Mother to Child Transmission of HIV/AIDS:

The Mitigating Role of Nutrition

A Business Case for Affordable Fortified Food for Pregnant and Nursing Mothers

in South Africa

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Acknowledgement must be made of the tremendous successes on the part of the Government of South Africa, thousands of domestic and foreign NGOs, USAID and other private and public programs, businesses, and individual efforts to alleviate mother to child transmission of HIV/AIDS ("MTCT") with their commitment and hard work.

Gratitude is expressed to the over 30 groups and many individuals throughout South Africa for their complete openness and energetic assistance in this assessment.

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SUMMARY

HIV/AIDS and chronic malnutrition are lethally joined, accelerating disease and death among affected South Africans. Providing a nutritious, varied diet and care to those in need, is essential. For mother to child transmission of HIV/AIDS, *Combining nutritionally dense food with care for women who are pregnant or nursing and for their infants, helps turn this tide of disease and death in four specific ways:*

1. Fully nourished mothers cope successfully with the physical demands of pregnancy, and if HIV positive, remain healthy care providing mothers, longer.
2. Higher birth weight, stronger infants from well nourished mothers can fend off disease and maintain health.
3. Mother's and child's bodies are in better condition for responding to HIV drug therapy when it is available.
4. Nursing Mothers have adequate energy and micronutrients themselves during breast milk production; or access to ready to use replacement milk for non-nursing mothers.

This report asserts the key role that nutrition plays in mitigating mother to child transmission (MTCT) of HIV/AIDS. Maternal care, malnutrition, the South African business environment and food industry are evaluated in this light. Conclusions are drawn from field and desk research into these areas and recommendations made for alleviating the MTCT crisis through affordable fortified ready-to-eat foods. Lastly, a formal "business case" is made for engaging private business in the manufacture and sales of these fortified functional foods that target underserved pregnant and nursing mothers and their young children.

The Business Case views MTCT and nutrition from a strictly commercial analysis point of view. We considered this an important and realistic exercise to demonstrate the challenges and incentives presented to a business interested in this underserved market niche. We have concluded that though this is a challenging market, with many constraints and a target consumer group with low purchasing power, there is in fact an opportunity to distribute nutritionally fortified foods to underserved pregnant and nursing mothers; and to conduct such a business at a profit that justifies the investment and risk. This business could be started by an existing South African food company or by an external food company entering the market.

At the request of the USAID Mission South Africa, Land O'Lakes sent a technical team to South Africa October 1 through 16, 2002 to do an industry assessment and create the business case for commercializing efficacious foods formulated to address the mother to child transmission of HIV/AIDS crises in South Africa. Our operating hypothesis was that ready-to-eat custom fortified MTCT foods will:

- Provide measurable improved health status of pregnant mothers who will give birth to higher birth-weight, healthier infants;
- Provide measurable benefit in mitigating MTCT of HIV through the introduction and proper use of a ready-to-consume breast milk substitute product;
- Improve the long term overall health and well being of both mother and child.

Conclusions: There is need, and there is strong potential for fortified foods to help mitigate the suffering resulting from mother to child transmission of HIV ("MTCT"). This can be accomplished via commercially viable food system solutions that create affordable fortified food access, and utilization for underserved pregnant, nursing mothers and their infants. Coordination and alignment among diverse MTCT prevention stakeholders (government, NGO's, donors, academia, research institutes, community based organizations ["CBO"], <u>that include a private business initiative</u>) will vastly improve the effectiveness of individual initiatives.

Land O'Lakes has evaluated a free-standing, commercially-oriented business response to the role nutrition plays in populations challenged with HIV/AIDS. Nutritious food becomes even more critical to survival for these people, maintaining strong body defense systems and making drug therapy effective. Existing South African food production and food delivery systems are in the position to extend food access to underserved citizens. *The industry can coordinate, redirect, and optimize it's systems to meet the changing needs of chronically malnourished citizens – in this case, pregnant and nursing Mothers.* But how do we connect the food industry to consumers, who lack buying power, or the knowledge about nutrition, to sustain robust demand for fortified products?

The scope of this assessment is focused on the ways private industry – even one single private business – can assume an immediate and effective role in addressing the nutritional aspects of MTCT by targeting pregnant and nursing mothers with technically proven, fortified, nutritionally-dense foods just as it might target other consumer segments in its market with value added products.

The *Business Case* will show that self-supporting production and distribution of these products can succeed by: creating products that measurably make a difference in consumer's health; marketing to recipient consumers with education and promotions; using a range of five different market channels in both traditional and non traditional marketing strategies; employing flexible pricing strategies; and actively leveraging the advantages available in South Africa to support such a business venture (government, NGO's, research institutes among others).

For our proposed business detailed under the "Business Case" section, the following financial summary reveals that an up front operating capital of approximately R5,000 is needed to initiate the business. There are positive cash flows after year two. The ratios shown are calculated over eight years. There is a very conservative linear growth projection providing 24 million 250 ml servings in year one achieving 48 million by the end of year two, and 96 million by year eight Revenues grow from R39 million to R222 million in year eight.

Financial Results Summary
Years 2003 – 2010 (Rand 000's)

Return on Invested Capital (ROI):	No capital equipment purchase is anticipated
Operating Capital:	Investment of 5,000 in year one
Volumes:	24 million 250 ml units in year one; 96 million units by year 8
Revenue:	R39,000 year one up to R222,000 by year eight
Net Present Value (NPV):	R3,160
Internal Rate of Return (IRR):	24.52%
Positive cash flows after year 2	

Food industry controls enormous capacities: Coca Cola, for example, places fully equipped "spaza" shop containers into informal and formal settlements in South Africa. The team visited one of these. It was a well stocked metal container converted to a Coca Cola spaza that is operated by a proprietor under agreement. Consider the power of such an admirable distribution initiative to sell affordable fortified foods targeting Mothers and infants. Parmalat has formulated cutting edge fortified dairy products targeting growing weaned children and young adults. Commercializing new products such as these in an affordable form for Mothers would be transformational.

This study could contribute to a call to action, a marshalling of initiative by the South African food industry. In collaboration with many other highly active groups private industry will contribute to making available an affordable "food basket" of essential nutrition to all pregnant and nursing women including their infants and weaning toddlers in South Africa.

FINDINGS AND INFERENCES

South Africa exemplifies to the world a nation that has transformed itself socially, economically, and politically as it continues to struggle against fractious forces in creative and humane ways. Few countries could sustain these pressures so effectively while working persistently toward a just and inclusive society. Never, however, has it been more critical for the world to show its unified admiration and support in tangible ways for South Africa's difficult journey.

HIV/AIDS ravages a people. Chronic hunger ravages a people. Here again, South Africa is struggling across many fronts. Some influential sectors appear reluctant to embrace inevitable consequences of these twin afflictions and take decisive action. On the other hand many organizations, government initiatives, and, most impressively, individual citizens are energetically engaged in difficult yet effective action.

Perhaps the most fundamental point to be made from this entire evaluation based on team field observations is the following lethal paradox:

> Within South Africa, there is comprehensive technical information, research, data bases, health and food infrastructure, HIV/AIDS initiatives, nutrition programs, committed individuals, effective food systems, fortified products, investment and development resources and active organizations that currently exist with momentum around HIV/AIDS, MTCT, and food fortification; [1] However, this hopeful aspect of reality is juxtaposed by the following conditions:
>
> - Apparent lack of coordination and communication of initiatives among groups working toward common purposes, central government, provinces, NGO's etc.;
> - Failure to apply the resources and technical research and know-how equally and effectively to MTCT nutrition initiatives;
> - Businesses with the capacities for delivering nutritionally dense foods to target populations constrained from action (paralyzed?) by market conditions (prices, regulatory, or self imposed profit requirements), and an inexplicable disregard for the statistics available regarding malnutrition as a cofactor in the progression of HIV/AIDS;
> - Inflexible import regulations -well intended- to protect domestic food industries but which in fact prevent critical food supplies from being donated to chronically malnourished South Africans – whose buying power currently prevents them from ever consuming on a regular basis most of the South African products being protected (e.g. dairy);
> - Consumer ignorance, or indifference, about the crucial role of nutrients in maternal health – thus not motivated to make effective diet decisions;

[1] To underscore the exceptional leadership South Africa possesses in this area, the reader is referred to: The National Food Consumption Survey, 1999; The Integrated Nutrition Program for South Africa; or the Medical Research Council

- Atomized NGO activities by thousands of groups throughout the country competing for scarce resources;
- Consequential chronic malnutrition and lack of access to complete diets for most of the 300,000 of the HIV positive pregnant and nursing Mothers each year.

The Paradox:
In a country with world leadership in social initiatives, cutting edge food technology, and a world class food industry, many mothers (HIV positive and negative) and their infants remain chronically undernourished at the most critical times of their lives.

The fragmented initiatives in South Africa to mitigate MTCT, to create fortified foods, to provide maternal care, to distribute food and to employ drugs are effective within their particular sphere, but in many cases operate separately, the benefits limited by the scope of each activity. There does not appear to be a country wide comprehensive effort to alleviate the MTCT of HIV/AIDS nor to effectively address the nutrition needs of pregnant and nursing Mothers and their infants. This is a team observation. The disconnect is not out of deliberate negligence but more a failure to collectively grasp how crucial a full spectrum of materials and care services is to the alleviation of MTCT: counseling, drugs, nutritious foods, breast milk replacement where elected, nutritious complementary infant foods and weaning foods, access to clinics, home follow up visits, and training for male spouse.

It is difficult to address a nutritional response to MTCT and food issues without extending the analysis broadly to the chronic food crisis in South Africa. But while it may appear narrow and simplistic, we have attempted to remain focused for the sake of offering one clear and concrete channel through which a positive difference can be made.

To bring the best of what the entire country of South Africa has to offer together with its citizens who are most vulnerable, and to do so at the scale that is necessary, will possibly require another national transformation; a transformation well beyond the scope of the present work.

For the present purpose, we have tightened the focus of effort in three ways:

1. How to use nutrition with maximum benefit for pregnant and nursing mothers and their infant children; here are the beginnings of the country and the foundation of family well being: South Africa's "human capital";

2. How access to highly nutritious diets can effect positive change in the risk of MTCT and, in the long term, the well being of mother and child; and

3. What role private business can play, using their own capacities for providing highly nutritious products to underserved mothers and infants.

Whether viewed as an exclusively retail activity or one involved in humanitarian assistance, we have sought to *understand MTCT and nutrition through the commercially viable domain of supply and demand market factors*: product supply, consumer demand, technology, food production and distribution, advertising and promotion. How do these "real world" market elements thwart underserved Mother's access to adequate nutrition, while at the same time present the opportunities to solve that same problem?

Inferences from field research that are examined in this report:

1. *Complete, sustained nutrition for mothers and their infants will contribute to the mitigation of MTCT. How?*

2. *Businesses that invest in product innovation, nutritious ingredients, and marketing of processed nutritionally dense foods - for even the most underserved and marginalized mothers and infants - will yield returns for a sustainable commercial enterprise. How?*

3. *NGO's play an essential role in the care for and delivery of nutritious diets to mothers and their infants. How?*

4. *Central and Provincial Governments must become more synchronized, in their policies and their resources, with ALL aspects of the MTCT nutrition initiatives. Why? How?*

5. *Advertising, promotion, information exchange, data bases, technology training and application is the propellant behind a successful national nutritional response to MTCT. How?*

6. *Universities and research institutions are active players in any successful and sustainable nutritional response to MTCT. Why? How?*

7. *USAID holds a key to the overall success of these initiatives. What is this key? A) Facilitating communications / information exchange: Creating and publicizing the MTCT nutrition database B) Consumer education about nutrition, promotion of products C) Monitoring and evaluation of positive change resulting from improved nutrition*

Private Business, Nutrition and HIV

Business solutions to consumer problems are motivated by returns-on-investment in the form of a product purchased – at a premium. If individuals, or a group of sufficient significance financially, have a need, business responds with innovation in products and services. But, in the case of impoverished South African mothers and infants, their need is not revealed through a "buying signal" – the purchase power to attract market solutions; income is lacking. It is difficult for a business to target a group that lacks buying power and faces food price inflation at the same time that business is being challenged by government to justify profits.

A business must ask itself: "What are the practical motivations for the South African food industry to marshal and divert its resources toward nutritious diets for pregnant and lactating mothers? Where is the return on investment ("ROI") balanced against risk? Where is the economic motivation for business to contribute to solving so fundamental a problem and for such an important group of South Africans? Where is the business case for South African food industry to engage in innovating business solutions in the HIV/AIDS – chronic malnutrition affliction?"

We believe that, with some qualification, such a business case exists, and that, if for no other reason, the potential costs of doing nothing will accelerate this engagement for businesses.

Direct threats from HIV/AIDS to continued South African business sector performance include:

- Increased absenteeism (one estimate is that 10% of the South Africa workforce is out on an HIV/AIDS related issue at any one time: funeral, care for relative, personal illness);
- Increases in costs for recruiting new staff and training them;
- Pay outs on insurance premiums go up;
- Skilled workers become ill and die;
- The number of employees who are sick with HIV/AIDS will jump dramatically over the next decade from only a few percent for some businesses today to 20%+.
- Costs to engage in corporate risk management;
- Loss of shareholder confidence – decrease in stock value;
- Businesses cannot quantify the costs of doing nothing……yet;
- Loss of customers to illness, reduced incomes, death; one major food company was projecting flat growth - a majority of AIDS deaths will occur among younger, economically active adults:

AIDS Prevalence in South Africa by Age

AGE	% Year 2000
<20	16.1
20-24	29.1
25-29	30.6
30-34	23.3
35-39	15.8
40-49	10.2
45+	13.1

Against these facts, consider the following:

- It is clinically proven that complete nutrition (macro and micro-nutrients, variety) makes a material difference in the long term survivability and continued functioning of Mothers / people with HIV.
- Women make up at least 50 percent of the workforce (this includes unpaid work in the home) and their pregnancies are significant life events with major health complications if they are malnourished.
- Newborn children are the human capital for all of South Africa; their health and survival is essential for future citizens, (employees, customers).
- Any risk of comparable magnitude (e.g. war, hurricane) - other than HIV/AIDS – would immediately accelerate a business's response to the crisis level.

Notwithstanding this, at the present moment the food industry in South Africa operates effectively in domestic, regional, and international markets. Technology, processing facilities, distribution, and staff are of world class caliber and businesses compete with these advantages in global markets. Many transnational food companies have selected South Africa for their continental headquarters.

CONCLUSIONS & RECOMMENDATIONS

South Africa has "first world" food production capabilities with efficient market, distribution, and retail systems. However, these do not adequately bridge the gap in goods and services between the middle class and marginalized groups in both urban and rural environments. One result is chronic malnutrition in a large segment of the population. This problem is compounded by the fact that many of those who can afford to eat diverse and balanced diets in the middle class do not, and as result suffer from various forms of micro-nutrient deficiency. Cultural and historical factors have contributed to poor eating habits especially among the most needy. Low birth weights, growth stunting and reduced cognitive ability are the most common signs of poor nutrition in children and young people. As a result, opportunistic diseases are common in the lower socio-economic groups.

HIV+ individuals with poor food access or poor eating habits advance through the stages of HIV infection more quickly than those with healthy diets (source: Department of Health; South Africa).

HIV+ mothers who are themselves malnourished increase the likelihood of mother to child transmission during birth and breast-feeding. The government of South Africa provides Nevirapene as a mitigating strategy for MTCT at the time of childbirth, however, this will not protect the baby during the subsequent months of breast-feeding. For this, the government has made breast milk replacement powder free to mothers. Approximately 90 percent are reported to elect breast milk replacement feeding when they learn they are HIV positive.

Nutritional interventions are a cost-effective strategy in lowering the risk of MTCT and, at the same time, delivering the benefits of a stronger and more productive mother caring for a healthy infant. Access to a varied and balanced diet in sufficient affordable quantities is the ultimate goal. However, in the short term, there is need for affordable functional (fortified) foods that will fill life threatening micronutrient deficiencies, are culturally acceptable, and can be delivered to the target group in a cost-effective manner. While we are focusing on one fortified beverage product in this business case, many other products are possible including ready to consume shelf stable breast milk replacement products, complementary foods for weaning, and pre-school foods to build strong children during this critical growth period.

An industry led fortified functional food initiative will expedite decision making, facilitate product development, force product distribution, provide a means for commercial promotions and most importantly, it will create a for-profit business structure that will ensure sustainability. The following are twelve essential components of an effective network for product development, production, distribution/sales, community extension worker training, consumer/beneficiary training and social marketing.

A "Formula" for Success in South Africa

1. ***Product innovation that links global and South African food technology,*** product and nutrition research with South African food processors.

2. ***South African Food Processors with Production Facilities*** and economy of scale which will facilitate efficient production and low product cost.

3. ***South African Food Businesses with Distribution Systems*** capable of reaching the lower socio-economic levels of the population in both the urban and rural markets. Strengthening and directing retail distribution channels: forming multiple access points to food. This includes bread, milling, soft drink manufacturing, brewers, and dairy, all with extensive distribution reach.

4. ***Actionable inputs from opinion leaders*** on issues of nutrition in South Africa and validating organizations such as academics, scientists, Department of Health and UNICEF. Coordinating and aligning the nutrition care initiatives of diverse players: Government, NGO's, entrepreneurs, private research institutions, clinics, academia.

5. ***Engagement of community*** based organizations (CBOs), and private voluntary organizations (PVOs), to bridge the distribution gap between producer/distributor and target beneficiaries in disadvantaged areas. (refer to best practices South Africa case study of CARE and AfricaFoods).

6. ***Nutrition Training Program and National Promotion Campaign*** for community extension workers, beneficiaries, and the general public.

7. ***Social marketing food and nutrition program*** (experiential marketing) that communicates in the "language" of the target beneficiaries; young mothers and the youth of South Africa about the nutrition crisis they are living with, its lethality for them and their offspring, and the solutions available to them.

8. ***Enabling Government Policy***, regulatory control, and support actions that put aside delays, debates, and special interest groups. Government policy must reward - not inhibit - industry initiatives to innovate in food production, procurement, formulation, distribution, and sales intended to feed Mothers and vulnerable children. This could extend to relief from VAT for uniquely targeted products such as MTCT nutrition.

9. ***Food industry Alignment, Coordination, and Focus*** that circumvents "business as usual" behaviors and mobilizes collective initiatives and resources toward nutritious food for pregnant and nursing women and vulnerable children. Mobilizing industry for proactive responses to nutrition gaps; demonstrating the link between nutrition and HIV to long term expediency for business goals; Enhancing production, preservation, and distribution of nutritious foods.

10. ***Engagement of South African technology and scientific community***: Universities, research organizations, donor organizations, ...The body of intelligence and human competency around HIV/AIDS, human nutrition, and maternal care are there to be applied by all involved. Food category development: innovating fortified and nutritionally dense foods to fill critical health gaps experienced living with HIV.

11. ***Individual Leadership Roles*** for entrepreneurs and others who are providing cutting edge innovations around this problem. These individuals require backing and opportunities to have leadership roles in forging ways forward: these individual leaders exist in the Government of South Africa – Central and Provincial – Non governmental organizations, PVOs, donors, private businesses, communities, clinics.

12. ***Data Base*** of the metrics around MTCT that is communicated widely throughout the country: numbers, locations, nutritional status, maps of care units, distribution centers, all with food access at the core. Organizations and individuals throughout the system must have timely, accurate and relevant data from which to draw inferences for action. It must operate exactly as does a business that is dependant on such market information to plan strategy. USAID is in a position to provide leadership in creating and actively distributing this data to a full range of stakeholders. South Africa stakeholders must *use the information and intelligence* already available such as the National Food Consumption Survey, 1999, with its thirteen concrete calls to action.

KEY PARTNER LINKAGES

Even our limited feasibility study revealed an extraordinarily broad arena of active stakeholders who were engaged with nutrition, fortification, and/or maternal health and MTCT. The many stakeholders with interests in this issue must maintain unrelenting focus on the specific work at hand: MTCT, nutrition's mitigating role, and commercial solutions to food availability, access, and utilization for those who are vulnerable.

Key stakeholders with defined interests, needs, activities, assets, expectations, and opinions surrounding MTCT and nutrition include:

- Central Government of South Africa
- Provincial Governments
- Non governmental organizations, foreign and domestic
- Private volunteer organizations
- Industry
- Academia
- Research institutes
- Start up entrepreneurs
- Advertising agencies
- Suppliers of ingredients and packaging
- Food Processors
- Employers
- Retail chains
- Distributors
- Health care institutions
- Communities
- Donors
- School feeding NGO's

Fragmented Initiatives

This impressive list of organizations with the potential for vanquishing chronic malnutrition among pregnant and nursing mothers and their infants suffers from serious fragmentation of their initiatives as reported by many of the individuals involved. There simply is not a unifying entity or forum where common problems, crises, solutions, resources, ideas and so on can be relayed among the group and coordinated for timely solutions. Many of these groups look to others for "the money", the "initiative", the "responsibility" for MTCT issues. ("What would a distribution company have to do with MTCT and nutrition for pregnant and nursing Mothers?") Many have embraced some domain as their work initiative but are very limited in their scope and coverage of the problem. Others simply do not grasp what role they might play or how their role could be expanded, and if discovered, are then looking around to see "who would pay for it". Donors are looking to businesses; businesses are looking at donors.

Moreover, this fragmentation of initiatives parallels a "fragmentation of capabilities." This is a fragmentation that is also solved via collaboration. Unity of purpose creates powerful business clusters throughout the world when disparate entities recognize a common goal or problem. Business clusters exist in many industries due to competitive advantages derived from this informal arrangement by members of the cluster. It is such a business cluster or clusters that are envisioned for South Africa to propel the production and distribution of fortified nutritional products.

Business clusters are formed by enterprises that identify their complementary assets, non competitive business arenas, yet common goals. They develop asset sharing mechanisms that support each business in the cluster without thwarting competition. In the case of successfully distributing a technically advanced nutritional product for South Africa, the example of *CARE and AfricaFoods* described on page 22, stands out.

