Draft Reports on the Costs of Promoting Exclusive Breast Feeding

Report 1: The Estimated Financial Costs of the Vertical Transmission Study as Implemented Under the Current Protocol

Report 2: The Estimated Costs and Implications of Large Scale Promotion of Exclusive Breast Feeding

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Report 2

The Estimated Costs and Implications of Large Scale Promotion of Exclusive Breast Feeding

Introduction

The success of the Vertical Transmission Study (VTS) in promoting exclusive breast feeding (EBF) and the recording of large positive impacts of such a practice have raised interest regarding the feasibility and likely impact of a larger programme based on similar principles.

The study was not designed to be a large-scale intervention but rather to examine the implications of EBF for HIV transmission and the general health of the infant. The study and the experience gained from its implementation do, however, provide a wealth of information on which discussion on the appropriateness of large-scale programmes can be based. There are a range of issues that must be examined when considering the possibility of introducing a new intervention, central among which are likely costs and outcomes. This report draws on the data from the VTS and the experience of those who conducted it so as to provide input on these two central issues of costs and outcomes.

The VTS was very comprehensive in its efforts to ensure that EBF was maintained at as high a level as possible. The intervention involved a series of antenatal home visits followed by regular post-natal support in the form of more home visits in rural areas and clinic visits in the urban area covered. Mothers enrolled in the study also received preferential medical care as they had access to student nurses and, when necessary, to doctors; they were also at times assisted with transport to access these services. While not part of the intervention, research visits to households also provided a means of identifying problems, which could then be reported so that additional support could be provided. The efforts made were comprehensive and resource intensive. The high resource requirements are likely to be prohibitive and hinder any suggestion of a large-scale intervention of the same design. Experience gained during implementation,

however, suggests that a simpler version of the intervention may still maintain many of the benefits. For these reasons, this report will examine the costs and outcomes associated with running such an intervention at Provincial level under three scenarios: full, simplified and basic. The full scenario examines the costs and outcomes associated with all intervention aspects of the VTS i.e. apart from research, if they were implemented at provincial level. The simplified scenario is based on the same design and examines the same implications, but for a less intense version. The basic scenario examines the costs and outcomes of a very scaled down version of the intervention.

The scenarios are examined at the provincial level, using KwaZulu-Natal data as an example. Given the high HIV prevalence and the large population in KwaZulu-Natal, together with the fact that the study was conducted in the province, it seemed the appropriate example.

As far as possible, the scenarios are based on data, on both cost and outcome, from the study site. Where the appropriate data have not been available, assumptions have been made drawing on the experience of those involved in the implementation.

The analysis provides estimates of the total cost of implementing each scenario and an indication of what outcome in terms of EBF you might expect in return for such an investment. Collectively these two outputs provide the basis for a cost effectiveness analysis (CEA) of the three scenarios. The CEA allows for the comparison not only of the total cost but also of the cost of each month of exclusive breast feeding resulting. This is important, as the more expensive options are also likely to be the more effective and an examination of total costs alone can be misleading. That said, the results of CEA need also to be considered for what they are. CEA is a particular tool and is useful in particular circumstances and the report will highlight the appropriate use of this output.

The province and the scenarios

As mentioned in the introduction, the purpose of this report is to estimate the costs and impacts associated with implementing three possible interventions to promote exclusive breast feeding in KwaZulu-Natal. This section details the scenarios and the provincial backdrop.

KwaZulu-Natal is South Africa's largest province in terms of population, even more so in terms of births. The population of the province makes up over 20% of the countries total population (Statssa, 2006). The province is also relatively balanced between urban and rural settings with the rural population comprising a little over fifty percent of the total. These characteristics made it ideal for selection as a base for the scenarios. The large population provides a good example of scale without getting involved in national modelling, which would require consideration of provincial variations in structures. The urban/rural balance is important as the intervention differs by setting; too urban or too rural a setting would have provided an unbalanced view. Further, much of the argument in favour of EBF relates to its importance in the context of HIV. KwaZulu-Natal has the highest recorded rates of HIV among women attending antenatal clinics, so the motivation for considering such an option is obviously high.

