Supplementary file 2: Aminde et al. Cost-effectiveness analysis of population salt reduction interventions to reduce blood pressure and cardiovascular disease burden in Cameroon: a mathematical modelling study

Contents

1. Introduction

In this section, we present additional details in regards to input parameters used for the modelling work, additional modelling methods to provide more clarity in the modelling approach and finally results of additional sensitivity and scenario analysis conducted to explore the robustness of the study findings under different scenarios.

2. Additional modelling methods

2.1. Estimating change in systolic blood pressure from reduction in salt (sodium)

Using evidence from the Cochrane systematic review and meta-analysis by He et al. [1], a 4.4-gram reduction in salt lead to a 5.39 mmHg and 2.42 mmHg reduction in systolic blood pressure (SBP) in hypertensive & normotensive people overall (i.e. all ethnicities) respectively. While in black populations, for those with hypertension the same 4.4-gram lead to 7.83 mmHg and 4.02 mmHg in hypertensive and normotensive adults respectively.

Based on the above, the following equations were used;

1. Main analysis
   - For black hypertensive populations; 1gram salt results in 7.83/4.4 = 1.7795 mmHg ⬇SBP
     Δ mean SBP = **-** 1.7795*(**x**), where **x** = change in salt in grams
   - For black normotensive populations; 1 gram salt results in 4.02/4.4 = 0.9136 mmHg ⬇SBP
     Δ mean SBP = **-** 0.9136*(**x**), where **x** = change in salt in grams
2. Sensitivity analysis, we used the salt reduction in all ethnicities;
   a. For hypertensive populations: 1 gram salt results in 5.39/4.4 = 1.225 mmHg ⬇SBP
      Δ mean SBP = **-** 1.225*(**x**), where **x** = change in salt in grams
   b. For normotensive populations: 1 gram salt results in 2.42/4.4 = 0.55 mmHg ⬇SBP
      Δ mean SBP = **-** 0.55*(**x**), where **x** = change in salt in grams

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2.2. Equations to estimate risk of CVD based on shifts in systolic blood pressure distribution

To model the health benefits of the salt reduction interventions, the potential impact fraction (PIF) was used to estimate changes in CVD incidence that would result from shifts in systolic blood pressure distribution (following reduction in salt described by equations described above). For estimation of the PIF, risk factor (in this case, SBP) distributions and relative risks linking SBP to the CVDs are required. Since blood pressure is a continuous risk factor, we use the 'distribution shift' method [2] for potential impact fraction estimation as seen below;

$$PIF = \frac{\int_a^b RR(x)P(x)dx - \left(\int_{a1}^{b1} RR(x)P{*}(x)dx + \int_{a2}^{b2} RR(x)P{*}(x)dx\right)}{\int_a^b RR(x)P(x)dx}$$

x = SBP exposure levels, RR(x) = relative risk function, P(x) = original SBP distribution, P* = SBP distribution after the intervention, a = start integration limit (90mmHg), b = end integration limit (220mmHg), a1 = start integration limit for normotensive people (90mmHg), b1 = end integration limit for normotensive people (139.9mmHg), a2 = start integration limit for hypertensive people (140mmHg), b2 = end integration limit for hypertensive people (220mmHg).

For all sex and five-year age groups, we assumed a theoretical minimum SBP of 115 mmHg, which is the lowest level considered for elevated CVD risk [3, 4].

The new incidence of CVD (I*) is thus estimated as: I* = I **x** (1-PIF).

Where

I = current incidence of ischaemic heart disease, haemorrhagic stroke, ischaemic stroke or hypertensive heart disease in the Cameroonian population for each sex and five-year age group.

I* = new incidence of ischaemic heart disease, haemorrhagic stroke, ischaemic stroke or hypertensive heart disease after the intervention.

2.3. Cardiovascular disease Markov models

Each of the four explicitly modelled CVDs that have strong causal link with salt and blood pressure [5, 6] has a separate disease Markov model with 1-year cycle length incorporated in the proportional multistate life table model. Each disease has four distinct health states, that is, healthy (alive without CVD), diseased (alive with CVD), death from (any of the) CVDs and death due to other causes. The movement of proportions of the populations between these health states is governed by transition hazards or probabilities (incidence, case fatality, remission), with death being absorbing states. In this chronic disease CVD model, remission is assumed to be zero. In addition, for all four CVDs modelled, the starting population in diseased state consists of the proportion of prevalent cases in the population for each sex and five-year age-group, and the rest were allocated to the healthy state. Disease epidemiology (incidence, prevalence, mortality) parameters were obtained from the Global Burden of Disease (GBD) 2016 study [7], and entered to DISMOD II software [8]. The latter to estimate unavailable (but required) parameters such as case fatality rate with the help of differential equations, while maintaining consistency in all the parameters. The figure below depicts the cardiovascular disease models.

