

The Economic Evaluation Report of Early Detection Of Anemia, Obesity And Short Stature

School Students Presidential Initiative

Prepared for The Ministry of Health and Population (MOHP)

١٠٠ مليون صحة

مبادرة رئيس الجمهورية لدعم صحة المرأة المصرية

Accsight Healthcare Integrated Solutions

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PREFACE

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ABSTRACT

Background and Objectives:

The prevalence of anemia, obesity, and short stature among school students has become a growing concern, leading to negative health outcomes and hindered educational performance. In response, the Presidential Initiative aims to implement early detection programs to identify and address these health conditions. In 2019, a presidential initiative for screening, early detection and treatment of anemia, short stature and obesity started in Egypt. The main objective of this study was to detect and measure the long-term health and economical benefits of running this initiative in Egypt.

Methodology:

Markov model was built to analyse the cost effectiveness and benefit of the universal screening and treatment campaign scenario versus no campaign scenario. The model accounted for the costs of Campaign in addition to , interventions, and comprehensive healthcare support to address these prevalent health conditions among children, Life years and QALYs gained and loss in productivity across both scenarios. The model time horizon is life-long, considering the mean age at diagnosis and the life-expectancy in Egypt. A discount rate equals to 3.5% was applied to both costs and outcomes.

Results:

10,546,971 children were screened from 2020 till 2023, out of which 3,265,275 (31%) were positive with either anemia,short stature obesity. The campaign resulted in direct costs savings of EGP 34.8 Billions, due to the life years saved by the campaign and lower acquisition price of management. 1.7 Millions Life years were saved and 5.2 Millions incremental QALYs were gained in “screening” scenario vs. “no screening” scenario among the cohort with confirmed cases. The Campaign averted productivity loss equivalent to 31 billion EGP.

Conclusion:

The results indicate significant clinical and economic benefits of the presidential initiative, better health outcomes in terms life-years gained and QALYs, as well as savings in treatment costs. Campaign is considered a dominant option, with a significant positive return on investment with ROI of 51% .

01 Introduction

02 Screening Initiative

03 Economic Evaluation

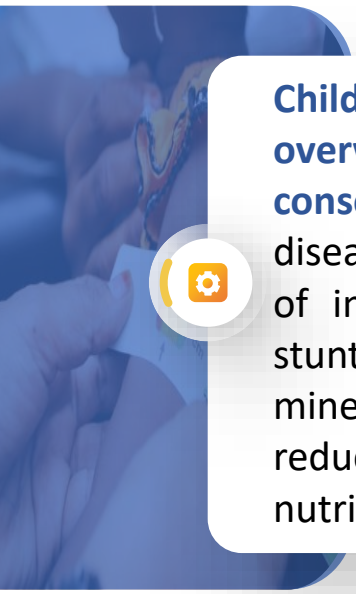
04 Initiative Outcomes

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01. Introduction



Introduction



Child malnutrition, encompassing both undernutrition and overweight, are global problems with important consequences for survival, incidence of acute and chronic diseases, healthy development, and the economic productivity of individuals and societies. Child undernutrition, including stunting, wasting, and deficiencies of essential vitamins and minerals which quantified their prevalence as potential for reduction through high and equitable coverage of proven nutrition interventions.

Early malnutrition may be a risk factor for obesity as well as some types of chronic diseases in adults. [1] Children who are overweight are more susceptible to non-communicable diseases such as diabetes and coronary heart disease and micronutrient deficiencies due to a poor diet.[2]

Anemia:

Anemia prevalence in children is high, especially in developing countries and frequently is multifactorial. It is often associated with childhood malnutrition, producing interlinked factors, several of which could be causally related to mortality risk. These factors include lack of hematinic (e.g., iron, folate, vitamins A, B-12 and C, and copper), impairment of red cell production by acute or subacute inflammation (with an increase in stored iron) and increased red cell destruction either via specific infections (e.g., malaria) or specific nutrients (e.g., vitamin A).[3]