Against the KZN backdrop the costs and outcomes of three scenarios, each based on a different intervention, will be estimated. The three scenarios are as follows.

Full scenario

This scenario essentially examines the costs and likely outcomes of implementing an intervention along the same lines as that which was implemented as part of VTS, with only some relatively small changes.

Simplified scenario

This scenario remains based on a similar model as implemented in the VTS but with less frequent pre- and post-natal visits.

Basic scenario

The basic scenario is entirely clinic-based, although it is envisaged that, as a complement, community health workers could support the intervention.

The scenarios differed according to the setting, with urban and rural areas modelled to receive different services. This was in line with what was done in the VTS where the intervention was largely home-based in rural areas, but clinic-based in urban.

A summary of the interventions modelled in each scenario is provided in the following table:

Table 2.1: Interventions by scenario and setting

	S 1 – Full		S 2 – Simplified		S 3 – Basic	
	Urban	Rural	Urban	Rural	Urban	Rural
Extended post-test counselling	30 min	30 min	30 min	30 min	30 min	30 min
Home visits						
Antenatal	0	4	1	1	0	0
Post-natal first month	0	4	1	2	0	0
Second month onward	0	1.2	0	0.6	0	0
Clinic visits						
Antenatal	4	0	2	2	1	1
Post-natal first month	4	0	1	0	1	1
Second month onward	1.2	0	0.6	0	0.5	0.5
Length of post-natal intervention	6	6	6	6	6	6

In addition to differing in the nature of the service provided, the scenarios differed in terms of the management structure deemed necessary to implement it. The VTS study, being of an academic nature, had a very closely managed intervention. This management structure is modelled in the full scenario but reduced to a more reasonable level in the simplified and basic scenarios. Details of the management structures modelled are provided in the annex to this report.