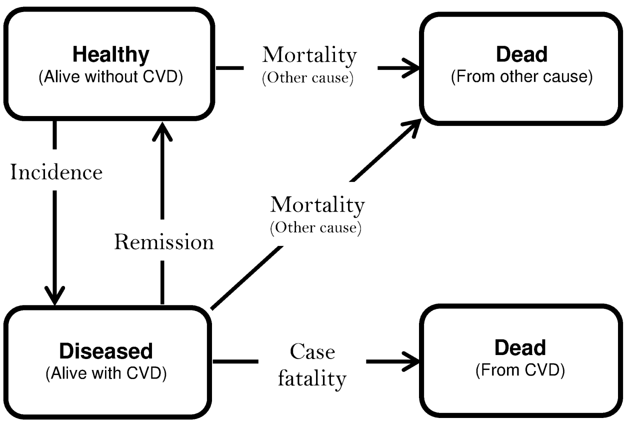

Figure 1: Conceptual framework for cardiovascular disease models (adapted from Barendregt et al. [8])

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2.4. The proportional multi-cohort multistate life table model

The proportional multi-cohort multistate life table model is used to estimate the difference in life years lived by the adult Cameroonian population aged 30 years and over, by comparing a population that continues to consume salt at current levels with a (hypothetical) identical population that receives the salt reduction interventions. The populations are stratified by sex and five-year age groups (hence, multi-cohort) and able to deal with comorbidity (hence, proportional) as opposed to a simple life table [9]. The calculated years lived by each of the cohorts is adjusted for poor health or disability (a numerical quantification of the degree of health loss due to a disease) using estimates derived from the Global burden of disease 2016 study [7].

For each of the CVDs modelled, this poor health adjustment is estimated by dividing the sex and age-specific years lived with disability (YLD) for that disease by the corresponding prevalence numbers. This gives an average weight of the proportion of health knocked out by the disease. This 'disability' weight is further adjusted for poor health due to other diseases not included in the model using all-cause prevalent years lived with disability (pYLD) per capita (excluding the diseases modelled). The difference in these now health-adjusted life years (HALYs) between the populations receiving the interventions and those not receiving is indicative of the health benefit attributed to the intervention. In our model, the cohorts are simulated till they reach 100 years or die.

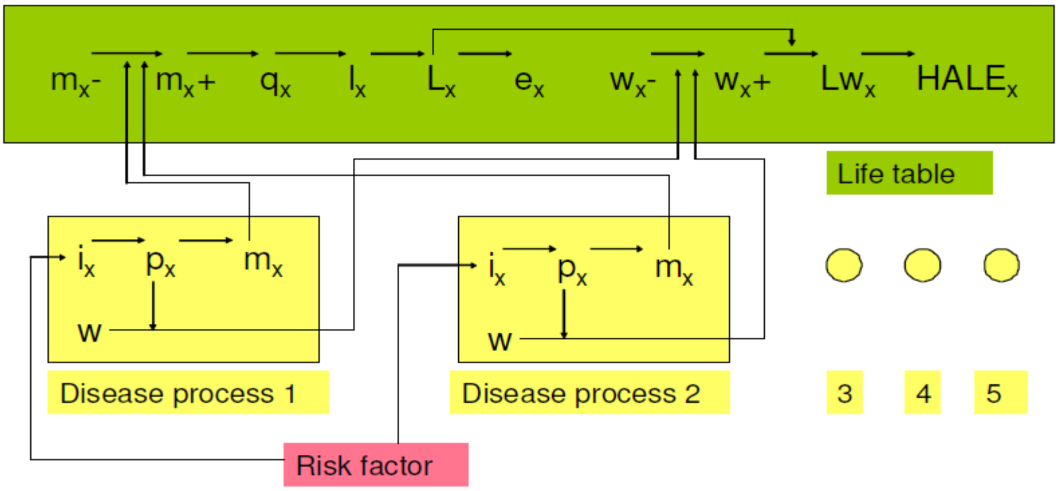

Figure 2: Representation of the proportional multi-cohort multistate life table model, including the interaction with the disease models and the risk factor [9].

In the disease models (yellow); i = incidence, p = prevalence, m = mortality.
In the life table (green); m = mortality, q = mortality probability, l = number of survivors, L = life years, Lw = health-adjusted life years (HALY), HALE = health-adjusted life expectancy, x = age.
'-' = parameter excluding the modelled diseases, '+' = overall parameter (including the diseases modelled).

