi
Meru National Park
Igembe Central
Tigania East
Tigania West
Imenti South
Chuka
Muimbi


Obesity Prevalence by ward and facilities screened
Obesity Prevalence
0.00 to 0.05
0.05 to 0.10
0.10 to 0.15
0.15 to 0.20
0.20 to 0.25
Facilities (num enrolled)
50 100 150 200 250
Leparua Community Conservancy
Ntunene
Antubetwe Kiongo
Maua
Ruiri/Rwarera
Kianjai
Kisima
Kirua/Naari
Nkomo
Akachiu
Municipality
Mbeu
Kibirichia
Nkuene
Abothuguchi Central
Mwanganthia
Mitunguu
Abogeta East
Igoji West
Igoji East
Mount Kenya National Park
Tharaka-Nithi
Meru National Park
Igembe Central
Tigania East
Tigania West
Imenti South
Chuka
Muimbi

Multivariable Analysis

The multivariable analysis assessed risk factors for various conditions (Table 3). The analysis found that in communicable diseases, males are more likely to be underweight (OR = 1.79, 95% CI: 1.19, 2.69). Both age and the time since HIV diagnosis were found to correlate with the risk of syphilis. Older patients, likely under better medical surveillance, showed a lower risk of developing syphilis (OR = 1.05, 95% CI: 1.02, 1.07). Patients with a longer duration since HIV diagnosis tend to be more attentive to prevention and treatment, which could explain the lower incidence of syphilis in this group. The association between a shorter time since HIV diagnosis and higher risk for Hepatitis C Virus (HCV) is questionable due to a small sample size and wide confidence interval. Similarly, the link between alcohol consumption and TB (OR = 17.0, 95% CI: 1.82, 375) is uncertain due to a broad confidence interval.

For non-communicable diseases (NCDs) results are reported in Table 4. Age again emerged as a critical factor, with increasing age associated with higher risks for hypertension, diabetes, and dyslipidemia. Overweight status was strongly linked to hypertension and mildly to diabetes but not to dyslipidemia. No significant associations were found between tobacco or alcohol consumption and NCDs.

In conclusion, the multivariate analysis identified the following independent associations:

- **Males have an increased risk of being underweight.**
- **Age is a significant risk factor for syphilis.**
- **Age is associated with higher risks of hypertension, diabetes, and dyslipidemia.**
- **Overweight status is linked to an increased risk of hypertension and diabetes.**

Interestingly, the study found no significant association between tobacco and alcohol consumption and NCDs, which could be attributed to the limited number of patients in these categories. Furthermore, despite common expectations, being overweight was linked to an increased risk of hypertension and diabetes but not to dyslipidemia, highlighting the need for further research to understand these relationships better.
Overall, these insights emphasize the complex interplay of factors such as gender, age, lifestyle habits, and HIV status in influencing disease risk and underscore the need for targeted public health interventions and monitoring in Meru County, especially for older patients at risk of NCDs.

Table 3 – Communicable, Maternal, Neonatal, and Nutritional Diseases multivariable regression

	TB			HepB			HepC			Syphilis			Underweight		
Characteristic	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Sex															
FEMALE	—	—		—	—		—	—		—	—		—	—	
MALE	1.54	(0.24-13.5)	0.7	0.25	(0.04- 1.03)	0.10	14.8	(1.17-436)	0.051	0.66	(0.30-1.34)	0.3	1.79	(1.19-2.69)	**0.005**
Age (years)	1.01	(0.94-1.08)	0.9	1.03	(0.99-1.07)	0.2	1.06	(0.96-1.16)	0.2	1.05	(1.02-1.07)	**<0.001**	1.00	(0.99-1.02)	0.9
Time from HIV diagnosis															
> 12 months	—	—		—	—		—	—		—	—		—	—	
6-12 months	0.00		>0.9	0.00		>0.9	0.00		>0.9	0.00		>0.9	1.25	(0.28-3.95)	0.7
< 6 months	0.00		>0.9	0.00		>0.9	71.1	(2.29- 2,42)	**0.008**	5.25	(1.43-15.5)	**0.005**	2.07	(0.72-5.24)	0.14
Tobacco consumers															
NO	—	—		—	—		—	—		—	—		—	—	
YES	2.91	(0.52-20.6)	0.2	0.77	(0.04-5.40)	0.8	0.00		>0.9	1.31	(0.42-3.66)	0.6	1.52	(0.79-2.84)	0.2
Alcohol consumers															
NO	—	—		—	—		—	—		—	—		—	—	
YES	17.0	(1.82-375)	**0.022**	2.81	(0.69-8.92)	0.11	0.00		>0.9	2.02	(0.87-4.35)	0.085	1.76	(1.07-2.86)	**0.024**

