

ITN Quantification Website Design Brief

Hannah Koenker

01 November, 2023

Contents

Background	1
Purpose and Scope	1
Branding and Design	2
Hosting	2
Previous iterations of the tool	2
Website Structure Mockup	4
What quantifier should be used for continuous distribution?	10
Quantifiers for CD at 70, 80, and 90	10

Background

The Alliance for Malaria Prevention provides practical implementation recommendations and best practices for countries conducting insecticide-treated net (ITN) mass campaigns, routine distribution, and school-based or community continuous distribution. One of AMP’s roles is to provide recommendations for quantifying the number of ITNs needed to achieve targeted levels of ITN coverage, under different combinations of channels. In 2023 AMP published a paper summarizing recommended quantification approaches for countries in sub-Saharan Africa, taking into account the median lifespan of ITNs in each country.

This work evolves from earlier Excel-based tools that calculated ITN access based on ITN inputs and population structure (NetCALC and NetCALC Lite). These tools are retired, as the conversion formula from nets-per-capita to ITN access was upgraded in the 2023 paper, but useful context for the current assignment is available at <https://continuousdistribution.org/wp-content/uploads/2022/03/NetCALC-Lite.zip>

This work will be funded by Tropical Health under a grant from the Bill & Melinda Gates Foundation awarded October 13, 2023.

Purpose and Scope

While the paper is an important step forward for integrating quantification recommendations into World Health Organization malaria guidelines, it does not provide a user-friendly way to look up recommended quantifier per country, or to compare the numbers of ITNs needed and estimated ITN access achieved under typical scenarios. AMP seeks a website designer familiar with Rshiny and R to translate the publication’s findings into a website accessible by national malaria programmes and their partners. The website will be linked from or housed within www.allianceformalariaprevention.com. This activity is a component of a revision of the www.cdtoolkit.org website, which is also part of AMP’s web resources.

Branding and Design

- Website will be part of www.allianceformalariaprevention.com and should reflect colors, look and feel, and have the AMP logo prominently
- Tropical Health logo will also be used e.g. in credits
- R for the Rest of Us logo ok to include in credits

Hosting

- How to manage this long term (access? Handover?)

Previous iterations of the tool

NetCALC was an Excel-based tool that used several variables (country population, ITN median lifespan, average household size, population age structure, reach of prenatal visits and 9-month measles vaccinations, school attendance rates, and more) to calculate how many ITNs were needed to achieve a targeted level of ITN access (proportion of the population that could use an ITN). Different ITN distribution channels (mass campaigns, primary school distribution, community-level distribution, prenatal care visits, vaccination visits) could be clicked on and off and start in different years to develop a plan for an overall ITN distribution strategy. Outputs were shown in graphs of ITN access over time as well as tables for the numbers of ITNs required for that specific population.

This tool was simplified in NetCALC Lite (which hid many of the variables and used rule of thumb assumptions for them), shown below. The first page inputs basic demographic information, the second page allows the user to select which channels are to be used for ITN distribution, and the final page presents the results (ITN access as well as table for the ITNs needed).

The screenshot shows the NetCALC Lite web application interface. At the top, there is a navigation bar with the title "NetCALC Lite" and a sequence of steps: "Get Started", "Tell Me More", "Channel Mix", "Generate Plan", and "Final Report". Below this is a subtitle: "Understanding your ITN quantification and channel mix for universal coverage".

The main form area is titled "Enter basic information to get started, then select an option below." It contains several input fields:

- "Give your ITN quantification report a name:" with the value "Cameroon NetCALC Workshop".
- "Enter the year of the last census:" with the value "2010".
- "Enter that year's estimated population:" with the value "25,402,353".
- "Enter the start year for this coverage plan:" with the value "2011". A note next to this field says "Please select the current year or a future year".
- "Average household size:" with the value "5.0".
- "Last mass campaign:" with a dropdown menu showing "1) Year" and "2010".
- "2) Number of nets distributed:" with a dropdown menu showing a yellow bar.

On the right side of the form, there are two buttons: "Instructions" and "Reset Data".

Below the form, there are two main options: "Recommend Channels" and "I Know Which Channels to Use". The "Recommend Channels" option is selected. Below it, there is a note: "With a bit more information, NetCALC Lite can recommend distribution channels for you".

