The Economic Consequences Of Malnutrition in Albania

(PART ONE)

Jack Bagriansky
UNICEF Consultant
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PART ONE

01. Background & Rationale

Poverty, malnutrition, and poor child development are locked in a vicious cycle of poor health, lower learning capacity, diminished physical activity and lower work performance or productivity. As this cycle threatens health and survival, it simultaneously erodes the foundation of economic growth - people's strength and energy, creative and analytical capacity, initiative and entrepreneurial drive. Extensive evidence demonstrates that lack of optimal nutrition for young children has consequences not only for health and survival but also for physical and intellectual growth, school performance and ultimately future earnings and productivity. When conditions of suboptimal child nutrition and development are widespread, the aggregate burden has significant negative implications for national economic growth. Achieving reductions in the prevalence of malnutrition can substantially reduce this national economic burden as well as generate human and social capital to fuel economic development.

Despite significant improvements over the past decade, key indicators of child malnutrition in Albania continue to exceed WHO thresholds and represent serious public health problems. At current prevalence rates, 6 indicators of nutrition shown below suggest that more than 400 thousand citizens of Albania, mainly women and children, suffer from some form of malnutrition. In some cases, such as maternal anemia, low birth weight or insufficient breastfeeding, malnutrition represents a threat to survival. In other cases, such as childhood anemia or stunting, the individual consequences are relatively modest deficits in physical growth, mental development and work performance. But with wide segments of the population affected, these modest deficits accumulate with overwhelming national impact. In all cases, these indicators of malnutrition prevent Albanian children and adults from achieving their full potential as students, workers, citizens and parents.

Table 1: Summary of 6 Key Nutrition Indicators in Albania[1]

Nutrition Indicator	Risk Group	National Prevalence (%)	Estimated # Affected	Risk or Deficit
Underweight	Children < 5 yrs	8.7%	14,970	Mortality
Stunting		19%	32,810	Retarded Development
Low Birth Weight		3.5%	1190	Mortality
Anemia	Children < 15 years	17.40%	130,054	Mental Development Deficit
	Working Age Adults	Female: 19% Male: 4.7%	251,726	Work Performance
	Lindjet nga gratë anemike	11.9%	4,046	& Earnings
Sub-Optimal Breastfeed	Fëmijët 0-6 muaj	32%	10,812	Risk of Perinatal Mortality
Folic Acid Related Birth Defects	Të gjitha lindjet	1.07/1000	68	Mortality and Morbidity

1 All data from DHS 2009 with exception of Birth Defects which is communication from Tirana Institute of Rehabilitation I

The scientific literature has developed a wide evidence base defining heightened mortality or morbidity risks or mental development and physical performance deficits associated with each of these 6 indicators – expressed as relative risk (RR) or deficit (%). In this analysis, these "coefficients of loss" are applied to the national health, education, demographic and economic environment to develop a scenario describing the magnitude of national economic consequences from the malnutrition status quo. While the human toll is immeasurable, the magnitude of the economic consequences on national economic activity is "modeled" via 4 pathways to economic loss:

- Mortality and disability in children with consequent lost value of a future workforce.
- Child cognitive development deficit resulting in inferior school performance and adult productivity.
- Current value of depressed productivity in working adults.
- Current value of excess and preventable healthcare and welfare utilization.

The sections that follow will analyze the national economic consequences pathway by pathway and indicator by indicator to offer a national Damage Assessment Report (DAR). Projections will be based the algorithm as well as demographic, labor and other economic shown below:

Table 2 Algorithm Used to Project Economic Losses from Each Nutrition Indicator

Number w/ Deficit or Risk		Average Wage		Labor Force Participation Rate		Average Working Life		Coefficient Risk-Deficit		Discount from ~ 15 yrs		Net Present Value of Loss (NPV)
Prevalence (%) x # in Risk Group	X	$4,106	X	61.9%	X	46.5 years	X	RR or % from Literature	X	@ 3%	=	$/yr

These national economic, demographic and labor data points were gathered from INSTAT and applied as follows:

- Average wage of $4106 per year based on average 2008 wage established by the Annual Business Survey 2008 by National Institute of Statistics (Instat) of LEK 27,951 per month and converted to USD at 100 Lek per USD. This was adjusted by 3 year cumulative inflation rate of 10.6% inflation based annual rates reported by INSTAT and Bank of Albania.[2] This average wage is about half the per capita GDP estimate

2 See Annex for inflation rates

(PPP) made by the World Bank for 2008.

- Participation in the labor force, including unemployment, is reported as 72% for males, 53% for women with national average at 61.9% from INSTAT.
- Average working life is reported assumed to begin at the reported legal age of 16 years and extend to 60 years for women and 65 years of age for men. Therefore, the average work life is 46.5 years. It is understood that this is a parameter in flux.
- Discount rate used to calculate Net Present Value is 3% recommended by the World Bank for social investment.[3] This social discount rate is not related to inflation but merely reflects the subjective time preference for current consumption over future consumption or savings.[4]

Projected losses from malnutrition in today's children do not begin until the child enters the work force and subsequently the lost earnings stretch out as much as 60 years in the future. The Net Present Value (NPV) is used to value future lost productivity in present currency units. The NPV "borrows" from the future at a 3% interest rate known as the "social discount rate." This enables a lifetime of future earnings to be expressed as a current annual economic loss. Needless to say, the NPV represents a fraction of "gross" earnings. The formula used to calculate the NPV is as follows:[5]

(# in Risk Group w/ Deficiency X Deficit Coefficient X Labor Participation Rate)
X
Present Value (Discount Rate, Work Life, Annual Wage)
–
Present Value (Discount Rate, Years until Workforce Entry, Annual Wage)
/
 # Annual Cohort in Risk Group

Caveat to the DAR

Converting indicators of malnutrition to economic activity and attaching a monetary value to that economic activity travels a long and winding road. First, monetizing the consequences of malnutrition is dependent on an incomplete evidence base, complex methodologies, and national health, demographic and economic statistics that are sometimes unavailable or unreliable. Second, many factors beyond human potential determine earnings or work performance. Work place incentives, available technology and sense of opportunity all effect how increased human performance potential

3 World Bank, Development Report 1993: Investing in Health. Oxford University Press World Bank 1993
4 Ross et all, Calculating the Consequences of Micronutrient Malnutrition on Economic Productivity, Health and Survival, AED 2003
5 See Excell Sheet AlbDAR.xls

translates into actual improved productivity and earnings. Finally, benefits of improved nutrition extend beyond the workplace to a range of "voluntary" activities including parenting and household activities to educational improvement, entrepreneurial pursuits and community participation. In a world where improvement in nutrition, health and subsequent productivity will emerge mainly from individual choices and behaviors, the significance of these "voluntary" activities cannot be overstated. However, these are not captured in the DAR analysis which focuses on monetary earnings only. For all these reasons and more, the margin of error is large and the calculations should be considered as an order of magnitude. These are projections to focus and facilitate policy discussion.

Over the next decades, a growing Albanian economy will doubtless lower this human and financial burden. However, nutrition status will respond relatively slowly. A recent World Bank analysis of malnutrition and economic growth in 79 countries concluded "that income growth can play an important role in malnutrition reduction, but that it is not enough. Increases in the number and effectiveness of direct nutrition interventions have a crucial role to play if nutrition goals are to be met."[6] According to the *Disease Control Priorities Project*, "Progress has been made in some areas, but the current magnitude of the problems and of the associated disease burden underscores the need for more investment in nutritional interventions."[7]

6 Harold Alderman, Simon Appleton, Lawrence Haddad, Lina Song and Yisehac Yohannes Reducing Child Malnutrition: How Far Does Income Growth Take Us? Centre for Research in Economic Development and International Trade, University of Nottingham CREDIT Research Paper No 105

7 Laura E. Caulfield, Stephanie A. Richard, Juan A. Rivera, Philip Musgrove, and Robert E. Black, Stunting, Wasting, and Micronutrient Deficiency Disorders, Disease Control Priorities in Developing Countries, 2006

02. Child Mortality Attributable to Malnutrition

Malnutrition rarely specified as a cause of death. However, the close association of malnutrition, infection, disease and premature death of children has been extensively documented with a range of analysis demonstrating that malnutrition is the underlying cause of more than half of all child deaths worldwide.[10] Of the estimated 36,251 thousand children born in Albania annually, 798 children die before their 5th birthday. More than 80% die as infants during the first year of life. And the first month of life is the most dangerous - half of all child deaths occurring in the first month. How many of these deaths are associated with malnutrition in children and their mothers? The sections that follow apply coefficients for higher risk of mortality that has been developed in the scientific literature for 5 indicators of malnutrition to paints a picture of child mortality that can be attributed to current prevalence of malnutrition in Albania.

Table 3 Child Mortality in Albania [8,9]

Age Segment	Rate/1000	Annual Projected Mortality
Child Mortality: < 5 Years	22	798
Infant Mortality: < 1Year	18	653
Neonatal Mortality: < 1 mos	11	399
Post Neonatal: 1-12 months	7	254
Perinatal Mortality: < 1 week	11	399

2.1 Underweight

For children less than 5 years of age underweight, defined as at least one standard deviation or more below expected weight for age, is a significant risk factor for mortality. A recent meta-analysis found that the relative risk of death for underweight children was 10 times for severe underweight (<-3 SD), 2.5 times for moderately underweight (<-2 SD), and 1.8 times for mildly underweight (<-1SD).[12] However, this analysis includes all causes of death including malaria, measles and diarrhea which are not considered major risks in Albania. Therefore, the DAR is based on the lower relative risks for pneumonia – a major cause of childhood death in Albania. Our calculations are as follows:

Table 4 Relative Risk of Mortality for Underweight Children from Various Causes [11]

	Severe < 3 SD	Moderate <2 – 3 SD	Mild < 1-2 SD
Overall	9.7	2.5	1.8
Diarrhea	9.5	3.4	2.1
Pneumonia	6.4	1.3	1.2
Malaria	1.6	1.2	0.8
Measles	6.4	2.3	1.3

8 DHS 2009 and INSTAT birth rate for 2008
9 DHS 2009 is higher than MOH reports for in-hospital births 10.3/1000 or 374/year.
10 Pelletier, D. L . A methodology for estimating the contribution of malnutrition to child mortality in developing countries. J Nutr. 124:2106S-2122S, 1994..
11 Robert E Black, Lindsay H Allen, Zulfiqar A Bhutta, Laura E Caulfield, Mercedes de Onis, Majid Ezzati, Colin Mathers, Juan Rivera, Maternal and child undernutrition: global and regional exposures and health consequences Maternal and Child Undernutrition Study Group, Lancet Published OnlineJanuary 17, 2008
Maternal and Child Undernutrition Study Group, Lancet Published OnlineJanuary 17, 2008
12 Ibid

- Based on an estimate of 163 thousand children 6-59 months of age, we calculate more than 14 thousand children are underweight.[13]
- Based on the data available in DHS 2009, and the assumption that 2/3rd of post-neonatal deaths are from months 1-6, the DAR estimates a mortality rate of 6/1000.[14]
- Applied to an estimated cohort of 163 thousand Albanian children 6-59 months of age, this mortality rate suggests that 230 annual deaths in this cohort.
- Based on the relative risks for mortality and prevalence of underweight shown in Table 5 below, the DAR model calculates a Population Attributable Risk (PAR) ranging from about 1% for mild and moderate cases up 8% for severe underweight.

These parameters are summarized in Table 5 showing separate PAR for mild, moderate and severe underweight yielding a projection of 23 deaths attributed to underweight. The toll is particularly severe on the approximately 27 hundred severely underweight children - representing more than 80%of these deaths.

Table 5 Calculation for Mortality from Current Prevalence of Underweight in Albania

Demographic Data and Assumptions			
Children 6-59 months	163,130	4.5 years x 36,251 annual births	
Estimated Number of Deaths from 6-59 Months	230	6/1000 deaths 6-59 month[15]	
Prevalence		**Number Children At Risk**	
Mild Underweight (assume Mild = Moderate)	3.5%6	5,355	
Moderate Underweight (DHS 2009)	3.5%	5,355	
Severe Underweight (DHS 2009)	1.7%	2,601	
Co-efficient for Loss	**RR Death**	**PAR**	**Attributed Deaths**
Mild Underweight	1.2	0.7%	2
Moderate Underweight	1.3	1.0%	2
Severe Underweight	6.4	8.4%	19
Annual Mortality Attributed to Underweight			23

2.2 Low Birth Weight

Often associated with maternal anemia, 3.5% of 36,251 births in Albania result in low birth weight infants weighing less than 2500 grams. These 1,260 babies will suffer significantly higher risk for mortality. Recent literature concludes that compared to normal weight births, babies weighing 1500–1999 grams were 8.1 times more likely to die and those weighing 2000–2499 grams were 2.8 times more likely to die during the first month of life than newborns weighing over 2500 grams.[17] Another review of 12 data sets concluded 2 times higher risk over the subsequent 11 months.[18] Our calculation is as follows:

13 With declining birthrate we calculate this population based on 2008 birth rate of 36,251 multiplied by 4.5 years.
14 Child Deaths(22) minus Neonatal Deaths(11) minus 2/3rd Post Neonatal Deaths (3.5) = 6
15 Calculation shown on Page 5
16 Assume mild (< 1 SD) same as moderate (1-2 SD)
17 Black et al Maternal & child undernutrition: global and regional exposures and health consequences Maternal and Child Undernutrition Study Group, Jan 17, 2008
18 Ashworth, A. Effects of Intrauterine Growth Retardation on Mortality and Morbidity in Infants in Young Children. European Journal of Clinical Nutrition. 1998.

- Relative risk of 2.8 applied to the prevalence of low birth weight yields a PAR of 5.9% for neonatal deaths (assuming no births with higher risks of < 2000g).
- Applied to estimate of 399 neonatal deaths (11/1000) yields an estimate of 24 deaths.
- Relative risk of 2 for children more than one-month yields a PAR 3.4% of post-neonatal deaths.
- Applied to estimate of 254 deaths of children 1-12 months yields estimate of 9 deaths.[19]
- The parameters for this calculation projecting 32 deaths per year as a result of low birth weight deliveries are shown in Table 6 below.

Table 6 Calculation for Deaths in Children Attributed to Low Birth Weight	
Background Data	
Prevalence of Low Birth Weight	3.5%[20]
Annual Cases of Low Birth Weight	1,269
Estimated Over-All Neonatal deaths per year (< 1 month)	299[21]
Estimated Post-NeoNatal Deaths (1-12 months)	254[22]
Loss Coefficient or Risk	
Relative risk of neonatal death of LBW v non-LBW infants (< 1 month)	2.8
Relative risk of post-neonatal infant death of LBW v non-LBW infants (1-12 months)	2
PAR of neonatal deaths attributable to LBW	5.9%
PAR of post-neonatal infant deaths attributable to LBW	3.4%
Attributable Deaths	
Number of neonatal deaths attributable to LBW	24
Number of post-neonatal infant deaths attributable to LBW	9
Number of infant deaths attributable to LBW	32[23]

2.3 Perinatal Mortality Attributed to Anemia in Pregnancy

Perinatal death is a major cause of child death in Albania with DHS 2009 finding rate of 11/1000 births. A recent meta-analysis of 10 studies quantified the often observed association of anemia during pregnancy and perinatal death and analysis concluded that where malaria is not a significant threat, as is the case in Albania, perinatal mortality decreases 16% for every 1 gram per deciliter increase in hemoglobin – a relative risk of 0.84.[24]

The prevalence of anemia among pregnant women in Albania was surprisingly found by DHS 2009 to be 11.9%, less than for the general population of women of reproductive age more than 17%.[25] Based on a small study by Buonomo et al in 2005 finding 61% anemia from iron deficiency, the DAR uses

19 SDSH 2009
20 Ibid
21 Ibid
22 Ibid
23 Note rounding error
24 Stoltzfus RJ, Mullany L, Black RE. Iron deficiency anaemia. In: Ezzati M, Lopez AD, Rodgers A, Murray CLJ, eds. Comparative quantification of health risks Geneva: World Health Organization, 2004: 163–209.
25 SDSH 2009

a series of algorithms to calculate a 0.67 gram per deciliter difference between current mean hemoglobin and projected mean in the absence of iron deficiency anemia. This 0.67 gram "deficit" in hemoglobin is applied to the coefficient of risk taken from the literature, the RR of 0.84, to project a PAR of 11%. Based on the overall estimate of 399 annual perinatal deaths, this suggests 44 perinatal deaths associated with maternal anemia.

Table 7 Calculation for Perinatal Deaths Attributed to Maternal Anemia	
Health Background Data	
Estimated Perinatal Mortality rate per 1000 live births	11
Total Perinatal death	399
Prevalence of anemia among pregnant women:	11.9%
Proportion of maternal anemia due to iron deficiency	73%
Coefficient for Loss	
Mean hemoglobin level at current prevalence:	13.2
Mean hemoglobin level in absence of iron deficiency:	13.7
Difference in mean hemoglobin in absence of iron deficiency:	0.67
RR of perinatal mortality associated with a 1 g/dL increase in hemoglobin:	0.84
Proportion of perinatal mortality due to iron deficiency anemia: Population Attributable Risk(PAR)	11%
Total Perinatal Deaths Attributed to Anemia	44s

2.4 Mortality Attributed to Sub-Optimal Breastfeeding

Table 8 Summary Relative Risk of Infant Mortality by Breastfeeding Behavior [26]				
	0- 6 months			6-23 months
	Predominant	Partial	None	None
Diarrhea	2.28	4.62	10.53	2.83
Pneumonia	1.75	2.49	15.13	1.52
All Mortality	1.48	2.85	14.4	3.68

Evidence from both developing and developed countries shows the critical life saving significance of exclusive breastfeeding during the first 6 months. A recent meta-analysis looking at studies from multiple counties concluded that the increased mortality risk for non-breastfed versus exclusively breastfed babies ranged from 10.53 for diarrhea, 15.13 for pneumonia and 14.4 from all causes.[27] The risks were lower, but still significant for predominant and partial breastfeeding - ranging from RR 1.48 to 2.28. After the first 6 months, babies who are not breastfed are also at higher risk of mortality than partially breastfed infants – though the risk not as acute as during the first 6 months. The DAR uses relative risks for pneumonia, the most common cause of childhood death in Albania and applies only to children less than 6 months of age.