[1]OR = Odds Ratio, CI = Confidence Interval

Table 4 - NCDs multivariable regression

	Hypertension			Diabetes			Dyslipidemia			Obesity		
Characteristic	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Sex												
FEMALE	—	—		—	—		—	—		—	—	
MALE	1.13	(0.74-1.71)	0.6	0.77	(0.17-2.52)	0.7	1.21	(0.82-1.78)	0.3	0.60	(0.31-1.10)	0.12
Age (years)	1.05	(1.03-1.06)	**<0.001**	1.08	(1.04-1.12)	**<0.001**	1.02	(1.01-1.04)	**<0.001**	1.00	(0.98-1.02)	0.8
Time from HIV diagnosis												
> 12 months	—	—		—	—		—	—		—	—	
6-12 months	1.09	(0.24-3.54)	0.9	7.25	(0.37-46.9)	0.078	0.85	(0.19-2.69)	0.8	0.00		>0.9
< 6 months	0.92	(0.21-2.83)	0.9	0.00	(0-inf)	>0.9	0.94	(0.27-2.59)	>0.9	0.00		>0.9
Tobacco consumers												
NO	—	—		—	—		—	—		—	—	
YES	0.74	(0.33-1.57)	0.4	0.00	(0-inf)	>0.9	0.60	(0.28-1.20)	0.2	0.18	(0.01-0.95)	0.11
Alcohol consumers												
NO	—	—		—	—		—	—		—	—	
YES	0.98	(0.57-1.65)	>0.9	0.45	(0.02-2.49)	0.5	1.40	(0.86-2.24)	0.2	0.87	(0.37-1.84)	0.7
Overweight												
FALSE	—	—		—	—		—	—				
TRUE	2.44	(1.74-3.42)	**<0.001**	3.34	(1.28-9.36)	**0.016**	1.25	(0.89-1.75)	0.2			

[1]OR = Odds Ratio, CI = Confidence Interval

POSSIBLE PUBLIC HEALTH INTERVENTIONS

In this section, we delve into an array of strategies and approaches that have been demonstrated to be effective in preventing and managing the range of diseases identified in our study. Drawing from a wealth of literature and best practices, these interventions are tailored to address the specific challenges and health risks associated with each pathology. By categorizing these interventions according to the diseases they target, we aim to provide a structured and targeted framework for public health officials and practitioners in Meru County. This will enable the implementation of focused, evidence-based measures to improve health outcomes and reduce the burden of both communicable and non-communicable diseases within the community. Through this comprehensive approach, we seek to bridge the gap between research and practice, ensuring that the interventions recommended are not only scientifically sound but also practically feasible and culturally sensitive to the needs of the local population.

Dyslipidemia

Dyslipidemia is a pathological alteration of lipid metabolism, characterized by abnormal serum lipid levels, including high cholesterol and triglycerides. This metabolic dysfunction is a significant risk factor for cardiovascular diseases, such as atherosclerosis, myocardial infarction, and cerebrovascular stroke. The causes of dyslipidemia can be multifactorial, encompassing genetic predispositions, unhealthy lifestyle habits (like a diet high in saturated and trans fats, physical inactivity), and the presence of comorbidities such as obesity, diabetes mellitus, and metabolic syndrome.

In our cohort it was present in 21.22% of the patients.

