



Family Planning in Egypt is a Financial Investment

Benefit- Cost Analysis of Egypt Family

Planning Program, 2014- 2050

By

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List of Abbreviations

Abbreviation	Description
BCA:	Benefit – Cost Analysis
CAPMAS:	Central Agency for Public Mobilization and Statistics
CBA:	Cost – Benefit Analysis
CPR:	Contraceptive Prevalence Rate
CYP:	Couple – Year of Protection
DHS:	Demographic and Health Survey
EGP:	Egyptian Pound
GDP:	Gross Domestic Product
HDI:	Human Development Index
IUD:	An Intrauterine device, a small Contraceptive device
IRR:	Internal Rate of Return
MOF:	Ministry of Finance
MOHP:	Ministry of Health and Population
NGOs:	Non-Governmental Organization
NPC:	National Population Council
TFR:	Total Fertility Rate
UN:	United Nations
USAID:	United States Agency for International Development

Executive Summary

This study is a follow up study of an earlier study conducted by the Policy Project (Chao,2005) aimed to demonstrate the financial benefits and costs of family planning programs in Egypt, and to help governments in their decision to allocate their scarce resources to such programs. It measured the financial benefits and costs of family planning programs in Egypt over a thirty years period (2000-2030), and compared its monetary costs to the monetary benefits in terms of reduced levels of social services required at lower levels of fertility, or in other words the savings in government expenditures on social services.

The study at hand gains its importance from the recent significant increase of the population problem, and aims to update the estimation for the benefits and costs of the family planning program in Egypt. It is noteworthy that this report extends the projections timeframe to more than thirty years (2014-2050), to align the timespan to the National Strategy for Family Planning in Egypt. We rely on the actual expenditure on social services according to the Egyptian budget for the fiscal year 2012/2013.

We also provide results for the thirty year period (2014-2044) in Appendix A and B. The results in Appendix A are based on the *actual* expenditure on services for the fiscal year 2012/2013. The estimation in Appendix B, is based on the *expected* expenditure on services for the fiscal year 2014/2015.

Hence the main purpose of this report is to update the analysis by Chao (2005) using the same methodology (benefit-cost analysis) to compare the current situation with the results of the previous study on the Egyptian family planning program.

It is also important to note that Chao's report was a follow up of Moreland study that was conducted in 1996 to support a strong public family planning program in Egypt. This study also indicated significant financial returns for investment in family planning programs in Egypt.

The objective of this report is comparable to the objectives of Chao's study (2005) and can be summarized into the following:

- (1) To estimate the impacts of family planning programs on government expenditures for social services such as health, education, housing, and food subsidies;
- (2) To compare reductions in government social services spending as a result of family planning programs to the costs of family planning services; and
- (3) To show the financial viability of family planning programs, and their effectiveness in improving the quality of social services".

This report estimated the number of births averted due to the family planning program at 43.31 million births for the period (2014-2050), at an estimated cost for family planning programs of around EGP 8 billion.

The benefit- cost ratio increased from EGP 40.27 (Chao, 2005) to EGP 56.12 in this study, which means that the average return on each Egyptian Pound spent on the family planning program, is estimated at EGP 56.12 for the period (2014-2050). The

benefit - cost analysis is based on the projection of government expenditure on family planning over the period 2014-2050 and the saving in government expenditure on health, education, food subsidy and housing due to the number of births averted by the family planning program over the same period. The saving in expenditure is only focused on public expenditure that is directly related to population growth. The projection of government expenditure saving includes total saving as well as sectorial saving on health, education, food subsidy and housing.

The benefit- cost (EGP 56.12) is the sum of the benefit-cost of health (EGP9.24), education (EGP31.15), food subsidy (EGP11.52) and housing and utilities (EGP4.21). These results show that the major saving will occur in the education expenditure, followed by food subsidy, health and housing and utilities. These results depend on the 2012/2013 actual expenditure figures.

The net savings stream was used in the calculation of the internal rate of return (IRR), which refers to the discount rate that makes the net present value of all cash flows from a particular project equal to zero. In other words it equates the present value of all costs with the present value of all benefits. The higher a project's IRR, the more desirable it is to undertake the project. The IRR for the family planning program 2014-2050 is 199.4%, compared to 182% for the Chao (2005) study. This is a relatively high IRR compared to ordinary investment projects and would suggest the approval of this project.

For sensitivity reasons the authors calculated in Appendix A, of this report the benefit-cost ratio over the period 2014-2044 which also shows an increase in the benefit- cost ratio from EGP40.27 (Chao, 2005) to EGP 46.56 for the period. The benefit- cost analysis presented in the Appendix A depends on the actual budget figures of 2012/2013. The forecasted increase in government expenditure will lead to an increase in the benefit-cost ratio, as everything else being equal the higher the expenditure of the government on social services and the more expenditure per person the higher the benefit- cost ratio for the family planning program. In Appendix B we show a benefit-cost ratio reaching EGP52.78 for the period 2014-2044. The benefit-cost ratio in Appendix B depends on the expected budget figures of 2014/2015, with a projection of the actual 2012/2013 figures of educational costs to the year 2014/2015.

المخلص التنفيذي

لدراسة " تحليل التكلفة /العائد من الاستثمار المالي فى برنامج تنظيم الأسرة فى مصر
٢٠١٤-٢٠٥٠"

يستكمل هذا التقرير دراسة (Chao,2005) التي استهدفت نتائجها توضيح المزايا المالية لبرنامج تنظيم الأسرة لمساعدة الحكومة في إتخاذ القرار وتوزيع عناصر الإنتاج النادرة. لقد تم تقدير هذه المزايا المالية لبرنامج تنظيم الأسرة لمساعدة صناع القرار في الحصول على قروض خارجية لتمويل هذه البرامج وتوزيع تلك الموارد. وجاء اهتمام هذه الدراسة بقياس النتائج المالية لبرنامج تنظيم الأسرة على مدى ثلاثين عاماً (٢٠٠٠ - ٢٠٣٠) ومقارنة التكاليف المالية لبرنامج تنظيم الأسرة بالمزايا المالية و التي يتم حسابها على أساس الوفر المحقق في الخدمات الإجتماعية نتيجة الخفض في معدلات الخصوبة .

وتكتسب الدراسة الحالية أهميتها من الزيادة الواضحة في مشكلة زيادة السكان و تقوم على تحديث نتائج دراسة (Chao,2005) لتوقع تقديراً جديداً لمعدل العائد/التكلفة لبرنامج تنظيم الأسرة في مصر . من الجدير بالإشارة أن هذه الدراسة تقوم على توقع النتائج لفترة ٢٠١٤ - ٢٠٥٠ و هي فترة أطول من الثلاثين عاماً التي وضعها Chao كفترة دراسته وذلك لضرورة ان تتماشى الدراسة الحالية مع الإستراتيجية القومية للسكان.

ويعتمد هذا التقرير على التكاليف الفعلية على الخدمات الإجتماعية لسنة ٢٠١٢/٢٠١٣ من الموازنة العامة للدولة. و يعرض الملحق (أ) نتائج الدراسة لفترة (٢٠١٤ - ٢٠٤٤) بناءً على الإنفاق الفعلي على الخدمات الإجتماعية للسنة المالية ٢٠١٢ / ٢٠١٣ حتى تتماشى مع الفترة الزمنية لدى Chao . بينما يعرض الملحق (ب) نتائج نفس الفترة (٢٠١٤ - ٢٠٤٤) بناءً على الإنفاق المتوقع على الخدمات الإجتماعية للسنة المالية ٢٠١٤/٢٠١٥ .

وبشكل عام فإن هدف هذا التقرير هو تحديث نتائج دراسة ٢٠٠٥ Chao باستخدام نفس المنهجية (تحليل العائد / التكلفة) لمقارنة الوضع الحالي بالوضع السائد في الدراسة السابقة . و من الجدير بالذكر، أن دراسة Chao مبنية على دراسة Moreland والتي اوضحت ارتفاع عائد الاستثمار على برنامج تنظيم الأسرة في مصر و أوصت بالقيام به.

و يمكن تلخيص أهداف هذا التقرير فيما يلي :

- أ- تقدير نتائج برنامج تنظيم الأسرة على الإنفاق الحكومي على الخدمات الإجتماعية و التي تشمل الصحة، التعليم ، الإسكان و الدعم الغذائي .
- ب- مقارنة الوفر في الإنفاق الحكومي على الخدمات الإجتماعية نتيجة لبرنامج تنظيم الأسرة
- ج- توضيح العائد المالي من برنامج تنظيم الأسرة واستخدامه في تحسين نوعية الخدمات الإجتماعية المقدمة

ولقد تم وضع سيناريوهين لمعدل الانجاب احدهما يفترض بقاء المعدل على ما هو عليه من عام ٢٠١٥ (٣،٥) حتى عام ٢٠٥٠ والسيناريو الثاني يفترض تناقصه حتى بلوغه معدل الاحلال (٢،١) في عام ٢٠٣٠ . وفى ظل السيناريو الثاني يقدر الإنخفاض في عدد المواليد نتيجة لبرنامج تنظيم الأسرة ب ٤٣,٣١ مليون مولود للفترة (٢٠١٤ - ٢٠٥٠) . و يتم هذا الوفر فى الإنفاق العام نتيجة لتكثيف برامج تنظيم الاسره بتكلفة مقدرة بنحو ٨ مليون جنيه مصري .

ولقد ارتفع معدل العائد / التكلفة من ٤٠,٢٧ جنيه مصري (Chao,2005)، إلى ٥٦,١٢ جنيه وفقاً لهذه الدراسة مما يعني أن متوسط العائد للجنيه المصري المنفق على هذا البرنامج يقدر ب ٥٦,١٢ جنيه مصري للفترة (٢٠١٤ - ٢٠٥٠) باستخدام بينانات الموازنه الفعلية للإنفاق على التعليم والصحة ودعم الغذاء والسكن والمرافق

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كذلك يوضح الملحق (أ) ارتفاع معدل العائد/ التكلفة من ٤٠،٢٧ جنيه مصرى كما فى دراسه Chao الى ٤٦،٥٦ فى الفترة ٢٠١٤-٢٠٤٤ (ثلاثون عاما) باستخدام بيانات الموازنه الفعلية للانفاق على التعليم والصحة ودعم الغذاء والمسكن والمرافق .و يوضح الملحق(ب) زيادة معدل العائد التكلفة من ٤٠،٢٧ جنيه مصرى الى ٥٢،٧٨ فى الفترة ٢٠١٤-٢٠٥٠ باستخدام بيانات الميزانية المقدره للانفاق على التعليم والصحة ودعم الغذاء والمسكن والمرافق للسنة المالية ٢٠١٤/٢٠١٥

وأخيراً يجب التأكيد على أن الوفرة فى الإنفاق هو وفر فى الإنفاق الحكومى المرتبط بشكل مباشر بالنمو السكانى . وتهتم الدراسة بتحديد هذا الوفرة بشكل إجمالى و بشكل قطاعي على قطاعات الصحة، و التعليم، و الدعم الغذائى، و الإسكان .

Introduction

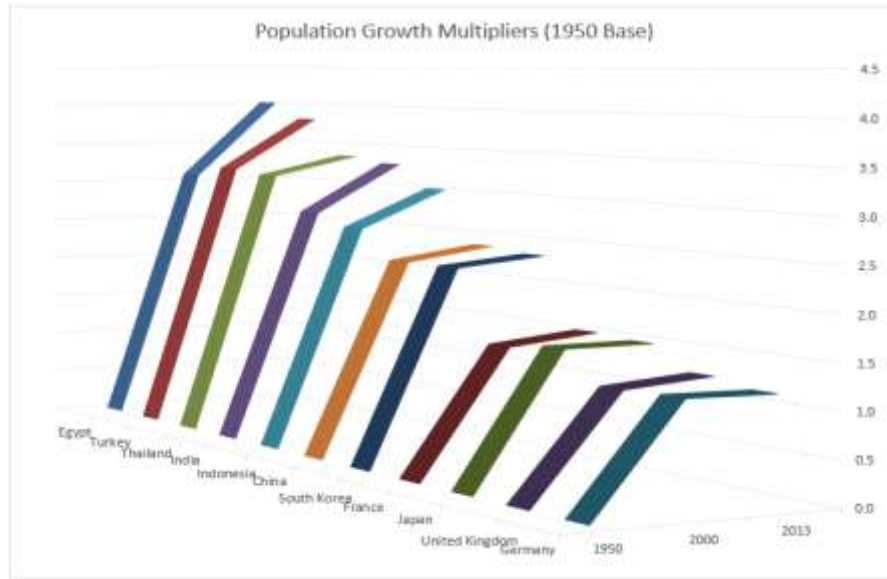
Egypt's real GDP growth forecast has been revised from 1.8% to 2.2% in 2013/14 (July-June) to reflect the impact of two recently announced fiscal stimulus packages. Real GDP growth will average 4.7% annually in the period 2014/15- 2017/18. Although the Egyptian pound has been buttressed in the near term by Gulf aid, it is expected to slide in 2015, due to several economic and political factors. The weakening of the pound should however contribute to stronger services and manufacturing exports. Consequently, we expect real GDP growth to recover reaching 5.5% in 2018.