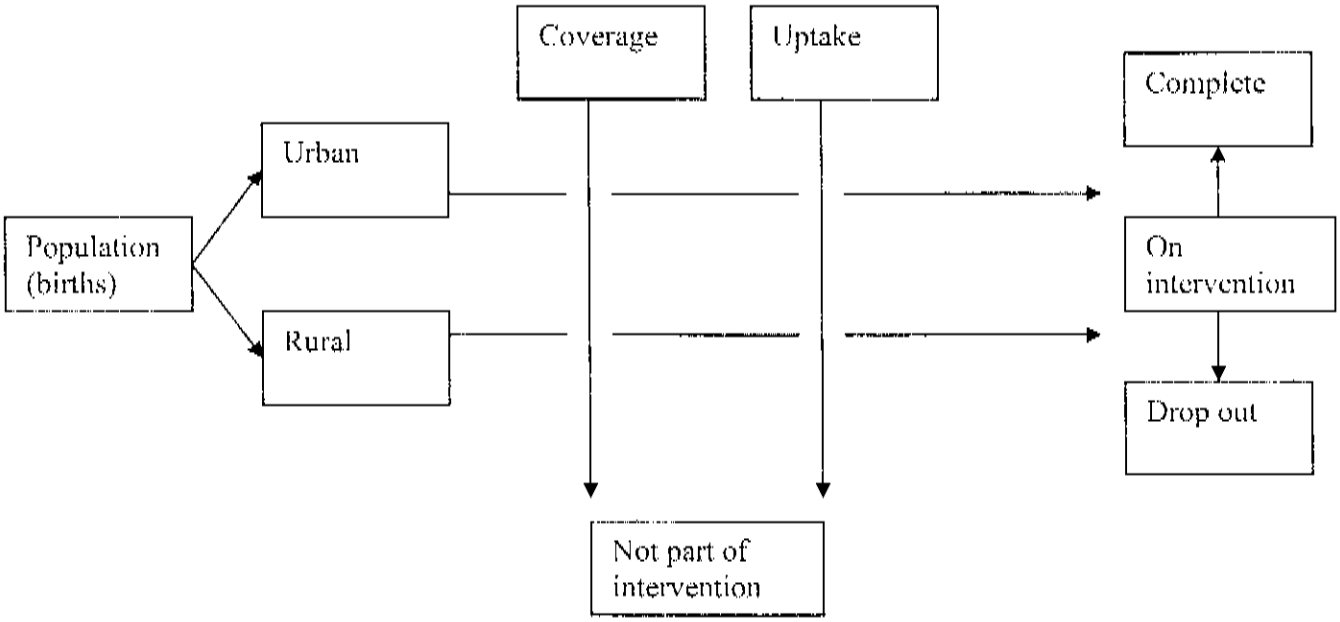
Methods

The following sections detail the methods used and major assumptions made with regard to the examination of the implications of the above scenarios.

The model

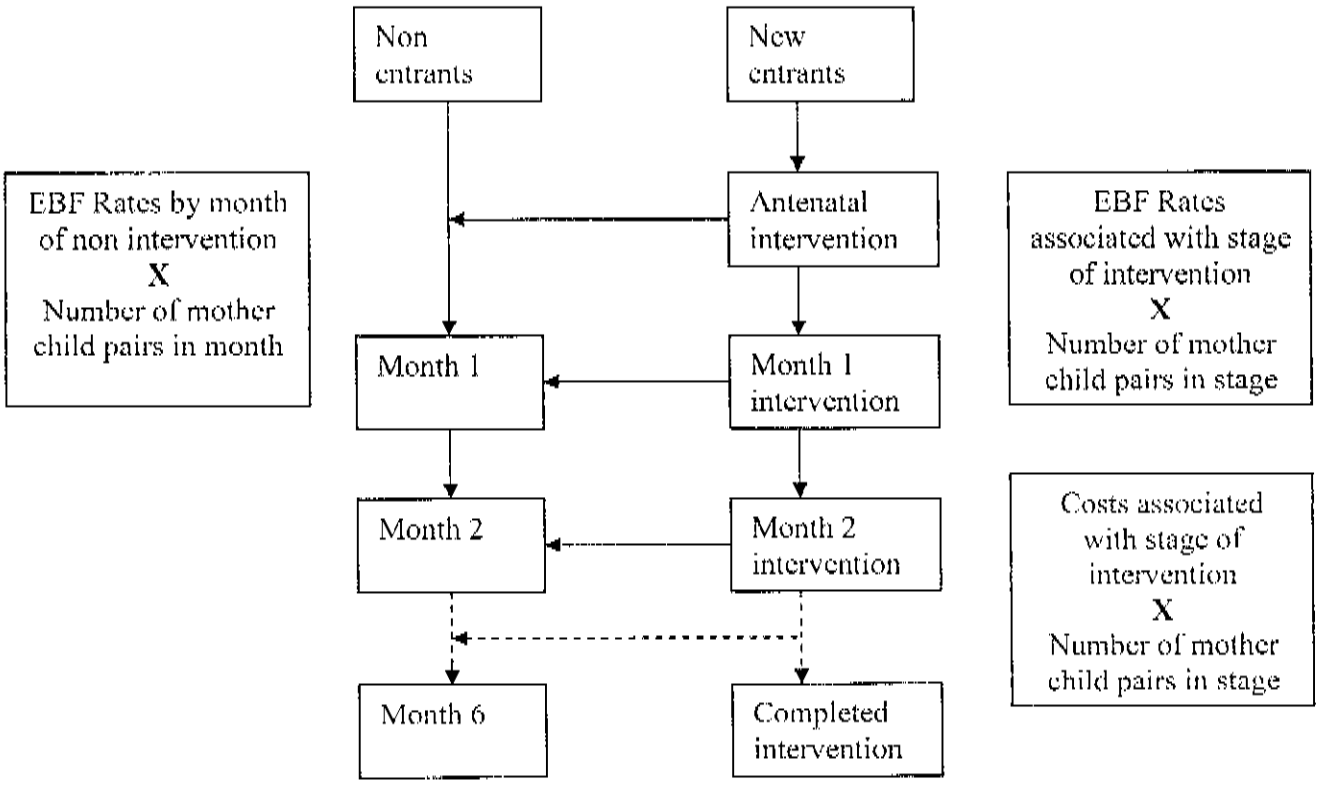
In order to estimate the costs and outcomes at the provincial level it was necessary to estimate the number of women and children who would be reached by the intervention. As the intervention differed in terms of the urban or rural setting, it was necessary to estimate the numbers by setting. To this end, the number of births, by setting, in the province was taken as a starting point. This was then adjusted according to the estimated coverage of the intervention, which is itself determined by the coverage of the state sector and assumed reach of the intervention. The population entering the intervention is then further adjusted according to assumptions regarding uptake. The following diagram summarises this first stage of the modelling process.

