EFFECTS OF RESULTS-BASED FINANCING INTERVENTION ON TECHNICAL EFFICIENCY OF HEALTH SERVICES IN AFGHANISTAN

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for the Degree of Master of Science Program in Health Economics and Health Care Management
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ผลของรูปแบบการจ่ายเงินตามผลลัพธ์ต่อประสิทธิภาพทางเทคนิค ของการให้บริการสุขภาพในประเทศอัฟกานิสถาน

นายนะจีบูลลาห์ โอชาง

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
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Thesis Title	EFFECTS OF RESULTS-BASED FINANCING INTERVENTION ON TECHNICAL EFFICIENCY OF HEALTH SERVICES IN AFGHANISTAN
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Field of Study	Health Economics and Health Care Management
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นายนะจีบูลลาห์ โอชาง: ผลของรูปแบบการจ่ายเงินตามผลลัพธ์ต่อประสิทธิภาพทางเทคนิคของการให้บริการสุขภาพในประเทศอัฟกานิสถาน (EFFECTS OF RESULTS-BASED FINANCING INTERVENTION ON TECHNICAL EFFICIENCY OF HEALTH SERVICES IN AFGHANISTAN) อ. ที่ปรึกษาวิทยานิพนธ์หลัก: รศ.ดร. ศิริเพ็ญ ศุภกาญจนกันติ, 88 หน้า.

รัฐบาลอัฟกานิสถานได้นำร่องรูปแบบการจ่ายเงินตามผลลัพธ์ (RBF) เพื่อปรับปรุง ตัวชี้วัดสภาวะสุขภาพ ของแม่และเด็ก และคุณภาพของการบริการด้านสุขภาพโดยใช้ Data Envelopment Analysis (DEA) ในการวิเคราะห์และเปรียบเทียบ ประสิทธิภาพทางเทคนิคของ RBF intervention ในสถานบริการสาธารณสุขกับสถานบริการสาธารณสุขที่ไม่มี RBF intervention ในการให้บริการทางสุขภาพตามชุดบริการสุขภาพขั้นพื้นฐาน (Basic Package of Health Services (BPHS)) ในประเทศอัฟกานิสถาน ระยะเวลาในการศึกษาคือหนึ่งปี(กรกฎาคม 2554 - มิถุนายน 2555) ใน 372 สถานบริการสาธารณสุข ส่วนการวิเคราะห์ปัจจัยที่มีผลต่อ ประสิทธิภาพทางเทคนิคในการให้บริการสุขภาพขั้นพื้นฐานได้ใช้แบบจำลองสมการถดถอย ในการวิเคราะห์ประสิทธิภาพทางเทคนิคของสถานบริการสาธารณสุขภายใต้รูปแบบการจ่ายเงินตามผลลัพธ์และกลุ่มควบคุม

สถิติเชิงพรรณนาแสดงให้เห็นว่าปัจจัยการผลิตที่มีความคล้ายคลึงกัน ทั้งกลุ่มทดลอง และกลุ่มควบคุม ได้ให้ค่าเฉลี่ยการให้บริการในศูนย์บริการสาธารณสุขพื้นฐาน (BHC) ในกลุ่มทดลองพบว่ามีค่าสูงกว่าของกลุ่มควบคุม อย่างมีนัยสำคัญทางสถิติ ($p < 0.05$) กล่าวคือมีค่าสูงกว่า 10% สำหรับผู้ป่วยนอก 24% สำหรับการฝากครรภ์ 21% สำหรับการดูแลหลังคลอด และ 29% สำหรับการส่งต่อ

การวิเคราะห์ DEA โดยจำแนกตามประเภทของสถานบริการสุขภาพที่ดำเนินการและแสดงให้เห็นว่าโดยเฉลี่ยกลุ่มทดลองของโรงพยาบาลชุมชน มีประสิทธิภาพทางเทคนิค โดยใช้รูปแบบผลตอบแทนต่อขนาดคงที่ (Technical Efficiency Constant Return to Scale (TECRS)) เป็น 87%; สำหรับประสิทธิภาพทางเทคนิคโดยใช้รูปแบบผลตอบแทนต่อขนาดแปรผัน (Technical Efficiency Variable Return to Scale (TEVRS)) เป็น 95.2%; และมีประสิทธิภาพของขนาด (Scale Efficiency (SE)) เป็น 90.7% เมื่อเทียบกับกลุ่มควบคุมซึ่งชี้ให้เห็นว่าต้องปรับปรุง 9% ใน TECRS และ 8.7% ใน SE นอกจากนั้นโรงพยาบาลชุมชนสามแห่งในกลุ่มทดลองใช้ระบบ RBF และ โรงพยาบาลหนึ่งแห่งจากกลุ่มควบคุม มีคะแนนประสิทธิภาพเต็ม หมายถึงทั้ง TECRS, TEVRS and SE (50% และ 16% ตามลำดับ) ผลการศึกษาแสดงให้เห็นว่า 20 จาก 92 BHCs ในกลุ่มทดลองมีคะแนนประสิทธิภาพเต็มเมื่อเทียบกับ 12 จาก 92 BHCs ในกลุ่มควบคุม (22% และ 13% ตามลำดับ)

คุณภาพของการให้บริการด้านสุขภาพ และจำนวนของสถานบริการสาธารณสุขที่ตั้งอยู่ในพื้นที่เขตเมือง มีความสัมพันธ์อย่างมีนัยสำคัญทางสถิติในเชิงบวกกับคะแนนประสิทธิภาพทางเทคนิคสำหรับสถานบริการสาธารณสุข อย่างไรก็ตามพบว่า RBF Intervention ไม่ส่งผลต่อคะแนนประสิทธิภาพทางเทคนิคสำหรับสถานบริการสาธารณสุขอย่างมีนัยสำคัญทางสถิติที่ 5%

สาขาวิชา เศรษฐศาสตร์สาธารณสุขและการจัดการบริการสุขภาพ ลายมือชื่อนิสิต ……..

ปีการศึกษา 2555 ลายมือชื่อ อ. ที่ปรึกษาวิทยานิพนธ์หลัก.....

#5485619329: MAJOR HEALTH ECONOMICS AND HEALTH CARE MANAGEMENT
KEYWORDS: TECHNICAL EFFICIENCY/DATA ENVELOPMENT ANALYSIS/ RESULT-BASED FINANCING INTERVENTION/HEALTH SERVICES/ AFGHANISTAN

NAJEEBULLAH HOSHANG: EFFECTS OF RESULTS-BASED FINANCING INTERVENTION ON TECHNICAL EFFICIENCY OF HEALTH SERVICES IN AFGHANISTAN. ADVISOR: ASSOC.PROF. SIRIPEN SUPAKANKUNTI, Ph.D., 88 pp.

The government of Afghanistan has been piloting a Result-Based Financing (RBF) Intervention to improve key maternal and child health indicators and the quality of health services. Data Envelopment Analysis (DEA) was used to analyze and compare the relative technical efficiency of the RBF intervention in health facilities and their associated control facilities for delivering the Basic Package of Health Services (BPHS) in Afghanistan. The study period is one year (July 2011-June 2012) in 372 health facilities. In the following stage, regression analysis was used to determine the factors of technical efficiency in the BPHS facilities.

The descriptive statistics show that with similar inputs across both treatment and control arms, average outputs in Basic Health Centers (BHC) were higher for the treatment arm compared to the control arm, with statistical significance ($p < 0.05$): 10% for outpatient visits, 24% for antenatal care, 21% for postnatal care and 29% for institutional deliveries.

A separate DEA analysis based on the type of each health facility was conducted and showed that on average the treatment arm of district hospitals' technical efficiency constant return to scale (TECRS) was 87%; for technical efficiency variable return to scale (TEVRS) was 95.2%; and scale efficiency (SE) was 90.7%, which indicates a 9% improvement in TECRS and 8.7% in SE compared to the control arm of district hospitals. Three district hospitals from the treatment arm and only one hospital from the control arm had full efficiency scores (50% and 16%, respectively). The findings also showed that out of 92 BHCs in the treatment arm, twenty fully efficient compare to 12 out of 92 BHCs in the control arm (22% and 13%, respectively).

The quality of health services and the number of health facilities located in urban areas were significantly positive correlated with health facility technical efficiency scores, while the RBF impact was not statistically significant on technical efficiency of health facilities with 5 per cent level of significant.

Field of Study: Health Economics and Health Care Management Student's Signature…….
Academic Year: 2012 ..... Advisor's Signature……...

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LIST OF ABBREVIATIONS

ANC	Antenatal Care
BHC	Basic Health Centre
BPHS	Basic Package of Health Services
CHC	Comprehensive Health Centre
CRS	Constant Return to Scale
DEA	Data Envelopment Analysis
DH	District Hospital
DMUs	Decision Making Units
DRS	Decreasing Return to Scale
EPHS	Essential Package of Hospital Services
HMIS	Health Management Information System
HP	Health Post
IRS	Increasing Return to Scale
MDG	Millennium Development Goal
MoF	Ministry of Finance
MoPH	Ministry of Public Health
NGO	Non-Government Organization
OLS	Ordinary Least Square
RBF	Results Based Financing
SBA	Specialized Birth Attendance
SE	Scale Efficiency
SM	Strengthening Mechanism
TB	Tuberculosis
TECRS	Technical Efficiency under Constant Return to Scale
TEVRS	Technical Efficiency under Variable Return to Scale
VRS	Variable Return to Scale
WB	The World Bank
WHO	World Health Organization

CHAPTER I
INTRODUCTION

1.1. Problem and Significance

Afghanistan has a total population of 25,000,000, of which only 20% is urban (WHO, 2010). It is a landlocked country in South-Central Asia neighbored with Turkmenistan, Uzbekistan and Tajikistan in the north, Iran in the west, China in the northeast and Pakistan in the south and east (Figure 1.1). At 249,984 sq mi (647,500 km), summers are hot and winters are cold in Afghanistan. Afghanistan consists of 34 provinces and twelve ethnic groups, Pashtoons (38%) and Tajiks (27%) are the dominant ones. More than 50% of the population speaks Dari (Persian) and 35% speaks Pashto. The majority of the population (84%) is Sunni Muslim and 15% Shi'a Muslim (CIA, 2011).

With reference to health indicators, life expectancy at birth is 45 years for women and 47 for men (ANDS, 2007). The under-one and under-five mortality rates are 111/1000 and 161/1000 live births (NRVA, 2009), and maternal mortality ratio is 327/100000 live births (MoPH, CSO, ICF, IIHMR and WHO, 2010). Whilst acute malnutrition is considered relatively low, chronic malnutrition in terms of prevalence of underweight children and stunting is estimated at 40% and 54% respectively. With a current GDP (Gross Domestic Product) per capita of USD 329, the total public health expenditure as percentage of GDP accounts for 3% of the overall operating budget and 5% of the development budget (ANDS, 2007).

In the last 3 decades, Afghanistan' has endured some of the roughest times of its history. In 1978 the communist regime took the power, leading to an invasion of the former Soviet Union military troops. It was the beginning of the conflict, insecurity, instability and severe war in Afghanistan. The communist regime remained in power until 1992, and during the 13 years of its ruling it hardly contributed to the welfare of the people due to the war economy and the fight against the Mujahedeen, the freedom fighters. After taking the power in 1992, a coalition of Mujahedeen factions brought Afghanistan into a new time of conflict , this time a civil war and inter-Mujahedeen fighting, which went on until 1996.

The Taliban ruled the country from 1996 to November 2001. The Taliban showed little interest in the health sector (Sondorp, 2002). In December 2001, the Taliban regime collapsed and a new democratic government was established.

In 2002, the level of health services was shocking. Unavailability of a policy framework, inequalities in health service provision across the country, low capacity of public and private sectors, shortage of health human resources, differences in the quality of the services, the absence of infrastructure, and lack of coordination were overriding the situation (Waldman, R., Strong, L. and Wali, A., 2006).

Soon after the collapse of the Taliban regime and the establishment of the new government, the ministry of health of Afghanistan identified its major requirements to address the most urgent problems. Hence, a basic package of health services (BPHS) was developed in March 2003. The key components of the BPHS focused on services that tackled the major health problems, services that were cost-effective and that could be equally accessed by both rural and urban populations (MoH, 2003). Shortly after its implementation the number of Afghan population that benefited from the BPHS increased significant.

Figure1.1 Map of Afghanistan

Source: The World Fact Book: Afghanistan (CIA, 2011)

1.1.1 Structure of the Health Care Services (HCS) delivery systems in Afghanistan:

The structure of the HCS system in Afghanistan is traditional. At the most peripheral level, community health workers (CHWs) who are non-health professionals with limited but highly targeted training are the initial point of contact for individuals seeking health care services. The sub-centre (SC) and basic health centre (BHC), formal structures maintained by the ministry of public health (MoPH), are staffed by health professionals and provide, at a minimum, all of the services that comprise the BPHS. Comprehensive Health Centres (CHCs), the next level of the system, provides the BPHS and additional services including minor and essential surgery. The District and Provincial Hospitals offer a broader array of more sophisticated medical care and, at the pinnacle of the healthcare services pyramid, tertiary hospitals in the major urban areas provide the most sophisticated care available in Afghanistan's public health services. There is a large private and traditional health sector in Afghanistan as well. Following types of health facilities are used (MoH, 2003):

1.1.1.1 **Health Post (HP):** At the community level, basic healthcare services are delivered by CHWs from their own homes, which is function as community HPs. A HP, ideally staffed by one female and one male CHW, HP is cover a catchment area of 1,000-1,900 people, which is equivalent to 100-150 families.

