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Cost-effectiveness of investing in the Sexual, Reproductive, Maternal, Newborn and Adolescent Health workforce in Tunisia.

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CONTENTS

Executive Summary

The aim of this report is to model the cost-effectiveness of human resources for health (HRH) policies aimed at increasing the effective coverage of essential reproductive, maternal, newborn and adolescent health (SRMNAH) interventions in Tunisia. The objectives are 1) to estimate the baseline (2015) levels of effective coverage of essential SRMNAH interventions in Tunisia, 2) to estimate the incremental cost and incremental effectiveness associated with a number of HRH policy options chosen by the Direction des Soins de Sante de Base (DSSB) at the Ministry of Health for the period 2015-2033, and 3) to estimate the incremental cost-effectiveness of these HRH policies with a view to prioritising these options from highest to lowest cost-effectiveness.

The set of HRH policies chosen by the DSSB for this cost-effectiveness analysis are :

1/ Policy Option 1 (TRAINING OPTION): Training all midwives in 1) obstetric emergencies and 2) perinatal care, aiming to increase their productivity and reduce their attrition from the MoH workforce;

2/ Policy Option 2 (INCENTIVES OPTION). Doubling (from 5 dinars to 10 dinars) the performance-based incentives per delivery which are currently being paid to midwives, aiming to increase their productivity and reduce their attrition from the MoH workforce;

3/ Policy Option 3 (LEGAL OPTION). Making it obligatory for general practitioners, obstetricians/ gynaecologists and paediatricians/ neonatologists to stay in their posts for 5 years after finishing their medical training, aiming to reduce their attrition from the MoH workforce;

4/ Policy Option 4 (ENTRY OPTION). Increasing the annual recruitment of midwives, general practitioners, obstetricians/gynaecologists and paediatricians/neonatologists, aiming to increase the effective coverage of SRMNAH interventions;

5/ Policy Option 5 (SALARIES OPTION). Increasing the salaries of midwives, general practitioners, obstetricians/gynaecologists and paediatricians/neonatologists, aiming to increase their productivity and reduce their attrition from the MoH workforce.

The methodology used in this report is cost-effectiveness analysis (CEA). CEA is used to compare the change in costs (incremental costs) and the change in effectiveness (incremental effectiveness, or improved health for the population) derived from the implementation of the HRH policies mentioned above with the status quo, or current policy setting. For each policy the estimation of the incremental cost-effectiveness ratio provides an indication of whether each of these policies is value for money. In order to perform this cost-effectiveness analysis, several steps are required. First, estimating the baseline (2015) level of delivery and effective coverage of the essential SRMNAH interventions. Second, estimating the change in the level of delivery, the costs and the effectiveness (in terms of life years gained) under the status quo and under the HRH policies for the period 2015-2033. Third, estimating the incremental cost-effectiveness ratio (ICER) of each of these policies and comparing this ICER with the willingness to pay threshold per life-year gained for Tunisia. In order to undertake this cost-effectiveness analysis, we used two mathematical models/ software tools: 1) The Effective Coverage Model (ECOMOD), a HRH modelling tool, and the Lives Saved Tool (LiST), an epidemiological model.

The results of this cost-effectiveness analysis show that:

1/ The clinical staff from the MoH needed to provide the essential SRMNAH interventions in 2018 was 4323, decreasing slightly over time to 4173 in 2033 due to the predicted demographic evolution in Tunisia;

2/ The clinical staff from the MoH available to provide the essential SRMNAH interventions in 2018 was 2292 (effective coverage = 53%), decreasing to 1435 in 2033 (effective coverage = 34%) due to insufficient projected entry of midwives, general practitioners, obstetricians/gynaecologists and paediatricians/ neonatologists into the MoH workforce in this period of time;

3/ The implementation of the five HRH options mentioned above would increase the availability of clinical staff to a maximum level of 1836 (effective coverage = 44%) in 2033. This maximum increase in effective coverage of the essential SRMNAH interventions would occur under Policy Option 5 (SALARIES OPTION);

4/ In terms of an increase in costs, the cheapest option would be Policy Option 1 (TRAINING OPTION), with an incremental cost of 56,077,314 TND. The most expensive option would be Policy Option 4 (ENTRY OPTION), with an incremental cost of 1,652,883,866 TND;

5/ In terms of an increase in effectiveness, the most effective option would be Policy Option 2 (INCENTIVES OPTION), with an incremental effectiveness of 14,526 life-years gained;

6/ In terms of cost-effectiveness, the most cost-effective option would be Policy Option 3 (LEGAL OPTION), with an incremental cost-effectiveness ratio (ICER) of 2,677 US$ per life-year gained. Of the HRH policy options that were modelled, this is the HRH policy option that has the highest value for money.

This is to our knowledge the first time that a rigorous cost-effectiveness analysis has been undertaking of alternative HRH policy policy options in Tunisia. The main **recommendation** of this report is to undertake a cost-effectiveness analysis of alternative approaches to implementing the new package of essential SRMNAH interventions which will take place shortly in Tunisia while at the same time addressing some study limitations (e.g. the lack of consideration for teamwork in the allocation of staff to tasks in the ECOMOD mathematical model, the translation of effective coverage into clinical effectiveness in the LiST mathematical model, the quality of some of the data available).

1. Aim and objectives

The aim of this report is to model the cost-effectiveness of human resources for health (HRH) policies aimed at increasing the effective coverage of essential sexual reproductive, maternal, newborn and adolescent health (SRMNAH) interventions, with an emphasis on midwifery-led HRH policies, in Tunisia. Specifically:

1/ To estimate the baseline (2015) levels of effective coverage of SRMNAH interventions in Tunisia.

2/ To estimate the incremental cost and incremental effectiveness associated with implementing a set of HRH policy options (with an emphasis on midwifery-led options) aimed at increasing the effective coverage of essential SRMNAH interventions in Tunisia for the period 2015-2033.

3/ To estimate the incremental cost-effectiveness of these HRH policies compared to the current status quo, and to suggest a possible prioritisation of these HRH policy options.

2. Methodology

2.1. Overview

Cost-effectiveness analysis (CEA) is a methodology within health economics which aims to determine whether implementing a specific health intervention is value for money (cost-effective) or not. In CEA, a health intervention (or often a set of health interventions) can be compared with the status quo in terms of both its long-term costs and its long-term effectiveness (that is, it's impact on the population's health) and from this comparison an index indicator (the incremental cost-effectiveness ratio, ICER) can be calculated. Depending on the value of this ICER, the health intervention is considered value for money (cost-effective) or not. We will illustrate the concept of cost-effectiveness with a hypothetical example:

Imagine a country (Kidneystan) in which the current status quo treatment for advanced kidney disease in the Ministry of Health (MoH) is haemodialysis. The MoH is considering switching from haemodialysis to kidney transplant for a sub-group of patients. Is this switch cost-effective? To determine whether or not the switch from haemodialysis to kidney transplantation is cost-effective, the steps are:

1/ Estimate the total costs to the MoH of providing haemodialysis and kidney transplantation over the long term (say 10 years);

2/ Estimate the impact on the health of the population (typically in Quality-adjusted life years, but it is possible to also used life years) for both haemodialysis and kidney transplantation over the long term (say 10 years);

3/ Calculate the difference in total costs between kidney transplantation and haemodialysis over the long term – this is called the incremental costs of kidney transplantation;

4/ Calculate the difference in the total effectiveness (the difference in total number of life years) between kidney transplant and haemodialysis – this is called the incremental effectiveness of kidney transplantation;

5/ Divide the incremental costs of kidney transplantation by the incremental effectiveness of kidney transplantation – the result of this division is the ICER;

6/ Compare the ICER with the willingness to pay (WTP) threshold per incremental unit of effectiveness for the country at hand (in this case Kidneystan). If the ICER is larger than the WTP threshold then it is not value for money (cost-effective) for the MoH to switch from haemodialysis to kidney transplant. If the ICER is smaller than the WTP threshold then it is value for money (cost-effective) for the MoH to switch from haemodialysis to kidney transplant). To illustrate this example with numbers: suppose that the incremental cost of kidney transplant over 10 years is 5,000,000 us dollars; suppose that the incremental effectiveness in terms of quality-adjusted life years gained is 2,000 years. The ICER is then 2,500 us dollars [1] per quality-adjusted life year gained. The WTP per quality-adjusted life year gained is 3,000 in Kidneystan. Is switching from haemodialysis to kidney transplant value for money (cost-effective)? The answer is YES.

