

The Nepal National Vitamin A Program: prototype to emulate or donor enclave?

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More than 250 million of the world's children suffer from vitamin A deficiency. Nepal is one of 60 countries in which this deficiency constitutes a significant public health problem. Each year in Nepal, vitamin A deficiency is responsible for the deaths of 9000 children and for 2500 children becoming permanently blind. The Nepal National Vitamin A Program (NVAP) was begun in 1993 in eight of the country's 75 districts. By the end of 1997, the programme covered 32 districts, and by 2003 its coverage will be nationwide.

The Nepal NVAP is considered by many to be a highly successful, model programme. It consists primarily of distributing high-dose vitamin A capsules to all children 6 to 60 months of age during twice-yearly campaigns. The capsule distribution is carried out by a previously existing network of Female Community Health Volunteers (FCHVs) that has been reinvigorated by the highly visible and universally acclaimed success of the NVAP. An important strategy of the programme has been the empowerment of the FCHVs, which has been accomplished by organizing, training and motivating community workers and other representatives from education, agriculture and other sectors, as well as political representatives, to support the FCHVs.

The annual cost of the NVAP is US\$1.7 million. It costs \$1.25 to deliver two vitamin A capsules to each participant. The cost per averted death is \$327. The NVAP reduces the incidence and severity of diarrhoeal disease and measles, which in turn reduces the need for Ministry of Health services, thereby annually saving the Government of Nepal \$1.5 million. Factoring in these cost savings, the net annual cost of the current NVAP is \$167 000, and the net annual cost of the permanent, nationwide programme is estimated at \$1.1 million. The NVAP is a highly cost-effective programme. The article concludes with a discussion of the sustainability and replicability of the programme.

Introduction

Vitamin A deficiency is the most important cause of childhood blindness in lower and middle income countries, and contributes significantly to morbidity and mortality from common childhood infections. Beaton and colleagues' meta-analysis of randomized community-based trials in eight countries concluded that vitamin A supplementation resulted in a 23% reduction in the mortality rates of children between the ages of 6 months and 5 years (Beaton et al. 1992). Vitamin A supplementation programmes are not only highly effective in reducing mortality and morbidity, but in countries in which vitamin A deficiency constitutes a public health problem, these programmes appear to be among the most cost-effective public health interventions available. The World Bank's analysis of 47 health interventions found only one to be more cost-effective than vitamin A supplementation. On the basis of this analysis, the World Bank has endorsed vitamin A supplementation as a public health programme priority.

The World Bank analysis, however, was based on the findings of just three studies, all of which had been conducted more than 15 years earlier.¹ Today, more than 5 years after publication of the World Bank report, there remains a dearth of

information about the cost of vitamin A supplementation programmes. The Institute of Medicine's 1998 report, *Prevention of Micronutrient Deficiencies*, lamented that:

'Review of past programs reveals an almost total lack of attention in program design and implementation to the systematic collection of data on costs' (page 5).

This article addresses this relative information void. It presents an analysis of the costs of the Nepal National Vitamin A Program (NVAP). Due to its high coverage rates and its presumed low cost, the NVAP is regarded by many international health experts as a model programme. It was showcased, for instance, at the September 1997 International Vitamin A Consultative Group Annual Conference held in Cairo. However, there does not exist a readily available description of the programme or its costs. Moreover, with the World Bank's endorsement of vitamin A interventions as one of the most cost-effective health strategies available to low and middle income countries and the United States Agency for International Development's recent promotion of vitamin A as 'a clear child survival priority over the next 5–10 years', the Nepal NVAP will continue to attract attention and interest for some time (USAID 1998). A detailed examination of the

structure, operations and cost of the Nepal programme, therefore, is warranted.

The next section provides a detailed overview of the NVAP. The third section presents an analysis of the programme's annual operating costs and its impact. The following section assesses whether the NVAP is a prototype worthy of emulation or a non-replicable donor enclave. The final section presents conclusions.

An overview of the Nepal National Vitamin A Program

Vitamin A deficiency is a significant public health problem in Nepal. Three major research projects conducted in Nepal in the late 1980s each concluded that periodic dosing of children 6 to 60 months of age with high-dose vitamin A capsules resulted in significant reductions in child mortality, in the order of 25–30%. The findings of these three research projects were discussed at a National Vitamin A Workshop held in Kathmandu in 1992. The workshop recommended that Nepal develop a national, multisectoral vitamin A programme in 32 priority districts, to be phased-in over a 4-year period. The workshop also recommended that the programme rely upon the already existing network of Female Community Health Volunteers (FCHVs) to distribute vitamin A capsules, with Ministry of Health (MOH) primary health care centres, health posts, sub-health posts and hospitals treating cases of vitamin A deficiency. The recommendations of the workshop were developed into a formal document, 'Guidelines for the Implementation of the National Vitamin A Deficiency Control Program in Nepal', which has served as the blueprint for the development of the NVAP.

Since its inception, the NVAP has focused overwhelmingly on organizing and conducting multi-sectoral training in vitamin A. When the programme is introduced in a new district, it provides training to MOH primary health care personnel at the district, health post and community levels, (1) to educate them about vitamin A, (2) to train them in the logistics of the vitamin A campaign distribution days, and (3) to empower Female Community Health Volunteers (FCHVs). Trainees also include representatives of the Ministries of Agriculture, Education, and Culture and Local Development, as well as non-government organizations (NGOs). From July 1993 to December 1996, the NVAP trained 38 549 persons, including more than 17 000 FCHVs.