1.1.1.2 **Sub-Centre:** Sub-centres is established to cover a population from 2,000 to 15,000. The MOPH has established these sub-centres in the private houses. A Sub-Centre is staffed by one male nurse and one community midwife (CMW).

1.1.1.3 **Basic Health Centre (BHC):** The BHC is a small facility offering the same services as a Sub-Centre but with more complex outpatient care. The BHC is supervising the activities of the HPs in its catchment area. The service of the BHC covered a population of 15,000-30,000 people, depending on the local geographic conditions and the population

density. The minimal staffing requirements for a BHC are a nurse, a CMW, and two vaccinators. Depending on the scope of services provided and the workload of the BHC, up to two additional Health Care Workers (HCWs) can be added to perform well defined tasks.

1.1.1.4 **Comprehensive Health Centre (CHC):** The CHC covers a larger catchments area of 30,000-100,000 people, offering a wider range of services than the BHC. The facility has limited space for inpatient care, but has a laboratory. The staffs of a CHC are also larger than that of a BHC, including both male and female doctors, male and female nurses, midwives, and lab and pharmacy technicians.

1.1.1.5 **District Hospital (DH):** At the district level, the DH handles all services in the BPHS, including the most complicated cases. The hospital is staffed with doctors including female obstetricians/gynaecologists; a surgeon, an anaesthetist and a paediatrician; midwives; lab and X-ray technicians; a pharmacist; and a dentist and dental technician. Each DH covers an approximate population of 100,000-300,000 people in one to four districts.

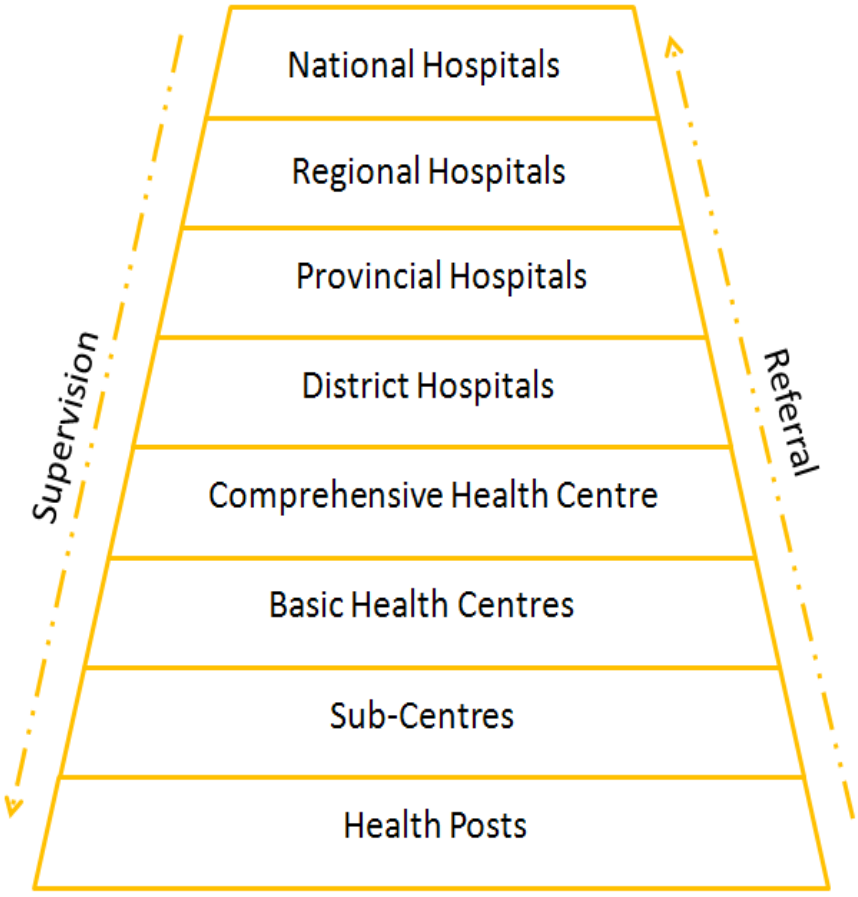
1.1.1.6 **Provincial hospital (PH):** The PH is the referral hospital for the Provincial Public Health (PPH) Care System. In essence, the PH is not very different from a DH: it offers the same clinical services and possibly a few additional specialties. In most cases, the PH is the last referral point for patients referred from the districts. In some instances, the PH can refer patients to higher levels of care to the regional hospital or to a specialty hospital (SH) in Kabul. Figure1-2 shows the continuum of care in Afghanistan health system.

1.1.1.7 **Regional Hospital (RgH):** The RgH is primarily a referral hospital with a number of specialties for assessing, diagnosing, stabilizing and treating, or referring back to a lower level hospital. The RgH provides professional inpatient and emergency services at a higher level than is

available at DHs and PHs, yet the overall objective remains the reduction of the high maternal mortality (MMR), infant mortality (IMR), and under 5 mortality (U5MR), and of other diseases and conditions responsible for Afghanistan's high mortality and morbidity.

1.1.1.8 **National Hospitals (NH):** NHs or specialty Hospitals (SHs) are referral centres for tertiary medical care and are located primarily in Kabul. They provide education and training for health care workers and act as referral hospitals for the PHs and RgHs.

Figure1.2 Afghanistan Health System Pyramid



Source: Afghanistan HNSS 2009/13 (HNSS, 2008)

Table 1.1 Afghanistan health facilities by Type

Health Facilities	Total Health facilities	RBF Health Facilities
Sub Centre	470	108 (29%)
Basic Health Centre	808	184 (50%)
Comprehensive Health Centre	384	68 (18%)
District Hospital	68	12 3%)
Provincial Hospital	29	0
Regional Hospital	5	0
National Hospital	4	0
Total	**1708**	**372**

Source: MoPH HMIS data base Jan 2012

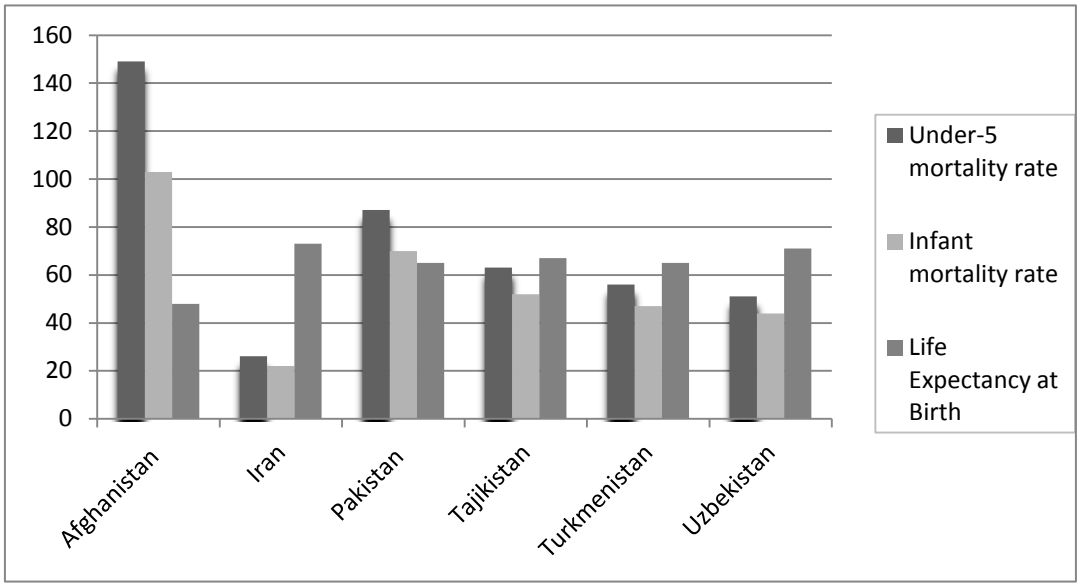
1.1.2 Comparison with Countries of the Region:

It is quite difficult to compare the health parameters of Afghanistan with those of its neighbouring countries. One might think of Pakistan and Iran as the closest neighbours, but neither has endured very recent conflict of the magnitude or duration that Afghanistan has faced. Afghanistan's neighbours to the North were part of the former USSR and, although their health system may have deteriorated some since the dissolution of the Soviet Union, they also have not suffered from the destruction and total breakdown of public administration that will continue to exercise detrimental effects in Afghanistan for some years to come. Nevertheless, it is worth presenting some of the officially recognized international data from the region. Figure1-3 shows the three key health indicator of the neighbouring countries compare to Afghanistan.

Afghanistan not only trails the other countries in the region by a considerable margin, but its progress stalled completely over the last fifteen years, whilst the other countries in the regions were making reasonable advances. However, over the last few years of collecting data through active methods such as health surveys and the

Balanced Scorecard (BSC), it is evident that important health indicators in Afghanistan are no longer stagnant; in fact, the gains have been impressive.

Figure1.3 Compare of the key health indicators with neighbours



Source: UNICEF annual publication, State of the World's Children, 2012 edition

1.1.3 General overview of Results-Based Financing (RBF):

The 2015 horizon of the Millennium Development Goals (MDGs) is now only few years away and progress to date has been limited (Horton, 2008). As an example, under-five mortality has decreased by only twenty percent in Sub-Saharan Africa between 1990 and 2005, whereas the MDGs call for a two-thirds decrease by 2015 (World Bank, 2006). While official development assistance for health has increased dramatically over the last few years, health outcome indicators have not seen balanced improvements. Some explanations for this are that public spending often benefits richer groups disproportionately, resources do not reach frontline providers and health worker productivity and morale is low, often plagued by absenteeism (World Bank, 2004).

Promoting the use of results-based financing (RBF) is one of the five actions being taken as part of the Global Campaign for the Health Millennium Development Goals. This is based on an assumption that the evidence suggests that small financial incentives targeted at the right level are enough to change behavior significantly and

achieve results. The Global Campaign, in a brochure describing its launch refers to linking funding to measurable results (Filmer, D., Hammer, J. and Pritchett, L., 1998). Three examples are given: subsidies for transportation to encourage mothers to give birth in health facilities as part of the Accredited Social Health Activists **(**ASHA) scheme in India (World Bank, 2007), payments from the national government to municipalities in Rwanda based on how many children sleep under mosquito nets, and payments by GAVI to countries for each additional child immunized. The World Bank, in its proposal to the Norwegian Government for a Health Results Innovation Grant with the goal of targeting and sustaining financing for the achievement of Millennium Development Goal (MDG) 4 and 5 results through RBF, defines RBF as "the provision of payment for the attainment of well-defined results" (Lu, C., Michaud, CM., Gakidou, E., Khan, K. and Murray, C.T., 2006)

RBF provides financial incentives to healthcare providers to improve performance measured by specific utilization and quality of care indicators. RBF can affect health care in two ways; first by providing incentives for providers to put more effort into specific activities, and second by increasing the amount of resources available to finance the delivery of services. Proponents of the approach highlight that RBF strengthens the link between resources and productivity, and provides incentives to increase the quantity and quality of services supplied; a highly desirable outcome in developing countries where utilization of critical life saving services is still very low. A number of low-income countries are piloting or scaling up RBF, including Afghanistan, Argentina, Democratic Republic of Congo, Benin, Eritrea, Ghana, Haiti, Indonesia, Kyrgyz Republic, Rwanda, and Zambia (World Bank, 2007).

1.1.4 Result Based Financing in Afghanistan:

There are number of projects that have been using RBF schemes in Afghanistan. Non-governmental organizations (NGO) in Afghanistan have used non-monetary goods such as well-baby delivery kits and other performance payments for mothers to deliver using a skilled birth attendant. They have also paid community health workers (CHW) for referring women to the health facility for deliveries using contraception, for tuberculosis case detection, etc. These schemes, however, have not been evaluated formally to show their efficiencies and impact on health outcomes.

A multi-donor trust fund is supporting the Ministry of Public Health (MoPH) to implement supply-side RBF that targets improve millennium development goals (MDGs) 4 and 5. In fact, RBF intervention in Afghanistan is complimentary to the existing performance based systems and is implemented within the framework of the exiting health system. The general objective of the RBF intervention is to MDG 4 (improve child health) and MDG 5 (reduce maternal mortality) by implementing interventions that provide performance payments for health workers in order to: i) Increase key maternal and child health outputs; ii) Further improve the quality of health care services; and iii) Ensure that patients and communities are increasingly involved and satisfied with the publicly financed health services they receive (MoPH, 2010).

Over the last nine years, the delivery of Basic Package of Health Services (BPHS) services has improved considerably in Afghanistan as demonstrated by household surveys and facility surveys. While coverage of services and quality of care has significantly improved, household surveys continue to show that the coverage of important preventive, promotive, and curative services remains low by global standards (Johns Hopkins University and Indian Institute of Health Management and Resarch, 2006). Whereas the use of modern contraceptives in rural Afghanistan has increased more than threefold, from 5% as estimated from the Multiple Indicator Cluster Survey in 2003 (CSO, 2003) to 16% as shown by the Afghanistan Health Survey (Johns Hopkins University and Indian Institute of Health Management and Resarch, 2006)in 2006, the absolute levels of contraceptive prevalence rate (CPR) are still very low. Trends in antenatal care (ANC) use in rural Afghanistan show more than six-fold increase from 5% (CSO, 2003) to 32% (Johns Hopkins University and Indian Institute of Health Management and Resarch, 2006). Though the proportion women who delivered under the attention of skilled practitioner has increased to about 19%, Afghanistan still also has one of the highest maternal mortality ratios (MMR) worldwide at 327 per 100,000 live births according to Afghan Mortality Survey 2010 (MoPH, CSO, ICF, IIHMR and WHO, 2010). Diphtheria Pertussis Tetanus (DPT) coverage is commonly used as a measure of the effectiveness of the routine health care system in delivering immunization services. Over 60% of 12-23 month olds received DPT1. However, with the second dose of

DPT there is a 12 percentage point drop in coverage and with the third dose there is a further 14 point drop to 34.6%. These declines in DPT coverage indicate that there are opportunities missed by the health care system.