In order to model the cost-effectiveness of HRH policies aimed at increasing the effective coverage of SRMNAH interventions, we will follow the same general approach as is explained above. More specifically, the task now is to:

1/ Estimate the baseline (2015) level of delivery of a package of essential SRMNAH interventions in Tunisia. This package corresponds to the 46 essential interventions proposed by the World Health Organisation (WHO) Partnership for Maternal, Newborn and Child Health (PMNCH) as highly effective and cost-effective;

2/ Estimate the changes over time in the level of delivery of these essential interventions due to a set of HRH policies aimed at increasing the effective coverage of these 46 essential interventions. Effective coverage refers to the percentage of services of high quality which can be provided by the available workforce. For example, effective coverage is 50% if 50% of the time of clinical work required to deliver the 46 essential interventions in Tunisia can be covered with the time of health workers which is actually available;

3/ Estimate the incremental costs and the incremental effectiveness (in life-years gained) associated with the changes in the level of service delivery brought about by these different HRH policies. Importantly, the perspective of this analysis for the cost analysis is that of the Tunisian Ministry of Health (this means that only the costs to the MoH, who is actually the decision maker, will be taken into account);

4/ Estimate the incremental cost-effectiveness of each of these policies;

5/ Rank each of the policies from most to least cost-effective. This can provide an initial guide to the MoH as to which HRH policies may be prioritised when cost-effectiveness is used as a criterion in policy implementation.

[1] 5,000,000/2,000 = 2,500

Figure 1 below provides an outline of this methodology.

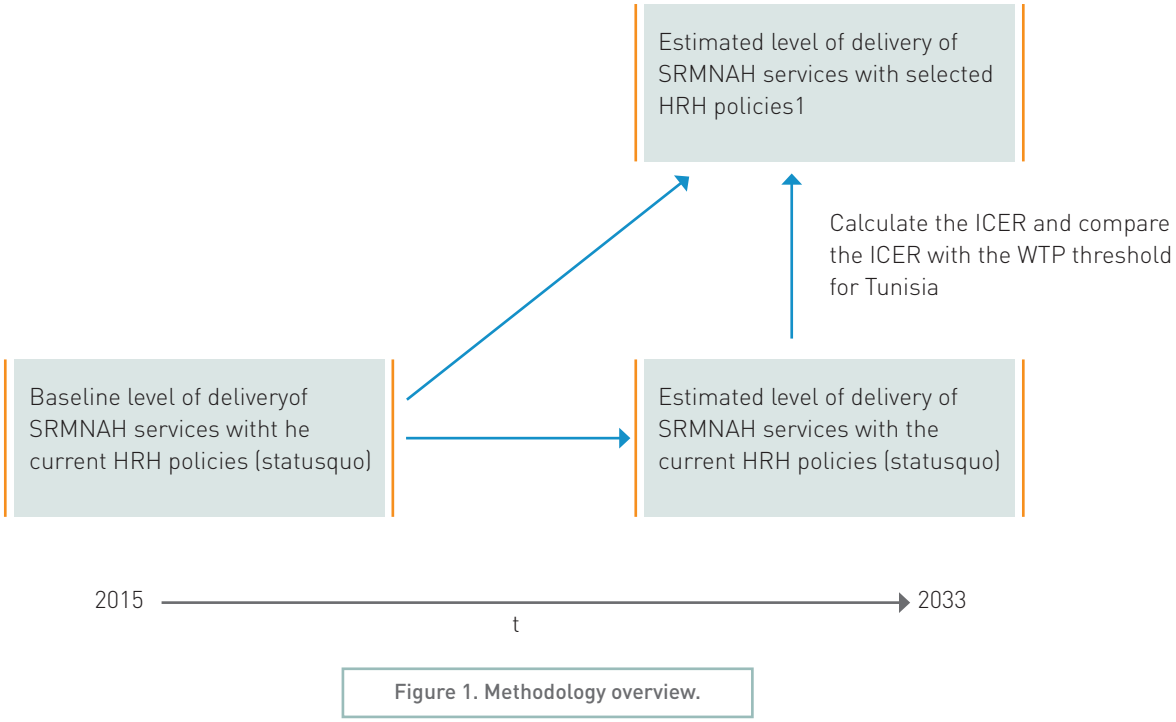


Figure 1. Methodology overview.

2.2. The model(s)

The cost-effectiveness analysis uses two different models to estimate the cost-effectiveness of different HRH policy options:

1/ The Effective Coverage Model (ECOMOD[2]), which is a mathematical model and computerised tool used to calculate the number of staff (midwives, general practitioners, obstetricians/gynaecologists, paediatricians/neonatologists) needed and the number of staff available to deliver all the essential SRMNAH services in Tunisia under the status quo and the number staff needed and available to deliver all the essential SRMNAH services in Tunisia under each of the chosen HRH policy options for each year of the projections (2015-2033). That is, a tool used to calculate over time the effective coverage of essential SRMNAH interventions under the status quo and under each of the policy options. Effective coverage here is the ratio of staff available over staff needed to deliver all the essential SRMNAH interventions. For example, if the staff needed to deliver all the essential SRMNAH services is 4,000 and the staff available to deliver these same services is 2,000 then the effective coverage is 50%. From this analysis, by calculating how much each essential SRMNAH service costs, we can then calculate the total cost of the status quo over the duration of the projections (2015-2033), the total cost of each policy option over the duration of the projections (2015-2033) and the incremental cost of each of the policy options with respect to the status quo for the duration of the projections (2015-2033);

[2] See Appendix 1 for an overview of ECOMOD. ECOMOD was developed by ICS Integrare with support from the Bill and Melinda Gates Foundation

2/ The Lives Saved Tool (LiST). LiST is a mathematical model and a computerised tool that allows to estimate the number of lives saved under each of the policy options (the incremental effectiveness) compared to the status quo. The use of LiST required estimating how an increase in effective coverage translates into an increase in clinical effectiveness. We used previous estimates from a UNFPA workforce assessment to make this translation.

Combining the incremental cost of each policy option with its incremental effectiveness in terms of lives saved using the incremental cost-effectiveness ratio (ICER) allows then for the prioritisation of the policy options from most to least desirable from the cost-effectiveness point of view.

2.3. The HRH policy options

We held two stakeholder workshops and several discussions with relevant MoH stakeholders from the DSSB in the MoH to determine what HRH policy options could be useful in order to increase over time the level of effective coverage of SRMNAH services in Tunisia. In total, five policy options were selected. They are described below.

Policy option 1 (TRAINING OPTION): Training all midwives in 1) obstetric emergencies and 2) perinatal care. The aim of this policy is to increase the productivity of midwives.

Specifically, this option proposes:

1.1. A course in obstetric emergencies (2-day session) for all midwives every five years. The course would require the use of a birth simulation laboratory. Each session would include six midwives/ two general practitioners/ two obstetricians/gynaecologists and two anaesthesiologists. That is, a total of 12 participants. The components of this course would be:

- Training 50 MoH trainers at a cost of 1200 dinars per trainee;
- Setting up 3 laboratories, one in each of the three regions (North, South, Centre). The cost of each laboratory, including the computer and the dolls is around 74,000 US$. That is about 185,000 TDN per laboratory;
- For an estimated total of 2105 midwives working for the MoH in Tunisia in 2015, it would be required to do, at six midwives a session, a total of 351 sessions. However, one session every 5 years should be enough;
- For each session there would be an additional cost of 60 TDN per participating person per day (for 12 participants and three trainers that would be a flat cost of 120 X 15 = 1800 dinars) in refreshments. For 351 sessions this is a total or 589,680 TDN;
- In each session the three trainers (one midwife, one obstetrician/gynaecologist, one paediatrician/ neonatologist) would be paid their salary and an incentive of 100 TDN. That is 35,100 TDN in total every 5 years.