At the bottom of the page, there are logos for VectorWorks, ECHOES HOPKINS, USAID, KDC, and other partners.

NetCALC Lite

Get Started → Tell Me More → **Channel Mix** → Generate Plan → Final Report

Understanding your ITN quantification and channel mix for universal coverage

Go Back Go Forward

Select the channels you will use in your ITN distribution plan, then click "Generate Plan" for estimates on number of ITNs to distribute per channel.

Instructions

Mass Campaign ? Yes 91
ANC/EPI ? Yes 91
School Distribution ? No 10
Community Distribution ? No 10

Generate Plan

NetCALC Lite

Get Started → Tell Me More → Channel Mix → **Generate Plan** → Final Report

Understanding your ITN Quantification and channel mix for universal coverage

Go Back Go Forward

Congratulations! Here are your ITN distribution plan results.

Instructions

Data were derived based on a set of assumptions. You can manually adjust data assumptions; just click "Change Data Assumptions".

Change Data Assumptions

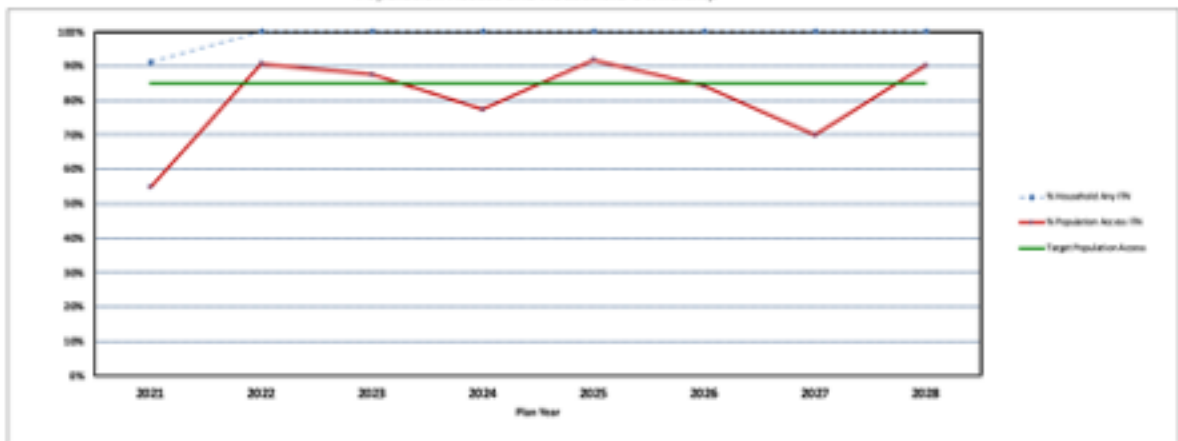
Get Your Final Report

Mass campaign ?
ANC/EPI ?
School distribution ?
Community distribution ?

TOTAL nets
% households owning any ITN
% population with access to an ITN

Number of ITNs per Distribution Channel									
	2021	2022	2023	2024	2025	2026	2027	2028	TOTAL
Mass campaign	0	15,235,124	0	0	15,407,835	0	0	17,869,233	48,512,192
ANC/EPI	1,862,131	1,704,091	1,746,697	1,795,364	1,835,123	1,881,902	1,928,027	1,976,227	14,524,544
School distribution	0	0	0	0	0	0	0	0	0
Community distribution	0	0	0	0	0	0	0	0	0
TOTAL nets	1,862,131	16,940,215	1,746,697	1,795,364	18,242,958	1,881,902	1,928,027	19,845,460	69,837,240
% households owning any ITN	91.2%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
% population with access to an ITN	14.7%	90.7%	87.1%	77.3%	81.7%	84.2%	88.8%	90.0%	

Population Access and Household Ownership



Current Iteration

In the 2023 ITN Quantification paper, Koenker et al refined the function that converted ITNs-per-capita into

population ITN access, and used country-specific ITN retention times (how long nets last in households) to model what ITN access looks like at varying inputs of ITNs, and then to identify the input level (described in terms of ITNs as a percent of total population) that achieves and maintains population ITN access at 70%, 80%, or 90% levels. Most countries aim for at least 80% ITN access in their national strategic plans.