Between October 1993 and March 1997, the NVAP sponsored seven two-day vitamin A capsule distribution campaigns. Following each campaign, the NVAP undertakes a mini-survey to determine the coverage and to assess the performance of the campaign. According to mini-survey findings, the coverage of capsule distribution has consistently been 80–85% of the target population.

In addition to the capsule distributions and the campaign distribution day-related training, the programme includes extensive training in vitamin A treatment protocols. Working with the Nepal Medical Association and the Nepal Institute

of Medicine, the NVAP has successfully incorporated the vitamin A case treatment protocol into the pre-service and in-service training curricula for physician and paramedical personnel in all health institutions and health training centres throughout the country. Through this initiative, more than 2300 physicians and paramedical personnel have received training.

The Nepal Vitamin A Program in detail

Financing and administration

Implementation of the NVAP began in April 1993 with financial and technical assistance from USAID, and to a lesser extent, UNICEF. USAID contracted Helen Keller International (HKI) to manage and administer the project. The Technical Advisory Group (TAG), a Nepalese NGO, was created specifically to assist the MOH in implementing the NVAP. The process of developing the TAG began in April 1993, with the inception of the NVAP. Its staff, now numbering 36, conducts the training, and has done most of the monitoring, supervision, and much of the information, education and communication activities related to the NVAP.

The TAG also works with the Chief of the MOH Nutrition Section, Child Health Division to coordinate with three MOH divisions: (1) the National Health Training Center for training FCHVs; (2) the National Health Education Information and Communication Center for development of supporting communications materials; and (3) the Logistics Management Division to coordinate the management and delivery of supplies. A local, for-profit entity, Management Support Services Pvt. LTD (MASS), has provided logistics support for the training sessions.

The NVAP linchpin: the Female Community Health Volunteers

The FCHV Program is the linchpin of the NVAP. It is the FCHVs who distribute the vitamin A capsules on distribution days. There is significant overlap in the FCHVs' strengths and weaknesses and those of the NVAP. In order to understand the NVAP – its costs, its effectiveness, and its evolution – and to be able to assess its sustainability, it is necessary to understand the FCHV Program.

FCHV Program antecedents

Nepal is divided into 75 districts. Each district is subdivided into village development committees (VDCs) which are further subdivided into wards. Health services are delivered through a system of government hospitals, primary health care centres and health posts. NGOs also have a significant presence in Nepal and many provide health services. A major initiative of the Government of Nepal has been the development of sub-health posts and the commitment that the Government will establish a sub-health post in every VDC in the country and within 2 hours walk of any Nepali. Sub-health posts are staffed by Auxiliary Health Workers (AHWs), Village Health Workers (VHWs) and Maternal and Child Health Workers (MCHWs).² Roughly half of the sub-health

posts' staff are paid by their respective VDC, the other half being paid by the Central Government through the MOH.

The FCHV Program began in 1988. It was first started in the 27 districts of the central and mid-western area of the country, and was expanded in subsequent years to include all of Nepal's 75 districts. In mid-1997, there were reported to be about 40 000 FCHVs. Each village or ward is supposed to have one FCHV who was to be selected by the local Mothers' Group. Many wards, however, do not have a Mothers' Group and the FCHV is often designated by the ward chief or by the health post in-charge.

Objectives of the FCHV Program

The objectives of the FCHV Program are: (1) to educate mothers and community members on primary health; and (2) to encourage the use of health services. Each FCHV is given a 15-day initial training in basic general health care, first aid, and hygiene. Thereafter, each FCHV is supposed to receive a 2-day refresher training course semi-annually. Upon completion of their initial training, FCHVs are given a small drug kit. The original idea was that supplies would be replenished by the ward and the health post. In most instances, however, the FCHVs' first-aid kits are quickly depleted and, at best, only haphazardly replenished.

It is widely reported that the FCHV Program had become largely moribund by the early 1990s. Some have questioned the long-term viability of the concept: how long can monthly meetings headed by a local, generally illiterate woman, whose major duty is to lead health education classes for her neighbours, provide adequate information to maintain sufficient interest and participation? Once her stock of supplies is depleted, what does the FCHV have to attract her neighbours? The NVAP has helped to change this scenario. By passing out vitamin A capsules in, what is by all accounts, a highly visible and highly valued programme, it has come to be a potent force reifying the FCHV Program, and has raised the stature of the MOH.

General training of the FCHV

The initial training of an FCHV consists of a 15-day session. The more general FCHV training curriculum – i.e. not the vitamin-A-only curriculum – was developed by the MOH National Health Training Center (NHTC). The NHTC has also developed a detailed schedule which structures the initial and refresher training sessions, and calls for spending 2.5 hours on vitamin A, 2.8% of total FCHV training time of 15 six-hour sessions.

The NHTC does not directly undertake all of the training. Nor does it directly train the FCHVs. The MOH approach to training is based on a training of trainers strategy. NHTC trainers train the master trainers of the five Regional Health Training Centers (RHTCs) who, in turn, train the district level personnel, the Health Education Technicians and the health post in-charges in the district. These district level trainees, in turn, train health post personnel, who then train the FCHVs.