Recommended Interventions:

- **Balanced Diet:** A diet rich in fruits, vegetables, whole grains, and healthy fats (like those in olive oil, fish, and nuts) can help reduce bad cholesterol (LDL) and increase good cholesterol (HDL). Limiting saturated and trans fats, sugars, and refined carbohydrates is important.
- **Regular Physical Activity:** Regular exercise can improve cholesterol levels and maintain a healthy body weight. Aim for at least 150 minutes of moderate physical activity or 75 minutes of vigorous activity per week, or a combination of moderate and intense aerobic activities.
- **Weight Control:** Maintaining a healthy body weight is crucial for managing dyslipidemia. Weight loss can significantly reduce LDL cholesterol and triglyceride levels and increase HDL levels.
- **Lipid-Lowering Medications:** When lifestyle changes are not enough to control lipid levels, lipid-lowering medications may be prescribed. These include statins, fibrates, niacin, and cholesterol absorption inhibitors. The choice of medication depends on the specific type of dyslipidemia and other medical conditions. European guidelines recommend high-intensity statins up to the maximum tolerated dose to achieve specific LDL-C reduction targets, depending on the risk level.
- **Specific Control for patients with diabetes:** In very high-risk patients with type 2 diabetes, a reduction of ≥50% from baseline LDL-C and a target of <55 mg/dl are recommended. Statin therapy should be intensified before introducing combination therapies.

- **Avoid Smoking:** Cigarette smoking negatively impacts lipid metabolism, raising LDL levels and reducing HDL, accelerating atherosclerosis development, and increasing cardiovascular risk.
- **Regular Screening:** Encourage public awareness of dyslipidemia and promote regular lipid level screening for early diagnosis and effective prevention of complications.

2019 ESC/EAS Guidelines for the management of dyslipidaemias: *lipid modification to reduce cardiovascular risk*: The Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and European Atherosclerosis Society (EAS)
https://academic.oup.com/eurheartj/article/41/1/111/5556353

Hypertension

Hypertension is a pathological condition characterized by elevated blood pressure values. According to the recent ACC/AHA guidelines, blood pressure categories are defined as: normal (systolic <120 mmHg and diastolic <80 mmHg), elevated (systolic 120–129 mmHg and diastolic <80 mmHg), stage 1 hypertension (systolic 130–139 mmHg or diastolic 80–89 mmHg), and stage 2 hypertension (systolic ≥140 mmHg or diastolic ≥90 mmHg), with diagnosis confirmed by two or more measurements. Hypertension can be primary or essential (accounting for 95% of cases) and mainly affects adults, or secondary to congenital or acquired diseases that involve the kidneys, adrenal glands, vessels, or heart. In the latter case, it also affects young individuals with very high blood pressure values that are challenging to manage solely with medical therapy. Common causes of essential hypertension often include unhealthy lifestyle habits, such as a diet high in salt and sedentariness, obesity, excessive alcohol consumption, and cigarette smoking, in addition to age and genetic predisposition.
Hypertension is a significant risk factor for cardiovascular and cerebrovascular events, including angina pectoris, myocardial infarction, and stroke. It is often underdiagnosed and is considered one of the leading causes of premature death worldwide. Therefore, it is crucial to recognize it preemptively and intervene with lifestyle modifications before resorting to pharmacological treatments if necessary.

In our cohort it was present in 20.2% of the patients.

Recommended Interventions:

- **Hypocaloric and Low-Sodium Diet:**
  - A balanced diet with reduced intake of saturated fats and salt, rich in fruits and vegetables, helps to lower blood pressure levels. It's important not to add salt to food since it is already naturally contained in them. The WHO recommends a daily salt intake of less than 5 grams of salt or 2 grams of sodium per person. Promoting healthy alternative cooking methods, such as steaming, baking, or grilling, is also beneficial.
- **Weight Loss:**
  - Maintaining a normal body weight is crucial for controlling blood pressure and reducing the risk of associated diseases.
- **Regular Physical Activity:**
  - Engage in at least 150 minutes per week of moderate-intensity aerobic activity or 75 minutes per week of vigorous aerobic activity. Adopting a less sedentary

lifestyle, sitting less, walking more, and using stairs can be helpful when it's not always possible to dedicate time for physical activity.