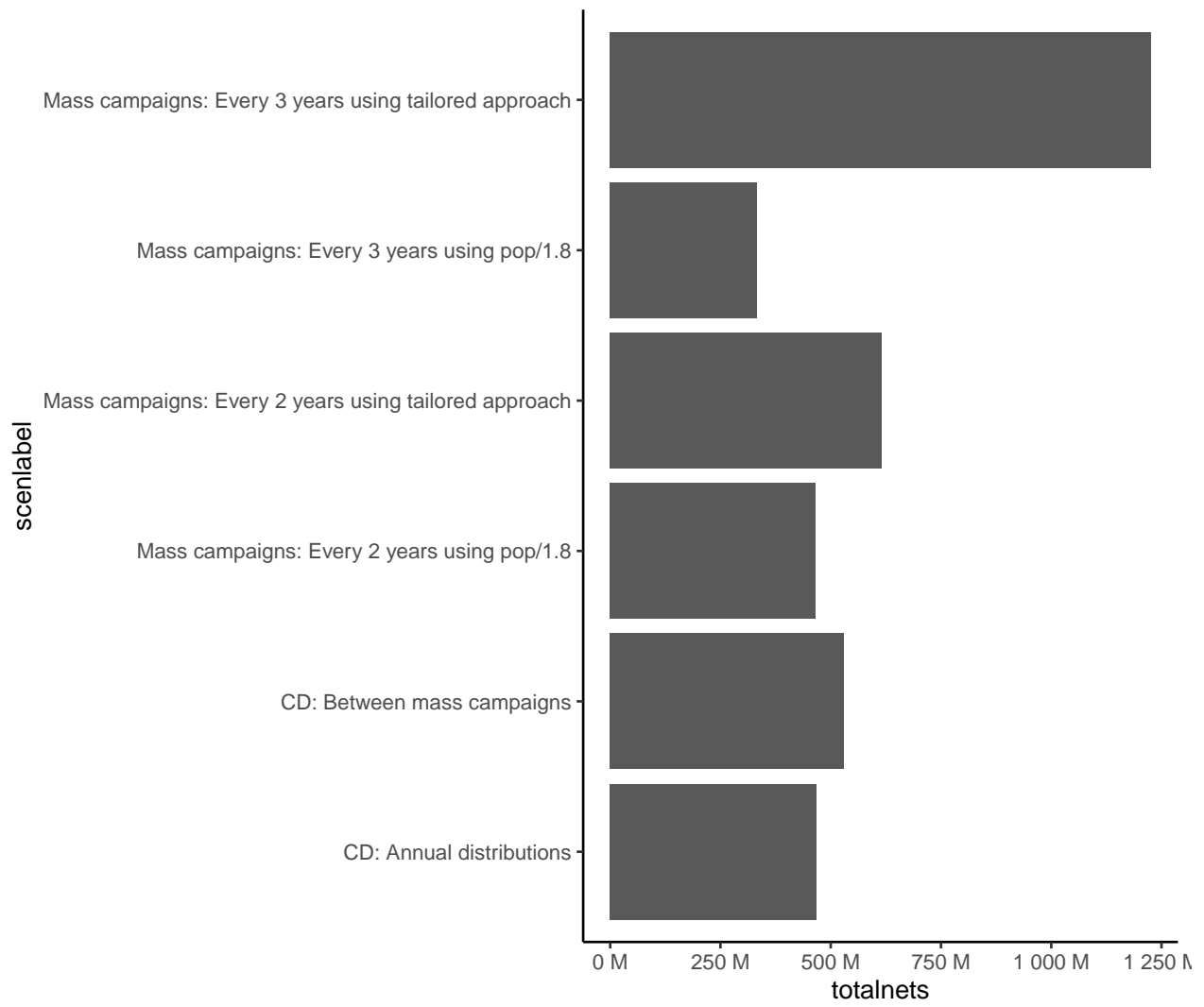
The goal is to provide a website that makes it easy for countries to: a) Compare the performance of different ITN distribution strategies in terms of ITN access achieved, and numbers of ITNs required, given an estimated ITN retention time, to allow them to select a strategy best suited for their context. b) For countries that do not trust the ITN retention time that was estimated for them, to pick a different retention time (between 1.0 and 3.5 in 0.5 year increments) and to compare the ITNs required and ITN access achieved. c) Select the population-based quantification factor relevant for their ITN strategy, to use going forward.