From 2015, the pace of weakening will slow, as the political situation stabilizes. Economic growth will begin to accelerate, as improved stability leads to a recovery in domestic demand. In addition, the business environment should see a number of long-delayed projects get under way, with a focus on electricity and hydrocarbons sectors. The improved security picture should also help to stimulate a bounce-back in the tourism sector.

However Egypt is still facing several economic challenges, its fiscal deficit is estimated in 2014/15 (July-June), at 12.7% of GDP, while the investment rate is only 14% of GDP.

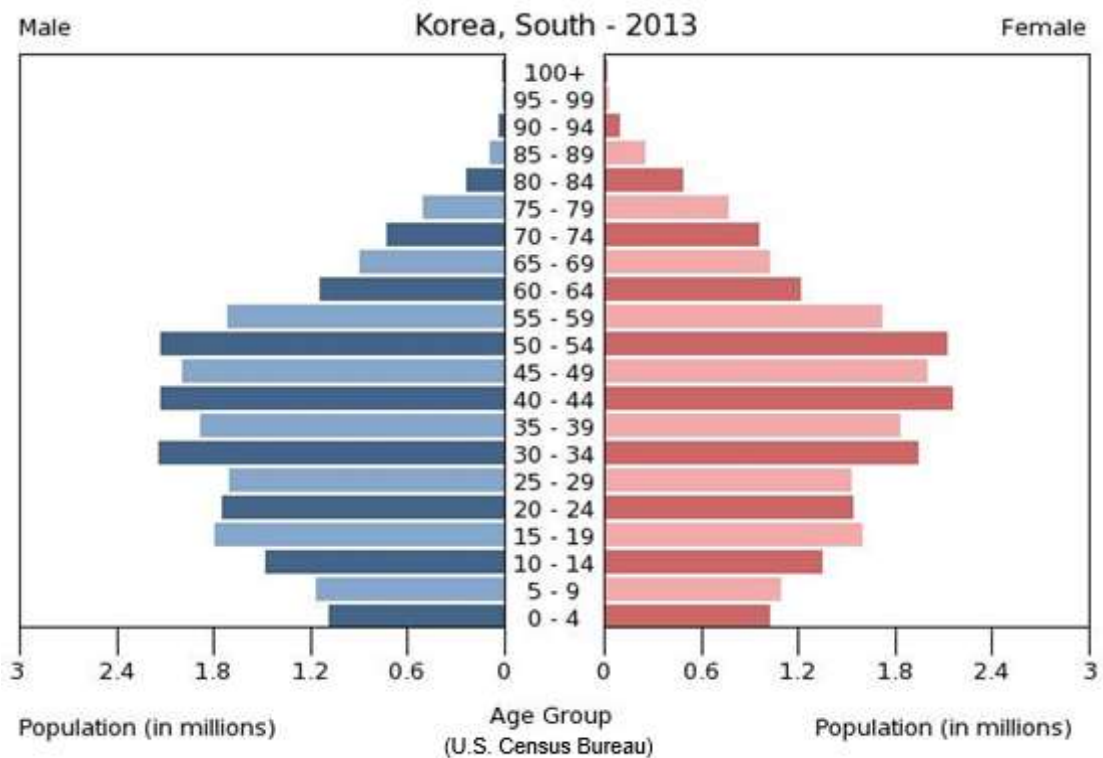
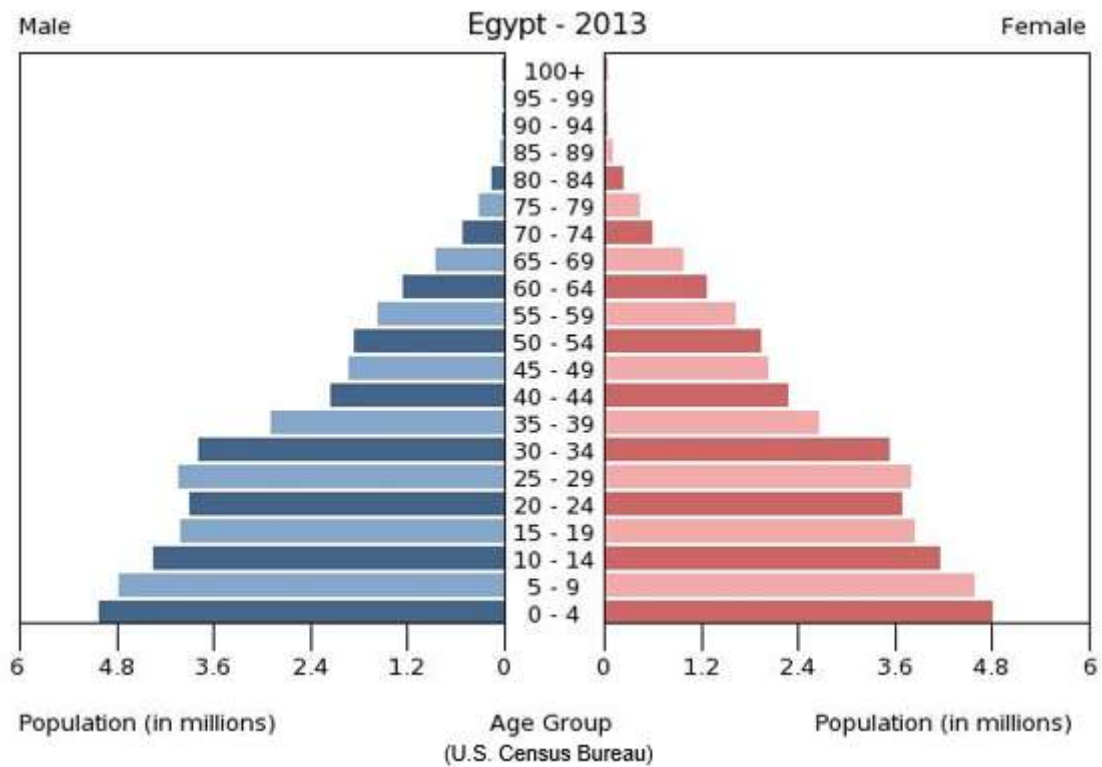
According to the population clock; 18th of February 2015, there are now 88.04 million individuals in Egypt and another 8 million Egyptians abroad, making the total population of Egypt 96 million. This size of population represents Egypt's human capital, but also a potential burden on a state trying to improve its economy by reversing declines in economic growth and achieving economic development. While the birth rate showed a steady decline from 25.38 in the year 2000 to 21.7 in the year 2010, it started a sharp increase reaching 24.22 in 2014 (Mundi, 2014). Births per household in 2013 reached four children, whereas 10 years ago it stood at 3.5. The Egyptian population has been growing at unsustainable rates for decades, but 2013 was a year of record growth, with the number of births reaching 2.6 million (compared to about 0.5 million deaths). This population boom comes at a time when the Egyptian government is struggling to provide basic government services. Figure (1) illustrates the population growth rate of some selected countries in terms of the ratio between their respective populations in the years 1950, 2000, and 2013. While the population growth rate for all countries grew considerably between 1950 and 2000, growth rates for most countries declined over the 13 years from 2000 to 2013. Meanwhile Egypt witnessed a fourfold growth since 1950, with Turkey coming in second with the second-highest overall growth. It is worth noting that both countries cannot be compared, as Turkey has an abundant supply of water and agricultural land compared to the mostly desert landscape of Egypt (A. Wagih, 2014).

Figure 1: Comparative analysis of population growth



Source: A Wagih, 2014

The problem does not just lie in the size of the population but in the composition of the population. South Korea has often been compared to Egypt as both had roughly the same population in the early 1960s. Today Egypt's population is almost 75% larger than South Korea's population. The comparison of the two countries' population pyramids in Figure (2) reveals the significant differences between the two countries in terms of the population composition. In the case of South Korea most of the population is in the currently productive categories, whereas the highest percentages in the case of Egypt are still below the productive age groups. South Korea with its demographic policies, human resource policies integrated with investment policies, benefited from the demographic window and achieved high economic growth accompanied with high rates of educational attainment.



Source: A.Waguih, 2014

Population growth in Egypt poses a threat to any government, if it is not accompanied by increases in production, which is the problem in Egypt. The data shows that Egypt's population has grown over the years, but the country has not increased in

agricultural land or in the amount of available water. Egypt, an agrarian country, is losing nearly 60,000 acres per year as a result of soil erosion and construction. Moreover, it suffers from a significant lack of water. According to CAPMAS(2014), total cultivated area increased from 7.9 million feddans in 2001 to only 8.8 million in 2012 (one feddan= 4200m²). Moreover, Egypt share of water from the Nile, approximately 55 billion cubic meters per year, has remained unchanged since 1954 despite a threefold increase in population.

Economic development is calculated by a country's per capita income and the amount of goods and services produced. Egypt experienced a sharp decline in these two indicators along with an increasing population rate in the period 2012-14. According to the Ministry of Finance data; growth in the domestic product has averaged around 2.2% (2011/12 – 2013/14), while Egypt's population growth rate reached 1.6% in the period 2010-2015. This figure is relatively high compared not only to developed countries with an average population growth of below 0.6%, but also to other developing countries, which have an average growth rate of 1.3% for the same period (HDI,2014).

The rising population is seen as a social time bomb which, if un-tackled, will exhaust Egypt's depleted resources, worsen a dire jobs market, and contribute to more social frustration. With 60% of Egyptians under 30 already, a bulging population will further reduce the limited opportunities for young people. Every year, more than 800,000 young Egyptians join the job market – which has a current unemployment rate of 13.1% (CAPMAS,2014)

Moreover CAPMAS (2014) reported that the poverty rate has increased, from 25.2% (2010/11) to 26.3% (2012/13), with a poverty rate of 9.6% among males and 24.5% among females. This in addition to the burden of adequate provision of social services can lead to several social problems. One example of the burden of inadequate social services is the public educational system in Egypt, which is under severe pressure due to the continual high rate of growth in the school-age population. This leads to several problems, notably many classrooms have densities in excess of 100 students per class, there exists a significant percentage of school graduates who cannot read or write properly, and the increase in expenditure on private tutoring. This in addition to the pressure on the higher educational system that leads to graduates who are not able to find suitable jobs due to the mismatch between their qualifications and labor market needs. High population growth will also pose a burden on other social services such as the health care system, the housing and utilities, and food subsidy.

In short, solving Egypt's demographic dilemma will require a government that can get together a strong population program plan of action, human resource development program and development efforts. The widely cited "medium-fertility variant," which is the United Nations' projection of a world population growing from 6.9 billion in 2010 to 9.1 billion by 2050, relies upon an assumption that the global fertility rate will decline by 24 percent to allow two children per woman. This can be a goal in itself. The question is: is this goal cost effective? The coming analysis will try to answer this question.

Section 1: Cost-Benefit Analysis and Its Applications to Family Planning Programs***1.1 Principles of Cost-Benefit Analysis***

Cost-Benefit Analysis (CBA), which is sometimes called benefit-cost analysis (BCA) estimates the total sum of the money value of all benefits and costs of any investment, in order to choose the investment that provides more benefits compared to the costs endured.

To determine the financial soundness of the investment the first step is that the benefits of the project should exceed the costs. If the costs exceed the benefits of the investment, it is not financially sound and cannot be chosen. The second step is to check by how much the benefit exceeds the cost. The more total revenues exceed total costs, the more profitable an investment project will be. In order to compare the total costs and total benefits of an investment project, we must use an appropriate discount rate to discount back to the present the costs and benefit streams generated over the entire life of the investment.

Chao(2005) used the following formula to compare all benefits and costs :

$$\frac{B_1}{(1+i)} + \frac{B_2}{(1+i)^2} + \dots + \frac{B_n}{(1+i)^n} > \frac{C_1}{(1+i)} + \frac{C_2}{(1+i)^2} + \dots + \frac{C_n}{(1+i)^n} ,$$

Where

C_1, C_2, \dots, C_n = the series of expected costs in year 1, 2, ..., n;

B_1, B_2, \dots, B_n = the series of expected benefits in year 1, 2, ..., n;

i = the appropriate discount rate for annual discounting

If the benefits generated by the investment are larger than the costs the project should be undertaken. On the other hand if the benefits are less than the costs the project should be rejected. The larger the difference between the benefits and the costs the more preferred the investment.