- **Reduction in Alcohol Intake:**
  - The WHO recommends reducing alcohol consumption, which is also implicated in the development of high blood pressure. The recommended maximum daily consumption is 1 drink for women and 2 for men.
- **Smoking Cessation:**
  - Cigarette smoking increases blood pressure and negatively impacts cardiovascular and cerebrovascular risk.
- **Antihypertensive Medication:**
  - When lifestyle changes are insufficient to reduce or control blood pressure, appropriate pharmacological therapy is necessary according to the severity of the disease. The pharmacological classes for managing hypertension are varied, and the choice of medication is at the physician's discretion, considering cardiovascular risk and any associated comorbidities. Compliance with pharmacotherapy is essential for proper management of blood pressure.
- **Population Screening and Regular Checkups:**
  - Raising public awareness about hypertension is crucial, increasing understanding of the disease burden, especially to educate the population about a correct lifestyle as a protective factor. Additionally, promoting regular checkups with one's doctor for early diagnosis and/or regular management of the disease is important.

References:

- Flack JM, Adekola B. Blood pressure and the new ACC/AHA hypertension guidelines. Trends Cardiovasc Med. 2020;30(3):160-164. doi:10.1016/j.tcm.2019.05.003 https://pubmed.ncbi.nlm.nih.gov/31521481/
- WHO Hypertension overview: https://www.who.int/news-room/fact-sheets/detail/hypertension
- WHO - Global action plan for the prevention and control of noncommunicable diseases 2013-2020 https://www.who.int/southeastasia/publications-detail/9789241506236
- PASCAR Roadmap on Hypertension. Roadmap to achieve 25% hypertension control in Africa by 2025

https://www.pascar.org/uploads/files/PASCAR_Roadmap_to_achieve_25__hypertension_control_in_Africa_2017_CVJA.pdf

Overweight / obesity

Overweight is a condition characterized by excessive accumulation of body fat relative to lean mass, both in terms of absolute quantity and specific body distribution. It is generally caused by unhealthy eating habits and a sedentary lifestyle. The classification of the population based on weight is done using the Body Mass Index (BMI, according to the American definition). An individual is defined as overweight with a BMI over 25, and as obese with a BMI of 30 or higher. While the potential genetic nature of obesity is well-documented, the multifactorial nature of its causes remains valid, including the possibility of genetic factors contributing to the maintenance of low body weight. Obesity and overweight are associated with premature death and recognized as risk factors for major chronic diseases, including cardiovascular diseases, hypertension, coronary artery disease, heart attack, and stroke, as well as altered metabolic conditions such as type 2 diabetes, hypercholesterolemia, dyslipidemia, and metabolic syndrome.

In our cohort this condition was present in 9.2% of the patients.

Recommended Interventions:

- **Hypocaloric and Low-Sodium Diet:**
  - A balanced and well-proportioned diet with reduced caloric intake, abundant in whole grains, fruits, and vegetables is recommended. Care should be taken with dressings; it is preferable to use them raw and limit oil intake (maximum of 2 tablespoons per day) and salt. Consumption of fried and sautéed foods should be avoided, promoting alternative and healthy cooking methods such as steaming, baking, or grilling instead. The intake of prepackaged foods high in saturated fats should be reduced. Additionally, the consumption of alcoholic and distilled beverages should be minimized.
- **Weight Loss:**
  - Maintaining a body weight within the normal range is essential for controlling blood pressure and reducing the risk of developing associated diseases.

- **Regular Physical Activity:**
    - Engage in at least 150 minutes per week of moderate-intensity aerobic activity or 75 minutes per week of vigorous aerobic activity. Adopting a less sedentary lifestyle, sitting less, walking more, and using stairs can help when it's not possible to dedicate time for physical activity.
- **Population Education:**
    - Informing the population about the risks associated with improper diet and an unhealthy lifestyle is crucial for preventing overweight and obesity. In 2021, the European Commission launched the "HealthyLifestyle4All" campaign to promote healthy lifestyles, facilitate access to physical activity, and encourage a comprehensive interdisciplinary and cross-sectoral approach linking nutrition, health, well-being, and sports. Promoting physical activity in open spaces, facilitating access to sports facilities, and creating public spaces for physical activity are important steps.