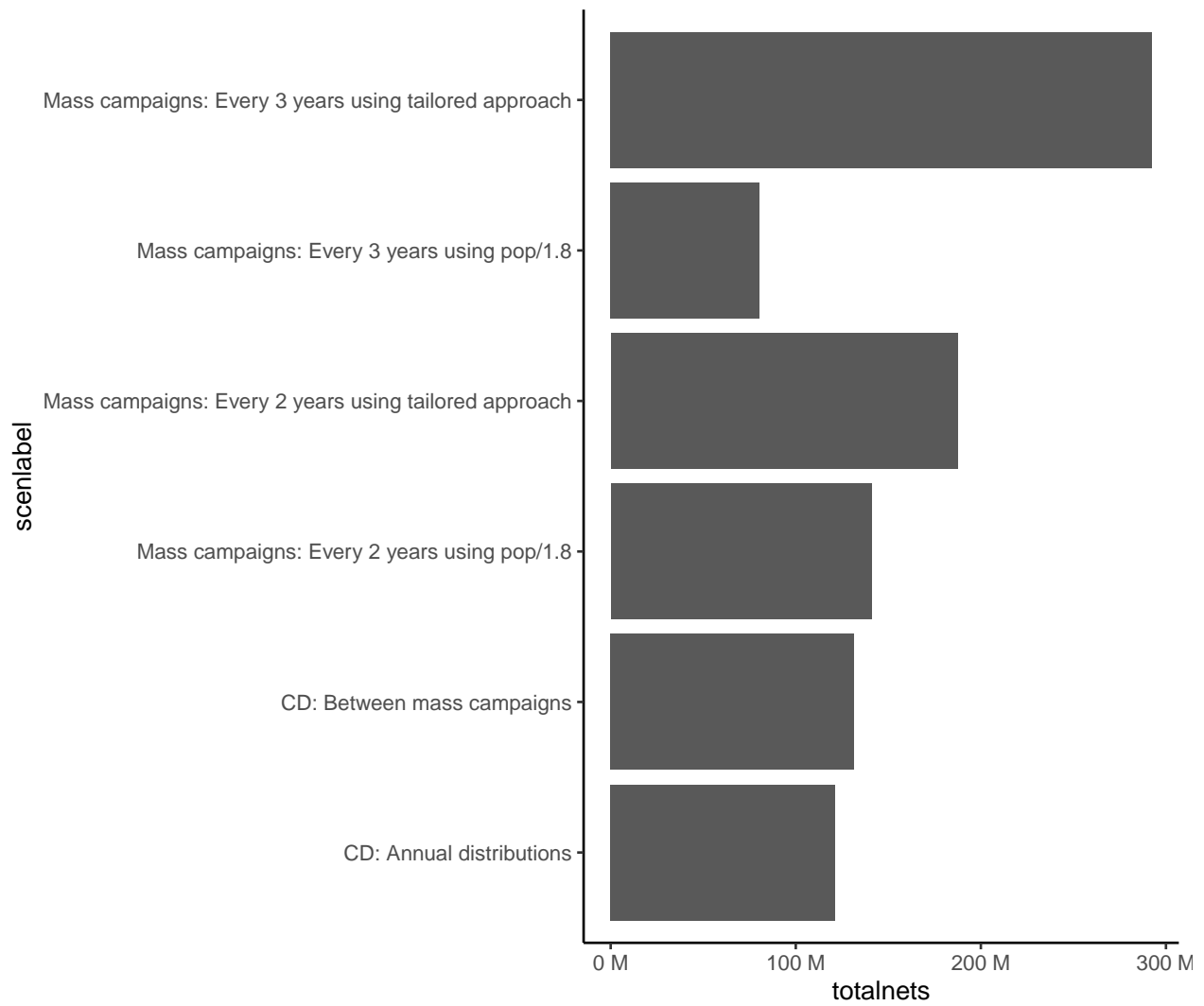
The paper uses a 10-year timeframe to allow for comparisons across multiple mass campaigns, which typically occur every three years. However, many countries will be more interested in having a three-year output option, as their Global Fund grants are three years long. For example, most countries will implement their Global Fund Grant Cycle 7 (GC7) from January 2024 to December 2026.