1.2 Applications to Public Family Planning Programs

Compared with projects in areas like irrigation or transportation, benefit-cost analysis of family planning projects is more confusing. The confusion arises because the typical family planning project simultaneously raises the level of per capita income due to the decrease in population, yet lowers the level of total income, at least in the long run because of the expected reduction in the labor force. In the long run it is hence not clear whether the overall economic benefits of the project should be considered positive or negative. Various methodologies have been proposed in attempt to solve this conundrum and yield widely varying benefit-cost ratios for family planning projects (Barlow1988).

Chao assumed that total production were to remain unaffected by the fertility decline in the short run and that it were to increase in the long run due to the increase in female labor participation and the redirection of the saving in expenditure on social

services to the improvement of these services and hence the increase in productivity. Basically he assumed that a lower fertility rate would lead to higher income per capita. The average increase in per capita income multiplied by the total population would approximate the total economic benefit of the family planning program. This analysis is usually called an “economic cost-benefit analysis.”²

Chao (2005) admits that his analysis is missing the nonmonetary benefits such as improvements in maternal and child health associated with family planning and lower fertility rates, which should be included in the family planning benefit-cost analysis in addition to income per capita. The exclusion of non-monetary benefits is due to the difficulties in measuring such non-monetary benefits, though they are very important for population and family planning policy formulation.

He also claims that family planning programs will lead to an increase in the individual's share in private consumption given total resources available for consumption. We find this conclusion debatable as the size of labor force in the future may also be declining affecting the size of production. His claim can however be explained by the assumption of increased productivity due to improved education as the number of pupils per class decrease. This is based on his main argument that the resources saved from not serving more people will be used to improve the quality of public services for the rest, which can be accepted as a straightforward argument.

Finally Chao did not use any weighting system for the benefits and considered the importance of all benefits equal.

1.3 Financial Cost-Benefit Analysis of Family Planning Programs

By accepting Chao's approach in defining savings from public sector services resulting from a smaller population size, we also accept his “financial benefit-cost analysis.” Chao found that many public services provided by the government are closely related to the population size, such as compulsory school education, health, food subsidies, social welfare, housing, utilities and infrastructure. The larger the population the higher the demand on these services. On another hand a lower number of population will lower the demand for public services, and hence will result in financial benefits or saved investment for other priorities. These benefits or saved investment might happen immediately with the reduction in the population size such as the savings in health services, or after a time span as in the case of education and housing.

Chao's main purpose of conducting a financial benefit-cost analysis of a family planning program is to evaluate the financial savings for the government as a result of providing the same level of services to a smaller group of people, without taking into consideration the effect of a smaller group of people on the labor force and productivity in the future.

²This kind of analysis is debatable due to its rigid assumptions; however Chao found that a study commissioned by the National Research Council in the United States in 1986 did support conclusions drawn from this approach (National Research Council, 1986).

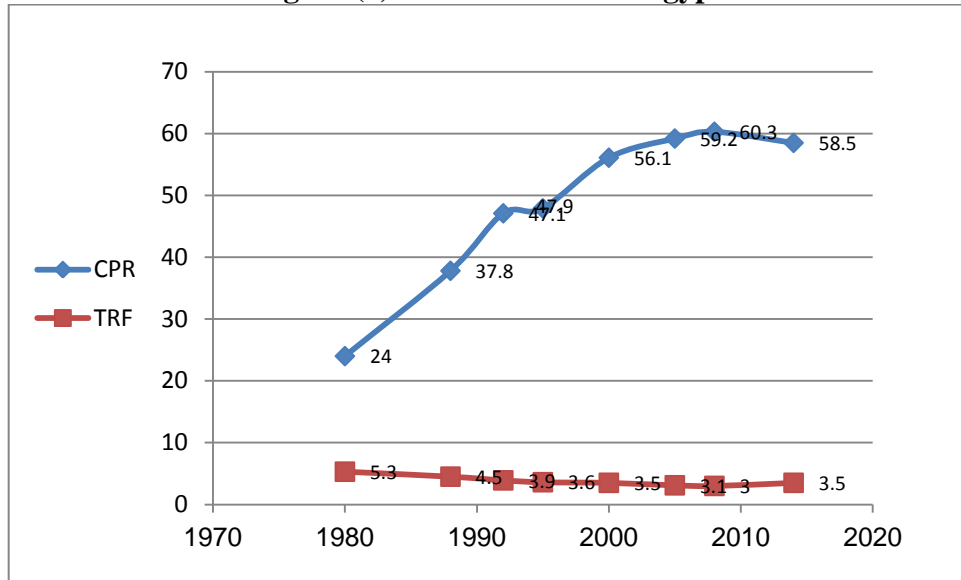
The “saved” resources can directly be used to improve the quality of services and or can be allocated to pay for the cost of family planning programs.

The analysis in Chao’s paper considers two points:

- The first is whether a family planning program is financially viable and sustainable. This is a decisive policy matter if the government wants to continue or expand an existing family planning program, which will require a substantial financial commitment. Costs and benefits are crucial for policy makers in this respect. Chao notes that his analysis addresses only the financial implications of family planning programs and not the financial implications of a population policy formulation
- The second question is what impact family planning program expenditures would have on the quality of services in the relevant social service sectors. This will be a matter of resource reallocation among various social service sectors competing for a given amount of resources. Chao considers the “savings” from family planning programs a source to improve the quality of services. This is very important as we are not advocating a fiscal austerity policy that rests on the reduction of public expenditure but rather a reallocation of government expenditure to increase the quality of public services.

Section 2: Estimated Demographic Impact of the Projected Egypt Family Planning Programs

The success of population policies and programs can be measured by the contraceptive prevalence rate (CPR), which refers to the percentage of women who are practicing, or whose sexual partners are practicing, any form of contraception. Figure (3) shows the initial success of Egypt in promoting contraception in the period 1980-2008. The percentage of women using any contraceptive method, from 1980 to 1995, increased from only 24% in 1980 to 47.9% in 1995. This positive trend continued until 2008, with a CPR rate of 60.3%, and Total Fertility Rate (TFR) of 3.0. Currently there is a reversal in this positive trend and the CPR in 2014 decreased to 58.5 % (DHS, various years), while the TFR increased to 3.5.

Figure (3):CPR and TRF in Egypt 1980-2014

Source :<http://statcompiler.com/>, accessed January 2015

2.1 Impacts of Family Planning Programs on Fertility: The Impact component.

The impact component is one of four components of the family planning benefit-cost analysis, which estimates and projects the impact of the family planning program on fertility rates. The current analysis updates the Chao (2005) results based on two family planning scenarios using the FamPlan Model. The first scenario (the constant-fertility scenario) assumes that the contraceptive prevalence rate would remain constant at the current level of 58.5% (DHS 2014). The second scenario assumes that the contraceptive prevalence rate would continue to increase to reach 74.44% in the year 2030. This is based on the medium-fertility variant (UN,2012), which assumes that fertility rates will eventually balance out around 2.1 children per woman, a level where couples would “replace” themselves in the population. In line with the national strategy for population 2015-2030 (NPC, 2014, p.36), the replacement rate is assumed to be reached in the year 2030, as the government will undertake a rigorous and comprehensive strategy to reach this level. The impact of these two scenarios on total fertility rates and population sizes is presented in Table 1.

Table 1 shows the changes in contraceptive prevalence rates (CPRs) and total fertility rates for the period 2014-2050 under the two CPR scenarios. Under the first scenario we assume constant CPR scenario, CPR would remain at the year 2014 level of 58.5% until 2050 and the corresponding TFR would remain at the year 2014 level of 3.5 (which is the same as the year 2000 level).

In the second scenario the CPR will increase continuously until 2030, when it will reach 74.4% and remain constant till the end of the period. Under the second scenario, with the higher CPR, the TRF will decline to its replacement level of 2.1 by 2030 and stay at the same level till the end of the period.

Table 1. Changes in CPR under Two Different TFR Assumptions

Year	Contraceptive Prevalence Rate		Total Fertility Rate	
	Constant TFR Scenario	Replacement TFR Scenario	Constant TFR Scenario	Replacement TFR Scenario
2014	58.5	58.5	3.5	3.5
2015	58.5	59.5	3.5	3.4
2020	58.5	64.5	3.5	3.0
2025	58.5	69.5	3.5	2.5
2030	58.5	74.4	3.5	2.1
2035	58.5	74.4	3.5	2.1
2040	58.5	74.4	3.5	2.1
2045	58.5	74.4	3.5	2.1
2050	58.5	74.4	3.5	2.1

Source: Based on the calculations of the researcher using "Spectrum Policy Modeling System"

Table 2. Changes in Births and Population Under Two Different TFR Assumptions

Year	Number of Births (in millions)		Total Population (in millions)	
	Constant TFR Scenario	Replacement TFR Scenario	Constant TFR Scenario	Replacement TFR Scenario
2014	2.67	2.67	86.73	86.73
2015	2.69	2.62	88.92	88.86
2020	2.77	2.36	100.07	98.66
2025	2.81	2.04	111.20	106.71
2030	2.92	1.75	122.40	112.99
2035	3.17	1.88	134.21	118.75
2040	3.68	2.08	147.68	125.04
2045	4.13	2.15	163.11	131.53
2050	4.48	2.08	180.00	137.45

Source: Based on the calculations of the researcher using "Spectrum Policy Modeling System"

2.2 Estimated Total Number of Births Averted by Family Planning Programs and their impact of population size: The demographic component³

The second component of the family planning benefit-cost analysis, which is known as the demographic component, creates different population projections based on the two alternative fertility scenarios. Two population projections were prepared under these two family planning/fertility scenarios. Projection A is based on the assumption of constant CPR and TFR and projection B is under the assumption of the

replacement TFP scenario. Table 2 shows the total number of births and total population sizes during 2014-2050 under projections A and B. The difference of both results is due to an expanded family planning program in Egypt. This result indicates that the expanded family planning program will avert a total of 43.31million births for the period 2014-2050 compared to 22.6 million births according to Chao(2005) for the period 2000-2030. We hence conclude that a family planning program will reduce the population size significantly in Egypt.

Section 3: Costs of Family Planning Programs

The next important question to answer is how much it would cost to provide the expanded family planning program to the public. For the benefit –cost analysis we first estimated the unit cost of providing different contraceptives through the family planning program. The data is extracted from the National Council Population Report (2014).We estimated the cost per couple-years of protection (CYP) at EGP 122.3 compared to EGP36 in the study of Chao(2005). It is worth noting that Chao’s estimations for the costs depended on the Report on the Costs of the Family Planning Program in Egypt, for the period 1999-2000 (Rowan, Abdel-Meguid, and Abdel-Akhar, 2003). The estimated cost per couple-years of protection (CYP) of EGP 36 Egyptian pounds is much lower than our estimated cost of EGP122.3.This can be explained by the general increase in the prices in the period 2005-2014, and the decrease of donor support in providing contraceptives. This cost per couple-years protection includes all program costs related to delivering family planning methods to users as well as personnel and facility costs. We apply the same calculation method in the calculation of the cost per acceptor and user.

The FamPlan model requires cost in the form of cost per acceptor and per user, and hence both were estimated and the results are shown in Table 3. Cost per acceptor and cost per user were derived by combining the cost per CYP and the number of CYP generated by each acceptor and user. The standard conversion factors were used, and are the same conversion factors used in Chao(2005).The only difference is related to IUD , as in our study it is 3.2 based on the Population Council report (2014)compared to 2.5 in (Chao,2005).Table 3 provides the estimated unit costs of contraceptives by method in Egyptian Pounds.

Table 3. Unit Cost of Contraceptives, by Method, 2014

Method	Conversion Factor	Unit Cost (EGP)
CYP		122.30
Acceptor		
Sterilization	9.0	1100.67
IUD	3.2	391.35
Implant	2.0	244.59
Diaphragms	1.0	122.30
User		
Pills	1.0	122.30
Condoms	1.0	122.30
Vaginal foaming	1.0	122.30

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tablets

Injectable 1.0 122.30

Creams 1.0 122.30

Note: the conversion factor of IUD and implants depends on national population council report.

