

Introduction

The dynamic model which has been developed to support CHP policy decisions for Kenya is based on many assumptions. These have greater or lesser levels of evidence. The project team should agree these assumptions and decide whether further validation is required on any of them.

To support this activity, I have listed all the major model assumptions, with sources of evidence where known, with notes to help discussion.

Assumptions table

No	Assumption	Rationale	Evidence	Notes
1	Population grows through the timeframe of the model at a rate consistent with UNPOP assumptions for Kenya across the different age groups, initialised at county and subcounty level from CIDPs		CIDPs for Kakamega, Nairobi, Turkana, Uasin Gishu	Checked against county predictions to 2027. UNPOP growth prediction is slightly higher than KNBS prediction.
2	Population demand for CHP services is calculated by assuming 1.75 x those living below the poverty line will use CHP services. If poverty rate > 0.95 (i.e. in Suguta refugee settlement) then only those living below the poverty line will use CHP services.	Assumed correlation between poverty and CHPs	Kenya average proportion below poverty line = 0.4. Poverty line is taken from Kenya County fact sheets (CRA, 2022). Kibra assumptions from county fact sheets seem incorrect, therefore Kibra data is taken from (Njagi et al., 2024) and the further demographic assumption that 75% of the residents of Kibra subcounty reside in Kibra slum.	Timely Kenya survey (TimelyKenya, 2024) suggests 45% have used/will use CHP services but this is only in last 2 months. The model assumption for the Kenya average usage of CHP services can be calculated as 70% of the population using CHP services in a year.

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No	Assumption	Rationale	Evidence	Notes
3	Poverty levels remain constant through the timeframe of model based on 20 year history.	Historical figures show a flat poverty level.	World Bank indicator database, national poverty lines indicator (WorldBank)	The model can be adjusted if a longer term poverty trend is observed.
SERVICES DELIVERED BY CHPs				
4	CHP services are split into ‘urgent’ and ‘routine’ categories. There are two urgent categories – a) emergency accompaniment of client to health facility, first aid and injury support b) visits to clients with fever, potentially malaria There are 5 routine categories c) visits for neonates and children less than 1 year old d) visits for children under five years old d) visits for child checkups and deworming – children 5 to 14 years old e) visits for people aged 15-64 years old which includes NCD screening and referrals f) visits for people aged 65 and over which include NCD screening and referrals	Based on interviews and evidence	Kenya Community Health Volunteers handbook (Sanitation, 2013)	The model structure has been discussed with the TWG and agreed in principle. The only feedback from TWG had been for a request for inclusion of TB as a separate category. This feedback referred to an earlier version of the model when CHP services were categorised rather than calculated on household visits. In the current version, CHPs would deal with TB cases as part of regular visits. If there is a requirement to include TB visits as a prioritised visit service, this could be incorporated.
URGENT CHP VISITS				
5	The need for emergency accompaniment service averages 3 visits per 1000 head of population per annum and each visit takes 10 hours average. Assume that CHPs need supplies e.g. consumables such as swabs and wound dressings for 50% of these visits. This figure does not include pregnancy related accompaniment. This is calculated from the predicted number of births – and the average visits	Number of visits is based on literature and births. An estimate of the time taken for emergency visits has been made from interviews.	Burden of emergency conditions and emergency care usage: new estimates from 40 countries (Chang et al., 2016). Effect of high-risk versus low-risk pregnancy at	Original figure changed with new evidence. The referenced report suggests 3 per 1000 head of population. Set at to 0.003 per head of population for non-pregnancy related emergencies and a calculation for pregnancy related