1.2. A course in standard perinatal care. This course does not require a birth simulation laboratory nor training of trainers. The components of this course, which would be run annually, would be:

- Assuming 20 midwives per course, a total of 106 sessions with 3 trainers each (see below). At 120 TND in food and other expenditures for each midwife, this would be a total of 2760 dinars per session or 292,560 dinars for all training sessions;
- -The participation of 3 trainers (one midwife, one obstetrician gynaecologist, one paediatrician/ neonatologist) for the two days. The trainers would each be paid, per session, their salaries and 100 TND in incentives.

How will this option be translated quantitatively into our models? First, increasing the competencies of the midwives in the model to cover all obstetric emergencies and perinatal care activities. Second, increasing the productivity of the midwives with respect to delivery and postnatal care activities by a constant annual amount of 30%. Third, decreasing the annual attrition rate by 30%.

Policy Option 2 (INCENTIVES OPTION): Doubling (from 5 dinars to 10 dinars) the performance-based incentives per delivery which are currently being paid to midwives. This policy aims to also increase the productivity of midwives. This would mean an annual incremental cost of 5 TDN per delivery. On average there are 227.000 deliveries per year and stable over time, that would imply an annual cost of 1.135,000 dinars.

How will this option be translated quantitatively into our models? Increasing the annual productivity of the midwives in all pregnancy and delivery activities by 30%, and decreasing the annual attrition of the midwives by 15%.

Policy Option 3 (LEGAL OPTION): Making it obligatory for general practitioners, obstetricians/gynaecologists and paediatricians/neonatologists to stay in their posts for 5 years after finishing their training. This policy is aimed at reducing attrition of the relevant cadres.

How will this option be translated quantitatively into our models? Assuming zero attrition for these cadres over the first five years, then returning attrition to current levels.

Policy Option 4 (ENTRY OPTION): Increasing the annual recruitment of midwives, general practitioners and obstetricians/gynaecologists. The aim of this policy is to increase the effective coverage of the essential interventions. We will model an increase in 50% of all the cadres being currently recruited annually. The annual cost of recruitment is equivalent to the annual salary of each recruited individual in each cadre.

How will this option be translated quantitatively into our models? Assuming an increase in 50% of all the cadres being recruited every year, except for GPs (where we will assume a recruitment of the current minimum recruitment for the other two physician cadres, as currently the recruitment numbers for this cadre are estimated to be 0).

Policy Option 5 (SALARIES OPTION): Increasing by 20% the salary of midwives, general practitioners, obstetricians/ gynaecologists and paediatricians/neonatologists. This policy is aimed at both reducing attrition of cadres and at increasing productivity.

How will this option be translated quantitatively into our models? Reducing the annual attrition for all cadres by 50% and increasing the annual productivity across the board by 20%.

3. Results

The results of this cost-effectiveness analysis are presented in two distinct sections. The first section involves an assessment over time of the effective coverage of the SRMNAH services in Tunisia with the current HRH policies (the status quo) and an assessment of the change in effective coverage which is due to each of the HRH policy options that were modelled (see section 2.3). Recall that by effective coverage we mean the percentage of the total number of staff needed to deliver the essential SRMNAH services which is available. The second section involves an assessment of the cost-effectiveness of each of the HRH policy options compared to the status quo.

3.1. Assessment of effective coverage over time

3.1.1. Effective coverage over time under the current HRH policies (status quo)

Figure 2 shows the estimated evolution of the staff needed, the staff available, and the effective coverage during the period of the model projections (2015-2033).

Figure 2. Effective coverage under the current HRH policies (status quo).

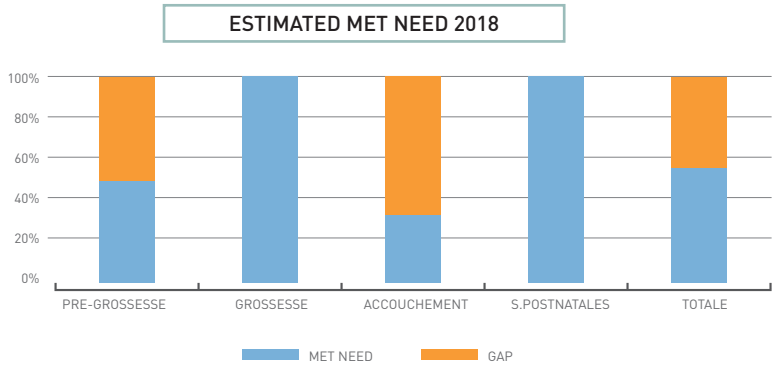
In Figure 2 above, the orange line shows the estimated evolution over time (2015-2033) of the number of staff (expressed in full-time equivalents of clinical time) needed to deliver all the essential SRMNAH services in Tunisia. Note that over time this number is slightly descending, reflecting the estimated demographic evolution in Tunisia (the population is estimated to decrease slightly between 2015 and 2033). The blue line shows the estimated evolution over time (2015-2033) of the number of staff (expressed also in full-time equivalents of clinical time) available to cover the number of staff needed to deliver all the essential SRNMAH services in Tunisia. Note how over time this number is constantly decreasing. The main reason for this is that the number of staff (midwives, general practitioners, obstetricians/ gynaecologists and paediatricians/ neonatologists) who every year enter the MoH workforce is lower than the number of staff (midwives, general practitioners, obstetricians/ gynaecologists and paediatricians/ neonatologists) who every year exit the MoH workforce due to retirement, death or voluntary attrition. Combining the evolution over time of the blue and orange lines, the gap between the lines is estimated to increase substantially. Expressed another way, the effective coverage of the essential SRMNAH interventions is predicted to decrease from 53% in 2018 to 34% in 2033. This is a reduction of 35% in the effective coverage over a period of 15 years.

Figure 3 below shows the effective coverage (also "met need") of the essential SRMNAH services by subgroup of essential services (pre-pregnancy/ pre-grossesse, pregnancy/ grossesse, delivery/ accouchement, and post-partum/ s. postnatales) for two years of the model projections: 2018 and 2033.

Figure 3. Effective coverage of essential SRMNAH services by subgroup of essential services: 2018 and 2033

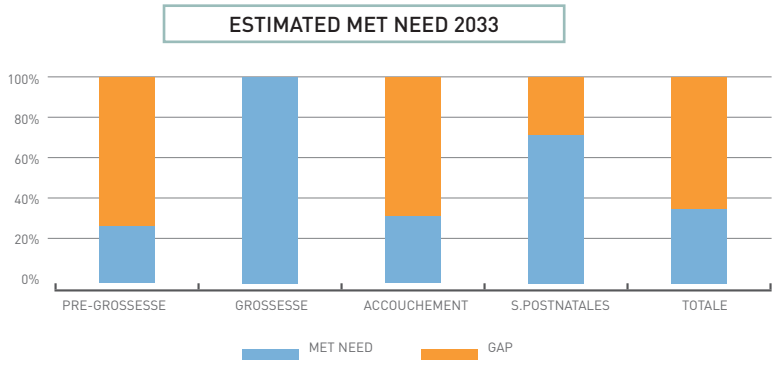
ETPs 2018

	PRE-GROSSESSE	GROSSESSE	ACCOUCHEMENT	S.POSTNATALES	TOTALE
MET NEED	1,381	408	282	221	2,292
GAP	1,410	0	621	-	2,031
NEEDED	2,790	408	903	221	4,323
% COVERAGE	49.5%	100.0%	31.3%	100.0%	53.0%



ETPs 2033

	PRE-GROSSESSE	GROSSESSE	ACCOUCHEMENT	S.POSTNATALES	TOTALE
MET NEED	725	350	219	141	1,435
GAP	2,146	-	549	48	2,744
NEEDED	2,871	350	768	189	4,178
% COVERAGE	25.2%	100.0%	28.5%	74.6%	34.3%



From Figure 3 above, the model estimates that for 2018 the total effective coverage (or met need) is 53% while in 2033 the total effective coverage descends to 34.3%. Considering the way the model allocates each of the staff cadres to each of the essential services (see Appendix 1) in 2018 the effective coverage of the essential pre-pregnancy (pre-grossesse) services is 25% and it remains at 25% in 2033. For the essential pregnancy (grossesse) services the effective coverage is 100% in both 2018 and 2033. For the essential delivery (accouchement) services the effective coverage descends from 31.3% to 28.5% between 2018 and 2033. For the essential (postpartum) services effective coverage descends from 100% to 74.6%.