Figure 2.1: Stage one



A monthly cycle was used to run the model, estimating the number of new entrants into the intervention under each scenario for each month. The data used in this and the next stage of the model are provided in the annex. Once the monthly entrant numbers were modelled, it was necessary to examine the pass through rates from month to month.

Figure 2.2: Stage 2



The above figure depicts stage 2 of the modelling process. New entrants were modelled as being part of the antenatal intervention. Thereafter, the cohort of new entrants passes from month to month with some, depending on assumptions, passing on to the non-intervention side of the model. A seven-month period was modelled for each of the scenarios so as to reach numbers at scale. The model then provides an estimate of the numbers by month, split between the intervention and non-intervention sides. The estimated effectiveness of each month was then combined with these figures so as to provide estimated outcomes. Similarly, the resources necessary to provide this level of service were estimated and costs attached.

In addition to running the model for the three scenarios, it was also run as if there were no intervention. This was used as the base case. The outcome in terms of months of exclusive breast feeding (MEBF) from this base model was subtracted from the MEBF modelled under each of the scenarios so as to identify the likely increase. Further, in relation to effectiveness, the conservative assumptions that there would be no spillover EBF into the non-intervention population and that dropouts would have no higher than the pre-intervention EBF rates were made for all scenarios.

The above model only considers costs, but there will, arguably, also be cost savings. EBF may well reduce the demand for other services, or may reduce the demand for free formula. Recently there has been studies that have sought to offset these costs; this is, however, largely inappropriate. The reduced demand for other services would indeed free up these services for other uses, which from an economic point of view is a saving, particularly if they are actually used for other purposes. There is, however, no guarantee that they will be used. Furthermore, the presentation of results would be complicated by this adjustment, as it would no longer represent the budgetary implications of the interventions. There may, however, be direct savings that would have direct budgetary savings, such as reduced formula feeding. In KZN, however, formula is provided to mothers after they have completed a period of breast feeding. If this policy were continued there would be no direct savings. While not included, it should be kept in mind that EBF might well free up other resources.

Costs and outcomes

The above model provides the numbers with which the costs and outcomes can be associated. In such exercises it is important to be clear on what costs and outcomes are considered, as there are a range of possibilities. The choice of what is included is based on the purpose of the analysis, which in this case is to provide evidence to support the decision process regarding the possible introduction of such a programme.

When conducting a costing there are many possible costs that can be included: provider costs, client cost and social costs. From a theoretical perspective, it is most appropriate to consider social costs as, arguably, this is what should be considered by policy makers. If social costs, and indeed client costs, are likely to differ considerably across scenarios or in the absence of intervention then there is a need to consider them. This is unlikely to be the case here, except that clinic visits place a greater cost on the client compared to home visits. Given that such costs are very difficult to determine and that policy options are generally presented with only provider costs, and that social costs would complicate comparison, the decision to consider only provider costs was taken.