References:

- WHO, acceleration plan to stop obesity. https://iris.who.int/bitstream/handle/10665/370281/9789240075634-eng.pdf?sequence=1
- Health service delivery framework for prevention and management of obesity. https://iris.who.int/bitstream/handle/10665/367784/9789240073234-eng.pdf?sequence=1
- HealthyLifestyle4Al https://sport.ec.europa.eu/initiatives/healthylifestyle4all
- HealthyLifestyle4Al https://sport.ec.europa.eu/healthylifestyle4all/pledge-board

Diabetes

Diabetes mellitus is a chronic endocrine-metabolic disorder characterized by altered glucose metabolism regulation. There are two main types: Type 1 diabetes (autoimmune), caused by insufficient insulin production from the pancreas' beta cells, and Type 2 diabetes, resulting from a combination of insulin resistance and relative deficiency in secretion. Insulin is crucial for maintaining glucose homeostasis, regulating cellular glucose absorption. Inadequate glycemic control in diabetes can lead to chronic hyperglycemia, which, if not effectively managed, can cause progressive damage and dysfunction to various organs and systems, especially the cardiovascular, renal, visual, and peripheral nervous systems.

In our cohort it was present in 1.8% of the patients.

Recommended Interventions:

- **Prevention and Management:**
  - Weight Control: Maintaining a healthy body weight through balanced diet and regular physical activity helps prevent Type 2 diabetes onset and better manage all diabetes types.
  - Balanced Diet: Consuming a variety of foods in proportions that do not cause weight gain; limiting sugar and saturated fat intake.
  - Regular Physical Activity: At least 30 minutes of moderate-intensity physical activity daily for adults, more for children and adolescents, to improve glycemic control and reduce cardiovascular risk.
  - Blood Glucose Monitoring: Regular monitoring of blood glucose levels to manage diabetes effectively.
  - Pharmacological Treatment: Using medication to control blood glucose levels as prescribed. Metformin therapy should be considered in adults at high risk of Type 2 diabetes, particularly those aged 25-59 years with a BMI $\geq$35 kg/m^2, higher FPG, and A1C levels. Periodic monitoring of vitamin B12 levels in patients treated with metformin is important.
  - Screening and Diagnostic Tests: Diabetes and prediabetes testing should include an informal assessment of risk factors or use of assessment tools like the ADA's Diabetes Risk Test.
  - Type 2 Diabetes Prevention: Monitor the development of Type 2 diabetes in people with prediabetes at least annually. Referral of overweight/obese adults

at high risk of Type 2 diabetes to intensive lifestyle behavioral change programs is advised.

- **Prevention of Complications:**
  - Foot Health: Regular foot checks to prevent ulcers and infections, common in diabetic patients.
  - Blood Pressure and Lipid Levels Control: Monitoring and managing blood pressure and cholesterol levels to reduce cardiovascular disease risk.
  - Screening for Complications: Regular eye exams to prevent diabetic retinopathy, kidney exams for diabetic nephropathy, and other checks to identify complications early.

American Diabetes Association. *Standards of Care in Diabetes-2023* Abridged for Primary Care Providers. Clin Diabetes. 2022 Winter;41(1):4-31. doi: 10.2337/cd23-as01. Epub 2022 Dec 12. Erratum in: Clin Diabetes. 2023 Spring;41(2):328. PMID: 36714254; PMCID: PMC9845083. https://diabetesjournals.org/clinical/article/41/1/4/148029/Standards-of-Care-in-Diabetes-2023-Abridged-for

Syphilis

Syphilis is an infectious disease primarily transmitted sexually. It is caused by a bacterium, Treponema pallidum, which is transmitted through sexual contact. An infected mother can transmit syphilis to the unborn child during pregnancy (via the transplacental route), during passage through the birth canal, and through breastfeeding. Specifically, syphilis is defined as:

- Acquired Syphilis if the infection is contracted after birth;
- Congenital or Prenatal Syphilis if contracted transplacentally;
- Connatal Syphilis if acquired during passage through the birth canal.