2.5. Additional input parameters used in the model

Table 1: Systolic blood pressure, salt and relative risks input parameters

Parameters		**Values**				**Source**
Systolic blood pressure, *mmHg* *mean (SD)*		Men	Women			[10]
	≤40 yrs.	126.97 (16.12)	120.87 (16.28)			
	40-59 yrs.	137.97 (24.19)	136.68 (24.08)			
	60-79 yrs.	148.02 (25.94)	149.12 (26.94)			
	≥80 yrs.	142.58 (18.84)	154.5 (33.3)			
Mean sodium intake for adults *(g/day)*		Men	Women			[11, 12]
	All ages	2.2	2.0			
Change in SBP *(mmHg)* due to salt *(every 4.4gram/day)* reduction		Blacks (base)	All ethnic (sensitivity)			[1]
	Hypertensive	-7.83 (-10.90 to -4.71)	-5.39 (-6.62 to -4.15)			
	Normotensive	-4.02 (-7.44 to -0.61)	-2.42 (-3.56 to -1.29)			
Relative risks, *for every 10mmHg increase in SBP*		IHD	I-stroke	H-stroke	HHD	
	25-29yrs	1.97 (1.44 – 2.59)	1.85 (1.39 – 2.59)	2.13 (1.55 – 2.91)	2.86 (1.82 – 4.11)	[6]
	30-34yrs	1.82 (1.46 – 2.20)	1.77 (1.43 – 2.25)	2.05 (1.59 – 2.65)	2.84 (1.85 – 4.19)	
	35-39yrs	1.66 (1.46 – 1.91)	1.69 (1.40 – 2.03)	1.96 (1.58 – 2.46)	2.81 (1.80 – 4.34)	
	40-44yrs	1.57 (1.40 – 1.79)	1.63 (1.35 – 1.95)	1.87 (1.49 – 2.30)	2.70 (1.76 – 4.19)	
	45-49yrs	1.53 (1.39 – 1.70)	1.57 (1.36 – 1.82)	1.78 (1.48 – 2.11)	2.50 (1.80 – 3.76)	
	50-54yrs	1.49 (1.38 – 1.61)	1.52 (1.36 – 1.69)	1.67 (1.44 – 1.93)	2.30 (1.77 – 3.46)	
	55-59yrs	1.44 (1.36 – 1.53)	1.47 (1.34 – 1.59)	1.58 (1.40 – 1.75)	2.10 (1.64 – 3.33)	
	60-64yrs	1.40 (1.33 – 1.48)	1.41 (1.30 – 1.52)	1.48 (1.33 – 1.61)	1.90 (1.44 – 3.17)	
	65-69yrs	1.36 (1.26 – 1.45)	1.36 (1.21 – 1.49)	1.37 (1.20 – 1.54)	1.71 (1.18 – 3.21)	
	70-74yrs	1.33 (1.22 – 1.42)	1.32 (1.17 – 1.45)	1.32 (1.16 – 1.49)	1.62 (1.05 – 3.14)	
	75-79yrs	1.30 (1.22 – 1.40)	1.28 (1.18 – 1.39)	1.31 (1.19 – 1.45)	1.64 (1.08 – 3.09)	
	≥80yrs	1.26 (1.13 – 1.43)	1.20 (1.10 – 1.37)	1.28 (1.12 – 1.51)	1.71 (1.10 – 3.26)	

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Table 2: Disease epidemiology input parameters