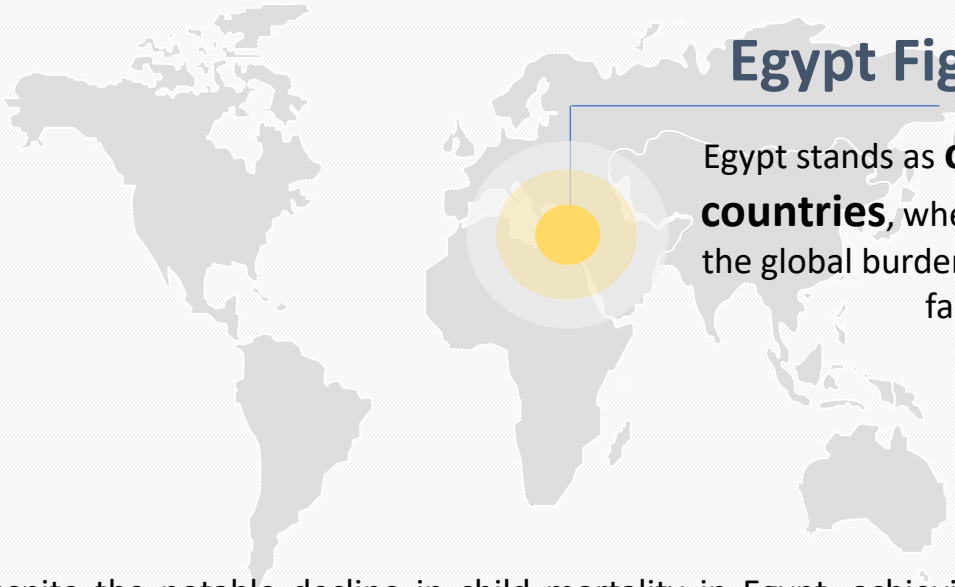
Stunting:

Stunting, defined as having a height-for-age z-score (HAZ) that is more than two standard deviations below the age–sex median for a well-nourished reference population, remains widespread in low- and middle-income countries. 165 million children in low- and middle-income countries were stunted. the economic rationale for investments that reduce stunting, a life-cycle frame work is important because investments to reduce stunting in early life may have impacts in terms of adult productivities and chronic diseases decades later.[4]

Nutrition interventions leads to three types of benefits – decreased mortality risks, avoided non-fatal health risks and increased lifetime productivity – reflecting both immediate and longer-term impacts [5]

Introduction

In Egypt, With two thirds of child mortality attributable to malnutrition

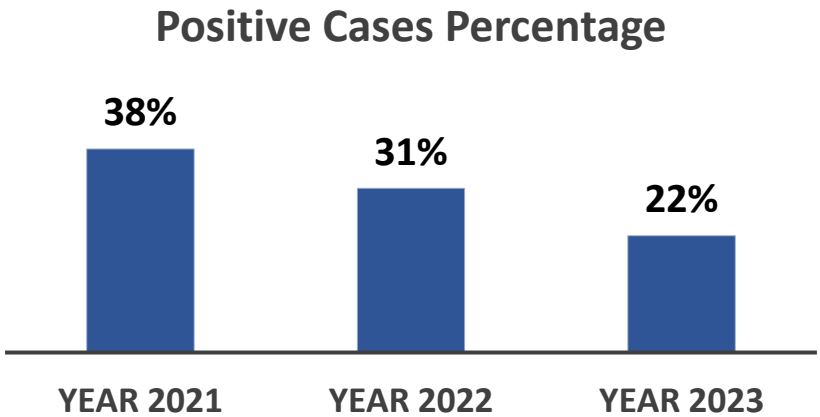


Egypt Figures

Egypt stands as **one of the 36 countries**, where 90 percent of the global burden of malnutrition falls

Despite the notable decline in child mortality in Egypt, achieving the Millennium Development Goal 4 of reducing by two-thirds the under-five mortality rate before 2015 remains challenging.

The double burden of malnutrition is characterized by the coexistence of undernutrition along with overweight, obesity or diet-related deficiencies within individuals. which is a major challenge in Egypt especially for overweight/obesity and stunting. [4] Anemia was diagnosed in 26% of children; while concurrent anemia and stunting was reported in 9.9%. Regarding anemia and anemia with stunting were more common among girls (30.0%). Anemia with stunting was significantly higher among children . children aged ≥9 years old representing 12%.[6]



Introduction

Early diagnosis (in symptomatic populations) and screening (in asymptomatic populations) are the two main components of cancer early-detection programs, as defined by the WHO, to reduce the incidence of advanced cancer and mortality.[5]

Egypt vision 2030 affirms the universal right to high quality healthcare, and the Sustainable Development Strategy (SDS) framed its dimensions that aims at ensuring all Egyptians enjoy a healthy, safe, and secure life through an integrated, accessible, high quality, and universal healthcare system capable of improving health conditions through early intervention, and preventive coverage.[6]

Health strategies were set to achieve this through different tactics on top of them “Enhancing preventive and public health programs”. Between 2014 and 2020, Egypt adopted a set of policies and launched number of health programmes & initiatives aimed at achieving the strategic objectives of the health sector, which are related to advancement of public health of Egyptians.