Beyond congenital syphilis, the consequences include obstetric complications such as late miscarriage, in-utero death, fetal hydrops, growth retardation, and preterm birth. It can also be transmitted through blood transfusion or blood products. The disease develops in various stages: primary, secondary, latent, and late. The antibiotic of choice for treatment is parenteral penicillin. The preparation, dosage, and duration of treatment depend on the stage of the disease and its clinical manifestations. In pregnant women, it has been shown to be highly effective in preventing transmission of the infection to the fetus.

In our cohort it was present in 5.2% of the patients.

Recommended Interventions:

- **Use of Contraceptives and Behavior Modification:**
  - Promote the use of barrier methods like condoms, reduce the number of sexual partners, and encourage monogamous relationships to minimize the risk of transmission.
- **Education and Awareness Campaigns:**
  - Implement comprehensive sexual education in schools and communities, conduct public advertising campaigns, and engage in community outreach programs to increase awareness about syphilis, its transmission, and prevention strategies.
- **Screening and Treatment Accessibility:**
  - Offer regular serological screenings for syphilis, particularly for pregnant women and their partners, and ensure easy access to treatment for those diagnosed, including partner notification and treatment.
- **Integration in Health Services and Community Engagement:**

- Integrate STI screening in regular health check-ups, especially in primary healthcare settings, and involve community leaders in promoting STI awareness and prevention.

References

- CDC, Centres for Disease Control and Prevention Syphilis overview https://www.cdc.gov/std/syphilis/stdfact-syphilis-detailed.htm

Hepatitis B

Hepatitis B is an infectious liver disease caused by the Hepatitis B Virus (HBV). This viral infection can vary from a self-limited acute illness to a persistent chronic condition. In its chronic phase, hepatitis B can lead to severe complications, including liver cirrhosis and hepatocellular carcinoma. The virus is primarily transmitted through contact with infected body fluids, including blood, semen, and vaginal fluids. The pathogenesis of hepatitis B is characterized by an immune response to the infection, which can result in progressive liver damage and sustained inflammatory response in the liver.

In our cohort it was present in 2.2% of the patients.

Recommended Interventions:

- **Prevention:**
  - HBV vaccination, safe sexual practices, and the use of sterile and safe needles in healthcare settings.
- **Management:**
  - Regular monitoring of liver function, antiviral treatment in cases of chronic infection.
- **Case Studies:**
  - A study demonstrated the effectiveness of community-based interventions to increase HBV testing among Korean immigrants in Los Angeles.

World Health Organization. Updates to the guidelines for testing and treatment of hepatitis B. https://www.who.int/news/item/29-04-2023-who-announces-the-update-of-hepatitis-b-guidelines-on-testing-and-treatment

Hepatitis C

Hepatitis C is an infectious liver disease caused by the Hepatitis C Virus (HCV). The infection can be asymptomatic or present with varying clinical symptoms and has a high risk of becoming chronic. Chronic hepatitis C often leads to progressive liver function deterioration, potentially resulting in cirrhosis and hepatocellular carcinoma. HCV transmission mainly occurs through exposure to infected blood, often due to unsafe medical practices, use of injectable drugs, and untested blood transfusions. The pathogenesis involves liver damage caused by both the virus's direct action and the host's immune response, leading to chronic inflammation and progressive tissue damage in the liver.

In our cohort it was present in 0.3% of the patients.

- **Prevention:**
  - Use of sterile needles, safe sexual practices, screening and treatment of at-risk individuals.
- **Management:**
  - Antiviral therapy to eliminate the virus, regular monitoring of liver function.