26 Robert E Black, Lindsay H Allen, Zulfiqar A Bhutta, Laura E Caulfield, Mercedes de Onis, Majid Ezzati, Colin Mathers, Juan Rivera, Maternal and child undernutrition: global and regional exposures and health consequences Maternal and Child Undernutrition Study Group, Lancet Published OnlineJanuary 17, 2008

27 Ibid

The DHS 2009 found that virtually all Albanian infants were breasted during the first month life – 68% exclusively and 32% partially. However, after the first month, exclusive breastfeeding data rates drop to about 17% - with 75% of mother partially breastfeeding and 8% not breastfeeding at all. Given the substantial differences in breastfeeding rates from the first month to the next 5 months, extremely higher risks associated with no breastfeeding at all (RR 15.3), and lower mortality in the 1-6 month period, the DAR addresses mortality risk for each age group separately.

Table 9 below shows the DAR calculation for children less than one month of age. 31.8% or 11,528 children who are partially breastfed have a 1.75 higher chance of death with a calculated PAR of 19%. Based on the rate of 11/1000 (DHS 2009) or 399 deaths of infants during the first month of life, estimated deaths from all causes among this cohort therefore estimated at 77 deaths associated lack of exclusive breastfeeding.

Table 9 Calculation for Mortality in Infants < 1 month Associated with Sub-Optimal Breastfeeding Behavior

Health Background Data		
Prevalence of Partial Breastfeeding	31.8%	DHS 2009
Births per year	36,251	
Non Exclusively Breastfed Infants	11,528	
Neonatal deaths per year (< 1 month)	399	11/1000 DHS 2009
Loss Coefficient or Risk		
Relative risk of neonatal death of LBW v non-LBW infants	1.75	Lancet
PAR of neonatal deaths attributable to LBW	19.3%	
Number of neonatal deaths attributable to LBW	**77**	

Table 10 below shows parameters for breastfeeding related deaths of infants 1-6 months, - when exclusive breastfeeding rates drop to 17.6% and almost 8% of infants are not breastfed at all. Since, we are comparing 3 behavior groups – exclusive, partial/predominant, and no breastfeeding the structure of the calculation is a bit different. We estimate mortality rate of 6/1000 for this ages (2/3rd of the post-neonatal death rate of 7/1000 reported in DHS 2009) suggesting 169 children die during these perilous 5 months. While about 6 thousand are protected with exclusive breastfeeding, 25.4 thousand face an increased mortality risk of 1.75. And for 2.6 thousand who receive no breastfeeding at all, the risk of death is more than 15 times that of an exclusively breastfed child. Our calculation is as follows:

- Based on the over-all mortality risk, we calculate that 11 of the 17.6% exclusively breastfeeding infants will die from other causes.

- From 83 estimated over-all deaths in the partial breastfeeding group and Relative Risk 1.75 we calculate a PAR of 36% and attributed deaths of 30 annually.

- From 75 estimated over-all deaths among the small non-breastfed group we apply a very high Relative Risk of 15.3 for a PAR of 52%. From this we calculate that 39 deaths from the approximately 2800 infants 1-6 months who receive no breastfeeding at all.

The parameters for our estimate of 69 annual deaths attributed to breastfeeding behaviors in children < 6 months are shown in Table 10 below.

Table 10 Calculation for Mortality in Infants 1-6 months Associated with Sub-Optimal Breastfeeding Behavior

Breastfeeding Status			Estimated Deaths From All Causes	RR Mortality	Calculated PAR	Projected Deaths Due Breastfeeding Status
Status	%	#				
Exclusive	17.6%	6,380	11	1		
Partial/Predominant	74.7%	27,079	83	1.75	36%	30
None	7.7%	2,791	75	15.3	52%	39

2.5 Neural Tube Defects: Indicator not included in DAR

Neural Tube Defects (NTD) including serious birth defects such as spina bifada and anencephaly are a significant cause of death and disability worldwide. Evidence clearly demonstrates that providing additional folic acid can avert most cases.[28] Based on partial data from Tirana Institute of Rehabilitation the DAR applies an NTD rate of 1.07/1000 births to the 36 thousand an estimated annual births for an estimate of 39 infants born annually with spina bifada, anencephaly or other serious birth defects.

There is little data on the fate of children born with neural tube defects in Albania. Based on communications with stakeholders the DAR assumes mortality in half the cases - with survivors equally segmented into severe and moderate lifelong disability. Parameters for estimates to arrive at a rough estimate of 19 deaths annually from folic acid deficiency related NTDs – along with 20 lifelong disabled – shown in Table 11 below.

Table 11 Parameters for Estimate for Burden of Neural Tube Defects (Spina Bifada & Anencephaly)

Annual NTD Rate/1000	1.07
Calculated Annual NTDs in Albania	39
Percentage of Disabled with Access to Surgery (births in facility)	96.7%
Proportion/Number Deaths	50% –19
Proportion/Number Severe Disability	25%-10
Proportion/Number Moderate Disability	25%-10

28 Medical Research Council Vitamin Study Research Group. Prevention of neural tube defects: results of the Medical Research Council Vitamin Study. Lancet. 1991;338:131–137.

2.6 Summary of Child Mortality Attributed to 5 Malnutrition Indicators

Based on the analysis of 5 indicators above, the table 12 below summarizes findings of morality attributable to child and maternal nutrition. Of 798 deaths in this age group the 5 indicators of malnutrition may represent 262, about 1/3rd of childhood mortality. Most of these are preventable with effective and inexpensive nutrition interventions.

Table 12 Total Estimated Deaths Attributed to 5 Malnutrition Indicators

	Annual Deaths of Children	% Nutrition Related Deaths
Perinatal Mortality	44	5%
Sub Opt BF	146	18%
Underweight/PEM	23	3%
LBW	32	4%
NTD	19	2%
Total	264	33%
Total Annual Child Deaths (< 5 yrs)	798	

2.7 Estimating Value of Workforce Lost to Child Mortality

What is the national economic impact of 26 child deaths? While the loss is immeasurable, in cold economic terms these childhood deaths simply represent a lost future workforce. The algorithm used in projecting the financial value of lost earnings potential of children as shown below.

Table 13 Algorithm Used for Value of Lost Workforce due to Child Mortality

Child Deaths Attributed to Malnutrition	X	Average Wage	X	Labor Force Participation Rate	X	Discount rate 45 yr work life from ~ 15 yrs old	=	Net Present Value of Losses (NPV) (000,000)
262		$4,106		61.9%		46.5years @ 3%		$8.35 million/yr

This calculation produces a Net Present Value (NPV) of $8.35 million annually in lost future earnings. The projection assumes 46.5 years of lost wages at $4106 per year for 61.9% of these children that are projected to be wage earners. In other words this economic calculation attributes no value at all to 38% of these child deaths – those who are not projected to be economically active. An economic analysis does not begin to measure the value of human life.

03. Depressed Future Productivity of Children

Malnutrition coincides with many health and economic deprivations which also retard children's growth and development. Isolating the "nutrition factor" or the "child development factor" is complicated by the countless interactions of nutrition, nature and nurture. However, there is substantial evidence that after correction for poverty and associated threats, nutrition has independent and additive impacts on child cognition and development.[29]

Weak health and poor nutrition diminish children's cognitive development through physiological changes, by reducing the ability to participate in learning experiences, or both. Even in mild or moderate cases, malnourished children score poorly on tests of cognitive function, psychomotor development and fine motor skills. They show lower activity levels, interact less frequently with their environments and thus fail to acquire physical and intellectual skills at normal rates. In large part these early childhood deficits determine their ability to capitalize on educational opportunities, later employment opportunities – resulting in an adult productivity deficit.

This analysis focuses on childhood anemia and stunting - indicators strongly associated with depressed cognition, inferior school performance and reduced future earnings. At current prevalence rates for these two indicators, ~ 1 of 5 Albanian children will not have the opportunity to grow to their full intellectual and productive potential.

3.1 Stunting or Small Stature

A number of studies have documented a direct association between lower adult height and reduced earnings in physical labor.[30] However, the full economic impact of stunting is better understood through links with reduced cognitive development and inferior school performance. Numerous studies have directly associated stunting with lower test scores in childhood cognition. A recent pooled analysis from 5 countries concluded that "being moderately or severely stunted was associated with lower scores for cognition in every study and the effect size varied from 0.4 to 1.05 SD."[31] Substantial evidence shows stunted children start school later, progress through school less rapidly and have lower over-all schooling attainment. A review of evidence from 79 countries concluded "for every 10% increase in stunting, the proportion of children reaching the final grade of primary school dropped by 7.9%."[32] Most recently, an authoritative review in the Lancet found that stunted children suffer a grade and school performance deficit of 2.91 years with each year of lost schooling decreasing future wages by 8.3%.[33] The review concludes that for a stunted child the impact in

29 Grantham- McGregor et al, Developmental Potential in the first 5 Years for Children in Developing Countries, The Lancet, VOl 369, 2007
30 Behrman (1993), Behrman and Deolalikar (1989), Deolalikar (1988), Foster and Rosenzweig (1993), Glick and Sahn (1997), Haddad and Bouis (1991), Schultz (1996), Strauss and Thomas (1998) and Thomas and Strauss (1997)
31 Psacharopoulos G, Patrinos H. Returns to investment in education: A further update. Educ Econ 2004; 12:111–34.
32 Ibid
33 Grantham- McGregor et al, Developmental Potential in the first 5 Years for Children in Developing Countries, The Lancet, VOl 369, 2007;

"the total percentage loss of adult yearly income (compounded)," is 22.2%. The DAR uses this last conclusion as the coefficient of deficit.

According the DHS 2009, 19.3% or more than 31 thousand of 163 thousand Albanian children aged 6 -59 months are stunted. Applying 22.2% deficit to this cohort yields depressed productivity to the national economy with a NPV of almost $58 million annually. NPV of individual losses are $1831 per child.

Table 14 Algorithm Used to Project Future Productivity Losses from Stunted Children

Number Stunted Children	X	Average Wage	X	Labor Force Participation	X	Annual Deficit Adult Earning	X	Discount 46.5 yr work life from 16 yrs old @ 3%	=	Net Present Value of Losses
31,484		$4,106		61.9%		22.2%		3%		$57.7 milion/vit

3.2 Anemia in Children:

A range of evidence links anemia in children to future productivity deficits as adults. The evidence shows a direct link of anemia-related cognitive development deficits with future earnings as well as an indirect relationship mediated by education:

- Anemia and Cognitive Development: A review of observational studies concluded anemic children score 0.5 to 1.5 standard deviations lower on intelligence tests.[34] A parallel body of literature documents the positive impact of iron intervention on cognitive scores, generally ranging from 0.5 to 1 SD.[35] The *Journal of Nutrition* found, "available evidence satisfies all of the conditions needed to conclude that iron deficiency causes cognitive deficits and developmental delays.[35]"

- Anemia and School Performance: Substantial literature links anemia and the ability of children to capitalize on educational opportunities. In addition to diminished cognitive ability, lack of energy undermines an anemic child's ability to concentrate and participate in learning experiences. A recent study linked anemia with significantly reduced school attendance.[37]

- Cognitive Scores and Future Earnings or Productivity: The association of childhood cognitive scores and productivity has been extensively documented. A recent review of the global literature by Galal et al linking cognitive test scores and earnings concludes

34 Pollitt, Ernesto Relationship Between Undernutrition and Behavioral Development in Children, Journal of Nutrition, August, 1995 Volume 125
35 Annex 7 provides descriptions and sources for a number of individual studies
36 Haas, J. and Brownlie T., Iron Deficiency and Reduced Work Capacity: A Critical Review of the Research Journal of Nutrition. 2001;131:676S-690S
37 Bobonis et al, Anemia and School Participation, Journal of Human Resources, Feb 2006

that a "0.25 SD increase in IQ… would lead to a 5%-10% increase in wages."[38]

A literature review from child psychology, nutrition and economic science, concluded that IDA related development deficits in children less than 5 years old children are associated a 4% drop in earnings.[39] Several intervention studies show that iron supplementation led to cognitive improvements which into adolescence with a correlation coefficient 0.62.[40] Therefore, the DAR corrects the original 4% deficit by a factor of 0.62 to arrive at a 2.5% decrease in wages for children less than 15 years of age.[41]

The 2009 DHS reports 17.4% of Albanian children suffer anemia. This suggests more than 131 thousand children age 6 months up to 15 years will not live up to their productive potential.[42] We estimate an NPV for lost earnings of about $7.2 million annually.

A small study by Buonomo et al in young children found that 61% of anemia from iron deficiency. This is the only available data to estimate the proportion of anemia from iron deficiency. However, stakeholders feel that based on their knowledge of the domestic situation, this study reports to low an attribution to IDA. In fact, WHO estimates that worldwide, 60% of anemia is caused by iron deficiency. [43] WHO recognizes that there is wide regional variation. Moreover, this global WHO estimate includes data from countries with high rates of other causes of anemia such as malaria, intestinal parasites and vitamin A deficiency – not the case in Albania. Therefore, we believe the 61% found in Buonomo may be low and with no hard data simply adjusts this figure upwards by 20% to assume 73% of anemia from iron deficiency.

Based on this assumption, we project NPV of losses from 95,616 children with IDA will suffer earnings deficits of nearly $5.2 million annually.[44] While the deficit for each child is about $55, given the wide prevalence of anemia and large numbers of involved, these relatively modest deficits accumulate with significant impact on the national economy. Parameters for this estimate of NPV lost to anemia and iron deficiency anemia is shown in Table 15 below.

38 G Osman M. Galal et al Proceedings of the International Workshop on Articulating the Impact of Nutritional Deficits on the Education for All Agenda, Food & Nutrition Bulletin Vol. 26, no. 2 (Supplement 2), June 2005
39 Horton & Ross The Economics of Iron Deficiency Food Policy 28 (2003) 51–75
40 Pollitt et al. 1995 and Jensen, 1980 in Horton & Ross The Economics of Iron Deficiency Food Policy 28 (2003) 51–75
41 Horton & Ross The Economics of Iron Deficiency Food Policy 28 (2003) 51–75
42 752,318 calculated from INSTAT
43 Stoltzfus et al, Iron Deficiency Anaemia, in Global Burden of Disease, WHO 2004
44 A small study by Buonomo et finding 61% of anemia from iron deficiency provides the only data on the proportion of anemia from iron deficiency in Albania. However, given the WHO global projection of 60% includes malaria, parasites, vitamin A deficiency and HIV as causes of anemia. Since these conditions are considered rare in Albania, stakeholders feel that this 61% figure found by Buonomo is low. Therefore, we arbitrarily adjust the Bunonomo's figure by 20% and apply 73% of anemia from iron deficiency in our calculations.

Table 15 Algorithm Used to Project Future Productivity Losses from Anemia and IDA Children										
# Anemic Children	X	Average Wage	X	Labor Force Participation	X	Annual Deficit Adult Earning	X	Discount 46.5yr work life from 16 yrs old	=	Net Present Value of Losses
Anemia: 130,903 IDA: 95,616		$4,106		61.9%		2.5%		3%		Anemia: $7.2 million/yr IDA: $5.23 million/yr

3.3 Long Term Disability from Folic Acid Related Neural Tube Defects

One half or 20 children projected to survive anencephaly and spina bifada at birth face life long disability and related productivity deficits. We assume that 10 children will be severely disabled suffering a total (100%) productivity loss and the other half moderately disabled suffer a 50% productivity loss. For severe disability, NPV for a 46.5 year work life (parallel to the algorithm for mortality) yields an annual productivity deficit of ~$295 thousand for 10 cases. For the additional 10 cases of moderate disability projected at 50% loss of productivity, the NPV is half that amount. We roughly project NPV of annual productivity losses from long-term disability at $450 thousand. These estimates are summarized in the table 16 below.

Table 16 Algorithm Used to Project Future Productivity Losses from Anemia and IDA Children										
# Disabled Children	X	Average Wage	X	Labor Force Participation	X	Annual Deficit Adult Earning	X	Discount 46.5yr work life from 16 yrs old	=	Net Present Value of Losses
Moderuar: 10 E rëndë: 10		$4,106		61.9%		Moderuar: 50% E rëndë: 100%		3%		$449,790

04. Depressed Current Productivity: Anemia in Adult Workers

Weakness, fatigue and lethargy brought on by anemia result in measurable productivity deficits in the manual labor. Aerobic capacity, endurance and energy efficiency are compromised 10-50%.[45] A substantial literature shows the negative impact of anemia on indicators of work performance. The output of iron supplemented rubber tree tappers involved in heavy manual labor in Indonesia was found 17% higher than non-supplemented co-workers.[46] There is also evidence anemia impairs less physically demanding work in "blue collar labor" or manufacturing.[47] [48] [49] Based on an extensive review of the literature, Ross & Horton estimate a 5% deficit among all manual or "blue collar" manufacturing work and an additional 12% loss for heavy manual labor such as agriculture and construction.[50]

The national prevalence of anemia has been established at 19% for women and 4.7% for men.[51] Based on our assumption of 73% of anemia from iron deficiency, of about 2 million working age adults in Albania, about 250 thousand are anemic and 182 suffer anemia as a result of iron deficiency. However, the DAR applies productivity deficits only to anemic adults who are actually employed. With only 53% labor participation rate among adult women and 72% in men, there are number of actual anemic workers is 141 thousand with 103 thousand those anemic due to iron deficiency.