Improvements in maternal and child health are the cornerstone of the Health and Nutrition Sector Strategy of MoPH. There are factors at both the household and facility level that contribute to low utilisation rates such as i) motivational problems amongst providers; ii) quality of patient-provider interactions; iii) hours of operation of the health facilities (HF) and; iv) others including travel time to the HF, and social and cultural factors. Hence, linking payment to health providers with their performance in the amount and quality of the services they provide could address the first three problems. This method of linking health outputs to performance is called results-based financing (RBF) (MoPH, 2010).

The general objective of the RBF intervention in Afghanistan is to improve millennium development goals (MDG) 4 (to reduce child mortality by increasing the coverage of vaccination) and MDG 5 (improving women's health by improving the access of women to antenatal care, postnatal care and skilled birth attendance care) to improve the health services by implementing RBF interventions that provide performance incentive payments for health workers in order to:

- Increase key maternal and child health outputs;
- Further improve the quality of health care services;
- Ensure that patients and communities are increasingly involved; and
- Satisfied with the publicly financed health services they receive.

The MoPH provide 10% additional financing for the BPHS implementers for implement the RBF in 9 provinces of Afghanistan.

The RBF intervention meant to increase the technical efficiency of health facility. This paper is trying to explore and analysis the technical efficiency of BPHS facilities in intervention provinces and to determine the factors associated with efficiency.

The scale efficiency score should be used for policy maker for upgrading or downgrading the type of health facilities.

1.2. Research Question

The question of interest of this study is to know the technical efficiency of RBF intervention in the delivering BPHS in the treatment group compare to control group; in nine intervention provinces of Afghanistan (Samangan, Panjshir, Bamyan, Jawzjan, Balkh, Saripul, Parwan, Takhar and Badakhshan).

Inclusion criteria: All treatment and control BPHS health facilities located in 9 provinces of RBF intervention.

Exclusion criteria: HFs which does not have matched pairs excluded from study.

Furthermore, this study identifies the factors affecting technical efficiency of the BPHS facilities:

The primary research question for the study is:

What is the technical efficiency of Result Based Financing (RBF) intervention in the treatment facilities (arm) compare to control facilities (arm) delivering BPHS in intervention provinces of Afghanistan?

Secondary research questions include:

- Are there significant differences in technical efficiency between the RBF treatment and control arms?
- What explanatory variables do affect the technical efficiency scores in the delivering BPHS in intervention provinces of Afghanistan?

1.3. Research Objectives

The general objective of this study is;

To analyze and compare technical efficiency of RBF intervention for delivering the BPHS; in intervention provinces of Afghanistan

Specific Objectives

- To analysis if there is a significant efficiency differences between the treatment and control arms; and
- To determine the factors of efficiencies in BPHS health facilities under RBF treatment and control arms in intervention province of Afghanistan.

1.4. Scope of the Study

The study utilizes data collected as part of the RBF intervention from nine provinces of Afghanistan (Samangan, Panjshir, Bamyan, Jawzjan, Balkh, Saripul, Parwan, Takhar and Badakhshan) to analysis technical efficiency using DEA technique at the health facility level comparing the treatment and control arms. In total, data were collected from 372 health facilities over a one year period (July 2011 –June 2012).

1.5. Possible Benefits

The study enhances the Ministry's understanding of issues related to health service utilization and implementation of the Result Based Financing project. It is anticipate that based on the study results, MoPH and donors may adapt health financing strategies and develop innovative ways to increase service utilization.

Finding helps the policy makers and international partners in the design of future health service delivery structure. In particular, the study seeks to guide decisions regarding financing mechanisms to increase levels of outputs. Finally the efficiency result contributes for improvement of health services provision by identifying less efficient health facilities and factors that affect the efficiency.

CHAPTER II

LITERATURE REVIEW

There are three most important themes for conducting literature review in this study as follow;

- To elaborate the concept of efficiency itself with focusing on efficiency in primary health care;
- To explore the appropriate technique for efficiency measurement of primary healthcare and
- To lesson and learn from similar conducted studies and avoid making mistake.

2.1. Concept of efficiency

Farrell defines efficiency as the conversion of inputs into outputs. Maximizing efficiently, then, is the production of the greatest amount of goods or feasible services using a certain combination of factors or inputs. There common efficiency measures includes: allocative efficiency, technical efficiency and overall efficiency (Farrell, 1957).

Allocative efficiency measures the ability of firms to use resources in optimal to produce different outputs. Technical efficiency describes the ability of a firm to maximum production with the least cost. In health care, technical efficiency is the ability to transform multiple resources (number of medical doctor, paying incentive to health workers, pharmaceutical and supply) into multiple output services (number of patients visit by medical staffs, safe delivery, ante-natal care, postnatal care and vaccination to children).

Finally, overall efficiency, measures the combined effects of allocative efficiency and technical efficiency (Coelli, 1996).

Technical efficiency is related to the productivity of inputs (Sathye, 2001). As a result, technical efficiency in health care is ability to transform multiple resources (number of medical doctor, paying incentive to health workers, pharmaceutical and supply) into multiple output services (number of patients visit by medical staffs, baby delivery, anti natal care, post natal care and provide vaccination to childers).

This norm in the technical efficiency is that the least amount of resources should be used for a given amount of output or the maximum level of output should be produced from fixed amount of resources. Whenever, further uses inputs than necessary for produce of given level of output, this indicate waste of resources and inefficiency. Similarly, less production of out from given amount of input is inefficiency.

Three following scenarios describe the expected association between input and outputs (Schiller, 2003);

- Constant Returns to scale (CRS): A proportionate increase in all inputs simultaneously resulting in the same proportionate increase output;
- Decreasing Returns to Scale (DRS): A proportionate increase in all inputs simultaneously resulting in a less proportionate increase output and
- Increasing Returns to Scale (IRS): A proportionate increase in all inputs simultaneously resulting in a greater than proportionate increase output.

A measure of technical efficiency under the assumption of CRS is measurement of overall technical efficiency. The overall technical efficiency measurement helps to determine inefficiency due to the input and output arrangements as well as the size of operations. The pure technical efficiency estimates a firm's efficiency from the frontier under the assumption of variable return-to-scale. It is a measure of technical efficiency without scale efficiency and purely reflects the managerial performance to organize inputs in the production process. Thus, pure technical efficiency measurement technique is used as an index to capture managerial performance (Coelli, 1996).

Scale efficiency, on the other hand, is the ratio of overall technical efficiency to pure technical efficiency is scale efficiency measure. The measure of scale efficiency provides the ability of the management to choose the optimum size. Those health centres with CRS can to be operating at their most productive scale sizes. Health facilities with DRS should scale down in input as well as outputs but IRS health facilities IRS should expand in both input and outputs to become scale efficient (Coelli, 1996).

The classic method for measuring of a firm or health centres efficiency in health economics is the traditional productions frontier approach based on the statistical and economics principles.

2.2. Efficiency measurement

It is easy to measure efficiency in goods producing industry where inputs and outputs can be determined by prices but the measuring efficiency is much complicated in the service industry where the measurement yardstick is not clear. The measurement of efficiency in the public health where profit is not the objective would be much difficult (Mensah, Y. and Li, S, 1992).

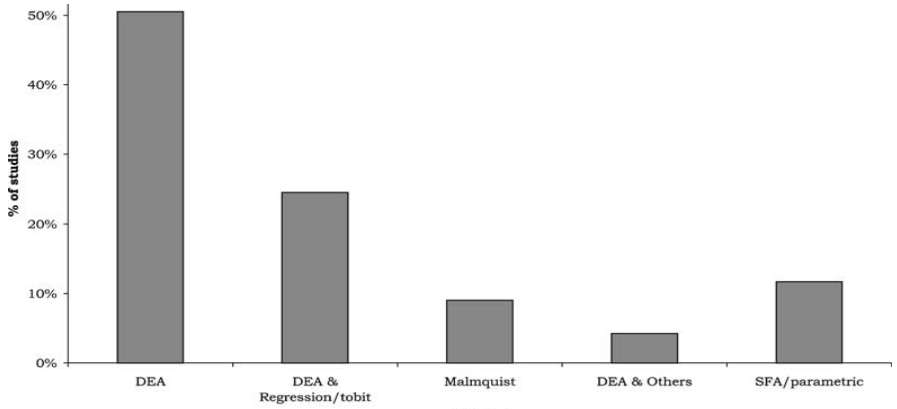
Generally, there are four techniques for measuring the efficiency. They are as follow (Hollingsworth, 2003):

1- Deterministic: This method does not contain random error component. Therefore, they may be sensitive to extreme observations since they assume that the observed distance to the frontier is due to inefficiency.
2- Parametric: Parametric techniques are regression-based approaches. Parametric techniques are subject to model misspecification.
3- Stochastic. Stochastic methods are less sensitive to outliers since part of the distance to the frontier can be attributed to random error. However, the model is limited one output.
4- Non-parametric: Non-parametric methods like DEA is a linear programming that measuring the relative performance ratio of outputs to inputs for each unit health units, with the score of zero to one or zero percent to hundred percent.

Between four different methods mentioned non-parametric method such as DEA which can measures the efficiency of multiple inputs and multiple outputs is the most appropriated for this study.

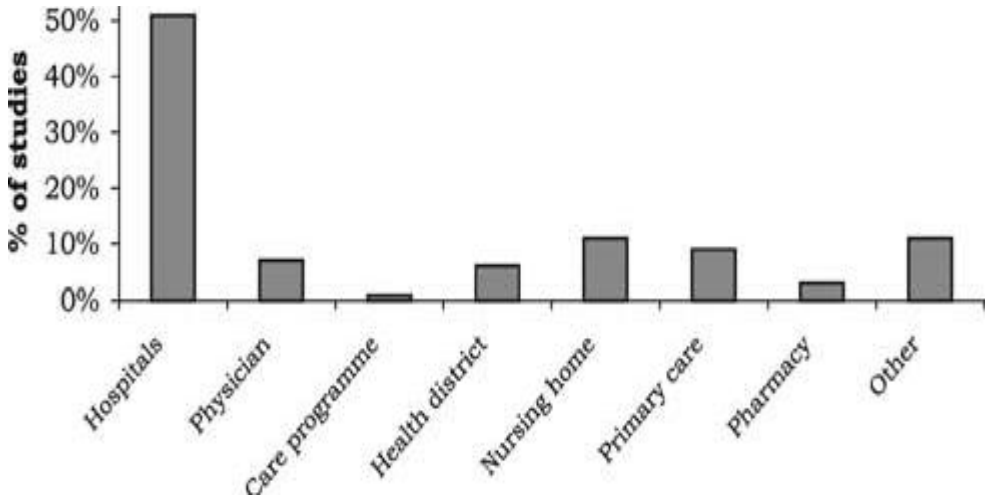
In last twenty years, both non-parametric and parametric methods have been increasingly used to measure the efficiency of health service performance.

Figure 2.1 Methods used in reported 188 efficiency studies



Source: Non-Parametric and Parametric Applications Measuring Efficiency in Health Care (2003)

Figure 2.2 Areas of application in health care



Source: Non-Parametric and Parametric Applications Measuring Efficiency in Health Care (2003)

According to Banker, Charnes, Cooper and Maindiretta (Banker, R.D., Charnes,A., Cooper, W.W. and Maindiretta, A, 1988) non parametric methods has a definite advantage greater than parametric method. First of all non parametric like DEA does not impress any assumption or functional form on the relationship between inputs and outputs. It is important when relation between inputs and outputs is not well-known. Secondly, DEA in addition to identify the efficient health facilities can calculate the degree of inefficiency. Third reason for using DEA contrast to parametric methods is the possibility of including multiple inputs and outputs in the efficiency analysis which is significant for the analysis of health facilities.

Measurement of efficiency by DEA technique is the degree of achievement with which a health facility uses its inputs/resources x to produce outputs y of a given quality and can be categories efficiencies and inefficiencies health facilities.

DEA evaluates relative efficiency of each set of homogeneous Decision-Making Units (DMUs). In the healthcare system each health facility is defined as one DMU.

The relative efficiency of a DMU is the ratio of the sum of its weighted outputs on the sum of weighted inputs.

The efficient frontier is constructed from a combination of inputs and outputs from the best performing health facility. Health facility technical efficiency is calculating the space from frontier. The inefficiency scare variation is from zero to one.

Health facility technical efficiency score is the weighted sum of outputs divided by the weighted sum of inputs. Individual technical efficiency is computed with following formula (Osei, D et al, 2005);

$$\text{Health facility Technical Efficiency Score} = \frac{\text{Weighted sum of outputs}}{\text{Weighted sum of inputs}}$$

For the first time Data Envelopment Analysis (DEA) introduce by Charnes, Cooper and Rhodes (Charnes, A., Cooper, WW. and Rhodes, E., 1978), efficiency defined as a weighted sum of outputs to the weighted sum of inputs, assumed constant returns to scale.