References

- Hepatitis C Guidance 2023 Update: AASLD-IDSA Recommendations for Testing, Managing, and Treating Hepatitis C Virus Infection. https://academic.oup.com/cid/advance-article/doi/10.1093/cid/ciad319/7179952?login=true
- Global Health Sector Strategies on HIV, viral hepatitis and sexually transmitted infections (GHSS) 2022-2030 https://www.who.int/teams/global-hiv-hepatitis-and-stis-programmes/strategies/global-health-sector-strategies

ANNEX 1

Diagnostic criteria and cut-offs used in the study

Cut-offs:

- **Blood Pressure:**
  - Optimal: max < 120 mmHg, min < 80 mmHg
  - Normal: 120 ≤ max ≤ 129 mmHg, 80 ≤ min ≤ 84 mmHg
  - High Normal: 130 ≤ max ≤ 139 mmHg, 85 ≤ min ≤ 89 mmHg
  - Grade 1 Hypertension: 140 ≤ max ≤ 159 mmHg, 90 ≤ min ≤ 99 mmHg
  - Grade 2 Hypertension: 160 ≤ max ≤ 179 mmHg, 100 ≤ min ≤ 109 mmHg
  - Grade 3 Hypertension: max ≥ 180 mmHg, min ≥ 110 mmHg
  - Isolated Systolic Hypertension: max ≥ 140 mmHg, min < 90 mmHg
- **Nutritional Status (BMI):**
  - Underweight: < 18.5 kg/m²
  - Normal Weight: < 25 kg/m²
  - Overweight: < 30 kg/m²
  - Obese: > 30 kg/m²
- **Abnormal GOT (AST):**
  - Women: < 9 or > 32 U/L
  - Men: < 10 or > 40 U/L
- **Abnormal GPT (ALT):**
  - Women: < 7 or > 38 U/L
  - Men: < 7 or > 43 U/L
- **High Random Blood Sugar:**
  - 11.1 mmol/l
- **HBG (Anemia):**
  - Women:
    - > 12 g/dL = Normal,
    - 10 ≤ Hb < 12 g/dL = Mild anemia
  - Men:
    - > 13 g/dL = Normal,
    - 10 ≤ Hb < 13 g/dL = Mild anemia

    - Both:
        - 8 ≤ Hb < 10 g/dL = Moderate anemia,
        - Hb < 8 g/dL = Severe anemia
- **Cholesterol:**
    - < 200 mg/dL = Normal,
    - < 240 mg/dL = Borderline,
    - > 240 mg/dL = Elevated
- **Triglycerides:**
    - < 150 mg/dL = Normal,
    - < 200 mg/dL = Borderline,
    - > 200 mg/dL = Elevated
- **Creatinine:**
    - < 1.2 mg/dL = Normal,
    - > 1.2 mg/dL = Elevated

Diagnostic criteria:

- Hypertension: include "Grade 1 hypertension," "Grade 2 hypertension," and "Grade 3 hypertension."
- Diabetes: High random blood sugar, i.e., blood glucose levels > 11.1 mmol/l.
- Dyslipidemia: "Elevated" cholesterol category and/or "Borderline" and "Elevated" triglyceride categories.
- Underweight: "Underweight" BMI category, i.e., < 18.5 kg/m².
- Overweight: "Obese" BMI category, i.e., > 30 kg/m².
- For Tuberculosis, Syphilis, Hepatitis B, and Hepatitis C: Positivity in the respective tests.
- Hypertransaminasemia: include moderate elevation (ALT or AST levels are 5-15 times the upper limit) and severe elevation (ALT or AST levels are more than 15 times the upper limit)
- eGFR (estimated Glomerular Filtration Rate):
    - Normal: GFR>90 ml/min
    - Mild renal impairment: GFR 90-60 ml/min
    - Moderate renal impairment: GFR 60-30 ml/min
    - Severe renal impairment: GFR<30 ml/min

REFERENCES

- National AIDS Control Council, 2019. Kenya AIDS Strategic Framework II.
- National AIDS Control Council, 2013a. Kenya AIDS Strategic Framework.
- National AIDS Control Council, 2013b. Kenya HIV & Aids research agenda (2014/2015-2018/2019).
- UNAIDS, 2023. Kenya country fact Sheet [WWW Document]. URL https://www.unaids.org/en/regionscountries/countries/kenya (accessed 12.3.23).