Another South African private business that is adapting its strategy and core competencies to therapeutic nutrition is *The Fedics Group* or "Fedics". Fedic's strategy includes a commitment: "...in developing Fedic's expertise and ensuring that, as the country's largest caterer, we are contributing effectively to the health of our nation." There are several other large caterers not interviewed. Fedics is noteworthy regarding maternal nutrition because of: 1) Their deep expertise in human nutrition and health interactions including pregnant and lactating women and HIV/AIDS patients; 2) their approach of providing a varied diet prepared from typical diet foods (fruits, vegetables, milk, corn meal, meat) and; 3) the *potential* they have to access underserved people, targeted by the present business case, through catering services to clinics, hospitals, mines, workplaces or other institutional channels. Here again, affordability and a focus on the more remotely located, poor, and chronically malnourished will require decisive management commitment, long term investment and concrete expectations for a return on investment. From Fedic's "Principles of Therapeutic Nutrition": "In its simplest form, therapeutic nutrition can be regarded as the role of food and nutrition in the treatment of various diseases. Sometimes the therapeutic diet is the *only* form of medical treatment....."

Fedics is linked into a functional *Tiger Brands* carbohydrate beverage called "Morvite". Fedics would distribute Morvite for miner's meals and to clinic workers for example. Morvite is a product "...which affords the rapid restoration of energy as well as essential minerals, trace elements and vitamins depleted under conditions of bad feeding and/or strenuous manual work and/or excessive heat stress." This product is backed by solid food chemistry and human nutrition findings. It is another example of how exceptionally competent the South African food industry is in addressing the technology of human nutrition. *But what could be done to close the gap and competently supply all pregnant and lactating Mothers with affordable nutritious foods?*

Capabilities and Gaps: In the following table, nine capability factors (at the top of the table) critical to delivering improved nutrition to all South African mothers and infants are correlated with each stakeholder's capacity in each factor. This has been generalized for illustrative purposes and could be more finely tuned to current realities. There are hundreds of other players in this arena not shown. It is possible there are inaccuracies but the principle of the need for linkages stands. The matrix reveals a possible explanation why most of these women are, in fact, not consuming adequate nutrition. Notice the gaps, across almost all organizations, in integrated systems to *fully deliver* customized affordable nutrition all the way to underserved women. We were exposed to some shining examples of success that are making it to them. *By matching gaps with capabilities, business clusters could form that would be highly effective across the full range of success factors.*

STAKEHOLDERS CAPABILITY & GAPS MATRIX

CAPABILITY SUCCESS FACTORS / ORGANIZATIONS	Food Supply	Distribution	Capital	Technology & Science	Fortified Products	Staff with Food System Competency	Food Manu-facturing Capacity	**Affordable** Products Formulated Specifically for Pregnant & Nursing Mothers	Market Reach Directly to Under-served Mothers or Children[1]
BUSINESSES - Processors									
Pioneer Foods	■	■	■	■	■	■	■		
Parmalat	■	■	■	■	■	■	■		
Coca Cola	■	■	■	■	■	■	■		
Clover Dairies	■	■	■	■	■	■	■		
Africa Breweries	■	■	■	■	■	■	■		
Ceres Juice	■	■	■	■	■	■	■		
Tiger Brands	■	■	■	■	■	■	■		
Nestle	■	■	■	■	■	■	■		
AfricaFoods / e-pap	■	■		■	■	■	■	■	
BUSINESSES – Retail / Food Service									
Major Retail	■	■	■		■	■	■		
Secondary Retail	■	■			■	■			
The Fedics Group	■	■	■	■	■	■			
Spazas	■	■			■	■			■
NGO's									
Community AIDS Response (CARE)		■				■			■
Humana Projects	■	■				■			■
Amy Biel Foundation	■	■			■	■	■		
Global NGO's (UNICEF, WFP)	■	■	■	■	■	■			■
RESEARCH INSTITUTES									
University Pretoria				■	■	■			
Medical Research Council				■	■	■			
OTHER STAKEHOLDERS									
GOSA School Feeding	■	■	■	■	■	■			
GOSA Maternal Health Clinics	■	■	■	■					■
Tetra Pak			■	■		■	■		
Roche			■	■		■			
Donors			■			■			■

G A P S

[1] This refers to formal – affordable - point of access created for pregnant and nursing mothers who are lacking sufficient income.

A template for Success: Community AIDS Response (CARE) and AfricaFoods
One noteworthy example where two organizations have collaborated matching assets that complement gaps is Community AIDS Response (CARE) and AfricaFoods. Their story carries important lessons. Africa Foods has taken the lead in formulating an appropriately fully-fortified maize meal "e"-pap that is instantized so it can be prepared with pre-boiled or sanitary warm water. It is a leadership product in the field of fortification and its efficacy in the diet has been substantiated through many trials. CARE is a young progressive South African NGO that has successfully engaged in extensive home care outreach for HIV/AIDS patients.

These organizations have succeeded in creating an exceptional best practices model for the integration of commercial food solutions with NGO community based distribution of affordable products.

"e"-pap product poster in clinic explaining health benefits and community based sales

The vision of CARE is to have a trained CARE worker on the ground in every suburb in the country within 5 years coordinating and providing home care and training for HIV/AIDS. Together with AfricaFoods, the fortified "e"-pap corn meal product is being used both as a job creation and income opportunity for community workers who distribute it, and as an affordable important adjunct to the diets for those most in need. CARE has the responsibility for controlling distribution and works through its own volunteer force, as well as including CBO's, clinics, relief agencies, traditional healers and individuals. Agents who distribute E-pap receive training in running a small business, nutrition, placing and filling orders, and service of their community customers. They earn an income from their sales of the product.

Here "e" pap is shown with some of its competitive product set and alternatives. The IWISA product is fortified, but cooking will reduce the claimed levels. On balance "e" pap is a superior fortified, instant product that is changing many lives for the better in South Africa while, at the same time, proving the value of fortified foods and collaboration between business and NGO's.

CARE is exceptional as an NGO in its motivation and follow through, networking broadly and inclusively sharing its assets, knowledge, and best practices with any organization or individual interested. (at the briefing for the assessment team, at least two other private organizations [including the Anglican Church, and a tiny regional NGO] were present to learn about the CARE service and food distribution model. In a similar fashion, AfricaFoods has reached out to major food processors and ingredient and packaging suppliers to engage their capacities in the development of superior, ready-to-consume, fortified maize meal products.

> This collaborative initiative between Community Aids Response (CARE) and AfricaFoods brings together the very best of what South Africans have to offer toward ameliorating the suffering from HIV/AIDS. In a focused, practical commercial solution, they distribute superior fortified nutrition in the form of "e"pap into the hands of those most in need, while rewarding everyone along the distribution channel with employment and income to sustain the enterprise. May others learn from their exceptional example.

MATERNAL NUTRITION & HIV / AIDS

Food Review, 2001 shows that the number of South Africans infected by AIDS is currently 4.7 million (11.6 percent), with a reported 1700 new daily infections. When measured by antenatal prevalence, the number of infected people in South Africa is 24.5 percent. These findings were confirmed by the International Monetary Fund (IMF's) *World Economic Outlook* Report of September 2000.

> Studies indicate that between 25 to 45 percent of HIV-infected mothers will pass on the virus to their infants during pregnancy, labor and delivery, or after birth through breast-feeding. One recent study (De Cock et al, 2000) reported that infection risk is thought to be 5 to10 percent during pregnancy; 10 to 20 percent during labor and delivery, and 10-20 percent through sustained breastfeeding. Other data analysis shows that approximately 20 percent of infants of HIV-infected mothers are infected before or during delivery (AED, 2001). Reports show that if all HIV-infected mothers breastfeed, another 14 percent of their infants will become HIV-infected through breast milk. Based on these findings, about two-thirds of children born to HIV-infected mothers will not become infected.

It is important to note that in industrialized countries including the United States, the rate of MTCT has decreased to as low as 1 to 2 percent of births among HIV-infected mothers. This decline is due to a combination of several protocols. These include HIV counseling and testing; prophylactic use of AZT or ZDV (zidovudine); voluntary cesarean delivery, prudent use of infant formula instead of breastfeeding (Mofenson et al, 2000, Lepage, et al, 2000). The Center for Disease Prevention and Control (CDC, 2001) reported that in the United States alone, between 1997-1999, perinatally acquired AIDS cases declined 66 percent. This means that elimination of perinatal transmission of HIV is an achievable goal as corroborated by others (Lepage et al, 2000).

HIV Transmission During Pregnancy

In most infected women, the placenta actually shields the fetus from HIV and does not allow the virus to cross (Anderson, 1997). If the placenta is insulted however, protection may be weakened, as in the case of the mother developing bacterial, parasitic, or viral placental infections during pregnancy. This is also true if the mother is presented with advanced immune deficiency associated with a disease such as AIDS. Some clinicians suggest that there is a greater risk of perinatal transmission of HIV if a woman becomes infected during pregnancy. This is because this new infection results in a very high level of viral development within a short time period. It is important to note, though, that one group of researchers (Roongpisuthipong et al., 2001) have reported no increased risk of MTCT or level of significance in viral load at delivery between HIV-infected women who seroconverted during pregnancy or those who were HIV positive when previously tested.

HIV Transmission During Labor and Delivery

During childbirth, between 10 and 20 percent of children born to HIV infected women will become infected unless steps are taken to prevent transmission of the virus. This means that infants born to HIV-infected mothers are at particularly high risk of becoming infected with the virus during childbirth. Many infants who get HIV during labor and delivery do so by sucking, swallowing, or aspirating maternal fluids that contain HIV, such as blood, cervical secretions, or a combination of fecal and maternal blood as the placenta separates. Some studies have identified a correlation between low levels of vitamin A and cervical lesions in pregnant women; a condition that could exacerbate blood born transmission of HIV. Higher risks of MTCT during labor and delivery may also be associated with the duration of membrane rupture, usually deliberately done to augment or induce labor; acute chorioamnionitis, as a result of untreated sexually transmitted illness, or other infection; or an invasive delivery technique which increases the infant's contact with the mother's blood (WHO, 1999; Anderson, 1997).

Summary of factors affecting mother-to-child transmission of HIV[3]

Maternal	Maternal immunological, ***nutritional***, and clinical status, behavioural factors
Obstetrical	Prolonged rupture of membranes (>4 hours), mode of delivery, intrapartum haemorrhage, obstetrical procedures, invasive foetal monitoring
Foetal	Prematurity, genetic, multiple pregnancy
Infant	Breastfeeding, gastrointestinal tract factors, immature immune system
Viral	Viral Load; Viral genotype and phenotype; Viral resistance

Summary of Interventions to Prevent Mother-to-child HIV Transmissions

Pregnancy Termination
Behavioural Interventions Reduction in the frequency of unprotected sexual intercourse. Reduction in the number of sexual partners. Lifestyle changes, including avoidance of drug use and smoking.
Therapeutic Interventions ***Vitamin A and other micronutrients***; Treatment of STDs
Obstetrical Interventions Avoidance of invasive tests; Birth canal cleansing; Caesarean delivery
Modification of Infant Feeding Practice Avoid breastfeeding; Early cessation of breastfeeding; Heat treatments of expressed breast milk

[3] Prevention of Mother-to-Child HIV Transmission and Management of HIV Positive Pregnant Women South Africa Department of Health; Directorate: HIV/AIDS and STDs; Launched October 2000

HIV Transmission Through Breastfeeding

Some reports show that HIV passes via breastfeeding to about 1 of 7 infants born to HIV-infected women (AED, 2001). Despite this, while HIV is present in breast milk, the viral concentrations in it are significantly lower than that found in blood. However, between 10 and 20 percent of infants born to HIV-infected mothers become infected through prolonged breast-feeding, defined as 18 months or longer. Follow-up studies (Coutsoudis, 2001a), showed that infants who were exclusively breastfed for three months or more had no excess risk of HIV infection over six months than those who were never breastfed. It is important to note that in situations where the prevalence of HIV is high, not breastfeeding is similarly associated with a three to five-fold increase in infant mortality. Researchers have recently reported that during breast-feeding, the risk of HIV transmission depends on several of the factors listed below:

- Infant Age

Data suggests that, although the risk of transmission may be lower when exclusive breast-feeding is practiced, between 50 and 75 percent of all breast feeding-related HIV transmission occurs in the first six months of life (WHO, 2001, Nduati et al., 2000). Also, the risk of postnatal transmission declines during the second year of life (Coutsoudis, 2001; Miotti et al., 1999).

- Breastfeeding Period

As long as the infant is breastfed, the risk of HIV transmission persists. The risk of HIV transmission through breastfeeding is greatest in early infancy (before 6 months of age) and persists as long as breastfeeding continues. Some studies have found that longer duration of breastfeeding is associated with increased risk of MTCT.

- Breastfeeding Method

Research is now being conducted in several countries, including South Africa, Zambia, and Zimbabwe, to further investigate the pathophysiology and better understand the relationship between HIV transmission and infant feeding patterns. Some data suggest that exclusively breast fed babies may have a lower risk of HIV infection than those who consume other types of foods, both liquids and solids, in the first months of life (Coutsoudis et al., 2001; Smith et al., 2000; Nicoll et al., 2000). It is believed that this lowered risk may be due to early immune stimulation as a result of early introduction of food and/or pathogens. This results in gastrointestinal disturbances that increase gut permeability and thus provide an entry point for the virus. Another theory is that perhaps breast feeding patterns are associated with breast health factors such as cracking, mastitis, etc., that may influence HIV concentrations in breast milk.

- New Maternal Infection During Breastfeeding Phase

Reports indicate that the risk of postnatal MTCT doubles to about 30 percent if a mother becomes infected with the virus while breastfeeding (Dunn et al., 1992). High maternal HIV viral load measured during pregnancy or after delivery have been associated with the increased rate of MTCT through breastfeeding; presence of STD's such as syphilis may also contribute to MTCT.

- Health of Breasts

Abscesses, mastitis, bleeding or cracked nipples along with other indications of breast inflammation or illnesses are associated with an increased risk of HIV transmission. (John, et al., 2001; Nicoll et al., 2000; Semba et al., 1999).

- Infant Oral Health Phase

Data (Dunn et al., 1992), suggest that those infants with oral lesions, particularly oral thrush within the first six months of life, appear to be at greater risk of becoming HIV infected during breastfeeding. A study in Kenya found that infant oral thrush before six months of age is a risk factor for post-neonatal infection of children;

The nutritional status of both Mother and child is a cofactor in: the integrity of mucus membranes in the birth canal, mouth, health of skin/nipples, immune system, body size for infant, and energy level.

The subject of HIV and infant feeding is complex, as is the dilemma it poses. There is an urgent need for more research to further investigate the effect of HIV and overall health outcomes of infants who are exclusively breastfed by HIV-positive mothers. Health outcomes of infants should be investigated and monitored, beyond their HIV status. This research should be done independent of organizational interests.

Impact of Breastfeeding on HIV-Positive Mothers

Lactation places high demands on the maternal stores of energy, protein and many micronutrients. In fact, maternal deficiencies of some micronutrients can affect the quality of breast milk (AED, 2000). It is for this reason that maternal nutrition stores should be established, conserved, and replenished accordingly. An additional 500 calories per day is recommended, as well as iron supplements to the diet for example, along with ample clean fluids. Calcium intake is important to prevent loss from Mother's bone mass.

There is however, a paucity of data on the impact of breastfeeding on HIV-positive women. Kenyan researchers, (Nduati et. al, 2001), reported a three-fold mortality increase in HIV-infected mothers who breastfed, when compared to those HIV-positive women who formula-fed their infants. *Metabolic and nutritional demands of breastfeeding were implicated as significant factors in this high incidence of maternal mortality.*

Nutritional Needs of the HIV-infected Woman During Pregnancy and Lactation

In South Africa, the problems of pregnant women who are HIV-positive have been eclipsed by their poverty, lack of access to food, and basic health services. Chronic hunger or simple starvation results in nutrient deficiencies. Inadequate intake of protein, calories, copper, zinc, selenium, iron, essential fatty acids, folate, and vitamins A, C, and E all interfere with the body's defense and immune function. Of particular concern are the unique nutrition needs of women during pregnancy and lactation which may compound the burden imposed by the HIV infection itself. Prematurity, low-birth weight, and malnutrition in the neonate are more common in HIV-infected mothers than their otherwise healthy counterpart (Bahl, 1995). Therefore, for the HIV-positive mother, healthful eating is indispensable for positive pregnancy outcome.

Pregnancy is a prime example of the physiologic synergism in which the mother, fetus, and placenta collaborate to sustain and nurture life. *The mother's food habits and overall health and nutritional status before conception, as well as during her pregnancy, influence the pregnancy's outcome.* Individually, pregnancy or HIV infection imposes physiological stress on the body. Pregnancy in the presence of HIV infection results in a negative synergistic effect on immune function. This increases the woman's vulnerability to viral, bacterial and fungal infections (USDHHS, 1996). Similarly, both increase metabolism, which results in an increased requirement for macro-nutrients including energy and protein as well as micronutrients.

All infections, no matter how mild, can decrease nutrient intakes and increase nutrient losses, even when the loss is sub clinical. These losses include decreased intestinal absorption, direct loss of nutrients in the gut, internal diversion for metabolic responses to infection and increased basal metabolic rate when fever is present (Scrimshaw, et al.). Almost any nutrient deficiency, if sufficiently severe, will impair resistance to infection. In this way, infection influences not only protein and energy status but also that of most other nutrients. The clinical importance of these consequences of infection depends on the prior state of the individual, the nature and duration of the infection and the diet of the individual during the infection, particularly dietary intake during the convalescent period and whether full recovery takes place before another infection occurs. Morbidity and mortality are increased further by poor sanitation practices which further makes poorly nourished women more susceptible.

Micronutrient deficiency exacerbates malnutrition and vice versa. Collectively, deficiencies of the micronutrients iodine, iron, and Vitamin A, affect mortality and morbidity levels in more people worldwide than protein energy malnutrition (Sardesai 1998). In South Africa, the micronutrients of concern also include Vitamin A, Zinc, Calcium, and Iron as identified in a report by (N. Steyn, et al. 2001).

The following are recommendations from the South Africa: Prevention of Mother-to-Child HIV Transmission and Management of HIV Positive Pregnant Women; Department of Health; Directorate: HIV/AIDS and STDs; Launched October 2000

Recommended medications in HIV positive pregnant women postpartum:

- ***Multivitamin tablets 1 twice a day***
- ***Vitamin A gel capsule 200 000***
- ***Ferrous sulfate 1 twice a day***
- *Ergometrine 1 tablet twice a day if necessary*
- *Amoxycillin 500 mg three times a day for 5 – 7 days*

- *Metronidazole 400 mg three times a day*

Nutritional Interventions

Vitamin supplementation must be started at the first antenatal care visit. Multivitamins and Vitamin A in particular has been shown to be effective in improving immunity.

Recommendations:

- **Multivitamin 1 three times a day**
- **Vitamin A 200 000 units daily**
- **Ferrous sulfate 1 two times a day**
- **Folic acid 1 daily**

Notwithstanding the above, no studies to date have established comprehensive nutritional requirements for the pregnant HIV-positive mother. However pregnancy and lactation increases the need for all nutrients including energy, protein, minerals and vitamins, to meet the greater structural and metabolic requirements. The Recommended Dietary Intake (National Academy Press, 2000) for some key nutrients during pregnancy and lactation are listed below.

Key Nutrients during pregnancy and Lactation

Nutrition Component	Function in the Body	Recommended Levels
Calories -fat and carbohydrates	to supply the increased fuel demanded by the increased metabolic workload	workload. 36 kcal/kg (300 additional calories during pregnancy; 500 during lactation
Protein	for the tremendous growth element for body tissue; presence of HIV / AIDS may double the required amount	A 10% increase to about 60g/day.
Folic Acid	for help build mature red blood cells and healthy embryonic tissue development	600ug during pregnancy; 500 during lactation
Vitamin A	for tissue growth; low levels in pregnancy may contribute to MTCT; maintenance of epithelial tissues; constituent of visual pigments	770ug for pregnancy;1300 during lactation
Calcium	for fetal development of bones and teeth; during nursing, protects mother from bone mass loss; blood clotting, neuromuscular activity	1000mg is considered an adequate intake during pregnancy and lactation
Iron	for increased hemoglobin synthesis; anemia increases the risk of death of the mother during or after childbirth due to severe bleeding with low hemoglobin reserves. There is also increased risk for the infant	27mg during pregnancy; 9 during lactation
Iodine	for hormone development in order to control basal metabolic development	220ug during pregnancy; 290 during lactation).
Zinc	to provide for the growing fetus; constituent of insulin, enzymes; contributes to protein synthesis, healing of tissue	11mg during pregnancy; 12 during lactation).

Birth weight, is directly affected by maternal health and nutrition. In addition to increasing the calorie and protein needs of pregnant and lactating women, the diet should be augmented with a complete prenatal multivitamin/multimineral, instead of only the minimal nutrients, vitamin A and folic acid currently being provided. The goal is to help reduce intra-uterine growth retardation and prevent childhood malnutrition and early death. Further, for women who are HIV-positive, comprehensive health care services can play a pivotal role in the prevention and treatment of opportunistic infections and other health conditions that can shorten their survival time with AIDS, diminish their quality of life, and obstruct their ability to care for their children and families. Improving the nutritional status of HIV-infected mothers may help to slow the progression of HIV and possibly prolong survival.

> "The concept of "child health begins before birth" in relation to planned parenthood (age, child spacing, nutritional and prenatal care), the importance of micronutrient supplementation during pregnancy (iron, folate) and preparation for choice of infant feeding (breastfeeding promotion) should be promoted to all women of child bearing age."[4]

Similarly, improving maternal health by providing comprehensive antenatal and postnatal support and care may help reduce the danger of MTCT. This can help improve nutritional status and overall health, reduce maternal mortality and thus infant and child mortality as well. Further, such health care can further reduce the woman's own risk of HIV infection by detecting and treating reproductive tract infections, including sexually transmitted illness as well.