IHD	Incidence		Prevalence		Mortality		Case fatality		Sources
	Men	Women	Men	Women	Men	Women	Men	Women	
30-34yrs	0.0011	0.0004	0.0035	0.0012	0.0001	0.0000	0.0199	0.0210	Global Burden of Disease (GBD) 2016 study [7]. Prevalence, incidence and mortality parameters from GBD are entered in DISMOD II to estimate case fatality while enforcing consistency in data [8]. Presented here are DISMOD II output data used as input in the cost-effectiveness model.
35-39yrs	0.0014	0.0005	0.0093	0.0033	0.0002	0.0001	0.0257	0.0229	
40-44yrs	0.0018	0.0007	0.0155	0.0058	0.0004	0.0001	0.0279	0.0212	
45-49yrs	0.0027	0.0012	0.0237	0.0096	0.0007	0.0002	0.0307	0.0246	
50-54yrs	0.0037	0.0018	0.0345	0.0152	0.0012	0.0005	0.0335	0.0311	
55-59yrs	0.0050	0.0027	0.0481	0.0228	0.0018	0.0009	0.0368	0.0386	
60-64yrs	0.0072	0.0043	0.0659	0.0334	0.0029	0.0017	0.0434	0.0509	
65-69yrs	0.0103	0.0069	0.0889	0.0484	0.0046	0.0033	0.0520	0.0676	
70-74yrs	0.0138	0.0103	0.1164	0.0674	0.0074	0.0060	0.0635	0.0889	
75-79yrs	0.0173	0.0142	0.1435	0.0873	0.0116	0.0100	0.0807	0.1150	
80-84yrs	0.0221	0.0190	0.1636	0.1036	0.0184	0.0161	0.1124	0.1552	
85-89yrs	0.0335	0.0268	0.1730	0.1095	0.0330	0.0278	0.1905	0.2538	
90-94yrs	0.0594	0.0395	0.1679	0.0940	0.0616	0.0444	0.3673	0.4732	
95yrs+	0.1039	0.0568	0.1623	0.0767	0.1039	0.0590	0.6404	0.7714	
I-Stroke	**Men**	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**	**Women**	**Sources**
30-34yrs	0.0001	0.0001	0.0004	0.0004	0.0000	0.0000	0.0205	0.0104	Global Burden of Disease (GBD) 2016 study [7]. Prevalence, incidence and mortality parameters from GBD are entered in DISMOD II to estimate case fatality while enforcing consistency in data [8]. Presented here are DISMOD II output data used as input in the cost-effectiveness model.
35-39yrs	0.0002	0.0002	0.0012	0.0013	0.0000	0.0000	0.0194	0.0098	
40-44yrs	0.0004	0.0004	0.0025	0.0027	0.0000	0.0000	0.0155	0.0097	
45-49yrs	0.0006	0.0006	0.0046	0.0048	0.0001	0.0001	0.0162	0.0124	
50-54yrs	0.0009	0.0009	0.0077	0.0080	0.0001	0.0001	0.0187	0.0155	
55-59yrs	0.0014	0.0013	0.0121	0.0123	0.0003	0.0003	0.0269	0.0232	
60-64yrs	0.0022	0.0022	0.0179	0.0183	0.0008	0.0007	0.0450	0.0408	
65-69yrs	0.0032	0.0034	0.0256	0.0263	0.0013	0.0015	0.0522	0.0577	
70-74yrs	0.0044	0.0051	0.0359	0.0369	0.0021	0.0026	0.0586	0.0715	
75-79yrs	0.0058	0.0072	0.0472	0.0489	0.0036	0.0049	0.0756	0.1008	
80-84yrs	0.0076	0.0097	0.0563	0.0568	0.0061	0.0087	0.1077	0.1530	
85-89yrs	0.0106	0.0130	0.0608	0.0584	0.0102	0.0134	0.1683	0.2299	
90-94yrs	0.0164	0.0174	0.0609	0.0529	0.0165	0.0190	0.2706	0.3599	
95yrs+	0.0260	0.0234	0.0634	0.0470	0.0248	0.0242	0.3910	0.5146	

IHD = Ischaemic heart disease, I-Stroke = ischaemic stroke, data are rates per 1.

Aminde LN, *et al. BMJ Open* 2020; 10:e041346. doi: 10.1136/bmjopen-2020-041346

H-Stroke	Incidence		Prevalence		Mortality		Case fatality		Sources
	Men	Women	Men	Women	Men	Women	Men	Women	
30-34yrs	0.0001	0.0001	0.0003	0.0002	0.0001	0.0000	0.2236	0.1650	Global Burden of Disease (GBD) 2016 study [7]. Prevalence, incidence and mortality parameters from GBD are entered in DISMOD II to estimate case fatality while enforcing consistency in data [8]. Presented here are DISMOD II output data used as input in the cost-effectiveness model.
35-39yrs	0.0002	0.0001	0.0005	0.0004	0.0001	0.0001	0.2687	0.2137	
40-44yrs	0.0003	0.0002	0.0008	0.0007	0.0002	0.0002	0.2912	0.2358	
45-49yrs	0.0006	0.0004	0.0013	0.0012	0.0004	0.0003	0.3295	0.2576	
50-54yrs	0.0009	0.0007	0.0021	0.0018	0.0007	0.0005	0.3406	0.2783	
55-59yrs	0.0012	0.0010	0.0030	0.0026	0.0010	0.0008	0.3385	0.3018	
60-64yrs	0.0017	0.0013	0.0042	0.0036	0.0014	0.0011	0.3430	0.3021	
65-69yrs	0.0022	0.0019	0.0055	0.0050	0.0019	0.0017	0.3493	0.3330	
70-74yrs	0.0029	0.0028	0.0068	0.0064	0.0027	0.0025	0.3895	0.3961	
75-79yrs	0.0037	0.0039	0.0079	0.0078	0.0035	0.0036	0.4469	0.4699	
80-84yrs	0.0049	0.0055	0.0089	0.0092	0.0046	0.0052	0.5188	0.5631	
85-89yrs	0.0070	0.0078	0.0103	0.0106	0.0067	0.0075	0.6506	0.7077	
90-94yrs	0.0106	0.0108	0.0123	0.0117	0.0101	0.0106	0.8173	0.9048	
95yrs+	0.0161	0.0140	0.0157	0.0127	0.0153	0.0138	0.9736	0.9135	
HHD	Men	Women	Men	Women	Men	Women	Men	Women	Sources
30-34yrs	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.2870	0.3010	Global Burden of Disease (GBD) 2016 study [7]. Prevalence and mortality parameters from GBD are entered in DISMOD II, assuming zero remission, to estimate incidence and case fatality while enforcing consistency in data [8]. Presented here are DISMOD II output data, used as input in the cost-effectiveness model. NB: GBD 2016 does not provide incidence.
35-39yrs	0.0001	0.0001	0.0004	0.0004	0.0000	0.0000	0.0364	0.0573	
40-44yrs	0.0001	0.0002	0.0009	0.0009	0.0000	0.0000	0.0259	0.0465	
45-49yrs	0.0001	0.0002	0.0013	0.0015	0.0000	0.0001	0.0286	0.0497	
50-54yrs	0.0001	0.0002	0.0016	0.0021	0.0001	0.0001	0.0361	0.0711	
55-59yrs	0.0001	0.0003	0.0016	0.0025	0.0001	0.0003	0.0494	0.1050	
60-64yrs	0.0004	0.0006	0.0022	0.0031	0.0001	0.0004	0.0659	0.1393	
65-69yrs	0.0010	0.0012	0.0046	0.0047	0.0002	0.0007	0.0536	0.1589	
70-74yrs	0.0013	0.0018	0.0090	0.0074	0.0004	0.0012	0.0399	0.1552	
75-79yrs	0.0012	0.0026	0.0131	0.0115	0.0005	0.0017	0.0400	0.1475	
80-84yrs	0.0014	0.0036	0.0161	0.0163	0.0007	0.0026	0.0454	0.1591	
85-89yrs	0.0024	0.0049	0.0206	0.0207	0.0011	0.0041	0.0543	0.1959	
90-94yrs	0.0044	0.0079	0.0289	0.0257	0.0022	0.0066	0.0760	0.2561	
95yrs+	0.0073	0.0126	0.0415	0.0337	0.0044	0.0107	0.1050	0.3166	