The Charnes, Cooper, Rhodes (CCR) model will be used to measuring the overall technical efficiency (θ_K^{CCR}) under the constant returns to scale (CRS) in production.

The Banker, Charnes, Cooper (BCC) model will be used to evaluate the pure technical efficiency (θ_K^{BCC}) under non-increasing returns to scale (Banker, R. D., Charnes, A. and Cooper, W. W., 1984).

The ratio of CCR and BCC is measuring the scale efficiency.

$$SE_k = \frac{(\theta_K^{CCR})}{(\theta_K^{BCC})}$$

Banker, Charnes and Cooper developed variable returns to scale model for efficiency measurement. DEA is a non-parametric technique, which is linear programming methodology efficiency evaluation and ranking of technical and scale efficiency score of many businesses.

DEA used at first for evaluating hospital in 1986 by Banker, Conrad and Strauss in one of US hospitals but now a day it is using for measure the primary healthcare efficiency of multiple inputs and outputs model (Bhat, R., Verma, B.B. and Reuben, E., 2001).

Technical efficiency can be measure input- or output-orientation. In output-oriented technical efficiency measurement answer the question of "how much reduction necessary in input to produce without change on output" and input oriented answer the question of "how much output should be expanding without changing the quantity of inputs"

Output orientation technical efficiency method: since the most of managers have not control on the change of input especially number of staffs. In addition, RBF concept is increase the output of health facilities with same amount of input at the intervention health facilities; therefore, technical efficiency output oriented is appropriate method for this study.

Like all models, DEA has strength and limitations (Osei, D et al, 2005).

Strengths of DEA technique includes;

- Can handle multiple inputs and multiple outputs;
- Easy use and no need for explicitly mathematical form of production function;
- It is not require pre adoption of a set of functional relations among the variables;
- individual score will be achieve for individual firm;
- It can be used in any input and output measurement; and
- Measure the efficiency without information on input and output prices or cost.

Weakness of DEA technique includes (Bhat, R., Verma, B.B. and Reuben, E., 2001);

- DEA underestimates the inefficiency in small sample and within inappropriate size of a health facility (too large or too small) give result unrealistic technical inefficiency;
- DEA is measuring the relative efficiency of DMU compared with pair not compare to theoretical maximum efficiency; and
- DEA is nonparametric technique and not easy to test statically the hypothesis.

2.3. Previous efficiency studies on primary health care:

Data envelopment Analysis (DEA) has been used increasingly to measure productive performance of health care services. In particular, DEA is more commonly used to analyze hospital efficiency as well as efficiency analysis of primary health care decision-making units (DMUs) in Africa, Europe and North America.

In South Africa, Kirigia, Sambo and Scheel (Kirigia, J.M., Sambo, L.G.and Scheel, H., 2001) using DEA method to analyze technical and scale efficiencies of primary healthcare facilities and found out that 70% of facilities to be technically inefficient and 16% received less than 0.5 efficiency score. To achieve the efficiency in Kawazulu-Natal clinics, the study suggest to decrease inputs by 417 nurse and 457 general staff or increase number of ANC, delivery, child care visit, dental visit, family planning, psychiatric visit, sexually transmitted disease visit and TB visit (115534, 1010, 179075, 5702, 121658, 36032, 56068, 34270, respectively).

Similarly, in Kenya, Kirigia, Emrouznejad and Sambo (Kirigia, J.M., Emrouznejad, A.and Sambo, L.G., 2002) analyze the efficiency of 54 public hospitals in Kenya using the DEA application and showed 14 out of 45 public hospitals (26%) were technically inefficient hospitals. The study identified out the inefficient hospitals with their magnitudes of input excess to be decreased to act efficient.

Another study conducted in 2004 analyzed the efficiency of primary health facilities and founts out 56% of health facilities were technically inefficient. The study aim was to measure the technical efficiency of individual primary health care facilities in Kenya and suggest the output targets for inefficient primary health facilities. The second aim of study was to estimate the magnitudes of excess inputs and recommend decreasing the excess inputs (Kirigia, J.M., Emrouznejad, A., Sambo, L.G., Munguti, N and Liambila, W., 2004).

Olga Milliken, et al (Olga Milliken et al, 2008)compare efficiency of four different models for providing primary health care in Canada using DEA technique. The study found significant different score in each models.

Akazili, Adjuik, Appiah and Zere (Akazili, J., Adjuik, M., Appiah, C.J. and Zere, E, 2008) examined the technical and scale efficiencies of 89 health centres in Ghana. The inputs used were clinical staff, non-clinical staff, number of beds and expenditure on drugs and supplies with general outpatient, antenatal care visits, deliveries, children immunized, and family planning visits. Only 31 (35%) health centres fond out technically efficient. The average for technical inefficient health centres were 0.57 (SD = 0.19). Scale efficiency analysis indicate that 19 (21%) health centres were scale efficient, with average 0.86 (SD=14).

Performance assessment of 337 health centres in Portugal conducted by Amada and Santos (Amado, C.A and Santos, S.P, 2009) using DEA technique focused on number medical staffs health staffs on the outputs of preventive care (family planning, maternity visits and vaccination) and curative consultations by doctor and nurse at the clinic and home for different patients grouped and vaccinations given by a nurse. The mean technical efficiency score was 84.4% (SD = 14.7%). The study found out huge deviation in equity of access to services, in technical efficiency and quality of services across district health centers. The recommendation was appropriate use of inputs at the health centers for improving the health services.

Marschall and Flessa (Marschall, P and Flessa, S., 2011) used Data Envelopment Analysis (DEA) technique for calculation efficiency of primary care in rural Burkina Faso. They have used two-stage DEA based on data from a comprehensive provider and household information system and found out that inefficiency is mainly a result of poor utilization of health care facilities.

CHAPTER III

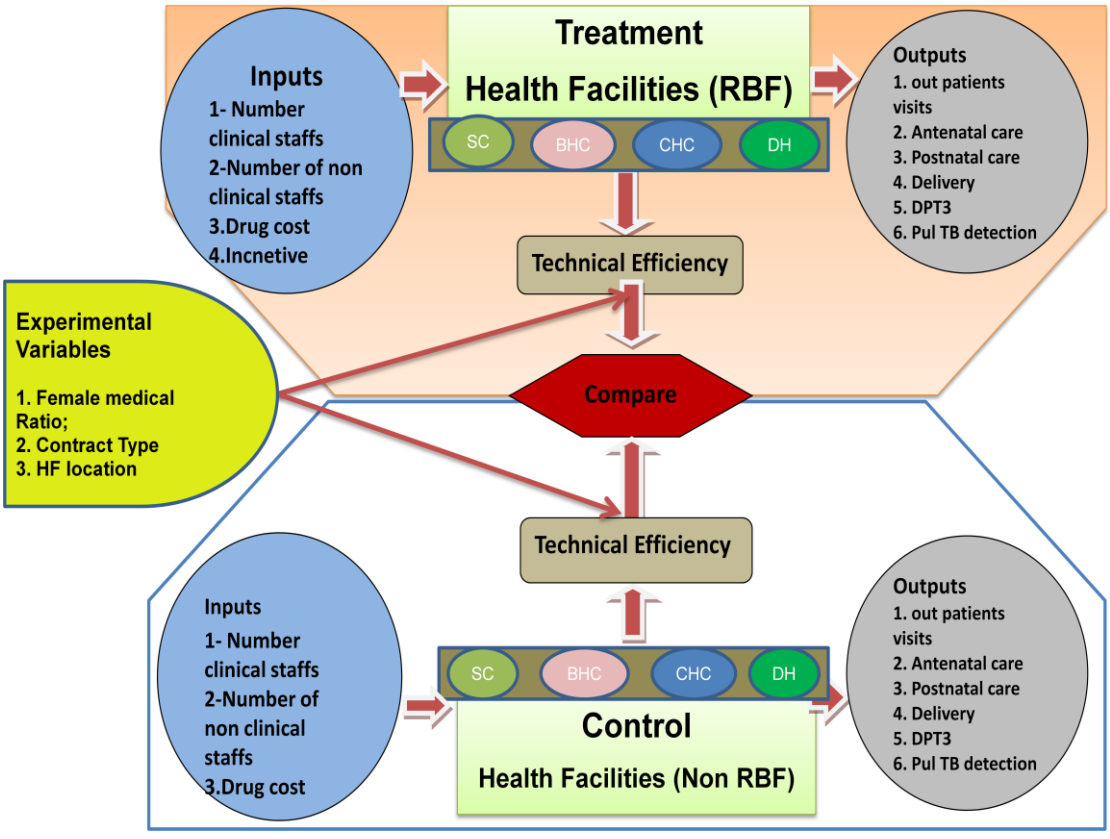
RESEARCH METHODOLOGY

The study has two stages. The first stage is using the DEA input-oriented and output-oriented technique to measure the technical efficiency of BPHS facilities, comparing the treatment arm with the control arm. Primary health care system of Afghanistan is mainly designed with fixed input and DEA output oriented determines the inefficacy health facilities in order to predict the quantity of output can increased compare to matched pair to become efficient.

The second stage is to run multiple linear regression model to examine the factors affecting (environmental variable that determinant facility efficiency) on the technical efficiency of BPHS health facilities in intervention provinces of Afghanistan.

The following conceptual framework guides the analysis of the study:

Figure 3.1 Conceptual Framework



3.1. Study Design

This study is descriptive and utilizes cross-sectional data from the Results Based Financing intervention. The two arms are as follow:

1. Treatment arms: performance-based payments are paid to health workers at BPHS facilities.
2. Control arms: no additional payments are made and operational activities follow the regular contractual arrangements.

Before implementation of RBF intervention the health facilities of each province matched based on type and last year OPD performance and each matched randomized in treatment or control arm.

3.2. Data Collection

Secondary data collected from Ministry of Public Health (MoPH) and Non Governmental Organizations (NGOs) which are the health provider at the intervention provinces of Afghanistan from July 2011 up to June 2012. Inputs data collected from Health Management Information System (HMIS); BPHS facilities registers, reports, human resources database, supervision database and HMIS reports were used to measure output and experimental variables. Table 3-1 represents the means of data collection.

Table 3.1 Means of data collection

Input	Means of data collection
1-Number of clinical staff	Human Resources Database/Health Implementer Financial Database
2-Number of non-clinical staff	Human Resources Database/Health Implementer Financial Database
3-Incnetive paid to staff in USD currency for the complete year of study	Human Resources Database/Health Implementer Financial Database
4-Pharmaceutical cost in USD currency for the complete year of study	Health Facilities Consumption Report and financial reports

Output (for period of July 2011-June 2012)	**Means of data collection**
1-Number of out-patients department (OPD) visit	Health Management Information System Reports
2-Number of antenatal care (ANC)	Health Management Information System Reports
3- Number of postnatal care (PNC)	Health Management Information System Reports
4- Number of delivery assist by health facility staff	Health Management Information System Reports
5-Number of children received DPT3 vaccine	Health Management Information System Reports
6- Number of pulmonary tuberculosis detection	Health Management Information System Reports
Experimental variables	**Mean of data collection**
1-Ratio of female medical staff	Health Management Information System Reports
2-HF location (Urban/rural)	Health Management Information System Reports
3-Contract type of health facility	Health Management Information System Reports
Efficiency Analysis	**Means of measuring**
1-Technical Efficiency of health facilities Regression Analysis: Ordinary Least Squares(OLS)	Data Envelopment Analysis 2.1 Stata 11

3.3. Selection of inputs and outputs data

Number of resource which were used by health facilities for complete one year of study were included as input because health facilities transferred resources (inputs) to produced outputs, similarly, all health facilities outputs were included for efficiency measurement of health facilities. Of course the services might be produced at different levels of quality. In addition, environmental factors (experimental

variables) which may have affected on the production of outputs were identified and included in the efficiency/inefficiency measurement. However availability and reliability of data has been considered. For better computational efficiency number of inputs and outputs in total are not more than one third of the health facilities which is being analyzed. (Charnes, A., Cooper, W., Lewin, A. and Seiford, L, 1995).

Health facilities in Afghanistan are providing the following services (MoH, 2003):

- Maternal and Newborn Health;
- Child Health and Immunization;
- Public Nutrition;
- Communicable Disease Treatment;
- Mental Health;
- Disability Services and
- Regular Supply of Essential Drugs.

There are some differences in providing services between type of health facilities, which are mainly availability of laboratories (CHC) and X-ray services and emergency surgery (DH) while the others do not. Given that not all activities are available in every health facilities for this study, the common resources and activities which are available in all type of health facilities selected as input and output.

DEA technique required homogeneous data, therefore, only the primary care sites data selected for efficiency measurement and run separate DEA according type of health facility and run combined DEA.

However, the objective of RBF is to increase the output of maternal and newborn health, child health, immunization and quality of health service by incentivized additional services, strengthen of monitoring and supervision (MoPH, 2010).

The inputs that are commonly used in the efficiency measurement are labour (doctors, nurses, physicians, and other medical, administrative and supportive staffs) and capital inputs (land, buildings, medical and equipment).

In this study inputs includes labour (clinical and non-clinical staff), incentive paid to health worker and cost of pharmaceuticals. Intermediate output data include numbers of out-patients department (OPD), antenatal care (ANC), post natal care

(PNC), deliveries, pulmonary tuberculosis cases detection and children received DPT3 vaccine.

The output and input variables selected based on previous studies, economic theory, and availability of data.