Cultivating the critical role of the FCHV in the NVAP

The process by which the NVAP has networked multisectorally has raised the stature of the FCHVs in their communities and has been an important source of motivation for FCHVs. The success of the NVAP has brought national attention and recognition to the critical role played by FCHVs in the programme. The NVAP has been able to breathe new life into the FCHV network and transform it into an important vehicle for improving the functioning of the public health care system. It has been able to do so as a result of (1) the multi-sectoral approach to their training which emphasizes process and empowerment, and (2) the TAG's guiding principle in its interactions with them: a well-planned and highly structured programme which consistently does what it says it is going to do, engenders trust and thereby confidence, commitment and dedication.

NVAP training of the FCHV

FCHVs have only two training sessions that are devoted exclusively to vitamin A. In both of these sessions, TAG personnel lead or participate in the training. After the two special vitamin A training sessions, the vitamin A refresher training is incorporated into the more general health FCHV refresher training sessions. FCHV training in both the general health course and in the vitamin A-specific course consists of an initial training of 15 days, followed in 6 months by a 2-day refresher training session. Thereafter, the programmes are one and the same, and vitamin A becomes but one subject in the more general health refresher training sessions.

TAG trainers lead the initial vitamin A training session at the district level, with participation of NHTC and RHTC trainers. Then, the TAG trainer, together with the participation of a newly trained district level person and a health post in-charge train the staff of each health post. Those trained at the health post level, assisted initially by a TAG trainer and a district level trainer, then train the FCHVs. In addition to the FCHVs, the trainees in this community level training include VHWs, MCHWs, ward members, and fieldworkers of the Women in Development Program, the Ministry of Agriculture and NGOs.

The TAG approach to FCHV motivation: the critical importance of process and trust

FCHVs are women who have been elected from their local Mothers' Group:

'because they have something special: leadership qualities, personal strength, respect in the community, and the desire to improve the health delivery within their community. Their main incentives are to increase their knowledge base through health trainings, to share their knowledge within their community, to distribute goods, and to receive community recognition as a health professional' (Hollander 1997: p. 4).

FCHVs are also motivated by the Government policy of giving them preferential treatment in hiring MCHWs – a

permanent, paid position at the sub-health post level. The dearth of employment opportunities in Nepal, especially for women, makes this an effective enticement. It is estimated that roughly one-quarter of all MCHWs were formerly FCHVs (Chataut 1994: p. 12).

The NVAP uses a multi-sectoral approach to encourage and, in effect, to 'jump-start' the community working together and networking. The TAG-led training brings together important members of the community to meet with the FCHV, to recognize her role and to support her – both in the logistics of the distribution campaign day requirements and more generally in educating the public about vitamin A. This recognition and the act of working together empowers and motivates the FCHV. The TAG training philosophy maintains that it is the training process, rather than the curriculum, that is the most critical aspect of the training.

Another important way in which the NVAP has empowered the FCHV has been by giving her something to do – maintaining a registry of all children less than 6 years of age in her jurisdiction – and giving her something that the community values and wants, vitamin A capsules. The registry serves several purposes. Developing the registry initially requires that the FCHV visit every household in her community. Through this process she has the opportunity to promote vitamin A to mothers and becomes known as the person in charge of the vitamin A capsule distribution day and a source of information on vitamin A.

The registry also helps the FCHV to organize her work and is used to make the vitamin A capsule distribution day more efficient. By having children's names and ages, the only thing needed to record that a specific child has received his/her dose on distribution day is the entering of a check mark next to his/her name. This keeps the amount of time devoted to record-keeping tasks to a minimum on the busy distribution days, and at the same time transforms the registry into a tool for determining the coverage of the programme and a record for monitoring the programme at the village level, enabling easy identification of children who have not been dosed.³ The registry is monitored by the VHW, the FCHV's supervisor, and other health and ward officials, and thereby becomes a tool of accountability and feedback, as well as an instrument to motivate the FCHV. An important part of the FCHV's training involves instructing her in how to use the registry.

Another key element in making the NVAP successful is also related to the motivating of and empowerment of the FCHV, but it is a much more subtle and easy to overlook aspect; namely, the need to effectively engender and maintain the trust of the FCHV. If the NVAP is to continue to rely on volunteers and continue to be successful, the relationship between the TAG and on the one hand, the MOH, and on the other hand, the FCHV, must be based on trust: i.e. the FCHV's expectations – based on what they have been told by the TAG and how the NVAP has been structured – must always be fulfilled or met. The FCHV's empowerment is a delicate thing, at least at this relatively early stage in the development and institutionalization of the programme. If

the FCHV is made to look ineffective or otherwise unable to meet the expectations of her community because of supplies or scheduling problems, the effect is to undermine her credibility, respect for her, her effectiveness and her power. As a result, making the NVAP a well-structured, standardized programme that works in a timely, predictable and widely understood manner, is the programme imperative.

Estimating the cost of the NVAP

The costing methodology: identifying cost centres and developing costing algorithms

With the assistance of the TAG and the MOH Nutrition Office, the primary activities of the NVAP were identified. These activities constitute the framework for categorizing the costs of the programme (see Table 1 categories). Each identified programme activity constitutes a cost centre in the cost analysis. The analysis is based on a hypothetical calendar year rather than any particular actual year of operations for a number of reasons. First, the frequency, and in some cases the intensity, with which some NVAP activities have been undertaken has varied over the life of the project. Second, this has been a dynamic project: the activities mix of the TAG has not remained static, nor has the content of many of the activities. The training curricula, for instance, have evolved markedly over the course of the programme. Third, the TAG has experimented with various efforts, some of which have proven successful and been adopted as part of the standard programme, and others that proved to be only one-time undertakings because they were regarded as not successful, too expensive or not considered institutionally viable. These one-time or discontinued activities no doubt cost money, but they cannot be regarded as core activities of the NVAP and are therefore not included in this analysis. The year which most closely approximates the level and mix of activities analyzed here is 1996.