As far as possible, cost data were obtained from the site of the VTS. Details of the methods used to collect data are provided in the site costing report. Mainly resource use data were taken from the site; the costs attached to these resources were drawn from provincial data. For example, the data on time spent by staff on different tasks was drawn from the site, while the costs associated with staff of different levels were taken from the provincial human resources scales. For structures, such as provincial management, required at scale but not required at site level, data from similar existing programmes – namely, the provincial PMTCT interventions - were used with adjustments for scale,

The intention of promoting EBF is to improve the health and well-being of children. In respect of those born to HIV positive parents, the aim is to reduce infection. There are, therefore, a variety of potential outcome measures that could be used. For the purposes

of this work, the outcome measure used was months of exclusive breast feeding (MEBF). The outcome measure has a number of advantages over alternatives but also some notable disadvantages.

The measure is useful as it relates to all infants on the intervention, whereas a measure such as HIV infections averted relates only to a subsample. It is also useful as the data on this outcome collected as part of the VTS are good. The major drawback is that it is a very specific outcome making comparison with other types of intervention difficult. For comparisons across scenarios it is perfect, as they all have the same aim; the problem is alternative interventions to improve child health via routes other than EBF.

The data on EBF rates associated with each scenario were based on adjusted rates from the VTS study. Data were not available on how reductions in the intensity or changes in the nature of delivery would affect outcomes. The VTS rates were therefore used as a base and adjustments were then made according to advice from the implementation team, who considered their experience and the data that were available. Details of the adjustments are provided in the annex.

The costs and outcomes estimated for each scenario are presented as totals and as cost effectiveness ratios. The totals reflect the total cost of implementing the scenario at a provincial level and the outcome total represents an estimate of the increase in MEBF resulting from such implementation. The cost effectiveness ratios are the cost per additional MEBF.

Cost effectiveness analysis is a powerful tool but must be interpreted with some caution. CEA in this case will identify the relative efficiency of the alternative scenarios in generating MEBF. The results of such efficiency analysis are often interpreted as showing one intervention to be better than the others. This is not the case; CEA only shows which is more efficient and efficiency is only one criteria. Policy makers may well choose a less efficient option, spend more, but as a result generate a higher number of MEBF.

Limitations

The above method was designed to generate the most useful results within the constraints of the project. The following section will outline these results, which do appear to provide useful policy support information. That said, there are some limitations to the approach that should be noted.

The model used is a population model and as such relies on resource to client ratios to estimate costs. This ignores to some extent the distribution of demand. Assuming that a new unit of a resource is required once the last has reached capacity implies that clients and resources can be perfectly matched, or that resource units are dividable, which may not always be the case. For example, if 100 clients required one counsellors the model would cost one counsellors, but if those clients were divided across two clinics there may be a need for two counsellors – one in each clinic. If the counsellors could be employed part-time or could travel, this would not be a problem. This limitation has been countered to some extent by allowing for some transport costs of staff. An infrastructure component could be added to the model, but it was felt that this would add unnecessary complexity: unnecessary because the object is to examine the costs and outcomes at scale not in KZN in particular. KZN is the example, if this were a costing specifically for provincial planning there might be an argument for the addition.

The more fundamental limitation is the data on outcomes, which has already been mentioned. The exercise requires that estimates of outcomes be made and adjustments were made to the VTS outcome data to do so. These adjustments were, however, based on assumptions regarding the impact of different aspects of the intervention and are therefore untested. The estimates made were very conservative, perhaps reducing the impact more than could be argued as appropriate. This was done so as not to over-estimate the impact but rather to be cautious.

Results

The following section details the results of the above described analysis. Firstly, the costs are discussed, then the outcomes, and finally a combination of the two. The analysis was based on a model with monthly iterations but for the purposes of comparison with similar work the results are presented annually.

The total annual costs estimated for each scenario are presented in the following table. The costs are broken down according to cost categories.