The selection of inputs and outputs for an efficiency study using DEA technique require more attention to keep away from the affect the distribution of technical efficiency score. Health status improvement is the ultimate output of a health system but it influenced by non health factors. In addition, measuring improvements in health status at the health facility level is not easy. Hence output in this study selected intermediate health services that apparently improve health status.

The DEA model for efficiency of health facility calculated using six output variables, four inputs variables and four experimental variables which are anticipated to have an effect on the technical efficiency of health facilities. Since the objective of this study is to calculate the technical efficiency of BPHS health facilities under the RBF intervention, the number of out-patient department (OPD) visit as a curative variable and number of ANC, PNC, delivery, number of children received DPT3 and pulmonary tuberculosis detection. To explore factors effect efficiency score of health facility, experimental variable such as ratio of female medical staff as a main indication for providing preventive care for maternal and child health care and location health facility of health facility used as environmental factor.

3.4. Population and Sample:

The study population includes all 372 health facilities located in 9 intervention provinces of Afghanistan (Samangan, Panjshir, Bamyan, Jawzjan, Balkh, Saripul, Parwan, Takhar and Badakhshan). There are four levels of health facilities (HFs) in the BPHS and they are include: i) Sub-Centers; ii) Basic Health Centers (BHC); iii) Comprehensive Health Centers (CHC); and iv) District Hospitals (DH). All the BPHS HFs within the selected provinces before RBF intervention randomly assigned to treatment and control arms base on type of their type and number of OPD provided.

3.5. Inclusion criteria:

All BPHS health facilities located in 9 provinces of RBF project.

3.6. Exclusion criteria:

Due to unfeasibility reason, HFs which does not have matched pairs excluded from study.

Table 3.2 RBF Health Facilities by Type and Location

No	Province	Total HF	SC		BHC		CHC		DH	
			Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
1	Balkh	78	2	28	6	24	3	11	0	4
2	Parwan	58	4	16	9	21	5	3	0	0
3	Badkhshan	48	0	12	3	23	2	8	0	0
4	Takhar	48	0	4	2	30	0	10	0	2
5	Sarpol	36	1	15	3	11	3	3	0	0
6	Bamyan	42	0	12	1	17	0	10	0	2
7	Samangan	28	0	10	1	11	1	3	0	2
8	Jawzjan	22	0	0	7	7	1	5	0	2
9	Panjshir	12	0	4	2	6	0	0	0	0
	Total	**372**	**7**	**101**	**34**	**150**	**15**	**53**	**0**	**12**

Source: MoPH HMIS data base Jan 2012

3.7. Data Entry and Data Analysis

Excel spreadsheet were used to entered the inputs and output as follows;
In the first column type of health facility and followed by either facility is in treatment group or control and then follow by name of facility, identification, output 1,2,3,4,5 and 6 and input,1,2,3 and 4.

The study aims are to (1) measure the technical efficiency of 372 health facilities that are participating in the RBF intervention provinces of Afghanistan, and to (2) determine the efficiency factors.

According to the study concept each health facility is one Decision Making Unit (DMU), each DMU which function as a best production possibilities frontier is the efficient health facility and below frontier DMU has been categories as inefficient. Generally, the best practice frontier can be determined either by using parametric

approaches like regression analysis or stochastic frontier analysis (SFA) or by applying nonparametric technique like DEA.

The efficiency in this study were measure in two stages, in which the efficiency scores estimated from DEA at the first stage from selected multiple inputs and multiple outputs, then in the second stage the health facilities efficiency score (as depending variable) regression with selected environmental variables as independent variables. The motivation for second stage analysis is to determine significant causes for efficiency health facilities and to recommend find way out from to change inefficient health facilities to efficient health facilities.

The DEA method were used to analyze technical and scale efficiencies and ordinary least square regression is used to analyze the determinants of efficiency.

The DEA technique has been used widely for several public and private sectors research. At the first time DEA used for efficiency measurement of one teaching hospital efficiency (Sherman, 1984). Later on, R. Morey et al. (Morey, R.C., Fine, D.J. and Loree, S.W., 1990) used DEA for comparing the allocative efficiencies of 60 hospitals in the USA. Sherman use DEA to evaluated and classified physicians according to their efficiency rate (Sherman, 1984).

Data Envelopment Analysis (DEA) is a linear programming, commonly using for measuring the relative efficiency performance of different health facilities. This was originally measure efficiency in a diverse range of organization including hospitals, schools, banks and network industries (Avkiran, 2011) DEA compares the ratio of outputs to inputs for each health facility with the score 0-1 or 0% to 100 % with maximum score of 1 (or 100%).

Multi input and multi output variables used for the efficiency analysis, Data envelopment analysis (DEA) programme version 2.1 (Coelli, 1996) designed by Coelli used for technical and scale efficiency of this study. Specifically, considering difficulty to adjust inputs at the primary health care level and the interest of RBF intervention which is increase the output of health services, DEA output oriented method is the appropriate technique for analyzing technical and scale efficiencies of this study. DEA can measure the efficiency based on production efficiency concept. DEA evaluates the relationship between input to a production process (example total

number of health worker in the health facility) and the outputs of the process (example number of antenatal visit per month by medical staff of health facility).

Efficiency/production = {(y , x); y can be produced from x}

or

$$\text{Health facility Tech Efficiency Score} = \frac{\text{Weighted sum of outputs}}{\text{Weighted sum of inputs}}$$

DEA model for efficiency analysis of multiple-output, multiple- input DMU K, with K = 1. …., n, can be present;

$$\text{DMU } (\theta)\ K = \frac{\sum j\ ui\ yik}{\sum j\ vi\ xik}$$

While u is the weight of each output yj (j = 1,2,3..., S), and v is the weight of each input xi(i = 1,2,3..., m)

Max u,v (u`yi/v`xi)

Subject to (u`yj/v`xj) ≤ 1 , j=1,2,……, N,

U,v≥0

The output oriented model is appropriate for this study to measure the relative efficiency of health facilities, since the resources are mainly fixed and mangers have greater control on the outputs somewhat to inputs.

The Charnes, Cooper, Rhodes (CCR) model were used to measuring the overall technical efficiency (θ_K^{CCR}) under the constant returns to scale (CRS) in production.

The Banker, Charnes, Cooper (BCC) model were used to evaluate the pure technical efficiency (θ_K^{BCC}) under finding solution of non-increase return to scale and non-decrease return to scale is model evaluated.

The ratio of CCR and BCC is measuring the scale efficiency.

$$SE_k = \frac{(\theta_K^{CCR})}{(\theta_K^{BCC})}$$

DEA is appropriate technique to use for this analysis of efficiency in this study as follow reasons;

- This technique can handle multiple input and multiple output models;
- Could be used for any input and output measurement;
- Not required explicitly mathematical form for the production function; and
- Inefficiency level can be analysis and quantified for each DMU (Thanassoulis, 1993).

In the RBF intervention healthcare workers have been receiving incentives based on additional outputs such as ANC, PNC, delivery, pulmonary tuberculosis detection and immunizations, therefore, the output-oriented DEA model also used for the analysis the efficiency of intervention. This study analyzed four multiple input and six multiple output for measuring the technical and scale efficiencies using the DEAP version 2.1 computer software. The DEAP version 2.1 software can measure technical efficiency under constant return to scale (TECRS), technical efficiency under variable return to scale (TEVRS) and scale efficiency (SE) scores (Coelli, 1996).

Individual BPHS health facility were used as single Decision Making unit (DMU) using appropriate portion of inputs to produce outputs to compare the efficiency in intervention provinces of Afghanistan. The most efficient health facilities get 1 and the others between zero and one.

Subsequently technical and scale efficiencies score using excel program analysis and compare descriptive statistic of the treatment and control arms.

In the second stage of analysis, regression analysis using ordinary least squares model were applied to examine the association of four explanatory variables: supervision score as quality index of health facility, ratio of female medical staff, location on the technical efficiency score in the RBF intervention provinces compare between treatment and control arm. The regression analysis was conducted using Stata 11.

OLS module:

The following equation considering Comprehensive Health Centers (CHC) as a reference group describes the fixed effect regression analysis on experimental variables affect on technical efficiency in each type and arm of intervention:

$$TEVRS\ i = \beta 0 + \beta 1 femaleratio\ i + \beta 2 location\ i + \beta 3 contract + \beta 4 Arm\ i + \delta 1 DH\ i + \delta 2\ BHC\ i + \delta 3\ SCi + \delta 4\ DH\ and\ Arm\ i + \delta 5 BHC\ and\ Arm\ i + \delta 7\ SC\ and\ Arm\ i + \sum i$$

Table 3.3 Description of the Experimental Variables

Experimental variables	Definition	Value
Location	Dummy variable 1 if Health facility located in urban (maximum two hours far from center of city), 0 otherwise if health facility located in rural	0 or 1
Contract	Dummy variable for contract type of province, Contract out =1, contract in =0	0 or 1
Arm	Dummy variable treatment arm =1, control arm =0	0 or 1
DH	Dummy variable for type of health facility, 1 if health facility is district hospital, 0 otherwise	0 or 1
BHC	Dummy variable for type of health facility, 1 if health facility is BHC, 0 otherwise	0 or 1
SC	Dummy variable for type of health facility, 1 if health facility is Sub-Center, 0 otherwise	0 or 1
DH Arm	Dummy variable, 1 if health facility is District hospital and treatment, 0 otherwise	0 or 1
BHC Arm	Dummy variable 1 if health facility is BHC and treatment, 0 otherwise	0 or 1
SC Arm	Dummy variable 1 if health facility is Sub-Center and treatment, 0 otherwise	0 or 1

Hypothesizes

The hypothesizes are as follow with 0.05 level of significant;

H1: Female medical Ratio of health facility has positive association with technical efficiency

Ho: $\beta 1 = 0$

H1: $\beta 1 > 0$

H2. Health facility located in urban area has positive association with technical efficiency

Ho: $\beta 2 = 0$

H1: $\beta 2 > 0$

H3. Number of contract out type of health facilities positively correlated with technical efficiency score of health facility.

Ho: $\beta 3 = 0$

H1: $\beta 3 > 0$

H4. Treatment arm of health facilities have positive association with technical efficiency

Ho: $\beta 4 = 0$

H1: $\beta 4 > 0$

CHAPTER IV
RESULTS AND DISCUSSION

This chapter provides the results of both input- and output-orientated approaches to examine efficiency of RBF. Results for the analysis without differentiation of health facility types are presented first, followed by individual type (DH, CHC, BHC and SC). It is organized in the following order:

1- Descriptive analysis of the input mix and output mix in the treatment arm compared to the control arm,
2- Analysis of input- and output-orientated DEA efficiency results in the treatment arm compared to the control arm, and
3- Results of regression analysis from both input- and output-orientated DEA on the experimental variables.

It should be noted here that because DEA is an empirically based estimation technique, it is highly sensitive to missing data, outliers, error measurements and random influences in the data (Marschall, P and Flessa, S., 2011). This can explain some of the results we observe here. Also, when examining some of the outputs for instance "TB detection rate" numbers of observations are particularly very small.

This study uses one year data (July 2011 to June 2012) to compare the input- and output-orientated DEA efficiency results between the treatment and the control arms for individual and combined health facilities. In this study 372 health facilities (DMUs) efficiency score calculated using DEA; each of whom is assigned one decision making unit (DMU).

4.1 Descriptive analysis of the input mixed and output mixed of DEA

Descriptive statistics of input mix data of DEA shows the numbers, mean, standard deviation, minimum, maximum and t- test of input and output mix of DEA. There were four multiple inputs as presented in Table 3-1 including labour (clinical and non-clinical staff), incentive amount paid to health worker and pharmaceutical cost.

Hypothesis:

The hypotheses were set with 0.1 level of significant (two tailed test) as bellow:

H1: On average the number of medical staff is expected to be different between treatment and control arms.

H2: On average the number of non medical staff is expected to be different between treatment and control arms.

H3: On average the drug cost is expected to be difference between treatment and control arms.

Ho: $\mu_{T.i} - \mu_{C.i} = 0$ two tailed test (with 0.1 level of significant)

H1: $\mu_{T.i} - \mu_{C.i} \neq 0$

$\mu_{T.i}$ is standing for mean of inputs in treatment arm and $\mu_{C.i}$ is standing for mean of inputs in the control arm.

The result of combined input analysis does not indicate statistically significant difference of input mix between the treatment and control facilities, with the exception of incentive payments which is only provided for treatment arm as per RBF design (Table 4-1).

Table 4. 1 Descriptive statistics of input of DEA health facilities

Descriptive statistics	Number of Clinical Staff	Number of non-clinical staff	Drug cost/USD	Staff Incentive /USD
Mean Treatment: n=186	6	3	5396	2205
Mean Control: n= 186	6	3	5512	0
Stand Deviation Treatment	5	2	4050	2458
Stand Deviation Control	5	2	4537	0
Minimum Treatment	0	0	840	0
Minimum Control	0	0	962	0
Maximum Treatment	28	12	29880	13136
Maximum Control	29	10	43555	0
P-value	0.90	0.88	0.79	0.00

Similarly, on separate analysis, the inputs were not showing any statistically significant (p-value >0.1) difference between the treatment and control facilities, with the exception of incentive payments.