Overall, the projections of effective coverage without a HRH policy change aimed at increasing the availability of staff to provide essential SRMNAH services are poor.

3.1.2. Effective coverage over time under the HRH policies

Figure 4 below shows the model estimates for the change in effective coverage of the essential SRMNAH services under each of the five policy options modelled in this exercise.

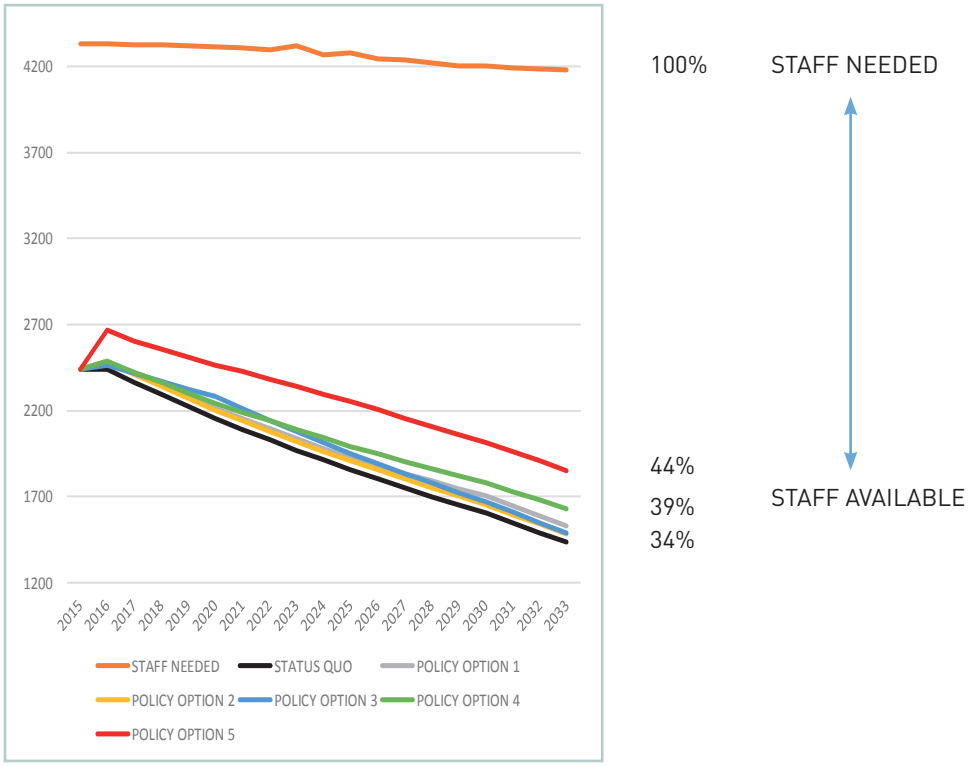


Figure 4 above shows the model projections of availability of staff to provide the essential SRMNAH services needed between 2015 and 2033 under the status quo (the black line), policy option 1 (training courses for midwives, the light gray line), policy option 2 (doubling the incentives for each delivery, the yellow line), policy option 3 (the legal obligation for clinicians to stay in their posts for 5 years after they finish their training, the light blue line), policy option 4 (increasing the entry of all cadres, the green line), and policy option 5 (increasing the salaries of all staff, the red line). From Figure 4, the effective coverage of essential SRMNAH services increases with all the policy options to a maximum of 44% when policy option 5 is implemented. In other words, policy option 5 (increasing 20% the salaries of all the cadres, which increases their productivity) is the policy option which has a greatest predicted impact on effective coverage. The next policy option with the biggest predicted impact on effective coverage (39%) is policy option 4 (increasing annually by 50% the current entries into the MoH workforce of each of the cadres), followed by policy option 1 (the training courses for midwives).

These results need to be considered with some care. As will be discussed more at length in the limitations section of this report, there are two considerations that may affect the estimations of effective coverage. First, the mathematical algorithm which allocates staff cadres to the essential SRMNAH services in the computer tool ECOMOD makes the crucial assumption that this allocation is sequential, not based on team work. Second, certain data parameters in the model (demographic, epidemiological, and workforce parameters) are subject to uncertainty.

3.2. Assessment of cost-effectiveness of the policy options

This section presents the cost-effectiveness results associated with the implementation by the MoH of the five HRH policy options chosen by the DSSB. Table 1 below shows the total costs and the total life-years accrued by the status quo and each of the five policy options. Recall that the perspective of this cost-effectiveness analysis is that of the MoH. This means that any costs falling outside the MoH are not included in the cost calculations.

Table 1. Total costs and total effectiveness (life-years accrued) of status quo and all policy options (2015-2033). Costs are expressed in TND

	TOTAL COSTS	TOTAL LIFE-YEARS ACCRUED
0. STATUS QUO	6,484,211,290	4,954,096
2. INCENTIVES OPTION	6,540,288,604	4,955,753
1. TRAINING OPTION	6,548,918,109	4,964,028
3. LEGAL OPTION	6,560,967,364	4,960,176
5. SALARIES OPTION	6,788,816,269	4,968,621
4. ENTRY OPTION	8,137,095,156	4,961,155

From Table 1, the total cost of the options moves in a bracket between 6,484,211,290 TND (status quo) to 8,137,095,156 TND (policy option 4, increasing the employment of all cadres by the MoH by 50% each year).

The maximum increase in costs between the status quo and the most expensive policy option (policy option 4) is 1,652,883,866 TND or 25.5%. In terms of life-years accrued due to the life saving potential of each policy, this indicator moves in a bracket between 4,954,096 life years (status quo) and 4,968,621 life years (policy option 5, increasing the salaries of all cadres by 20%). The maximum increase in life-years is between the status quo and policy option 5 and it is 14,525 (0.2%). The main reason for the low impact of the policies is the low estimates of the parameters that translate effective coverage into clinical effectiveness. These come from a statistical study in a previous UNFPA workforce assessment and are likely underestimates.

Table 2 below ranks each of the five policy options from lowest to highest incremental cost.

Table 2. Ranking of policy options by increasing incremental costs of all policy options (2015-2033). Costs are expressed in TND, ICER in US$ per life year gained

	INCREMENTAL COSTS	INCREMENTAL EFFECTIVENESS	ICER	RANKING
1. TRAINING OPTION	56,077,314	1,657	13,907	1
3. LEGAL OPTION	64,706,819	9,932	2,677	2
5. SALARIES OPTION	76,756,074	6,080	5,187	3
2. INCENTIVES OPTION	304,604,979	14,526	8,616	4
4. ENTRY OPTION	1,652,883,866	7,059	96,205	5

From Table 2, the cheapest policy option to implement is policy option 1 (the midwives training option) at an incremental cost of 56,077,314 TND compared with the status quo. The most expensive option is policy option 4 (the employment and hence entry into the MoH workforce of 50% more individuals from each cadre each year) at an incremental cost of 1,652,883,866 TND.

Table 3 below ranks each of the five policy options from the highest to the lowest in terms of the incremental effectiveness.

Table 3. Ranking of policy options by decreasing incremental effectiveness of all policy options (2015-2033). Costs are expressed in TND, ICER in US$ per life year gained

	INCREMENTAL COSTS	INCREMENTAL EFFECTIVENESS	ICER	RANKING
2. INCENTIVES OPTION	304,604,979	14,526	8,616	1
3. LEGAL OPTION	64,706,819	9,932	2,677	2
4. ENTRY OPTION	1,652,883,866	7,059	96,205	3
5. SALARIES OPTION	76,756,074	6,080	5,187	4
1. TRAINING OPTION	56,077,314	1,657	13,907	5

From Table 3, the policy option that improves effectiveness by most life-years due to its impact on the survival of the population of mothers, neonates and stillbirths is policy option 2 (doubling the incentives per delivery from 5 to 10 TND), which accrues 14,526 life-years more than the status quo. The policy option which improves effectiveness by the least life-years is policy option 1 (the midwives training option) which accrues an additional 1,657 life-years compared to the status quo.