Table 2.2: Total annual cost by scenario

	S 1 – Full	S 2 - Simplified	S 3 Basic
Compensation	65714382	35985200	10174678
Facilities	132000	132000	72000
Equipment	816416	486111	134038
Transport	4805566	1359892	269408
Communications	1246261	500302	89854
Total cost	72 714 625	38 463 505	10 739 978

The implementation of the full scenario is, as would be expected, far greater than the other two. It was estimated that the full scenario would cost over R70 million per annum. To recap: this is an estimate of what it would cost if the intervention as it was structured in the VTS was offered across the province of KZN. The simplified scenario came out at closer to R40 million and the basic was by far the lowest estimate - a little over R10 million.

For all three scenarios, the major cost item was compensation, which in all scenarios accounted for over 90% of the total cost. The interventions are all labour intensive and it is worth noting what staffing levels are required. The following table provides the results of the modelling exercise on the staff needs associated with each scenario on which the above costs are based.

Table 2.3: Implementation staff requirements by scenario

	S 1 – Full	S 2 - Simplified	S 3 – Basic
PMTCT counsellors	51	51	51
BF counsellor for home visits	661	314	34
BF counsellor clinic based	173	107	121
Clinic assistants	292	292	0
Supervisors	131	17	5
Managers	16	6	0
Infant feeding specialists	13	0	0

All three scenarios involved extended PMTCT counselling to introduce the intervention and so have similar requirements in this regard. The more intense the intervention the more counsellors on breastfeeding would be needed. In view of the intensity of the full and simplified interventions, a clinic assistant was included to support the intervention; this position was not deemed necessary in the basic scenario. The management ratios modelled in the full scenario were considered unnecessarily high and so were reduced in the others. This, combined with fewer counsellors, resulted in an estimate of a far smaller number of supervisors and managers needed in the second two scenarios. In scenario 2, the roles of infant feeding specialist and manager were combined and included only under the manager heading.

There is a significant demand for labour across the scenarios, although obviously more so in the first two. It is, however, important to note that the major demand is for counsellors and clinic assistants and not health professionals.

To start up interventions such as the three being discussed requires training for the new staff. These training costs were estimated on the basis of the modelled staff needs above and are presented in the following table.

Table 2.4: Start-up training costs by scenario

	S 1 – Full	S 2 - Simplified	S 3 – Basic
Initiation training	1 620 000	959 000	261 000

Obviously, the fewer staff requiring training the lower the costs predicted, resulting in far larger training cost estimates for scenarios 1 and 2 compared to 3.

Thus far the results show that scenario 1 is the most expensive option of the three interventions designed to lead to the same outcome. It is more expensive because it is more intensive and would be expected to lead to better outcomes. The following table presents the results of the estimated impact of the three interventions. The impact is reported in two forms: firstly, the total number of months women were supported and EBF: secondly, the number of those months that are a result of the intervention and would not have occurred otherwise.

Table 2.5: Annual outcomes by scenario

	S 1 – Full	S 2 – Simplified	S 3 – Basic
Supported MEBF	330220	275223	69771
Increased MEBF	281947	226950	22306

The modelled effectiveness of the more intensive scenarios 1 and 2 suggested that these interventions would be more than 10 times as effective as the basic intervention in increasing the number of months of exclusive breastfeeding. So, while the basic is far cheaper, it is also predicted to be far less effective.

Considering both the costs and outcomes together allows for the examination of the relative efficiency of the three options under consideration. The table below provides

two cost/outcome ratios. The first is the total cost divided by the number of months women who were part of the intervention breastfed exclusively. The second is the cost divided by the months of exclusive breastfeeding that occurred only as a result of the intervention.

Table 2.6: Cost effectiveness results

	S 1 – Full	S 2 – Simplified	S 3 – Basic
Cost per supported MEBF	220	140	154
Cost per increased MEBF	258	169	481

Examining first the cost per supported MEBF: despite the higher effectiveness, the full scenario is the most expensive per unit; the simplified is the most efficient, with the basic a close second. The basic, however, is a close second only because in this measure it is given credit for supporting mothers who EBF even if they would have done so anyway. Once the interventions are evaluated in terms of the cost per increased MEBF the simplified scenario is by far the most efficient. The basic scenario while much cheaper was predicted to be so ineffectual that it is estimated to be very inefficient. The full scenario, on the other hand, was predicted to be more effective but also much more costly and so also less efficient.