Training costs

TAG's costs of the different activities were estimated using a combination of methodologies. Working closely with TAG staff, distinct algorithms were devised to identify the personnel, travel, time and materials inputs of the major TAG activities. Distinct algorithms were developed to estimate the TAG costs for:

- initial, refresher and orientation training at the district level;
- initial and refresher training at the health post and community/FCHV levels;
- initial and refresher municipality training; and
- treatment protocol training.

The costs that TAG incurs in this training are limited to those of paying the trainers and their transportation and per diem costs. Most of the participant-related costs are paid for by MASS. MASS prepares a budget for every TAG training session and assigns a staff-person to attend each TAG training session. This staff-person, usually with one or two locally hired assistants, provides general administrative support to

Table 1. Total annual costs of the Nepal National Vitamin A Program by activity/cost centre ('000s rupees)

Activity/cost centre	TAG costs	Logistics (MASS) costs	HKI costs	UNICEF costs	Total direct outlays	Off-budget personnel costs	Total costs	% distribution
1. Initial Training	4 760	6 524	—	—	11 284	—	11 284	12.2
2. Refresher Training	2 517	5 166	—	—	7 683	—	7 683	8.3
3. Orientation Training	309	100	—	—	409	—	409	0.4
4. Treatment Protocol Training	454	383	—	—	836	—	836	0.9
5. Municipality Training	349	95	—	—	444	—	444	0.5
6. Promotion	4 874	—	233	538	5 645	19 720	25 365	27.4
7. Supervision and Monitoring	4 209	—	—	—	4 209	4 688	8 897	9.6
8. Planning and Coordination	—	—	—	—	—	—	—	—
(a) Personnel	308	—	2 939	—	3 247	—	3 247	3.5
(b) Other	708	—	83	—	791	—	791	0.9
(c) Total	1 016	—	3 022	—	4 038	—	4 038	4.4
9. General Program Development and Admin. (i.e. all other, unassigned TAG costs)	—	—	—	—	—	—	—	—
(a) Personnel	1 122	—	6 011	—	7 133	—	7 133	7.7
(b) Other	6 554	1 153	9 500	—	17 208	—	17 208	18.6
(c) Total	7 676	1 153	15 512	—	24 341	—	24 341	26.3
10. Campaign Day Distribution	—	—	—	—	—	4 220	4 220	4.6
11. Vitamin A Capsules	—	—	—	5 002	5 002	—	5 002	5.4
Total: ('000s of Rupees)	26 164	13 420	18 767	5 540	63 892	28 628	92 520	—
Total: ('000s of US\$)	471	242	338	100	1 151	516	1 667	—
% financing by source:	28.3	14.5	20.3	6	69	31	100	—

the meeting and (at the meeting) pays per diems and training allowances to all trainees.

MASS records of its actual payments were used to develop algorithms for costing logistics support. The more difficult and time-consuming part of constructing these algorithms involved identifying the number of participants of each type attending each type/site of training in each of Nepal's three ecological zones (the *terai*, hill and mountain zones). Since MASS does not maintain electronic files containing this information, it was necessary to develop estimates from hand-written records. An additional complication was that MASS does not maintain this same sort of data in any type of aggregated form. The cost model-based estimates were found to closely approximate the actual number and composition of NVAP trainees, deviating by less than 3% (see Annex 1).

The TAG and MASS algorithms were used to estimate the number and type of trainers, and trainees, support staff, the cost of training allowances, travel costs, per diems, materials and reproductions, meeting expenses, and (if necessary) the cost of renting a facility.

Promotion costs

In each district where the TAG team has already conducted training, a TAG programme coordinator visits to undertake promotional activities for the upcoming distribution. The promotion consists of orchestrating a campaign to raise awareness about the upcoming capsule distribution. TAG research has revealed that most women are not able to remember dates, and many of them are not able to identify the current date. Accordingly, the promotion period is no more than three weeks before the distribution in order to better ensure good coverage.

Promotional activities include radio and television advertisements broadcast on nationwide channels, radio spots on regional channels, movie house slides that are displayed (along with other advertisements) before the feature film is shown, pamphlet distribution, local miking, playing specially prepared vitamin A audio cassettes at village gatherings, and spray painting messages using durable sheet metal stencils.

The TAG and Helen Keller International both have budgets for these activities. In addition, UNICEF prints roughly 25 000 leaflets per capsule distribution campaign that it contributes to the TAG for distribution. UNICEF also gives the TAG monies (in 1996, about US\$7000) for additional printed materials and radio and television spots (both development and broadcasting). UNICEF's five regional offices also support the development and broadcasting of vitamin A campaign radio spots, which are broadcast on radio channels with sub-national (i.e. regional) coverage. The TAG also publishes a semi-annual newsletter.

Supervision and monitoring costs

The primary monitoring and supervising activity of the NAVP consists of mini-surveys of (a) the mothers (or caretakers) of the target-age children and (b) of the FCHVs. The surveys

are conducted in the weeks immediately after the vitamin A capsule campaign distribution days (i.e. semi-annually).