Table 4.1.1 Descriptive statistics of input of DEA mix in District Hospitals

Descriptive statistics	Number of Clinical Staff	Number of non-clinical staff	Drug cost/USD	Staff Incentive /USD
Mean Treatment; (n=6)	25	9	20403	6930
Mean Control ; (n=6)	25	9	23265	0
Stand Deviation Treatment	3	1	6014	5107
Stand Deviation Control	4	1	10327	0
Minimum Treatment	20	8	12678	1739
Minimum Control	20	7	15016	0
Maximum Treatment	28	12	29880	13136
Maximum Control	29	10	43555	0
P-value	0.66	0.48	0.57	0.01

Table 4.1.2 Descriptive statistics of input of DEA mix in CHC

Descriptive statistics	Number of Clinical Staff	Number of non-clinical staff	Drug cost/USD	Staff Incentive /USD
Mean Treatment; (n=34)	11	5	8368	3990
Mean Control; (n=34)	10	6	8304	0
Stand Deviation Treatment	2	1	2766	3066
Stand Deviation Control	2	1	3391	0
Minimum Treatment	5	2	2660	151
Minimum Control	5	3	2168	0
Maximum Treatment	16	9	14366	12688
Maximum Control	14	9	17521	0
P-value	0.10	0.43	0.93	0.00

Table 4.1.3 Descriptive statistics of input of DEA mix in BHC

Descriptive statistics	Number of Clinical Staff	Number of non-clinical staff	Drug cost/USD	Staff Incentive /USD
Mean Treatment ; (n=92)	5	2	4804	1834
Mean Control; (n=92)	5	2	4811	0
Stand Deviation Treatment	1	1	2053	1742
Stand Deviation Control	1	1	1698	0
Minimum Treatment	0	0	2246	0
Minimum Control	1	0	1659	0
Maximum Treatment	9	7	13299	8701
Maximum Control	10	5	13034	0
P-value	0.72	1.00	0.98	0.00

Table 4.1.4 Descriptive statistics of input of DEA mix in SC

Descriptive statistics	Number of Clinical Staff	Number of non-clinical staff	Drug cost/USD	Staff Incentive /USD
Mean Treatment; (n=54)	2	1	2792	1182
Mean Control ; (n=54)	2	1	2975	0
Stand Deviation Treatment	1	0	1174	1300
Stand Deviation Control	1	0	1264	0
Minimum Treatment	0	1	840	0
Minimum Control	0	1	962	0
Maximum Treatment	5	2	5965	6861
Maximum Control	5	2	6596	0
P-value	0.83	0.78	0.43	0.00

Intermediate outputs were included number of outpatients visit (OPD), antenatal care (ANC), post natal care (PNC) visits, deliveries assisted by health facility staff, pulmonary tuberculosis case detection and number of children who received DPT3 vaccine.

Hypothesis

The hypotheses were set with 5 per cent level of significant (one tailed test) as bellow:

H1: On average, the numbers of OPD visits are expected to be higher in treatment arm compared to control arm;

H2: On average, the numbers ANC visits are expected to be higher in treatment arm compared to control arm;

H3: On average, the numbers PNC visits are expected to be higher in treatment arm compares to control arm;

H4: On average, the numbers deliveries are expected to be higher in treatment arm compared to control arm;

H5: On average, the number children received DPT3 are expected to be higher in treatment arm compared to control arm;

H6: On average, the number pulmonary TB detection are expected to be higher in treatment arm compared to control arm;

Ho: $\mu_{T.o} - \mu_{C.o} \leq 0$ one tailed test (with 0.05 level of significant)

H1: $\mu_{T.0} - \mu_{C.0} > 0$

$\mu_{T.o}$ is standing for mean of outputs in treatment arm and $\mu_{C.o}$ is standing for mean of outputs in the control arm.

In the combined analysis of health facilities the output performances of the treatment arm shows higher figures compared to control arm. However, the level of differences is not statistically significant (P value > 0.05). Therefore, with combined descriptive analysis and at 5 per cent level of significant we cannot reject null hypothesis of equality of the performance between treatment and control arms.

Table 4. 2 Descriptive statistics of output mix of DEA

Descriptive statistics	No.of OPD	No.of ANC	No.of PNC	No.of Deliveries	No.of DPT3	No.of TB +
Mean Treatment: n=186	15493	739	290	134	462	5
Mean Control: n= 186	14980	676	274	131	424	4
Stand Deviation Treatment	9872	683	320	216	425	11
Stand Deviation Control	11029	649	380	295	447	9
Minimum Treatment	2935	0	0	0	0	0
Minimum Control	1334	0	0	0	0	0
Maximum Treatment	186	186	186	186	186	65
Maximum Control	100121	4081	3697	3326	3520	60
P-value	0.31	0.18	0.33	0.46	0.20	0.29

On separated descriptive analysis based on type of health facilities, the output performances are emerged dissimilarity in the comparison between treatment arm and control arm.

The descriptive statistics showed that with similar inputs across both treatment and control arms, on average outputs in BHC for the followings are higher for the treatment arm compared to the control arm, with statistical significance ($p < 0.05$): 10% for OPD visits (14348:13041), 24% for ANC visits (714:575), 21% for PNC visits (246:204) and 29% for delivery care (82:64). Contrarily, in the three other types of health facilities (DH, CHC and SC) the descriptive analysis demonstrated slightly higher output performance in the treatment arm compared to the control arm but the differences are not statistically significant (P value > 0.05). As a result, within 5 per cent level of significant output performance are considerable higher in treatment arm compare to control arm while in DH, CHC and SC we cannot reject null hypothesis of equality of the output performances between treatment and control arms with 5 per cent level of significant in DHs, CHCs and SCs.

Table 4.2.1 Descriptive statistics of output of DEA in District Hospitals

Descriptive statistics	No.of OPD	No.of ANC	No.of PNC	No.of Deliveries	No.of DPT3	No.of TB +
Mean Treatment; (n=6)	44540	2295	1268	963	1266	32
Mean Control ; (n=6)	52054	1821	1397	1220	1251	23
Stand Deviation Treatment	9997	647	633	683	650	22
Stand Deviation Control	24483	1047	1307	1109	1138	21
Minimum Treatment	25054	1433	508	379	387	7
Minimum Control	35348	488	319	335	445	4
Maximum Treatment	53730	3099	2259	2259	2329	64
Maximum Control	100121	3464	3697	3326	3520	60
P-value	0.25	0.18	0.41	0.31	0.48	0.25

Table 4.2.2 Descriptive statistics of output of DEA in CHCs

Descriptive statistics	No.of OPD	No.of ANC	No.of PNC	No.of Deliveries	No.of DPT3	No.of TB +
Mean Treatment; (n=34)	25237	1328	544	283	776	17
Mean Control; (n=34)	25297	1352	524	258	851	14
Stand Deviation Treatment	7940	658	343	190	430	16
Stand Deviation Control	7302	637	325	186	457	12
Minimum Treatment	7465	235	76	32	105	0
Minimum Control	9960	397	117	46	263	0
Maximum Treatment	47241	3099	1580	789	2449	65
Maximum Control	41224	2773	1431	930	1897	43
P-value	0.48	0.43	0.40	0.29	0.24	0.21

Table 4.2.3 Descriptive statistics of output of DEA in BHCs

Descriptive statistics	No.of OPD	No.of ANC	No.of PNC	No.of Deliveries	No.of DPT3	No.of TB +
Mean Treatment ; (n=92)	14348	714	246	82	541	2
Mean Control; (n=92)	13041	575	204	64	448	2
Stand Deviation Treatment	6265	557	182	63	289	4
Stand Deviation Control	4833	502	168	50	215	4
Minimum Treatment	4305	0	0	0	135	0
Minimum Control	5853	0	0	0	70	0
Maximum Treatment	33975	3095	884	302	1589	26
Maximum Control	32891	4081	895	202	1130	24
P-value	0.05	0.03	0.05	0.01	0.01	0.34

Table 4.2.4 Descriptive statistics of output of DEA in SCs

Descriptive statistics	No.of OPD	No.of ANC	No.of PNC	No.of Deliveries	No.of DPT3	No.of TB +
Mean Treatment; (n=54)	8081	238	97	44	43	0
Mean Control ; (n=54)	7668	296	113	46	23	0
Stand Deviation Treatment	3076	182	80	41	127	0
Stand Deviation Control	3139	276	101	45	79	0
Minimum Treatment	2935	0	0	0	0	0
Minimum Control	1334	0	0	0	0	0
Maximum Treatment	15451	751	300	161	741	0
Maximum Control	18787	1178	370	161	542	0
P-value	0.24	0.09	0.18	0.39	0.15	0.00

4.2 Results of both input- and output-oriented DEA measurement

There are three types of technical efficiency scores and one pattern of scale inefficiency provided by DEA program which are:

1- Technical efficiency under constant return to scale assumption (TECRS) score

2- Technical efficiency under variable return to scale assumption (TEVRS) score

3- Scale efficiency (SE) score
4- Pattern of scale inefficiency classified into 2 groups:

- Increasing return to scale (IRS)
- Decreasing return to scale (DRS)

This study explores and compares the results of both input-oriented and output-oriented measurement DEA.

Input-oriented measurement DEA efficiency scores are ranged from 0 (totally inefficient) to 100% (efficient). On combined DEA, the results show that out of 186 treatment and 186 control health facilities 27 (15%) treatment facilities and 20 (11%) control health facilities had all three efficiency scores (TECRS, TEVRS and SE scores equal to 1).

Alternatively, 159 (85%) treatment health facilities showed inefficiency which varied scores from 99.9% to 16.6%. Similarly, 166 from 186 control health facility (89%) in control arm had inefficiency score ranging from 99.9% to 17.4%.

Table 4.3 Overall DEA input oriented result

Arm	All three efficiency score (TECRS, TEVRS and SE)	Inefficient	Total
Treatment; n=186	27	159	186
	(15%)	(85%)	(100%)
Control; n=186	20	166	186
	(11%)	(89%)	(100%)

In addition, on separate DEA analysis based on the individual facility 3 out of 6 treatment district hospitals (50%) and only 1 from 6 district hospitals of control arm (16%) had all three efficiency scores (TECRS, TEVRS and SE scores equal to 1). Hence, from 6 of the treatment arm of hospitals (50%) and five from 6 control hospitals (84%) showed inefficiency ranging from 98.5% to 54% in the treatment arm and 94.8% to 63% in the control arm with mainly increasing return to scale (IRS) pattern of scale inefficiency in both arms.

The findings also showed 20 out of from 92 treatment Basic Health centers (22%) and 12 out of 92 control Basic Health centers (13%) had all three efficiency scores (TECRS, TEVRS and SE scores equal to 1). Seventy two out of 92 of treatment arm of Basic Health Centers (78%) and 80 (87%) control health facilities had inefficiency scores ranging from 99.9% to 26.6%. In addition, the pattern of scale inefficiency in this group was mainly an increasing return to scale (IRS) pattern which was observed in 69 out of 72 (96%) in treatment and 77 out of 80 (96%) in control health facilities.

From pattern scale efficiency analysis it inferred that 55% of CHCs and 79% BHCs have inappropriately big size and demonstrated scale inefficiency (increased return to scale). In contrary, 67% of Sub centers have inappropriately small size and shows scale inefficiency (decreased return to scale) which requires improvement on scale size of health facilities.

Table 4.4 Technical efficiency scores of input-orientated DEA

Status of Scale efficiency of Input Oriented DEA							
HF type	Arm	Efficient	Inefficient	Total	Pattern of Scale Inefficiency		
					IRSi	DRSi	Total
DH	Treatment	3	3	6	3	0	3
	Control	1	5	6	5	0	5
CHC	Treatment	9	25	34	19	6	25
	Control	12	22	34	19	3	22
BHC	Treatment	20	72	92	69	3	72
	Control	12	80	92	77	3	80
SC	Treatment	24	30	54	8	22	30
	Control	36	18	54	8	10	18

Output-oriented measurement DEA resulted in twenty nine from 186 treatment facilities (16%) and 20 out of 186 control health facilities (11%) had all three efficiency scores (TECRS, TEVRS and SE scores equal to 1). Consequently, it showed that 157 (84%) out of 186 from treatment health facilities and 166 (89%) from 186 control health facilities had inefficiency scores.

Table 4.5 Result of DEA output oriented result on combine health facilities

Arm	All three efficiency score (TECRS, TEVRS and SE)	Inefficient	Total
Treatment	29 (16%)	157 (84%)	186 (100%)
Control	20 (11%)	166 (89%)	186 (100%)

A separate DEA analysis based on individual type of health facility was conducted and showed that 3 out of 6 treatment district hospitals (50%) and only one (16%) out of 6 district hospitals of control arm had all three efficiency scores. Additionally, three out of 6 treatment hospitals (50%) and 5 out of 6 control hospitals (84%) had inefficiency scores from 98.5% to 54% in the treatment arm and 86% to 63% in the control arm. In addition, the pattern of scale inefficiency in both group were an increasing return to scale (IRS).

Similarly, the findings show that 19 out of 92 BHCs (21%) and 12 out of 92 among control health facilities (13%) had all three efficiency scores. Consequently, seventy three from 92 BHCs in treatment arm (77%) and 80 from 92 control health facilities had inefficiency scores varying from 99.9% to 26.6%.