The current available demographic database does not assess the relationship between hunger and fetal outcome measures, including impact on intra-uterine growth retardation.[5] This evaluation is critical since malnutrition is often an intergenerational occurrence. Maternal and child health assessment tools should be updated to include statistics on this indicator with appropriate analysis and intervention strategies implemented as warranted. This particular data is important since fetal growth and development is directly affected by the mother's nutritional status. Simply put, it is difficult for an unhealthy mother to give birth to a healthy infant.

Conclusions

In South Africa, there is a plethora of activities aimed at preventing mother to child transmission. However, these interventions are not readily available or easily accessible to the most economically deprived, those with meager combined resources. According to clinic staff in the villages/townships visited, breastfeeding well beyond the first year of life is a normal practice for individuals who have no other food source for feeding. However, when infant formula is available, HIV-positive mothers usually never breast feed. A lack of food, then, appears to be a primary factor in MTCT in these communities.

Malnutrition has contributed to a significant percent of AIDS-related deaths in South Africa. While prevention remains the most effective tool in managing HIV/AIDS, hunger which

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[4] National Food Consumption Survey for South Africa, 1999; p. 21

[5] The "Maternity Case Record" which is the official document from the department of health makes no mention of the nutritional status of the mother, requests no data on this, and no tests appear to be required.

leads to malnutrition is one of the most pervasive factors that exacerbates this virus. Malnutrition weakens the immune system and makes illness worse. Adults who survive malnutrition as children are less physically and intellectually productive and suffer from a higher level of disability and chronic illness (UNICEF 1998). Underlying causes of malnutrition include not only inadequate access to safe, wholesome, nutritious food, but also inadequate care of children and mothers and unhealthy environments. Furthermore, malnourished children often have infections; the younger they are the greater the mortality risk. Reports show that Sub-Saharan Africa is the only region in which the prevalence of child malnutrition has been increasing. It has been surmised that deterioration in women's overall health status and vulnerability due to reduced life expectancy may be significant contributory factors to this dilemma (Messer et al. 1998).

INTEGRATED MATERNAL CARE SERVICES

Safe Motherhood

Ninety four percent of women were reported to have received antenatal care (ANC) from a doctor, nurse or midwife over the last 5 years. In non-urban areas, most ANC was provided by a nurse or midwife. The maternal mortality ratio (MMR), number of maternal deaths per 100,000 live births is between 150[6] and 230[7]. Most women (84 percent) receive medical assistance, doctor, nurse or midwife, at delivery. The Ministry of Health has initiated Confidential Enquiry into maternal deaths since 1997 in an effort to further reduce the MMR. Infant mortality rate (IMR) was found to be 45 per 1000 live births for the period roughly from 1993 – 1997.[8] IMR for 2000 was 59 per 1000 and under-5 mortality rates for 1995 was 87 but 120 for 2000.[9] Based upon the Maternal and Neonatal Program Effort Index (MNPI) for South Africa, conducted by the Policy Project, births attended by skilled personnel are 84%; CPR using modern methods for married women of reproductive age is 55 percent; abortions are permitted on broad socioeconomic grounds; access to safe motherhood services is 73 percent (61 percent for rural); 72 percent of women have access to antenatal care; and 69 percent to postpartum family planning. Forty-eight hour post-partum check-up coverage is 36 percent rurally and 61 percent in urban areas. Nearly half of the population lives in rural areas.

Exclusive breastfeeding was found to be very low, even in the first three months of life, when only 10 percent of infants are given nothing but breast milk. Breast feeding promotion needs to be further supported while factoring the complexities that HIV/AIDS brings to breast milk promotion.

Breastfeeding and supplementation

Percent distribution of living children by breastfeeding status, food supplementation and use of a bottle with a nipple according to age, South Africa 1998

			Breast milk and:				
Age of child	Not BF	Breast only	Plain water	Other liquids	Solid or mushy food	Total	Bottle fed
0 – 3 months	16.6	10.4	8.9	48.5	15.6	100	48.3
4 – 6 months	20.1	1.2	2.2	40.0	36.5	100	37.5
7 - 9 months	33.3	0.9	0.7	19.6	45.5	100	30.2
10 – 12 mo's.	29.5	0	0.4	12	58.2	100	23.2
Total	24.4	3.5	3.4	31.5	37.2	100	35.8

1998, South Africa DHS

[6] 1998, South Africa DHS
[7] WHO, 1999
[8] 1998, South Africa DHS
[9] March 2002, PHNIP South Africa Health Statistical Report

Family Planning
Total fertility rate has been declining and is now 2.9 children per woman for the period of 1993 – 1997. This is consistent with increasing access to education (only 7 percent WRA have no education) and an increase in contraceptive use.

Universal knowledge of modern contraception among women interviewed and relatively high use of modern contraception (CPR of 49.3 percent), however, the types most popular were injection, pills and female sterilization; this shows a need to promote the use of family planning methods which also encourage disease prevention, especially sexually transmitted infections and HIV.

The following is excerpted from: South African Department of Health; Expanded Terms of Reference from the Maternal Child and Women's Health Committee; draft policy 1995

> "Malnutrition in rural regions, and rape and battery are serious health problems. Black babies and children often suffer needlessly and die early; this is so because they frequently fall prey to ordinary diseases which are easily preventable or treatable. Perinatal, infant and child mortality rates are high with marked disparities between the races, the regions and between the urban and rural areas. Perinatal mortality is the single largest cause of the death of infants and children. Newborn babies suffer the effects of maternal disorders, therefore hypertension, sepsis, infections, abruptio placentae, haemorrhage, pre-term labour and unexplained still births are the most frequent causes of perinatal deaths. Good antenatal care and improved services for delivery can reduce the incidence of these problems.
>
> Low birth weight are prone to serious diseases in the first weeks of birth and are likely to fail to achieve their potential for growth and development in later life. About 10 - 19% of Black babies born in hospitals are low birth weight. Beyond the neonatal period, the major causes of infant mortality are diarrhoea and respiratory diseases. The latter two, together with perinatal causes, viral diseases, congenital defects and ill-defined causes, account for just over 90% of all infant deaths. Children beyond infancy die from a similar range of diseases; malnutrition and infection are especially important in pre-school children. Morbidity data are very weak. Diarrhoea, respiratory infections, allergies, malnutrition *(protein/energy malnutrition and micro-nutrient deficiencies),* poisoning, and child abuse are undoubtedly common. ..... *HIV/AIDS is looming large on the horizon."*
> *(Italics added)*

STI / HIV / AIDS
According to UNAIDS 2000 data, HIV prevalence for adults in South Africa is 19.9 percent, for females 15 to 24, estimates range from 22.5 percent to 27.1 percent and for males of the same age group, they range from 7.6 percent to 15.1 percent.[10] Sixteen percent of females report condom use with last non-regular partner[11] Awareness of HIV/AIDS is high

[10] March 2002, PHNIP South Africa Health Statistical Report
[11] Ibid

at 97 percent for 15 to 49 year olds. In general those in rural populations had less knowledge of methods of prevention of AIDS than those in urban areas. Detailed information of HIV/AIDS which would enable behavioral change to prevent further infections of HIV is not as high. Eight to ten percent of women said that staying with one faithful partner and using a condom will not protect them from HIV/AIDS.
Fifteen percent of women 15 to 49 years said to avoid touching a person with AIDS to protect against AIDS and 17 percent said to avoid sharing food as a means of protecting a person from getting AIDS. Women living in urban areas and younger women are more likely to use condoms than other women.

STI prevalence in South Africa is very high. For a proxy indicator, only men were asked about symptoms of STIs, 12 percent of adult men reported recently having symptoms associated with STIs. Levels were higher among non-urban men, men in KwaZulu –Natal and Mpumalanga Provinces and African men.[12]

Helen Joseph Hospital care services
The hospital has 522 beds. There are about 80 to 90 HIV+ diagnoses per week. There is a long wait between being tested and found to be positive and the first visit to a doctor so this hospital has a wellness program at which the CD4 count is checked and the clients are counseled on nutrition, HIV, coping skills, disclosure, etc... Less than 5 percent of the clients are on antiretrovirals and for those who are, they are usually sponsored by a relative or employers. The three drug therapy costs around R900[13] per month and a good wage is R600 per month. Costs are lower in Swaziland. The clinic offers a variety of alternative treatment programs with the philosophy that everything should be tried so this includes low dose electric therapy. Their clients like the "e"-pap fortified corn pap that is provided.

There is not antenatal care provided at this hospital, women go to Coronation Hospital. Abortion is legal and therefore many women do terminate their pregnancies.

> In an assessment of community-based HIV/AIDS Care and Support programs in South Africa, food was identified in focus group discussions as a primary need. This was also highlighted several times by people met the LOL Assessment team. One nurse was quoted as saying, "You know I really wonder whether some patients aren't dying of starvation and not AIDS." Another said, "Look, people need money, food, clothing and only then can you take on the emotional and medical issues of AIDS."

PLWHAs who participate in programs feel they have been given a 'new lease on life.' They are interacting with others, finding that they are not alone, and that there are others with this disease with whom they can talk. One person said they were able to tell their mother as a result of being in the support group. The community based care and services provided tend to be fragmented, not standardized, with few examples of well-developed

[12] DHS for South Africa, 1998
[13] Ten South African Rand = approximately one U.S. dollar

referral systems linking to social, medical and advocacy services. Coordination appears to be lacking in general. There is focus almost exclusively on those who are already ill with AIDS and there seems to be little available for the asymptomatic HIV infected population.[14]

Helen Joseph Hospital (HJH) has a wide array of primary and allied health services for individuals with HIV/AIDS. Services include nutrition education, food sanitation and safety measures, issues related to privacy and disclosure, coping and management skills, even stress reduction management and massage therapy. The lack of ARV usage is directly linked to poor financial resources. Clinical staff reported satisfactory outcome measures characterized by ongoing ability to work and acceptable viral loads for individuals taking ARVs. Through ongoing nutrition education and food supplementation efforts, the 5 percent individuals that were taking ARV's were eating adequately. Dietary intervention is especially helpful when taking ARVs, because in many instances, food intake can be the difference between the success and failure with these medications. This is because many ARVs have special dietary needs for their absorption in the body. Also, in the presence of HIV/AIDS, certain organs like the liver and kidneys also require greater amounts of energy and certain micronutrient to effectively process high level of toxic therapies being consumed on a regular basis. Supplemental feeding is also provided for HIV-positive individuals at HJH. The primary supplemental feeding offered is the fortified corn meal mixture called, "e" pap.

There were five common program types identified for models of community-based care and support:

1. Funding, technical assistance and support programs;
2. Advocacy and community mobilization;
3. Drop-in centers/support programs, which provide support groups and counseling, education and often have an income generating activity (IGA);
4. Community home-based care programs, which provide the above and also offer some home visiting;
5. Comprehensive home-based care programs which provide the above plus varying levels of nursing care.[15]

Major challenges identified by programs for affected children were:

- Accessing child welfare grants, including the documents required for grants;
- Maintaining children in school, because of no school and uniform fees, regardless of whether the child is between 7 and 15 years;
- Finding suitable housing or placement for both infected and affected children; and
- Providing the basic necessities for children such as food, clothes, counseling support and a normalized environment

[14] Ibid
[15] Ibid

Langa Clinic care services

Langa is the first Black township in South Africa. The maternal child health clinic there is an excellent entry point for delivering the HIV/AIDS prevention and education message. The clinic provides prenatal and antenatal care to all women, including those who are HIV-positive. Clinical staff reports that unemployment, low socio-economic status and high rate of HIV/AIDS are the major health challenges to infant and maternal outcome measures. Social grants in the form of enriched corn meal, is given only at stage four of the HIV/AIDS infection range.

The disease stages are defined by the MOH.

Stage 1	Asymptomatic phase
Stage 2	Oral thrush
Stage 3	Combination of opportunistic infections or co-infections such as TB
Stage 4	Full blown AIDS

Good nutrition is particularly critical to asymptomatic people who are HIV-positive since corrective measures may slow weight loss and avoid nutritional complications seen in later stages of the disease or when nutrient intake is suboptimal. Left untreated, HIV infection progresses to acquired immunodeficiency syndrome (AIDS).

Like other infections, HIV interacts with malnutrition in a devastating, vicious cycle. Low levels of Vitamin A in pregnant women increase the rate of HIV transmission to their unborn babies. Beyond loss of adipose tissue, muscle stores and the prevalence of diarrhea associated with HIV/AIDS, other health issues such as oral thrush, anorexia, or a loss of appetite, all of which impact food intakes, are usually not immediately addressed. Also, there is a plethora of data to show that good nutrition, when applied rigorously, can help to strengthen the immune system (Fields-Gardner et. al., 1997; Nerad et. al. 1994).

Unlike the HJH program, where nutrition intervention is provided and supported, such programs are neither provided nor applied as a preventive measure at Langa clinic. Instead, provision of food at the Stage 4 level can be viewed as merely a humanitarian act. Unfortunately, the body is often so ravaged at stage 4 that the meager offering of enriched corn meal is no match for this virus.

There are no ongoing wellness programs at this facility. Similarly, no allied health programs like those seen at HJH are available at this facility. During the antenatal phase, mothers who are HIV positive are discouraged from breastfeeding. Clinical staff reported after giving birth, mothers are encouraged to return once monthly to have babies evaluated. During the post-natal period, mothers are persuaded through the provision of fortified corn, and milk when available, as an incentive to bring their babies in for well-baby visits. Growth monitoring detection is conducted at each visit. Mothers who are HIV-positive continue to be discouraged from breastfeeding whereas; mothers who are negative are encouraged to breast feed. Clinic staff also reported that >90 percent of pregnant women received some form of antenatal care at least once during their pregnancy. This finding is in concert with SADHS report in which a substantive percent of women, 94 percent, received antenatal care from a nurse or doctor. Only 15 percent of births between 1993-1998 were delivered without medical assistance.

Clinical staff reported that because supplemental feeding stops after six months of age, mothers lack the incentive to return for well-baby visits and just do not come. It is after these six months, when food is scarce, that infant mortality increases. While cumulative data is unavailable at this time, review of data collection sheets by the assessment team showed that there is a concerted effort to monitor and provide intervention to children, including those born to mothers who are HIV-positive, and who are failing to thrive. This is done so that immediate corrective methods are implemented and relapses avoided. *Such intervention is in concert with researchers (UNICEF 1996) who reported that the risk of dying from a disease is twice as high for mildly malnourished children, five times as high for moderately nourished children, and eight times greater for children classified as severely malnourished.*

Conversely, other researchers have found that such programs have been largely ineffective, since analysis estimates show that the vast majority of malnutrition-related deaths worldwide (83 percent) occur in children who are mildly and moderately underweight. Similarly, other researchers (Pelletier 1994) have shown that the quantitative relationship between malnutrition and mortality is consistent across various populations representing diverse ecological, disease, and cultural environments. The bottom line is that malnourished children are at greater risk of dying that those who are well fed.

Maternal mortality ratio is alarmingly high at 150 per 100,000 live births. Infant mortality rate was 45 deaths per 1,000 live births between 1993-1997 (SADHS, 1998). *This means that in South Africa, one out of every twenty-two children dies before reaching their first birthday.* Morality rates were directly tied to economic, social, and demographic conditions in which people live. Where socio-economic conditions are poor, infant mortality rates are high. The more economically deprived, rural areas such as those in the Northern Cape, Eastern Cape and-KwaZulu-Natal were reported to experience higher infant mortality rates than other areas.

Breast Feeding: Discussions with nursing staff as well as mothers indicate that while exclusive breastfeeding is recommended from birth to the first four to six months, mothers who are HIV-positive are strongly discouraged from breast-feeding. Unfortunately, breast-feeding even among women who are HIV-negative is reported to be low in Langa township. *Nursing staff report that this is so, since only those who are HIV-positive can receive supplemental feeding. In this instance, a mother feels comfortable identifying with being HIV-positive in order to secure food for her household.*

According to the SADHS, only 10 percent of children between the ages of 0-3 months receive exclusive breast-feeding whereas less than 2 percent of those between 4-6 months of age are exclusively breastfed. Mothers reported that they did not breast feed for many reasons. Some of these reasons included working out of the home, not feeling strong enough to breast feed, and not having enough time to breast feed. Among those who did not breast-feed however, the major reason was fear of "poisoning" their infant. This is different from the women in Duncan village, where it was reported that women who are HIV-negative usually breastfeed and women who are positive do not.
However, to deflect the risk of being labeled HIV-positive, mothers who are in fact positive will breast feed in public, but will not in private.

Diarrhea: Both clinic staff and mothers reported that diarrhea is a major problem for infants and young children, particularly those who are not breast-fed. Diarrhea most often results from faulty infant feeding practices, particularly inadequate breast-feeding, poor personal hygiene practices, and contaminated food. This childhood disease can cause serious feeding problems and can negatively affect the nutritional status of children. Due to poor appetite, low absorption of food from the gut, with resulting increased loss of body fat and muscle stores, chronic diarrhea results in malnutrition. The 1998 SADHS reported that 13 percent of children under five years, were reported to experience diarrhea in the two-week period before the survey. Also, diarrhea was most prevalent among children age 5–23 months.

Water Usage: An adequate amount of water needed to satisfy hygienic, metabolic, and domestic requirements is about 29 liters per person per day (World Bank 1997). This measure is used to proxy the broad dimensions of a country's health environment, including access to sanitation and health care. There were no available data to indicate amount of available water usage for the township/village (Langa and Duncan village) that were evaluated. However, both residents and clinical as well as project staff reported that water was not readily available for all households. Similarly, there were insufficient sanitary facilities including latrines/toilets for the community. Staff also reported that pests and insects were a problem, with flies a major nuisance.

In discussion with households, they were aware of sanitation and safety issues through good personal hygiene, safe food handling and storage, careful handling and disposal of human excreta and human waste, and keeping the household clean. However, consistent sanitation efforts were not routinely practiced in the homes visited. This was evidenced by the amount of flies. Water borne vectors increase not only morbidity, but mortality risks as well. The importance of this issue cannot be over stressed since child health and nutrition is largely related to health and sanitary conditions (von Braun and Kennedy 1994). Evidence also shows that clean water and better sanitation are associated with lower rates of child mortality, morbidity, and better nutrition. The impact of sanitation on HIV/AIDS cannot be overlooked since poor sanitation directly increases the risk of opportunistic infections. Also, malnutrition and disease often interact to increase morbidity and mortality. Malnutrition indirectly raises susceptibility to infection and infection can induce malnutrition by reducing intake, absorption, and utilization of nutrients.

Stunting prevalence: Clinic staff reported that data was collected on stunting, but that this data was not readily available for review. Because it is a long-term indicator of nutritional status, stunting, or short height-for-age, is not affected by short-term factors such as acute food shortages or epidemic illness. The impact of this is significant since stunting is usually evidenced after chronic exposure to malnutrition. These children will mature to become stunted adults. In South Africa, stunting prevalence in children aged 1-9 years is over 20 percent (Steyn, N. et al., 2001). Studies show that productivity of manual labor declines by 1.4 percent for every percent loss in adult height. Therefore, one significant consequence of stunting is a loss in productivity.

Food insecurity: In general, food security means that everyone has full access, at all times, to food needed for a healthful life. *When asked about hunger prevalence, all participants indicated that every week, they went at least two days without eating anything and that their household routinely ate only one meal 1 to 3 times every week.*
On the other days they ate two or more meals. The cornmeal mixture pap is eaten at all meals. The four persons who reported that they ate three meals each day said that they mostly ate the cornmeal mixture, pap, each mealtime. Collectively, all participants reported that their diet was poor and as a group were able to identify the components of a healthy diet (grains, fruits, vegetables, milk, meat). Fifty percent of the participants reported that it would be impossible to prepare meals with no flies present. The high consumption of corn and other limited foods items (brown bread, whole milk, tea, white sugar and beans, also known as samp) appears to be only tolerated in order to stave off hunger. These findings correlate with those of other researchers, (Steyn et al , 2001) where it was reported that, at the national level, five out of ten individuals, four out of ten children, and two out of three households experienced food insecurity.

Conclusions drawn and recommendations
Programs that were able to develop partnerships or referral relationships with other service and care agencies were more successful. Some programs were able to engage local businesses to provide food parcels, soup kitchens, transport or office supplies. There is the need to provide technical assistance and capacity building to community based programs. Standards and guidelines for monitoring and evaluations systems are needed (standards for home-based care, training of care givers, and the management of volunteers). Providers need opportunities to clarify values and perspectives and to build their skills in promoting first acceptance and then disclosure.

Existing initiatives undertaken by the Central Government, nine Provincial governments, private clinics, NGO, institutions, and communities in addressing critical care needs of Beneficiaries could not be comprehensively reviewed here. There are substantial activities. We did not get any indication from desk study or interviews that the nutritional gaps of underserved pregnant and nursing Mothers were being comprehensively addressed anywhere.

BENEFICIARIES

The focus of this assessment and business case is Mother to Child Transmission of HIV / AIDS. Our target group is pregnant and nursing Mothers - and their infants. To calculate what this population looks like we utilized the following data sources, assumptions, and formula:

- South Africa's annual number of births = 1,114,000
  UNICEF Statistics, 2/1/02

- Predicted HIV prevalence among women at antenatal clinics, as of July 2002 = 29.0 percent
  (Actuarial Society of South Africa (ASSA), *HIV/AIDS profile in the provinces of South Africa * Indicators for 2002,* November, 2002)

- For the years 2003-2008 (years covered by the business study), ASSA projects that the average prevalence rate at antenatal clinics over the course of these years will be between 28.26 percent and 31.16 percent

- Multiplying these percentages towards the current annual birth rate of 1.114 million:
  28.26 percent x 1,114,000 = 314,816 HIV positive new Mothers
  31.16 percent x 1,114,000 = 347,122 HIV positive new Mothers

Factoring in population growth would make these numbers even higher. Child mortality, inclusion or exclusion based on socio-economic status, would further refine the numbers as well. To be conservative, *we rounded down the number to 300,000 HIV positive new Mothers and did not factor in any population growth or other criteria over the years.* The government of South Africa would project lower prevalence rates in the most current Department of Health statistics, (National HIV and syphilis prevalence sero-prevalence survey of women attending public antenatal clinics in South Africa, 2001)

Providing fortified foods to pregnant and nursing Mothers must be "presumptive." That is, the foods must be made widely available - irrespective of HIV status - through a multitude of distribution channels that are presumed to access and ideally saturate the target group with more nutritious products.