While Tables 1-3 provide useful information, the appropriate test in terms of assessing the cost-effectiveness of the five policy interventions is the estimated incremental cost-effectiveness ratio. Recall from the Methodology section that the ICER shows what is the incremental cost per quality of life-year gained, in this case the incremental cost per life-year gained. When the ICER is below the willingness to pay (WTP) per quality of life year gained threshold then the policy option is value for money (cost-effective), when it is above the WTP threshold the policy option is not cost-effective. A recent estimate at the University of York of the maximum WTP threshold for Tunisia is 2,592 US$. Table 4 shows the ranking of the options in terms of the ICER.

Table 4. Ranking of policy options by increasing incremental cost-effectiveness ratio of all policy options (2015-2033). Costs are expressed in TND, ICER in US$ per life year gained

	INCREMENTAL COSTS	INCREMENTAL EFFECTIVENESS	ICER	RANKING
3. LEGAL OPTION	64,706,819	9,932	2,677	1
5. SALARIES OPTION	76,756,074	6,080	5,187	2
2. INCENTIVES OPTION	304,604,979	14,526	8,616	3
1. TRAINING OPTION	56,077,314	1,657	13,907	4
4. ENTRY OPTION	1,652,883,866	7,059	96,205	5

From Table 4, the most cost-effective option is policy option 3 (legally restricting clinicians from leaving their posts for 5 years after training) with an ICER of 2,677 US$ per life-year gained, followed by policy option 5 (increasing the salaries of all the cadres by 20%) with an ICER of 5,187 US$ per life-year gained. The least cost-effective option is policy option 4 (allowing entry into the MoH workforce, i.e. employing 50% more of each cadre every year) with an ICER of 96,205 US$ per life-year gained.

The ranking above is an initial estimate of how the MoH could prioritise the five policy options in terms of their value for money. Notice how the only policy option which could be considered cost-effective when compared with the WTP threshold is policy option 3 (legally restricting clinicians from leaving their posts for 5 years after training). Indeed, the ICER for this option is 2,677 US$ per life-year gained, a little above the WTP threshold of 2,592 US$. Based on the results from the University of York, the remaining options would be too expensive for the resources available currently at the MoH.

4. Discussion, limitations and recommendations

To our knowledge, this is the first time that a rigorous attempt has been made at estimating the trend over time of the effective coverage of the essential SRMNAH services in Tunisia under the current HRH policies (status quo) and under alternative HRH policies proposed by the MoH to increase effective coverage of these essential SRMNAH services. To our knowledge it is also the first time that a rigorous attempt has been made at estimating the cost, effectiveness and cost-effectiveness of delivering the essential SRMNAH services in Tunisia under the current HRH policies (status quo) and under alternative HRH policies proposed by the MoH to increase effective coverage of these essential SRMNAH services.

The first point for discussion is that this report has shown, based on the demographic, epidemiological and human resources data available, that between 2015-2033 the effective coverage of the essential SRMNAH services by the MoH is going to be substantially reduced. The main reason of course is that over time the replacement rate of SRMNAH cadres is too low to compensate the exits due to either retirement, death or voluntary attrition. If the MoH does not take action to revert this trend the health of mothers and new-borns is going to suffer.

The second point for discussion is that the HRH policies which were modelled in this exercise (which included: training courses to improve the productivity and reduce the attrition of midwives, increasing delivery-related incentives also to increase the productivity and reduce the attrition of midwives, imposing a legal obligation for clinicians to stay in their posts for 5 years after they have finished their training to reduce their attrition, substantially increasing the entry of all SRMNAH cadres into the MoH by employing more, and increasing the salaries of all SRMNAH cadres to increase their productivity) are all interesting options for the MoH in Tunisia to increase the effective coverage of SRMNAH services but they need to be assessed carefully because they may vary substantially in terms of their cost-effectiveness. For example, policies which artificially limit attrition (such as the legal obligation for all clinicians to remain in their post for 5 years after they have finished their training) have a higher potential for cost-effectiveness than policies aimed at substantially increasing the hiring of new staff cadres. Considering the very strong resource constraints currently being faced by the MoH in Tunisia, prioritising cost-effective policies for the improvement of service delivery is of great importance. In our view, this report is the first step in generating evidence that may guide the MoH in their HRH policy decision-making process to be able to design and implement, in the future, highly cost-effective policies to improve the delivery of essential SRMNAH services in Tunisia. This point is of particular importance at the moment because the MoH is currently embarking in the implementation of a new package of essential SRMNAH services in the whole country. In our opinion, it is of great relevance to assess in the coming months, as the MoH prepares to implement the package, the cost-effectiveness of alternative modes of implementation of this very same package.

This report and the modelling exercise that substantiated it have the following **limitations**:

1/ The mathematical algorithms that allocate cadre full-time equivalents to tasks in the ECOMOD software tool need to be refined. Currently, the ECOMOD software tool assigns staff to activities based on a sequential approach (first the midwives, then the general practitioners, then the gynaecologists and obstetricians, etc). However, it is fit for purpose to re-design the algorithms so that the software tool assigns staff to activities based on a teamwork-type of approach;

2/ The parameters used in the LiST model to translate the increase in effective coverage due to the HRH policies into an increase in clinical effectiveness are based on limited evidence. These estimates need also to be refined using information directly from the Tunisia MoH stakeholders;

3/ The quality of the data available from Tunisia to populate the ECOMOD model is limited. This pertains particularly to two data elements. First, the human resources data from the MoH. Second, the HRH policies which were modelled in this exercise. In both cases, the data and assumptions used to make the projections need to be substantially refined.

We would like to make a number of **recommendations**:

1/ This report presents a rigorous methodology and a wealth of demographic, epidemiological, human resources and cost data to support evidence-based policy decision making by the MoH with respect to the delivery of essential SRMNAH services. Considering that the MoH is now in the process of beginning the implementation of a new package of essential SRMNAH services throughout the country, we recommend that the overarching methodology presented here is used to study the impact on effective coverage, cost, effectiveness and cost-effectiveness of alternative HRH policies to support the implementation of this new package of essential SRMNAH services.

2/ We recommend that, in order to provide adequate evidence to support the MoH in making evidence-based decisions during the implementation of the new package of essential SRMNAH services, a number of steps should be taken:

Step 1. Design by the MoH with support from UNFPA of a set of alternative detailed and realistic HRH policies to support the implementation of the new package of essential SRMNAH services in Tunisia;

Step 2. Detailed mapping by the MoH with support from UNFPA of the implementation plan of the the new package of essential SRMNAH services by region;

Step 3. Review and improvement of the demographic, epidemiological, clinical effectiveness and human resources data required for modelling the cost-effectiveness of HRH policies to improve the delivery of SRMNAH services. Ideally the data will now be available on a regional basis;

Step 4. Redesign of the ECOMOD software tool to incorporate 1) the predicted pattern of health service provision of the new essential package of SRMNAH services in Tunisia, and 2) the regional component in the delivery of the new essential package of SRMNAH services ;

Step 5. Using ECOMOD and LiST, modelling the current and future impact of alternative detailed and realistic HRH policies to support the implementation of the new package of essential SRMNAH interventions on 1) effective coverage of SRMNAH services, 2) costs to the MoH, 3) health of the population (i.e. effectiveness), and 4) cost-effectiveness.

Appendix 1.

Overview of the Effective Coverage Model (ECOMOD)

ECOMOD is a mathematical model and an Excel-based computerised tool which was originally developed to estimate the workforce needed and the workforce available to provide the 46 essential Sexual, Reproductive, Maternal, Newborn and Adolescent Health (SRMNAH) interventions established by the WHO Partnership for Maternal, Newborn and Child Health (PMNCH) as highly effective and cost-effective in the 73 countries with the highest burden of maternal and child mortality and morbidity for the State of the World's Midwifery Report (SOWMY) 2014.