The Central, Regional and District-level MOH officials supervise the vitamin A capsule distribution days. In the first year of the project, the meagre level of per diem paid by the Government and shortages of other critical inputs (e.g. gasoline) constituted obstacles discouraging this supervision. Believing that this was (and remains) an important activity that contributes to the effectiveness and sustainability of the NVAP, USAID has increased the per diem and pays for this activity.

Planning coordination versus general programme development and administration costs

After quantification of the resources required to produce all of the other activities (which are more discrete and more readily identifiable), their total costs were summed and subtracted from the total 1996 expenditures of the NVAP. The residual was the sum of (1) Planning & Coordination, and (2) General Program Development and Administration. In an analogous manner, the personnel not assigned to other particular activities were similarly assigned to these two residual categories of activities. Rather than leave this entire residual in a single, nondescript block, an effort was then made to identify and extract Planning & Coordination, and the remainder is labelled General Program Development and Administration.

Annual, off-budget personnel costs of the NVAP

While the time that FCHVs and other trainees spend in training is directly paid for by the NVAP, the time they spend implementing NVAP activities is not. This time represents an opportunity cost that is not captured in the financial cost accounting system of the programme. While the training sessions they participate in are designed to also serve as planning sessions in setting up, supporting and implementing the vitamin A capsule distribution campaign, the trainees devote additional time to these activities outside of the training sessions. These are not costs directly allocated to or paid for by the NVAP. Nevertheless, they are resources that are devoted to the programme, and therefore constitute costs incurred in implementing the programme. There is no system for reporting or tracking the amount of time that the 40 000 FCHVs and others spend on the NVAP. Given the substantial number of persons involved and the indispensable role they play in implementing the NVAP, it is important to estimate the amount of time these persons devote to the NVAP and the cost that they represent.

Based on discussions with TAG and MOH personnel, time estimates were developed for the typical representatives of the Ministries of Health, Agriculture, Education and Local Development (including Women in Development) who are trained by the NVAP and subsequently assist in implementing the NVAP. Based on these time estimates, by activity, along with the value of the total reimbursement of these persons (including fringe benefits), it is estimated that these off-budget costs annually total 28.6 million rupees (US\$516 000).

Sixty-nine percent of the indirect costs arise from promotion activities, with the remainder split roughly evenly between Supervision & Monitoring and Campaign Day activities.

Total annual operating costs of the NVAP⁴

Table 1 presents the total costs of the NVAP by activity and agency, and the percentage distribution. Sixty-nine percent of the total annual operating costs of the NVAP are comprised of direct outlays, 31% are off-budget personnel costs. Figure 1 shows the distribution of the NVAP's total costs by agency. The single most important cost category is Promotion, which accounts for 28% of total NVAP costs. All types of training together are only the third largest expenditure, accounting for 22% of the costs. The vitamin A capsules provided by UNICEF constitute a mere 5% of the total costs of the NVAP.

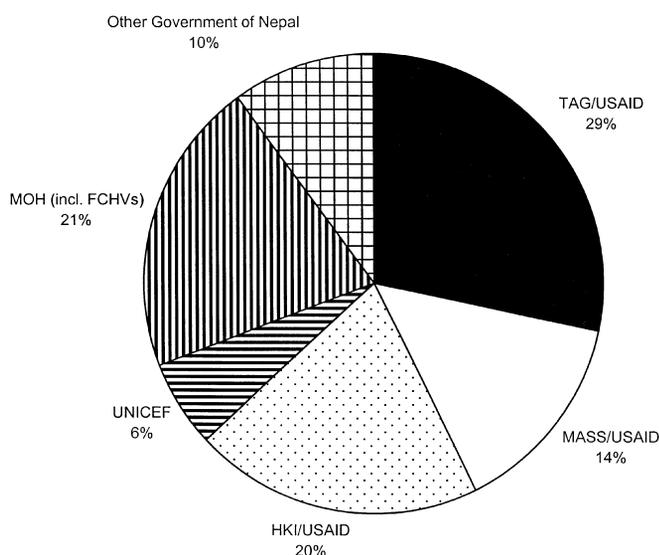


Figure 1. Annual cost of the Nepal National Vitamin A Program by source of financing

Total annual long-term costs

A plan for phasing-in the NVAP throughout the remainder of the country over a five and a half year period was developed. Each subsequent phase of the programme introduces new districts into the sequential training process, graduates a set of districts from training, and adds districts to the Promotion, Distribution and Supervision & Monitoring activities. At the end of five and a half years, all training will be completed, and all other activities, now expanded in scope to cover all 75 of Nepal's districts, will be maintained indefinitely. The ongoing activities constitute what may be considered to be the permanent NVAP; i.e. the NVAP beyond its start-up phase. The annual long-term costs of maintaining the permanent NVAP are presented in Table 2.⁵

Average total cost per beneficiary

There are three imperfect sources of information about the coverage rate of the NVAP, and their reported levels of coverage vary substantially. Based on its mini-surveys and post-campaign day discussions with NVAP implementers, the TAG estimates that coverage is about 85% of the eligible population of 1 993 000 children aged 6–60 months. Two surveys provide alternative, and significantly lower, estimates of coverage. Both, however, provide information on a subset of the target population; 6- to 35-month-old children, as opposed to 6–60 months old. Moreover, the two surveys' geographical domains do not coincide with those of the NVAP's 32 priority districts.