The presidential initiative **“100 Million Health”**; has contributed to achieving comprehensive healthcare for all citizens and guarantee providing a decent medical service to all Egyptians with international standards that keep pace with the development that Egypt is currently witnessing in all fields

Accordingly, A nationwide screening, early detection and treatment of Breast Cancer among Egyptian women started in July 2019, costs and outcomes are reported and analysed in this report for the period from July 2019 to March 2022.

02. Screening Initiative



Early Detection and treatment Of Anemia, short stature & Obesity Initiative



I. Initiative Objectives:

Promote Malnutrition awareness between school children and the importance of early screening and detection of Anemia, short stature & Obesity with fully reimbursed treatment with the latest evidence based treatment protocols.

II. Initiative Protocol:

The Initial screening protocol by measuring weight, height and Hemoglobin level among school children. Positive cases are then referred to for further investigations.

Based on these investigations they may need referral to tertiary care unit. Anemic children, stunted children might be referred to endocrinologist. Normocytic and Macrocytic referred to hematologist. Upon examinations, nephrologist or any other specialty for obese children.

Initiative Protocol:

01. **Measuring Height, weight & Hemoglobin level**
02. **Lab Investigations**
03. **Initiate treatment**
04. **Specialist Examination**

Out of the **27,946,914 children** were screened **8,601,848 (31%)** were positive with either anemia,short stature obesity. Positive Short stature will undergo further investigations as follow:

Baseline investigations needed for short stature

1. CBC.
2. Urine and stool analysis. Treatment accordingly
3. Urea, creatinine. If abnormal refer to nephrologist
4. Liver function tests . if abnormal refer to specialist
5. TSH/Free T4 . if abnormal refer to endocrinologist

Screening initiative

Baseline investigations needed for obese children

1. Lipid profile
2. Fasting glucose
3. Liver function tests

IF anemic CBC Manage according to the standard protocol

Outcomes include data collected over 3 years from the campaign launch in 2020 till 2023.