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	per annum per birth - 1.26 accompaniments per birth.		the first antenatal care visit on the occurrence of complication during pregnancy and labour or delivery in Kenya: a double-robust estimation (Bagayoko et al., 2023)	accompaniment based on proportion of population under 1 year old which starts at 2.7% and decreases to 2.2% in 2040. Assuming 26.6% complications during pregnancy i.e. before labour/delivery - approx. 0.03. Variable is 'pop.target community demand for household visits by service and area[emergency and first aid]'
6	Fever visit demand is based on malaria prevalence (all ages), as suspected malaria is the main reason for an emergency visit. The national average prevalence in 2020 was 7%, Kakamega 23%, Nairobi 1%, Turkana 3%, Uasin Gishu 1%. In endemic counties which have implemented Community Case Management, CHPs test for suspected malaria using RDT kits if they have supplies available. If the test is positive and supplies are available, antimalarial drugs are given. If there are no RDT kits, antimalarial drugs are dispensed to suspected cases, increasing the usage and leading to overtreatment. Every fever visit reduces capacity for routine household visits.	Malaria is a major public health problem and CHPs would prioritise visiting a household where a fever is reported. If supplies are unavailable, or in fever cases in children under five, the CHP should refer the client.	(Zablon et al., 2026) (F Sakari, 2024) for Kakamega malaria rates (Bousema et al., 2010) Disease duration https://www.kenyanews.go.ke/government-to-conduct-mass-distribution-of-treated-mosquito-nets-in-uasin-gishu/	Prevalence is converted to incidence using the approximate formula: Prevalence = Incidence x disease duration Incidence gives visits per year required. Positive proportion of malaria cases taken from KHIS community health malaria test positivity rate.
ROUTINE CHP VISITS				
7	CHP average capacity assumes 100 households per CHP which are visited 9 times per year (assuming that CHPs do not get to all their assigned houses every month).		(Ministry_of_Health, 2020)	Assume that the CHP assesses / educates / treats multiple people in a routine visit, depending on whom is in the household.

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	Exception: Turkana CHPs are each assigned 25-50 households because of distance. An assumption of 35 households has been made for Turkana, Turkana West and Suguta. CHP assessments are performed at frequency according to age group – every visit for infants and 1-4 year olds, one in three visits for children aged 5-14 and 15 to 64 year olds and one in two visits for over 65 year olds. Numbers of people in each age group are calculated from population statistics and household size. No time allocation has been made for CHP routine visits but they may take up to an hour.		Child visit frequency - Newborn and child health strategic plan (Ministry_of_Health, 2022b; Ng'Ang'A et al., 2026)	Turkana West may have higher CHP ratios because 40% of CHPs work in refugee camps where higher ratios are possible.
8	Diarrhoea treatment is given to all ages if supplies are available when diarrhoea is reported at a visit. Diarrhoea reporting rate is based on diarrhoea prevalence.	Diarrhoea prevalence is used rather than reported incidence because diarrhoea cases will be picked up by CHPs during routine visits.	(Ogumbo et al., 2024) gives regional all age prevalence (Mberu et al., 2024) gives national under 5 prevalence 14%	Diarrhoea treatment is classified as a routine service based on understanding of clients' self treatment options with ORS/Zinc available in pharmacies or traditional herbal treatments being used in rural areas. The assumption is that CHPs do not deviate from their household visit routine to deal specifically with diarrhoea cases.
9	Deworming tablets are given to children aged from 2 years old to 14 twice a year if supplies are available.	Administering deworming tablets is	Kenya integrated community case	

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		a standard CHP service	management implementation framework (Ministry_of_Health, 2022a)	
10	Assessments of 15 to 64 year olds and over 65s require NCD screening (blood pressure monitoring and blood glucose strips) which can only be performed if supplies are available.	Routine visits include monitoring if supplies are available.	(Khayeka-Wandabwa et al., 2025)	Screening results in referrals by CHPs
11	CHP performance is improved by training and supervision. Assume 5 hours training/supervision per year is required to maintain performance and 15 hours to increase performance by 5%. No links to financial incentives have been provided because studies give conflicting information. Supply chain reliability improves motivation. Greater than 50% supplies improves motivation, less than 50% decreases motivation. Trust improvement increases motivation, trust reduction reduces motivation.	CHP	(Gopalakrishnan et al., 2021; Kok et al., 2015) (Ng'Ang'A et al., 2026; Singh et al., 2015)	Studies on training/supervision are based on monthly support. Pay regularity/reliability is essential for pay to have a motivating effect. The effect of pay on motivation and performance has not been modelled due to insufficient data.
12	CHP trust starts at a nominal 90% and increases or decreases depending on whether community demand for CHP services is met. Supply availability influences the equation. Trust can rise above 100%, which increases CHP usage above the nominated proportion of the community. CHPs visit the same number of households irrespective of size. This assumption means that	The model captures trust because it was a major feature of the CHP and community interviews. Estimates on trust have been made	(Chandani et al., 2014)	Kenya CHP trust improves from 90% to 0.9 in 2040 with full supplies to 103% (i.e. trust increases population who wish to receive CHP services) and to 71% with 10% supplies. Some services do not need supplies otherwise the drop would be greater.