The 1996 Family Health Survey (FHS) estimated that nationally 32% of children aged 6–35 months had received a vitamin A capsule in the preceding NVAP distribution. The same source reported that in the *terai* (in which the NVAP functions in all but one of the districts) the coverage rate was 53%. The second survey, the 1995 Nepal National Multiple Indicator Survey (NMIS), found that in the six districts surveyed (all of which were among the 32 priority districts), 71% of

Table 2. Total annual long-term costs of the Nepal National Vitamin A Program by activity/cost centre after the programme has been implemented throughout Nepal ('000s rupees)

Activity/cost centre	Total direct outlays	Off-budget personnel costs	Total costs	% distribution
1. Initial Training	–	–	–	0.0
2. Refresher Training	–	–	–	0.0
3. Orientation Training	–	–	–	0.0
4. Treatment Protocol Training	–	–	–	0.0
5. Municipality Training	–	–	–	0.0
6. Promotion	28 415	46 219	74 634	51.7
7. Supervision and Monitoring	11 043	10 988	22 031	15.3
8. Planning and Coordination	4 038	–	4 038	2.8
9. General Program Development and Administration (i.e. all other, unassigned TAG costs)	24 341	–	24 341	16.9
10. Campaign Day Distribution	–	9 892	9 892	6.9
11. Vitamin A Capsules	9 308	–	9 308	6.5
Total: ('000s of rupees)	77 145	67 099	144 244	
Total: ('000s of US\$)	1 390	1 209	2 599	
% of financing:	53	47	100	100

Table 3. The Nepal National Vitamin A Program: average cost per child receiving two vitamin A capsules per year

Source of coverage estimate	Programme coverage estimate	Current programme			Permanent, nationwide programme		
		No. of children (6–60 months)	Average total cost per child		No. of children (6–60 months)	Average total cost per child	
			Rupees	US\$		Rupees	US\$
TAG post-campaign mini-surveys	85%	1 694 050	55	0.98	2 293 298	63	1.13
Family Health Survey (adjusted)	53%	1 056 290	88	1.58	1 753 699	82	1.48
National Multiple Indicator Survey (adjusted)	71%	1 415 030	65	1.18	2 158 398	67	1.20
<i>Mean (single best point estimate)</i>	<i>70%</i>	<i>1 388 457</i>	<i>69</i>	<i>1.25</i>	<i>2 068 465</i>	<i>71</i>	<i>1.27</i>

children aged 6–35 months had received at least one vitamin A capsule.

Table 3 presents several measures of the average incremental cost of the NVAP. The FHS and NMIS estimates have been modified in an attempt to make them more comparable and to estimate a range of costs per child dosed with vitamin A. The two surveys' coverage rates are likely to be low because their study population (which includes only 6–35 month olds) is the more difficult to reach segment of the 6–60 month old target population. The FHS finding of 53% in the *terai*, has been revised upward to 65% and is assumed to characterize all of the NVAP districts. Similarly we have taken the NMIS findings from six districts and assumed these figures also characterized the entire 32 districts of the NVAP. It is thought that the children who participate in one vitamin A distribution generally participate in both annual distributions. Thus the coverage rates of the single distributions are assumed to be roughly equivalent to the proportion of the target population that receives two capsules per year, and is thereby protecting them from vitamin A deficiency.

The resulting estimate of the average total cost of a child receiving two vitamin A capsules per year ranges from 55 to 133 rupees (US\$0.98 to \$1.58). If the start-up costs of training are excluded and only the costs of what is regarded as the permanent, long-term NVAP are taken into account, the average total cost falls to between 63 and 82 rupees (US\$1.13 to \$1.48).

Averted morbidity and mortality, cost savings and net costs⁶

Each year, approximately 38 000 children aged 6- to 59-months old die in Nepal. Assuming (1) the vitamin A programme can reduce child mortality by 28% (West and Sommer 1984), and (2) the NVAP has a coverage rate of 70%, it is estimated that the current NVAP (covering 32 of the country's 78 districts) annually saves the lives of about 4200 children under the age of five. During the current start-up phase of the NVAP, the supplementation programme costs US\$397 per averted death. The permanent, long-term programme will annually save about 7500 lives, and will cost about \$345 per averted death. If the long-term programme proves to be less effective, and provides coverage of only 50%, the cost per averted birth would rise to \$489. As can be seen from Table 4, these figures are among the most cost-effective of primary health care interventions.

Table 4. Comparison of the cost-effectiveness of primary care interventions: cost per death averted

Intervention	Cost per death averted (US\$ 1996)
Vitamin A supplementation	
Current Nepal Program	
(a) Assuming 85% coverage	327
(b) Assuming 70% coverage	397
Permanent Nepal Program	
(a) Assuming 85% coverage	289
(b) Assuming 70% coverage	345
Breastfeeding promotion (Horton et al. 1996)	169
Measles immunization (Martines et al. 1993)	216
Rotavirus immunization (Martines et al. 1993)	333
Malaria vector control (Walsh and Warren 1979)	1254
Cholera immunization (Martines et al. 1993)	3025
Oral rehydration therapy (Martines et al. 1993)	3405

Note: Adjustments to 1996 US\$ assuming an average annual inflation rate of 3%.

In addition, the NVAP currently is estimated (with 70% coverage) to prevent annually 1100 children from going blind. When the programme becomes national in scope it will prevent 2000 children from going blind each year.

Furthermore, owing to the reductions it generates in the incidence and the severity of diarrhoea disease, acute respiratory illness and measles, it is estimated that when the NVAP becomes a nationwide programme, it will reduce the utilization of MOH services, thereby enabling annual health-care cost savings of roughly US\$1.5 million.⁷ These cost savings represent 58% of the total annual costs of the supplementation programme. Thus, the net annual costs of the NVAP will be US\$1.1 million and the net cost per averted death will be \$147.