ECOMOD is a complex tool which incorporates several main components: 1) a demographic component to estimate the evolution over time of a country's population, 2) an epidemiological component to estimate the evolution over time of the needs for medical contacts in a country vis a vis the 46 essential SRMNAH interventions, and 3) a cohort simulation component to estimate the evolution over time of the number of full-time equivalents (FTE) of clinical time of SRMNAH workforce available to provide the full-time equivalents (FTE) of SRMNAH needed to deliver the 46 essential SRMNAH interventions to all those who need it.

The ECOMOD model has two complementary sides, so to speak, the workforce requirement modelling side and the workforce availability modelling side. Let's see how each side operates in turn.

1. Modelling workforce requirements in ECOMOD

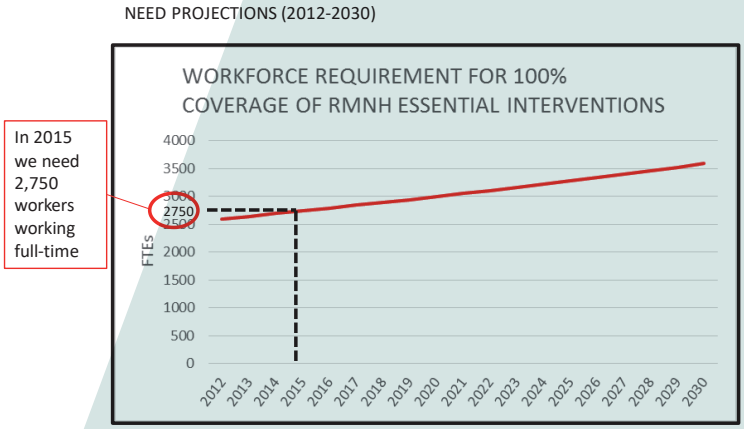
By workforce requirements modelling we mean modelling the total number of full-time equivalents (FTE) of SRMNAH workforce (typically midwives, general practitioners, gynaecologists/ obstetricians and paediatricians/ neonatologists) clinical time which are required to deliver, in any given geographical area (it can be a country, or a region, or a city) all the 46 essential SRMNAH services to all those people who need these services. For each of the essential SRMNAH services the model estimates, for each year of the projections, 1) the number of people who need these services, 2) the clinical time of a competent workforce needed to provide these services and 3) the total amount of FTEs of a competent workforce needed to provide these services. Figure 5 illustrates this with an example (in the example one FTE is taken to be 1880 hours of work).

Figure 5. Illustration of ECOMOD's workforce requirements modelling

ESSENTIAL INTERVENTIONS	Time needed from a skilled workforce to provide each essential intervention	How many women need each essential intervention in 2015?	How many hours are needed from a skilled workforce?	How many FTEs are needed from a skilled workforce to provide each essential intervention in 2015?
1.Family planning advice	20 min = 0.33 hrs	All WRA (13,000,000)	0.33 x 13,000,000 = 990,000 hrs	= 990,000 / 1880 = 527 FTE
2.Delivery of condoms	15 min = 0.25 hrs	All WRA using condoms (10,000)	0.25 x 10,000 = 250,000 hrs	= 250,000 / 1880 = 133 FTE
3.Delivery of contraceptive pills	20 min = 0.33 hrs	All WRA using contraceptive pills (15,000)	0.33 x 15,000 = 4,950 hrs	= 4950/ 1880 = 2.7 FTE
4. Delivery of injectable contraceptives	20 min = 0.33 hrs	All WRA using injectibles (3,000)	0,33 x 3,000 = 990 hrs	= 990 / 1880 = 0.53 FTE
5. Delivery of contraceptive implants	40 min = 0.66 hrs	All WRA using implants (1000)	0.66 x 1,000 = 6,600 hrs	= 6,600 / 1880 = 3.51 FTE
6. IUD insertion	35 mi = 0.71 hrs	All WRA using IUD (2000)	0.71 x 2,000 = 1,420 hrs	= 1420 / 1880 = 0.76 FTE
7. Female sterilisation	70 min = 1.2 hrs	All WRA using sterilisation (1000)	1.2 x 1,000 = 1,200 hrs	= 1200/ 1880 = 0.64 FTE
8. Prevention of HIV in women of reproductive age	14 min = 0.233 hrs	All WRA (13,000,000)	0.233 x 13,000,000 = 3,029,000 hrs	= 3,029,000/ 1880 = 1,611 FTE
9. Management of HIV in women of reproductive age	240 min = 4 hrs	All HIV+ WRA (50,000)	4 x 50,000 = 200,000 hrs	= 200,000 / 1880 = 106 FTE
ETC	ETC	ETC	ETC	ETC
TOTAL				= 2,750 FTEs

Estimating all the FTE requirements (or workforce needs) for all the SRMNAH interventions in a given year gives us, over time, an estimation of the evolution of the FTEs required to provide 100% coverage for the essential SRMNAH services (see Figure 6 below).

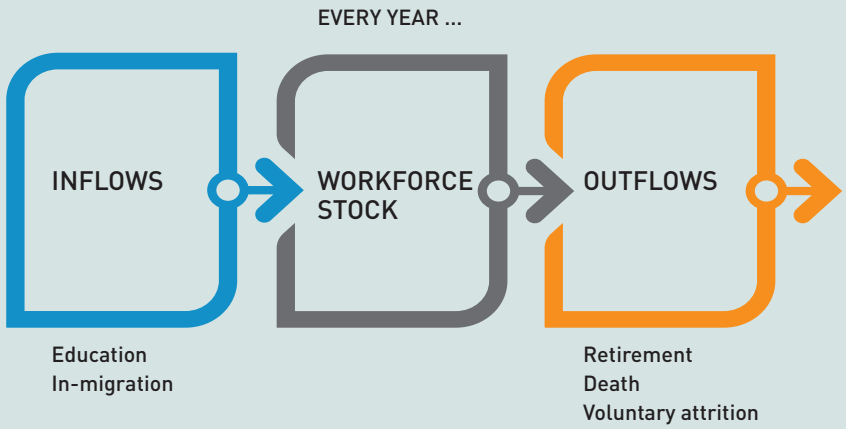
Figure 6. Representation of need for SRMNAH workforce.



2. Modelling workforce availability in ECOMOD

In order to model the actual SRMNAH workforce which is available in a specific country or region to cover the workforce needs for SRMNAH services, ECOMOD uses a rather complex cohort simulation. This cohort simulation takes as a starting point the idea that in any one year there is a stock of SRMNAH professionals but that as every year passes this stock changes in two key ways (see Figure 7).

Figure 7. Stock and flow of SRMNAH full-time equivalents

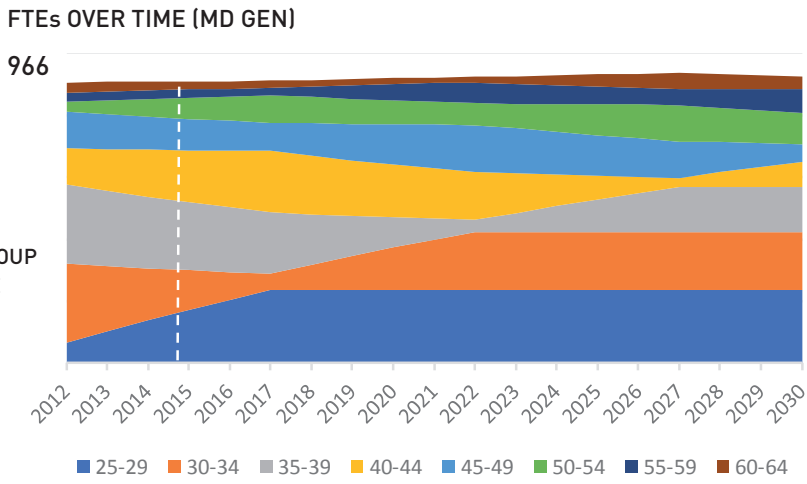


Indeed, every year, the stock of SRMNAH FTEs available (of, typically, midwives, general practitioners, gynaecologists and obstetricians, and paediatricians/ neonatologists) to provide the time needed to cover the essential SRMNAH services changes depending on 1) "entries" into the workforce due to recently graduated SRMNAH cadres which are employed by the MoH, or due to immigrant workforce of SRMNAH cadres also employed by the MoH, and on 2) exits from the SRMNAH workforce due to retirement, death, or voluntary attrition. For each SRMNAH cadre, if in a given year the entries are higher than the exits, the stock of FTEs available increases. If the entries are lower than the exits, the stock of FTE available decreases. ECOMOD's cohort simulation looks at the entire professional lifetime of each SRMNAH cadre (see Figure 8 for an example of the kind of data required to generate this cohort simulation for a sample cadre, medical doctors - generalists).