We then combined the projected numbers of acceptors and users for the time period 2014-2050 and the unit costs of acceptors and users. This step allowed us to project the total cost of family programs for both family planning scenarios. Table 4 shows the total family planning program cost projections for the two scenarios. Basically the costs of family planning programs will be higher under the second scenario (replacement TFR) projection. The difference will continuously increase and reach the highest level of 28.46% in 2029. After that the difference will decrease gradually reaching the lowest level of 0.71% by 2050. After 2030 the replacement level will have been reached and the CPR will remain unchanged till the end of the period.

Table 4. Projected Total Family Planning (FP) Program Costs

Year	Total FP Program Cost (in billions of EGP)		% of Difference
	Projection A (Constant Scenario)	Projection B TFR (Replacement Scenario)	
2014	1.03	1.07	-3.20%
2015	1.05	1.10	-4.90%
2016	1.06	1.13	-6.61%
2017	1.07	1.16	-8.31%
2018	1.09	1.20	-10.01%
2019	1.11	1.24	-11.71%
2020	1.12	1.27	-13.41%
2021	1.14	1.31	-15.12%
2022	1.16	1.35	-16.82%
2023	1.18	1.40	-18.52%
2024	1.20	1.44	-20.23%
2025	1.21	1.48	-21.93%
2026	1.23	1.52	-23.64%
2027	1.24	1.56	-25.34%
2028	1.26	1.60	-27.05%
2029	1.30	1.67	-28.46%
2030	1.32	1.68	-26.60%
2031	1.35	1.70	-26.09%
2032	1.37	1.72	-25.46%
2033	1.40	1.74	-24.72%
2034	1.42	1.76	-23.87%
2035	1.44	1.77	-22.91%
2036	1.46	1.78	-21.85%
2037	1.48	1.79	-20.68%
2038	1.50	1.80	-19.43%
2039	1.52	1.80	-18.08%
2040	1.55	1.80	-16.64%
2041	1.57	1.81	-15.11%

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2042	1.59	1.81	-13.51%
2043	1.62	1.81	-11.82%
2044	1.65	1.81	-10.05%
2045	1.67	1.82	-8.43%
2046	1.71	1.82	-6.83%
2047	1.74	1.83	-5.28%
2048	1.77	1.84	-3.75%
2049	1.81	1.85	-2.22%
2050	1.84	1.85	-0.71%
Cumulative	51.23	59.07	-15.30%

Source: Based on the calculations of the researcher using "Spectrum Policy Modeling System"

Section 4: Impact on Government Social Services Expenditures: The sectorial component

The third component of the family planning benefit-cost analysis, the sectorial component focuses on the estimation and projection of the resource requirements of various social services (e.g. health, education) under the alternative fertility scenarios.

It is evident that population size has a direct impact on government expenditure on various kinds of social services including public health, education, food subsidies, housing and utilities. A higher rate of population growth means a larger number of children and adults demanding services and hence an increase in total government expenditures. By reducing population growth, family planning programs can reduce total public expenditure and the saved resources can be reallocated to increase the quality of the services provided.

Projected annual public expenditure on health, food subsidies and housing and utilities were calculated under the two family planning scenarios based on the multiplication of the projected population under both scenarios A and B by the per capita expenditure in the equivalent sectors based on the Egyptian government budget of 2012/2013.

To measure the public expenditure on the education sector the calculations were based on the product of unit per student cost multiplied by the number of school children enrolled in primary, preparatory and secondary schools⁴. Although the Egyptian government provides education in public universities for free, this item of expenditure was ignored in line with the education categories used in the original study.

The summation of the public expenditure on health ,education ,food subsidies , housing and utilities was then compared under the two alternative fertility scenarios to calculate the total savings in government expenditures due to the family planning program for each year from 2014-2050.

⁴It is important to note that we apply the methodology adopted by Chao(2005), to be able to compare the final results of our study with the results of 2005. We have several concerns that must be taken into account for further analysis in the future. In general this methodology ignores the impact of fertility control on the future size of population and the working force, which will be declining and negatively affecting the size of production. However this decrease in production size can be compensated by the improvement in quality of labor and labor productivity through the reallocation of government expenditure to the improvement of the educational and health programs.

In this paper we are relying on actual expenditure in year 2012/2013 for the health, education, housing and public services and food subsidies. In Appendix B we show the same analysis based on the estimated figures of the budget for the year 2014/15. Although the results in Appendix B are based on estimated figures rather than actual, it is important to show these results as we are expecting an overall large increase in expenditure on health and education based on the current new Egyptian Constitution (2014). The new constitution paves the way for a government policy for 2014/2015 that will reduce subsidies and provide large increases in public expenditure of health and education. Table(5) shows the substantial difference of public expenditure on the health, education and housing and public services based on the actual budget 2012/2013 and projected budget 2014/2015.

Table 5. Public Expenditure on Various Sectors (in million Egyptian Pounds)

Sector	Actual Budget 2012/2013	Projected Budget 2014/2015
Health	26128	42402
Education	66180	94355
Food Subsidies	32551	31557
Housing and public services	11912	21911

Source: Ministry of Finance, 2014

4.1 Projected Expenditures on Public Health

In the public health sector total expenditure is assumed to be directly related to population according to the formula:

$$\text{Total Health expenditure}_t = \text{Population} * \text{per capita Health expenditure}_t (1)$$

The baseline per capita health expenditure was derived from the actual total health expenditure in year 2012/2013. In order not to overestimate expenditure in the future, the per capita expenditures were held constant for the complete time period projection. The values are expressed in 2013 constant prizes.

Table 6 shows the calculation of the public expenditure for the two projections under scenarios A and B. The difference in expenditure occurs starting the second year (2015), and continues to increase each year as more births are averted. The difference in expenditure on health continues to increase from year 2015 (0.07%) to reach 23.64% at the end of the period in year 2050. This saving in expenditure is due to the lower number of population and hence is projected to increase due to the family planning program. The cumulative saving for the period 2014/2044 is EGP101.92 billion.

Table 6. Projected Total Public Health Expenditures

Year	Total Public Health Expenditures (in billions of EGP)		% of Difference
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	
2014	27.07	27.07	0.00%

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2015	27.76	27.74	0.07%
2016	28.45	28.39	0.22%
2017	29.15	29.02	0.43%
2018	29.84	29.63	0.70%
2019	30.54	30.23	1.03%
2020	31.24	30.80	1.41%
2021	31.94	31.35	1.85%
2022	32.63	31.87	2.33%
2023	33.32	32.37	2.85%
2024	34.02	32.85	3.42%
2025	34.71	33.31	4.03%
2026	35.40	33.75	4.69%
2027	36.10	34.16	5.38%
2028	36.80	34.55	6.11%
2029	37.50	34.92	6.88%
2030	38.21	35.27	7.68%
2031	38.92	35.63	8.47%
2032	39.65	35.98	9.25%
2033	40.39	36.34	10.02%
2034	41.13	36.70	10.77%
2035	41.89	37.07	11.52%
2036	42.68	37.45	12.27%
2037	43.50	37.83	13.02%
2038	44.34	38.23	13.78%
2039	45.21	38.63	14.55%
2040	46.10	39.03	15.33%
2041	47.02	39.44	16.12%
2042	47.96	39.85	16.91%
2043	48.92	40.25	17.72%
2044	49.91	40.66	18.54%
2045	50.92	41.06	19.36%
2046	51.94	41.45	20.20%
2047	52.98	41.83	21.05%
2048	54.03	42.20	21.90%
2049	55.10	42.56	22.77%
2050	56.19	42.91	23.64%
Cumulative	1493.47	1322.38	11.46%

Source: Based on the calculations of the researcher using "Spectrum Policy Modeling System"

4.2 Projected Expenditures on Education

In this section we analyze the impact of the family planning programs on student enrollment and public expenditures on education covering the primary level (age 6-10), preparatory level (age11-13) and secondary level(age14-16) in Egypt⁵.

The school enrollment data was extracted from the school enrollment data for the school year 2012/2013 (CAPMAS ,2014).Table 7 shows the projection of the number of primary students under the two scenarios A and B. The table shows no difference between the two scenarios in the first 7 years (2014-2020). Starting the years 2021 there is a difference of 0.53% between the two scenarios. This means that the number of students enrolled will start to decrease and the difference will increase continuously to reach 44.71% by the year2050 (end of the projection period).

Total education expenditure is a function of the school-age specific population and the per student expenditure by level (CAPMAS,2014). The total cost of education at each level for a given year was found by multiplying the number of students enrolled in the primary level by the per student expenditure on education for the primary level. The per capita education expenditure is assumed constant for the complete projection period (2014-2050).

The formula used is the following

Total Education expenditures $_{(i,t)}$ =Number of students $_{(i,t)}$ *per capita education expenditure $_{(i,t)}$

Where i = the level of education, t = year

Table 7. Projected Number of Primary Students

Year	Number of Students (in millions)			% of Difference
	Projection A (Constant Scenario)	TFR	Projection B (Replacement Scenario)	
2014	10.28		10.28	0.00%
2015	10.54		10.54	0.00%
2016	10.77		10.77	0.00%
2017	10.95		10.95	0.00%
2018	11.07		11.07	0.00%
2019	11.15		11.15	0.00%
2020	11.19		11.19	0.00%
2021	11.87		11.81	0.53%
2022	12.56		12.37	1.52%
2023	13.27		12.89	2.90%
2024	14.00		13.35	4.60%
2025	14.74		13.77	6.58%
2026	15.49		14.12	8.80%
2027	15.59		13.83	11.29%

⁵This analysis neglects totally the dropping out rates from schools as well as repetition rates and maintenance costs of schools.

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2028	15.66	13.50	13.78%
2029	15.72	13.16	16.28%
2030	15.78	12.81	18.77%
2031	15.83	12.46	21.27%
2032	15.88	12.11	23.78%
2033	15.95	11.76	26.28%
2034	16.03	11.41	28.79%
2035	16.13	11.08	31.30%
2036	16.25	10.75	33.81%
2037	16.40	10.51	35.91%
2038	16.59	10.35	37.60%
2039	16.80	10.27	38.88%
2040	17.03	10.26	39.77%
2041	17.31	10.34	40.28%
2042	17.66	10.52	40.45%
2043	18.06	10.71	40.69%
2044	18.51	10.92	41.00%
2045	19.01	11.14	41.41%
2046	19.57	11.37	41.90%
2047	20.14	11.59	42.48%
2048	20.71	11.77	43.14%
2049	21.27	11.94	43.89%
2050	21.83	12.07	44.71%
Cumulative	577.58	430.89	25.40%

Source: Based on the calculations of the researcher using "Spectrum Policy Modeling System"

Table 8 shows the projection of the number of preparatory students under the two scenarios A and B. The table shows no difference between the two scenarios in the first 13 years (2014-2026). Starting from year 2027 there is a difference of 1.01% between the two scenarios. This means that the number of students enrolled in the preparatory level will start to decrease after 13 years and the difference will increase continuously to reach 41.5 by the year 2050 (end of the projection period).

Table 8. Projected Number of Preparatory Students

Year	Number of Students (in millions)			% of Difference
	Projection A (Constant Scenario)	TFR	Projection B (Replacement Scenario)	
2014	4.43		4.43	0.00%
2015	4.48		4.48	0.00%
2016	4.57		4.57	0.00%
2017	4.71		4.71	0.00%
2018	4.87		4.87	0.00%
2019	5.02		5.02	0.00%
2020	5.14		5.14	0.00%
2021	5.24		5.24	0.00%
2022	5.31		5.31	0.00%
2023	5.35		5.35	0.00%

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2024	5.37	5.37	0.00%
2025	5.38	5.38	0.00%
2026	5.38	5.38	0.00%
2027	6.01	5.95	1.01%
2028	6.67	6.49	2.75%
2029	7.35	6.98	5.02%
2030	7.41	6.86	7.51%
2031	7.46	6.72	10.01%
2032	7.50	6.56	12.51%
2033	7.53	6.40	15.01%
2034	7.56	6.23	17.50%
2035	7.58	6.06	20.00%
2036	7.60	5.89	22.51%
2037	7.62	5.72	25.01%
2038	7.66	5.55	27.51%
2039	7.70	5.39	30.01%
2040	7.75	5.23	32.51%
2041	7.81	5.08	35.01%
2042	7.88	4.93	37.52%
2043	7.98	4.85	39.21%
2044	8.10	4.85	40.09%
2045	8.23	4.92	40.18%
2046	8.36	4.99	40.30%
2047	8.51	5.07	40.47%
2048	8.71	5.17	40.71%
2049	8.97	5.28	41.05%
2050	9.24	5.41	41.50%
Cumulative	252.43	201.81	20.05%

Source: Based on the calculations of the researcher using "Spectrum Policy Modeling System"

Table 9 shows the projection of the number of secondary students under the two scenarios A and B. The table shows no difference between the two scenarios in the first 16 years (2014-2030). Starting the year 2031 there is a difference of 1.01% between the two scenarios. This means that the number of students enrolled will start to decrease and the difference will increase continuously to reach 40.47% by the year 2050 (end of the projection period). Total education expenditure is a function of the school-age specific population and the per student expenditure by level (CAPMAS, 2014). The total cost of education at each level for a given year was found by multiplying the number of students enrolled in the secondary level by the per student expenditure on education for the secondary level. The per capita education expenditure is assumed constant for the complete projection period (2014-2050).