Website Structure Mockup

The website will likely need to take a several step process for the majority of users:

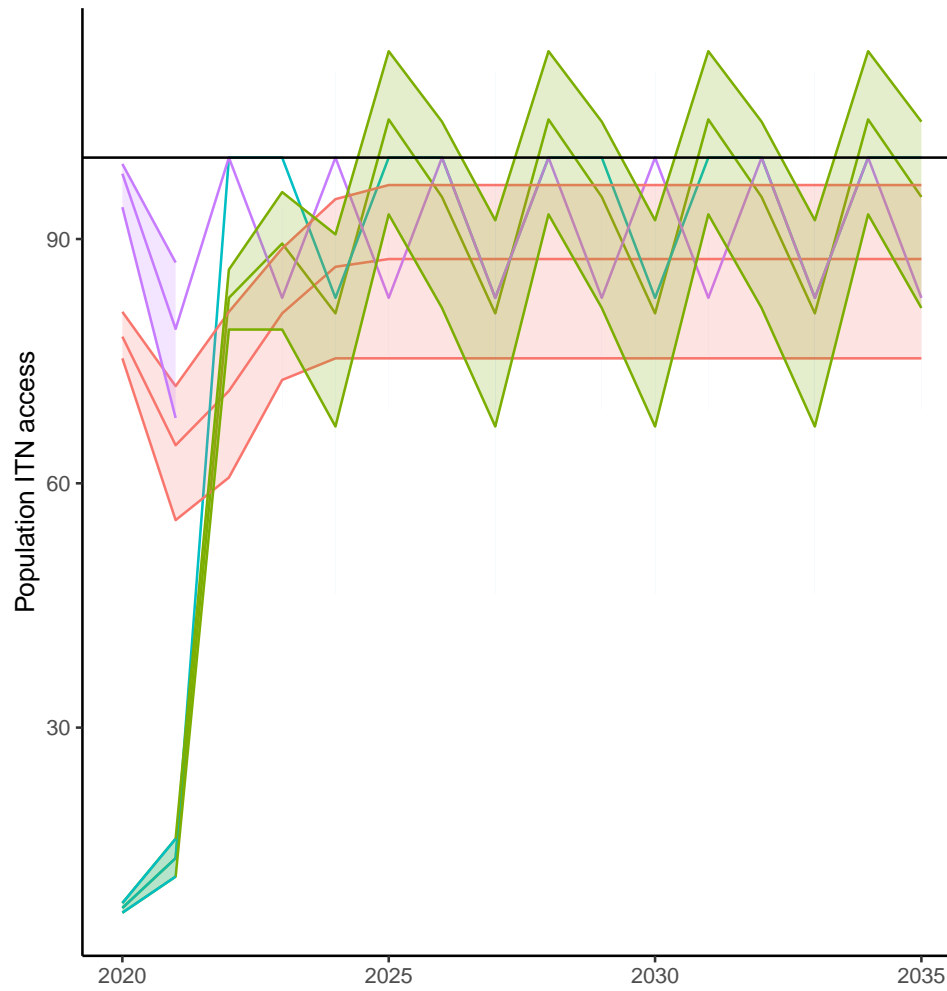
1. Select the country of interest
2. Select the target level of ITN access (70/80/90)
3. Select a 3-year or 10-year time horizon?
4. View the bar chart of number of ITNs needed over 3/10 years – each bar represents a different distribution scenario
 - could be tabbed, or faceted by target level of ITN access





Note that the two plots above could be combined / faceted, whatever seems appropriate design-wise.