Figure 8. Simulation of a cohort of medical doctors - generalists in ECOMOD by age group: data requirements

REQUIRES:

1) INITIAL AGE DISTRIBUTION
2) AGE OF ENTRY/ RETIREMENT
3) % TIME SPENT IN CLINICAL WORK
4) ANNUAL MORTALITY RATE BY AGE GROUP
5) ANNUAL VOLUNTARY ATTRITION RATE
6) ANNUAL INVOLUNTARY ATTRITION RATE

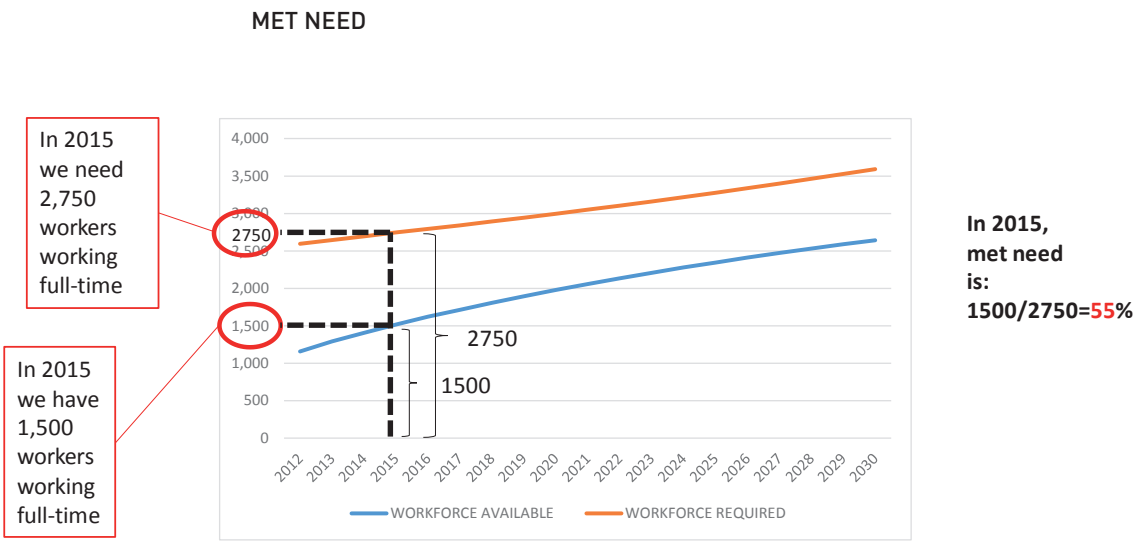


In the example from Figure 8, note how in 2015 the model estimates that there will be 966 FTEs of medical doctors – generalists to provide the essential SRMNAH services. This total number of FTEs stays stable over time, reflecting that the number of FTEs of this cadre entering the SRMNAH workforce each year are more or less the same than the number of FTEs of this cadre exiting the SRMNAH workforce each year.

Once the total number of FTEs of each cadre which are available to provide the essential SRMNAH services are calculated for each year of the projections, ECOMOD proceeds to match these FTEs to the FTEs of each of the essential SRMNAH services which are actually needed by the population. This process is called FTE allocation in ECOMOD. The way ECOMOD allocates FTEs available to FTEs required is based on two specific principles: the principle of skills-mix adjustment and the principle of sequential allocation. According to the principle of skills-mix adjustment, for any SRMNAH cadre an FTE will be allocated to a specific SRMNAH service only if the cadre is competent (i.e. has the skills-mix) to provide that specific SRMNAH service. According to the principle of sequential allocation, the FTEs of each SRMNAH cadre which are available in any particular year are allocated to the FTEs needed in that year in a sequential fashion, i.e. the midwives first, the general practitioners second, the gynaecologists and obstetricians third, etc. This is to say, the allocation of SRMNAH resources to each essential SRMNAH service is not viewed as a team work in which each cadre takes up a percentage of the total tasks, but rather as each cadre exhausting its time in a particular task before the next cadre is allocated.

At any rate, the main output of the ECOMOD model projections is the estimation of effective coverage or met need for the essential SRMNAH services. Effective coverage or met need is the % of all FTEs required to provide the essential SRMNAH services in a particular country or region which is actually available. Figure 9 illustrates the concept of effective coverage.

Figure 9. Effective coverage (met need) for the essential SRMNAH services in a hypothetical country or region.



An important aspect of ECOMOD is that it is a very flexible tool which can be modified in many different ways to provide estimations not only of effective coverage but also of costs, effectiveness (in combination with the LiST tool) and cost-effectiveness. In addition, it may be used not only for the estimation of workforce need and availability for SRMNAH services but for a whole host of other public health services.

Appendix 2.

Key data

Table A2.1. Essential SRMNAH interventions and relevant staff competencies

	MIDWIFE	GENERAL PRACTITIONNER	OBSTETRICIAN/ GYNECOLOGIST
1: PRE-PREGNANCY			
FP counselling	Y	Y	Y
Delivering contraceptive methods (condoms, pills, vaginal barrier)	Y	Y	Y
Delivering contraceptive methods (pills, injectables)	Y	Y	Y
Delivering contraception (implant)	-	Y	Y
Delivering contraceptives (IUD)	Y	Y	Y
Deliveringcontraception (sterilization)	-	-	Y
Prevention and management of STIs and HIV in all WRA - Prevention of STIs	Y	Y	Y
Prevention and management of STIs and HIV in all WRA - Prevention of HIV	Y	Y	Y
SYPHILIS (managament of all WRA)	Y	Y	Y
GONORRHEA (managament of all WRA)	Y	Y	Y
CHLAMYDIA (managament of all WRA)	Y	Y	Y
TRICHOMONIASIS (managament of all WRA)	Y	Y	Y
Prevention and management of STIs and HIV in all WRA - Management of HIV	Y	Y	Y
Enrichment / Supplementation with folic acid	Y	Y	Y

	MIDWIFE	GENERAL PRACTITIONNER	OBSTETRICIAN/ GYNECOLOGIST
2: ANTENATAL CARE			
Supplementation with iron and folic acid	Y	Y	Y
Tetanus vaccination	Y	Y	Y
Prevention and management of malaria with mosquito nets and antimalarial - Prevention	N/A	N/A	N/A
Prevention and management of malaria with mosquito nets and antimalarial - Management	N/A	N/A	N/A
Prevention and management of STIs and HIV in all WRA (as part of antenatal care) - HIV Prevention	Y	Y	Y
Prevention and management of STIs and HIV in all WRA (as part of antenatal care) - HIV Screening	Y	Y	Y
GONORRHEA (management)	Y	Y	Y
CHLAMYDIA (management)	Y	Y	Y
TRICHOMONIASIS (management)	Y	y	y
Prevention and management of STI and HIV (management of HIV)	Y	Y	Y
Calcium supplementation to prevent hypertension	Y	Y	Y
Smoking cessation intervention	Y	Y	Y
Screening and treatment of syphilis - screening	Y	Y	Y

Table A2.1 (cont). Essential SRMNAH interventions and relevant staff competencies