H-Stroke = haemorrhagic stroke, HHD = hypertensive heart disease, data are rates per 1.

Table 3: Disease-specific disability and all-cause prevalent years lived with disability (pYLD) rates by sex and five-year age groups

	IHD		I-stroke		H-stroke		HHD		pYLD		Source
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	
30-34yrs	0.0577	0.0580	0.1156	0.1347	0.1204	0.1414	0.0897	0.0886	0.1059	0.1217	GBD 2016 study [7].
35-39yrs	0.0539	0.0519	0.1153	0.1330	0.1231	0.1444	0.0862	0.0848	0.1172	0.1354	
40-44yrs	0.0518	0.0490	0.1146	0.1320	0.1183	0.1389	0.0848	0.0825	0.1293	0.1472	
45-49yrs	0.0486	0.0447	0.1152	0.1350	0.1198	0.1369	0.0845	0.0830	0.1413	0.1555	
50-54yrs	0.0455	0.0410	0.1189	0.1375	0.1207	0.1412	0.0836	0.0833	0.1541	0.1629	
55-59yrs	0.0429	0.0388	0.1201	0.1423	0.1204	0.1430	0.0832	0.0820	0.1693	0.1740	
60-64yrs	0.0403	0.0368	0.1231	0.1463	0.1243	0.1468	0.0814	0.0818	0.1901	0.1892	
65-69yrs	0.0376	0.0349	0.1240	0.1484	0.1248	0.1478	0.0802	0.0803	0.2197	0.2125	
70-74yrs	0.0364	0.0344	0.1318	0.1556	0.1326	0.1558	0.0787	0.0791	0.2514	0.2401	
75-79yrs	0.0340	0.0328	0.1441	0.1662	0.1458	0.1659	0.0777	0.0773	0.2770	0.2696	
80-84yrs	0.0317	0.0303	0.1543	0.1748	0.1562	0.1755	0.0757	0.0760	0.2906	0.2980	
85-89yrs	0.0297	0.0271	0.1629	0.1826	0.1644	0.1850	0.0749	0.0748	0.3463	0.3414	
90-94yrs	0.0307	0.0275	0.1723	0.1904	0.1732	0.1945	0.0740	0.0741	0.4254	0.3687	
95yrs+	0.0391	0.0381	0.1826	0.2016	0.1847	0.2042	0.0744	0.0741	0.6156	0.4143	

IHD = ischaemic heart disease, I-stroke = ischaemic stroke, H-stroke = haemorrhagic stroke, HHD = hypertensive heart disease

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2.5.1. Disease healthcare costs

There is no nationally representative study regarding healthcare costs for diseases in Cameroon. For this study, average annual healthcare costs per person for diseases modelled were obtained from a cost of illness study conducted at two major (tertiary) hospitals in Cameroon with collected data from 2013 to 2017 [13]. These costs were estimated in the local currency -central African francs (XAF), and converted to US dollars. Costs of unrelated diseases were projected using the most recent (2015) World Bank estimate for health expenditure per capita for Cameroon [14]. All costs were adjusted to 2016 (baseline year) prices using the World Bank consumer price index for Cameroon [15]