4. View a line graph of ITN access trends over the 10 years for each of the different distribution scenarios

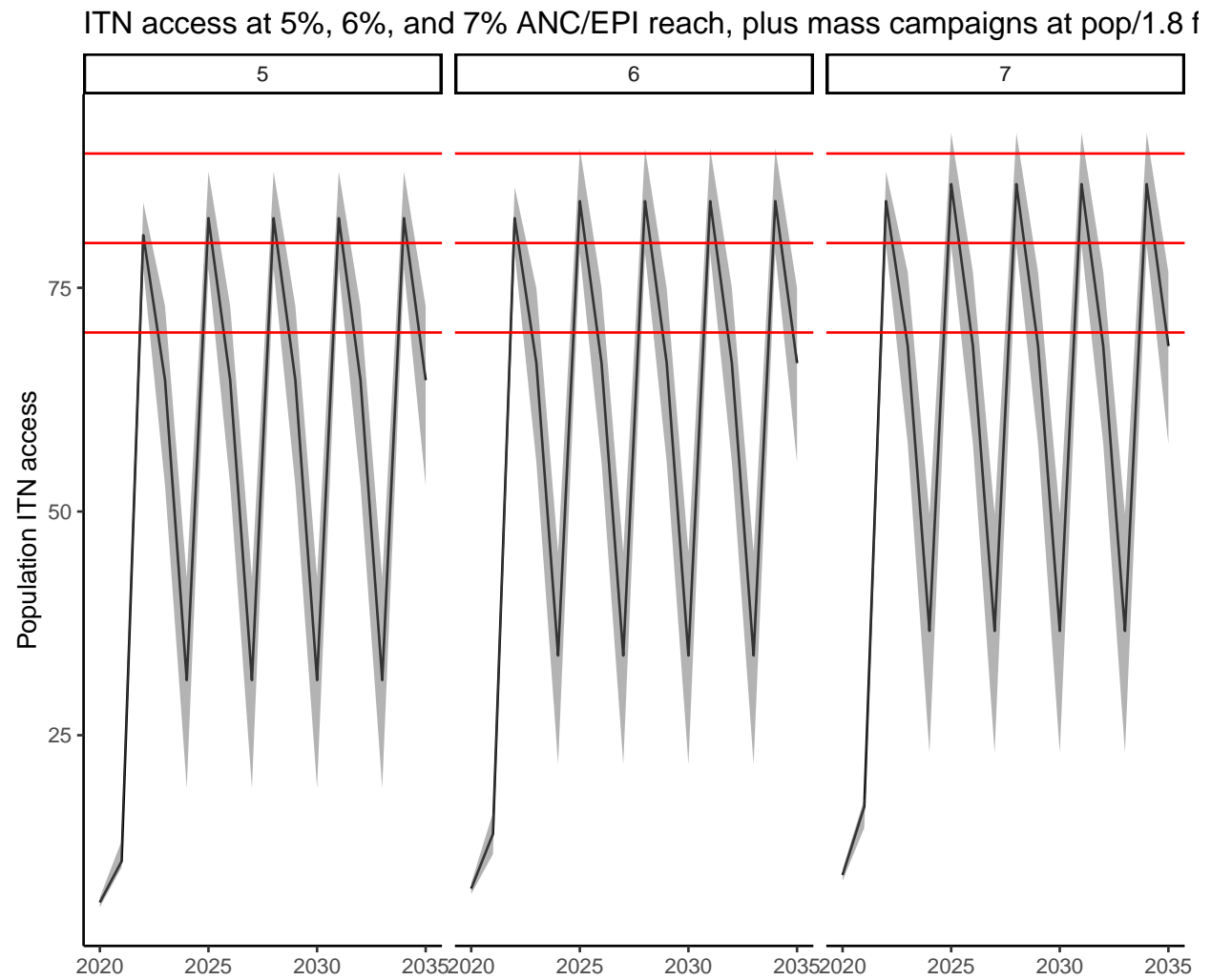


(could be faceted rather than overlaid)