Table 9. Projected Number of Secondary Students

Year	Number of Students (in millions)		% of Difference
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	
2014	3.20	3.20	0.00%
2015	3.18	3.18	0.00%
2016	3.17	3.17	0.00%

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2017	3.17	3.17	0.00%
2018	3.20	3.20	0.00%
2019	3.27	3.27	0.00%
2020	3.37	3.37	0.00%
2021	3.48	3.48	0.00%
2022	3.58	3.58	0.00%
2023	3.67	3.67	0.00%
2024	3.74	3.74	0.00%
2025	3.79	3.79	0.00%
2026	3.82	3.82	0.00%
2027	3.84	3.84	0.00%
2028	3.84	3.84	0.00%
2029	3.84	3.84	0.00%
2030	4.29	4.25	1.01%
2031	4.76	4.63	2.75%
2032	5.25	4.99	5.02%
2033	5.30	4.90	7.51%
2034	5.33	4.80	10.01%
2035	5.36	4.69	12.51%
2036	5.38	4.58	15.01%
2037	5.40	4.45	17.50%
2038	5.41	4.33	20.00%
2039	5.43	4.21	22.51%
2040	5.45	4.08	25.01%
2041	5.47	3.97	27.51%
2042	5.50	3.85	30.01%
2043	5.54	3.74	32.51%
2044	5.58	3.63	35.01%
2045	5.63	3.52	37.52%
2046	5.70	3.47	39.21%
2047	5.79	3.47	40.09%
2048	5.88	3.52	40.18%
2049	5.97	3.57	40.30%
2050	6.08	3.62	40.47%
Cumulative	170.68	142.41	16.56%

Source: Based on the calculations of the researcher using "Spectrum Policy Modeling System"

In table 10 we show the projected total education expenditure, which is the sum of the expenditure of the education on primary, preparatory and the secondary level. When comparing the difference between the two scenarios A and B in terms of projected total education expenditure we find that there is no difference between them in the period 2014 to 2020. Starting the year 2021 there is a difference of 0.24% ,which will continuously increase to reach 42.76% in the year 2050 (end of projection period).

Table 10. Projected Total Education Expenditures

Year	Total Education Expenditures (in billions of EGP)			% of Difference
	Projection A (Constant Scenario)	TFR	Projection B (Replacement Scenario)	
2014	55.66		55.66	0.00%
2015	56.35		56.35	0.00%
2016	57.21		57.21	0.00%
2017	58.15		58.15	0.00%
2018	59.15		59.15	0.00%
2019	60.19		60.19	0.00%
2020	61.20		61.20	0.00%
2021	63.72		63.56	0.24%
2022	66.15		65.68	0.71%
2023	68.45		67.50	1.38%
2024	70.61		69.03	2.24%
2025	72.67		70.29	3.28%
2026	74.65		71.30	4.48%
2027	77.26		72.72	5.87%
2028	79.85		73.88	7.47%
2029	82.47		74.85	9.24%
2030	84.86		75.37	11.18%
2031	87.27		75.71	13.25%
2032	89.72		75.87	15.44%
2033	90.20		74.03	17.93%
2034	90.65		72.13	20.43%
2035	91.08		70.19	22.94%
2036	91.55		68.24	25.46%
2037	92.10		66.49	27.81%
2038	92.73		64.93	29.98%
2039	93.47		63.59	31.97%
2040	94.32		62.45	33.79%
2041	95.34		61.56	35.44%
2042	96.60		60.93	36.92%
2043	98.09		60.63	38.19%
2044	99.81		60.65	39.24%
2045	101.75		60.97	40.08%
2046	103.88		61.53	40.77%
2047	106.23		62.35	41.31%
2048	108.78		63.40	41.72%
2049	111.49		64.44	42.20%
2050	114.36		65.46	42.76%
Cumulative	3098.01		2427.64	21.64%

Source: Based on the calculations of the researcher using "Spectrum Policy Modeling System"

4.3 Projected Expenditures on food subsidy:

The total expenditure on the food subsidy program is assumed to be a function of the size of population. We measured the per capita level expenditure on food subsidy by dividing the total expenditure on food subsidy for the year 2012/2013 based on the published budget (Ministry of Finance, 2014) and divided it by the total number of population in January 2013. The per capita expenditure remained at the 2014 level throughout the projection period. Table 11 shows total expenditure based on the two scenarios A and B. In the first year (2014) there is no difference in total expenditure, in the second year the first difference is shown and has a value of 0.07%. In the years 2030 the difference between the two scenarios is 7.68%, and continues to increase till it reaches a difference of 18.45% in the year 2044, and the level 23.64% in the year 2050 (end of projection period). The cumulative saving (which is the difference between the expenditures under the two projections A and B) for the complete period 2014-2050 is EGP213.14 billion.

Table 11. Projected Total Food Subsidy Expenditures

Year	Total Expenditures on Food Subsidy (in billions of EGP)			% of Difference
	Projection A (Constant Scenario)	TFR	Projection B (Replacement TFR Scenario)	
2014	33.73		33.73	0.00%
2015	34.58		34.56	0.07%
2016	35.44		35.37	0.22%
2017	36.31		36.15	0.43%
2018	37.18		36.92	0.70%
2019	38.05		37.66	1.03%
2020	38.92		38.37	1.41%
2021	39.79		39.05	1.85%
2022	40.65		39.71	2.33%
2023	41.52		40.33	2.85%
2024	42.38		40.93	3.42%
2025	43.24		41.50	4.03%
2026	44.11		42.04	4.69%
2027	44.98		42.56	5.38%
2028	45.84		43.04	6.11%
2029	46.72		43.51	6.88%
2030	47.60		43.94	7.68%
2031	48.49		44.38	8.47%
2032	49.40		44.83	9.25%
2033	50.31		45.27	10.02%
2034	51.24		45.72	10.77%
2035	52.19		46.18	11.52%
2036	53.18		46.65	12.27%
2037	54.19		47.13	13.02%
2038	55.24		47.63	13.78%
2039	56.32		48.12	14.55%
2040	57.43		48.63	15.33%

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2041	58.58	49.14	16.12%
2042	59.75	49.64	16.91%
2043	60.95	50.15	17.72%
2044	62.18	50.66	18.54%
2045	63.44	51.15	19.36%
2046	64.71	51.64	20.20%
2047	66.00	52.11	21.05%
2048	67.32	52.57	21.90%
2049	68.65	53.02	22.77%
2050	70.00	53.45	23.64%
Cumulative	1860.60	1647.46	11.46%

Source: Based on the calculations of the researcher using "Spectrum Policy Modeling System"

4.4 Projected Expenditures on Housing and Utilities

The total expenditure on infrastructure is the sum of the expenditure on housing, infrastructure, water and sanitation. We measured the per capita expenditure by dividing the total expenditure on housing and utilities of the fiscal year 2012/2013 by the population in January 2013. Table 12 presents the projected expenditures on the item housing and utilities according to the two scenarios A and B. In the year 2014 the total expenditure is the same under both scenarios, the two projections show different results starting years 2015 at a level of 0.07% and this difference increases to 7.68 % in the year 2030 and reaches the level 18.45% in the year 2044 and 23.64% in the year 2050 (end of projection period) .The cumulative savings for the projection period 2014-2050 is EGP78.01 billion.

Table 12. Projected Total Expenditures on Housing and Utilities

Year	Total Expenditures on Housing and Utilities (in billions of EGP)		% of Difference
	Projection A (Constant Scenario)	TFR Projection B (Replacement TFR Scenario)	
2014	12.34	12.34	0.00%
2015	12.66	12.65	0.07%
2016	12.97	12.94	0.22%
2017	13.29	13.23	0.43%
2018	13.61	13.51	0.70%
2019	13.92	13.78	1.03%
2020	14.24	14.04	1.41%
2021	14.56	14.29	1.85%
2022	14.88	14.53	2.33%
2023	15.19	14.76	2.85%
2024	15.51	14.98	3.42%
2025	15.83	15.19	4.03%
2026	16.14	15.39	4.69%
2027	16.46	15.57	5.38%
2028	16.78	15.75	6.11%
2029	17.10	15.92	6.88%
2030	17.42	16.08	7.68%
2031	17.75	16.24	8.47%
2032	18.08	16.40	9.25%
2033	18.41	16.57	10.02%
2034	18.75	16.73	10.77%
2035	19.10	16.90	11.52%
2036	19.46	17.07	12.27%
2037	19.83	17.25	13.02%
2038	20.21	17.43	13.78%
2039	20.61	17.61	14.55%
2040	21.02	17.80	15.33%
2041	21.44	17.98	16.12%
2042	21.86	18.17	16.91%
2043	22.30	18.35	17.72%

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2044	22.75	18.54	18.54%
2045	23.21	18.72	19.36%
2046	23.68	18.90	20.20%
2047	24.15	19.07	21.05%
2048	24.63	19.24	21.90%
2049	25.12	19.40	22.77%
2050	25.62	19.56	23.64%
Cumulative	680.89	602.88	11.46%

Source: Based on the calculations of the researcher using "Spectrum Policy Modeling System"

Section 5: Total savings compared to family planning program costs

The family planning program will lead to a decrease in population size which will be translated in a lower level of public expenditure on health, education, food subsidies and housing and utilities. Table 13 summarizes these results, in the first column we show the projections years from 2014 to 2050. The second column shows the total social sector saving by adding all the differences for each year shown in the tables (tables 6-12) in the sectors health, education, food subsidy, housing and utilities. The third column shows the extra family planning costs due to the adoption of the family planning program. The last column shows the net saving in government expenditure which is the result of the subtraction of the extra family planning costs from the total social sector saving in the sectors health, education, food subsidy, housing and utilities. The first year 2014 shows a negative value, which means that the costs of the family planning program are higher than the benefits in saving in social expenditure. This however changes immediately in the second year, reflecting that the benefits of the family planning program are higher than the costs. The net saving continues to increase starting 2015 until the end of the projection period by 2050. By the year 2044 the net saving reaches EGP 63,989.84 million, and in the year 2050 the net saving has a value of EGP 84,768.43 million.

The net savings stream was used in the calculation of the internal rate of return (IRR), which refers to the discount rate that makes the net present value of all cash flows from a particular project equal to zero. In other words it equates the present value of all costs with the present value of all benefits. The higher a project's IRR, the more desirable it is to undertake the project. The IRR for the family planning program 2014-2050 is 199.4%, compared to 182% for the Chao (2005) study. This is a relatively high IRR compared to ordinary investment projects and would suggest the approval of this project.

Table 13. Projected Total and Net Savings in Public Expenditures

Year	Total Savings in Public Expenditures (in millions of EGP)		
	Total Social Sector Savings	Extra Family Planning Costs	Net Social Sector Savings
2014	0.00	32.99	-32.99
2015	55.47	51.23	4.24
2016	167.40	69.92	97.48
2017	336.53	89.15	247.39
2018	563.33	108.98	454.35
2019	848.08	129.48	718.60

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2020	1,190.93	150.67	1,040.26
2021	1,747.12	172.53	1,574.58
2022	2,520.13	195.04	2,325.09
2023	3,512.59	218.14	3,294.45
2024	4,726.71	241.80	4,484.91
2025	6,164.53	265.94	5,898.58
2026	7,827.87	290.46	7,537.41
2027	9,783.63	315.22	9,468.41
2028	12,034.96	340.13	11,694.83
2029	14,585.23	369.41	14,215.82
2030	17,415.95	352.36	17,063.59
2031	20,474.91	352.25	20,122.66
2032	23,767.12	349.97	23,417.15
2033	27,104.06	345.52	26,758.53
2034	30,486.47	338.88	30,147.58
2035	33,927.03	330.11	33,596.93
2036	37,451.96	319.31	37,132.65
2037	40,910.45	306.63	40,603.82
2038	44,310.50	292.11	44,018.39
2039	47,659.74	275.69	47,384.06
2040	50,964.23	257.36	50,706.87
2041	54,257.02	237.19	54,019.84
2042	57,579.47	215.20	57,364.28
2043	60,875.75	191.38	60,684.37
2044	64,155.29	165.45	63,989.84
2045	67,420.59	141.10	67,279.49
2046	70,699.20	116.53	70,582.67
2047	74,007.10	91.63	73,915.47
2048	77,351.81	66.34	77,285.47
2049	80,942.29	40.01	80,902.28
2050	84,781.57	13.14	84,768.43
Cumulative	1,132,607.04	7,839.25	1,124,767.78

Source: Based on the calculations of the researcher using "Spectrum Policy Modeling System"

Section 6: Family Planning Program Benefit-Cost Ratios: The cost benefit impact

The study assumes that the costs and benefits occur over a 37-year period of time. It is hence important to incorporate the time value of money, and change the values that will occur in the future to present values using a discount rate. As this study is aimed to be comparable with the results of the original study (1996) and the study by Chao (2005), we used the same discount rate of both studies namely 10%.