Table 4: Estimates for healthcare costs of diseases

Disease	Costs (US$) per prevalent case	
	Mean	SD
Ischaemic heart disease	1,650	1,283
Ischaemic stroke	1,738	1,438
Haemorrhagic stroke	1,406	1,093
Hypertensive heart disease	627	436
Health expenditure per capita	65	6.5

2.5.2. Intervention costs

The tables below present a summary of the major components of the intervention costs per annum, which were estimated guided by the WHO NCD costing tool [16]. This used an ingredients approach for estimation of resource consumption, which included aspects such as program management, health promotion, media and advocacy, training and meetings, mass media advocacy, law enforcement, rent and office supplies/utilities. All unit costs such as salaries, per diems, transportation, time for television and radio adverts, newspaper adverts, billboards and flyers and office supplies were obtained locally and scaled up nationally where appropriate. This tool guided especially the estimation of costs for the media campaign and the salt substitute interventions. In addition, for the salt substitute intervention, we estimate the excess cost of replacing a proportion of regular salt (100%NaCl) with KCl salt for the substitute with reduced sodium content (65% NaCl + 35% KCl) that is modelled. Regarding the school-based education program to children, elements of resource use for the intervention were obtained from the trial [17] scaled up to cover all primary school in Cameroon. Contrary to targeting just one class per school as was done in the trial, for our cost estimates, we expanded to include children all classes in all primary schools in Cameroon in order to maximise the population reach and national coverage of the intervention. We also included national and provincial programme management costs, which were not included in the trial. These resources were then valued using local unit costs to estimate the total intervention costs per annum. Costs were converted to US dollars for comparative purposes and adjusted using World Bank consumer price indices for Cameroon to the study baseline year - 2016.

Table 5: Estimated annual costs for mass media and salt substitute interventions

Cost components	Mass media campaign cost (US$)	Salt substitute (US$)
Program management (salaries for Director, manager, Admin & clerical officers, Secretary, Accountant, IT Manager & officer, cleaner)	13,969	13,969
Health promotion, advocacy (Salaries for public health (PH) specialist, PH officer, Health trainers, Public Relations (PR) manager & officers)	13,088	13,088
Trainings and meetings (per diems and travel/transport costs for trainers, national and local experts, for all meeting & training days)	72,106	72,106
Mass media (Television and radio time, newspapers, flyers/ leaflets, billboards) adverts	1,151,613	566,564
Office supplies & rents (rents for office/meeting space, office consumables, computer, printer)	46,162	46,162
Law enforcement (Salaries for superintendent, lawyer & legal officer, health enforcement officer)	-	25,415
Replacing portion of NaCl with KCl substitute (Estimated excess cost based on consumption data [18]	-	5,191,084
Total cost per annum	1,296,939	5,928,389

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Table 6: Estimated annual costs for school-based education program intervention

Cost component	**Cost (US$)**
Personnel costs by roles (salaries/per diems for health education teachers, school principals, trainers)	2,868,325
Materials (Education books, family newsletters, posters for home & classroom, fridge magnets, teaching aids, logistics)	5,341,209
Monitoring cooking salt use (class teachers-in-charge, materials – salt utensils, logs of high salt food, weighing scales per class, stickers per child (family))	4,196,975
Program management (as estimated from Media campaign)	13,969
Total cost per annum	12,420,479

NB: This was scaled up to reach all children enrolled in all classes for all primary schools in Cameroon for maximum population reach.

Aminde LN, *et al. BMJ Open* 2020; 10:e041346. doi: 10.1136/bmjopen-2020-041346

3. Additional results from sensitivity analysis

Table 7: HALYs, net costs and cost-effectiveness at varied discount rates and time horizons