Table 17 Manual Labor Share Calculations

Sector	% Labor Force (INSTAT)	Estimated % Manual (authors assumption)	% Manual
Ag/For Fishing	44.70%	95%	42.47%
Trade	11.70%	20%	2.34%
Manufacturing	7.10%	90%	6.39%
Construction	8.40%	90%	7.56%
5 Other categories			2.3%
% Manual			61%

While there is reason to believe anemia has a negative impact on all kinds of work performance, the published evidence is limited to "blue collar" or manual work requiring physical exertion. Based on 2INSTAT report of proportion of labor force employed in various economic sectors shown in Table 16, the DAR makes educated a series of assumptions which project about 61% of workers employed in jobs requiring physical

45 Celsing F., Blomstrand E., Werner B., Pihlstedt P. Effects of iron deficiency on endurance and muscle enzyme activity Med. Sci. Sports Exerc. 1986;18:156-161
46 Basta S. S., Soekirman D. S., Karyadi D., Scrimshaw N. S. Iron deficiency anemia and the productivity of adult males in Indonesia. Am. J. Clin. Nutr. 1979;32:916-925
47 Li R., Chen X., Yan H., Deurenberg P., Garby L., Hautvast J.G.A.J. Functional consequences of iron supplementation in iron-deficient female cotton workers in Beijing, China. Am. J. Clin. Nutr. 1994;59:908-913
48 Scholz B. D., Gross R., Schultink W., Sastroamidjojo S. Anaemia is associated with reduced productivity of women workers in even less-physically-strenuous tasks. Br. J. Nutr. 1997;77:47-57
49 Unturo J., Gross R., Schultink W. The association between BMI and hemoglobin and work productivity among Indonesian female factory workers. Eur. J. Clin. Nutr. 1998;52:131-135
50 Ross L Horton S The Economic Consequences of Iron Deficiency, Micronutrient Initiative 1998
51 SDSH 2009

exertion or endurance. Based on this assumption in Table 17 the DAR narrows down the population with anemia in manual labor to about 51 thousand workers. 15% these assumed to be engaged in heavy labor in construction, agriculture and other sectors" involving significant exertion, energy and endurance.

The calculations above define the group of employed adults with anemia and iron deficiency related work performance deficits. Nearly 63 thousand adult men and women with iron deficiency anemia are engaged in manual jobs suffer productivity deficits estimated at 5% suggesting losses of about $13 million annually. About 13 thousand of these jobs are projected to be heavy manual labor where the evidence indicates an added 12% deficit, or an additional $6 million in work performance deficits. As shown in Table 17 below, these modest 5-17% deficits accumulate into national losses from iron deficiency anemia of nearly $19 million. If all anemias are included, this loss to national economic activity is more than $26.4 million annually.

Table 17 Current Adult Productivity Loss from IDA

	Women	Men	Totals
Health Data Background			
Prevalence of anemia in women	19.0%	4.7%	
% with Iron Deficiency Anemia @73%%	14%	3%	
Demographic and Labor Data Background			
Working Age Adults	1,054,568	1,045,420	2,099,988
Labor Participation Rate/Economically Active	53%/556,812	72%/753,748	1,310,560
Manual Labor Share/Manual Laborers	61%/ 339,637	61%/459,761	799,398
Heavy Manual Labor Share of Overall Manual Labor	15%/ 50,946	15%/68,964	119,910
Economic Productivity Loss Projections			
Workers with IDA in Manual Labor	47,136	15,784	62,919
Productivity Deficit in Manual Labor @ 5%	$9,677,872	$3,240,721	$12,918,593
Workers with IDA in Heavy Manual Labor	9,680	3,241	12,921
Additional Loss for Heavy Manual Labor @ 12%	$4,769,808	$1,597,213	$6,367,021
Total Productivity Losses from IDA	$14,447,680	$4,837,934	**$19,285,614**
Total for Losses from All Anemia			**$26,402,924**

05. Excess Healthcare Expenditures

Malnutrition in children contributes to impaired immunity and infection. Consequently, malnourished children may suffer more frequent or more severe illness which in turn translates into increased utilization of health services. This can generate a significant financial burden on the individual families as well as the health and medical system. The DAR found little specific national medical and hospital cost data and therefore the estimates below are considered speculative.

5.1 Excess Healthcare Costs Due to Suboptimal Breastfeeding

Table 18 RR of Diarrhea and ARI by Breastfeeding Status[52]

Breastfeeding Behavior and Age Segment	Diarrhea Cases	ARI Cases
	RR	RR
0-6 months: No Breastfeeding	3.65	2.07
0-6 months: Partial Breastfeeding	1.26	1.79
6-12 months: No Breastfeeding	1.2	1.17

A long literature has documented the association of suboptimal breastfeeding and increased morbidity from acute respiratory disease and diarrhea. For children 0-6 months, the most recent authoritative review in the Lancet finds that partially breast feed infants have a relative risk of RR of 1.26 for diarrhea morbidity and the risk triples for those not breastfeeding at all. For ARI the relative risk of morbidity is 1.79 for partial breastfeeding while infants with no breastfeeding are twice likely to suffer respiratory disease. For older children 6-12 months, the risks are lower but still RR of 1.2 for diarrhea and RR of 1.17 ARI place higher risks of morbidity on sub optimally breastfed infants.

Based on segmented DHS 2009 reports of diarrhea or ARI in children 0-6 months and 6-12 months over the past two weeks, the DAR extrapolates an annual national burden 64,799 as shown in Table 18 below. How many of the cases above can be attributed to the higher risks of morbidity related to suboptimal breastfeeding behaviors?

Table 19 Calculation for Total Number of Diarrhea and ARI Cases in Children < 1 Year

	Diarrhea		ARI		
	0-6 months[53]	6-12 mos	0-6 months	6-12 months	Total
% Had Diarrhea in past 2 weeks (DHS)	8.3%	6.4%	3.6%	9.2%	
Projected per child over 6 mos	1.08	0.83	0.47	1.20	
Case Over Birth Cohorts	19,557	15,080	8,483	21,678	64,799

Using the same methodology to compare 3 groups applied to in projecting deaths from suboptimal breastfeeding behaviors in 1-6 month olds, the DAR project 7077 excess cases of diarrhea and ARI as follows:

52 Robert E Black, Lindsay H Allen, Zulfiqar A Bhutta, Laura E Caulfield, Mercedes de Onis, Majid Ezzati, Colin Mathers, Juan Rivera, Maternal and child undernutrition: global and regional exposures and health consequences Maternal and Child Undernutrition Study Group, Lancet Published OnlineJanuary 17, 2008

53 Assume 17,000 children in each 6 month cohort.

- With calculated PAR of 16-17% for non-exclusive breastfeeding in children 0-6 months, about 2800 of the 19.6 thousand expected diarrhea cases are projected to be attributable to suboptimal breastfeeding behaviors. While the risks are higher for no breastfeeding, about ¾ of cases are from the much larger partially breastfed group.

- Of about 8.5 thousand estimated ARI cases among 0-6 months, we calculate PARs of 37% and 7.6% to projected 2579 cases attributable to suboptimal breastfeeding. While the risks are higher for no breastfeeding, about 90% of cases are from the much larger partially breastfed group.

- Of about 37 thousand estimated cases of ARI and diarrhea among 6-12 month olds, we project 1690 cases among the 26% of children who are not breastfed at all during this time. While the risks and PARs are lower in this age group, the incidence of ARI and diarrhea increases.

Background to this calculation in the DAR is shown in Table 20 below. .

Table 20 Cases of Diarrhea and ARI Among Children 0-6 months Attributed to Breastfeeding Behavior

	# Children by BF Status	Expected # Cases	Relative Risk	PAR	BF Attributed Cases
Diarrhea Cases by BF status					
Exclusive: 17.6%	5,984	2,462	1		
Partial: 74.7%	25,398	13,164	1.26	16.3%	2141
None: 7.7%	2,618	3,931	3.65	16.9%	666
ARI Cases by BF status				**subtotal**	2807
Exclusive	5,984	893	1		
Partial	25,398	6,784	1.79	37.1%	2518
None	2,618	809	2.07	7.6%	62
				subtotal	2579
Cases of Diarrhea and ARI Among Children 6-12 months Attributed to Breastfeeding Behavior					
No Breastfeeding: 26.5%	4497				
Diarrhea		15,080	1.2	5%	758
ARI		21,678	1.17	4.3%	933
				subtotal	**1690**
Total Excess Cases					**7077**

The cost of these excess or preventable cases of diarrhea and ARI in children 0-12 months of age is difficult to define because the cost-structure of PHC services is budgeted on a fee-for-service basis and is not fully quantified. However, a cost estimate of $259 thousand per year is ventured

in the table below based on a series of extrapolations and assumptions including:

- DHS 2009 reports 49% of diarrhea and 65% of ARI cases taken to health centers enabling a calculation of 4015 of 7077 cases actually requiring attention of the health system.

- A recent USAID analysis estimated the cost of primary health care visits at $16.15 each and associated drug costs at 36% of overall costs.[54] Presuming each case results in two visits plus medicines the cost per case totals $46.98. This additional caseload suggests about $198 thousand annually in additional costs to the health care system.

- Based on estimates of total cases above and data for total hospital admissions for ARI and diarrhea provided by MOH, the DAR calculates the proportion of children admitted for further hospital treatment ranging from 2-7% for the two age groups and two conditions to estimate 105 admissions attributable to suboptimal breastfeeding behavior.

- DAR applies $187 per hospital visit based on 2005 estimate from WHO CHOICE model, corrected for 5 years of inflation plus an additional $100 for cost of hospital medicines and expendables.[55] The annual cost of breastfeeding-related hospitalizations is about $30 thousand.

- Finally, we estimate pharmacy and other costs of home treatment at $10 per case for the calculated 3062 cases not taken to health centers.

These parameters are reviewed in Table 20 below.

Table 20 Rough Estimates for Health Care Costs for Treating Morbidity Associated with Suboptimal Breastfeeding Behaviors

	Diarrhea	ARI	Total
Total Excess Cases	3565	3512	7077
Treated in Health System[56]	49%	65%	
Excess Cost @ $49.31/Case[57]	1,732	2,283	4,015
Cost to Primary Health System	$85,426	$112,572	$197,998
Hospital Admission from Excess Cases	75	30	105
Cost of Hospitalization @ $287.59/Case[58]	$21,607	$8,662	$30,270
Untreated Cases			3,062
Cost of Home Treated Cases @ $10			$30,615
Total Annual Costs			**$258,883**

54 USAID HII Expenditures for PHC, 2008
55 http://www.who.int/choice/country/alb/cost/en/index.html
56 SDSH 2009
57 USAID HII Expenditures for PHC, 2008
58 3 days hospital bed $187.6 (WHO Choice Model 2005 Plus inflation) + $100 for treatments an drugs (stakeholder Estimate)

5.2 Costs Associated with Low Birth Weight Deliveries

3.5% of infants born in Albania are low birth weight babies, weighing less than 2500 grams. Beyond the associated mortality rate, there are direct costs to the health system of the estimated 1,269 annual cases of low birth weight deliveries. We venture an estimate of $2.33 million annually based on the following parameters:

- Average maternity days spent in hospital is 2 days for normal birth but 10 days for complications like low birth weight – an excess of 8 days.[59]
- Basic hospital cost of $69/dy is based on WHO Choice 2005 corrected for inflation of hospital. The resulting cost of extra days in hospital as a result of low birth weight delivery is about $614 thousand per year.[60]
- Expenses related to referral and transport of cases to hospitals with sufficient pediatric facilities is estimated at $100 per case or nearly $123 thousand annually.[61]
- Incubator for 4 days is estimated at $300 per case or nearly $1.5 million for these 1,269 cases.
- Cost of post-maternity care is estimated at $121 thousand based on two visits to a health care center are the $46.98.
- Only the 96.7% of deliveries in a health care facility are considered in this calculation.

These parameters are reviewed in Table 21 below.

Table 21 Parameters for Cost Estimates Associated with Low Birth Weight Deliveries

Additional Stay in Days	8.50	Maternity Hospital Tirana
Cost of Hospital Bed	$ 69	WHO 2005 Adjusted
Cost of Referral and transports	$ 100	Stakeholder Discussions
Cost Special Treatments (Incubator etc.)	$ 300	Maternity Hospital Tirana
Proportion in Facility	96.7%	Births in Facility, DHS
Cost Per Case for Post Maternity Care	94	2 Visits at USAID Estimates
Projections		
Cost of Extra Days in Hospital for Mother and Child		$613,755
Cost of Incubator/Intensive Care		$1,472,298
Cost of Referral, Transport		$122,692
Cost of Post Maternity Care		$120,999
Projected Burden on Health System		**$2,329,743**

59 Communication from Maternity Hospital Tirana
60 WHO Choice 2005 corrected for inflation http://www.who.int/choice/country/alb/cost/en/index.html
61 Informacion nga Materniteti i Tiranës

5.3 Medical and Welfare Costs Associated with Folic Acid Related Birth Defects.

Surviving cases of Neural Tube Defects (NTD), such as spina bifada and anencephaly, result in significant mortality as well as medical, rehabilitation and other care expenses. In fact, the bulk of the financial burden is related to the medical care and welfare support for the roughly estimated half of NTD births who are projected to survive an average 25 years. While data is thin, assumptions for our estimate of $4.1 million in annual medical and rehabilitation costs for 20 cases, more than $200 thousand annually are as follows:

- Cost of pediatric corrective surgery is estimated at $2000.[61] This cost is applied to the 96.7% of births in medical facilities who are presumed to have access to pediatric surgery to calculate an annual cost of $75 thousand per year. Associated costs of referral and transport to Tirana Hospital at $200 per case add an additional $7.5 thousand.[62]

- Ongoing costs of rehabilitation are estimated at $9800 per case/year by Tirana Institute of Rehabilitation. Presuming an average survival of 25 years, we project NPV of $3.3 million annually for medical care and rehabilitation of these cases.

- Albania provides social security payments for disabled persons according to a defined list of conditions from the Ministry of Social Affairs & Equal Opportunity. While spina bifada and anencephaly are not included, we presume that these will fall under the category the same category as spinal cord injuries which are eligible for payments of Lek 8700 per month. In addition, the ministry provides a subsidy for caretakers working with disabled persons of 9200 Lek/month. The NPV of these to payments of roughly $2148 annually over 25 year estimated survival totals $725,413.

Parameters for our estimate of $4.1 million annually in health care costs associated with surviving cases of spina bifada, anencephaly and other NTDs is reviewed in Table 22 below.

Table 22 Parameters for Projecting Medical and Rehabilitation Costs Associated with Folic Acid Related NTDS

	Per Case	Annual Cost	
Cost of Surgery and Care	$2,000	$75,017	Annual Cost all Cases
Cost of Referrals and Transport	$100	$7,502	Annual Cost all Cases
Cost of Rehabilitation/Care	$9800/vit	$3,309,612	NPV over 25 years 1/2 Cases
Cost of Welfare/Social Security Payments	$2148/vit	$725,413	NPV over 25 years 1/2 Cases
Economic Productivity Loss Projections		**$4,117,544**	

62 Ibid
63 Ibid

06. Summary: National Economic Consequences of Child Malnutrition

At current prevalence for 6 indicators of malnutrition in Albania, the burden on national economy of may total about $107 million annually including all anemia and $97.6 if only iron deficiency anemia is included. This burden represents about 0.7% of GDP. About one-quarter of these are current annual losses from adult productivity deficits and excess medical and welfare costs. The remaining ¾ represents the future losses calculated as an NPV from lost workforce due to child mortality and from lower earnings due to child cognitive and schooling deficits. And these losses accumulate as each new cohort of children fails to make their full potential economic and social contributions. The table 23 below outlines these losses by individual indicator

Table 23 Summary National Damage Assessment Report Based on 6 Indicators of Malnutrition in Albania

	Lost Future Work force	Lost Future Work Potential	Lost Current Productivity in Adults	Excess Health Care Costs	Total (IDA)	Total (All Anemia)
	NPV USD 000,000		USD 000,000			
Perinatal Mortality	$1.38				$1.29	
Stunting		$57.66			$57.66	
Underweight	$0.79				$0.79	
Sub Opt BF	$4.58			$0.258883	$4.84	
Anemia 0-5 Years		$5.25			$5.25	$7.19
LBW 25%	$1.01			$2.33	$3.34	
NTD	$0.59	$0.44979		$4.12	$5.157	
Anemia in Adults			$19.29		$19.29	$26.4
Total					**$97.7**	**$107.3**

Over 10 years, presuming 0.65% population growth the continuing the status quo for national nutrition indicators suggests tragic loss of life and significant economic impacts: [64]

- More than 2700 deaths attributable to indicators of maternal and child nutrition status along with breastfeeding behaviors.
- More than $1 billion dollars in depressed health care costs and depressed economic activity. This rises to $1.1 billion if anemia from any cause is included.

The DAR summary above provides opportunity to develop strategic perspectives on nature of the national burden of malnutrition:

64 Instat for population increase 2007-2008. Recent birth rate increases and decreases are too unstable to extrapoloate.

- *Stunting Represents More than Half the Total Burden.* The economic burden posed by stunting in today's Albanian children is monumental. Stunting is a complex indicator of chronic malnutrition related to maternal health, nutrition, behaviors and genetic make-up as well as child health, nutrition and environmental factors as well as intergenerational influences.
- *Anemia is a Major Economic Burden:* Iron deficiency anemia in pregnant women, children and working adults represents more than ¼ of the economic burden of malnutrition. If all anemias are taken into account this proportion rises to 1/3rd of the total economic impact of malnutrition.
- *Mortality Indicators:* The economic impact of low birth weight, underweight, neural tube defects and suboptimal breastfeeding accounts for about 8% of the estimated economic burden. While the economic impact is limited, these indicators account for nearly all the nutrition related mortality. This burden of preventable deaths cannot be fairly and realistically valued with the economic methodology.

The results also offer some perspectives on strategic opportunities to lower the burden of malnutrition and sub-optimal child development.