	MIDWIFE	GENERAL PRACTITIONNER	OBSTETRICIAN/ GYNECOLOGIST
2: ANTENATAL CARE			
Screening and treatment of syphilis - Treatment	Y	Y	Y
Antihypertensives to treat high blood pressure (including low dose aspirin to prevent pre-eclampsia)	-	Y	Y
Magnesium sulphate for eclampsia (midwife)	Y	Y	Y
Magnesium sulphate for eclampsia (obs/gyneco)		Y	Y
Antibiotics for premature rupture of membranes before term	Y	Y	Y
Corticosteroids to prevent respiratory distress (midwife)	-	Y	Y
Corticosteroids to prevent respiratory distress (physician)	-	Y	Y
Safe abortion	-	-	Y
Postabortion Care (midwife)	y	-	-
Postabortion Care (obs/Gyn)	-	-	y
Reduce the abnormal presentation at delivery with external cephalic version	-	-	y
Manage the premature rupture of membranes at term	y	y	y

3: DELIVERY	MIDWIFE	GENERAL PRACTITIONNER	OBSTETRICIAN/ GYNECOLOGIST
Management of labor and childbirth without problems and social support during childbirth (midwife)	Y	-	-
Management of labor and childbirth without problems and social support during childbirth (obs / gyn)	-	y	y
Active management of the 3rd stage of labor (placental extraction) to prevent postpartum haemorrhage (including uterine massage, uterotonic and cord traction)	Y	Y	Y
HIV screening and management during childbirth - screening in the absence of previous testing	Y	-	Y
HIV testing and management during childbirth - management	-	-	Y
Cesarean maternal / fetal indication (with antibiotic prophylaxis- midwife)	-	--	Y
Caesarean maternal / fetal indication (with antibiotic prophylaxis-auxiliary-obs / gyn)	-	-	y
Management of prolonged pregnancy - auxiliere or midwife	Y	-	-
Management of prolonged pregnancy - obs/gyn	-	-	y
Management of postpartum haemorrhage (placental extraction and / or surgical and / or oxytocic surgery -sage femme	Y	-	-
Management of postpartum haemorrhage (placental extraction and / or surgical and / or oxytocic surgical - obs/gyn	-	y	y

Table A2.1 (cont). Essential SRMNAH interventions and relevant staff competencies

	MIDWIFE	GENERAL PRACTITIONNER	OBST/GYN	PEDIATRICIAN
4: POSTNATAL CARE				
Preventive postnatal care	Y	Y	Y	
Detection and treatment of postpartum septicemia	Y	y	y	
Neonatal resuscitation with balloon and mask	Y	Y	Y	Y
Maternal care according to the kangaroo method	Y	y	y	
Additional support for feeding small and premature newborns	Y	y	y	
Management of newborns with jaundice	Y	y	y	Y
Initiation of prophylactic ART for HIV-exposed newborns	-		Y	y
presumptive treatment with antibiotics of newborns at risk of bacterial infection	-	y	y	y
Surfactant to prevent respiratory distress syndrome among prematures	-			y
Continuous positive pressure ventilation for the management of newborns with respiratory distress syndrome	-	-	-	y

Table A2.2 below shows estimates of the main demographic data used in the model along with the sources of data (2014-2025). These estimates were then extended linearly for the period 2025-2033.

Table A2.2. Estimates of demographic data used in model.

Year	Population	WRA (15-49)	Pregnanat Women	Delivery	Newborn
2014	11007326	3004091	266033	228298	225887
2015	11151874	2998015	265495	228144	225733
2016	11295786	3018557	262287	227733	225322
2017	114385573	3020897	259078	227076	224665
2018	11579489	3023145	255870	226184	223773
2019	11717634	3025854	252661	225048	222637
2020	11852031	3029358	249453	223644	221233
2021	11981822	3033742	244780	221933	219522
2022	12106152	3038865	240106	219871	217460
2023	12224364	3044459	235433	217433	215022
2024	12336026	3082261	230760	214630	212219
2025	12440878	3050317	226087	211556	209145

Source: Recensement Général de la Population et de l'Habitat 2014, Principaux indicateurs. Avril 2015

United Nations population database, medium fertility, 2012 revision

Source: Institut National de la Statistique, 2015. Estimations

Source: Institut National de la Statistique, 2015. Les projections de la population 2014-2044, INS et UNFPA

Table A2.3 (in French) shows the default epidemiological descriptors used in the exercise.

Table A2.3. Epidemiological descriptors: Tunisia

EPIDEMIOLOGICAL DESCRIPTORS	BASELINE (2012)	CURRENT VALUE
Family planning unmet needs %	7%	
Contraceptive prevalence	63%	
prevalence of Mix method contraception: 1- condom (%) 2- pills + injectables (%) - IUD (%) - female sterilization (%)	 8% 28% 29% 6%	 14.3% 21% 11.4% 0.01%
Syphilis incidence /1000 WRA	2.1	
Gonorrhoea Incidence / 1000 WRA	8.1	
Chlamydia incidence/1000 WRA	9.8	
Trichomoniasis incidence/ 1000 WRA	64	
Number of women in needs of ARV	294	
% of population living in a malaria geographic area	0	
Number of confirmed malaria cases	0	
Number of FE HIV and in needs of ARV	84	
% of adults women smoking	11%	
Prevalence of gestationnal hypertension/1000 WRA	3.47	

EPIDEMIOLOGICAL DESCRIPTORS	BASELINE (2012)	CURRENT VALUE
Incidence of pre-eclampsia	2.8%	
Incidence of eclampsia (% pre-eclampsia)	6%	0.06%
Premature birth rate (% of deliveries)	10%	
Estimated number of unsafe abortion/1000 WRA	0.0005	
Estimated number of unsafe abortion / 1000 WRA	0.018	6%
Presentations du siege (% of deliveries)	4%	
%Pregnant women without 4 antenatal visits	15%	14.90%
HIV prevalence (adults)	0.1%	
Recommended rate of ceasarian (% of delivery)	5%	
% Interrupted pregnancies after 41 weeks	5%	
HPP incidence /1000 WRA	7.28	
Incidence of postpartum sepsis / 1000 WRA	3.25	
% of newborns need resuscitation	1%	
% of newborns with a birth weight deficit	7%	
% of new-ness with jaundice	1.85%	
Incidence of bacterial infections in newborns	20%	
Incidence of respiratory distress syndrome in newborns		

Table A2.3 (cont). Epidemiological descriptors: Tunisia

Age group	Annual maternal mortality rate by age group (2012)	Annual Maternal Mortality rate by age group (2015)
<20	0.00055	0.00151
20-24	0.00071	0.00100
25-29	0.00085	0.00097
30-34	0.00108	0.00141
35-39	0.00136	0.00174
40-44	0.00195	0.00270
45-49	0.00283	0.00389
50-54	0.00479	0.00660
55-59	0.00764	0.00964
60-64	0.01234	0.01680
65-69	0.01931	0.02535
70-74	0.03348	0.04933
75-79	0.05462	0.10461

Table A2.4 presents the stock and annual entries into the MoH of the key SRMNAH staff in Tunisia. The annual projections 2018-2033 are based on maintaining constant the entries into the MoH from the last year available.

Table A2.4. Stock at baseline and annual projected entries for each SRMNAH staff.

	Stock 2015	Entry 2016	Entry 2017	Projection entries 2018-2033
Midwives	2105	99	6	6 per year
General practitionners	3797	0	0	0 per year
Obstetricians/ gynecologists	160	20	20	20 per year
Pediatrician/ neonatologists	140	20	20	20 per year

Other human resources parameters of importance are shown in Tables A2.5.

Table A2.5. Proportion of time spent by each staff doing administrative and clinical tasks.

Professional group	% OF TOTAL WORKING TIME in doing ADMINISTRATIVE ACTIVITIES AGAINST CLINICAL ACTIVITIES (IN AVERAGE)	% OF clinic WORKING TIME TO PROVIDE ESSENTIAL INTERVENTIONS SRHMN (IN AVERAGE)
Midwives	30%	100%
General practitionner	20%	20%
Obs/gyn	15%	80%
Pediatric/neanatologist	15%	80%

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