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No	Assumption	Rationale	Evidence	Notes
	CHPs have more work to do in counties with larger household sizes e.g. Turkana.			Demand drops as trust drops and people use other services.

Base Case

The 'base case' for the model assumes

- 5 hours of supervision per CHP per year
- 50% supply availability
- Community case management for malaria active in Kakamega county, not in any other studied counties. To discuss (specifically Turkana)
- CHPs accompany clients to health facilities for medical emergencies including labour, pregnancy related pain or other medical emergencies e.g. injury.

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Attachment 2 modelling scenarios

For an all-inclusive system model, different scenarios will be considered, under various assumptions and expected outputs. In all the scenarios, we shall set the projected model duration to run up to 2040. The possible scenarios are highlighted here:

1. CHP resourcing:

This will focus on CHP numbers and we shall consider three scenarios, namely; zero growth, growth with population, with 1 year time lag and instantaneous growth with population. These are based on the assumption that CHP demand increases in proportion to population. A survey conducted in 2024 can be used for predicting the proportion of populations who will use CHP services. It is expected that the model will predict CHP resourcing vs needs, first for the 6 sub-counties under study, then by extrapolation for the two counties and the nation at large.

2. CHP productivity:

Under this we shall consider supervision, training and remuneration, under the scenarios: Zero training and supervision, x hours training per CHP per annum and regular pay vs irregular pay. The effect of training and/or supervision as well as pay as a motivator will come from literature and it is expected that CHP services will be affected by these different scenarios.

3. CHP supplies:

Here we shall consider the supply of key commodities, and the scenarios are; Full supply, 50% of required supplies and zero supplies after initial 2023 shipments got exhausted. We shall use CHP history of tests done and treatments administered as a proxy for availability of history. These scenarios assume there's no data on supplies available. If supply data becomes available then scenarios will be reviewed accordingly. Key output will include CHP testing and treatment services by need (malaria, diarrhoea, deworming) delivered, as well as CHP screening services delivered (assumptions on commodities utilized like batteries).

4. CHP malaria policy:

The scenarios considered here will include: No malaria treatment by CHPs, and

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CHPs authorized for Community Case Management and supplied with drugs in endemic counties. We shall use the Kakamega County malaria Community Case Management (CCM) publication to get malaria data on prevalence and trends for model. The expected outputs include CHP services delivered. Key output will be estimates in malaria prevalence changes affected by CHP services. It may be possible to extend outputs to include Disability Adjusted Life Years (DALYs) reduction relating to CCM.

5. CHP NCD management policy: To be guided by TWG discussion.

This will focus on two scenarios, namely; NCD screening only and NCD screening and community case management. **These assumptions will be guided by TWG input.** Expected outputs are CHP services delivered and possible extension to DALYs.

6. CHP emergency accompaniment: To be guided by TWG discussion.

Two scenarios here: Patients accompanied by CHPs are given priority rather than having to wait in queues. The assumption here is that time for all other CHP services is reduced because CHPs spend time waiting with clients. Total CHP capacity for delivering all other services is the expected output.

7. CHP prioritisation: To be guided by TWG discussion.

Possible considerations:

- 1) **Prioritise by service:** Under this we have emergency support, malaria diagnosis and treatment, diarrhoea treatment (U5s only or all?), under 5 child health checks, over 5 child health checks/deworming, NCD screening and general referrals.
- 2) **Split so households are covered in shifts:** CHPs attend houses in rotation unless they are called to an emergency, suspected malaria case

Two modelling alternatives here:

- a) A 'cascade' model where highest priority services use available input first.
- b) An allocation model where scenarios can be changed by using an allocation input – pie chart which can be manipulated to adjust split. Services delivered is the expected output.

UPDATE DECISION