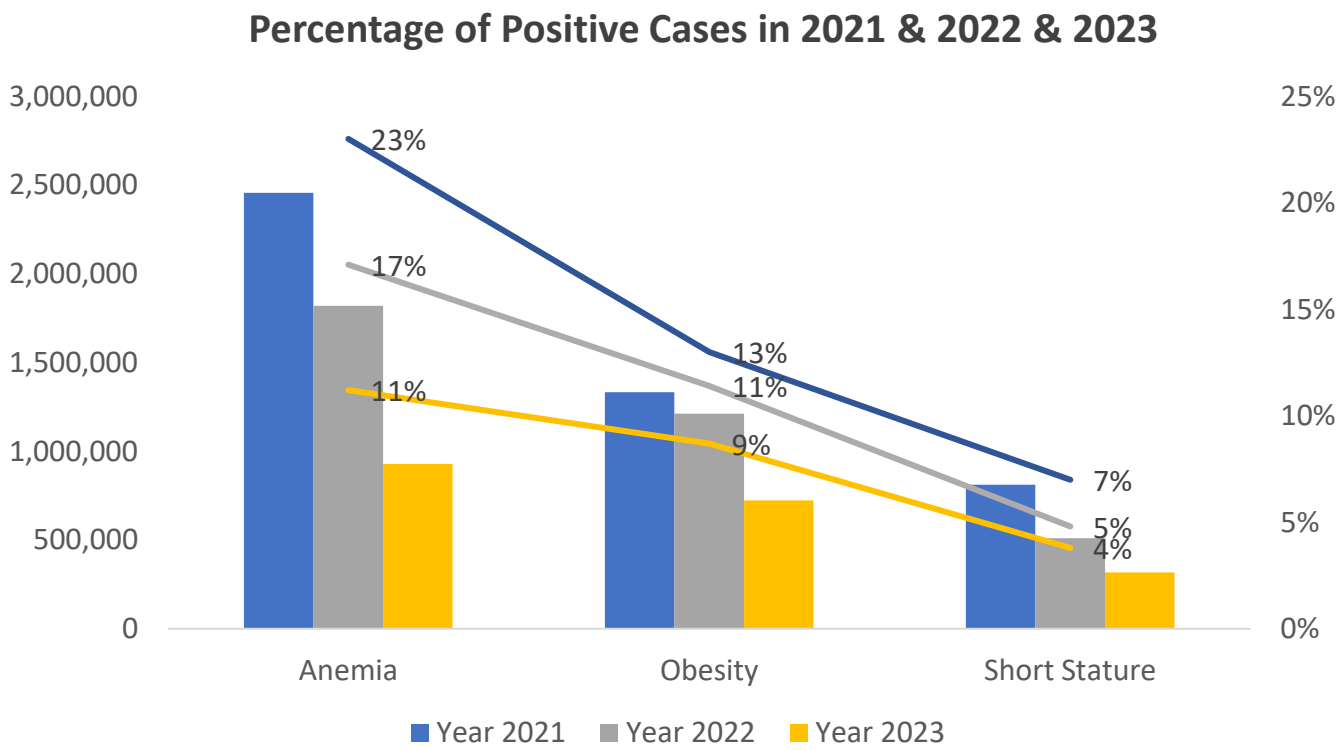
PCU
27,946,914

Lab tests
8,601,848 (31%)

TCU
860,184 (0.10%)

Years	2020-2021	2021-2022	2022-2023
Screened	8,460,688	11,199,646	8,286,580
Positive Cases	**38.4%**	**31%**	**22.7%**

Screening initiative



Total campaign costs in terms of screening and treatment of Anaemia, stunting and obesity in 2023 were 10,766,996,238 .

Screening & diagnosis cost / child is **88 EGP**

Treatments as per latest guidelines were secured and acquired at a discounted price compared to before campaign.

INITIATIVE RESULTS

The study yielded more clinical outcome in terms of 5.2millions incremental more QALYs and 1.7 millions incremental more life years saved with less cost with difference of 34.8 billion EGP saved in favour of the campaign, thus the campaign arm is considered dominant over the no campaign arm.

Short Stature Initiative Results

Savings	ROI	
6.6 Billions EGP	**57%**	*A return of **1.57 EGP for every 1 EGP** spent on the campaign*

Clinical Benefits	**557K Life years saved**	**1.3M QALYs gained**

Anemia Initiative Results

Savings	ROI	
8.4 Billions EGP	**29%**	*A return of **1.29 EGP for every 1 EGP** spent on the campaign*

Clinical Benefits	**649K Life years saved**	**2.9M QALYs gained**

Obesity Initiative Results

Savings	ROI	
19.8 Billions EGP	**70%**	*A return of **1.70 EGP for every 1 EGP** spent on the campaign*