- *Stunting Reduction Strategies:* High losses mean interventions that reduce stunting offer high economic returns. While there is some evidence of single interventions improving linear growth, the evidence suggests that substantial reductions in stunting will require multiple investments in reinforcing interventions including health, nutrition and education programs targeting both mother and child.
    - Given the high prevalence of stunting in the first year of life, interventions focusing on pre-natal and neonatal nutrition may be effective. Maternal nutrition and education during pregnancy and lactation may yield high returns.
    - Given that 1/3rd of stunting is found in the lowest economic quintile and about 40% is found in the mountainous regions of the country, specific interventions targeting lower socioeconomic segments will be effective.
- *Reducing Child Mortality:* The analysis suggests that less than 10% of child mortality is from the traditional indicator of child malnutrition, underweight. About 30% of mortality may be the result of maternal nutrition (NTD, low birth weight and perinatal mortality) while more than half is from maternal behavior, i.e. suboptimal breastfeeding. Therefore, lowering child mortality will require a focus on maternal nutrition and behavior prior to birth and immediately after delivery.
- *Breastfeeding Promotion:* Improving breastfeeding behaviors offers a major opportunity to address about half of nutrition related child mortality. With current low baseline rates of optimal behaviors, investments in breastfeeding promotion may offer substantial returns. Some strategic insights from the analysis include:

- Even though 68% of women exclusively breastfeed and virtually all women breastfeed to some extent during the first month, still about 1/3rd of the deaths attributed to suboptimal breastfeeding are related to ~32% of women who partially breastfeed during the first month. Intensive promotion during the first month focusing on this issue may be effective.

- About 40% of breastfeeding attributed mortality is related to the 8% of women who do not breastfeed at all during months 1-6. This group should be carefully studied and characterized to enable effective targeted interventions during this time frame.

- *Flour Fortification:* Flour fortification with at least iron and folic acid offers a significant opportunity to directly address nearly 40% of the burden of malnutrition - represented by iron deficiency anemia in pregnant women and children and adults as well as folic acid related birth defects. Anemia is widespread among adults and children and among all socio-economic segments suggesting that population-wide approaches such as fortification may be effective.[65] The size of the population suffering iron deficiency without anemia is often the same as the anemic population, suggesting it is possible that 30-40% of Albanian children and women are either anemic, iron deficient or both. Therefore a population wide approach like fortification will be effective. However, while fortification will add some iron to the diets of very young children and pregnant women, these risk groups have high iron needs that will also require addition intervention such as supplementation. Therefore, addressing the burden of anemia will require a mix of interventions.

ANNEX: Background Assumptions and Calculations

Inflation Rates gathered from INSTAT and Bank of Albania Press Releases						
					3 Year Cumulative Inflation	**5 Year Cumulative Inflation**
2005	2007	2008	2009	2010	2007-2010	
5%	3%	3.5%	2.5%	4.5%	10.6%	120%

Key Assumption		
Total Population	3,224	Instat 2008 + 2 years at 0.65%
Working Age Adults	2,099,988	http://www.instat.gov.al/
Work Age Men	1,045,420	http://www.instat.gov.al/
Working Age Women	1,054,568	http://www.instat.gov.al/
Children < 5 years	181,255	Calculated from Annual Births vs 230,000 Current from INSTAT
Annual Births	36,251	Instat 2008
Population Growth	100.65%	Based on 2007-2008
Children < 15 years	752,318	Instat
Birth Growth	100.65%	Based on 2007-2008
DA as % of Iron Deficiency	**73.0%**	*Based on (Buonomo et al, 2005) plus 20%*

WHO 2005 Choosing Interventions that are Cost Effective	**http://www.who.int/choice/country/alb/cost/en/index.html**
Cost per bed day by hospital level*	
HOSPITAL COSTS	Int $ 2005
Primary	39.95
Secondary	52.12
Tertiary	71.19
Cost per outpatient visit by hospital level*	
	Int $ 2005
Primary	**12.76**
Secondary	18.09
Tertiary	26.77

USAID HII Expenditures for PHC, 2008		
Average Cost Per PHC Service	1800	$16.15
Full Cost at 64% for Service	2812.5	
36% Average Cost of Prescriptions	1012.5	$9.08
Total Cost Per Case		
2 Visits plus Drug	$41.38	
Corrected for 2 years inflation	$46.98	

Integrated Essential Nutrition Services: An Economic and Investment Analysis

(PART TWO)

Jack Bagriansky
UNICEF Consultant
November, 2010

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PART TWO

01. Introduction to Essential Nutrition Services

The national Damage Assessment Report (DAR) reviewed the human and economic consequences emerging from 8 indicators of malnutrition in Albania. The DAR found $97.7 million annually in economic losses can be attributed to current rates of malnutrition in Albania.

This paper proposes a package of nutrition interventions provisionally named Essential Nutrition Services (ENS) along with conceptual set of activities and budgets. This paper projects that implementation of ENS can cost-effectively reduce losses identified in the DAR reduced by more than one-third.

The evidence shows that comprehensive and simultaneous interventions are most effective[1]. The Damage Assessment Report (DAR) measured the consequences of malnutrition on an indicator by indicator basis. However, the reality for intervention to lower these losses is more complex. Indicators of malnutrition interact and produce multiplicative effects – and no single intervention can fully address these complex interactions. While individual indicators are useful in measuring impact, a holistic and comprehensive set of interventions are more likely to break this cycle and achieve real and measurable results.

Pregnant women and young children below 24 months of age suffer the highest rates of malnutrition and most severe risks for mortality and morbidity. The 1000 days extending from pregnancy through child reaching 24 months of age represent a period of acute vulnerability with highest risks of morality, morbidity and growth retardation. This 1000 day window of risk also defines a window of opportunity for intervention. Focusing interventions on child health and development during a 1000 day window of opportunity stretching from pregnancy up to 2 years of age - may yield the highest returns in terms of reduced child mortality, improved child health, physical growth and mental development – and ultimately future gains in national productivity.

ENS is a package of targeted, low cost and preventative health services delivered via Ministry of Health, Ministry of Education, Ministry of Labor and the private sector to capitalize on this “window of opportunity” by concentrating intervention resources on this period of highest risk. The primary ENS investment focuses on 4 “life-cycle” segments representing the 1000 day period of highest risk:

- *Segment 1: Pregnancy* Provide enhanced nutrition services and education to pregnant women as part of antenatal visits.

1 Robert E Black, Lindsay H Allen, Zulfiqar A Bhutta, Laura E Caulfield, Mercedes de Onis, Majid Ezzati, Colin Mathers,

- *Segment 2: Birth:* Enhanced education and counseling during stay in maternity ward integrated with ongoing BFHI.

- *Segment 3: Infant 0-6 Months* Supplements, education and breast-feeding promotion focused on lactating women.

- *Segment 4: Infant/Toddler 6-24 months:* Child feeding and care education along with multiple micronutrient powders (Sprinkles or MMPs).

ENS recognizes that within this 1000 day window of risk, low income women and children suffer the most acute risks. According to the DHS 2009, children in the lowest economic quintile suffer rates of stunting and underweight 60-70% higher than the more affluent. And about twice as many of four higher income quintiles feed their children fully balanced diets (all 3 food groups)[2].

Given the concentration of malnutrition in these lower income groups, optimal nation-wide and population-wide improvements in nutrition status cannot be achieved without special focus on interventions for this lower economic quintile.

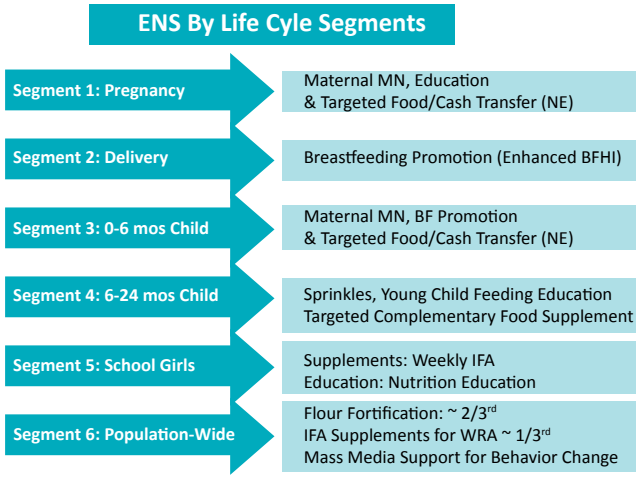
A recent review by WFP recommends that social safety net programs "incorporate objectives, actions and nutritional indicators in the different stages of social protection programs" and that policymakers "review or change design of conditional transfer programs (cash, in-kind, vouchers) to increase nutritional impact."[3] Therefore, in conjunction with the Ministry of Labor (MOL) Ndhima Ekonomique (NE), a social protection program providing assistance to low income families Albania, ENS propose that low income pregnant women and children who are eligible for NE financial assistance are also targeted with food transfers, most probably as specially formulated food products appropriate for pregnancy, lactation and infancy.[4] Within the ENS framework this activity focuses on 3 critical components of the 1000 day window:

- *Segment 1: Pregnancy* Monthly food transfer to lowest income pregnant women served by the NE.

- *Segment 3: Infant 0-6 month* Monthly food transfer to low income pregnant women served by the NE.

- *Segment 4: Infant 6-24 months:* Protein, calorie and micronutrient dense complementary food to the low income children.

2 SDSH, 2009
3 Nutritional Dimension of the Social Safety Nets in Central America and the Dominican Republic". World Food Programme, Prill 2010
4 While a couponing or voucher approach is in some respects preferable, discussions with domestic experts suggests that retail food stores do not have the capacity to process vouchers. Communication: Pavaci and Ferizai, Albanian Agrobusiness Council



ENS also, recognizes that improving the nutrition status of infants and children may involve intervening outside the 1000 day window of risk. Women often enter pregnancy with poor nutrition status and may not access antenatal services until the second or third trimesters. Their awareness of good nutrition practices is frequently low. Moreover, high rates of stunting and anemia found in children less than 6 months of age suggest the influence of intergenerational factors on fetal growth and development. Also, the DAR finds significant health and economic impacts of iron deficiency anemia among women (and men). Therefore, ENS includes interventions outside the 1000 day period of acute risk which require population-wide reach and capacity beyond the public health or social services sector.

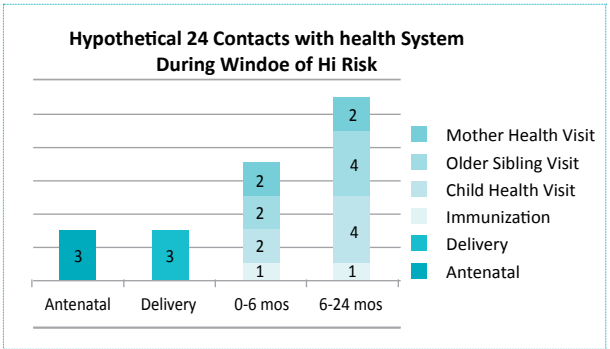
- *Segment 5:* Via Ministry of Education, providing school girls 10-15 years of age, when iron deficiency and anemia rates rise, with weekly iron-folic acid tablets as well as nutrition and motherhood education.

- *Segment 6:* Via Ministry of Agriculture regulate the market for milled flour products to ensure population-wide access to bread and flour products fortified with iron and folic acid. In addition, ENS proposes iron folic acid supplementation for rural women who may have access to fortified flour. Finally, national broadcast media campaigns are proposed to support all behavior change components of ENS – as well as other health and nutrition issues.

Table 1 below summarizes a proposed package of interventions across the 6 life-cycle segments.

Table 1: Overview of 6 Life Cycle Segments			
Life Cycle Segment	**Goals**	**Objective**	**Program Strategies**
Segment 1. Pregnancy	1. Reduce perinatal death, low birth weight deliveries and neural tube defects. 2. Enhance chances of optimal growth	1. Reduce anemia, folic acid deficiency & micronutrient status. 2. Improve dietary intake of most vulnerable women. 3. Improve awareness & behavior	1. Multiple Micronutrient Supplements 2. Nutrition Mother Education 3. Targeted food/vouchers
Segment 2. Delivery:	1. Reduce neonatal and infant death. 2. Improve motherhood behaviors	1. Improve rate of exclusive breastfeeding in 1st month. 2. Enhance continued optimal breastfeeding practices.	1. Breastfeeding Promotion
Segment 3. Lactation and Infancy: 0-6 months	1. Reduce infant deaths 2. Reduce infant morbidity 3. Protect maternal health. 4. Reduce Stunting	1. Improve rate of exclusive breastfeeding to 6 months 2. Protect maternal micronutrient status. 3. Improve diet of vulnerable women. 4. Improve behaviors for child growth.	1. Breastfeeding Promotion, 2. Nutrition Education & Support. 3. Maternal Micronutrient Supplement 4. Targeted food/vouchers
Segment 4 6-24 month old children	1.Protect child survival 2. Improve micronutrient status. 3. Reduce Underweight 4. Reduce Stunting	1. Improve rates of continued breastfeeding 2. Improve initial complementary feeding 3. Improve dietary intake of most vulnerable children. 4. Improve behaviors to enhance child growth.	1. Feeding Education & Support. 2. Multiple Micronutrient Powders 3. Targeted complementary food supplements.
Segment 5 Teen Age School Girls	1. Improve future health and birth outcomes	1. Reduce IDA and folic acid deficiencies 2. Improve nutrition & motherhood skills	1. Iron Folic Acid Supplements 2. Motherhood & Nutrition Education
Segment 6 Population-Wide	1. Improve Productivity of Working Adults 2. Reduce neural tube defects. 3.Improve child growth and development 4. Raise awareness to support all ENS activities.	1. Reduce anemia and folic acid deficiency among children and adults. 2. Improve population wide health and nutrition behaviors.	1. Flour Fortification 2. Annual Mass Media Campaign 3. Targeted Iron Folic Acid Supplementation in rural areas.

1.1. ENS Strategic Concept: Integrated Delivery Model



Pregnancy and early childhood are periods of high demand and relatively frequent contacts with the health system - for antenatal care, birthing services, post-natal consultations, child immunizations and sick child visits. These contacts of mother and child with the health system define an opportunity to deliver simple educational messages and inexpensive low technology products like nutritional supplements. The attached graph provides a conceptual over-view estimating more than 20 contacts of mothers and young children and the primary health care system during the critical 1000 day period. When mother and child are regarded as a single *unit of service*, there are clearly sufficient opportunities for health personnel to intervene without significant additional investment in "demand creation," i.e. via promotion to attract clients to health clinics or campaigns bringing services into the field.

The ENS strategic concept is to capitalize on current capacity and utilization patterns with simple services designed to be "added on" to ongoing antenatal care, maternity home, postpartum care, immunization as well as well-baby, sick-child or sick-mother visits.[5]

Therefore, integrating additional nutrition services into these ongoing contacts may represent a cost-effective approach to delivering ENS program components for Life-Cycle Segments 1-4. While additional financing for ENS will be required for pharmaceutical supplies and food, communications materials, food, training and logistics, we assume that basic personnel and infrastructure for the provision of the proposed services are currently in place and that the ENS will require no additional staff or infrastructure. ENS represents a commitment to changes in policy that refocus and reapportion current effort and resources.

This "integrated delivery" model is considered a global public health "best practice" offering both cost efficiencies in program implementation as well as synergistic health and nutrition impacts. The approach is consistent with WHO guidelines for maternal and child care which state that "strategies should be built into the primary health care system and existing programmes such as maternal and child health, integrated management of childhood illness, adolescent health, making pregnancy safer/safe motherhood."[6]

Likewise, via the ongoing activities of the NE, ENS proposes integration of nutrition objectives and activities to improve the urgent nutrition needs of the lowest income Albanians. The NE currently targets 13.7% of the lowest income Albanians. Leakage outside the target group is recognized as relatively high, estimated at 50% by the World Bank, and NE operational approaches are currently in process of reform. However, we believe modest leakage is not a threat to the effectiveness of ENS' proposed food transfer. DHS 2009 found that among the middle economic quintiles 15-21% of children are stunted, anemia prevalence is 16-21%, and 4-6% underweight. While not as acute as the lowest 20%, more affluent classes suffer significant levels of malnutrition. Therefore, while efforts to address targeting within the NE should continue to improve the programs results, effectiveness of the proposed nutrition component will not be greatly diluted by leakage to this less affluent half of the population.

1.2 Coverage Assumptions for ENS Activities

Coverage achieved for a range of parallel health and other activities suggests sufficient capacity within MOH, MOL/NE, MOE and the private flour milling sector to achieve equally high coverage of the proposed ENS package. For example, if 93% of women access antenatal care and 95% of children are fully vaccinated, it is reasonable to project

5 The ENS package should optimize integration with ongoing services such as Safe Motherhood, iron supplementation of women, Integrated Management of Childhood Illnesses, Baby Friendly Hospital Initiative.
6 Guidelines for the use of iron supplements to prevent and treat iron deficiency anemia. INACG, WHO and UNICEF. IUNACG. Washington. Edited by Stoltzfus R., Dreyfus M.L. 1998

that ENS might achieve similar levels of coverage. Or, current market patterns for large scale flour milling outlines opportunities for coverage of flour fortification. Table 2 shows coverage of these parallel services that will be used as the basis for projecting coverage of appropriate ENS activities.