Scenarios	HALY Mean (95% CI)	Net costs (US$ million) Mean (95% CI)	ICER# (cost in US$/HALY) Mean (95% CI)	ICER* (cost in US$/HALY) Mean (95% CI)
Mass media campaign				
0% discount, lifetime	114,244 (62,924 to 174,480)	-118.5 (-459.6 to 48.5)	833 (492 to 1,444)	Dominant (Dominant to 537)
0% discount, 10 years	4,367 (2,376 to 6,782)	-10.7 (-46.2 to 6.7)	2,890 (1,644 to 5,094)	Dominant (Dominant to 2,149)
0% discount, 15 years	11,193 (6,090 to 17,321)	-26.8 (-100.0 to 8.6)	1,744 (995 to 3,080)	Dominant (Dominant to 1,020)
0% discount, 30 years	49,395 (27,056 to 76,070)	-91.2 (-305.3 to 11.3)	814 (477 to 1,404)	Dominant (Dominant to 278)
5% discount, lifetime	28,304 (14,495 to 43,262)	-45.2 (-161.2 to 10.0)	931 (534 to 1,731)	Dominant (Dominant to 461)
5% discount, 10 years	3,155 (1,594 to 4,838)	-7.6 (-34.3 to 5.4)	3,183 (1,851 to 5,838)	Dominant (Dominant to 2,547)
5% discount, 15 years	6,856 (3,469 to 10,514)	-16.4 (-63.1 to 6.6)	2,016 (1,152 to 3,709)	Dominant (Dominant to 1,323)
5% discount, 30 years	19,338 (9,864 to 29,650)	-38.2 (-131.4 to 6.6)	1,083 (624 to 1,990)	Dominant (Dominant to 456)
School-Education program				
0% discount, lifetime	842,582 (677,236 to 1,014,810)	-700.3 (-3,034.3 to 502.8)	1,039 (776 to 1,387)	Dominant (Dominant to 622)
0% discount, 10 years	31,808 (25,875 to 37,937)	-44.4 (-275.7 to 80.7)	3,961 (2,976 to 5,246)	Dominant (Dominant to 2,655)
0% discount, 15 years	81,575 (66,052 to 97,490)	-152.2 (-649.7 to 97.4)	2,304 (1,715 to 3,075)	Dominant (Dominant to 1,220)
0% discount, 30 years	360,916 (291,650 to 432,536)	-594.6 (-1,988.9 to 136.0)	1,046 (782 to 1,376)	Dominant (Dominant to 622)
5% discount, lifetime	209,092 (158,903 to 264,678)	-275.2 (-1,004.5 to 118.3)	1,206 (869 to 1,655)	Dominant (Dominant to 588)
5% discount, 10 years	23,157 (17,535 to 29,252)	-26.4 (-197.5 to 68.7)	4,405 (3,134 to 5,960)	Dominant (Dominant to 3,263)
5% discount, 15 years	50,327 (38,207 to 63,678)	-84.4 (-379.8 to 77.1)	2,723 (1,946 to 3,743)	Dominant (Dominant to 1,655)
5% discount, 30 years	142,197 (108,397 to 180,384)	-234.6 (-824.9 to 85.1)	1,413 (1,020 to 1,945)	Dominant (Dominant to 630)
Switch to salt substitute				
0% discount, lifetime	892,100 (745,899 to 1,046,941)	-1,213.1 (-3,643.5 to 1.5)	469 (357 to 600)	Dominant (Dominant to 2)
0% discount, 10 years	33,578 (28,432 to 38,951)	-117.0 (-366.6 to 8.4)	1,753 (1,367 to 2,229)	Dominant (Dominant to 272)
0% discount, 15 years	86,109 (72,840 to 100,093)	-263.0 (-766.9 to -7.7)	1,027 (795 to 1,293)	Dominant (Dominant to Dominant)
0% discount, 30 years	381,300 (321,098 to 443,334)	-828.5 (-2,304.4 to -82.1)	467 (361 to 590)	Dominant (Dominant to Dominant)
5% discount, lifetime	219,524 (168,453 to 271,686)	-433.1 (-1,270.7 to -22.1)	541 (394 to 730)	Dominant (Dominant to Dominant)
5% discount, 10 years	24,310 (18,706 to 30,262)	-85.5 (-278.0 to 12.0)	1,980 (1,445 to 2,686)	Dominant (Dominant to 494)
5% discount, 15 years	52,836 (40,617 to 65,666)	-166.3 (-499.6 to 1.2)	1,227 (891 to 1,662)	Dominant (Dominant to 23)
5% discount, 30 years	149,299 (114,647 to 184,900)	-360.7 (-1,039.7 to -22.8)	637 (467 to 855)	Dominant (Dominant to Dominant)

HALY = Health-adjusted life years, shorter time horizons, ICER = Incremental cost-effectiveness ratio, #Only intervention costs were considered, *In addition to intervention costs, cost offsets and cost from unrelated diseases in future were taken into account (that is, net costs).

Table 8: Lifetime HALYs, net costs and cost-effectiveness under different intervention effects, sodium reductions and sodium-BP relationships