Mothers of South Africa

We know that most women who are underserved live in urban or rural "informal" settlements (the team visited several such as shown in the photograph); many are underemployed - outside of the home; they have primary responsibility for feeding themselves and their children, and

their household is impoverished or food insecure. Some women, such as the woman in black hat in the photo are strong community leaders and entrepreneurs. She has her own livestock farm and is a visionary. She is forming a women's cooperative and should be of the many individuals in South Africa to be championed in the struggle for improved nutrition.

The other women shown were much less optimistic about their futures and control over their food supply. They would not want seeds to plant a small garden or chickens because they feared immediate theft of anything they produced.

Determining the nutritional status of pregnant women who visit clinics could not be achieved by this team. We did not locate quantitative data or physiological research, such as blood testing, to document this. This data may exist, however. It was anecdotally reported that under-nutrition of women was chronic and that no food was provided to women at the clinics for their own use.

> "It would appear that women sacrifice the quality of their diets and limit the amount of food eaten by the adults in a household in order to preserve the amount of food available to their children."[2]

The women who graciously welcomed us into their communities and even homes reported that "we seldom eat any meat, we do not buy milk", we get 100 Rand from the government to live on.

> "Food insecurity was, on average, experienced nationally by two out of three households, five out of ten individuals and four out of ten children respectively at the household, individual and at the child hunger level."[3]

> "At the National level, one out of two Households experienced hunger, one out of four were at risk of hunger and only one out of four households appeared food secure"[4]

From the above we have inferred that the nutritional status of pregnant and lactating women and their infants is poor and that the need for fortified food supplementation is critical. Clinic personnel were knowledgeable about the critical need for maternal nutrition and that such nutrition was essential to work in combination with drug therapies for effective outcomes.

The government of South Africa donates infant formula to any Mother whose HIV diagnosis is positive and she has the choice of using this to replace her breast milk.

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[2] National Food Consumption Survey for South Africa, 1999; p. 14
[3] Ibid
[4] Ibid

Informal "squatter settlements" such as Duncan Village, East London, shown here can be many decades old and are established communities. There is reportedly over 80 percent unemployment. Residents graciously welcomed the team into their small homes where as many as 18 individuals lived. The interiors were clean and carefully tended with curtains, oil cloth, wall coverings and what furnishings could fit to make a remarkably fine home. Residents did express feelings of helplessness about employment and income, and looked to the government for larger monthly stipends. Children who cheerfully attached themselves to our tour appeared seriously malnourished.

"Home" to millions of South Africans
who need affordable fortified foods

THE CASE FOR FOOD FORTIFICATION

Nutrition's Essential Role within HIV/AIDS

Some forms of neglect in human needs are extreme and immediately apparent. Obvious examples include loss of oxygen or temperatures that can result in death within seconds. Next consider water, which, under some circumstances one may live without for about a week. Food deprivation, absolute starvation, can take even months to kill a well fatted human male. But there are many other needs that human beings have, the lack of which will have much subtler forms of consequences possibly over many years. This category would include micronutrient deprivation and chronic long term malnutrition. Another easily overlooked human need is the craving for companionship, care, and emotional/spiritual support in times of illness and suffering.

Chronic long term malnutrition is the silent destroyer of life and life's potential that causes low birth weight, stunting, poor brain development, psychological problems, lack of energy and motivation, susceptibility to infection and disease. Research has documented these "slow" consequences of chronic malnutrition in young children:

- Energy malnutrition reduces a child's learning capacity by 10 percent
- Anemia reduces a child's ability to learn by about 20 percent
- Iodine deficiency lowers IQ by 15 percent

Healthy, well fed mothers giving birth to full birth-weight babies starts their life on a strong foundation. Supporting the nutrition of Mothers and their infants is an investment in human capital, in their future and the future of South Africa.

Living productively with HIV and surviving AIDS secondary infections requires intact body protection systems and a functional immune system. *The nutritional status of the individual is physiologically linked to the ability of the body's defense systems to protect and perform adequately. Nutrition - micronutrients and macronutrients - are essential to the performance of the body's defense systems described below.*

The Body's Defense Systems[19]

The body has systems to defend it against the entry and activity of foreign agents. At the most basic level, these can be understood as three simultaneously co-acting systems. The first two of these are "non-specific", acting against any intruding agents with a generalized response. One of these non-specific defenses is external and the other is internal. The external defense comprises the skin and mucus membranes with secretions lining openings to the interior of the body such as the nasal passage, bronchia, urogenital tract.

The internal non-specific system includes circulating white blood cells ("phagocytes") and antimicrobial proteins that do not discriminate among invading agents that they attack and destroy.

[19] R. Campbell; Land O'Lakes, Monograph on Human Immune System, 2001.

The third line of the body's defenses is also internal but "specific" and is the true "immune system" commonly referred to. This system includes the production of "antibodies" comprised of specialized proteins and white blood cells or "lymphocytes." The distinction of this system is its remarkable capacity to "recognize" and adapt specific attack responses to a particular invading agent, such as a virus or bacteria, and then to produce antibodies with "memory" for future encounters.

NONSPECIFIC DEFENSE MECHANISMS		**SPECIFIC DEFENSE** (IMMUNE SYSTEM)
First Line Defense	**Second Line Defense**	**Third Line Defense**
-Skin -Mucus Membranes -Secretion of skin & mucus membranes	-Phagocytic white blood cells -Antimicrobial proteins -Inflammatory response	-Lymphocytes -Antibodies (Immunoglobulins)

International clinical research has shown that access to nutritionally complete foods/diets contributes to strong body defense systems, living longer, more productive lives with asymptomatic HIV, and to more successful responses to drug therapy when that is available - and affordable.

> "Nutritional status plays a cardinal role in the gradual progression of HIV infections to full-blown AIDS." [20]

> "The potential for micronutrient deficiencies to act as co-factors in HIV transmission and progression is most obvious in poor populations with inadequate dietary intake and a high infectious disease burden. But since micronutrient deficiencies may be precipitated by HIV infection per se, a role for micronutrients is likely even in affluent populations.....Micronutrient deficiencies could be co-factors in the progression of HIV infection to AIDS and death, in the sexual transmission of HIV, and in mother-to-child transmission of HIV."[21]

Fortification of common foodstuffs such as oil or flour with a key vitamin (Vitamin A) has a strong mpetus in development in Africa and elsewhere. Carrying this initiative even further into more nutritionally dense consumer foods, and promoting more balanced diets (protein, energy, vitamins, minerals) can have a significant effect on improved nutrition for

[20] Immunity and Human Nutrition

[21] United Nations Sub-Committee on Nutrition ("ACC/SCN"), Dr. Henrik Friis, Research Dept. of Human Nutrition, The Royal University, Denmark

a greater number of vulnerable people and thus immune function and sustainable health for HIV positive - and negative - across a large population. That is the intended foundation of this scope of work as it focuses on PMTCT.

Food must provide a complete complement of nutrition to have the required benefit on the human body. Any shortfall results in physical changes that can become threatening to health, especially in the case of pregnant and nursing Mothers. Therefore, providing adequate, wholesome nutritious (enriched or fortified) foods to HIV-positive pregnant women, lactating women, and infants at 6 months of age during the rapid weaning phase is essential.

Provide mothers fortified or enriched foods in addition to multivitamins/multiminerals. To do this effectively the following should be considered:

- Best food carriers for fortification;
- Feasibility of fortification technology;
- Bioavailability of fortificants;
- Stability of the fortificant during manufacture, distribution and preparation if indicated;
- Sensory evaluation or organoleptic acceptability of the fortified food;
- Cost-benefit analysis;
- Best mechanisms to get this food to resource-poor communities;
- With respect to suitable food vehicle, those foods that are commonly consumed within specific vulnerable ethnic groups as well as among all income groups should be considered. (Milk, corn, sugar, bread, biscuits, margarines, and fats are commonly fortified.)
- Ensure that fortified or enriched food provide specified nutrients and meet the quality factor requirements established by South Africa's governing body. These food products should also be manufactured in accordance with the quality control procedures.

Other factors to be considered include the following:

- Quality factor, or nutrient potency and biological effectiveness of the fortified food are maintained subsequent to processing.
- Ingredient interactions and time should not reduce biological effectiveness of the food.
- Manufacturers should ensure that unsafe nutrient levels or by-products are not created from ingredient addition or breakdown, or interactions caused by processing or by time.
- Manufacturers regularly audit their operations to ensure that those operations comply with established quality control procedure regulations.
- Good manufacturing practices are maintained to help ensure that all of the required nutrients and other ingredients are included at designated levels in the fortified or enriched food and that this food is not contaminated with microorganisms or other harmful materials.
- Establish protocol for manufacturers to make submission to the governing agency when making major changes that affect the food product;

- Specify that nutrient quality control testing is completed to ensure accuracy not only when each batch of food enters into commerce, but that must be done on each batch of food product.
- Establish a food recall protocol.
- Support safe infant feeding practices.
- Improve maternal-child-health services (antenatal, postnatal, and child health) especially in economically deprived townships and settlements where HIV/AIDS incidence is particularly high.
- Strengthen family planning and counseling services

Food Fortification Technology

Food fortification and functional food ingredients are a complex and well documented area of food science with thousands of research publications, clinical trials, university departments, research institutions, private businesses, and other organizations deeply involved. This holds true for South Africa specifically where the knowledge base around food fortification and nutrition is equal to any other developed country in the world. Within the context of extensive technology, there must remain a concrete goal: *HIV positive Mothers suffering from chronic malnutrition will benefit from a timely, pragmatic approach for delivering safe, efficacious, fortified foods that supplement their nutritional gaps.*

There are practical steps and considerations that any business should take in approaching such an enterprise. Some of these are pointed out above and more are listed below. The measure of success is not the most elegantly designed fortification program, but rather the best nutrition to the most women in the shortest time that can be supported by sustainable commercial initiatives. Safety, efficacy, and affordability must all equally be achieved.

Steps in the development of fortified foods[22]

- Determine the prevalence of micronutrient deficiencies.
- Segment the population if prevalence data indicates the need.
- Determine the micronutrient intake from a dietary survey.
- Obtain consumption data for potential vehicle foods.
- Determine micronutrient availability from the typical diet.
- Seek government support, from both policy makers and legislators.
- Seek food industry support.
- Assess the status of potential vehicles and the processing industry chain, including raw material supply and product marketing.
- Choose the type and amount of micronutrient fortificant or mixes.
- Develop the fortification technology.
- Perform studies on interaction, potency, stability, storage, and organoleptic quality of the fortified food.
- Determine bioavailability of nutrients in the fortified food.
- Conduct field trials to determine efficacy and effectiveness.

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[22] Quentin Johnson, Consultant, The Micronutrient Initiative; Relief Diets Workshop; Fortifying Staple and Blended Foods; Issues Affecting Implementation

- Develop standards for the fortified foods.
- Define product, packaging, and labeling requirements.
- Develop legislation and regulations for mandatory compliance. Food fortification programs that have been successful have generally been mandatory.
- Promote campaigns to educate and improve consumer awareness.

Conditions for success

- Political support, from within the nation and from donors
- Industry support
- Adequate application of legislation, including external quality control
- Appropriate fortification level
- Good bioavailability of the fortificant
- No inhibitory effect of the common diet
- Human resource training at industry and marketing level
- Consumer acceptability (consumers can reject even donated food)
- No cultural or other objections against fortified foods
- Adequate laboratory assessment of micronutrient status
- Adequate study design or statistical evaluation
- In the case of iron deficiency anemia, absence of parasitism or other non-dietary causes of anemia
- No constraints regarding procurement of micronutrients

A business with interest in the present approach for South Africa has at its disposal substantial technical and other "free" resources within the country from which to develop its products, including:

- Medical research data on the biology of human nutrition, HIV / AIDS – the bodies protection systems and nutrition; the physiological role of nutrition for Pregnant women: Nursing mothers; Weaning children
- Food Fortification: science, efficacy, processing, analysis
- Product fortification lab analysis: safety, quality, biological utilization
- Intellectual property rights protection
- Human clinical research substantiating efficacy claims
- Proprietary and trade art expertise through consultants
- Academia resources
- Fortificant supplier resources
- Formulation, Packaging, and Processing technology support

Within the demanding fortified product development context, a business with expectations for developing its market and securing sustainable profit from its activities will want to protect its technology and formulations for proprietary fortified and functional products. In other words, details about its successful approaches will become proprietary information. This is the competitive basis for investing in innovation and market entry and must be acknowledged here as a feature of delivering improved nutrition to underserved pregnant and lactating Mothers.

PRODUCT

The ideal for a nutritious diet is a varied and nutritionally balanced "food basket" of dietary choices or, in the USA, the food pyramid could be visualized. In circumstances such as those found among many people in South Africa and specifically among our target group of underserved Mothers, this ideal is far from their reach. For the purposes of building a commercial business case, we have designed a prototype functional fortified product that would be effective over the short term while access to this ideal food basket was hopefully evolving through a variety of development initiatives. The very extensive "National Food Consumption Survey: Children aged 1 -9 years, South Africa, 1999 provides excellent insights into diet as do the many research initiatives of the Integrated Nutrition Program.

Three components of an ideal food basket:

1. Fresh farm and garden fruits, vegetables, grain, animal products; (a large segment of the estimated 57 percent impoverished South Africans live in former "homelands" and informal settlements where subsistence farming is not realistic – such farming accounts for 6 percent of the total income of non-urban families.)[23]

2. Processed and fortified foods from the traditional food basket: maize meal, oil, milk, juice, margarine, sugar, tea, beer, soft drinks, maas, makau

3. *Processed functionally fortified foods targeted to specific nutritional gaps and groups: biscuits, "e" pap, nutritional beverages ready to drink, fortified bread, milk, and combination products.*

Currently there are a number of progressive fortified processed foods in existence. We are not referring to staples fortified with one or two micronutrients such as iodized salt. Rather we are focusing on foods that have a more comprehensive complement of fortificants intended to provide a substantial percentage of adult recommended daily allowance of micronutrients. These include: carotene biscuit, "e" pap, fortified juices, fortified milk beverages, fortified soy beverage dry mixes, etc. and many more are in market or development in South Africa from Noogy foods Toders power bars, PWM, Sasko, Cannon Gate, Galaxy, Ceres juice, Coca Cola, Parmalat, Clover, Africa Breweries, and Nestle, among many others.

The prototype product we will consider here for purposes of a business case feasibility relating to pregnant and lactating Mothers is the following:

A 250 milliliter adult serving, ultra high temperature (UHT) processed, shelf stable, aseptically packaged dairy based fortified beverage. This beverage is ready to consume and comprises one serving for a mother. It will contain the ingredients and fortificants shown under the product specification on the following pages. Note that some of these ingredients can be varied according to palatability or ingredient cost without materially altering the performance of the product.

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[23] Project for Statistics on Living Standards and Development. South Africans Rich and Poor: Baseline Household Statistics, August 1994

Also, this basic product formula is an approach that is adaptable to a child's formula for use as complementary food during weaning and during the 1 to 3 year critical growth period that has been determined to be highly vulnerable in South Africa. There are many other functional ingredients and approaches that can be taken to the development of like products that could contribute to this becoming an extremely energized and competitive new product category in South Africa. The South African consumers would be the winners as product value in the diet increases and prices come down.

There are a large range of other MTCT product possibilities. Some of these include ready to drink breast milk replacements, ready to use complementary foods for infants, and weaning foods. Combining current knowledge, published research, and rapidly evolving functional ingredient technology for optimizing nutrition for infants and children will produce excellent product innovations for businesses desiring proprietary products. These were not considered here as a business case evaluation for the sake of simplicity. We believe a business case can be made as well for other target consumers and products.

Once a business meets with success, product line extensions and category expansion will follow as it does with other consumer products. In order to create and preserve equity in a nutritional product market in South Africa, a business will require that its technology, brand, and product claims are all protectable at some level, and that their investment in ongoing innovation can establish a competitive advantage with returns on their investments.

Cow's milk has been selected as the base food ingredient for our prototype product. This is founded upon the substantial nutrition provided by milk and by its high level of acceptability in the diet of South Africans for centuries. Milk is the secretion of epithelial cells in the lactating mammalian female's mammary gland. It is produced as a source of highly concentrated nourishment with multiple functions essential for the survival and growth of offspring. As such, its composition has evolved to be a dense and complete blend of energy, protein, vitamins, minerals, water and numerous other elements critical to the body's growth and performance. It has been taken from cows for thousands of years in Africa and throughout the world and valued as an excellent source of food for humans.

Nutrient Contribution of Milk and Milk Products to the U.S. diet [1] (excluding butter)

- 73% of the Calcium
- 33% of the Phosphorous
- 31% of the Riboflavin
- 19% of the Protein
- 16% of the Magnesium
- 21% of the vitamin B 12
- 17% of vitamin A
- 10% of vitamin B6
- appreciable amounts of vitamin D (if fortified) and Niacin equivalents
- 9% of total calories available came from dairy

1 National Dairy Council, from USDA

Milk is a colloidal solution made up of six primary components: water, fat, lactose (milk sugar), proteins, minerals, and vitamins. It has over 100 identifiable components when viewed in detail. It contributes to the human diet as an excellent source of most critical nutritional elements including sources of carbohydrates, and energy. Where consumption is high, the nutritional status of the population is improved. There are associated functional properties of plain and modified milk products that measurably strengthen the body's defenses from illness and contribute to recovery. In the diets of young children, growing adolescents and pregnant women, milk has been proven to provide a

concentration of critical nutritional elements that promote growth and robust health. Promoting the consumption of milk promotes strong, well-developed bodies.

Milk is rich in high quality protein with high bioavailability in the body. There are two major types of proteins found in milk. These are Casein and Whey Proteins. Proteins contribute about 21 percent of the energy value in milk. One important measure of value to the human diet is "biological value" or "BV." Biological value is a determinant of how effectively the protein can be metabolized and used for maintenance and growth. Milk proteins have a very high BV. The most significant constituents of dairy proteins are amino acids. These include 9 "essential" amino acids that are essential to survival and cannot be synthesized by humans; and 9 "non-essential" amino acids. The protein needs of someone with AIDS is significantly greater that an average person.

Per Capita Milk Consumption and Percent Daily Energy Intake from Milk in Selected Countries (1998)

Country	Consumption (Kg/year)	% Daily energy intake
Ireland	171.96	17.8
Yugoslavia	169.7	15.3
Turkey	121.0	6
Ecuador	106.3	8
Honduras	85.5	6
Armenia	74	7
South Africa	**50.9**	**3**
Nepal	35.4	3
Uganda	23	2.2
Thailand	21.7	1

FAO 1998. Food Balance Sheets 1998, Rome.

Minerals contained in milk

Minerals in Whole Milk	Quantity per liter
Calcium (mg)	1227.3
Chlorine (mg)	1031.35
Copper (mg)	0.1
Iodine (mcg)	237.21
Iron (mg)	0.52
Magnesium (mg)	138.2
Manganese (mg)	0.04
Molybdenum (mcg)	20.63
Phosphorus (mg)	963.28
Potassium (mg)	1567.65
Selenium (mcg)	15.47
Sodium (mg)	505.36
Zinc (mg)	3.92

ESHA Research, 1998.

Vitamins contained in milk

Vitamins in Whole Milk	Quantity per liter
A (IU)	1299.5
B1 Thiamin (mg)	0.39
B2 Riboflavin (mg)	1.67
B3 (mg) Niacin	0.87
B6 (mg)	0.43
B12 (mcg)	3.68
Biotin (mcg)	19.6
Vit C (mg)	9.69
Vit. D (IU)	41.25
Vit. E (IU)	1.54
Folate (mcg)	51.57
Vit K (mcg)	41.25
Panthotenate (mg)	3.24

ESHA Research, 1998.

The following is a representative formula for the proposed fortified beverage. Land O'Lakes performed two experimental runs in September and December of 2002 to confirm that a product such as this is feasible and functional and that the processing conditions in the appendix are accurate. Supplier contacts for US sources of these ingredients are available.