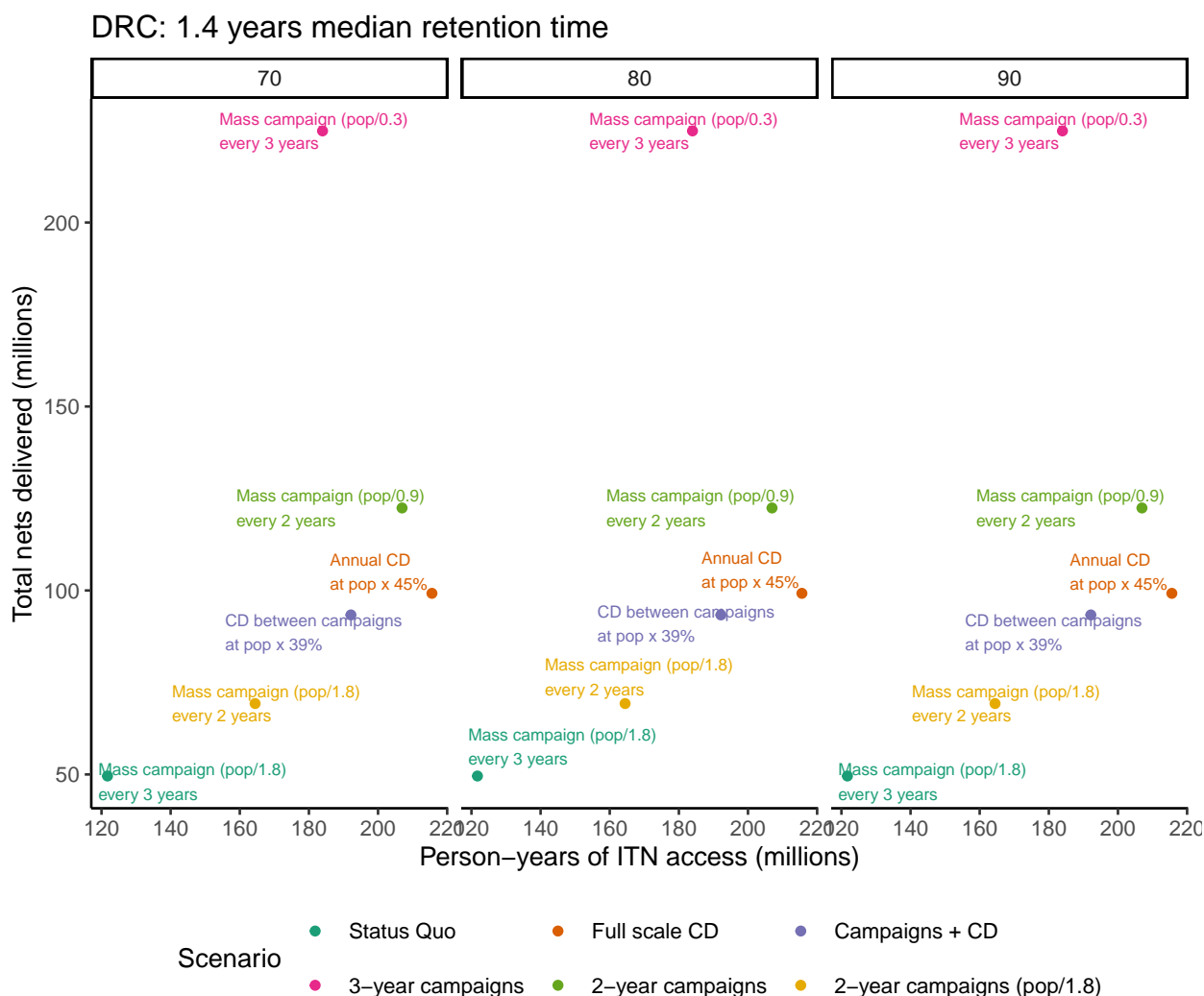
5. Option to view ITN access at different quantification levels. There are 131 total scenarios (3x group 1, 51 x group 2, 41 x group 3, 3 x group 6. We can ignore groups 4 and 5). For example:

ITN access at various quantification factors for annual school/community distributic





6. View the cost/benefit plot (frontier plot) for 10 years. Is facet useful here? Probably not. Could just show 80% target and note similar findings (relative channel performance) at other target levels.



What quantifier should be used for continuous distribution?

Probably tabs for two scenarios (2 and 3, e.g. annual continuous distribution and between-campaign distribution). Best to include the modeled retention time in the same table as the illustrative retention times? Maybe?