Assessing the Nepal NVAP: a prototype worthy of emulation, or a non-replicable donor enclave?

To date, Nepal's National Vitamin A Program has posted remarkable accomplishments. It has already saved the lives of thousands of children and prevented thousands of children

from going blind. Is the NVAP a model programme? Is this vitamin A supplementation programme one that other low and middle income countries should strive to duplicate? Or is it an unsustainable effort made possible only by the extraordinary financial and programmatic support provided by international assistance, and, as such, likely to prove a short-lived effort?

Sustainability issues and concerns

The process of institutionalizing the NVAP has confronted a chicken-egg type of problem. On the one hand, the NVAP has not been institutionalized within the MOH, in part, because the programme has been donor-driven, and organized and administered independent of the MOH. On the other hand, in the early stages of the development of the NVAP, the MOH was undergoing major institutional changes, and could not (or would not) provide the necessary cadre of programme coordinators, who constitute more than half of the TAG's personnel and who are the primary interface with the FCHVs. TAG hired the programme coordinators only when the programme ran into an implementation impasse owing to the shortfall of these key staff. Hence, at the Central Office level, the MOH has not been involved much in the NVAP, primarily because it has not made a commitment. The entire Nutrition Office of the MOH consists of one person, with no support staff. If institutionalization is to proceed, the MOH must make more of a commitment.

The NVAP and the long-term solution to vitamin A deficiency in Nepal

There is evidence from the mini-surveys that the communication and transfer of knowledge from the FCHVs to mothers is lacking. As a result, while the supplementation approach has been highly successful, little progress is being made on developing longer term solutions to vitamin A deficiency, such as gardens and dietary change or fortification. A powerful argument may be made, however, that dietary change is a strategy that takes too long to generate an impact, and that Nepal, with its high levels of vitamin A deficiency-related morbidity and mortality, cannot afford to pursue this strategy at the expense of its supplementation efforts without a great deal of human suffering. The other long-term solution, fortification, does not hold great promise at this moment either. With 84% of the population living in rural areas and a high proportion of the population outside the market economy, there are no promising potential food vehicles that could be fortified and expected to have a significant impact on the incidence of vitamin A deficiency.

Strengthening the weak link in the FCHV system: supervision

The link between the FCHVs and the formal health care delivery system are the village health workers who are widely reported to have become relatively inactive in recent years. The absence of an effective MOH-based supervisory system for community volunteers is a troubling aspect of the NVAP that raises concerns about the ability of the system to maintain its impressive performance to date, and about the

sustainability of the system. Recognizing the problem of supervision and its importance to the success of the NVAP, the TAG developed coordinating committees at each of the three levels at which it provides vitamin A training. The purpose of these committees was twofold:

- to develop a locus of responsibility; to charge 'someone' for being certain that the things that need to be done to ensure a successful capsule distribution campaign were done; and
- to help sustain the dynamism and the energy that the TAG approach to training had generated and that empowered the FCHV.

The coordinating committees were intended to provide an institutionalized, organizational forum comprised of representatives of the political system and the health system (primarily, but not only, the MOH). This approach, however, has not proven successful, and has led to yet another strategy; to simply encourage the routine discussion of the vitamin A programme at the district and health posts' regular meetings. Whether this approach will prove adequate to maintain interest in, and commitment to the programme, is uncertain.

The risk of killing the 'golden goose'

The success of the NVAP piggy-backing on the FCHV and reinvigorating the FCHV network has spawned other piggy-backing initiatives. Since 1996, the FCHVs have been used to mobilize the community on national polio immunization day. In 1997, another task was added to the FCHVs' responsibilities, the diagnosis and treatment (with antibiotics) of acute respiratory illnesses. Some fear that the FCHVs may become so overburdened that they will not be able to continue to carry out the NVAP with the same dedication and in accordance with the demanding schedule of the two semi-annual distributions, in which adhering to relatively tight time schedules is a critical factor for the success of the programme.

The sustainability of the Technical Advisory Group

The TAG was developed specifically to implement the NVAP, and originally was funded entirely by USAID. This group of energetic, capable and highly motivated professionals has begun working in a number of related fields, independently of USAID. By diversifying its portfolio of activities and funding sources, the TAG is better ensuring its ability to survive over the longer term, if and when USAID funding for the NVAP ceases. These activities are contributing to making the TAG a more sustainable entity, but there is still a long way to go.

Conclusion

Vitamin A supplementation is one of the most cost-effective health interventions available. The sustained high coverage rates and low cost of the Nepal NVAP make it an attractive model for other developing countries to replicate. This article has presented a detailed description of this widely recognized and highly regarded, but relatively unknown programme – its structure, operations, cost and impact – in order to elucidate

the secrets of its success and thereby make it more available to other countries as a prototype from which to learn.

The Nepal MOH's network of 40 000 female community health volunteers is a critical element of the Nepal NVAP, and one that predates the NVAP. While the pre-existence of the FCHV network facilitated the initial organizational development of the NVAP, the network was moribund at that time. Thus, while there was a structure on which to build, it was one that was fraught with shortcomings. That the TAG was able to build on this structure, transform it into the foundation of the NVAP and, by so doing, invigorate the entire MOH from the bottom-up, is primarily a result of the TAG's training. The absence of such a network, however, should not be regarded as an insurmountable impediment to developing a similar such programme in another country. Many countries have networks of health promoters that could be piggy-backed on to form the implementation arm of a national vitamin A programme. The complete absence of such a network, however, does suggest that the start-up phase of a programme modelled on that of Nepal will be more expensive and take considerably longer. Whether the same high and relatively stable participation rates attained in Nepal could be replicated is uncertain; it is the outcome of a host of factors.