It could be argued that the assumptions used in the modelling of the impact of the intervention were too harsh. By way of sensitivity analysis the following is provided on the other end of the spectrum. The results above were based on the assumption that changes at any point in the intervention alter outcomes from there on. For this reason changes in the antenatal part of the intervention had the greatest impact on outcomes. The table below calculates the cost effectiveness results based on the assumption changes only affect the following month and the intervention returns to full effectiveness there after. In this model antenatal changes only affect the first month of feeding. This is not

presented as a realistic assumption, but rather to show the sensitivity of the results to assumptions regarding changes in the effectiveness resulting from changes in the design.

Table 2.7: Cost effectiveness results – short reduction

	S 1 – Full	S 2 – Simplified	S 3 – Basic
Cost per supported MEBF	220	122	42
Cost per increased MEBF	258	144	52

With the basic intervention's lack of antenatal services no longer dominating the results it shows up as the most effective by some distance.

Summary and conclusions

As part of the VTS an intervention was conducted to promote EBF and this intervention was highly successful. Given the benefits of EBF that were then seen, the attractiveness of a similar large-scale intervention was obvious. It was, however, clear that the highly intensive nature of the VTS intervention would make large-scale replication very expensive. In the light of this, it was decided that the costs of a large-scale version of the intervention should be examined. Anticipating the high costs associated with the intensity of the intervention, it was further decided to cost two alternative simpler interventions.

This report has outlined how the costs and outcomes likely to be associated with the alternative scenarios were calculated and presented the results. As expected, the full intervention is highly expensive. On the other hand, too basic an intervention seems unlikely to have much of an impact. Considering these two results together in a CEA suggests that a somewhat simplified version of the VTS intervention would be the most efficient option.

While clearly showing the relative efficiency, the results of the cost effectiveness analysis should be interpreted with caution and not taken to clearly recommend one scenario over the others. The results of this report should be read collectively. If a province such as KZN were deciding between the above three interventions, the results would recommend that they select the full intervention if they want their actions to result in as many months of EBF as possible and the cost was not an issue. If they wanted to have as high coverage as possible for as low a cost as possible and the outcome itself was not the primary factor, then the results would suggest pursuing the basic intervention. If the province agreed that they wanted to promote EBF but had a limited budget that was less than the total needed for scenario 2, then they should pursue the simplified intervention. This last set of circumstances is typically the most common, which is why the results of CEA are usually interpreted as making a clear recommendation, but it is worth noting that that recommendation is only valid in these particular circumstances.

As already mentioned, one of the circumstances in which the CEA results do lead to clear recommendations is the acceptance that EBF is in fact desirable, given the cost. The above results provide some support to policy makers wishing to make a decision in this regard. If the benefits of a month of EBF are worth more than R170 then the intervention is worthwhile. Attaching a rand value to benefits such as child health is extremely controversial and based largely on value judgements, as a result so too is the decision.

Annex B

Table B1: Management assumptions

	S 1 – Full	S 2 - Simplified	S 3 Basic
Provincial management			
Director	1	1	1
Deputy director	2	2	2
Regional	5	5	2
Admin	3	3	1
Field management ratios			
HB counsellor/supervisor	6	24	30
CB counsellor/supervisor	8	24	30
Supervisor/manager	9	30	30
Infant feeding specialist/supervisor	10	-	-

Table B2: Outcome adjustments

Aspect	Adjustment	Reduction in effectiveness
Antenatal visits	1	0.9
	2	0.5
	3	0
	4	0
First month	1	0.25
	2	0.25
	3	0
	4	0

Post-natal per 4 weeks	2	0
	1	0
	0.5	0.25
	0	0.9
Time per visits	45	0
	30	0
	15	0.2
	5	0.75