Scenarios	**HALY** Mean (95% CI)	**Net costs (US$ million)** Mean (95% CI)	**ICER (cost in US$/HALY)** Mean (95% CI)	**ICER* (cost in US$/HALY)** Mean (95% CI)
Mass media campaign				
Full effect over first 20 years, 50% thereafter, 3% discount rate	24,886 (13,559 to 38,216)	-24.6 (-141.0 to 24.0)	1,600 (913 to 2,903)	Dominant (Dominant to 1,472)
Full effect first 20 years, zero effect after, 3% discount	21,585 (11,663 to 33,038)	-16.6 (-111.2 to 26.2)	1,834 (1,048 to 3,193)	Dominant (Dominant to 1,612)
Sodium-SBP relationship for all ethnicities#, 3% discount	18,544 (10,241 to 28,064)	-8.9 (-80.2 to 27.4)	2,122 (1,244 to 3,565)	Dominant (Dominant to 2,106)
School-Education program				
Full effect over first 20 years, 50% thereafter, 3% discount rate	183,792 (137,049 to 233,171)	-91.1 (-846.8 to 279.0)	2,049 (1,460 to 2,863)	Dominant (Dominant to 1,599)
Full effect first 20 years, zero effect after, 3% discount	157,684 (117,957 to 198,134)	-24.4 (-616.4 to 282.2)	2,366 (1,700 to 3,255)	Dominant (Dominant to 1,977)
Sodium-SBP relationship for all ethnicities#	138,741 (103,823 to 178,988)	22.5 (-457.4 to 305.7)	2,716 (1,888 to 3,790)	216 (Dominant to 2,480)
Switch to salt substitute				
Full effect over first 20 years, 50% thereafter, 3% discount rate	206,311 (158,712 to 264,329)	-277.0 (-983.1 to 58.5)	865 (615 to 1,174)	Dominant (Dominant to 314)
Full effect first 20 years, zero effect after, 3% discount	167,000 (126,831 to 212,745)	-192.9 (-721.2 to 85.4)	1,063 (759 to 1,461)	Dominant (Dominant to 558)
Sodium reduction in alternate meta-analysis [20]	353,348 (138,887 to 576,033)	-606.1 (-1,985.7 to 38.1)	562 (288 to 1,281)	Dominant (Dominant to 174)
Sodium-SBP relationship for all ethnicities#	146,597 (110,502 to 186,237)	-197.3 (-766.9 to 81.5)	1,210 (868 to 1,656)	Dominant (Dominant to 589)

HALY = Health-adjusted life years, ICER = Incremental cost-effectiveness ratio, #Only intervention costs were considered, *In addition to intervention costs, cost offsets and cost from unrelated diseases in future were taken into account (that is, net costs). #Sodium-SBP relationship reported for all ethnicities as opposed to only black ethnic populations (used in base case analysis) [1]

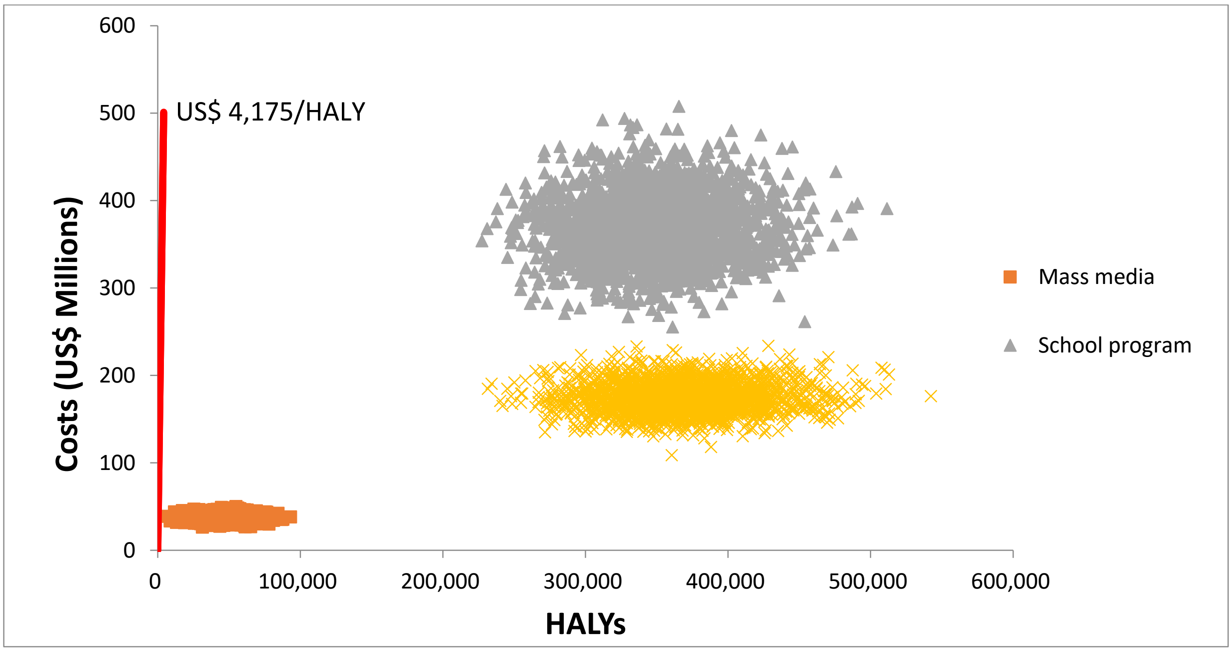

Figure 3: Cost-effectiveness plane showing salt reduction interventions compared to 'do-nothing' scenario over the lifetime (ICERs estimated using only intervention costs)

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