INGREDIENT	Weight-Kilos	% of total by weight
Whole Fluid Milk	350.14	35.01%
Anhydrous Milk Fat	10	1.00%
Soy Flour	15	1.50%
Brown Rice Flour	15	1.50%
Whole Maize Flour	20	2.00%
Whey Protein Concentrate	15	1.50%
Fortificant Premix	1	0.10%
Flavor	0.5	0.05%
Maltodextrin	28	2.80%
Stabilizer	0.06	0.01%
Sucrose	35	3.50%
Salt	0.3	0.03%
Pure Water	505	50.50%
Oil	5	0.50%
Total Batch	**1000**	**100.00%**

VITAMINS	% of Daily Required 250 ml serving
C Ascorbic Acid	100
A Palmitate	100
D 3 Cholecalciferol	30
E Acetate Tocopheryl Acetate	30
K 1 Phytonadione	30
H Biotin	30
B 1 Thiamine Mononitrate	30
B 2 Riboflavin	50
B 3 Niacinamide	30
B 5 d-Calcium Pantothenate	30
B 6 Pyridoxine Hydrochloride	30
B 9 Folic Acid	30
B 12 Cycanocobalamin	30

NUTRITIONAL ANALYSIS	250 ml serving content	
Calories	237 kcal	
Calories from fat	87 kcal	
Total Fat	8.75 g	
Saturated Fat	5.6 g	
Cholesterol	25 mg	
Sodium	212 mg	
Total Carbohydrate	32 gm	
Calories from Carbohydrates	133	
Dietary Fiber	4 gm	
Sugars	11 gm	
Protein	9 gm	
On a solids basis:	Actual	Recommended Guidelines
% Complex Carbohydrate	55%	48%
% Sugars	9%	10%
% Fat	18%	30%
% Protein	18%	12%

MINERALS	
Zinc (as Zinc Gluconate)	30
Calcium	100
Iodine	30
Iron	50

pH = 6.7

Viscosity = 91 cps

Solids not fat = 16%, 40 grams / 250 ml serving

Pure Water = 201 ml / 250 ml

Processing Specification for UHT aseptic MTCT Nutritional Beverage

1000 kilogram batch

_____Weigh out all ingredients according to formula. Label and arrange in one location in order of their addition. Have the ingredient staging double checked and initialed.
_____Blend **fortification premix** with **15 kg water** 15-20 deg. C. (this is subtracted from the formula water specified) (a 10% Total Solids solution in cold-warm water, stirred for at least 20 minutes prior to addition to batch)
_____Dry blend **stabilizer** with **1 kg sugar**

Milk, fat, pre-emulsion

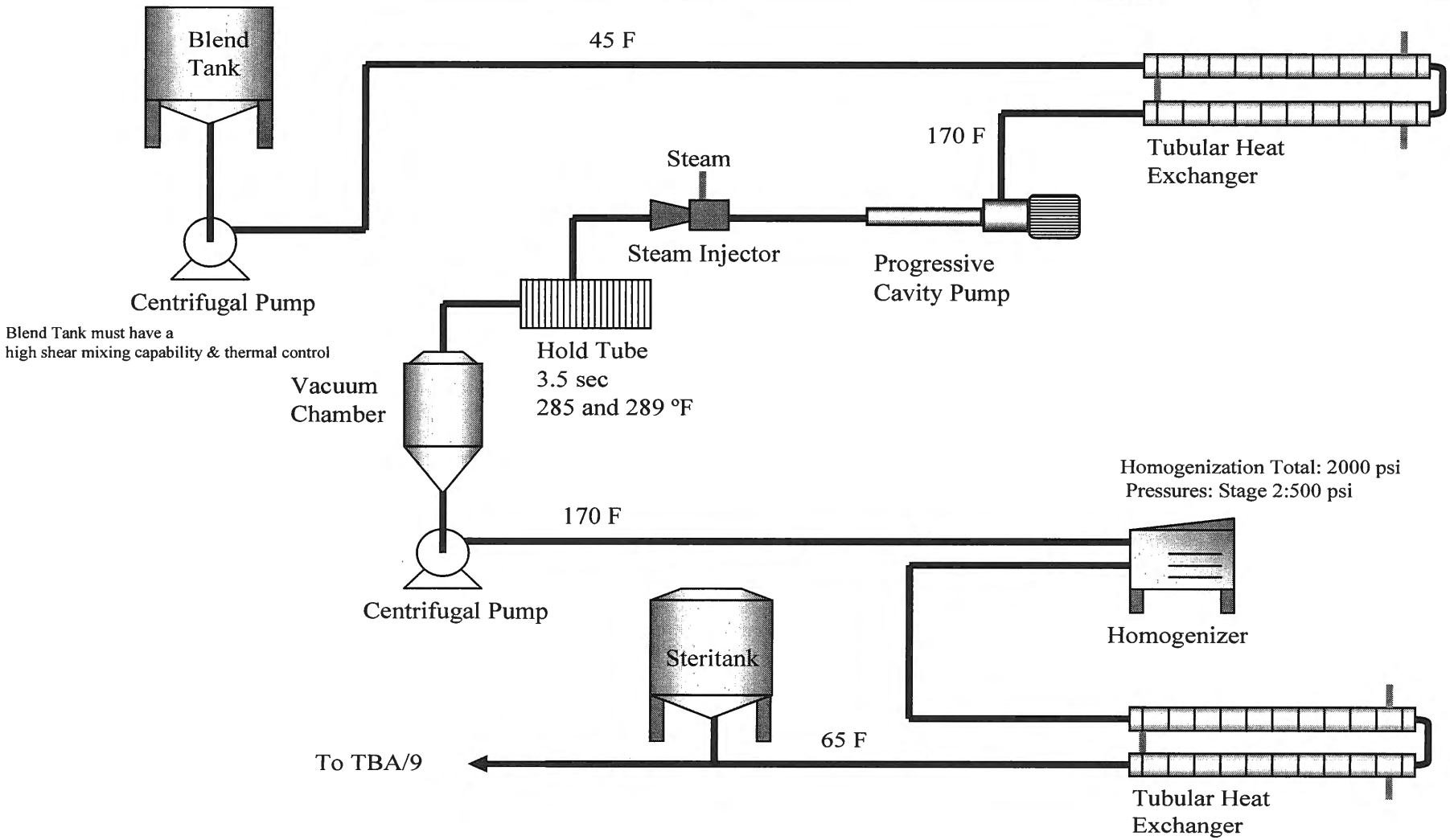
_____Fill jacketed, high sheer mixing tank with **fluid milk**
_____Heat milk to 40 degrees C.
_____Add hot **liquid** anhydrous milk fat/vegetable oil
_____Mix thoroughly under high sheer

_____Add warm **formula water** (35 degrees C)
_____Add slowly **maize, soy, and rice flour** one at a time with high shear mixer assuring that each is dispersed before adding the next
_____Agitate for at least10 minutes until flour is rehydrated.
_____Add **protein concentrate**
_____Add **maltodextrin**
_____Add **stabilizer / sugar blend**
_____Continue agitation and prepare for foaming; Utilize vacuum or commercial de-foaming agent to control foaming
_____Add **fortification premix** solution
_____Add natural **vanilla flavor**
_____Add **salt**
_____Add **sugar**

Hold finished packaged product under incubation for seven days and inspect for package bloating. Perform pH tests on representative samples and standard plate count analysis prior to release of product.

Process Flow Diagram for MTCT Fortified UHT Beverage

Hold Time (seconds)	Flow Rate (GPM)	Temp. °F Preheater in	Preheater out	Injector in	Injector out	Holding Tube in	Holding Tube out	Flash Chamber in	Flash Chamber out	Cooler in	Cooler out
3.5	5.7	45	170	170	294	294	293	293	170	170	67



Ultra High Temperature (UHT) Process Flow for low acid MTCT Nutritional Beverage using Tetra Therm Aseptic VTIS

Product Design Criteria

- Retail price approximately 3 Rand (approximately 30 US cents);
- 250 ml serving, adult;
- Shelf stable without refrigeration for up to 12 months;
- Hand held, drink from container;
- Tetra Pak aseptic container
- Ready to drink (no need for paraffin, fire, water, or preparation, all of which further burden a woman);
- Nutritionally dense: Fortified at the 25 to 100% level with essential vitamins and minerals (100% for critical micronutrients such as vitamin A, calcium);
- Nutritionally dense: a substantial amount of macronutrients: fat (energy), protein, carbohydrate;
- the nutrition provided by the beverage is customized to supplement the increased nutrition requirements of pregnant and nursing mothers – especially experiencing HIV;
- Delicious, palatable by culturally selected standards;
- Comprised of ingredients available and affordable in South Africa;
- Ease of processing and manufacture; broadly available technology;
- Attractively packaged and labeled – prestige value of product can compete with comparable beverages such as soft drinks, beer;

Other key acceptance criteria:

- A recognized comparative advantage over existing product choices
- Compatible with cultural practices, familiar in form
- Easily, clearly communicated product advantages
- Low barrier to trial – purchase of one serving at a low price made easy for the target population

Even though Land O'lakes performed two test runs of a product like this, it is critical that any final product be developed and tested in South Africa and on site to confirm the formula and process specifications included above. Some "fortified" foods identified in stores in South Africa made unsubstantiated claims, misrepresented what the fortification level would be after cooking and generally revealed a lack of scientific rigor in assuring that the products would indeed provide physical benefit to the nutritional status of the consumer.

It is the further recommendation that businesses contemplating fortified and functional foods for the South African market take advantage of the many resources available to them to develop, validate, and even receive endorsements for their products: Research Institutes, Universities, ingredient suppliers, packaging suppliers, and government can be involved.

The present product will be a milk, soy, whole grain flour viscous beverage roughly similar to a Makau / Maas blended product. It will be slightly sweet with a natural to lightly vanilla flavor which can be easily altered to taste for consumer preference. Functionally the following nutrition statement is representative:

By drinking 250 ml of the beverage per day, a pregnant and nursing Mother would be meeting a significant percentage of her recommended daily vitamin and mineral requirements. She will also experience a sensation of satiety and feel energy for a sustained period. It is intended to be consumed in combination with other less nutritiously dense foods such as pap and as varied a diet as possible.

BUSINESS CASE

Business Environment

With a population of 44.5 million and a Gross Domestic Product (GDP) of $103.83 billion diversified across industry, agriculture and services, South Africa is sub-Saharan Africa's economic engine. Since the end of apartheid, the Government has, through liberalization, sound macroeconomic management and an improved trade and investment environment attracted substantial inflows of foreign investment and returned South Africa to international trade. The previously isolated corporate sector has become internationally competitive through improving capacity and producing higher quality, competitively priced goods. This emergence fueled strong and steady export growth and a diversification away from commodity dependence. As a result, South Africa's macroeconomic performance has been positive overall since 1994. The Government has exercised impressive fiscal and monetary discipline and has adhered to strict spending guidelines. They have improved the legal and taxation systems and moved toward international standards across the regulatory environment.

But they have been less successful in addressing South Africa's glaring socio-economic issues: providing housing, education and jobs to the majority of the population who in the wake of apartheid remain impoverished, unemployed and unskilled. The economy has also been vulnerable to external shocks such as the Asian meltdown, rising fuel prices, Zimbabwe's political turmoil, and the regional food security crisis. Because of these external shocks and investor uncertainty, the national currency (Rand) has recently performed poorly, falling more than 34 percent against the dollar since January 2001 – although it has recently rallied. The rapid and severe depreciation, coupled with the impact of regional food shortages on domestic food prices, drove inflation to over 15 percent in October. The Reserve Bank in response hiked interest rates four times for the year to October to 13.5 percent, and the rate at which businesses borrow – the prime rate – reached 17 percent. Fortunately, continued export growth largely offset this environment of high interest rates and inflation, and the domestic economy performed well in 2002, recording growth in overall manufacturing, financial services, agriculture and transport and communications.

South Africa's economic outlook is positive. Inflation is projected to end the year at 9.6 percent, decline to 8.06 percent in 2003, and finally come below the Government's target range of 3-6 percent in 2004. Interest rates will likewise ease, with the prime rate falling from the current 17 percent to 15.5 percent next year. The economy is expected to grow 2.5 percent in 2002 and a healthy 3.1 percent in 2003. External factors, like oil prices, the performance of the dollar, and the ongoing regional food crisis, could alter this forecast. Between mid-October and mid-November, for example, both the dollar and international oil prices fell while the Rand rallied. A stronger Rand would lead to lower inflation and interest rates, which could spur consumer spending and economic growth. On the other hand, a strong Rand could erode the trade balance and remove some of the protection domestic producers have enjoyed against import penetration. One of the country's largest banks, ABSA, predicts the Rand will remain relatively stable, within a range of R9.50 and R10.20 to the dollar.

Political Outlook

The Economist Intelligence Unit assigns South Africa a moderate level of political risk. Though no major political upheavals are expected, there are several contentious issues facing the government. Organized labor threatens civil action against privatization, the slow pace of empowerment, and high inflation. There is growing dissatisfaction with the government's ability to bridge the gap between setting a policy and actually implementing it. Inefficiency, capacity constraints, and an apparent disconnect between the national and provincial levels of the civil service continue to hamper service delivery. All quarters are pressuring the government to articulate and implement a comprehensive national HIV/AIDS strategy, but the ANC is becoming increasingly averse to criticism, especially on politically-sensitive issues like AIDS. This sensitivity, when coupled with civil service inefficiencies and capacity constraints, poses risks for investors who would conduct business with the government.

Labor Market

Unemployment remains South Africa's most pressing problem, with an estimated 30 percent of the economically active population unemployed. The government desperately needs to create jobs, promote employment equity, and improve the low skills base through vocational training. Along these lines, government has, since1994, introduced several pieces of labor legislation. This legislation inadvertently created a more inflexible labor market and strengthened collective bargaining, which has led to strikes (1.25 million workdays lost in 2001), and has driven up per-employee costs. To maintain competitiveness, the formal sector shed more than 1.3 million jobs over the last six years, completely reversing government's intended outcome.

The outlook for the labor market is mixed. On the one hand, government has taken a firm stance in wage negotiations and remains ardently committed to privatizing state owned assets. This indicates an eventual weakening of the influence of organized labor and an inflow of skills development through privatization. On the other hand, government is defining, refining and ramping up its empowerment legislation and regulatory environment, and the consequences will probably raise labor costs. Higher costs and legislated empowerment will heighten investor unease. In the long-term, AIDS poses the greatest risk to the labor market, as it is projected to further raise unit costs through absenteeism, increased training costs, and through limiting productivity.

Taxation

South Africa has a narrow tax base, so tax rates are high. The effective tax burden is currently around 28 percent. The top personal tax rate is 42 percent and the corporate tax rate is 30 percent. Local branches of foreign companies pay a higher tax rate of 35 percent, but are exempt from dividends tax of 12.5 percent. The value-added tax (VAT) of 14 percent applies to most domestically-sold goods and services except a basket of staple foodstuffs. This analysis assumes the higher, foreign-branch tax rate of 35 percent. For a more comprehensive analysis of the tax environment, see the United States State Department's Country Commercial Survey for South Africa.

Trade & Investment Regime
South Africa is a relatively open economy, with foreign trade accounting for more than 50 percent of GDP. Export growth averaged 13.9 percent annually between 1995-2000 and over 20 percent during the past three years. Annual growth of 9 percent is projected to 2015, as South Africa's commitment to WTO continues to improve the trade regime. Presently, most tariffs range from 0-30 percent. South Africa is member to several trade agreements that will continue to expand trade. Regionally, the South Africa Customs Union provides tariff-free trade between South Africa, Botswana, Namibia, Lesotho and Swaziland and the US government is currently discussing a freed trade agreement with SACU. The 14-nation Southern African Development Community trading bloc is also pursuing a free-trade regime. With 190 million people and a combined GDP of US $176 billion, the SADC region remains one of the largest unexploited markets in the world, but the pace of progress at the political level has been disappointing South Africa in June also signed a ground-breaking trade treaty with the European Union (EU) that will grant duty-free access to 95 percent of South Africa's exports to the EU and 86 percent of EU imports into South Africa. SA-EU trade grew more than 30 percent during the six months after the treaty took effect. The government is eager to attract foreign investment, and offers incentives to investors, mainly orientated towards exports.

Regulatory Environment
For the most part, South Africa's corporate regulatory environment is aligning with international standards with improvements in financial, accounting, environmental and intellectual property regulation. As mentioned previously, investors will need to contend with the anticipated additional costs of complying with the pipelined empowerment program. Since it is at this time unclear what the precise impact of this will be, we have excluded empowerment costs from this analysis. Within the food industry, the main regulatory body is the Department of Health's Food Control Unit, (similar to the USA's Food & Drug Administration). The Food Control Unit is introducing labeling regulations regarding content, nutrition claims, and Genetically Modified Organisms (GMOs). Some of these regulations are expected to take effect within the next year, and will add costs to manufacturing. We assume this legislation would be enacted prior to our launch date, and have excluded these costs. The government recently clarified a biotechnology policy in the draft "National Biotechnology Strategy for South Africa," but it will be some time before this is implemented. Presently, enterprises utilizing GMOs must apply for a permit, and this layer of red tape may present some challenges to our proposed venture.

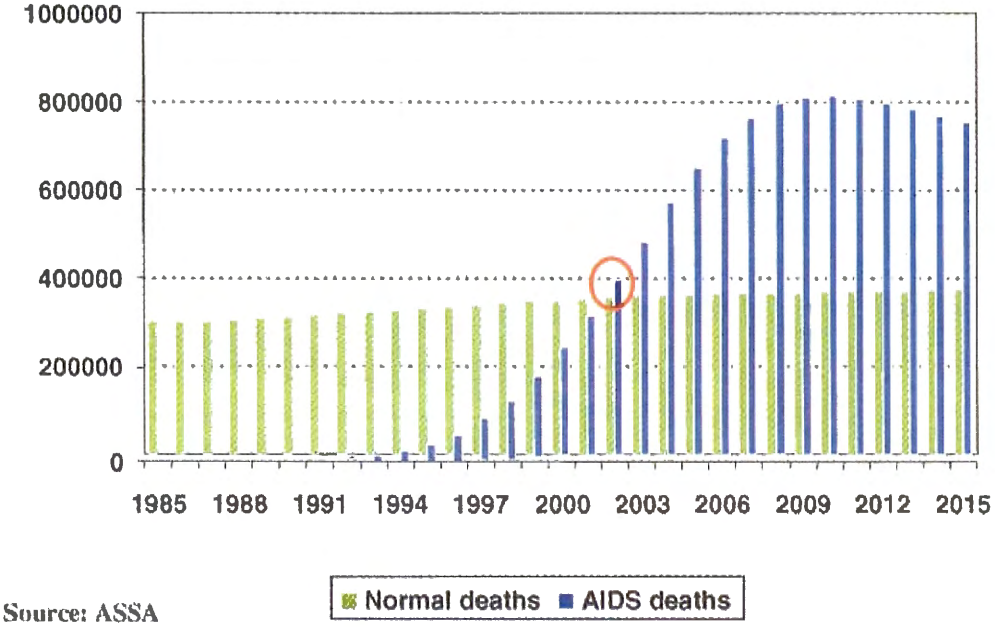
The current environment of rising food price inflation may lead to additional layers of regulation. The government is investigating whether anti-competitive behavior has played a role in soaring food prices. An initial investigation by the Competition Commission found 'no clear smoking gun,' but left open to question what role, if any, the highly-concentrated retail sector may have played. The Minister of Trade and Industry and the Reserve Bank Governor have publicly speculated on retailer culpability and a report by the Treasury cited " lack of competition in the supply chain beyond the farm gate, especially at retail level." Incensed retailers have attempted to defend themselves, but record-breaking mid-term financial results have only fueled public mistrust. The government has proposed establishing a regulatory body to 'monitor the supply chain' and this would most certainly be an unwelcome development to the business sector. It is unclear what action government will take, but margins along the supply chain may come under pressure.

Long-term economic prospects and the impact of HIV/AIDS
In spite of alarming HIV/AIDS statistics, both government and business have been slow to implement HIV/AIDS interventions. Recent projections by ABSA Bank indicate that HIV/AIDS will have significant impact on South Africa's business environment over the medium term. Unless businesses and government implement strong HIV/Aids intervention programs, ABSA has forecast HIV/AIDS will by 2015 result in some of the following effects:

- South Africa's total population will be 20 percent smaller than it would have been;
- The economically active population is expected to be 23.5 percent smaller than it would have been;
- Aids is expected to cause more than 715,000 deaths per year by 2009;
- By 2005, South Africa will have lost 11 percent of its labor force to HIV/AIDS;
- Labor force growth slows, productivity declines through sickness, absenteeism and higher training costs;
- Higher per unit labor costs and lower productivity encourages more capital-intensive production methods;
- South African goods become less competitive, dampening FDI and capital inflows;
- Lower FDI and capital inflows pressure the balance of payments and, ultimately, the Rand;
- Government expenditure on health and social services will increase;
- Household consumption patterns will shift away from durable goods towards services;
- UNAIDS estimates South Africa's economy will be 17 percent smaller in 2010 than it would have been

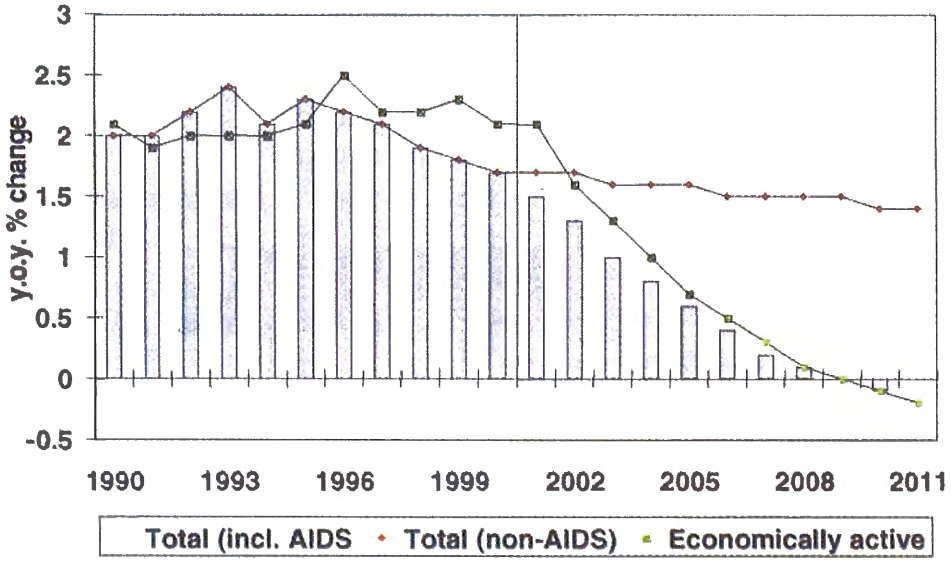
HIV/AIDS Impact on Demographics and Labor Force, 2001-2015				
Demographics	Because of HIV/AIDS	If there was no HIV/AIDS	**Labor Force**	
Population growth	0.1%	1.4%	Prevalence, high-skills workers	16.4%
Total Population (mn)	47.4	56.9	Prevalence, semi- & unskilled workers	25.5%
Economically active population (mn)	16.5	20.4	Prevalence in mining sector	27%

Graph 1: PROJECTED AIDS DEATHS



Source: ASSA

Graph 2: SA POPULATION GROWTH



These tables are from the South African Food and Beverage Mfg. Review, June, 2001: "The impact of AIDS on staple foods". It illustrates the depth of knowledge and engagement the food industry is capable of.