Clinical Benefits	**560K Life years saved**	**920K QALYs gained**

03. Economic Evaluation

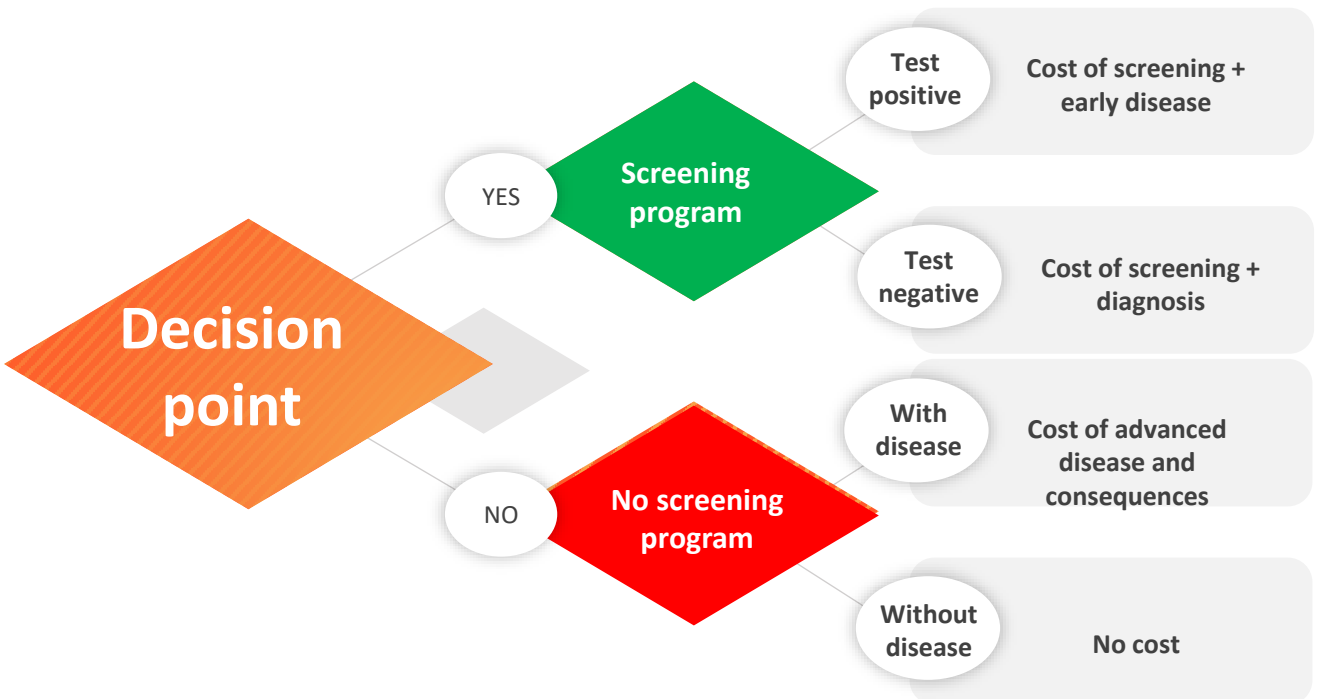


ECONOMIC EVALUATION

A Model assessing the cost benefit of the clinical and economical consequences of running anemia, short stature& obesity screening among school children and treatment campaign versus no Campaign

I. Study Methodology:

- ✓ The economic analysis used a decision tree approach to determine the cost-effectiveness and benefits of the campaign.
- ✓ The study compares 2 strategies scenarios “screening and treatment strategy” versus “no-screening strategy and treatment upon detection”.



Model Decision Tree

ECONOMIC EVALUATION

Markov model was built to follow up the stunted, anaemic and obese confirmed cases, their prognosis and death through out their life-time.

For Short stature and Anemia: Markov model developed based on following two health states: Alive with stunting or anemia ,and dead

- All patients in model experience events or death during model cycle which is one year.
- The risk of these event depend on treatment received on campaign arm. While the risk of stunting severity happens on NO campaign arm either mild, moderate & severe stunting with corresponding mortality risk .
- The risk for anaemia happens only on NO campaign arm and so mortality risk increases.
- Patients transitioning from obese to obesity complications (hypertension ,diabetes& cardiovascular events) was calculated as follows:

	Obesity	Hypertension	Diabetes	CVS	Death
Obesity	0.9913	0.0040	0.0012	0.0028	0.0007
Hypertension	0.0000	0.9993	0.0000	0.0000	0.0007
Diabetes	0.0000	0.0000	0.9993	0.0000	0.0007
CVS	0.0000	0.0000	0.0000	0.9993	0.0007
Death	0.0000	0.0000	0.0000	0.0000	1

l: Model structure



ECONOMIC EVALUATION

- The study considers **the main benefit of the early detection offered by the campaign is the early intervention and accordingly, lower treatment costs, lower mortality rates and accompanied loss of productivity.**
- Treatment options were assumed to be acquired at a discounted price compared to before campaign. Treatment protocol cost and investigations is considered for all children once detected and consultant visit on annual basis for 10% of children need special care upon their investigations

Treatment outcomes

- Model is built on lifetime time horizon, with cohort starting age is 6 years old and is extended till life expectancy, considering a 3.5% discount rate as per EGY Guidelines.
- **Quality adjusted life years (QALYs) were calculated based on the utility associated** to each disease ,(either anaemia or stunting) or complications for obesity children ,which obtained from literature.
- **Life years gained were calculated based on the average life expectancy** in Egypt and the survival rate for each condition diagnosed.
- **Productivity loss was estimated according to the minimum monthly wage** in Egypt in 2021, until retirement age taking into consideration female and male unemployment rates in Egypt.

ECONOMIC EVALUATION

I. Study Inputs:

Variables	Input
Number of Cases Confirmed	1,970,765
Number of Cases Stunting (During Initiative)	318089
Number of Cases Anaemia (During Initiative)	928558
Number of Cases Obesity(During Initiative)	724118
Mortality rate	
Relative risk of Anemia on mortality	1.72
HR of stunting on mortality (mild)	2.18
HR of stunting on mortality (moderate)	2.38
HR of stunting on mortality on severe	6.33
HR of obesity on mortality	1.80
Relative risk of Anemia on mortality	1.72
Utilities	
Healthy	0.98
Short Stature (Cognitive problems)	0.76
Anemia	0.76
Hypertension	0.95
Diabetes	0.76
CVS	0.55
Unemployment rate for both	0.1366
Annual Wage	24,000
1SD increase in Height result in hours earning	20.00%
Discounting Rate	3.5%