Table 2: Indicators of Capacity to Deliver ENS Components		
Segment	**Current Parallel Service**	**Coverage**
Segment 1	Provision of Antenatal Care	93%
	Mean # Visits During Antenatal Care	67% 4+ Visits
Segment 2	Deliveries in Health Care Facility	97%
Segment 6	Large Scale Flour Milling Coverage	63%
Segment 3 & 4	Fully immunized children	95%
Segment 5	Secondary School Girls Attendance	**~25%**
Segments 1,3 & 4	Eligibility Coverage of NE	14%/50%

02. ENS Program Description and Budget

For each Life Cycle Segment, a rough set of activities is described along with a "conceptual" calculation for financing[7]. This conceptual perspective on ENS budget requirements is segmented into two parts – *cash* costs and *in-kind* costs. First, procurement or cash costs which apply to pharmaceuticals, communications materials or other inputs requiring line-items budgets are projected as follows:

Table 3: Conceptual Calculation for Cash or Procurement Cost

Unit Cost	X	Units/ Person/ Year	X	Target Group	X	Coverage Objective	=	Annual Procurement Cost
$		#		#		%		$/yr

Second, the cost of delivering ENS relies on the contribution of human and organizational capacity of MOH, MOL and other implementing agencies. This this analysis describes theses as "in-kind" costs. As discussed earlier, we assume that there is sufficient potential capacity within the existing staffing and infrastructure of the various implementing agencies to deliver ENS services without requiring increases budget. In other words, we assume current capacity can absorb these in-kind costs and make the necessary in-kind contributions without the hiring or additional staff or building of additional infrastructure. However, we include the costs of training and upgrading of specific equipment as part of "Start-Up Costs" in Section 2.7. For the purposes of our analysis, we calculate a conceptual monetary value of these in-kind costs as follows:

Table 4: Conceptual Calculation for In-Kind Cost

Contacts/ Person/ Year	X	Minutes/ Contact/ Service	X	Overhead and Management	=	Total Incremental Time	X	Cost Per Hour	=	Annual In-kind Cost
$		minutes		Add 15%		Hours/Year		Lek 5400[8]		$/yr

The sections that follow address each ENS Life Cycle Segment individually with a brief description of the proposed concept, activities and a conceptual budget for both procurement of inputs requiring cash outlays as well as in-kind effort of personnel from the implementing agencies.

7 Caveats. This is intended to provide a "conceptual" budget to facilitate policy discussions. This is not meant to substitute for rigorous needs assessment and program budgeting. Also note that costs will also be sensitive to final specifications for inputs and protocol for frequency of delivery of the various ENS services. These should be established by the appropriate expert national panels

8 Based USAID HII Expenditures for PHC, 2008

2.1 Life Cycle Segment 1: Pregnancy

With ~25% of Albanian infants stunted at 1 month of age, it seems reasonable to address the risk of growth retardation prior to birth during fetal growth. Global evidence indicates that much of early malnutrition is related to macro and micronutrient status of the mother. ENS proposes that over the course of at least two antenatal visits women seeking care are provided with:

- 90 multiple micronutrient supplements per pregnancy.
- Nutrition counseling during at least 2 contacts.
- Educational to enhance awareness and compliance during two contacts.
- Maternal food transfer for low income pregnant women

High utilization of antenatal services provides an opportunity to cost effectively integrate these simple affordable nutrition activities to improve maternal health, fetal growth and birth outcomes. More than 97% of women seek antenatal care services more than twice and more than 2/3rd visit PHC more than 4 times during their pregnancy.

Table 5 suggests annual cash input costs for these Segment 1 activities of ~$282 thousand to provide: micronutrient supplements, communications materials and targeted food transfer. About 30% of this procurement cost is to provide to provide 33-34 thousand pregnant women with 90 multiple micronutrients and nutrition education while the remaining 70% represents the cost of procuring food products for distribution to about 4500 pregnant women - at about $45 per year per pregnancy.

Table 5: Estimated Cash Costs for Procurement of Inputs to ENS Segment 1

Life Cycle Segment 1: Pregnancy	Unit	Cost/ Unit	#/Units	Target Group	Coverage	Program Annual Costt
Multiple Micronutrient Supplement	Supplement	$0.02[9]	90	36,251	92.5%	**$60,358**
Antenatal and Child Care Education	Materials	$0.30[10]	2	36,251	92.5%	**$20,119**
Maternal Food Supplement for Low Income	Food Transfer	$5.00[11]	9	4,966	90%	**$201,131**
Subtotal						**$281,616**

The projected value of in-kind effort of government staff to deliver Segment 1 ENS services is ~$972 thousand. About 70% of this effort is associated with the estimated additional contact time required to provide ENS services during antenatal visits for 33-34 thousand women (based on 5 minutes for each of four contacts to support distribution of educational material distributions and micronutrient supplements). The remainder represents the estimated value of NE personnel to manage logistics and communication for 12 monthly food transfer distributions for low income women.

9 Based on general estimate to be refined by final specifications.
10 Based on UNICEF Materials
11 Based on costs Mexico Program plus ~ 10% as defined in Leroy, J, Vermandere, H, Neufeld, L, Bertozzi, S Improving Enrollment and Utilization of the Oportunidades Program in Mexico Could Increase Its Effectiveness, Symposium: From Efficacy Trial to Public Health Impact: Improving Delivery and Utilization of Nutrition Programs, The Journal of Nutrition . Nutr. 138: 638–641, 2008

Table 6: Estimated Value of Added Effort by Current Staff to Implement ENS Segment 1					
Life Cycle Segment 1: Pregnancy	Target Group	Coverage	Contact @ 5 minutes	Annual Effort (hours) [12]	In Kind Effort @ Lek 5400 hr
Multiple Micronutrient Women	36,251	92.5%	2	6427	34,705,801
Antenatal and Child Care Education	36,251	92.5%	2	6427	34,705,801
Food Supplement/Coupon for Low Income	4,966	90%	12	2827	27,757,137
Total Lek					97,168,739
Total in USD					$971,687

The total cost of providing Segment 1 ENS package during pregnancy is estimated at $1.25 million including all cash and in-kind effort costs. About 22% of Segment 1 costs are hard procurement costs with the remainder the effort of MOH and MOL staff in delivering ENS services. About 2/3rd of these costs are associated with providing enhanced antenatal counseling and the remaining third for food transfers.

Table 7: Summary Annual Cash and In-Kind Costs for ENS Segment 1 Services				
Life Cycle Segment 1: Pregnancy	Cash	In-Kind	Total	% Cash
Multiple Micronutrient Women	$60,358	$347,058	$407,416	15%
Antenatal and Child Care Education	$20,119	$347,058	$367,177	5%
Maternal Food Supplement for Low Income	$201,139	$277,571	$478,710	42%
Subtotal	$281,616	$971,687	$1,253,303	22%

2.2 Life Cycle Segment 2: Delivery in Maternity Homes:

ENS recommends full and sustained expansion of Baby Friendly Hospital Initiative to all obstetric care and maternity facilities including: full implementation of rooming-in after birth; providing support to assure early initiation of breastfeeding; education to promote longer term breastfeeding behaviors; and initial counseling for comprehensive child feeding, care and education.

Given the high losses attributed to low rates of exclusive breastfeeding in Albania, ENS proposes supporting BFHI with an additional half hour of counseling per mother along with production of supporting annual communication materials. ENS assumes that all births in health facilities, nearly 97%, can be covered in this environment where health professionals are highly trained and have the full attention of new mothers during their 2-3 days in the facility. Communication materials are budgeted at about $70 thousand or $2 per birth in health facilities. About 94% of the total $1.1 million Segment 2 cost is associated with the half an hour of incremental time by maternity care personnel devoted to each pregnancy.

12 Includes 15% for management

Table 8: Estimated Costs for Procurement of Inputs to ENS Segment 2						
Segment II: BF Education/Care to BFHI	Cost/Unit	#/Units per person		Target Group	Coverage # 96.7%	Program Cost
Annual Cash Procurement Costs	$/Unit	#		#		**USD**
	$2.00	1		36,251		**$70,109**
Annual In-kind Effort	**Target Group**	**Coverage**		**Contact**	**Annual Effort**	
	#	#		# / vit	Hours + plus 15%	
	36,251	96.7%		1	20156	**$1,088,449**
Total Annual Costs	**Cash**	**In-Kind**	**Total**		**% Cash**	
	$70,109	**$1,088,449**	**$1,158,558**		**6%**	

2.3 Life Cycle Segment 3: Lactation & Infancy

While breastfeeding initiation is high and almost all Albanian children are breastfed though the first month of life, by the second month nearly ¾ are not exclusively breastfed and 8% are not breastfed at all. This defines an area of high human and economic losses and urgent action – with the promise of substantial improvement.

These first six months are a period of relatively frequent contacts with the medical system for vaccinations and follow-up visits for both mother and child. 95% full vaccination of children suggests capacity for similar coverage with additional services. This offers a key opportunity to promote continued exclusive breastfeeding during a time when optimal behaviors are deteriorating. ENS recognizes that nutrition status of the mother may be a key to healthy breastfeeding practices. Therefore, ENS recommends the following package of services integrated into all primary health care and specialized obstetric care contacts with mothers both during clinic or home visits:

- Continued multiple micronutrient supplements for lactating mothers.
- One-on-one breastfeeding education with promotional materials at health center visits.
- Substantial efforts to organize group/peer counseling where feasible.
- Maternal food transfer for low income lactating women.

Cash costs for procurement of inputs to reach up to 95% of lactating women in Segment 3 totals less than $127 thousand annually. About half is for procurement of food transfer and about one-quarter for procurement of supplements. Communications materials to support breast-feeding promotion - one-on-one counseling at $0.30/mother as well as group counseling at $1.00/mother represent about 20% the segment costs. Coverage projection for peer counseling assumes this activity will serve possibly 50% of women rather than the 95% projected for one-on-one services for women who visit health centers.

Table 9: Estimated Cash Costs for Procurement of Inputs to ENS Segment 3						
Segment 3	Unit	Cost/Unit	#/Unit	Target Group	Coverage	Program Cost
Breastfeeding Education/Promotion	Materials	$0.30	2	18,126	95%	**$10,342**
Maternal Multiple Micronutrient	Supplements	$0.02	90	18,126	95%	**$31,027**
Peer Counseling for Breastfeeding	Materials	$1.00	2	18,126	50%	**$18,126**
Maternal Food Supplement for Low Income	Food Voucher	$5.00	6	2,483	90%	**$67,046**
Subtotal						**$126,541**

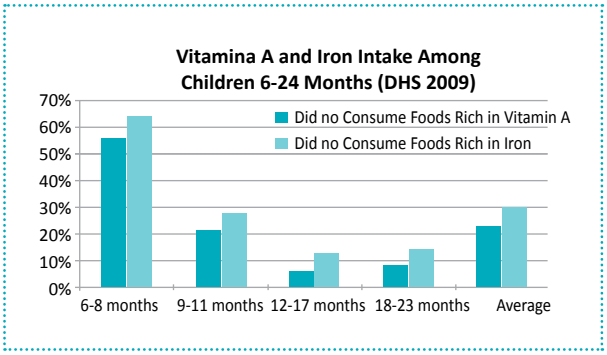
In-kind effort for Segment 3 activities is estimated at $520 thousand annually. About 50% of this effort focuses on counseling and education to improve exclusive breastfeeding practice throughout the 6 month period. 4 maternal/child contacts with health system are enhanced with added 5 minutes per contact for nutrition and breastfeeding counseling. However, the added 5 minutes per contact associated with distribution of multiple micronutrient supplements, about 1/3rd of Segment 3 in-kind costs, also might include time devoted to breastfeeding promotion. The remainder is to protect the nutrition status of lactating women through micronutrient supplementation and food transfers to low income.

Table 10 Estimated Value of Added Effort by Current Staff to Implement ENS Segment 3					
Segment 3	Target Group	Coverage Objective	Contacts/ Beneficiary	Annual Effort in Hours	Value of In Kind Effort
Breastfeeding Education/Promotion	18,126	95%	2	3304	17,840,658
Maternal Multiple Micronutrient	18,126	95%	2	3304	17,840,658
Peer Counseling for Mothers	18,126	50%	2	1737	9,379,946
Food Supplement/Coupon for Low Income	2,483	90%	6	707	6,939,284
Total In Lek					52,000,546
Total in USD					**$520,005**

Total cost of Segment 3 is projected at $647 thousand per year. About half the costs are for breast feeding promotion, 1/3rd for maternal supplementation and 1/5th for food transfers to low income mothers. 80% of overall costs represent the value of MOH and MOL staff effort while actual cash financing for procurement is about 20% of this total.

Table 11: Summary Annual Cash and In-Kind Costs for ENS Segment 3 Services				
Life Cycle Segment 3	Cash	In-Kind	Total	% Cash
Breastfeeding Education/Promotion	$10,342	$178,407	$188,749	5%
Maternal Multiple Micronutrient	$31,027	$178,407	$209,434	15%
Peer Counseling for Mothers	$18,126	$93,799	$111,925	16%
Maternal Food Supplement for Low Income	$67,046	$69,393	$136,439	49%
Total	$126,541	$520,005	$646,547	20%

2.4 Life Cycle Segment 4: Children 6-24 months.



Typically, rates of stunting and anemia rise dramatically during this period. However, this pattern is was not found in Albania by the DHS of 2009 - with anemia and stunting declining modestly during this time frame. Nevertheless, DHS found that from 6-24 months nearly 1/3rd of children did not regularly consume iron-rich foods and possibly one-quarter did not consume vitamin A rich foods. For younger children, 6-8 months old, more than half did not consume important micronutrient-rich foods. Therefore, this ENS component recommends a range of interventions to address low micronutrient intakes and other potential causes of underweight, stunting and anemia in young children. The ENS recommends a comprehensive focus on young child feeding and care during this 18 month period including:

- *Multiple Micronutrient Powders (MMPs or Sprinkles):* Sachets offering 5 to 15 or more micronutrients enable "in-home" fortification of complementary foods, creating a more nutritionally dense meal. A key ingredient in sprinkles is zinc, a micronutrient that has been associated with decreased morbidity and mortality along with increased growth in children.

- *Child Feeding & Care Counseling and Education:* Content of messages and counseling to mothers will shift from breastfeeding behaviors to best practices for infant and young child feeding and care including food choice, preparation and hygiene.

- *Complementary Food Distributions for Low Income:* Based on DHS 2009, children of low income families are at highest risk for low intakes of iron and vitamin A - along with higher rates of anemia and stunting. ENS proposes developing a complementary food product that provides an appropriate nutrient dense food with blending of cereals, oils, milk powder and micronutrients. Product development should also focus on flavor, packaging and other factors to associate this infant with commercial products and to distinguish it from a relief food or welfare product.[13]

Procurement costs for this relatively large 6-24 month old target group, nearly 55 thousand children each, totals about $728 thousand annually, the largest cash requirement for any of the ENS Life Cycle Segment. As with Segment 3, capacity for feasible coverage is based on percentage of fully vaccinated children (95%).

13 A model for this product may be WFP's recently developed CSB++ which is designed to meet the needs of 6-24 month old children.

- The cost of sprinkles varies with the range and level of vitamins and minerals included – ranging from ~ $0.015-0.6 per sachet. While final cost will be determined by MMP specifications we budget a mid-figure of $0.03/ sachet. This represents about 40% of the procurements costs for this segment.
- ENS budgets 3 education materials for each mother to support infant and child feeding and care counseling are budgeted at $0.30 each.
- Cost of providing ~ 3 kg monthly of complementary food is budgeted at $5.00 per month, a bit more than costs found for food transfers in Latin American programs.[14] This represents more than half the cash costs for this segment.

Table 12: Estimated Cash Costs for Procurement of Inputs to ENS Segment 4

Segment 4	Unit	Cost/Unit	#/Unit	Target Group	Coverage	Program Cost
Multiple Micronutrient Powders	Sachets	$0.03	180	54,377	95%	**$279,245**
Feeding/Care/Parenting Education	Materials	$0.30	3	54,377	95%	**$46,541**
Complementary Food Supplement for Low Income	Comp Food	$5.00	12	7,450	90%	**$402,277**
Total						**$728,063**

In-kind effort from MOH and MOL/NE personnel in the delivery of this ENS segment is valued at $1.75 million annually. About three quarters of this effort represents value of services from MOH personnel in distributing MMPs twice annually and providing feeding and care education 3 times annually. Cost to MOL for distribution and management of complementary food transfer represents about 25% of in-kind costs. Start-up costs for development and the food product itself are budgeted in Section 2.7

Table 13: Estimated Value of Added Effort by Current Staff to Implement ENS Segment 4

Segment 4	Target Group	Coverage	Contacts/ Beneficiary	Annual Effort	In Kind Effort @ Lek 5400 hr
Multiple Micronutrient Powders	54,377	95%	2	9911	53,521,973
Feeding/Care/Parenting Education	54,377	95%	3	14867	80,282,960
CF Food Supplement for Low Income	7,450	90%	12	4241	41,635,705
Total in Lek					175,440,639
Total in USD					$1,754,406

Costs for Segment 4 total $2.5 annually, including nearly $1.7 million in in-kind effort, predominantly to provide nutrition counseling. Cash costs for procurement of MMPs for nearly 55 thousand children and complementary food for more than 4000 children represent about 30% of over-all costs.

14 Leroy, J, Vermandere, H, Neufeld, L, Bertozzi, S Improving Enrollment and Utilization of the Oportunidades Program in Mexico Could Increase Its Effectiveness, Symposium: From Efficacy Trial to Public Health Impact: Improving Delivery and Utilization of Nutrition Programs, The Journal of Nutrition . Nutr. 138: 638–641, 2008

Table 14 Summary Annual Cash and In-Kind Costs for ENS Segment 4 Services				
Segment 4	Cash	In-Kind	Total	% Cash
Multiple Micronutrient Powders	$279,245	$535,220	$814,465	34%
Feeding/Care/Parenting Education	$46,541	$802,830	$849,370	5%
CF Food Supplement for Low Income	$402,277	$416,357	$818,634	49%
Total	$728,063	$1,754,406	$2,482,470	29%

2.5 Life Cycle Segment 5: 10-15 Year Old School Girls

Teen-age girls are at high risk for anemia – and marriage and motherhood often follow soon after secondary school years. Therefore, secondary school offers a channel to ensure that young girls enter motherhood with improved iron status as well as with positive maternal knowledge and behaviors. Given the suggestion of a strong intergeneration impact on anemia and stunting rates in Albania, this represents an opportunity to break this intergenerational cycle.

ENS proposes collaborative effort with Ministry of Health and Education to deliver weekly iron-folic acid supplements (estimated at 39 weeks/yr) along with educational components on a range of subjects from maternal and child nutrition to other behaviors including prevention of obesity.Along with current secondary school participation by girls, we project 90% coverage of the 10-14 year old age group – about 163 thousand girls[15].