Summary of business environment risks and opportunities:
Risks: The operating environment will in the near term be characterized by high inflation and interest rates, currency uncertainty, a high overall tax burden, and a heavy regulatory environment. Recent trade agreements will present US investors with stiff export competition from the EU. Further, HIV/AIDS is likely to limit productivity gains and increase labor costs.
Opportunities: Trade agreements with the EU and SADC will expand export markets. Gross Domestic Product is expected to grow at a strong pace by 2004, which could increase household disposable income. The worsening HIV/AIDS crisis will intensify the pressure on both government and the corporate sector for comprehensive solutions, which may include nutritional interventions. Consumer price inflation will drive demand for low-priced, fast-moving consumer goods.

BUSINESS CASE
COMMERCIAL FEASIBILITY

The Business Case views MTCT and nutrition from a strictly commercial analysis point of view. We considered this an important and realistic exercise to demonstrate the challenges and opportunities presented to a business interested in this underserved market niche. We have concluded that though this is a challenging market, with many constraints and a target consumer group with low purchasing power, there is in fact an opportunity to distribute nutritionally fortified foods to underserved pregnant and nursing mothers; and to conduct such a business at a profit that justifies the investment and risk. This business could be started by an existing South African food company or by an external food company entering the market.

We will take the approach of designing a business plan to commercialize the prototype product described above with the specific goal of meeting some of the critical nutritional needs of underserved Mothers presumptively feeding HIV negative, HIV positive and those with active AIDS. (See section on Beneficiaries)

There is growing momentum for fortification of staple foods as a nationwide intervention to reduce micro-nutrient deficiencies in all socio-economic levels. The government of South Africa as completed fortification guidelines for this purpose that will soon become mandatory. Fortification of bread, juices, cereals and other popular foods is gaining popularity and manufacturers are using this value-added feature as a selling message.

The Nutrition and Fortification Task Force is an industry-led consortium with members from the Grocery Manufacturers Association, Grocery Retailers Association, other industry such as Roche, and humanitarian organizations such as UNICEF. This is an advocacy and policy organization that works closely with government in drafting regulatory guidelines and also with the food industry to promote understanding of nutritional issues and encourage responsible practices.

The government of South Africa realizes that antiretrovirals and condoms are not enough to stop the coming avalanche of HIV+ people that will soon reach stage three and four of the infection. The government now advocates nutritional interventions that will keep HIV+ individuals healthy for a longer period and thereby maintain productivity in the workplace and ensure care for infants and children at home. In addition, nutritional programs are more cost effective, easier to manage and culturally acceptable.

On the commercial side, there are product gaps between the high priced baby formulas and fortified cereals at the bottom end. There are product gaps in the fortified dairy sector as well as a limited selection of 'functional foods." This provides an opportunity at retail. In summary, there is support and there is opportunity to launch a new food category. The down side is that introducing a new product into the humanitarian market is time and work intensive because there is now central system or single regulating organization. However, the will is there among humanitarian organizations.

Market attributes contributing to feasibility diagnosis:

- Sophisticated market characterized by soaring inflation, strong brand loyalty, market concentration;
- Growing demand for low-cost nutritious foods;
- Innovative market channel strategy could push demand through historically untapped channels;
- Unexploited target market;
- Unlocking potential would require intensive marketing (advertising, promotion, and product trials). Strong alliances critical to developing channels, in turn requires exceptional partner identification and management at the institutional, industry, and retail levels. Production outsourcing will enable easy entrance/exit and rapid profitability;

Objectives, success criteria

- Maintain a gross margin close to 20 percent.
- Achieve net profit of 16.65 percent of sales by year three.

Critical Success Factors

- Product positioning
- Price Point
- Effective national marketing and awareness campaign
- Cost containment
- Developing non-traditional channels and leveraging alliance resources to unleash channel potential

Discussion:
Overall, there is a lot of downside risk to this venture. However, if the business is able to come close to demand projections, this is viable. The best prospects domestically would be the retail and commercial food service channels, and the business would need to develop strong strategies for unlocking this market potential. Selling to government, NGOs and other such institutions increases risks and with the need to lessen dependence on this segment (currently at 54 percent of total unit sales). The business would need an aggressive export strategy, as export sales would have a strong positive impact on performance. At the projected price levels, the business can record positive net income by year two. In fact, there is room to open the margin further and still come below R3 at the retail level.

The biggest downside for this venture is the projected cash flow. Lots of cash would need to be pumped in for the first years until the business hit a positive cash balance. High sales growth results in two drains on cash: first, it increases the production costs which are paid in cash in this analysis. Second, it increases accounts receivable, which is basically delayed cash. Ability to collect this cash quickly may be the biggest factor affecting business performance, and it is therefore not ideal that government and other slow-to-pay institutions are projected to be among the largest customers.

If the business could secure financial support in marketing, this would improve results by reducing operating expenses and also by more effectively penetrating our market. If the business could secure some sort of short-term financing support on booked sales to institutions (i.e. guarantees on government transactions) this would have a significant positive impact on cash flows.

The ultimate question for management would be: what is their required rate of return, and does the net present value of future cash flows meet this requirement?

Key Findings

Risks to the business
Currency risk, high levels of inflation and interest rates, heavy regulatory environment, potential for increasing labor costs, fierce competition, high tax rates.

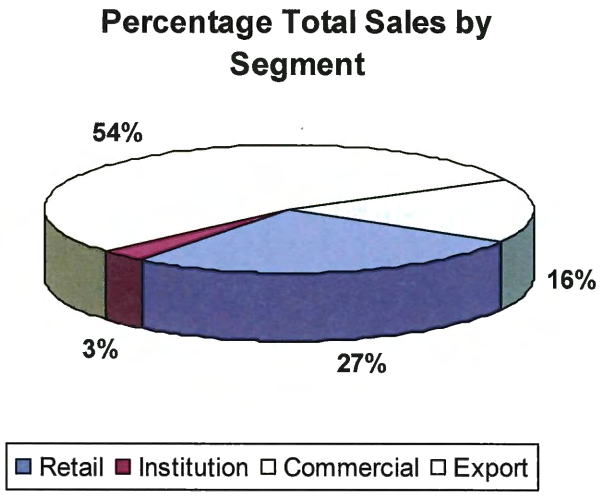
Risks – financial
High dependence on institutional channels (government), who take longer to pay, negatively impacting cash flows. Profit levels and cash flow position would be highly sensitive to our ability to keep collection periods for accounts receivable minimal and to source most inputs locally. Exposure to imported inputs increases exchange rate risk but also would increase inventory levels, which would have a significant impact on performance.

Opportunities
Export potential, cost advantages and retail clout provided through a major South African manufacturer. Growing consumer demand for this type of product. Untapped potential with at-risk pregnant and lactating mothers. The trend among industry leaders to provide HIV interventions for their employees. The movement among food sector stakeholders in cooperation with the government to deliver more nutritious products to disadvantaged population groups.

Corporate Structure
The South African supply chain is highly-concentrated, and the consumer market, brand-driven. Forming an alliance with an established manufacturer would provide rapid market entrance and afford benefits across distribution, merchandizing, and marketing. South Africa's excess production capacity provides an opportunity for contract manufacturing and distribution which would require less capital expenditure, minimize the production ramp-up period and lower exit barriers. The business model discussed in this analysis is based on a toll manufacture operating agreement with a major South African food or beverage manufacturer with a well established retail and distribution network. There is an opportunity for such an arrangement to evolve into a joint venture later. There are many options for such an arrangement in South Africa including multinational dairy and juice processors (Ceres, Parmalat), large domestic dairy and juice processors (Clover), and independent domestic dairies (Groebler).

Market Analysis / Segmentation

The market for this product is comprised of four segments. Institutional sales would include all sales to government agencies, non-governmental organizations, and other humanitarian or multilateral entities that may provide channels to delivering nutrition to the at-risk population groups. Retail sales would be primarily focused on higher income groups, simply for the fact that the majority of South Africa's population does not have adequate disposable income to be regular consumers of food products other than staple foodstuffs. South Africa's commercial food services may represent an effective channel to target consumers in the workplace, at private schools and in private hospitals. Finally, the opportunity to export is tremendous, particularly across the region.



1) Institutional: The target market is HIV/Aids-positive pregnant or lactating women, which in South Africa averages 300,000 women per year.[5] The majority of these women could not afford to purchase the product on a daily basis, and would rely on institutional provision of products, through national and provincial government programs, non-governmental organizations, and other multilateral or humanitarian efforts involved with at-risk women. Considering the likely expansion of institutional PMTCT programs and within the context of this business strategy, we project capturing 40% total market share through selling into these channels. This equals 135,000 women per year, or 49,275,000 units per year. A certain percentage of the total at-risk pregnant women (perhaps 5-10%), would also be reached through retail and commercial food service channels.

2) Retail: Limited consumer research data is available for South Africa. We have based retail sales projections on household disposable income statistics provided by Statistics South Africa. According to these statistics, approximately 9,460,000 South African consumers earn enough disposable income to comfortably afford occasional use of our product. We project capturing 10% of these higher-income consumers at least twice per month.

3) Commercial Food Service: South Africa's three major food service companies supply an estimated 1,500 accounts across heavy industry, private clinics and private schools, charging between R10-R15 per meal served. A review of customer menus found that private hospitals and mines are already including energy-drinks and some nutritiously enriched food products in their menus, but there appears to be ample opportunity to complement existing offerings to this segment with innovative, fortified, ready to eat foods: energy bars of compressed milk powder, fortified biscuits and breads, juices and milk, soy, rice, or maize flour beverages, biscuits, fortified instantized maize meal among the options.

[5] Assumes 30% HIV-prevalence rate for pregnant women; 1,100,000 pregnancies per annum

- **Industry:** Heavy industries record some of South Africa's highest HIV prevalence rates and have already suffered the consequence of a less healthy labor force in increased absenteeism and per-employee productivity losses. Businesses are now considering interventions to protect the long-term value of their employees and offset the higher costs of a dying unhealthy work force. Recently, South Africa's largest mining houses, including Anglo-American, Gold Fields, and DeBeers have announced plans for comprehensive HIV/AIDS interventions programs. This trend underlines our projection of capturing 5 percent of the employees in these industries through commercial food service programs. *Please refer to the work place meals scenario outlined at the end of this section.*

- **Schools:** South Africa has 12 million learners attending around 28,000 schools. Of all the schools, 22,000 are primary (grade 1 to grade 6). School feeding programs are common at the primary level. While government feeding programs through the Department of Health already service the neediest public primary schools, these programs are under-budgeted, with the typical per-student meal budget averaging less than one Rand. Private schools, serviced in part by commercial food service companies, are able to afford a more diverse, nutritious menu. Of the roughly 240,000 students attending private schools, we conservatively estimate capturing 5 percent of this market, or 12,000 students.

- **Health Care[25]:** Similar to the education sector, the private health sector has access to a far larger pool of resources per patient but caters to a smaller percentage of the population than the public health sector. South Africa's public hospitals service an estimated 80 percent of the population with a total capacity of 119,310 hospital beds. [26] The private industry services 20 percent of the population at 200 private hospitals, with a combined capacity of 23,000 hospital beds. Commercial Food Service companies are primary food service providers to these private hospitals.[27] We estimate the business could deliver nutrition to at least 2,300 private hospital patients annually.

4) Exports

The export market holds tremendous potential. The SADC region is home to 190 million consumers and is in the process of moving towards free trade by the year 2008. Regional trade is not yet without obstacles. High transport costs and other non-tariff barriers may dampen regional export prospects. However, we plan to aggressively leverage the tariff-free trade regime afforded through the Southern African Customs Union. With good transport routes and relatively straight-forward trade between Botswana, Namibia, Lesotho and Swaziland, we estimate we could conservatively deliver an additional 15 percent of total output to these countries.

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[25] From Health Systems Trust, "South African Health Review", 1998
[26] South Africa Department of Health Factsheet, July 1998
[27] From NetCare industry overview, http://www.netcareinvestor.co.za/

Market Size, Market Share and Total Projected Annual Unit Sales by Segment

Segment	Market Size # of People	Projected Share	Consumers Reached	Annual Units Per Consumer	Total Annual Units
Commercial					
Industry					
Mining	477,000	5%	23,850	48	1,144,800
Construction	315,000	5%	15,750	48	756,000
Automotive	70,000	5%	3,500	48	168,000
Private Health Care	23,000	10%	2,300	156	358,800
Private Schools	240,000	5%	12,000	36	432,000
Commercial Sub-Total					**2,859,600**
Retail	9,460,000	10%	946,000	24	**22,704,000**
Institutional	300,000	45%	135,000	365	**49,275,000**
Exports[28]					**13,206,812**
TOTAL ANNUAL UNITS					**88,045,412**

Scenario: Workplace Meals

Workplace meal programs provided by employers represent an ideal entry format for delivering better nutrition in the form of functional fortified foods. There are millions of female and male employees working in businesses across South Africa who are provided some form of noon meal by their employer every work day.

Referencing our target group, pregnant and lactating women, it is estimated that of the workforce receiving these meals a significant percent are women and, of these women, a large number are pregnant or nursing at a given time.

HIV positive individuals and those struggling with active AIDS are a growing segment of the work force as shown. Extrapolating from national seroprevalence statistics we estimate there could be as many as 10 percent of workers receiving work place meals who are infected. The provision of a nutritionally dense micronutrient fortified meal each day will make measurable differences in their lives. First, their on job performance will be improved through more energy and mental acuity as has been clinically proven. Second, work days lost to illness will be reduced through stronger body protection systems and better health. And third, their productive lives living with HIV positive status will be significantly increased. Of course, workers who are not HIV positive will also measurably benefit from improved nutrition.

[28] Exports calculated at 15% of total domestic demand

The following Cost / Benefits summary chart could be extrapolated to conditions in the South African work place with estimated improvements quantified in financial terms:

	Typical Work Meal	Cost in Rand /staff	With Fortified Diet	Cost in Rand /staff	Benefit in Rand / 1,000 staff
Job performance	___% efficiency		___ % efficiency		
Sick days	National Average =		Estimated =		
HIV+ productivity	Post HIV + years =		Post HIV + years		
Medical insurance					

It follows that it would be to the advantage of employers to subsidize worker family health as well, through fortified groceries sent home with the worker. Providing food to employees to take home to their families will substantially expand the reach of this benefit at a small relative additional cost. Moreover, the employees would have an affordable deduction from their salary to support this food supply assuring them an actual higher overall income (they will save money over spending at the market because of the employer purchase volume advantage) and benefit from the improved health of their families.

Frorn a food business perspective this reveals a powerful food service market opportunity that has been under-exploited in South Africa. Contracts for supplying this worker "food basket" assure the food enterprise a dependable forecasted demand for their product while giving the worker the price negotiating strength of their employer.

Return on Investment

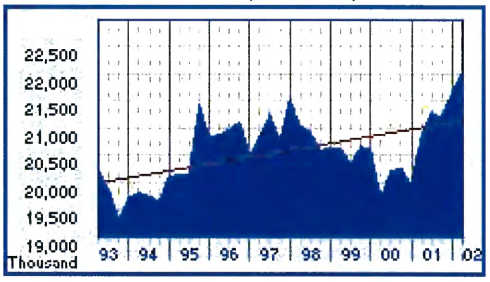
1. Workers: Well being, job performance, health, longevity and increased life income earning;
2. Workers Family: Superior nutrition, Well being, improved health, longer family income; reduced grocery spending;
3. Employer: Reduced costs per employee for sick days, health care; increased productivity; Increased over all efficiency of asset use resulting in revenue and profit;
4. Food Supplier: forward purchase contracts, dependable sales volumes; reduced advertising and promotion costs; reduced cost of sales; Brand awareness building;
5. Health care system: Reduction in demand place on resources and costs;
6. Employee health insurance: reduced cost yielding greater returns to the insurer;
7. Other: Community, Region, government benefits.

Industry Analysis

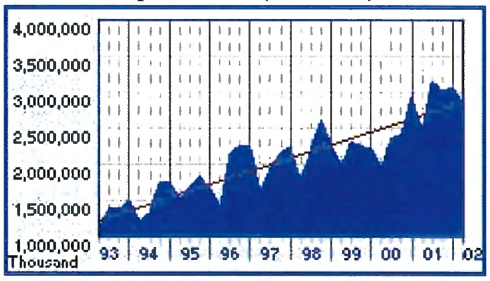
With an annual turnover of just under $4 billion, food & beverage production is the largest of South Africa's manufacturing sectors, contributing 15 percent to overall manufacturing, and employing over 200,000 people across approximately 1800 companies. The top ten food companies contributing 68 percent to total turnover. The sector enjoyed several years of success as the opening of South Africa's economy led to improved international competitiveness of their products, foreign investment inflows and strong export performance. (See Tables) During the past year, however, the sector has suffered a setback in the context of soaring price inflation.

Food & Beverage Sector:

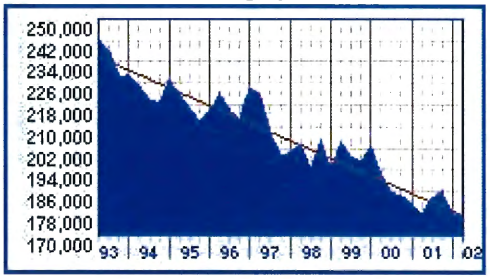
Total Sales ('00 Prices)



Export Values ('00 Prices)



Total Employment



A rise in global commodity prices and the fast and severe Rand depreciation drove up producers' prices for imported inputs. Producer price inflation was further exacerbated by the regional maize shortage caused by the southern Africa food security crisis, as South Africa's farmers sold their maize surplus at higher international prices, forcing domestic consumers to pay import prices that are up to 50 percent higher. High maize prices have had a ripple effect across dairy, beef, poultry, and other maize-dependent food industries. Consequently, by September, the producer price indices (PPI) for agricultural and food producers stood at 30.5 percent and 28.4 percent respectively. This was nearly double the overall PPI, which stood at 15.4 percent. South Africa's food sector has not been able to offset this negative operating environment through export earning as most other manufacturing industries in South Africa were able to do in 2002. Instead, while South Africa's overall manufacturing output grew, output in the food sector contracted by 5.8 percent.

The impact on consumers has been severe. According to the Chairman of the country's second largest grocery retailer Pick'n Pay, this environment has led to "the fastest escalation in food prices I have seen in 51 years of retailing."

Pick'n Pay two page advertisement, Sunday Times, September 29, 2002:
Over the last year the prices have increased as follows:

Maize	76%
Poultry	17.8%
Eggs	17.4%
Milk	14.5%
Sunflower oil	25.7%
Margarine	14%
Tea	25%
Bread	25.7%
Pasta	28.7%

Pick'n Pay announces it will subsidize its food prices with another 10 million Rand

Here is another example of the latent potential in the food industry to "subsidize" the delivery of fortified foods to pregnant and lactating mothers.

By August, consumer food price inflation was at 18.1 percent for the year. To the poor and working class, who spend up to a third of their income on food, these increases have been devastating and threaten social unrest. Amid accusations of 'poverty pricing,' retailers, trade unions and consumer organizations are calling for government intervention. The government has so far responded with an R1.5 billion increase in social grants (similar to welfare) throughout the remainder of 2002-2003. They have also introduced a limited quantity of no-brand subsidized maize meal. Government is contemplating more substantive demand-side interventions that include: food stamps, export restrictions, lowering import tariffs, or expanding the basket of foodstuffs that are zero-rated. Although such interventions would not positively impact South Africa's international competitiveness, this could provide opportunities for certain fast moving consumer goods.

Industry Participants / Competition

From production to distribution to retail, market share for the food and beverage products industries and sub-industries is concentrated in the hands of a few large enterprises. The largest producers and retailers also control distribution chains. Detailed financial information is not readily available for these enterprises due to the fact that many are either privately held or subsidiaries of foreign companies. Of those publicly listed companies, most are diversified conglomerates, and South Africa's disclosure rules do not require companies to report financials at a divisional level. Extensive industry interviewing and analysis would therefore be a requisite component of a comprehensive feasibility study. We established some of the following preliminary information about participants:

Producers:

Food: *Unifoods (Unilever), AngloVaal, Tiger Brands, Pioneer, Astral, HL&H, Robertsons,*
Beverages: *South African-Miller Breweries, Coca-Cola/Cadbury Schweppes, Ceres (Pioneer)*
Dairy Products: *Parmalat, NCD Clover, Dairy Belle.* South Africa's dairy industry contributes about 7% to total food production. The historically concentrated industry has seen an erosion of market share towards smaller, independent dairies. In 1998, the majors controlled 85% of market share. Today, the three largest dairies claim 41% (Clover 25%, Parmalat 10%, Dairybelle 6%), while South Africa's 1000+ private dairies account share the balance. Annually, South Africa produces about 2 billion liters of raw milk, 18,500 tons of butter, 36,000 tons of cheese, and 37,000 tons of milk powder. Imports make up the balance: 13,000 tons of milk powder, 6,000 tons of butter, and 3,000 tons of cheese.

Retailers:

Shoprite/Checkers, Pick 'n Pay, Spar (Pioneer), Woolworth's
According to industry sources, turnover for the retail sector is believed to be split fairly evenly across formal and informal retail segments. In the formal retail segment, the dominant chains capture 55% of total turnover in 1300 outlets, versus the informal segment's 68,000 outlets. Major retail chains not only control South Africa's distribution chain, but also compete directly with food & beverage processors through contract-processing 'house' or generic brands. Clearly, effective channel management and product merchandizing strategies for the formal segment will be critical.