Table 4.6 Technical efficiency result of output-orientated DEA

Status of Scale efficiency of output Oriented DEA							
HF type	Arm	Efficient	Inefficient	Total	Pattern of Scale Inefficiency		
					IRSo	DRSo	Total
DH	Treatment	3	3	6	3	0	3
	Control	1	5	6	5	0	5
CHC	Treatment	10	24	34	5	19	24
	Control	15	19	34	8	11	19
BHC	Treatment	40	52	92	24	28	52
	Control	33	59	92	32	27	59
SC	Treatment	24	30	54	8	22	30
	Control	36	18	54	8	10	18

Descriptive statistics of technical efficiency scores of DEA, both input- and output-oriented showed the numbers, mean, standard deviation, minimum and maximum, First, the input oriented DEA assumes that these health facilities had limited control over the volume of their output. Secondly, the output orientated DEA assumes that management has no control over inputs but can increase the outputs of health facilities towards health promotion, improve patient provider relationships and conduct outreach services. Technical and scale efficiency results were analyzed without differentiation of the type of health facility and then by type of health facility.

In the combine analysis there was not significant difference between treatment arm and control arm on technical efficiency results.

Table 4.7 DEA technical efficiency scores analysis

Descriptive Statistics	Input-oriented DEA			Output-oriented DEA		
	TECRSi	TEVRSi	SEi	TECRSo	TEVRSo	SEo
Mean Treatment;(n=186)	61.5%	69.5%	87.8%	61.5%	65.1%	94.3%
Mean Control;(n=186)	62.6%	70.8%	88.1%	62.6%	66.2%	94.7%
Stand. Deviation Treatment	23.3%	20.9%	13.9%	23.3%	23.1%	8.6%
Stand. Deviation Control	22.1%	20.3%	13.8%	22.1%	21.9%	9.4%
Minimum Treatment	16.5%	21.5%	34.6%	16.5%	20.4%	56.2%
Minimum Control	17.4%	29.1%	17.4%	17.4%	27.7%	17.4%
Maximum Treatment	100%	100%	100%	100%	100%	100%
Maximum Control	100%	100%	100%	100%	100%	100%

On separate analysis, technical efficiency of DHs output-oriented analysis found that the average score for treatment arm for CRS technical efficiency (TECRS) was 87% (SD=20.1); 95.2% (SD = 11.9) for VRS technical efficiency (TEVRS); and 90.7% (SD = 13.9) for scale efficiency (SE). In control DHs, the TECRS was 78% (SD=14.5); VRS TEVRS was 95.7% (SD = 10.5); and scale efficiency (SE) was 82.2 % (SD = 13.5). These scores indicate a 9% improvement in TECRS and 8.7% SE in the treatment arm compared to the control arm. The average of 95.2% for TEVRS in treatment hospitals implies that the inefficient health facilities would need to increase their outputs by 4.8% to become efficient.

Technical Efficiency of Basic Health Centers output-oriented analysis found that the average score for the treatment arm for TECRS was 66.2% (SD=23.1); 69.1% (SD = 22.9) for TEVRS and 95.6% (SD = 7) for SE. In control health facilities, TECRS was 64.4% (SD=22.7), VRS TEVRS was 68.5% (SD = 22.7), and SE was 94.1 % (SD = 9.4). This shows 1.8% improvement in TECRS, 0.6% in TEVRS and 1.5% SE in the treatment arm compared to control arm. The average of 69.1% for TEVRS in treatment BHC implies that the inefficient health facilities would need to increase their outputs by 30.9% to become efficient.

Table 4.7.1 DEA Technical efficiency scores analysis in District Hospital

Descriptive Statistics	Input-oriented DEA			Output-oriented DEA		
	TECRSi	TEVRSi	SEi	TEVRSo	TECRSo	SEo
Mean Treatment;(n=6)	87.0%	100.0%	87.1%	87.0%	95.2%	90.7%
Mean Control;(n=6)	78.3%	99.1%	78.9%	78.3%	95.7%	82.0%
Stand. Deviation Treatment	20.1%	0.1%	20.1%	20.1%	11.9%	13.9%
Stand. Deviation Control	14.5%	2.1%	14.0%	14.5%	10.5%	13.5%
Minimum Treatment	54.0%	99.8%	54.1%	54.0%	70.9%	69.7%
Minimum Control	63.5%	94.8%	63.5%	63.5%	74.3%	63.5%
Maximum Treatment	100%	100%	100%	100%	100%	100%
Maximum Control	100%	100%	100%	100%	100%	100%

Table 4.7.2 DEA Technical efficiency scores analysis in CHCs

Descriptive Statistics	Input-oriented DEA			Output-oriented DEA		
	TECRSi	TEVRSi	SEi	TECRSo	TEVRSo	SEo
Mean Treatment;(n=34)	76.4%	84.6%	89.3%	76.4%	79.4%	96.1%
Mean Control;(n=34)	84.6%	91.3%	92.0%	84.6%	89.0%	95.0%
Stand. Deviation Treatment	21.4%	14.1%	15.8%	21.4%	21.4%	4.3%
Stand. Deviation Control	18.2%	12.2%	12.0%	18.2%	15.5%	10.3%
Minimum Treatment	24.2%	56.7%	29.0%	24.2%	24.2%	83.0%
Minimum Control	49.7%	54.1%	49.7%	49.7%	52.4%	49.7%
Maximum Treatment	100%	100%	100%	100%	100%	100%
Maximum Control	100%	100%	100%	100%	100%	100%

Table 4.7.3 DEA Technical efficiency scores analysis in BHCs

Descriptive Statistics	Input-oriented DEA			Output-oriented DEA		
	TECRSi	TEVRSi	SEi	TECRSo	TEVRSo	SEo
Mean Treatment;(n=92)	66.2%	80.9%	80.2%	66.2%	69.1%	95.6%
Mean Control;(n=92)	64.4%	86.9%	73.0%	64.4%	68.5%	94.1%
Stand. Deviation Treatment	23.1%	15.3%	16.9%	23.1%	22.9%	7.0%
Stand. Deviation Control	22.7%	10.1%	20.3%	22.7%	22.7%	9.4%
Minimum Treatment	26.6%	40.9%	45.4%	26.6%	27.1%	71.4%
Minimum Control	26.3%	60.2%	34.9%	26.3%	27.7%	53.9%
Maximum Treatment	100%	100%	100%	100%	100%	100%
Maximum Control	100%	100%	100%	100%	100%	100%

Table 4.7.4 DEA Technical efficiency scores analysis in SCs

Descriptive Statistics	Input-oriented DEA			Output-oriented DEA		
	TECRSi	TEVRSi	SEi	TECRSo	TEVRSo	SEo
Mean Treatment;(n=54)	66.5%	69.3%	95.9%	66.5%	69.3%	95.9%
Mean Control;(n=54)	66.8%	70.9%	95.5%	66.8%	70.9%	95.5%
Stand. Deviation Treatment	23.6%	23.5%	7.0%	23.6%	23.5%	7.0%
Stand. Deviation Control	21.4%	21.7%	13.4%	21.4%	21.7%	13.4%
Minimum Treatment	26.6%	28.1%	71.8%	26.6%	28.1%	71.8%
Minimum Control	18.1%	34.6%	18.1%	18.1%	34.6%	18.1%
Maximum Treatment	100%	100%	100%	100%	100%	100%
Maximum Control	100%	100%	100%	100%	100%	100%

Overall frequencies of TECRS and TEVRS in both input- and output-oriented DEA results between treatment and control arms were almost the same. The difference observed that around 61% of health facilities were in range of 79.1% to 37.4%; There were 145 (86%) fully scale efficient health facilities in the treatment arm while in control arm they were 24 (14%).

Table 4.8 Technical efficiency ranging in combine health facilities

Score		Arm	Input-oriented DEA			Output-oriented DEA		
			TECRSi	TEVRSi	SEi	TECRSo	TEVRSo	SEo
100%		Treatment	27	33	145	29	33	35
		Control	20	33	24	20	30	44
79.2%	99.9%	Treatment	19	27	0	18	22	138
		Control	27	29	123	27	23	133
58.3%	79.1%	Treatment	47	68	33	46	51	12
		Control	51	70	31	51	59	6
37.4%	58.2%	Treatment	62	48	7	62	61	1
		Control	66	48	7	66	60	2
16.5%	37.3%	Treatment	31	10	1	31	19	0
		Control	22	6	1	22	14	1
Total (DMU)			**372**	**372**	**372**	**372**	**372**	**372**

Description of technical efficiency/inefficiency scores and pattern of scale inefficiency of both input- and output-oriented DEA result were analyzed based on type of health facilities.

District hospitals: The most frequencies of TECRS and SE scores in both input- and output-oriented DEA were full efficient. Overall frequencies of TECRS and SE scores in both input- and output-oriented DEA were higher in the treatment arm compared to the control arm in the full efficient (100%) whole TEVRS were the same in both arm.

Table 4.8.1 Technical efficiency ranging in district hospitals

Score		Arm	Input-oriented DEA			Output-oriented DEA		
			TECRSi	TEVRSi	SEi	TECRSo	TEVRSo	SEo
100%		Treatment	3	5	3	3	5	3
		Control	1	5	1	1	5	1
88.5%	99.9%	Treatment	1	1	1	1	0	1
		Control	0	1	0	0	0	0
79.9%	88.4%	Treatment	0	0	0	0	0	0
		Control	2	0	2	2	0	2

65.5%	76.8%	Treatment	1	0	1	1	1	2
		Control	2	0	2	2	1	2
54.0%	65.4%	Treatment	1	0	1	1	0	0
		Control	1	0	1	1	0	1

Comprehensive Health Centers: Overall frequencies of TECRS, TEVRS and SE scores in both input- and output-oriented DEA result between treatment and control arm were the same. Proportion of treatment facilities scored above of average 50% while in the control arm was found 64%.

Table 4.8.2 Technical efficiency ranging score in CHCs

Score		Arm	Input-oriented DEA			Output-oriented DEA		
			TECRSi	TEVRSi	SEi	TECRSo	TEVRSo	SEo
100%		Treatment	8	11	12	8	11	10
		Control	12	18	12	12	18	16
81.1%	99.9%	Treatment	8	9	16	8	6	24
		Control	9	8	16	9	5	16
62.1%	81.0%	Treatment	8	12	4	8	8	24
		Control	6	7	5	6	7	16
43.1%	62.0%	Treatment	7	2	1	7	6	0
		Control	7	1	1	7	4	1
24.2%	43.0%	Treatment	3	0	1	3	3	0

Basic Health Centers: Overall frequencies of TECRS, TEVRS and SE scores in both input- and output-oriented DEA were higher in the treatment arm compared to control arm in the fully efficient (100%) range. The most frequencies of efficiency scores in input -oriented DEA results were in the range of 81.4% to 63.1% and for output-oriented DEA result were in the range of 63.0% to 44%. Proportion of treatment facilities scored above of average technical efficiency was found 49% while in the control arm 47% of health facilities were scored above the average technical efficiency score.

Table 4.8.3 Technical efficiency ranging score in BHCs

Score		Arm	Input-oriented DEA			Output-oriented DEA		
			TECRSi	TEVRSi	SEi	TECRSo	TEVRSo	SEo
100%		Treatment	19	21	20	19	21	41
		Control	12	17	13	12	17	34
81.5%	99.9%	Treatment	7	24	26	12	11	46
		Control	12	51	19	7	14	49
63.1%	81.4%	Treatment	18	35	28	12	16	5
		Control	21	21	29	18	17	8
44.7%	63.0%	Treatment	26	11	18	21	28	0
		Control	22	3	22	26	27	1
26.3%	44.6%	Treatment	22	1	0	22	16	0
		Control	25	0	9	22	17	0

Sub-Centers: Overall frequencies of TECRS, TEVRS and SE scores in both input- and output-oriented DEA result were equally in all ranges a part from 3rd quartile which about 33 per cent of Sub-centers in treatment and control arm scored in the range from 35.5 % to 18%. Proportion of both treatment control facilities which scored above of average technical efficiency was found equally 45% which indicated that greater proportion of health facilities technical efficiency scored lower than average technical efficiency score.

Table 4.8.4 Technical efficiency ranging score in SCs

Score		Arm	Input-oriented DEA			Output-oriented DEA		
			TECRSi	TEVRSi	SEi	TECRSo	TEVRSo	SEo
100%		Treatment	10	12	25	10	12	25
		Control	8	12	36	8	12	36
79.5%	99.9%	Treatment	9	9	25	7	6	25
		Control	5	5	14	5	5	14
59.0%	79.4%	Treatment	11	12	4	12	14	4
		Control	13	12	2	13	12	2
38.6%	58.9%	Treatment	18	17	0	16	13	0
		Control	18	17	1	18	17	1
18.1%	38.5%	Treatment	6	4	0	10	9	0
		Control	10	8	1	9	8	1

4.3 The results of regression analysis from both input- and output-oriented DEA

Simple linear regression model (ordinary least squares estimation) was used to provide more details about the factors affecting the technical efficiency scores of RBF health facilities (determinants of facility efficiency). Technical efficiency under variable return to scale assumption (TEVRS) from DEA was used as the dependent variable with four independent variables (female medical ratio, contract type of health service at the province, location of health facility and arm of intervention) to calculate the magnitude and direction of their relation considering the type and interaction between type and arm of intervention. There were two equations of ordinary least squares estimation for both input- and output-oriented DEA using Stata 11. Regression results from each type of health facility could not be interpreted because all coefficients of explanatory variables were insignificant due to the small sample size for the regression analysis. Therefore, the equation considering Comprehensive Health Centers (CHC) as a reference group described below as a fixed effect regression module was selected to investigate at the effect of RBF in each arm considering the experimental factors. There were two equations of OLS estimation for both in-put and output oriented DEA shown below;

Regression technical efficiency input- oriented DEA module:

$$INPUTTEVRS\ i = \beta 0 + \beta 1 femaleratio\ i + \beta 2 location\ i + \beta 3 contract\ i + \beta 4 Arm\ i + \delta 1 DH\ i + \delta 2\ BHC\ i + \delta 3\ SCi + \delta 4\ DH\ and\ Arm\ i + \delta 5 BHC\ and\ Arm\ i + \delta 7\ SC\ and\ Arm\ i + \sum i$$

Regression technical efficiency output- oriented DEA module:

$$OUTPUTTEVRS\ i = \beta 0 + \beta 1 femaleratio\ i + \beta 2 location\ i + \beta 3 contract\ i + \beta 4 Arm\ i + \delta 1 DH\ i + \delta 2\ BHC\ i + \delta 3\ SCi + \delta 4\ DH\ and\ Arm\ i + \delta 5 BHC\ and\ Arm\ i + \delta 7\ SC\ and\ Arm\ i + \sum i$$

Location of health facility is the only explanatory variable that has positively significant affect on technical efficiency input-oriented technical efficiency score but

RBF intervention, female medical staffs of health facility and contract type of health service in the province are insignificantly correlated to technical efficiency input-oriented score because pvalue are more than 0.05 (0.302, 0.160 and 0.43 respectively are) as can be seen in Table 4-9 below.