As shown in Table 15, providing iron folic acid supplement weekly during 39 weeks of the school year along with production of classroom education materials is projected to require about $113 thousand annually.Presuming 10 minutes per classroom for 9 annual supplement distributions, Table 16 calculates the value of teacher's time is estimated at $929 thousand annually[16]. Total costs for Segment 5 ENS is about $1 million annually, with cash procurement requirement representing about 11%. The predominant share of costs is involved in 11.5 minutes per classroom per month (10 minutes plus management of 15%) in delivering and recordkeeping for the iron folic acid distribution.

Table 15: Estimated Cash Costs for Procurement of Inputs to ENS Segment 5						
Segment 5	Unit	Cost/Unit	#/Unit	Target Group	Coverage	Program Cost
Iron Folic Acid Supplements	Supplements	$0.01	39	181,255	90%	**$63,621**
Motherhood/Parenting Education	Materials	$0.30	1	181,255	90%	**$48,939**
Total						$112,559

15 DHS 2009 Figure 2.2 Rough average of female school attendance 10-14 years.
16 Half a minute per student assuming class of 20 pupils

Table 16: Estimated Value of Added Effort by Current Staff to Implement ENS Segment 5					
	Target Group	Coverage	Contacts/ Beneficiary	Annual Effort[17]	In Kind Effort @ Lek 5400 hr
	#	#	#/vit	15%	
Iron Folic Acid Supplements	181,255	90%	9	14,070	75,977,565
Motherhood/Parenting Education	181,255	90%	1	3127	16,883,903
Total Lek					
Total USD					$928,615

Table 17: Summary Annual Cash and In-Kind Costs for ENS Segment 5				
	Cash	In-Kind	Total	% Cash
Iron Folic Acid Supplements	$63,621	$759,776	$823,396	8%
Motherhood/Parenting Education	$48,939	$168,839	$217,778	22%
Total	$112,559	$928,615	$1,041,174	11%

2.6 Life Cycle Segment 6: Population-wide intervention

There are limits to the capacity of the public health system to reach address population-wide nutrition and health risks including childhood anemia, stunting, obesity and other causes of adult chronic disease. Therefore, ENS includes 3 components focusing on raising population wide nutrition status and awareness including:

- Flour fortification with at least iron and folic acid
- Iron-folic acid supplementation in rural areas not served by fortification
- Mass media to support awareness of ENS as well as other health issues

These are reviewed individually below.

2.6.1. Flour Fortification.

ENS recommends fortification of flour with iron and folic acid to reduce population-wide levels of anemia and folic acid deficiency. While fortification levels designed for population-wide consumption are not sufficient to protect pregnant women and children within the 1000 day window of acute risk, fortified flour contributes to over-all protection and ensures women enter pregnancy with good nutrition status. In addition, DAR shows significant economic losses from anemia among adult women and men engaged in manual labor. Levels of folic acid are sufficient to prevent most neural tube defects.

17 Includes 15% for management

FAO Food Balance Sheets for Albania (2007) report average per capita consumption of 375 grams per day of wheat, which we correct for milling extraction (75%at large mills) to estimate average per capita flour consumption of 281 grams per day. At this level of consumption, The World Health Organization's *Recommendations for Wheat and Maize Fortification* define 30 ppm of iron from either ferrous fumarate or ferrous sulfate along with 1.3 ppm of folic acid as safe and efficacious[18]. As indicated in Table 18 below, average consumption of flour fortified to these WHO recommended levels will provide substantial nutrition protection for a woman of reproductive age ranging from 29% to 63% for iron (mid bioavailability diet) and 64% to 80% for folic acid, depending on whether WHO Recommended Nutrition Intakes (RNI) or Estimated Average Requirements (EAR) are used as standard of protection[19].

Table 18: Delivery of Iron and Folic Acid Nutrition Protection via Fortification at Average Flour Consumption and based on WHO Recommended Levels of Iron and Folic Acid

	Added Dietary Units @ 281 grams consumption	Proportion RNI	Proportion EAR
Added Iron @ 30 ppm	8.4 mg/dy	29% of 29.4 mg/dy[v]	63% of 13.4 mg/dy
Added Folic @ 1.3 ppm &70% retention	256 ug/dy	64% of 400 ug/dy	80% of 320 ug/dy

As shown in Table 19, based on an average proportion of national wheat consumption that is imported (from 2003-2007), we roughly project that 63% of national consumption is milled at 20 large and about 16 medium sized mills. This represents the segment of wheat flour consumption in Albania that can be cost-effectively fortified – the remainder is grown and milled in small village level facilities where fortification cannot be cost effectively applied. Therefore, roughly projects 2/3rd of the population can be protected from iron and folic acid deficiency with flour fortification.

Table 19: Calculation for Average % of Wheat Imported and Available to Large Scale Millers for Fortification

	Domestic Production FAO 2007	Imported	Total	% Imports
	000 MT	000 MT	000 MT	000 MT
2003	256	429	685	63%
2004	253	465	718	65%
2005	260	417	677	62%
2006	231	413	644	64%
2007	250	406	656	62%
5 Year Average	250	426	676	63%

With reports of 36 mills capable of cost effectively integrating fortification technology we estimate start-up capacity building and capital investment of $252 thousand[21]. Running costs for fortification of 208 thousand MT are estimated at $291 thousand - about 80% representing the cost of

18 Recommendations on Wheat and Maize Flour Fortification Meeting Report: Consensus Statement Effectiveness in Reducing Anemia WHO, 2009
19 EAR recommended by WHO for the planning and evaluation of fortification programs.
20 Albanian Food Manufacturers Association
21 Albanian Food Manufacturers Association

premix. The projected unitfor the proposed iron and folic acid premix is provided in Table 21. We estimated $16 thousand in cash costs for quality assurance and overhead and an additional $37.8 thousand in in-kind effort on the part of mill personnel.

Table 20: Flour Fortification Start-Up Costs

Start-Up	Total	Cash	In-Kind
Capital Investment (Microfeeders)	$180,000	$180,000	
Training & Capacity Building	$72,000	$72,000	
Total	$252,000	$252,000	
Recurring Costs			
Premix	$220,603	$220,603	
Distribution and 2% Tax	$10,659	$10,659	
Added Labor Effort	$17,280		$17,280
Feeder Maintenance and Quality Assurance	$29,160	$21,960	$7,200
Management at 5% Input Costs	$13,352		$13,352
Total	**$291,054**	**$253,222**	**$37,832**

Table 21: Estimated Cost of Flour Fortification Premix Based on WHO Recommended Levels

	Fortification Level	Fortificant Compound	Fortificant Compound in MT Flour	Compound Cost/Kg	Cost per Component	Share Nutrient Costs
	mg/kg		mg/kg	$/kg		%
Folic Acid	1.3	Folic Acid	1.44	$40.00	$0.39	5.5%
Iron	30	Fumarate	93.75	$6.50	$4.06	58%
Nutrients Subtotal			95.19			
Excipient		55		$1.00	$0.37	5%
			150g	**Nutrient Cost/KG**	**$4.81**	68%
				Up Charge/kg	**$2.25**	32%
				Cost/kg	**$7.06**	
				Cost/MT @ 100 g/MT	**$1.06**	

While a full needs assessment was not conducted in Albania, based on a generic approach costs to regulation and monitoring of flour fortification are outlined in Table 22 below. The work program includes 4 inspections annually at each of 36 mills and 10 days of “market sweeps” to monitor the market. Start-up training along with procurement of laboratory equipment is estimated at $65 thousand. Recurring annual costs of procurement of expendables for transport and analysis is estimated at less than $19 annually with an additional $33 thousand in estimated inspector salaries and amortization of vehicles.

Table 22: Estimated Government Regulatory Costs for Mill and Market Inspections and Analysis				
	Unit	**Start-Up**	**Annual Recurring**	
Mill Inspection			Cash	In-Kind
Training	Workshops and Materials	$25,000		
Inspector Salaries	4 Inspections/mill/yr @ 1/2 day/inspection			$720
Transport	40km for 4 inspections/Mill/yr		$14,400	$14,400
Spot Test Materials	Samples: 2/mill/per inspection		$72	
Shipping to Lab	Reagent Costs for 25% of Tests		$1,440	
Management	25% of Inspection & Sampling Costs			$14,008
Monitoring in Market				
Inspector Salaries	Inspector Days: 10 Market Sweeps/yr @ $10			$100
Transport	KM @ 40 Sweeps @ 40 km each		$1,000	$1,000
Spot Test Materials	50 Samples per Market Sweep		$125	
Shipping to Lab	10% of Tests		$1,000	
Management	25% of Market Monitoring Costs			$806
Laboratory Analysis				
Lab Equipment		$40,000		
Laboratory Labor	Samples (from above) @ 1/2 day labor per sample			$1,830
Expendables	Sample		$610	
Management	25% of Laboratory Analysis Costs			$610
Totals		**$65,000**	**$18,647**	**$33,474**

2.6.2. Iron Folic Acid Supplementation for Women of Reproductive Age in Rural Areas

Domestic wheat supplies hundreds of small mills where fortification is not technically or financially feasible. If 63% of flour consumption is successfully fortified, then 37% of national consumption supplied by domestic agriculture and residing in rural areas will not have regular access to fortified flour (in the near term). This may represent about 270 thousand of 734 thousand adult women of reproductive age. Therefore, ENS recommends an effortto reach this at-risk population with a program of preventative weekly iron folic acid supplements distributed via the health system. However, there are substantial barriers to wide coverage.

Awareness of anemia, demand for health services and contacts with the health system among non-pregnant women is limited. Most women in this target group live in rural hard-to-reach areas that are typically under-served by health and public services. Although social marketing may have some impact in raising awareness and demand, ENS projects consistent coverage of only 15% of this target group – about 41 thousand women targeted with 52 iron-folic acid supplements annually. While the costs of procurement are minimal, the in-kind effort of MOH staff in counseling women and distribution of iron folic acid tablets is substantial – about 98% of the projected $865 thousand annually.

Table 23: Estimated Cost for Iron Folic Acid Supplementation of Rural Women with Limited Access to Fortified Flour					
Cash Costs	**Supplement Cost**	**Supplement /Yr**	**Supplement /Yr**	**Projected Coverage**	**Projected Cost**
	$0.01	52	271,701	15%/40,755	$21,193
In Kind Costs	**Contacts /Year**	**Minutes /Contact**	**Total Hours**	**Cost @ 5400Lek/Hour**	**Cost USD**
	4	5	15623	84,363,043	$843,630
Total Cost					$864,823

2.6.3 Annual Multi-Media & Broadcast Campaigns

Given wide access to television, radio and other modern channels, broadcast and mass media campaigns to raise over-all nutrition awareness offers a key opportunity to:

- Raise awareness of key behaviors related to malnutrition during the 1000 days window of opportunity from pregnancy through early childhood
- Support population-wide ENS efforts namely flour fortification and iron folic acid supplementation
- Raise awareness and change behaviors related to diet and nutrition related disease including obesity, heart disease, diabetes and other chronic diseases.

While the full scope and cost of an annual health and nutrition related campaign should await more specific objectives and concrete planning, we roughly project an annual budget of $250,000.

Table 23 Life Style Segment 6: Population-Wide				
	Cash	**In-Kind**	**Total**	
Mothers/children consume fortified flour	$267,620	$239,834	$507,454	53%
Mass Communications	$250,000	$0	$250,000	100%
Targeted WRA for Iron/Folic Acid Supplementation	$21,193	$843,630	$864,823	2%
	$538,813	$1,083,464	$1,622,277	33%

2.7 Development, Start-Up and Over-all Management of ENS

The delivery of ENS components will require some investments in start-up and development as well as well as modest investments in ongoing management at the central level. These costs are difficult to anticipate. Although we assume that these are largely in-kind effort of staff there may be small associated cash costs which we very roughly project a one-time $495 thousand for start-up and recurring annual costs of $84 thousand. These include:

- Product development for food products targeting pregnant and lactating women as well as complementary food for children 6-24 months. This will involve collaboration with nutritionists and pediatricians as well as with private sector. In addition, the World Food Program has developed a product CSB++ which may serve as a model. We conceptually budget $75 thousand for this activity.

- Delivery of several components will require the consensus among key medical and nutrition experts on the most appropriate dose and frequency for delivery of medical and pharmaceutical components of ENS. We conceptually budget $30 thousand for this activity.

- Mainly within MOH but also to some extent within Ministry of Labor sections managing the NE and in health related secondary school sections of the Ministry of Education there will be a need for initial cascade training of management and line-staff. We conceptually budget one-time start-up expenses of $220 thousand within MOH and $170 for MOL and MOE. Recurring annual cash costs for training are estimated at 10% of start-up training.

- Recurring annual cash costs are anticipated for central management and planning at the central level. We roughly estimate $25 thousand within MOH and $10 each within MOL and MOE. It should be noted that staff time for routine management and supervision are accounted for in the 15% of time added to each individual beneficiary contacts.

Start-up and training as well as ongoing communication and central management for inspection and monitoring associated with regulation of flour fortification are budgeted within that component budget. The rough conceptual budget is shown in Table 24.

Table 24: ENS Start-Up Costs		
	Start-up	Recurring
	1st Year Only	**Annual at 10%**
Start Up& Development		
Food Transfer Product Development	$75,000	
Protocol & Delivery Development	$30,000	
Cascade Training : MOH		
Training of Trainers	$20,000	$2,000
Medical Doctors	$50,000	$5,000
Nurses	$50,000	$5,000
Patronage Nurses	$50,000	$5,000
Volunteers	$50,000	$5,000
Cascade Training : MOL (NE) & MOE		
Training of Trainers	$20,000	$2,000
Commune & Local Authorities	$50,000	$5,000
District Managers	$50,000	$5,000
Local Social Workers	$50,000	$5,000
Recurring Management		
MOH Management		$25,000
MOLS Management		$10,000
MOE Management		$10,000
Total	**$495,000**	**$84,000**

2.8 Financial Overview & Analysis of ENS

Table 25: Summary ENS Annual Conceptual Budget ($000)					
	Cash Costs	**In-kind Effort**	**Total**	**% Cash Costs**	**% Over-All Costs**
Life Cycle Segment 1: Pregnancy	$281,616	$971,687	$1,253,303	14%	15%
Life Cycle Segment 2: Birth	$70,109	$1,088,449	$1,158,558	4%	14%
Life Cycle Segment 3: 0-6 months	$126,541	$520,005	$646,547	6%	8%
Life Cycle Segment 4: 6-24 months	$728,063	$1,754,406	$2,482,470	37%	31%
Life Cycle Segment 5: 10-15 Years	$112,559	$928,615	$1,041,174	6%	13%
Life Style Segment 6: Population-Wide	$544,573	$914,937	$1,459,509	28%	18%
Annual Management	$84,000		$84,000	4%	1%
Recurring Total	**$1,947,462**	**$6,178,100**	**$8,125,562**	100%	100%
Percent Cash vs. In-kind	24%	76%			
Start-Up					
Capacity Building For MOH, MOL, M)E	$495,000				
Capacity Building Flour Fortification	$317,000				
Start-Up Total	**$812,000**				

Total annual cost for delivery of ENS at scale is estimated at $8.1million, the predominant share, about 3/4 of this amount, representing the in-kind effort of MOH, MOL and MOE staff and systems. Annual cash required for procurement of goods and services totals $1.95 million.Segment 4 targeting the crucial 6-24 month age group represents the largest investment – more than 30% of cash costs and nearly 40% of over-all requirements. Start-up costs including equipment and training are estimated at about $800 thousand.

Responsibility for implementation and financing is segmented as follows:

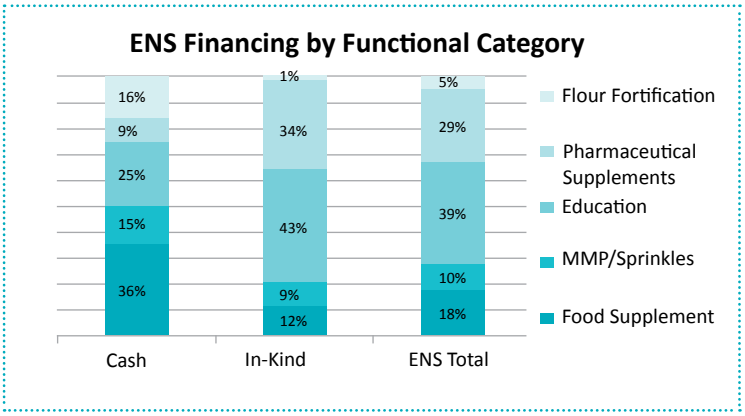
- Services delivered by MOH, Segments 1-4 plus iron folic acid supplements to women of reproductive age in Segment 6 represents more than ¾ of the total budget and about 2/3rds of the required cash financing.

- Services delivered by the MOE in Life Cycle Segment 6for iron supplements and educational services delivered to teen-age girls in secondary schools, represent 13% of total ENS costs and 6% of cash costs.

- Flour fortification represents 6% of over-all costs and 15% of ENS cash requirements. With the exception of start-up costs, this is delivered by primarily by private sector flour millers and financed by the market place. Regulatory and monitoring activities by Ministry of Agriculture represent a small share of flour fortification costs – about $19 thousand annually or 7% of the cash requirements.

- Responsibilities for the annual $250 thousand for supporting national mass communications campaign are not defined at this point. This may be the responsibility of the MOH but possibly of other sectors.

A financial over-view by functional category, shown in the attached graph, reflects distribution of ENS budget among various service categories. Key insights from this segmentation include:



- Education, health promotion and mass media to develop optimal child care and feeding and other behaviors represents 39% of over-all ENS costs including ¼ of cash costs.
- Inexpensive pharmaceutical supplements represent only 9% of cash costs but 29% of over-all costs reflecting estimated in-kind effort for management and delivery.
- Micronutrient supplementation for children 6-24 months via sprinkles represents 15% of cash costs and 10% of over-all costs. The ratio varies from supplements for women due to the higher cost of the individually packaged sprinkles versus inexpensive multiple micronutrient tablets.
- Food transfers via the NE comprise 18% of over-all costs but the relatively high cost of food procurement represents more than 1/3rd of ENS cash procurement costs.