6.1 Results of the Current Report

The results of this report are presented in the **fourth column** of the following table (Table 14). It shows the total benefit-cost ratio is EGP56.12 for the period 2014-2050, which is the sum of the cost benefit of health (EGP9.24), education (EGP31.15), food subsidy(EGP11.52) and housing and utilities (EGP 4.21). These results show that the major saving will occur in the education expenditure, followed by food subsidy,

health and housing and utilities. These results depend on 2012/2013 actual expenditure figures.

The IRR for the family planning program 2014-2050 is 199.4%, compared to 182% for the Chao (2005) study. This is a relatively high IRR compared to ordinary investment projects and would suggest the approval of this project.

The fifth column of Table (14) shows the final results of Appendix A. The benefit - cost ratio is EGP46.56 for the period 2014-2044(30 years), which depends on the actual budget figures of 2012/2013.

The sixth column of the following table shows the final results of Appendix B. The benefit-cost ratio reached EGP52.78 for the period 2014-2044. The cost-benefit analysis presented depends on the expected budget figures of 2014/2015, with a projection of the 2012/2013 figure of educational cost in year 2014/2015

Table 14. Benefit-Cost Ratios

	Moreland (1996) Results	Chao (2005) Results 2000-2030	This Report Results 2014-2050	Appendix A Results 2014- 2044*	Appendix B Results 2014- 2044**
Health	1.74	9.41	9.24	7.81	12.08
Education	6.64	19.20	31.15	25.47	25.47
Food Subsidy	1.76	6.02	11.52	9.72	8.99
Water, sanitation, and other Utilities	9.23	5.64			
Housing	7.22				
Housing and Utilities			4.21	3.56	6.24
Total	26.59	40.27	56.12	46.56	52.78

- All the results are based on a 10% discount rate

*refers to the results shown in detail in the Appendix A, the benefit-cost analysis depends on the projection of the public expenditures on health, education food subsidy and housing in the actual budget of 2012/2013.

** refers to the results shown in detail in the Appendix B, the benefit-cost analysis depends on the projection of the public expenditures on health, education food subsidy and housing in the projected budget of 2014/2015.

6.2 Comparison to Previous Results

Table 14 compares the results of this study to the previous study of Moreland (1996) and Chao(2005). There is an increase in the benefit-cost ratio from 26.59 (Moreland, 1996), to 40.27 (Chao, 2005) to 56.12 for the period 2014-2050.

The forecasted increase in government expenditure will lead to an increase in the benefit-cost ratio, as everything else being equal the higher the expenditure of the government on social services and the more expenditure per person the higher the benefit-cost ratio for the family planning program. This confirms the financial profitability of the family planning programs.

Section 7: Policy and Program Implications

Our analysis in this report reconfirms the results of the 1996 study and 2005 study on the favorable financial returns of Egypt's family planning program. The benefit-cost ratio has gone up from EGP40.7 to EGP56.12. This change in benefit-cost ratio reflects recent significant increases in social service expenditures, particularly in the health and education sectors.

In this context the report recommends several policies such as:

- 1- Implementation of an overall complete family planning program
- 2- Adoption of an advocacy action plan to adopt these programs as financially sound programs
- 3- Public costs will have to increase if Egypt is to achieve a full demographic transition to two children per family by 2050. With less donor support, the government needs to allocate the funds required to sustain the family planning program. This can be achieved through various ways such as increasing financing from the MOHP budget; increasing the role for NGOs and the private sector; increasing client payments; and third-party payment mechanisms such as insurance. In the meantime the efficiency of this family planning program requires reduction in costs, reallocation of resources to reduce costs; elimination of unnecessary costs; changes in the method mix to cheaper methods; increased efficiency of client's use; and reduction in avoidable switching.
- 4- Integration of human resource development programs in national programs to benefit from the demographic gift in addition to acceleration of family planning programs to limit the population increase for achieving better quality in service delivery

Section 8: Future Studies

The extremely high benefit-cost ratio suggests that continuing a successful family planning program would help the government reduce the fiscal burdens of providing social services to the population. The high benefit-cost ratio means that if the government can manage to continue a successful family planning program, then it will benefit greatly from the favorable financial consequences. With no donor funding the government must provide replacement funds. The additional contraceptive costs to the government estimated by Chao at EGP200-300 million annually, can be considered a small fraction of the potential reduction in social services expenditure burdens which are in billions of Egyptian pounds per year

In this context we recommend:

- Further analysis of the trend in the cost of family planning programs to GDP over the time span assuming a reduction of fertility rates.
- An advocacy plan which requires strong support from a number of ministries, i.e. the ministry of education, housing, supplies....
- In general this analysis should be repeated taking into account all the considerations that are mentioned in this report, for example the future study should include the non-financial benefits of family planning programs. Family planning programs have financial and non-financial benefits as well as direct and indirect benefits. An Expanded benefit-cost analysis would go beyond considering just the financial aspects and reveal the many other benefits of family planning programs. Family planning programs have many direct and indirect benefits, and all benefits should be estimated and documented as potential total contributions of the Egypt family planning programs.
- It is worth noting that the family planning program might have a negative impact in terms of financial returns, if we consider the impact on the size of labor force. To determine this aspect the future analysis will require the study of the age structure of the population and its impact on economic growth and income per capita.
- Moreover the analysis in this report is very simple as we have ignored some important indicators, i.e. the maintenance costs, depreciation rates, dropout rates...etc. The future study must include them.
- Finally the idea of a demographic window can be discussed and the policies to accelerate it can be identified to enable the best use of the potential entrants to the labour market. This is a new dimension in tackling the population problem in Egypt, where policies are divided into policies to accelerate the momentum of the population window, policies during the population window to achieve the maximum benefits out of it, and policies after the demographic window to prepare for a growing elderly population.

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APPENDIX A (All results are based on the calculations of the researcher using "Spectrum Policy Modeling System")

The results using the actual expenditure for the actual budget of 2012/2013 for the period 2014-2044

Table A1. Changes in CPR under Two Different TFR Assumptions

Year	Contraceptive Prevalence Rate		Total Fertility Rate	
	Constant	Replacement	Constant	Replacement
	TFR Scenario	TFR Scenario	TFR Scenario	TFR Scenario
2014	58.50	58.50	3.50	3.50
2019	58.50	63.48	3.50	3.06
2024	58.50	68.46	3.50	2.63
2029	58.50	73.45	3.50	2.19
2034	58.50	74.44	3.50	2.10
2039	58.50	74.44	3.50	2.10
2044	58.50	74.44	3.50	2.10

Table A2. Changes in Births and Population Under Two Different TFR Assumptions

Year	Number of Births (in millions)		Total Population (in millions)	
	Constant	Replacement	Constant	Replacement
	TFR Scenario	TFR Scenario	TFR Scenario	TFR Scenario
2014	2.67	2.67	86.73	86.73
2019	2.76	2.42	97.84	96.83
2024	2.80	2.10	108.98	105.25
2029	2.88	1.80	120.13	111.87
2034	3.10	1.85	131.76	117.57
2039	3.58	2.05	144.82	123.74
2044	4.05	2.15	159.89	130.25

Table A3. Unit Cost of Contraceptives, by Method, 2014

Method	Conversion Factor	Unit Cost (EGP)
CYP		122.30
Acceptor		
Sterilization	9.0	1100.67
IUD	3.2	391.35
Implants	2.0	244.59
Diaphragms	1.0	122.30
User		
Pills	1.0	122.30
Condoms	1.0	122.30
Foam	1.0	122.30
Injectable	1.0	122.30
Jelly	1.0	122.30

Note: the conversion factor of IUD and implants depends on national population council report.

Table A4. Projected Total Family Planning (FP) Program Costs

Year	Total FP Program Cost (in billions of £E)		% of Difference
	Projection A	Projection B	
	(Constant TFR Scenario)	(Replacement TFR Scenario)	
2014	1.03	1.07	-3.20%
2015	1.05	1.10	-4.90%
2016	1.06	1.13	-6.61%
2017	1.07	1.16	-8.31%
2018	1.09	1.20	-10.01%
2019	1.11	1.24	-11.71%
2020	1.12	1.27	-13.41%
2021	1.14	1.31	-15.12%
2022	1.16	1.35	-16.82%
2023	1.18	1.40	-18.52%
2024	1.20	1.44	-20.23%
2025	1.21	1.48	-21.93%
2026	1.23	1.52	-23.64%
2027	1.24	1.56	-25.34%
2028	1.26	1.60	-27.05%
2029	1.30	1.67	-28.46%
2030	1.32	1.68	-26.60%
2031	1.35	1.70	-26.09%
2032	1.37	1.72	-25.46%
2033	1.40	1.74	-24.72%
2034	1.42	1.76	-23.87%
2035	1.44	1.77	-22.91%
2036	1.46	1.78	-21.85%
2037	1.48	1.79	-20.68%

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2038	1.50	1.80	-19.43%
2039	1.52	1.80	-18.08%
2040	1.55	1.80	-16.64%
2041	1.57	1.81	-15.11%
2042	1.59	1.81	-13.51%
2043	1.62	1.81	-11.82%
2044	1.65	1.81	-10.05%
Cumulative	40.70	48.07	-18.11%

Table A5. Projected Total Public Health Expenditures

Total Public Health Expenditures (in billions of £E)			
Year	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	% of Difference
2014	27.07	27.07	0.00%
2015	27.76	27.74	0.07%
2016	28.45	28.39	0.22%
2017	29.15	29.02	0.43%
2018	29.84	29.63	0.70%
2019	30.54	30.23	1.03%
2020	31.24	30.80	1.41%
2021	31.94	31.35	1.85%
2022	32.63	31.87	2.33%
2023	33.32	32.37	2.85%
2024	34.02	32.85	3.42%
2025	34.71	33.31	4.03%
2026	35.40	33.75	4.69%
2027	36.10	34.16	5.38%
2028	36.80	34.55	6.11%
2029	37.50	34.92	6.88%
2030	38.21	35.27	7.68%
2031	38.92	35.63	8.47%
2032	39.65	35.98	9.25%
2033	40.39	36.34	10.02%
2034	41.13	36.70	10.77%
2035	41.89	37.07	11.52%

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2036	42.68	37.45	12.27%
2037	43.50	37.83	13.02%
2038	44.34	38.23	13.78%
2039	45.21	38.63	14.55%
2040	46.10	39.03	15.33%
2041	47.02	39.44	16.12%
2042	47.96	39.85	16.91%
2043	48.92	40.25	17.72%
2044	49.91	40.66	18.54%
Cumulative	1172.30	1070.38	8.69%

Table A6. Projected Number of Primary Students

Year	Number of Students (in millions)		
	Projection A	Projection B	% of Difference
	(Constant TFR Scenario)	(Replacement TFR Scenario)	
2014	10.28	10.28	0.00%
2015	10.54	10.54	0.00%
2016	10.77	10.77	0.00%
2017	10.95	10.95	0.00%
2018	11.07	11.07	0.00%
2019	11.15	11.15	0.00%
2020	11.19	11.19	0.00%
2021	11.87	11.81	0.53%
2022	12.56	12.37	1.52%
2023	13.27	12.89	2.90%
2024	14.00	13.35	4.60%
2025	14.74	13.77	6.58%
2026	15.49	14.12	8.80%
2027	15.59	13.83	11.29%
2028	15.66	13.50	13.78%
2029	15.72	13.16	16.28%
2030	15.78	12.81	18.77%
2031	15.83	12.46	21.27%
2032	15.88	12.11	23.78%
2033	15.95	11.76	26.28%
2034	16.03	11.41	28.79%
2035	16.13	11.08	31.30%