Summary of industry risks and opportunities
The food and beverages sector is characterized by entrenched competition and market domination across the supply chain. Soaring consumer price inflation has led to a public outcry against manufacturers and retailers. Even as government contemplates demand-side interventions and a tighter regulatory environment, organized labor is threatening massive civil action. Meanwhile, there has been a proliferation of independently-produced, low-price, nutritiously-void beverage products enormously popular with consumers. This development, coupled with the threat of public unrest and the growing call for fortified or enriched products for the chronically malnourished masses, is forcing major producers downstream. Many of the large food and beverage manufacturers are developing cheap, enriched products for the mass market. Retailers are also moving downstream, with at least two of the largest enterprises rolling out new chains intended to compete at the informal retail level. Any new entrant to South Africa's food sector would be vulnerable to the competitive response of the sector's major players.

Economic projections point towards a challenging operating environment for the food and beverage sector. Although strong GDP growth and the recent rebound of the Rand may grow disposable incomes and reduce import inflation, high levels of consumer inflation and high interest rates are not expected to ease significantly until 2004. An already heavy regulatory environment may get tighter as government contemplates establishing a regulatory body to 'monitor the supply chain.' Additional labeling regulations are expected to increase costs. A shortage of skilled labor and demands for job creation undermine the ability to remain competitive through utilization of technology and capital intense production. On the other hand, demand is growing for lower-priced and nutritious products, creating market opportunity.

The move by retailers downstream could open a national distribution channel for products targeted at low-income, rural populations. A fragmented and inefficient informal retail distribution network currently services these population groups. Government interventions on food price inflation could lower production costs and create demand for certain food products. Market concentration may present partnering opportunities that could deliver cost benefits through economies of scale.

A weaker Rand would benefit domestic producers by protecting them from import penetration, while lower tariffs and freer trade with Europe and the region are projected to continue to fuel strong export growth. A strong export strategy would be indispensable and offset some of the risks posed by the domestic operating environment.

Sourcing
Sourcing raw materials may present challenges. Annual producer price inflation for imports was 16% by August, and continued currency weakness would pressure import costs. Both packaging and the 'premix' are expected to be sourced locally. Fresh whole milk represents 35% of total raw materials and has seen 40% price rises on the domestic market during the past year, primarily due to maize-price inflation. Cost of Goods Sold will therefore be highly sensitive to milk price and supply. There has not been a significant supply surplus of raw milk, and this situation worsened last year as a number of smaller dairy farmers moved out of dairy. The domestic milk supply situation is expected to improve next year, expanding a projected 5%, but supply shortages could be countered through importing milk powder.

The importation of donated skim milk powder, while controversial, could provide a powerful impetus to making better nutrition more available to our target groups. Blended with domestic milk, it would substantially reduce the cost of products, offering a business start up "subsidy" incentive to suppliers and at the same time make the products affordable to the very poor. It would also expand milk consumption into underserved markets (very few of the poor women targeted consume or purchase milk at this time). As their livelihood improved, they may become new purchasers of milk from the domestic dairy industry.

Production Strategy

More than 90% of South Africa's population is concentrated around the five urban areas of Johannesburg, Durban, Capetown, Port Elizabeth and East London. The Gauteng region, with Johannesburg as the economic center, is the powerhouse of South Africa, generating 37% of GDP. This would be the natural entrance point, and we have based projections on a centralized production facility. Good roads link Johannesburg with other major population centers. Given the relatively long distances between these cities, we have assumed high distribution costs – equivalent to 25% of the wholesale selling price. Additional production facilities are an alternative worth consideration, as this would lower distribution costs. Full production is estimated to ramp over a 24-month period, in line with demand. We have assumed a work year of 200 work days, and output per shift-per production line at 120,000 units: 250 ml Tetra Pak bricks of fortified, UHT shelf stable dairy based beverage.

Note: The Marketing Plan follows the business case section of the report.

Sales Forecast

The sales forecast assumes cost and price growth in line with projected inflation. A straight-line demand curve that meets full demand at 24 months is projected in this preliminary analysis. Thereafter, unit sales growth is projected in line with monthly GDP growth. Sales growth is steep for the first 24 months, but this is reasonable given a starting base of zero and conservative market penetration. Overall, annual unit sales are predicted to grow from nearly 24 million units in year one to over 96 million units by year five. Total annual revenues on these sales are projected to grow from R 39 million in year one to R222 million for year five. This growth forecast excludes the potential upside of export market development. Lower than anticipated unit sales would result in lower but positive net income. No significant changes in the product line or in the proportion between different segments are considered.

Five-Year Sales Projections ('000 Rand)

	% of Total Sales	2003	2004	2005	2006	2007
Commercial	3%	1,326	4,113	5,991	6,726	7,551
Exports	16%	6,123	18,996	27,667	31,062	34,873
Retail	27%	10,526	32,656	47,562	53,398	59,950
Institutional	54%	21,088	65,422	95,285	106,977	120,103
Total	100%	**39,063**	**121,187**	**176,505**	**198,163**	**222,477**

Cost & Pricing Strategy

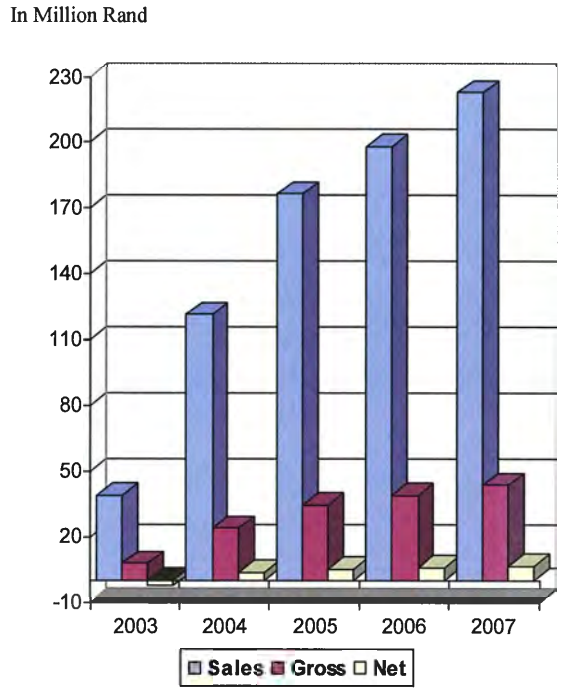
This analysis assumes outsourced production through contract processing. Preliminary information indicates that the per-unit cost for processing and packaging ingredients would be approximately R0.06. Estimates for packaging materials are based on pro forma quotations. The raw material cost was developed from a survey of retail prices for required inputs, and is therefore conservative as we would likely be able to purchase inputs at prices that are lower than retail. The high distribution costs reflect a national distribution strategy and are based on advice from industry participants. After considering household disposable income data and household monthly food expenditure data by income group, we determined that the retail price point would need to be at or below R3.00. This appears comfortably achievable after adding our gross margin. A retail audit of similar products available at major retail outlets showed that our price would be competitive. We plan on offering a discounted price to institutional customers, which would enable them to earn a commission while still delivering product below retail prices.

Costs of Good Sold in Rand	**Year 1**	**% Total Costs**
Raw Material	0.655	49.786%
Processing	0.060	4.556%
Packaging Material	0.225	17.087%
Distribution	0.376	28.571%
Sub Total COGS	1.316	100.000%

Pricing Model	**Rand**	**Gross Margin**
Wholesale Margin / Selling Price to wholesaler	1.712	30.0 %
Institutional Margin / Selling Price	1.580	20.0 %
Retail Price to consumer (+20% markup +14% VAT)	2.342	

Financial Projections

The accompanying chart shows the expected performance of key financial indicators: sales, gross margin, and net income (profit/loss). *Units are in millions of Rand.* The chart demonstrates viability through strong sales growth generating annual revenues in excess of R222 million by year five. A large ratio of accounts receivables would pressure cash flows in the initial years. Given that slower-paying institutional customers are expected to account for a majority of sales, an aggressive collection policy will be critical. Profitability will be largely driven by sales performance in the retail, commercial and export segments, where margins are much higher than in the institutional segment.



Considerations / Recommendations

- A strategy for aggressive penetration of the retail and commercial markets would significantly improve profitability and cash flows by reducing dependence on sales to slower-paying and less profitable institutional channels.
- Sourcing raw materials locally will reduce currency risk and enable lower inventory levels, which would strengthen cash flow positions.
- Identifying organizations to strongly advocate for government nutrition interventions, zero-VAT rating on additional food products, and other demand-side interventions could improve market potential and reduce costs
- Multiple production facilities could reduce distribution costs and improve profitability
- Leveraging partner resources to share or supplement marketing costs would reduce operating expenses, immediately improve cash-flow positions and would strengthen the effectiveness of a challenging marketing effort.
- An aggressive collection policy would be a necessity in order to reduce the negative impact high levels of receivables would have on cash flows
- There is room to open the gross margin on wholesale price and still come below the estimated price point

Assumptions

- Corporate Tax Rate is set at 35 percent
- From year three onwards, sales volume growth rate = projected GDP growth rate (3%)
- From year three onwards, turnover growth rate = GDP (3%) + inflation (6%) = 9%
- R5 million of additional anticipated working capital is financed through balloon debt, at an interest rate of 10%
- Assumes utilization of existing plant capacity
- Marketing budget for each of the first two years is R6.1 million based on estimates provided below. Thereafter, marketing is fixed at 5% of sales.

Estimated Initial Marketing Budget (per month)
(000 Rand)

Radio	144
Road Shows	360
Leaflets	5
Total	509
Annualized	6,108

Break-even Analysis

The break-even analysis is based upon on achieving the targeted market share within two years, on a straight-line basis. It is also assumed prices for domestic inputs will remain stable, adjusted for inflation.

The essential insight is that projected sales levels would run comfortably above break-even from year two onwards.

Per Unit Financials in Rand

	2003	2004	2005	2006	2007
Revenues / Unit (1)	1.638	1.786	1.946	2.121	2.312
Cost of Goods / Unit	1.32	1.44	1.56	1.71	1.86
Gross Profit / Unit	0.32	0.35	0.38	0.42	0.45
Operating Expenses / Unit (2)	0.42	0.27	0.29	0.32	0.35
Operating Income	(0.10)	0.08	0.09	0.10	0.11

Projected Incremental Profit and Loss

Projected demand levels assume the following: in South Africa, the business will reach more than 1.13 million consumers on annual unit sales of 74.8 million. Exports would add another 13.2 million units, for total unit sales by end of year two of 88 million. Assuming a 24-month straight line ramp to these levels, positive net income occurs during the second year of operations. Annual net income will surpass R6 million in year five, on revenues of R222 million. Profitability will be largely driven by sales performance in the retail, commercial and export segments, where margins are much higher than in the institutional segment.

Incremental Profit & Loss ('000 Rand)

	2003	2004	2005	2006	2007	2008	2009	2010
Sales								
Total Sales	**39,063**	**121,187**	**176,505**	**198,163**	**222,477**	**249,775**	**280,422**	**314,830**
Cost of Goods Sold								
Total Cost of Good Sold	31,401	97,414	141,881	159,290	178,835	200,778	225,414	253,072
Gross Profit	7,663	23,772	34,624	38,872	43,642	48,997	55,009	61,758
Operating Expenses								
Marketing	6,108	6,108	8,825	9,908	11,124	12,489	14,021	15,742
Selling, General & Administrative	3,906	12,119	17,651	19,816	22,248	24,977	28,042	31,483
Total Operating Expenses	10,014	18,227	26,476	29,724	33,372	37,466	42,063	47,225
Income From Operations	-2,352	5,546	8,148	9,148	10,270	11,531	12,945	14,534
Other Expenses / Income								
Interest Expense	500	500	500	500	500	500	500	500
Earning Before Income Taxes	-2,852	5,046	7,648	8,648	9,770	11,031	12,445	14,034
Provision for taxes (35%)	-998	1,766	2,677	3,027	3,420	3,861	4,356	4,912
Net Income	**-1,853**	**3,280**	**4,971**	**5,621**	**6,351**	**7,170**	**8,089**	**9,122**

Projected Incremental Operating Capital

The projected operating capital assumes forty-five day collection period for Accounts receivable, and thirty days of raw materials and works-in-progress for Inventories. It will be critical to maintain an aggressive collection policy, given that government channels are projected to account for more than half of sales volume. Further, if most raw materials cannot be sourced locally, inventory levels may be higher. Any significant change in inventories would have an adverse impact on cash flows. Exchange rate volatility would exacerbate this risk, given that imported inputs would most likely be sourced from countries that are not export markets. Accrued Expenses are assumed to be 45 percent of operating expenses given as a year-end provision for taxes.

Incremental Working Capital Requirements
('000 Rand)

	2003	2004	2005	2006	2007	2008	2009	2010
Current Assets								
Accounts Receivable	4,883	15,148	22,063	24,770	27,810	31,222	35,053	39,354
Cash	988	-7,119	-8,369	-5,173	-1,545	2,568	7,225	7,494
Inventories	2,617	8,118	11,823	13,274	14,903	16,732	18,784	21,089
Total Current Assets	8,487	16,147	25,518	32,872	41,168	50,521	61,063	67,937
Current Liabilities								
Accounts Payable	835	1,519	2,206	2,477	2,781	3,122	3,505	3,935
Accrued Expenses	4,506	8,202	11,914	13,376	15,017	16,860	18,929	21,251
Total Current Liabilities	5,341	9,721	14,120	15,853	17,798	19,982	22,434	25,186
Long-term Debt, net of current portion	5,000	5,000	5,000	5,000	5,000	5,000	5,000	0

Projected Incremental Cash Flows and Internal Rate of Return (IRR)

Projections indicate this business could generate a positive cash flow stream that would realize an internal rate of return of 21.41% by the eight year.

Projected Incremental Cash Flows ('000 Rand)

	2003	2004	2005	2006	2007	2008	2009	2010
Cash flows from operating activities:								
Net income (loss)	-1,853	3,280	4,971	5,621	6,351	7,170	8,089	9,122
Change in working capital:								
Accounts receivable	-4,883	-10,265	-6,915	-2,707	-3,039	-3,412	-3,831	-4,301
Inventories	-2,617	-5,501	-3,706	-1,451	-1,629	-1,829	-2,053	-2,305
Accounts payable	835	684	687	271	304	341	383	430
Accrued expenses	4,506	3,696	3,712	1,462	1,641	1,843	2,069	2,323
Total cash flows from operating activities	-4,012	-8,107	-1,250	3,196	3,628	4,113	4,657	5,269
Cash flows from financing activities:								
Proceeds from long-term debt	5,000	0	0	0	0	0	0	0
Repayment of debt								-5,000
Total cash flows from financing activities	5,000	0	0	0	0	0	0	-5,000
Terminal Value								2,239
Net Cash Flow	**988**	**-8,107**	**-1,250**	**3,196**	**3,628**	**4,113**	**4,657**	**2,508**

	2003	2004	2005	2006	2007	2008	2009	2010
Net Cash Flow	988	-8,107	-1,250	3,196	3,628	4,113	4,657	2,508

Net Present Value (5 years, 2003-2007)	
Discount Rate for Terminal Value	12.00%
Discount Rate for NPV =	**12.00%**
NPV =	**-2,666**
IRR (2003 - 2010)	**n/a**

Net Present Value (8 years, 2003-2010)	
Discount Rate for Terminal Value	12.00%
Discount Rate for NPV =	**12.00%**
NPV (R'000) =	**3,162**
IRR (2003 - 2010)	**24.52%**

Competitors

We were able to locate or learn about only a few food processing businesses specifically considering maternal nutrition for underserved populations. AfricaFoods was again a leader. This does not mean others are not also involved in these foods. On the other hand, when considering fortified beverages and solid foods overall, most of the businesses interviewed, some that were not, academic institutions, breweries, soft drink manufacturers, and even NGO's were actively pursuing this form of innovation or had functioning prototypes. The technology and interest discovered in South Africa around fortified foods were very comprehensive and impressive. According to the National Food Consumption Survey respondents were informed about fortification and showed a willingness to select for such foods.

The frequency of purchasing foods enriched with vitamins and minerals by area of residence: South Africa 1999

Response (%)	Area of Residence						
	Commercial Farms	Formal Urban	Informal Urban	Tribal	Urban	Rural	RSA
Number (n)	48	303	97	303	400	351	751
Regularly twice/week)	25	53	41	31	50	30	41
Sometimes	75	47	58	69	49	70	59
Never	0.	0.3	1	0.3	0.5	0.2	0.4

If consumer purchase power were to improve, this category could become hotly competitive driving down prices and providing an incentive for innovation in the industry. Really, it appears this is a building wave constrained at the present by low incomes among the most in need and lack of industry focus on the poor majority of South Africans.

Parmalat exemplifies a South African beverage business with fortified product leadership as illustrated by some of their progressive products shown in this photo. It can only be imagined what a transformation of health for South African Mothers would occur if products similar to this were actually made available to underserved women and their young children on a daily basis. Also shown are an innovative soy beverage and the two traditional stalwarts of African nutrition: Maas and Mageu, both would make outstanding formats for fortification and addition of functional ingredients.

BUSINESS CASE
MARKETING PLAN

Marketing faces an especially large and unique start-up challenge. It must achieve operations viability across the following nine critical competitive arenas to assure product success and business profitability. It must also work diligently to integrate its products and marketing initiatives with extensive integrated maternal care services in place and growing in South Africa.

1. Achieve product awareness, knowledge about the clear comparative advantage – benefits – of consuming the product. This is a large promotion and education challenge.

2. Create a degree of prestige value for the product, raising the value perception in Mother's and the market's impression.

3. *Build a brand* with strong quality and nutrition associations to protect the business's equity and to drive investment into the new product segment. Brand will also be essential to line extensions and to export. Products must be validated and endorsed by research institutions and government.

4. Keep the products "in front of Mothers" wherever they might look for food. These are the five market channels described; but creativity in saturating distribution channels and driving demand is essential. Imagine a Coca Cola marketing approach for products exclusively for pregnant and lactating Mothers.

5. Aggressively apply the full force of food and nutrition technology toward innovative line extensions targeting not only Mothers health but the growth of their young children: complementary foods for weaning and foods for pre-schoolers.

6. Network creatively through informal market channels to reach poor and remote settlements.

7. Export is essential to a long term business viability and growth. This will bring money into South Africa as it promotes the new nutrition category in countries with like needs.

8. Develop pricing strategies that are niche oriented. This could entail cross subsidizing products: selling under cost of production in certain markets while subsidizing that loss with profits from more prosperous markets. Or it could work with government to forgive value added taxes, or import duty on ingredients, for some consumer segments, to reduce prices.

9. Marketing challenge will be to reach out to collaborative product development and marketing arrangements, creating a business cluster around MTCT and nutrition that rewards participants by helping them succeed in their objectives.

Such organizations include: other distributors, NGO's, government programs, community programs, and many others.

The market channels are divided into two main segments: commercial and Institutional (including humanitarian). Different marketing strategies will be needed to address the particular needs of each channel. For example, the commercial package must generate enough profit to support retail promotions and advertising. The humanitarian package must be priced low enough to be affordable to CBOs, PVOs, donor agencies, government, and clinics. Sustainability requires that production for both channels is profitable. Subsidies, if available, should be applied to social marketing and consumer education programs. Donor agencies can support CBOs by purchasing the lower cost "humanitarian" package.

The cornerstone of the project is a modern dairy with national scope of distribution. Large dairies in South Africa have efficient distribution systems that reach all channels of the food trade and penetrate the rural markets and informal retail system (source: Clover, Pioneer Foods, Ceres Juices, and Parmalat). This will insure availability of the product to all socio-economic classes (whether they can afford it or not)

Product

There are high quality vitamin and mineral fortified food supplements and baby formulas currently available in South Africa supermarkets, both imported and domestically produced. However, these are priced out of reach to all but the highest socio-economic groups. (refer to store audit). At the other end are low cost fortified biscuits and dry porridge mixes that are distributed through an informal but progressive network of community based organization. While extremely promising, this system can produce price inconsistencies, distribution gaps, inadequate consumer training and potential failures of the distributing organizations to meet customer and supplier requirements.

What is proposed is a parallel commercial approach where a private food business custom formulates, produces, and then distributes affordable fortified product intended for underserved pregnant and lactating Mothers. To accomplish this on a sustainable basis will require a creative multiple market channel approach combined with flexible pricing strategies, and leadership innovative products that deliver a measurable nutritional punch to the consumer. This fortified food methodology requires no less focus, discipline, and sustained follow through than one of the "drug programs" intended to mitigate MTCT.

The synergy of leading food technology, innovative distribution channels, and a modern South African dairy can create this new product category. A dairy based, vitamin and mineral fortified, ready to eat, functional food will bridge the nutrition gap for Mothers. Think of a "liquid meal" that offers high bioavailability and concentrated nutrition in a ready to eat small, portable format. This solves many problems associated with helping disadvantaged groups. For example safe water for mixing is no longer an issue. Dirty hands and biscuits are no longer an issue. There is no preparation required, no fires or boiling of water. It can easily be administered in schools, health clinics and hospitals, factories and mines. The commercial potential is strong because there is currently nothing like it in the market. A liquid meal at an affordable price will be attractive to all retail channels just as traditional foods such as Maas and Megeu.