Part of the success of TAG training and the high participation rates of trainees in the Nepal NVAP is attributable to relatively high training allowances and per diems that are paid to trainees. In a country as poor as Nepal, and one saddled with so high a level of unemployment, especially among women, this is not an inconsequential consideration. The typical FCHV is a rural, illiterate woman whose opportunities to earn cash are extremely limited. NVAP training, even if only twice a year for a few days, is a powerful inducement. The travel per diems and training allowances that are paid to health and other officials in addition to their regular salaries are roughly twice as much as those of the Government. The effectiveness of the programme, therefore, must be regarded as the outcome of a combination of the TAG's unique training programme, coupled with what are by Nepal standards, relatively generous financial incentives.

The poverty of Nepal is a factor in the assessment of the NVAP in another way, as well. The low costs of the programme are due in part to the fact that wages in Nepal are among the lowest in the world. With personnel costs constituting such a large proportion of the total costs, this too is a pertinent consideration.

The replicable features of the Nepal NVAP are chiefly related to the TAG's training, the programme's greatest strength. They include the following.

- The training of trainers approach, which economizes on costs while serving to multiply knowledge of the programme.
- The TAG's multi-sectoral approach to training, including its training of local politicians and the FCHVs' immediate superiors within the MOH, contributes to the high visibility of the programme. By bringing together local, community-level decision-makers and providing them with a largely set

agenda focused on the logistics of how to help the FCHV carry out the next campaign day distribution, the orientation programme jump-starts the campaign-day distribution planning activities, concomitantly empowering the FCHVs.

- The TAG's training philosophy, together with the structure and process of its training programme, cultivates the self-respect, trust and commitment of the FCHVs.
- The TAG's ability to engender and maintain this confidence, trust and dedication of the FCHVs stems from its having developed a well-planned and highly structured programme, and from the TAG's consistently doing what it says it is going to do.
- The contracting out of the management of and payment for all of the NVAP's logistics-related activities has established a watchdog overseeing the use of this portion (14%) of the programme's budget, and has enhanced the efficiency of the programme.

In conclusion, at this juncture the National Vitamin A Program of Nepal cannot be labelled a prototype worthy of emulation. Nor, however, should it be dismissed as being nothing more than a short-lived donor enclave. While the programme remains critically dependent on international assistance for 70% of its total operating costs, the TAG's model has important lessons for other poor countries in designing and implementing not only vitamin A supplementation programmes, but other primary health care programmes as well.

Endnotes

¹ The three studies were a 1978 Haitian analysis (Austin et al. 1981) and studies conducted in Indonesia and the Philippines in 1975 (West and Sommer 1984).

² The AHW was first introduced in 1992 as what is commonly described as a 'mini-doctor'. The AHW is initially trained for 14 months, compared to 3 months for both an MCHW and a VHW.

³ The findings of the mini-surveys suggest that the registries have shortcomings, and have undermined their credibility as a source of census data and thus to calculate coverage rates. The registry remains an important tool for FCHVs, however, for the three reasons cited in the text.

⁴ All of the cost estimates presented here are in current rupees. The 1996 exchange rate (55.5 rupees = US\$1.00) was used in making currency conversions.

⁵ Distinct costing algorithms were developed for each of three ecological zones of Nepal; the terai, hills and mountain region zones. The higher costs of the permanent programme compared to the current programme reflect the fact that the domain of the current programme is comprised of proportionately more districts located in the lower cost terai and hill zones. Complete details about the costing methodology and cost estimates are available from the author on request.

⁶ This section is based on modifications of the USAID Opportunities for Micro-Nutrient Interventions (OMNI) software program (Galarraga and Sanghvi 1998).

⁷ Assumes: (1) the average cost of treating a severe case of measles or diarrhoea is \$3.12, (2) the vitamin A programme reduces severe measles cases by 50%, thereby averting roughly 45 000 MOH visits, and (3) the NVAP reduces severe diarrhoea cases by 25%, thereby averting 440 000 MOH visits.

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Biography

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Annex 1. The Nepal National Vitamin A Program: estimating the programme's indirect costs (rupees)

Current and former trainees/participants	No. of participants	Total reimbursement per day	Average no. of days per person per year				Total cost per year (all persons)			
			Supervision & monitoring	Promotion day	Campaign	Total	Supervision & monitoring	Promotion day	Campaign	Total
FCHVs	17 031	510 930	6	20	4	30	3 065 580	10 218 600	2 043 720	15 327 900
Non-FCHV health	3 250	410 638	2	4	4	10	821 275	1 642 550	1 642 550	4 106 375
Agriculture	4 963	627 075	-	3	-	3	-	1 881 225	-	1 881 225
Education	5 073	640 974	-	3	-	3	-	1 922 921	-	1 922 921
Local development	7 174	906 435	-	3	-	3	-	2 719 305	-	2 719 305
NGOs	1 057	133 552	6	10	4	20	801 312	1 335 520	534 208	2 671 039
Total	38 548	-	14	43	12	69	4 688 167	19 720 120	4 220 478	28 628 765