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2036	16.25	10.75	33.81%
2037	16.40	10.51	35.91%
2038	16.59	10.35	37.60%
2039	16.80	10.27	38.88%
2040	17.03	10.26	39.77%
2041	17.31	10.34	40.28%
2042	17.66	10.52	40.45%
2043	18.06	10.71	40.69%
2044	18.51	10.92	41.00%
Cumulative	455.05	361.02	20.66%

Table A7. Projected Number of Preparatory Students

Year	Number of Students (in millions)		
	Projection A	Projection B	% of Difference
	(Constant TFR Scenario)	(Replacement TFR Scenario)	
2014	4.43	4.43	0.00%
2015	4.48	4.48	0.00%
2016	4.57	4.57	0.00%
2017	4.71	4.71	0.00%
2018	4.87	4.87	0.00%
2019	5.02	5.02	0.00%
2020	5.14	5.14	0.00%
2021	5.24	5.24	0.00%
2022	5.31	5.31	0.00%
2023	5.35	5.35	0.00%
2024	5.37	5.37	0.00%
2025	5.38	5.38	0.00%
2026	5.38	5.38	0.00%
2027	6.01	5.95	1.01%
2028	6.67	6.49	2.75%
2029	7.35	6.98	5.02%
2030	7.41	6.86	7.51%
2031	7.46	6.72	10.01%
2032	7.50	6.56	12.51%
2033	7.53	6.40	15.01%
2034	7.56	6.23	17.50%
2035	7.58	6.06	20.00%

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2036	7.60	5.89	22.51%
2037	7.62	5.72	25.01%
2038	7.66	5.55	27.51%
2039	7.70	5.39	30.01%
2040	7.75	5.23	32.51%
2041	7.81	5.08	35.01%
2042	7.88	4.93	37.52%
2043	7.98	4.85	39.21%
2044	8.10	4.85	40.09%
Cumulative	200.42	170.97	14.69%

Table A8. Projected Number of Secondary Students

Year	Number of Students (in millions)		
	Projection A	Projection B	% of Difference
	(Constant TFR Scenario)	(Replacement TFR Scenario)	
2014	3.20	3.20	0.00%
2015	3.18	3.18	0.00%
2016	3.17	3.17	0.00%
2017	3.17	3.17	0.00%
2018	3.20	3.20	0.00%
2019	3.27	3.27	0.00%
2020	3.37	3.37	0.00%
2021	3.48	3.48	0.00%
2022	3.58	3.58	0.00%
2023	3.67	3.67	0.00%
2024	3.74	3.74	0.00%
2025	3.79	3.79	0.00%
2026	3.82	3.82	0.00%
2027	3.84	3.84	0.00%
2028	3.84	3.84	0.00%
2029	3.84	3.84	0.00%
2030	4.29	4.25	1.01%
2031	4.76	4.63	2.75%
2032	5.25	4.99	5.02%
2033	5.30	4.90	7.51%
2034	5.33	4.80	10.01%
2035	5.36	4.69	12.51%

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2036	5.38	4.58	15.01%
2037	5.40	4.45	17.50%
2038	5.41	4.33	20.00%
2039	5.43	4.21	22.51%
2040	5.45	4.08	25.01%
2041	5.47	3.97	27.51%
2042	5.50	3.85	30.01%
2043	5.54	3.74	32.51%
2044	5.58	3.63	35.01%
Cumulative	135.62	121.25	10.60%

Table A9. Projected Total Education Expenditures

Total Education Expenditures (in billions of EGP)			
Year	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	% of Difference
2014	55.66	55.66	0.00%
2015	56.35	56.35	0.00%
2016	57.21	57.21	0.00%
2017	58.15	58.15	0.00%
2018	59.15	59.15	0.00%
2019	60.19	60.19	0.00%
2020	61.20	61.20	0.00%
2021	63.72	63.56	0.24%
2022	66.15	65.68	0.71%
2023	68.45	67.50	1.38%
2024	70.61	69.03	2.24%
2025	72.67	70.29	3.28%
2026	74.65	71.30	4.48%
2027	77.26	72.72	5.87%
2028	79.85	73.88	7.47%
2029	82.47	74.85	9.24%
2030	84.86	75.37	11.18%
2031	87.27	75.71	13.25%
2032	89.72	75.87	15.44%
2033	90.20	74.03	17.93%
2034	90.65	72.13	20.43%
2035	91.08	70.19	22.94%

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2036	91.55	68.24	25.46%
2037	92.10	66.49	27.81%
2038	92.73	64.93	29.98%
2039	93.47	63.59	31.97%
2040	94.32	62.45	33.79%
2041	95.34	61.56	35.44%
2042	96.60	60.93	36.92%
2043	98.09	60.63	38.19%
2044	99.81	60.65	39.24%
Cumulative	2451.52	2049.50	16.40%

Table A10. Projected Total Food Subsidy Expenditures

Year	Total Expenditures on Food Subsidy (in billions of EGP)		% of Difference
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	
2014	33.73	33.73	0.00%
2015	34.58	34.56	0.07%
2016	35.44	35.37	0.22%
2017	36.31	36.15	0.43%
2018	37.18	36.92	0.70%
2019	38.05	37.66	1.03%
2020	38.92	38.37	1.41%
2021	39.79	39.05	1.85%
2022	40.65	39.71	2.33%
2023	41.52	40.33	2.85%
2024	42.38	40.93	3.42%
2025	43.24	41.50	4.03%
2026	44.11	42.04	4.69%
2027	44.98	42.56	5.38%
2028	45.84	43.04	6.11%
2029	46.72	43.51	6.88%
2030	47.60	43.94	7.68%
2031	48.49	44.38	8.47%
2032	49.40	44.83	9.25%
2033	50.31	45.27	10.02%
2034	51.24	45.72	10.77%

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2035	52.19	46.18	11.52%
2036	53.18	46.65	12.27%
2037	54.19	47.13	13.02%
2038	55.24	47.63	13.78%
2039	56.32	48.12	14.55%
2040	57.43	48.63	15.33%
2041	58.58	49.14	16.12%
2042	59.75	49.64	16.91%
2043	60.95	50.15	17.72%
2044	62.18	50.66	18.54%
Cumulative	1460.49	1333.50	8.69%

Table A11. Projected Total Expenditures on Housing and Utilities

Year	Total Expenditures on Housing and Utilities		
	(in billions of EGP)		
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	% of Difference
2014	12.34	12.34	0.00%
2015	12.66	12.65	0.07%
2016	12.97	12.94	0.22%
2017	13.29	13.23	0.43%
2018	13.61	13.51	0.70%
2019	13.92	13.78	1.03%
2020	14.24	14.04	1.41%
2021	14.56	14.29	1.85%
2022	14.88	14.53	2.33%
2023	15.19	14.76	2.85%
2024	15.51	14.98	3.42%
2025	15.83	15.19	4.03%
2026	16.14	15.39	4.69%
2027	16.46	15.57	5.38%
2028	16.78	15.75	6.11%
2029	17.10	15.92	6.88%
2030	17.42	16.08	7.68%
2031	17.75	16.24	8.47%
2032	18.08	16.40	9.25%
2033	18.41	16.57	10.02%
2034	18.75	16.73	10.77%

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2035	19.10	16.90	11.52%
2036	19.46	17.07	12.27%
2037	19.83	17.25	13.02%
2038	20.21	17.43	13.78%
2039	20.61	17.61	14.55%
2040	21.02	17.80	15.33%
2041	21.44	17.98	16.12%
2042	21.86	18.17	16.91%
2043	22.30	18.35	17.72%
2044	22.75	18.54	18.54%
Cumulative	534.46	487.99	8.69%

Table A12. Projected Total and Net Savings in Public Expenditures

Year	Total Savings in Public Expenditures		
	(in millions of EGP)		
	Total Social Sector Savings	Extra Family Planning Costs	Net Social Sector Savings
2014	0.00	32.99	-32.99
2015	55.47	51.23	4.24
2016	167.40	69.92	97.48
2017	336.53	89.15	247.39
2018	563.33	108.98	454.35
2019	848.08	129.48	718.60
2020	1,190.93	150.67	1,040.26
2021	1,747.12	172.53	1,574.58
2022	2,520.13	195.04	2,325.09
2023	3,512.59	218.14	3,294.45
2024	4,726.71	241.80	4,484.91
2025	6,164.53	265.94	5,898.58
2026	7,827.87	290.46	7,537.41
2027	9,783.63	315.22	9,468.41
2028	12,034.96	340.13	11,694.83
2029	14,585.23	369.41	14,215.82
2030	17,415.95	352.36	17,063.59
2031	20,474.91	352.25	20,122.66
2032	23,767.12	349.97	23,417.15
2033	27,104.06	345.52	26,758.53
2034	30,486.47	338.88	30,147.58

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2035	33,927.03	330.11	33,596.93
2036	37,451.96	319.31	37,132.65
2037	40,910.45	306.63	40,603.82
2038	44,310.50	292.11	44,018.39
2039	47,659.74	275.69	47,384.06
2040	50,964.23	257.36	50,706.87
2041	54,257.02	237.19	54,019.84
2042	57,579.47	215.20	57,364.28
2043	60,875.75	191.38	60,684.37
2044	64,155.29	165.45	63,989.84
Cumulative	677,404.47	7,370.51	670,033.96

Table A13. Benefit-Cost Ratios

	1996 Results	2000 Results	2014 Results
	(10% discount rate)	(10% discount rate)	(10% discount rate)
Health	1.74	9.41	7.81
Education	6.64	19.20	25.47
Food Subsidy	1.76	6.02	9.72
Water, sanitation, and other Utilities	9.23	5.64	
Housing	7.22		
Housing and Utilities			3.56
Total	26.59	40.27	46.56

APPENDIX B (All results are based on the calculations of the researcher using "Spectrum Policy Modeling System")

The results using the projected expenditure for the planned budget of 2014/2015 for the period 2014-2044

Table B1. Changes in CPR under Two Different TFR Assumptions

Year	Contraceptive Prevalence Rate		Total Fertility Rate	
	Constant TFR Scenario	Replacement TFR Scenario	Constant TFR Scenario	Replacement TFR Scenario
2014	58.50	58.50	3.50	3.50
2019	58.50	63.48	3.50	3.06
2024	58.50	68.46	3.50	2.63
2029	58.50	73.45	3.50	2.19
2034	58.50	74.44	3.50	2.10
2039	58.50	74.44	3.50	2.10
2044	58.50	74.44	3.50	2.10

Table B2. Changes in Births and Population Under Two Different TFR Assumptions

Year	Number of Births (in millions)		Total Population (in millions)	
	Constant TFR Scenario	Replacement TFR Scenario	Constant TFR Scenario	Replacement TFR Scenario
2014	2.67	2.67	86.73	86.73
2019	2.76	2.42	97.84	96.83
2024	2.80	2.10	108.98	105.25
2029	2.88	1.80	120.13	111.87
2034	3.10	1.85	131.76	117.57
2039	3.58	2.05	144.82	123.74
2044	4.05	2.15	159.89	130.25

Table B3. Unit Cost of Contraceptives, by Method, 2014

Method	Conversion Factor	Unit Cost (EGP)
CYP		122.30
Acceptor		
Sterilization	9.0	1100.67
IUD	3.2	391.35
Implants	2.0	244.59
Diaphragms	1.0	122.30
User		
Pills	1.0	122.30
Condoms	1.0	122.30
Foam	1.0	122.30
Injectables	1.0	122.30
Jelly	1.0	122.30

Note: the conversion factor of IUD and implants depends on national population council report.