The ENS cost per person, shown in Table 26, varies widely depending on the population size as well as type of service provided. Key points include:

- Highest per person costs are for food transfers to the low income via the NE. At $5 per person per month food procurement plus in-kind management and logistics, the total cost of this activity is $107 to cover a low income woman during 9 months of pregnancy to $122 to protect a growing child 6-24 months of age. Cash procurement represent about half these per person costs.
- In this conceptual budget, cash costs for education and promotion materials generally range $0.30-0.90 per person per year depending on the number of communication materials distributed annually. Including MOH costs for providing associated counseling, management and logistics the full cost for education and nutrition education ranges $11-$17 per person depending on the planned number and length of contacts with beneficiaries.
- While the cash cost for pharmaceutical supplements for pregnant women, rural women and school girls is quite low, from $0.52-$1.80 per person per year, when in-kind effort is included these costs rise to $10-12 per women within antenatal service delivery and to $21 for contacts with rural women of reproductive age for iron folic acid supplementation. Supplementation of schools girls is considerably less expensive at $5 per pupil.
- Delivery of 180 annual sachets of multiple micronutrient powers is more than $15 per child – about 1/3rd representing the cost of the Sprinkles/MMP.
- Flour fortification, widely recognized as among the least expensive and most cost-effective nutrition interventions costs about $0.18 annually per consumer

Table 26: Reach and Per Person Costs of ENS			
	People Reached Annually	**Total Annual ENS Cost Per Person**	**Total Annual Cash Cost Per Person**
Life Cycle Segment 1: Pregnancy			
Multiple Micronutrient Women	33,532	$12.15	$1.80
Antenatal and Child Care Education	33,532	$10.95	$0.60
Maternal Food Supplement for Low Income	4,470	$107.10	$45.00
Life Cycle Segment 2: Birth	-		
BF Education/Care to BFHI	35,055	$33.05	$2.00
Life Cycle Segment 3: 0-6 months	-		
Breastfeeding Education/Promotion	17,237	$10.95	$0.60
Maternal Multiple Micronutrient	17,237	$12.15	$1.80
Peer Counseling for Mothers	9,063	$12.35	$2.00
Maternal Food Supplement for Low Income	2,235	$61.05	$30.00
Life Cycle Segment 4: 6-24 months	-		
Multiple Micronutrient Powders	51,712	$15.75	$5.40
Feeding/Care/Parenting Education	51,712	$16.43	$0.90
CF Food Supplement for Low Income	6,705	$122.10	$60.00
Life Cycle Segment 5: 10-15 Years			
Iron Folic Acid Supplements	163,130	$5.05	$0.39
Motherhood/Parenting Education	163,130	$1.34	$0.30
Life Style Segment 6: Population-Wide			
Flour Fortification	2,030,903	$0.18	$0.15
Mass Communications	3,191,419	$0.08	$0.08
Targeted WRA for Iron/Folic Acid 10%	40,755	$21.22	$0.52

In Table 27 below, the start-up and annual costs outlined above are synthesized into a projected 10 year budget totaling $79 million, with $19.4 million in cash costs. The budget is based on the following assumptions:

- All start-up activities including equipment purchases and cascade training for MOH, MOL, MOE, MOA and private sector millers is implemented in the first half of program Year 1.
- Six months of project activities at scale during Year 1. Consequently, annual recurring program costs are projected at 50% of annual costs.
- Services and costs are expected to expand by 0.65% annually along with projected population growth.

Table 27: Conceptual Budget 10 Year Budget (USD $000,000)							
	Essential Nutrition Services		**Flour Fortification**		Start-Up & Management	**10 Year Cost**	
Year	Cash	Total	Cash	Total	Cash	Cash	Total
1	$0.80	$3.45	$0.464	$0.518	$0.495	$1.36	$3.60
2	$1.60	$7.75	$0.273	$0.345	$0.084	$1.96	$8.18
3	$1.61	$7.80	$0.275	$0.346	$0.084	$1.97	$8.23
4	$1.62	$7.85	$0.276	$0.348	$0.084	$1.98	$8.28
5	$1.63	$7.90	$0.278	$0.349	$0.084	$1.99	$8.33
6	$1.64	$7.95	$0.280	$0.351	$0.084	$2.01	$8.39
7	$1.65	$8.00	$0.281	$0.352	$0.084	$2.02	$8.44
8	$1.66	$8.06	$0.283	$0.354	$0.084	$2.03	$8.49
9	$1.68	$8.11	$0.284	$0.356	$0.084	$2.04	$8.55
10	$1.69	$8.16	$0.286	$0.357	$0.084	$2.06	$8.60
T	**$15.58**	**$75.03**	**$2.980**	**$3.676**	**$1.251**	**$19.41**	**$79.09**

03. Projected Coverage and Effectiveness

Calculations for benefits achieved by delivery of ENS services are based on achieving reductions in the baseline losses calculated in the DAR. National baseline losses are assumed to be reduced in direct proportion to two parameters:

- Program coverage: the percentage of people who receive products and services from the intervention.
- Program effectiveness: the proportion of those covered people who are protected or move from a "deficient" to a "sufficient" condition due to their participation in the intervention.

The formula used in the calculation of benefits is shown in Table 27 below:

Table 27

Baseline Losses from DAR	X	Program Coverage	X	Program Effectiveness	=	Benefits or Reduced Baseline Losses from DAR
$/yr		%		%		$/yr

Since coverage and effectiveness may vary by intervention, this calculation is made for each individual intervention and indicator.The results are then added for a total ENS benefit. Projecting real effectiveness and coverage of nutrition interventions remains more in the realm of art than science. However, the following rough estimations are ventured.

3.1 Projected Coverage

Beneficiary coverage figures are not always the same as coverage for protection from a particular risk indicator. Coverage figures calculated in program descriptions and budgets in the previous sections are relatively straightforward and based on simply on delivery of products and services to beneficiaries. In some cases, estimated coverage of the "nutrition indicator" like maternal anemia will follow the same straightforward approach. Therefore, coverage of supplements to pregnant women defines coverage of this single indicator, maternalanemia (and risk of perinatal mortality). However, in many cases, ENS often offers multiple interventions with varying levels of coverage addressing the same indicator. For example, underweight and stunting are sensitive to multiple maternal and child interventions offeredin Segments 1-4 as well as the impacts of pre-pregnancy status addressed via flour fortification, school girl supplementation and nutrition education disseminated via mass media.Therefore, some of the

coverage assumptions for individual indicators are a bit more complex and speculative. Background to assumptions for coverage of indicators used in this analysis includes:

- *Stunting and Underweight:* Maternal supplementation, breastfeeding promotion, sprinkles for infants 6-24 months and young child feeding and care education all may contribute to reduce in stunting and underweight. Other interventions outside the 1000 day window of opportunity such as flour fortification or supplementation of school girls may also impact maternal status. However, we take coverage as an average for the delivery of direct ENS within the 1000 days in Segments 1-4 – or 95%.

- *Low Birth Weight and Maternal Anemia (Perinatal Death):* Coverage is considered to be maternal nutrition and supplementations services delivered during Segment 1, pregnancy - or 93%. In addition to these services other interventions will benefit pregnant women and their infants including flour fortification and school girl supplementation. And mass media health campaigns may motivate women to seek antenatal services earlier in pregnancy.

- *Optimal Breastfeeding:* Coverage parameter for improvements in rates of exclusive breastfeeding will be taken as an average of breastfeeding promotion activities in Segments 1, 2, 3 as well as mass media campaign - or 95%.

- *Neural Tube Defects:* Acombination of interventions delivering folic acid to women of reproductive age. First, 63% of women consuming fortified flour. Second, an additional 15% to be reached via rural supplementation program. Since more than 95% of women will also be covered by micronutrient supplementation during pregnancy, we speculate an additional 10% coverage - for a total of 88%.

- *Iron Deficiency Anemia in Children< 15 years*: In addition to 63% of children will consume iron fortified flour, ENS provides coverage of iron nutrition via supplementation with sprinkles in Segment 4, with coverage of 92.5% during the critical 6-24 month period. Since 18 months is 9.6% of the 14.5 years of protection needed for this target group, we add a parallel proportion, 9.6%, to 63% to reach a rough estimate of about 73% coverage.

- *Iron Deficiency Anemia in Adults:* The parameters for coverage of adults are flour fortification at 63% and iron fortification of rural women at 15%. Since women represent 80% of all adult anemia we calculate and additional 12% to project 75% coverage.

Table 28 below outlines assumptions for coverage of 8 indicators or malnutrition in the DAR:

Table 28: Summary of Coverage Assumption and Rationale		
	Assumed Coverage	Rationale for Assumption of Coverage
Underweight	95%	Interventions: Provision of antenatal and young child nutrition services Coverage: Average Segments 1-4
Low Birth Weight	93%	Interventions: Full range Antenatal Services: Coverage: Segment 1
Maternal Anemia & Perinatal Death	93%	Intervention: Provision of Multiple Micronutrient Supplements (MMS): Coverage: Segment 1
Sub Optimal Breastfeeding	94.8%	Intervention: Provision of Breastfeeding Education Coverage: Average of Segment 1,2, 3 and Broadcast Campaign
Neural Tube Defect	88%	Intervention: Provision of Folic Acid Coverage: Flour Fortification (63%) + 6 Rural IFA Coverage (15%) + Provision of folic acid during pregnancy (additional 14.5%)
Stunting	95%	Interventions: Provision of antenatal and young child nutrition services Coverage: Average Segments 1-4
IDA Children	73%	Intervention: Provision of Iron to Children < 15 yrs Coverage: Flour Fortification (63%) plus 4 MMP/Sprinkles (92.5% of children for 1.5 years out of 14.5 year period or 10.5%)
IDA Adults	75%	Provision of Iron to Adults Coverage: Flour Fortification (63%) + Iron Folic Acid Supplementation of rural women (15% of women – 80% of anemia among adults)

3.2 Discussion and Evidence of Effectiveness of ENS Interventions:

The sections below review the literature which provides the background for projections of ENS effectiveness in improving nutrition indicator among those reached by interventions.

3.2.1 Segment 1: Antenatal Nutrition Interventions:

Several major health organizations recommend prophylactic distribution iron/folic-acid supplements during pregnancy including World Health Organization (WHO), United States Centers for Disease Control & Prevention (CDC) and the International Anemia Consultative Group (INACG).[22] A recent comprehensive review of 8 programs found maternal supplements reduce risk of anemia at term by 73%.[23] Several studies link maternal iron supplementation to improved birth outcomes including:

- Four studies finding reductions in low birth weights ranging from 16% to 44%.[24]
- Two studies finding perinatal and neonatal deaths reduced by 45% and 86%.[25]

However, the literature suggests that although more expensive multiple micronutrient supplementation may be more effective not only in preventing anemia during pregnancy but also may achieve better results in lower-

22 Dietary Supplement Fact Sheet, Office of Dietary Supplements, United States National Institutes of Health; Standards for Maternal and Neonatal Care, WHO, 2006; Guidelines for the Use of Iron Supplements to Prevent and Treat Iron Deficiency Anaemia, International Life Sciences Institute, 1998

23 Bhutta t al Maternal and Child Undernutrition , What works? Interventions for maternal and child undernutrition & survival, Lancet January 17, 2008

24 Fawzi et al, Lancet 1998 May16;351(9114):1477-82; Christian P. et al Am J Clin Nutr 1998 Aug;68(2):404; Scholl et al, American Journal of Epidemiology 1997;146:134-41;

25 Atukoral et al, Am J Clin Nutr 1994, Aug;60(2):286-92; DeLong et al Lancet 1997 Sep 13;350(9080):771-3.

ing the risk of child mortality. Some findings from studies include:

- Proportion of women who became non-anemic was 35% in the vitamin-A- group, 68% in the iron group, 97% in the group supplemented with both.[26]
- Infants of women receiving the multiple micronutrients experienced 10% reductions in fetal, perinatal mortality and neonatal mortality.[27]
- Multiple micronutrient supplementation was associated with 39% greater reduction in maternal anemia compared with placebo or two or less micronutrients. [28]

Therefore, ENS proposes multiple micronutrient supplementation (including iron and folic acid) even though these are significantly more expensive.

As previously discussed food supplements represent more than half the cash costs of services provided to pregnant women. Nevertheless, a range of evidence suggests that food supplementation during pregnancy may be a cost-effective approach to improving birth outcomes as well as improving antenatal health.

- Review of 7 trials concluded balanced energy protein supplementation in pregnancy was associated with a 32% reduction in term low birth weight and 45% reduction in the risk of stillbirths.[29]
- Evaluation of prenatal care and food transfers provided by the United States Women's Infants and Children's Program (WIC) to low income women found Prenatal WIC benefits reduced low birth weights by 25 percent and very low weights by 44 percent.[30]

3.2.2 Segment 2-3: Breastfeeding Promotion

In response to the significant infant mortality, excess health care expenditures and high economic losses attributedby DAR to non-exclusive breastfeeding, Segments2-3 invest significant resources in breastfeeding promotion. It should be noted that the individual and peer counseling included in Segment 2-3 will also be supported by mass media budgeted in Segment 6.

Effectiveness estimates are based on a large body of evidence demonstrating that breastfeeding promotion produces significant results. A Lancet review of multiple studies and evaluations found:

26 Suharno, D., Muhilal, D., Karyadi, C. E., West, J. G., Hautvast, A. J. & West, C. E. (1993) Supplementation with vitamin A and iron for nutritional anaemia in pregnant women in west Java, Indonesia. Lancet 342: 1325–1328.

27 The Effect of Maternal Multiple Micronutrient Supplementation on Fetal loss and Infant Death in Indonesia: A Double Blind Cluster Randomized Trial The National Institute for Health Research and Development, Jakarta, Indonesia, The University of Mataram, Mataram, Indonesia, Mataram General Hospital,Mataram, Indonesia, Helen Keller International, Jakarta, Indonesia, Johns Hopkins University Bloomberg School of Public Health, Baltimore, United States, Micronutrient Forum Paper, 2007

28 Bhutta t al Maternal and Child Undernutrition , What works? Interventions for maternal and child undernutrition & survival, Lancet January 17, 2008

29 Bhutta t al Maternal and Child Undernutrition , What works? Interventions for maternal and child undernutrition & survival, Lancet January 17, 2008

30 Summarized in Carlson, Andrea, Estimating the Effect of the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) on Children's Health Andrea Carlson, Center for Nutrition Policy and Promotion, USDA

- Chances of exclusive breastfeeding in the first month more than tripled (OR 3.45)
- Chances of exclusive breastfeeding from 1-6 months nearly doubled (OR 1.93)
- Group counseling increases chances of exclusive breastfeeding >500% (OR 5.19). [31]
- In addition, an evaluation of the impact of mass media alone in Honduras found 1 68% improvement in exclusive feeding.[32]

This evidence suggests that the proposed ENS package including individual and peer counseling along with periodic mass media support will have a significant impact and reestablish the optimal breastfeeding and child care practices among mothers in Albania – with significant reductions in child mortality and morbidity along with protection of child growth. ENS proposes consistent breastfeeding promotion to pregnant women in Segment 1 and lactating women in Segments 2 and 3 as well as general education provided teenage girls and women of reproductive age Segments 5 and 6. Based on this concerted effort and the summary evidence above we speculate that 50% effectiveness of ENS activities.

3.2.3 Segment 4: Complementary Feeding Interventio

Universal distribution of MMPs and complementary food transfers to low income toddlers represent a significant commitment of about half a million dollars annually for procurement. However, this investment to protect nutrition of children in the critical 6-24 month time period is key to reducing childhood anemia, stunting and underweight. Wide distribution of MMPs or Sprinkles in ENS is based on evidence that this multiple rather than a single micronutrient approach is more effective in reducing micronutrient deficiencies as well as suggestions that these promote growth. Some background literature includes:

- Neither vitamin A nor iron interventions improved linear or ponderal growth in children. The multiple micronutrient was the most effectiveintervention tested, not only for improving anemia but alsofor improving iron status.[33]

- While finding no effect on linear growth with zinc and/or iron, supplementation with multiple micronutrients produced a significant increment in linear growth.[34]

31 Bhutta t al Maternal and Child Undernutrition , What works? Interventions for maternal and child undernutrition & survival, Lancet January 17, 2008
32 Hernandez O, Lani M, Margaret P. Assessment of the impact of a national intervention to promote exclusive breastfeeding in Honduras. Washington DC: Academy for Educational Development, 1995.
33 Usha Ramakrishnan, Nancy Aburto, George McCabe, Reynaldo Martorell Multimicronutrient Interventions but Not Vitamin A or Iron Interventions Alone Improve Child Growth: Results of 3 Meta-Analyses J. Nutr. 134: 2592–2602, 2004
34 Rosado et al Separate and joint effects of micronutrient deficiencies on linear growth. J Nutr. 1999 Feb;129(2S Suppl):531S-533S

- Multiple micronutrient supplement demonstrated greater weight gain and was the most effective treatment for controlling anemia and iron deficiency.[35]

- Micronutrient sprinkles have been extensively tested in the field with 16 studies with consistently significant results and finding anemia "cure rates" of up to 90%.[36]

There is substantial evidence from Latin American demonstrating effectiveness of well implemented food transfers targeting children 6-24 months to reduce stunting.