Store Audit in Johannesburg

Product	Size	Fortification	Price – S. A. Rand	Price per Kilo
Sunflower Oil	2 Liter		16.99	8.50
Salt	1Kg		2.39	2.39
Sugar – Selati	10 Kg		48.99	4.90
Rice – Osmans Taj Mahal	10 Kg	Not enriched	39.99	3.00
Snow Flake Cake Flour	12.5Kg	A, B, Niacin, B4, Folic Acid, Iron, Zinc	62.50	5.00
IWISA – Corn Meal	12.5 Kg	Super enriched	48.79	3.90
IWISA Special	10 Kg	Enriched	36.99	3.70
IWISA Special	10 Kg	Enriched	36.99	3.70
Impala "Special" corn meal	10 Kg	Not Fortified	35.49	3.55
Marie Quality Biscuit	150 gm		1.99	13.27
Bulk Bag – The Bistro Biscuit	750 g		18.99	25.32
Bread; White Albany	800 gm	calcium	3.49	4.36
Brown (whole wheat)	700 gm	calcium	3.99	5.70
Rusks – Bokomo	500 g		10.69	21.38
Parmalot Omega 3 + Vitamin milk – UHT	1 liter	Omega 3, 8 Vitamins	7.19	7.19
Nestle Starter Infant Formula	1.8 Kg		96.99	53.88
Clover UHT Milk full cream 2 & Skim	1 liter		5.99	5.99
Bonita Everfresh milk	1 liter		5.59	5.59
Parmalat full cream UHT	1 liter		5.79	5.79
Origms Soy milk UHT	1 liter		9.49	9.49
Bonita Flavored Milk Strawberry – sterilized plastic bottle	350 ml		3.69	10.54
Clover Shake Sterilized plastic	350 ml		4.69	13.40
Clover Flavored milk, Sterilized plastic	250 ml	Fortified	3.39	13.56
Powder Milk (100 g into 900 ml H2O)= yield 30 liters; Sungold Econo mix	3 Kg	Glucose & Palm Kernel Oil	129.99	4.3 (reconstituted)
Cremora	1 Kg		19.69	
Clover whole milk plastic bag; Pateurized	1 liter		4.99	4.99
Clover whole milk plastic bottle - Pasteurized	1 liter		5.49	5.49
Clover whole milk plastic bottle - Pasteurized	2 liter		8.99	4.50
Parmalat plastic bottle - Pasteurized	2 liter		10.29	5.15
Parmalat plastic Bag Pasteurized	1 liter		4.89	4.89
Clover Drinking plastic Bottle	500 ml		3.29	6.58
Grobler Gable top carton	500 ml		2.99	5.98
Dairygold – AMASI EGOLI plastic bottle	2 Lliter		13.49	6.75
Dairygold Amasi gable top carton	500 ml		4.29	8.58
Bonita Amasi Full fat, gable top	500 ml		4.89	9.78
Mageu "Number 1" gable top	1 liter		5.29	5.29
IWISA Special	10 Kg	Enriched	36.99	3.70
Mageu "Number 1" Gable top	500 gm		3.29	6.58
Clover Mass, gable top	2 liter		14.99	7.5
Dew Fresh; liquid yogurt	500 ml		8.49	16.98
Parmalat Flavored drink yogurt – Prizma UHT	330 ml		4.89	14.82
Clover Dannon flavored drink yogurt Plastic bottle Sterilized	350 ml		5.49	5.69
Ceres Junior Juice In a 6 pack	200 ml		2.16	2.60
OROS Orange Squash 1:3 dilute=20 liters	5 liter		38.99	1.95
Coke 200 ml (in a 6 pack)	200 ml		2.83	14.15
Coke	340 ml		3.	8.82
Coke	2 liter		8.49	4.25

Price

A modern dairy can produce such a product and deliver it to the market at close to parity with existing dairy-based products. We propose a single 250 ml serving size with a retail price point below three Rand. This will ensure affordability to 60% of the population (source AMPS 2001 Living Standard Measure). Perhaps an additional 15% could afford such a product on a less frequent basis.

The lowest socio-economic groups 27% of the population must be reached with the humanitarian package or through institutional feeding programs. This product will be distributed without a retail markup and free of 12%Vat to 0-rated NGOs. It will go to market at 60% of the retail price. For non 0-rated NGOs it will go to market at 66% of the retail price. *The business's pricing strategy is creating product access and affordability to underserved target consumers (mothers) while at the same time, aggressively exploiting more lucrative domestic niches and export opportunities that balance its profit goals for the business.*

Placement

South African bakeries, beer companies, dairies and soft drink companies have distribution systems that reach the furthest into rural communities as well as urban informal markets. They frequently deliver their products further than wholesale distributors.

The obvious choice is production and distribution through a modern dairy with national scope. The right profit structure will drive distribution. If the producer's profit structure and distribution allowance is attractive, then product launch, new distribution and proper shelf placement at retail will be in the best interest of the dairy. A new dairy food category can increase market share and profits for the producer. A new product category can increase profits to the retail community segment. A national dairy has the ability to place a new product with advantageous shelf position to ensure that consumers will see it. An attractive profit structure on the commercial package will allow the producer to sell the humanitarian pack at a much lower price. *The Business's market placement strategy is to have nutritious, affordable, customized, products in front of mothers wherever they look for food or care.*

Promotion

The core target customer/beneficiary is young mothers and ultimately their pre-school children. In addition these nutritional products will include South African youth in general. South African youth – including young mothers - are very brand conscious and want new "cool" products that they can identify with. The fact that young people will give up breakfast or lunch in order to have a few minutes talk time on their cellular telephones, validates this point. When a product is perceived "cool" and is affordable, the demand will pull distribution throughout the retail system from supermarkets to spaza shops that serve the poorest communities. Positioning the brand in this manor will put it in the hands of the target beneficiaries. *The promotion strategy will entail creating a strong prestige association for use of this nutritional product.* "I am proud of how I take care of myself and my child by investing in quality foods such as.....".

Milk is not perceived as 'cool' (Clover Dairy). Brand positioning must create the concept of a new, innovative product that delivers nutritional, energy and good health in a modern way. The concept, package, message and graphics must be in style. Promotions must deliver the concept of good health through maternal nutrition in an innovative culturally powerful way. Social marketing programs that are informative and entertaining can work in both the commercial and humanitarian channels; e.g. a women telling women campaign. The team met with *Inroads Advertising Agency* to go into depth about this challenge. This is an example of a South Africa firm superbly qualified to launch such a campaign through village plays and radio.

Communication Strategies and Promotions

A three-format system of communication will reach all potential customers/beneficiaries:

1. **Radio**

Radio penetrates all socio-economic levels in South Africa and is the primary source of information for 82% of the population in both urban and rural communities (source AC Nielsen) Radio is also the most efficient way to reach the target age group, young people between the ages of 18 and 35. This is the most "at risk" segment of the population for exposure to HIV. This is the age group with pregnant and lactating women. This age group is most likely to respond to information on nutrition in general and interventions for MTCT in particular.

2. **Experiential**

Road shows, village plays, rallies, and workshops communicate in a culturally acceptable manor in traditional settings. Broadcasts on indigenous language radio stations will reach deep into the rural communities. This is where Inroads Agency shines.

3. **Educational Demos for Retail and Humanitarian Channels**

Product tasting at retail stores and distribution of informational leaflets will increase awareness of nutrition and the product. These leaflets will also be used for training of CBOs, PVOs and beneficiaries in disadvantaged communities.
The messages must be believable, as many African are skeptical of nutritional claims on packaged foods or do not fully understand the concept of nutrition. This is particularly true of Africans who have not completed secondary school

Customers Segmentation

Nutritional deficiencies exist at all socio-economic levels in South Africa. Positioning the right nutritional product as a "functional food" or "liquid meal" can serve many potential users. It can target young professional that eat on the run, laborers that need a high energy ready to eat food to consume on the job, South African youth that are looking for products that are new and "cool", mothers that are concerned about the well being of their families and pregnant and lactating women that need nutritionally dense and highly bio-available foods. The following tables are from the *National Food Consumption Survey, 1999* revealing considerable consumer awareness and motivation towards fortified foods.

The percentage of respondents who thought that foods enriched with vitamins and minerals were healthier by area of residence: South Africa 1999

Response (%)	Area of Residence						
	Commercial Farms	Formal Urban	Informal Urban	Tribal	Urban	Rural	RSA
Number (n)	284	1018	320	1111	1338	1395	2733
Yes	64	76	79	68	77	67	72
No	2	4	3	1	4	1	2
Don't Know	33	20	19	31	20	32	26

The percentage of respondents who bought foods enriched with vitamins and minerals as determined by area of residence: South Africa 1999

Response (%)	Area of Residence						
	Commercial Farms	Formal Urban	Informal Urban	Tribal	Urban	Rural	RSA
Number (n)	284	1017	319	1099	1336	1383	2719
Yes	37	53	48	40	52	40	46
No	26	23	24	25	23	25	24
Don't Know	37	24	28	35	25	35	30

The percentage of respondents who would buy foods enriched with vitamins and minerals even if they were more expensive by area of residence: South Africa 1999

Response (%)	Area of Residence						
	Commercial Farms	Formal Urban	Informal Urban	Tribal	Urban	Rural	RSA
Number (n)	284	1018	320	1104	1338	1388	2726
Yes	34	47	36	32	45	32	38
No	32	33	41	40	35	38	37
Don't Know	35	20	21	29	20	30	25

Customer Segments and Market Channels for MTCT Fortified Foods

Retail	Institutional	NGO/Humanitarian
Pregnant and lactating women Children and students Office workers Young professionals Commuters	Food service at • Factories • Gold mines • Auto manufacturing plants Hospitals Police Firefighters Military	Pregnant and lactating women HIV intervention programs Community health clinics School feeding programs Emergency response Refugees

Customer Priorities in Descending Order

- Pregnant women: to ensure strong infants at birth.
- Lactating mothers: to ensure an adequate supply of high quality breast milk for strong infant immune systems to reduce the risk of MTCT.
- Children 6 months to 5 years: primary growth years and high risk of intestinal diseases.
- Primary and secondary school children (school feeding programs) to increase cognitive ability and school attendance.
- Young adults, young professionals, commuters, mine and factory workers who may have little time for proper meals.

Distribution and Market Channels

There are five market channels:

1. Chain Stores

- Supermarket chains;

Dairy companies supply perishable foods to the supermarkets directly and supply non-perishable dairy to the chain store distribution centers.

2. Specialty

- Convenience shops
- Petrol station shops
- Spar

Dairy companies supply these retail outlets directly.

3. Wholesale distributors / Informal

- Independent grocery stores
- Over the counter stores
- Spaza shops
- Hawkers

This is a demand driven system with distributors delivering store door.
Their trucks reach the outskirts of squatter's camps and as far as transportation centers in the rural areas. Beyond that point, an informal distribution system carries product to the spaza shops private pickup trucks, bicycle couriers and by hand.

A "Spaza" shop in a rural community
prices are higher than large retail stores in the city
Stock: corn meal, rice, beans, margarine, oil, sugar, tea, soap-

4. Institutional

Food service companies supply meals to:

- Hospitals
- Factories
- Mines
- Schools/Universities

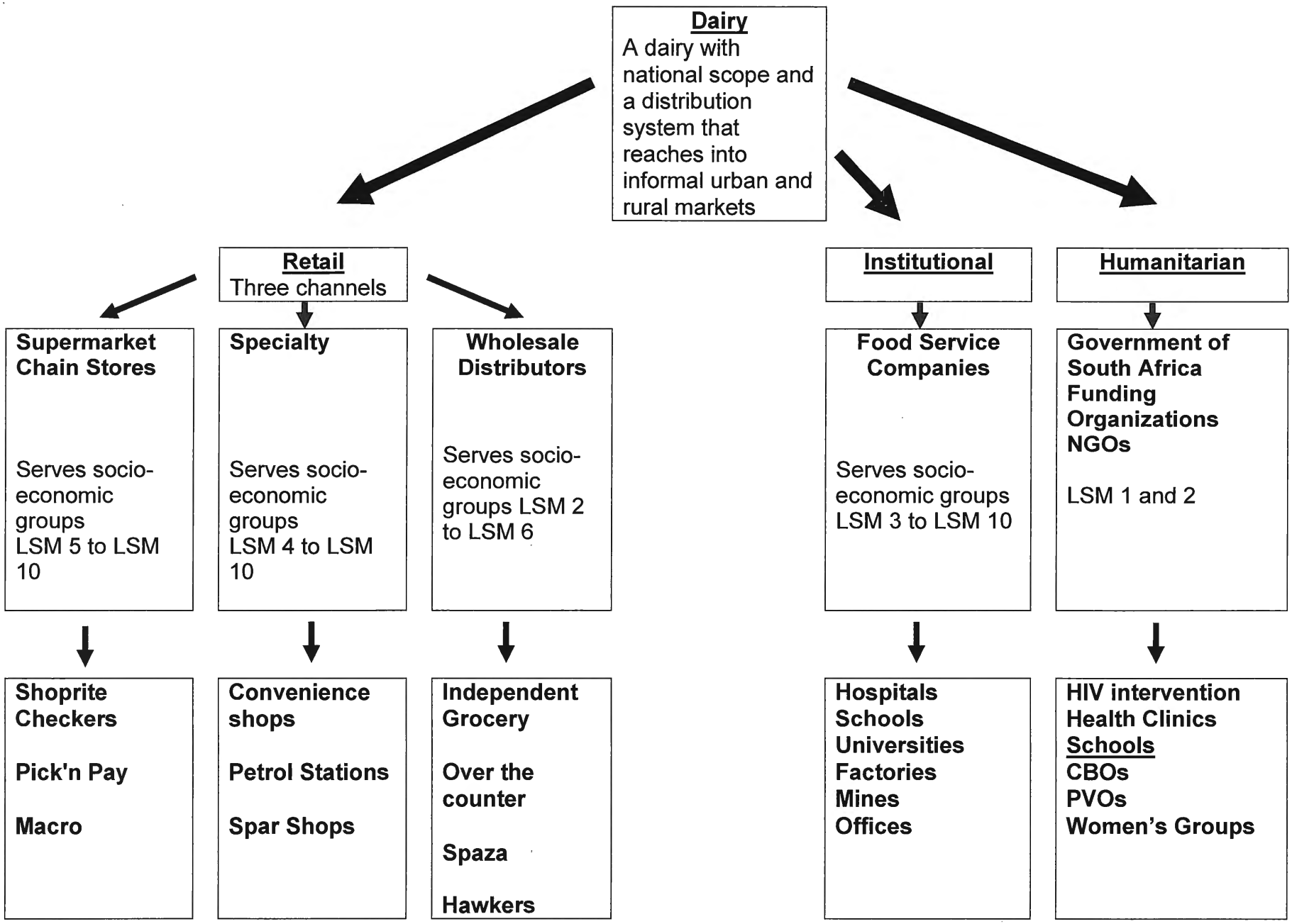
This channel is growing as employers realize the importance of nutrition in keeping their workforce productive.

5. Humanitarian / NGO

This is an informal network built on community outreach programs and implemented by CBOs and PVOs. Small-scale specialty producers supply directly to the implementing organizations. Effective training and monitoring is necessary to develop a sustainable supply chain.

- HIV intervention for MTCT
- Health clinics and community hospitals
- PVO's, Hospices and HIV outreach
- Income generating projects involving CBOs
- School feeding program

Distribution System



Socio-Economic Groups
LSM Living Standard Measure (AMPS 2001, 43 M people)
Percent of Population Served by Channel Of trade

	% Population	Average Household Income	Retail Food Source Penetration			Institutional Food Penetration	Humanitarian Intervention
			Supermarket	Convenience & Spar	Spaza	Food Service	
LSM 10	5 %	R 13,406					
LSM 9	5.1 %	R 9,743					
LSM 8	5.6 %	R 7,407					
LSM 7	5.8 %	R 5,495					
LSM 6	12.1 %	R 3,731					
LSM 5	11.9 %	R 2,289					
LSM 4	14 %	R 1,595					
LSM 3	13.6 %	R 1,113					
LSM 2	14.5 %	R 895					
LSM 1	12.6 %	R 748					
Potential to reach % Population			45.5 %	59,5 %	66.1 %	Insufficient data to estimate %	27.1 %
Number of /Customers/ Beneficiaries			19,565,000	25,585,000	28,423,000		11,825,000

Pricing Strategies
The most efficient strategy is to have one product with one brand, one name, however in two packages, a commercial/institutional pack and a humanitarian/NGO pack. Each pack must go to market at a price that will support itself, however the humanitarian/NGO pack will have a smaller profit margin. This "cross-subsidy" two-tier price system will ensure sustainability of the business enterprise while delivering an affordable product to the humanitarian market.

The strategy is as follows:

Humanitarian/NGO pack
Selling price that will support
- Production costs
- Distribution reaching the informal market
- Social marketing
- Small producer profit
- 0-rated to qualified organizations, Department of Health, UNICEF, USAID, etc.

Institutional Pack
Selling price that will support
- Production costs
- Distribution
- Social marketing
- Reasonable profit to the producer
- 0-rated to qualified organizations such as Police, Fire, Military, School Feeding Programs.

Commercial/Institutional Pack
Selling price that will support
- Production costs
- Distribution reaching the informal market
- Marketing and advertising
- Reasonable profit to the producer
- Reasonable profit to the retailer

MANUFACTURING / INFRASTRUCTURE

Food processing is a fully developed industry in South Africa. The assessment team visited dairy, juice, and grain processors. High quality, innovative processed food products from South Africa are exported throughout the world. The specific UHT processed, aseptically packaged low acid beverage being considered for this business case could be processed at dozens of processing facilities throughout South Africa. Two specific processors with capacity, distribution, and exceptional track records that the team interviewed are Clover (a large scale multiple site processor) and Groebler Dairies (an independently owned midsized dairy and juice processor). These processors were cooperative and open to contract production and product innovation. From a technology, capacity, and fee standpoint, contracting for the manufacture and distribution of a fortified low acid beverage would not be a problem in South Africa.

Infrastructure

Manufacturing infrastructure in South Africa: roads, power; cold chain distribution, communications, water, sewer, fuel, transportation, warehousing raw materials and finished product storage, is well established and successful making quality food available and accessible - when it is directed to do so. The point to be made here is that it is not for lack of infrastructure that pregnant and nursing Mothers are or would be lacking nutrition. The deformities in the food system addressed in this feasibility assessment lie outside the realm of physical infrastructure capacities.

One exception involves the informal sector which has evolved over decades in response to internal segregation of supply and demand market performance. "Spazas", fresh markets, and other forms of "informal" trade are a kind of parallel infrastructure into remote and underserved locations both rural and urban. These informal systems, including the fresh produce markets, present important opportunities to provide affordable nutrition access to pregnant and nursing mothers.

ATTACHMENTS

- Assessment Team
- Scope of Work summary
- Interview contacts
- References

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Assessment Team scope of work Introductory document used with interviewees:

Commercially Produced Fortified foods that Mitigate Mother to Child Transmission of HIV /AIDS
October, 2002

United States Agency for International Development sponsored Assessment Team to determine feasibility for

Introduction: At the request of the USAID Mission Director for South Africa, an assessment team led by Land O'Lakes International Development[29] will work in South Africa September / October 2002. The team is tasked with creating a South Africa business case for developing and commercializing fortified foods that are efficacious for mitigating mother to child transmission of HIV ("MTCT").

Operating Hypothesis: "MTCT foods" definition for purposes of this assessment is a "menu" of fortified products for pregnant women, post-partum mothers, and non-breast-feeding infants. Ready-to-eat custom fortified MTCT foods will:

- Provide measurable improved health status of pregnant mothers who will give birth to higher birth-weight, healthier infants;
- Provide measurable benefit in mitigating MTCT of HIV - potentially through the introduction and proper use of a ready-to-consume breast milk substitute product[30]; and,
- Improve the long term overall health and well being of both mother and child.

All products will be developed in the context of the local South African environment: social, cultural, and economic. All products will be formulated to meet the nutritional deficiencies of People Living With HIV/AIDS.

Business case: and market overview will define issues and activities needed to implement MTCT food production with the end goal of determining for USAID if this approach is viable. It will identify the various channels of commercial and non-commercial foods and feeding activities and list the organizations involved. It will research existing foods in the relief and development sector as well as fortified foods in the commercial sector that are comparable or similar to MTCT products contemplated. The business case will identify constraints, opportunities, product gaps, and market niches that could be entry points for a future development. The assessment team will identify local and regional companies as businesses suitable for the production and distribution of MTCT foods and for the supply of commodities and materials needed for production and packaging. The research will summarize the legal and regulatory requirements for product certification, validation, registration, trademark registration, label and content requirements, and VAT. The

[29] A not-for-profit division of Land O'Lakes engaged in international development with USAID for over 20 years
[30] recommendation will be accomplished in a manner that is not in violation of the **International Code of Marketing of Breast milk Substitutes** and will be made with endorsement of appropriate Government and health officials.

assessment will give a roadmap outline for the way forward with recommendations for South African collaborators, product development, production development, product introduction, channels of trade, and a start-up outline marketing strategy.

Support For Mothers: Commercial delivery of supplemental foods addressing MTCT shall be matched with a mother / infant support structure that includes voluntary counseling and testing, antiretroviral drug therapy, health services for delivery, and coaching for aftercare.

Assessment Activities in South Africa

- Work with health and HIV/AIDS professionals in South Africa to identify the products.
- Work in concert with Government, community and social development professionals to identify the products. This includes incorporation of local ingredients, preparation, social marketing strategy, education awareness, distribution approaches, etc.
- Assess the market potential for the products and propose forms of future market and consumer research. Clearly define the target market channels and in collaboration with local professionals determine a strategy for product distribution to those most in need that builds upon existing initiatives.
- Work with South African food processors to determine what it would take to produce the product and packaging locally. Identify what ingredients are available locally and what ingredients would need to be imported.
- Undertake a preliminary commercial feasibility assessment of the product (costs of production, distribution and promotional costs, estimated product selling price, market size).
- Define the quantifiable measures for determining both Mother / Child health and business outcomes, monitoring, and evaluation to prove program performance. The replicability of findings from any pilot program considered will be critical. Of special importance is the long-term monitoring of the impact of these nutrition interventions on overall health and survival of mother and infant, and how the USAID assessment findings and approach can be generalized to situations elsewhere in Africa.

Collaborators: assessment will draw upon a network of South African based authorities on MTCT:

- USAID Mission in South Africa
- Government of South Africa
- Local food processors and distributors
- Health and HIV/AIDS professionals working in South Africa
- Local and International NGOs

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