Table B4. Projected Total Family Planning (FP) Program Costs

Year	Total FP Program Cost (in billions of EGP)		% of Difference
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	
2014	1.03	1.07	-3.20%
2015	1.05	1.10	-4.90%
2016	1.06	1.13	-6.61%
2017	1.07	1.16	-8.31%
2018	1.09	1.20	-10.01%
2019	1.11	1.24	-11.71%
2020	1.12	1.27	-13.41%
2021	1.14	1.31	-15.12%
2022	1.16	1.35	-16.82%
2023	1.18	1.40	-18.52%
2024	1.20	1.44	-20.23%
2025	1.21	1.48	-21.93%
2026	1.23	1.52	-23.64%
2027	1.24	1.56	-25.34%
2028	1.26	1.60	-27.05%
2029	1.30	1.67	-28.46%
2030	1.32	1.68	-26.60%
2031	1.35	1.70	-26.09%
2032	1.37	1.72	-25.46%
2033	1.40	1.74	-24.72%
2034	1.42	1.76	-23.87%
2035	1.44	1.77	-22.91%
2036	1.46	1.78	-21.85%
2037	1.48	1.79	-20.68%
2038	1.50	1.80	-19.43%
2039	1.52	1.80	-18.08%
2040	1.55	1.80	-16.64%
2041	1.57	1.81	-15.11%
2042	1.59	1.81	-13.51%
2043	1.62	1.81	-11.82%
2044	1.65	1.81	-10.05%
Cumulative	40.70	48.07	-18.11%

Table B5. Projected Total Public Health Expenditures

Year	Total Public Health Expenditures (in billions of EGP)		% of Difference
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	
2014	41.88	41.88	0.00%
2015	42.94	42.91	0.07%
2016	44.01	43.92	0.22%
2017	45.09	44.90	0.43%
2018	46.17	45.85	0.70%
2019	47.25	46.76	1.03%
2020	48.33	47.65	1.41%
2021	49.41	48.50	1.85%
2022	50.48	49.31	2.33%
2023	51.56	50.09	2.85%
2024	52.63	50.83	3.42%
2025	53.70	51.53	4.03%
2026	54.77	52.21	4.69%
2027	55.85	52.85	5.38%
2028	56.93	53.45	6.11%
2029	58.02	54.03	6.88%
2030	59.11	54.57	7.68%
2031	60.22	55.11	8.47%
2032	61.34	55.67	9.25%
2033	62.48	56.22	10.02%
2034	63.63	56.78	10.77%
2035	64.81	57.35	11.52%
2036	66.03	57.93	12.27%
2037	67.29	58.53	13.02%
2038	68.60	59.14	13.78%
2039	69.94	59.76	14.55%
2040	71.32	60.39	15.33%
2041	72.74	61.02	16.12%
2042	74.20	61.65	16.91%
2043	75.69	62.28	17.72%
2044	77.22	62.90	18.54%
Cumulative	1813.64	1655.95	8.69%

Table B6. Projected Number of Primary Students

Year	Number of Students (in millions)		% of Difference
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	
2014	10.28	10.28	0.00%
2015	10.54	10.54	0.00%
2016	10.77	10.77	0.00%
2017	10.95	10.95	0.00%
2018	11.07	11.07	0.00%
2019	11.15	11.15	0.00%
2020	11.19	11.19	0.00%
2021	11.87	11.81	0.53%
2022	12.56	12.37	1.52%
2023	13.27	12.89	2.90%
2024	14.00	13.35	4.60%
2025	14.74	13.77	6.58%
2026	15.49	14.12	8.80%
2027	15.59	13.83	11.29%
2028	15.66	13.50	13.78%
2029	15.72	13.16	16.28%
2030	15.78	12.81	18.77%
2031	15.83	12.46	21.27%
2032	15.88	12.11	23.78%
2033	15.95	11.76	26.28%
2034	16.03	11.41	28.79%
2035	16.13	11.08	31.30%
2036	16.25	10.75	33.81%
2037	16.40	10.51	35.91%
2038	16.59	10.35	37.60%
2039	16.80	10.27	38.88%
2040	17.03	10.26	39.77%
2041	17.31	10.34	40.28%
2042	17.66	10.52	40.45%
2043	18.06	10.71	40.69%
2044	18.51	10.92	41.00%
Cumulative	455.05	361.02	20.66%

Table B7. Projected Number of Preparatory Students

Year	Number of Students (in millions)		% of Difference
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	
2014	4.43	4.43	0.00%
2015	4.48	4.48	0.00%
2016	4.57	4.57	0.00%
2017	4.71	4.71	0.00%
2018	4.87	4.87	0.00%
2019	5.02	5.02	0.00%
2020	5.14	5.14	0.00%
2021	5.24	5.24	0.00%
2022	5.31	5.31	0.00%
2023	5.35	5.35	0.00%
2024	5.37	5.37	0.00%
2025	5.38	5.38	0.00%
2026	5.38	5.38	0.00%
2027	6.01	5.95	1.01%
2028	6.67	6.49	2.75%
2029	7.35	6.98	5.02%
2030	7.41	6.86	7.51%
2031	7.46	6.72	10.01%
2032	7.50	6.56	12.51%
2033	7.53	6.40	15.01%
2034	7.56	6.23	17.50%
2035	7.58	6.06	20.00%
2036	7.60	5.89	22.51%
2037	7.62	5.72	25.01%
2038	7.66	5.55	27.51%
2039	7.70	5.39	30.01%
2040	7.75	5.23	32.51%
2041	7.81	5.08	35.01%
2042	7.88	4.93	37.52%
2043	7.98	4.85	39.21%
2044	8.10	4.85	40.09%
Cumulative	200.42	170.97	14.69%

Table B8. Projected Number of Secondary Students

Year	Number of Students (in millions)		% of Difference
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	
2014	3.20	3.20	0.00%
2015	3.18	3.18	0.00%
2016	3.17	3.17	0.00%
2017	3.17	3.17	0.00%
2018	3.20	3.20	0.00%
2019	3.27	3.27	0.00%
2020	3.37	3.37	0.00%
2021	3.48	3.48	0.00%
2022	3.58	3.58	0.00%
2023	3.67	3.67	0.00%
2024	3.74	3.74	0.00%
2025	3.79	3.79	0.00%
2026	3.82	3.82	0.00%
2027	3.84	3.84	0.00%
2028	3.84	3.84	0.00%
2029	3.84	3.84	0.00%
2030	4.29	4.25	1.01%
2031	4.76	4.63	2.75%
2032	5.25	4.99	5.02%
2033	5.30	4.90	7.51%
2034	5.33	4.80	10.01%
2035	5.36	4.69	12.51%
2036	5.38	4.58	15.01%
2037	5.40	4.45	17.50%
2038	5.41	4.33	20.00%
2039	5.43	4.21	22.51%
2040	5.45	4.08	25.01%
2041	5.47	3.97	27.51%
2042	5.50	3.85	30.01%
2043	5.54	3.74	32.51%
2044	5.58	3.63	35.01%
Cumulative	135.62	121.25	10.60%

Table B9. Projected Total Education Expenditures

Year	Total Education Expenditures (in billions of EGP)		% of Difference
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	
2014	55.66	55.66	0.00%
2015	56.35	56.35	0.00%
2016	57.21	57.21	0.00%
2017	58.15	58.15	0.00%
2018	59.15	59.15	0.00%
2019	60.19	60.19	0.00%
2020	61.20	61.20	0.00%
2021	63.72	63.56	0.24%
2022	66.15	65.68	0.71%
2023	68.45	67.50	1.38%
2024	70.61	69.03	2.24%
2025	72.67	70.29	3.28%
2026	74.65	71.30	4.48%
2027	77.26	72.72	5.87%
2028	79.85	73.88	7.47%
2029	82.47	74.85	9.24%
2030	84.86	75.37	11.18%
2031	87.27	75.71	13.25%
2032	89.72	75.87	15.44%
2033	90.20	74.03	17.93%
2034	90.65	72.13	20.43%
2035	91.08	70.19	22.94%
2036	91.55	68.24	25.46%
2037	92.10	66.49	27.81%
2038	92.73	64.93	29.98%
2039	93.47	63.59	31.97%
2040	94.32	62.45	33.79%
2041	95.34	61.56	35.44%
2042	96.60	60.93	36.92%
2043	98.09	60.63	38.19%
2044	99.81	60.65	39.24%
Cumulative	2451.52	2049.50	16.40%

Table B10. Projected Total Food Subsidy Expenditures

Year	Total Expenditures on Food Subsidy (in billions of EGP)		% of Difference
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	
2014	31.17	31.17	0.00%
2015	31.96	31.94	0.07%
2016	32.76	32.69	0.22%
2017	33.56	33.41	0.43%
2018	34.36	34.12	0.70%
2019	35.16	34.80	1.03%
2020	35.97	35.46	1.41%
2021	36.77	36.09	1.85%
2022	37.57	36.70	2.33%
2023	38.37	37.28	2.85%
2024	39.17	37.83	3.42%
2025	39.97	38.35	4.03%
2026	40.76	38.85	4.69%
2027	41.57	39.33	5.38%
2028	42.37	39.78	6.11%
2029	43.18	40.21	6.88%
2030	43.99	40.61	7.68%
2031	44.82	41.02	8.47%
2032	45.65	41.43	9.25%
2033	46.50	41.84	10.02%
2034	47.36	42.26	10.77%
2035	48.24	42.68	11.52%
2036	49.14	43.12	12.27%
2037	50.08	43.56	13.02%
2038	51.05	44.02	13.78%
2039	52.05	44.48	14.55%
2040	53.08	44.94	15.33%
2041	54.13	45.41	16.12%
2042	55.22	45.88	16.91%
2043	56.33	46.35	17.72%
2044	57.47	46.82	18.54%
Cumulative	1349.77	1232.41	8.69%

Table B11. Projected Total Expenditures on Housing and Utilities

Year	Total Expenditures on Housing and Utilities (in billions of EGP)		% of Difference
	Projection A (Constant TFR Scenario)	Projection B (Replacement TFR Scenario)	
2014	21.64	21.64	0.00%
2015	22.19	22.18	0.07%
2016	22.74	22.69	0.22%
2017	23.30	23.20	0.43%
2018	23.86	23.69	0.70%
2019	24.42	24.16	1.03%
2020	24.97	24.62	1.41%
2021	25.53	25.06	1.85%
2022	26.09	25.48	2.33%
2023	26.64	25.88	2.85%
2024	27.20	26.26	3.42%
2025	27.75	26.63	4.03%
2026	28.30	26.98	4.69%
2027	28.86	27.31	5.38%
2028	29.42	27.62	6.11%
2029	29.98	27.92	6.88%
2030	30.54	28.20	7.68%
2031	31.12	28.48	8.47%
2032	31.70	28.77	9.25%
2033	32.29	29.05	10.02%
2034	32.88	29.34	10.77%
2035	33.49	29.64	11.52%
2036	34.12	29.94	12.27%
2037	34.77	30.25	13.02%
2038	35.45	30.56	13.78%
2039	36.14	30.88	14.55%
2040	36.85	31.20	15.33%
2041	37.59	31.53	16.12%
2042	38.34	31.86	16.91%
2043	39.11	32.18	17.72%
2044	39.90	32.51	18.54%
Cumulative	937.19	855.70	8.69%

Table B12. Projected Total and Net Savings in Public Expenditures

Year	Total Savings in Public Expenditures (in millions of EGP)		
	Total Social Sector Savings	Extra Family Planning Costs	Net Social Sector Savings
2014	0.00	32.99	-32.99
2015	71.81	51.23	20.58
2016	216.73	69.92	146.81
2017	435.70	89.15	346.56
2018	729.34	108.98	620.35
2019	1,098.00	129.48	968.52
2020	1,541.88	150.67	1,391.21
2021	2,216.23	172.53	2,043.70
2022	3,124.55	195.04	2,929.51
2023	4,269.57	218.14	4,051.43
2024	5,653.71	241.80	5,411.91
2025	7,279.36	265.94	7,013.42
2026	9,148.76	290.46	8,858.29
2027	11,329.20	315.22	11,013.98
2028	13,824.31	340.13	13,484.18
2029	16,637.91	369.41	16,268.50
2030	19,753.03	352.36	19,400.67
2031	23,101.19	352.25	22,748.94
2032	26,687.80	349.97	26,337.83
2033	30,324.67	345.52	29,979.14
2034	34,012.78	338.88	33,673.90
2035	37,768.05	330.11	37,437.94
2036	41,620.37	319.31	41,301.06
2037	45,420.09	306.63	45,113.46
2038	49,176.29	292.11	48,884.19
2039	52,897.63	275.69	52,621.95
2040	56,590.90	257.36	56,333.54
2041	60,289.89	237.19	60,052.70
2042	64,036.91	215.20	63,821.72
2043	67,777.06	191.38	67,585.68
2044	71,520.74	165.45	71,355.29
Cumulative	758,554.48	7,370.51	751,183.97

Table B13. Benefit-Cost Ratios

Center for Economic and Financial Research and Studies
Cairo University

	1996 Results (10% discount rate)	2000 Results (10% discount rate)	2014 Results (10% discount rate)
Health	1.74	9.41	12.08
Education	6.64	19.20	25.47
Food Subsidy	1.76	6.02	8.99
Water, sanitation, and other Utilities	9.23	5.64	
Housing	7.22		
Housing and Utilities			6.24
Total	26.59	40.27	52.78