- Food transfer program in Columbia increased in height on average 0.44 cm for children aged 0–12 months.[37]

- The Progressa Program in Mexico resulted in 16 % increase in mean growth rate per year corresponding to 1 cm increase in height per year, reduced prevalence of stunting by 10% in 12–36 months age group.[38]

- Red de Protección Social in Nicaragua found decline in stunting from 41.9% to 37.1%.[39]

- A recent Lancet review of food transfers in food in-secure populations (we presume the population served by the NE) found reduced stunting "in food-insecure populations" with added ponderal growth of 3.6 cm.[40]

3.2.4 Segment 5: Adolescent Supplementation

"Adolescent females become more susceptible to iron deficiency during the growth spurt and the onset of menstruation and have been suggested as a logical target group for supplementation to replete iron stores before pregnancy."[41] It is difficult to describe effectiveness of supplementation and nutrition education for adolescent girls on the 8 specific nutrition indicators under consideration which focus on the 1000 window of risk. However, this is considered a rational approach to reaching outside the 1000 day window and breaking the potentially inter-generational hold of malnutrition in Albania. The acute need and significant potential impact of providing iron supplementation to teenage school girls has been extensively documented.[42]

35 Cornelius M. Smuts, Carl J. Lombard, A. J. Spinnler Benade , Muhammad A. Dhansay, Jacques Berger, Le Thi Hop, Guillermo Lo´ pez de Romana, Juliawati Untoro, Elvina Karyadi, Jurgen Erhardt, and Rainer Gross, Efficacy of a Foodlet-Based Multiple Micronutrient Supplement for Preventing Growth Faltering, Anemia, and Micronutrient Deficiency of Infants: The Four Country IRIS Trial Pooled Data Analysis J. Nutr. 135: 631S–638S, 2005.
36 Studies summarized by Sprinkles Global Health Initiative http://www.sghi.org/about_sprinkles/faqs.html
37 Mesnard, A. Evaluation of the Familias en Acción Programme in Colombia: Do Conditional Subsidies Improve Education, Health and Nutritional Outcomes? Institute for Fiscal Studies, London. 2005.
38 Bhutta t al Maternal and Child Undernutrition , What works? Interventions for maternal and child undernutrition & survival, Lancet January 17, 2008
39 Ibid
40 Ibid
41 Lindsay H. Allen, Iron Supplements: Scientific Issues Concerning Efficacy and Implications for Research and Programs, J. Nutr. 132:813S-819S, 2002
42 Lynch S: The potential impact of iron supplementation during adolescence on iron status in pregnancy. J Nutr 130:(2S):448S-451S, 2000

- A study in Malaysia found 78-81% "cure-rates" among anemic teen age school girls and "mean hemoglobin increased significantly and consistently in relation to the length of treatment."[43]

- A study conducted among Indonesian teen-age school girls found weekly supplementation was equally effective as daily administration: "After 2 months of supplementation, groups supplemented weekly and daily showed similar significant improvements ($P < 0.001$) in hemoglobin concentrations." [44]

- A review of the literature in the Journal of Nutrition found that in trials comparing weekly and daily supplementation "the relative efficacy was greatest across studies in the case of pregnant women, adolescents and school-age children."[45]

3.2.5 Segment 6 Flour Fortification to Reduce IDA and NTDs

The current state-of- the- art for projecting the impact of flour fortification with iron remains limited. However, recently the World Health Organization published *WHO Interim Recommendations on Flour Fortification*.[46]

Summary National Program and Large Scale Trial Evalutions					
	Program Typo	Raik Group	Para në Dorë	Pre Fortification	Decrease
Vezuela	National	Children	16%	9%	44%
Oman	National	School girls	56%	38%	32%
		Pregnant	49%	43%	12%
Darjeeling	State	School aged	60%	46%	23%
		Teen Girls	70%	55%	21%

The WHO author panel comprehensively reviewed published evidence and trials using a range of iron compounds and concluded that fortification with ferrous sulfate delivering a dose of 7.1 mg/Dy was "efficacious." We estimate in Albania flour fortification would deliver an average of 8-9 added milligrams daily.

Evaluations of impact on anemia or iron deficiency as a consequence of national flour fortification are scarce. The most comprehensive evaluation is from a national program in Venezuela during the 1990's which found a decrease in anemia among lower income children from 16% to 9% - an improvement of 44%.[47] An evaluation of the Venezuelan program found drop in iron deficiency from 37% to 15% - an improvement

43 E-Siong Tee, Mirnalini Kandiah, Narimah Awin, Suet-Mei Chong, N Satgunasingam, L Kamarudin, and Fernando E Viteri School-administered weekly iron-folate supplements improve hemoglobin and ferritin concentrations in Malaysian adolescent girls, Am J Clin Nutr 1999;69:1249–56.
44 Angeles-Agdeppa, W Schultink, S Sastroamidjojo, R Gross and D Karyadi Weekly micronutrient supplementation to build iron stores in female Indonesian adolescents, Am J Clin Nutr July 1997vol. 66 no. 1 177-183
45 Lindsay H. Allen, Iron Supplements: Scientific Issues Concerning Efficacy and Implications for Research and Programs, J. Nutr. 132:813S-819S, 2002
46 Recommendations on Wheat and Maize Flour Fortification Meeting Report: Interim Consensus Statement, WHO 2009
47 Layrisse, M et al. Early response to the effect of iron fortification in the Venezuelan population, Am. J. Clin. Nutr. 1996
48 Scrimshaw et al, Success of Micronutrient Fortification of Cereal Flours in Venezuela, Micronutrient Initiative, 2002

of 59%.[48] As shown in the chart above, other subnational programs found anemia decrease of 21% to 32%. However, for these programs the questions remain about implementation, choice of iron compound and coverage – suggesting these programs could be more effective.

We propose an effectiveness factor of 50% for reduction in iron deficiency anemia - meaning that half of the iron deficiency anemia among the consumers of flour will be prevented by flour fortification. This is consistent with a reduction in over-all anemia by a bit more than 1/3rd (based on 73% of anemia from iron deficiency estimated in the DAR). This seems a reasonable figure since iron deficiency among Venezuelan children dropped 59% with consumption of fortified flours. Moreover, we should note that evaluations reviewed above: do not correct coverage which presumably is less than 100% - therefore, effectiveness among actual consumers may be greater. Finally, these programs do not have the benefit and do not match the WHO Recommendations for level and iron compound.

While young children may not consume as much flour as older children and adults, we apply this 50% effectiveness across the board because young children 6-24 months will also benefit from provision of micronutrient sprinkles in Segment 4. Micronutrient sprinkles has demonstrated anemia “cure rates”of up to 90%.

The evidence demonstrates that providing additional folic acid can avert most cases of neural tube defects.[49] The results of flour fortification with folic acid in the United States, Canada, Costa Rica and Chile provide the background data for projecting effectiveness of flour fortification in reducing rate of NTDs. In each case, folic acid fortification was followed by an immediate increase in population serum folate concentrations and significantly reduced rates of NTDs.[50] 3 studies reported reduction in spina bifida and anencephaly in the United States ranging from 20% up to 50%. [51] Two Canadian studies found NTDs reduced from more than 2 per 1000 births to a little over 1 per 1000. [52] Initial data evaluating folic acid fortification in Chile suggests up to 47% decline in NTDs. [53] Costa Rica found reductions in well covered urban populations of 87%. [54]

49 Medical Research Council Vitamin Study Research Group. Prevention of neural tube defects: results of the Medical Research Council Vitamin Study. Lancet. 1991;338:131–137.

50 Lawrence JM, Petitti DB, Watkins M, Umekubo MA. Trends in serum folate after food fortification. Lancet 1999; Jacques PF, Selhub J, Bostom AG, Wilson PW, Rosenberg IH. The effect of folic acid fortification on plasma folate and Total homocysteine concentrations. New England Journal of Medicine 1999; 340:1449-54.Ray JG, Vermeulen ; MJ, Boss SC, Cole DE. Increased red cell folate concentrations in women of reproductive age after Canadian folic acid food fortification. Epidemiology 2002; 13:238-40

51 Honein MA, Paulozzi LJ, Mathews TJ, Erickson JD, Wong LY. Impact of folic acid fortification of the US food supply on the occurrence of neural tube defects. JAMA 2001; 285:2981-6; Persad VL, Van den Hof MC, Dube JM, Zimmer P; Incidence of open neural tube defects in Nova Scotia after folic acid fortification. CMAJ: Canadian Medical Association Journal. 2002; 167:241-5; 14. Williams LJ, Mai CT, Edmonds LD. Prevalence of spina bifida and anencephaly during the transition to mandatory folic acid fortification in the United States. Teratology 2002; 68:33-39.

52 De Wals P, Rusen ID, Lee NS, Morin P, Niyonsenga T. Trend in prevalence of neural tube defects in Quebec. Birth Defects Research 2003; 67:919-23; Persad VL, Van den Hof MC, Dube JM, Zimmer P. Incidence of open neural tube defects in Nova Scotia after folic acid fortification. CMAJ: Canadian Medical Association Journal. 2002; 167:241-5.

53 Grosse SD, Hopkins DP, Mulinare J, Llanos A, Hertrampf E. Folic acid fortification and birth defects prevention: lessons from the Americas. AGROFood industry hi-tech 2006; 17.

54 Chen LT, Rivera MA. The Costa Rican experience: reduction of neural tube defects following food fortification programs. Nutr Rev 2004;62:S40-3.

Based on the range of evidence above we speculate effectiveness of 75% in reducing NTDs. This includes both impact of folic acid in bread and pasta n but also provision of supplements to pregnant women in Segment 1, teen age girls in Segment 5 and adult women of reproductive age in Segment 6.

3.2.6 Synthetic Indicators: Stunting and Underweight.

Stunting and underweight are sensitive to a range of factors including initial birth outcome, micronutrient and food supplements, caring and feeding practices and over-all child health influenced by breastfeeding status. For example, each episode of diarrhea is associated with a 4% reduction in chance stunting.[55]

Because stunting and underweight are holistic nutrition indicators, projecting effectiveness of ENS package is difficult. Recently the impact of 8 key interventions for which sufficient evidence of effectiveness is available was modeled as part of the Lancet Child Development Series.[56] As indicated in Table 26 below, in one form or another, all these interventions modeled in the Lancet are either included as part of ENS, part of current health services or are considered to be of insignificant impact in Albania. Moreover, while the Lancet review focuses strictly on the 1000 day window of risk, ENS also includes interventions to address to multi-generational impact malnutrition with interventions addressing adolescent girls, women of reproductive age and the general population. Therefore, adopting the Lancet findings can be considered conservative effectiveness assumption.

Table 29: Comparison of ENS and Lancet Modeled Interventions

Modeled Interventions in Lancet 2008	Parallel ENS Interventions
Balanced Energy Protein Supplements	Segments 1-4: Food Transfers for Food Insecure Populations
Coverage with Preventative Treatments	Ongoing vaccination and other current health system programs
Multiple Micronutrient Supplementation in Pregnancy	Segment 1
Breastfeeding Promotion and Support	Segments 1-3 and 6
Complementary Feeding Supportive Strategies	Segment 3-4
Vitamin A Coverage	Not Needed in Albania
Zinc Supplementation	Segment 4: Included in Sprinkles
Hygiene Interventions & Promotion	Segment 3-4
	Additional Interventions in ENS
	Segment 5: School Girl Supplementation and Education
	Segment 6: Supplementation for Women of Reproductive Age
	Segment 6: Flour Fortification

55 Bhutta t al Maternal and Child Undernutrition , What works? Interventions for maternal and child undernutrition & survival, Lancet January 17, 2008

56 Bhutta t al Maternal and Child Undernutrition , What works? Interventions for maternal and child undernutrition & survival, Lancet January 17, 2008

The results of the Lancet modeling are shown in Table 30 below. ENS coverage is projected from 90-99%, modeled in the Lancet. However, since the DAR model applies to stunting at all ages - not segmented by age group as done in the Lancet - we average all segments in the table to obtain a projected reduction of 33.3% in stunting. Applying this figure seems relatively conservative since the Lancet projections already correct for coverage – whereas we will correct for coverage once again.

Table 30: Modeled Impact of 8 Interventions on Stunting

Coverage	12 months	24 months	36 months	Average
99%	33.1%	35.8%	35.5%	34.8%
90%	31.1%	32.4%	32.1%	31.9%
Average	32.1%	34.1%	33.8%	33.3%

3.3 Summary ENS Effectiveness Estimates

Based on the literature reviewed above the table below outlines the effectiveness estimates that will be used in the ENS analysis.

Table 31: Summary of Assumed Effectiveness of ENS Components

	Assumed Effectiveness	Rationale or Source for Assumption
Underweight	33.3%	Parallel to modeled impact on stunting (Lancet 2008)
Low Birth Weight	16%	Lower end of cited studies (Christian et al)
Maternal Anemia & Perinatal Death	39%	Achieved with MMS (Bhutta et al)
Sub Optimal Breastfeeding	50%	Combining Estimate from multiple cited sources
Neural Tube Defect	75%	Combining Estimate from multiple cited sources
Stunting	33.3%	Parallel to 8 modeled intervention (Lancet 2008)
IDA Children	50%	Combined evidence from flour fortification and sprinkles
IDA Adults	50%	Combined fortification and supplementation of rural & pregnant women

04. Calculations for 10-Yr Benefits of ENS Package

4.1 Projected Reductions in Child Mortality at ENS Scale:

Based on original baseline losses found in DAR along with estimates for coverage and effectiveness, ENS (when implemented at scale) is projected to reduce nutrition related child mortality by 41% - saving about 110 lives annually. More than 60% of this improvement is attributed to improvements in exclusive breastfeeding through the first 6 months of life.

Table 32: Projected Reductions in Child Mortality

	Baseline Mortality	Estimated Coverage	Estimated Effectiveness	Lives Saved
Perinatal Mortality	44	93%	39%	16
Suboptimal Breastfeeding	146	95%	50%	69
Underweight	23	95%	33%	7
LBW	32	93%	16%	5
NTD	19	88%	75%	13
Total	265			110

4.2 Benefits or Saved Economic Losses

Annual economic losses measured in the DAR of $97.7 million are projected to be reduced by $34.31 million as a consequence of the coverage and effectiveness of ENS interventions. Substantial savings within each Pathway include:

- Pathway #1: NPV of lost future workforce from child mortality is reduced from $8.12 to $3.36 million.
- Pathway #2: NPV of future losses from child cognitive deficits resulting in depressed adult productivity are reduced from about $20 million.
- Pathway #3: Current losses from depressed productivity of anemia adults working in manual labor are cut by $7 million.
- Pathway #4: Current and future value of excess healthcare and welfare utilization is by $3 million annually.

Table 33 below shows calculations for each individual condition under each Pathway.

Table 33 Projected Reductions in Benefits or Savings from ENS Package of Interventions				
	Baseline Losses from DAR	**Estimated Coverage**	**Estimated Effectiveness**	**Benefits or Saved Losses**
Pathway #1: NPV of Childhood Mortality				
Perinatal Mortality	$1.29	93%	39%	$0.47
Sub Opt BF	$4.44	95%	50%	$2.11
Underweight/PEM	$0.79	95%	33%	$0.25
LBW	$1.01	93%	16%	$0.15
NTD	$0.59	88%	75%	$0.39
Sub-Total	**$8.12**			**$3.36**
Pathway #2: NPV of Cognitive Deficits				
Stunting	$57.66	95%	33%	$18.21
Childhood IDA	$5.25	73%	50%	$1.91
NTD	$0.45	88%	75%	$0.30
Subtotal	**$63.36**			**$20.41**
Pathway #3: Adult Productivity				
Iron Deficiency Anemia	$19.29	75%	50%	$7.23
Subtotal	**$19.29**			**$7.23**
Pathway #4: Health Care Expenditures				
Suboptimal Breastfeeding	$0.49	95%	50%	$0.23
Low Birth Weight	$2.33	93%	16%	$0.34
Neural Tube Defect	$4.12	88%	75%	$2.72
Subtotal	**$6.94**			**$3.30**
Total	**$97.71**			**$34.31**

4.3 Benefit Cost Ratio

A benefit-cost ratio (BCR) is an indicator which attempts to summarize the overall "value for money" of a project or proposal. A BCR is the ratio of the benefits, expressed in monetary terms, relative to costs, also expressed in monetary terms.[57] A BCR of more than one indicates an attractive investment that returns more than is invested.

A 10 year scenario for ENS costs and benefits, parallel to the 10 year budget outlined in earlier sections is based on similar assumptions:

57 Wikipedia

- Since nutrition interventions take time to have effect, benefits are assumed to follow implementation by 1 year. Therefore, 50% scale achieved in year 1 will reflect benefits of 50% in year 2.
- Benefits are at 100% scale for years 3-10
- Costs are not calculated for Year 10 since benefits are not taken into account.
- status quo losses – along with the costs - are expected to grow along with the population at a rate of 1.65% annually.

ENS program is projected to deliver about $300 million in economic benefits over 10 years. This can be achieved at a total cost of $79 million when the contribution of current government capacity is included, suggesting a Benefit Cost Ratio of 4. In other words, a return of $4 is projected for every dollar in cash and in –kind effort devoted to ENS. When cash procurement costs only are taken into account this already positive ratio is improved. Based on about $19 million in actual cash budgetary expenditures, delivering $300 million in benefits indicates a Benefit Cost Ratio of more than 17. By either measure, ENS promises to be a cost-effectiveness investment.

Table 34: 10 Year Benefit Cost Ratio Calculation for ENS

Year	ENS Costs		ENS Projected Benefits	Benefit Cost Ratio		Net Benefits	
	Cash Only	Total		Cash Cost	Total Cost	Cash	Total
1	$1.36	$3.60	0	-	-	-$1.36	-$3.60
2	$1.96	$8.18	$17.15	8.8	2	$15.19	$8.97
3	$1.97	$8.23	$34.52	17.5	4	$32.55	$26.29
4	$1.98	$8.28	$34.75	17.5	4	$32.76	$26.46
5	$1.99	$8.33	$34.97	17.5	4	$32.98	$26.64
6	$2.01	$8.39	$35.20	17.5	4	$33.19	$26.81
7	$2.02	$8.44	$35.43	17.6	4	$33.41	$26.99
8	$2.03	$8.49	$35.66	17.6	4	$33.63	$27.17
9	$2.04	$8.55	$35.90	17.6	4	$33.85	$27.35
10	$2.06	$8.60	n/a			$34.07	$27.53
Total	**$19.41**	**$79.09**	**$299.70**	**17.3**	**4.3**	**$280.29**	**$220.62**