ECONOMIC EVALUATION

I. Study Inputs:

Variables	Input
Stunting	
Severe Stunting	6.35%
Moderate Stunting	47.51%
Mild Stunting	46.13%
Obesity complications risk	
Obesity	0.9830
Hypertension (obese)	0.0101
Diabetes Mellitus (obese)	0.0022
CVD (obese)	0.0047
No Obesity	0.9920
Hypertension (normal)	0.0040
Diabetes Mellitus (normal)	0.0012
CVD (normal)	0.0028
Obesity	0.9830

Screening Cost variables	Input in EGP
Total PCU Rewards (During Initiative)	172,707,548.05
Total TCU Rewards (During Initiative)	12,716,626
Total Pathology Costs (During Initiative)	209,065,345
Total Pathology Costs Before Initiative	261,331,681.4

Protocols Costs Variables	Input in EGP
During Initiative	
Anaemia (annual cost)	1,448
Stunting (annual cost)	6,847.50
Obesity (annual cost)	276.8
Before Initiative	
Anaemia (annual cost)	1,809.38
Stunting (annual cost)	8,559.38
Obesity (annual cost)	

04. Initiative Outcomes

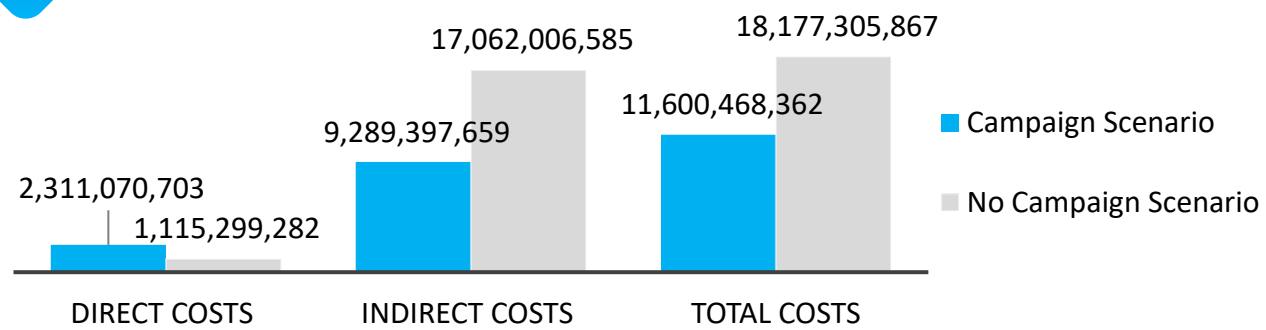


INITIATIVE RESULTS

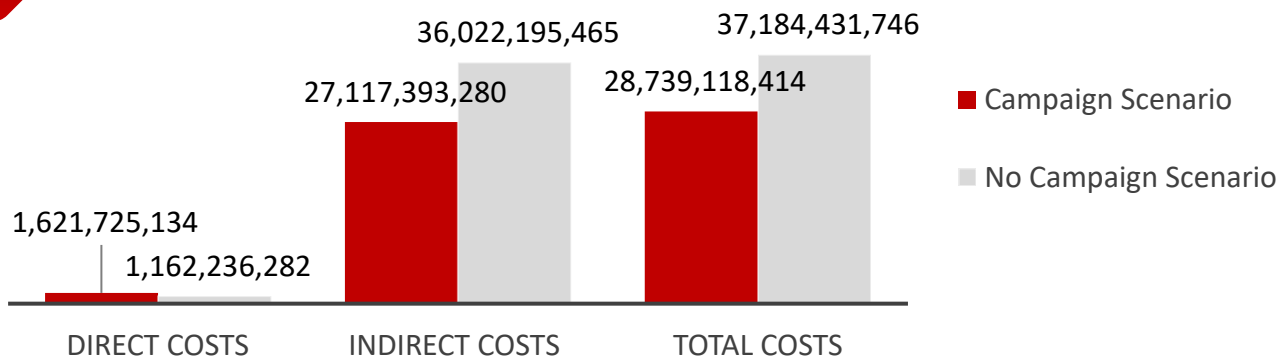
The study measured the difference in the life-time costs and outcomes of both scenarios:

- Direct Costs in terms of Screening and Diagnosis Costs
- Direct Costs of Treatment Protocols and Monitoring
- Loss in Productivity Averted