Quantifiers for CD at 70, 80, and 90

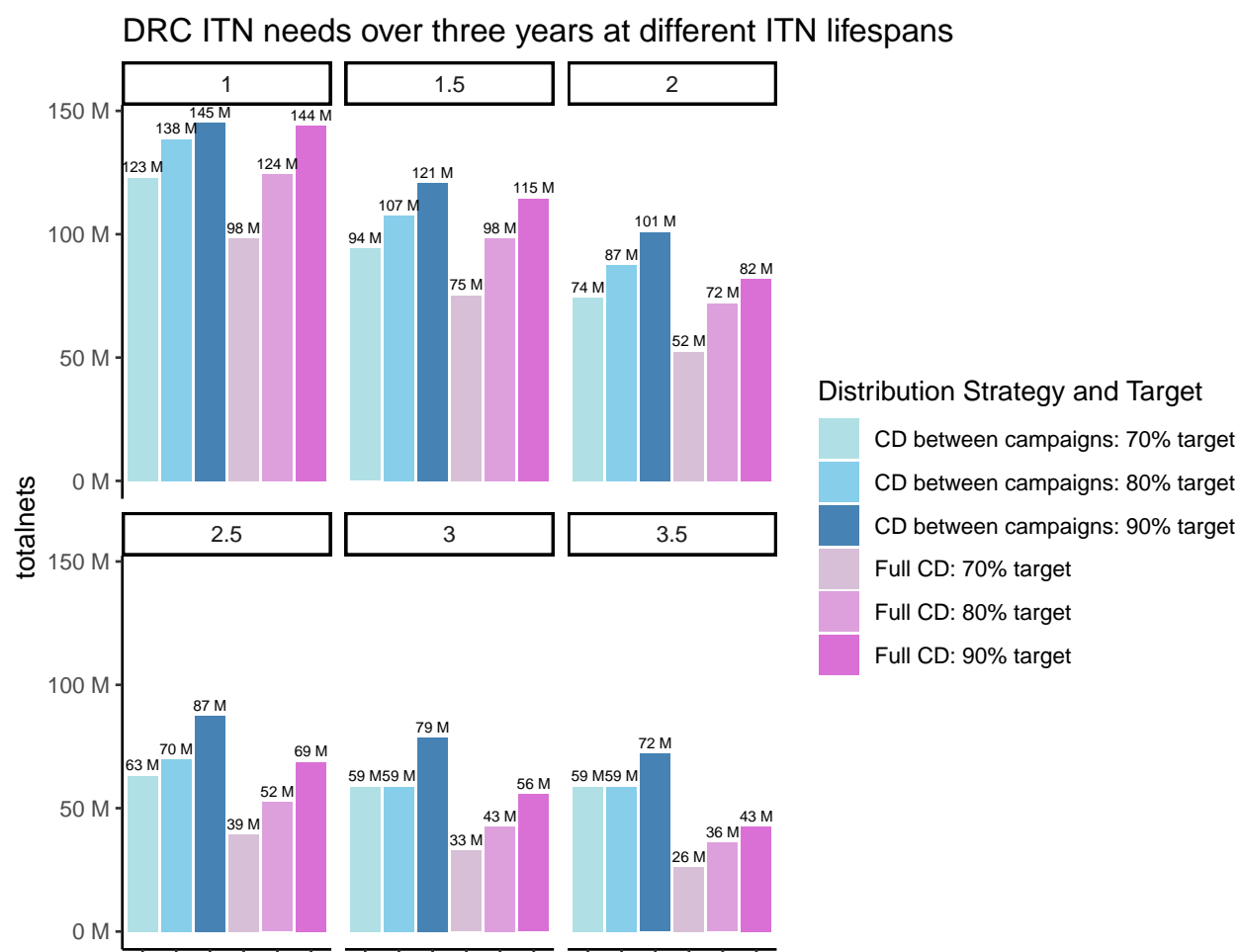
In the table below the country should of course not be in the table itself, but as part of the title/caption.

```
## Warning: fonts used in `flectable` are ignored because the `pdflatex` engine
## is used and not `xelatex` or `lualatex`. You can avoid this warning by using
## the `set_flectable_defaults(fonts_ignore=TRUE)` command or use a compatible
## engine by defining `latex_engine: xelatex` in the YAML header of the R Markdown
## document.
```

CD Strategy and Target Level of ITN access	ITN Retention Time in Years						
	1.0	1.4	1.5	2.0	2.5	3.0	3.5
Full CD: 70% target	30	24	23	16	12	10	8

CD Strategy and Target Level of ITN access	ITN Retention Time in Years						
	1.0	1.4	1.5	2.0	2.5	3.0	3.5
Full CD: 80% target	38	31	30	22	16	13	11
Full CD: 90% target	44	37	35	25	21	17	13
CD between campaigns: 70% target	29	18	16	7	2	0	0
CD between campaigns: 80% target	36	24	22	13	5	0	0
CD between campaigns: 90% target	39	25	28	19	13	9	6

The resulting number of nets required under each of the scenarios can also be shown. I have not joined in the 'real' numbers here but similar process could be done as for the above table.



For comparison, 1 mass campaign at population/1.8 in 2026 would require 62,559,811 ITNs. Routine ITNs through ANC and EPI are not included in these calculations, but would be additional for all scenarios.