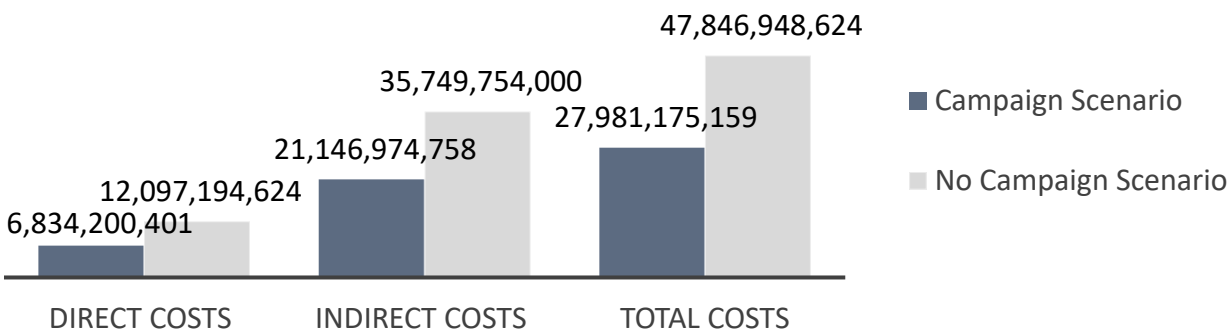
Short stature



Anemia



Obesity



INITIATIVE RESULTS

Short stature	Direct Costs (Diagnostics, Treatment & Monitoring)	Indirect Costs (Loss in Productivity)	Total Costs
Campaign Scenario	2,352,263,411	9,289,397,659	11,641,661,069
No Campaign Scenario	1,106,551,834	17,062,006,585	18,168,558,419
Difference	**1,245,711,576**	**(7,772,608,926)**	**(6,526,897,350)**

Anemia	Direct Costs (Diagnostics, Treatment & Monitoring)	Indirect Costs (Loss in Productivity)	Total Costs
Campaign Scenario	1,621,725,134	27,117,393,280	28,739,118,414
No Campaign Scenario	1,162,236,282	36,022,195,465	37,184,431,746
Difference	**459,488,852**	**(8,904,802,184)**	**(8,445,313,332)**

Obesity	Direct Costs (Diagnostics, Treatment & Monitoring)	Indirect Costs (Loss in Productivity)	Total Costs
Campaign Scenario	6,834,200,401	21,146,974,758	27,981,175,159
No Campaign Scenario	12,097,194,624	35,749,754,000	47,846,948,624
Difference	**(5,262,994,223)**	**(14,602,779,242)**	**(19,865,773,465)**

What if these cases were not detected?



By Age of 25 Years Old…

DIABETES
(RR=1.8)

HYPERTENSION
(RR=2.5)

CORONARY HEART DISEASE
(RR=1.7)

PRODUCTIVITY LOSS
(-20%)

SCHOOL
COGNITIVE SKILLS

HOSPITALIZATION

SCHOOL
COGNITIVE SKILLS

Mortality consequences:

MORTALITY
RELATIVE
RISK

1.8

2.2 - **2.4** - **6.3**
mild moderate Severe

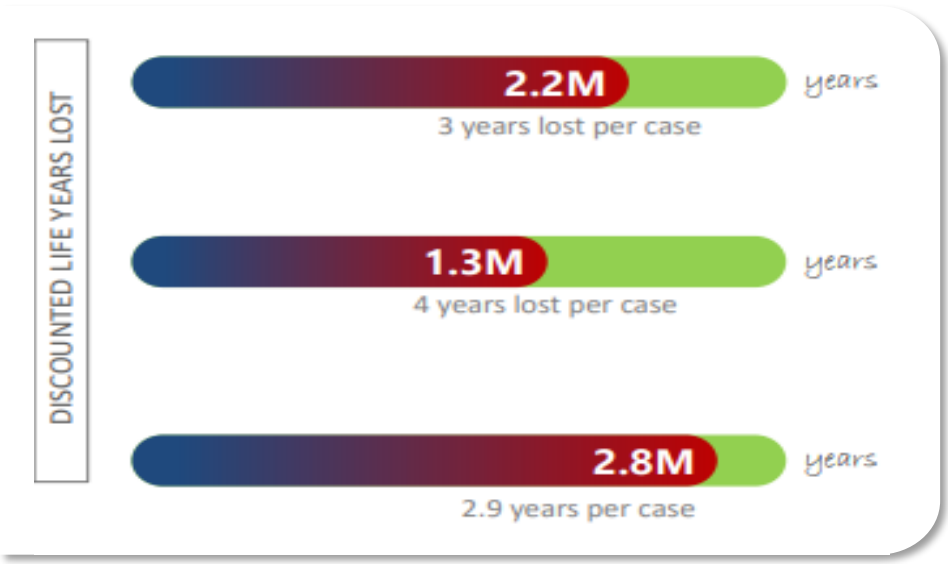
1.7

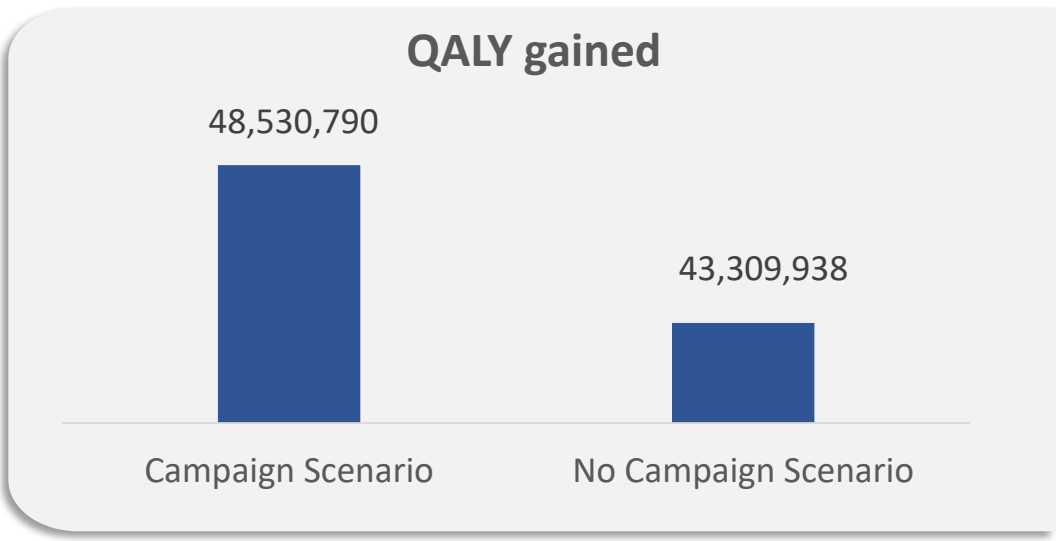
Relative risk is the ratio of the probability of death occurring without screening versus the probability of the death occurring with screening.

What if these cases were not detected?

The study measured the difference in the life-time costs and outcomes of both scenarios:

- Life Years Saved
- Quality Adjusted Life Years (QALYs) Gained
- Loss in Productivity Averted





Summary

Conclusion



Anaemia ,short stature &obesity among school children represents a major health hazard clinically, socially and economically, evaluating the initiative from health economics perspective and return on investment is an important step to ensure the right allocation of resources and validating the approach.

The initiative showed dominance in terms of cost effectiveness yielding more life years gained, more QALYs and in the same time cost savings. It's a dominant options versus not doing the campaign, and this is mainly due to the early detection in earlier age counteract the complications and mortality.

Recommendations



Early Detection and treatment Of anemia, short stature& Obesity Initiative is important to continue among school children with same methodology in screening and referral.

The continuation of the presidential initiative will yield both clinical and economic benefits through the early detection of anemia, obesity and short Stature, which are important precursors to many health consequences and found beneficial in enhancing future health, higher economic return and longevity of the Egyptian Generations.

ANNEX:

1. **Anemia:** Hemoglobin level < 11.5 g/dl according to age specific cut-off levels established by WHO
2. **Obesity:** is defined by BMI >+ 2 SD for age and sex
3. **Short stature** defined by Height <- 2 SD for age and sex
4. **QALY:** quality adjusted life year, a generic measure of disease burden, including both the quality and the quantity of life lived. 1 QALY is interpreted as 1 life year lived in perfect health state.
5. **Cost-Effectiveness Analysis:** a form of economic analysis that compares the relative costs and outcomes of different interventions.
6. **ICER:** incremental cost-effectiveness ratio, is a summary measure representing the economic value of an intervention, compared with a comparator. It is usually the main output or result of an economic evaluation, it's ICER is calculated by dividing the difference in total costs by the difference in outcomes.
7. **ROI:** Return on investment, is a mathematical formula to evaluate investments in a program or project and judge how well the investment has performed compared to others or compared to not doing the investment.

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