R-squared value (R^2) of this estimated equation was slightly low ($R^2 = 0.1043$) because the selected explanatory variables might be not the good explanatory variables for this dependent variable (technical efficiency input-oriented score).

The estimation indicated no any significant technical efficiency input-oriented score difference in type of health facilities compared to reference group (CHC) except Sub-centers which had 9.8% higher technical efficiency score compared to reference group.

It can explain that if number of urban health facilities in the scheme increased by one the technical efficiency variable return to scale input-oriented score increased by 0.08. Contrarily, the estimation indicated insignificant correlation between technical efficiency score and three other experimental variables (health service contract type of province, female medical ration and RBF intervention). Therefore, the RBF intervention does not impact on input-oriented technical efficiency variable return to scale score.

Table 4.9 Regression estimation of technical efficiency of input-oriented DEA

Explanatory Variables	**Coefficient**	**Std.Error**	**t-statistic**	**p-value**
Constant	.7094286	.044050	16.10	*0.000
Arm	-.056205	.05436	-1.03	0.302
Female Ratio	-.128846	.09155	-1.41	0.160
Location	.089505	.03005	2.98	*0.003
Contract	.022359	.02827	0.79	0.430
DH	-.105589	.08749	-1.21	0.228
BHC	-.050252	.03969	-1.27	0.206
SC	.098388	.04361	2.26	*0.025
DH and Arm	.030773	.12373	0.25	0.804
BHC and Arm	.086250	.05610	1.54	0.125

SC and Arm	.054926	.06136	0.90	0.371
N=372		**$R^2 = 0.1043$**		
Adjusted $R^2 = 0.0794$		**Probability (F-statistic) = 0.0000**		
***Significant with p-value <0.05**				

Considering the Comprehensive Health Centres as a reference type of health facilities, the Linear combinations of estimators test (lincom) were not specified any significant difference between treatment and control arms in each type of health facility with technical efficiency score.

Similarly, the result of technical efficiency output-oriented score regression on explanatory variables, just location of health facility shows significantly positive effect on the technical efficiency output-oriented score and the four others explanatory variables as RBF intervention, female medical staffs of health facility and contract type of health service in the province are insignificantly correlated to technical efficiency output-oriented score because p-value greater than 0.05 (see Table 4-10 below).

The R-squared value (R^2) of the equation also seems to be low (R^2 = 0.0508) that might be due to unrelated explanatory variables to the dependent variable (technical efficiency input-oriented score). The regression estimation emerged the probability of F-statistic equal to 0.0401 meaning this equation was linear statistical model.

It is observed that no any significant technical efficiency output-oriented score difference in type of health facilities across type of health facilities apart from BHCs which had 11% lower technical efficiency score contrast to reference group.

The equation indicated that if number of urban health facilities in the scheme increased by one the technical efficiency variable return to scale input-oriented score increased by 0.10. Conversely, the equation showed insignificant correlation between technical efficiency score and three other experimental variables (type of health service delivery contract in the province, female medical staff and RBF intervention). Hence, the RBF intervention does not have impact on technical efficiency variable return to scale output-oriented score.

Table 4 10 Regression estimation of technical efficiency of output-oriented DEA

Explanatory Variables	**Coefficient**	**Std.Error**	**t-statistic**	**p-value**
Constant	.7040089	.0495288	14.21	*0.000
Arm	-.0694115	.0541065	-1.28	0.200
Female Ratio	-.0809062	.1029375	-0.79	0.432
Location	.1035519	.0337969	3.06	*0.002
Contract	.0429145	.0317888	1.35	0.178
DH	-.0628918	.0983761	-0.64	0.523
BHC	-.1141248	.0446275	-2.56	*0.011
SC	-.040591	.049042	-0.83	0.408
DH and Arm	.102878	.1391218	0.74	0.460
BHC and Arm	.0745972	.0630858	1.18	0.238
SC and Arm	.0368371	.068991	0.53	0.594
N=372		**$R^2 = 0.0508$**		
Adjusted $R^2 = 0.0245$		**Probability (F-statistic) = 0.0401**		
***Significant with p-value < 0.05**				

Linear combinations of estimators test (lincom) demonstrated only small improvement in the technical efficiency score in the treatment arm of District Hospitals and Basic Health Centers contrast to their control arms but the difference were not statistically significant at $p<0.05$.

Table 4.11 Linear combination estimation test

Type of Health Facilities	**Coefficient**	**Std.Error**	**t-statistic**	**p-value**
District Hospitals	.0334666	.1282283	0.26	0.794
Basic Health Centers	.0051857	.0329015	0.16	0.875
Sub-Centers	-.0325744	.0427439	-0.76	0.447

In the RBF, improving quality of health service is one of the objectives. The study examines the correlation between technical efficiency score and quality score of

health facility. Quality of health service in this study defined as mean of supervisory score from using the National Monitoring Checklist (NMC) during the study period.

Ho: $\rho \leq 0$ one tailed test (with 0.05 level of significant)

H1: $\rho > 0$

Regardless of type of health facility, it shows positive correlation of 0.1436 between technical efficiency score of health facilities and their quality indexes which indicate the success of RBF intervention in improving quality of health services. The t-test with p-value less than 0.05 indicated significant higher mean of quality score compare to mean efficiency score.

Table 4.12 Correlation of overall health facility technical efficiency and quality score

Variables	Technical efficiency score	Quality score
Technical efficiency score	1.0000	
Quality score	0.1355	1.0000
p-value =0.000	t=10.008	

On the individual correlation analysis negative relationship were found between technical efficiency score and quality score of care in district hospitals. The negative correlation might be due to low number of sample size and in appropriate NMC as a tool as a quality index for district hospitals. Additionally, with p-value greater than 0.05 (P-Value = 0.2518) the difference between mean of technical efficiency and quality cannot reject.

Table 4.12 1 Correlation of DH technical efficiency and quality scores

Variables	Technical efficiency score	Quality score
Technical efficiency score	1.0000	
Quality score	-0.09	1.0000
p-value =0.2518	t=0.67	

On the separated correlation analysis positive association were found between technical efficiency score of CHC and their quality score but with p-value greater than 0.05

(P-Value = 0.144) it concluded that there were not any differences between mean of technical efficiency and quality index of CHCs.

Table 4.12.2 Correlation of CHC technical efficiency and quality scores

Variables	Technical efficiency score	Quality score
Technical efficiency score	1.0000	
Quality score	0.1602	1.0000
p-value =0.144	t=1.06	

The BHCs correlation analysis indicated positive association between technical efficiency score and quality of health facility. Additionally, the mean of health care quality with p-value less than 0.05 (p-value = 0.000) indicated greater than efficiency score of BHCs.

Table 4-12 3 Correlation of BHC technical efficiency and quality score

Variables	Technical efficiency score	Quality score
Technical efficiency score	1.0000	
Quality score	0.1597	1.0000
p-value =0.000	t=7.67	

Correlation between technical efficiency score and quality score of care was estimated for SCs which was show positively 0.2753, while the p-value greater than 0.05 indicated no difference between mean of technical efficiency and quality of health services for the SC type of health facilities.

Table 4.12.4 Correlation of SC technical efficiency and quality scores

Variables	Technical efficiency score	Quality score
Technical efficiency score	1.0000	
Quality score	0.2753	1.0000
p-value =0.88	t=-1.1918	

CHAPTER V
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The objectives of this study are to measure health service efficiency RBF treatment compared to the control health facilities in Afghanistan throughout the period of July 2011 to June 2012 using DEA technique. It also aimed to identify the determinants of health service efficiency using regression analysis. This study used input and output oriented DEA to measure the insufficient use of resources including personnel, drugs cost and incentive and inefficient health service provision. The results are analyzed in three following aspects:

1. Descriptive statistics of Analysis of input and outputs;
2. Analysis of efficiency (input and output-orientated DEA) and
3. Analysis of determinants of health facilities efficiency.

The descriptive statistics show that with similar inputs across both treatment and control arms, average outputs in treatment arm were higher compare to control arm. The highest improvement is demonstrated at Basic Health Centers (BHC) where treatment arm showed better performance at the proportion of 10% for outpatient visits, 24% for antenatal care visits, 21% for postnatal care visit and 29% for delivery care compared to the control arm, with statistical significance ($p<0.05$).

This study explores and compares the results of both input-oriented measurement DEA and output-oriented measurement DEA. The technical efficiency results have shown considerable variation between treatment and control arms across difference types of health facilities.

The result of input-orientated measurement efficiency revealed that number of treatment health facilities with all three efficiency scores (TECRS, TEVRS and SE scores equal to 1) are higher compared to control health facilities on combine DEA result (respectively 15% and 11%). In addition, on separate DEA analysis based on the health facility type, district hospitals from the treatment arm (50%) had full efficiency scores in contrast to control hospitals (16%). Similarly, twenty from 92

treatment BHCs while only 12 from 92 control BHCs had fully efficiency score. On average 9% improvement in TECRS, 1% in TEVRS and 8.2% in SE were indicated in the efficiency score of district hospitals' in the treatment arm respect to control hospitals. The findings also showed that on average technical score of BHCs in the treatment arm was slightly higher than the control arm.

In conclusion, number of health facility with fully efficient score in treatment arm of district hospitals and BHCs indicated higher efficiency compare to their control pair groups. In addition, analysis of technical efficiency shows variation across the types of health facilities between treatment and control arms. There is small improvement in technical score of District Hospitals and Basic Health Centers in the treatment arm were higher than their control pair groups.

The regression estimation of input and output -oriented technical efficiency variable return to scale scores to explanatory variables indicated only positively correlated with number of health facilities located in urban, while the three others experimental variables (type of health service delivery contract of province, female medical ratio and RBF intervention) showed insignificant correlation in respect to technical efficiency score. In addition, equation did not indicate no any significant differences on technical efficiency input and output-oriented score difference in type of health facilities across different types of health facilities (apart from lower score of BHCs in output-oriented and high score of SCs in input-oriented DEA result in contrast to reference group (CHCs)).

In conclusion, there were significantly positive correlation between the health facilities located in the urban area and technical efficiency score. However, the result did not indicate any significant differences between treatment and control arm in each type of health facility in respect to technical efficiency of health facilities for the period of July 2011 to June 2012 in the RBF intervention provinces of Afghanistan.

5.2 **Policy Implications**

A number of lessons emerge from this study and could be used to reforming the Result-Based Financing intervention and implementation of the Basic Package of Health Services. Firstly, the unit cost of RBF incentive payments to healthcare workers are considerably low ($ US 20 per month per staff as per table 4 1) which

could be one of the reason for not adequately motivating health workers to provide additional health services as adequate incentive payment mechanism can keep motivated the health workers (Tulloch, 2008).

Secondly, delay on the payment to health workers which find out during data collection is one of de-motivating cause of health workers for better performance hence a policy of advance payment (or physical availability of cash in the health facility) should be considered. RBF may even become a de-motivating factor if the payment not paid on time and this is not appropriately organized (Toonen, Jurrien and Bertram van der Wal., 2012).Thirdly, there may be other motivating and satisfaction factors that have nothing to do with monetary payments that RBF doesn't address for example non monitory incentive (Tulloch, 2008). Fourthly, for maternal health services, the program should pay some incentives or pay transportation costs to address additional access issues for poor patients. Payments should also be given to community health workers for any ANC, PNC, delivery and DPT3 vaccine cases to increase service utilization at the community level (Tulloch, 2008).

Lastly, the CHCs and BHCs which demonstrated scale inefficiency due to inappropriate big size need to be downgraded. Contrary, the Sub centers which were show inappropriate small size should be upgraded.

5.3 Limitations of the Study:

Several limitations exist in this study;

1- Efficiency is measured relative to performance of other health facilities within the group (and not to a theoretical or benchmarked standard);
2- The efficiency score may be influenced by external factors, such as disease outbreak or insecurity, which are not captured in the dataset;
3- Limitation on availability of reliable data which was identified during data collection.
4- Literature shows that service utilization is influenced by, social, cultural behavioral and economic factors, as well as structural factors including capital cost, medical equipments, and availability of vehicles. However, this study is limited by the available data and was not able to calculate the effect of these factors and health facility efficiency score.

5- The study did not focus on allocation efficiency.
6- The study used only one year data of health facility which corresponds to the inception of RBF implementation which likely to improve in the coming years.
7- Outputs used in the study were only intermediate and are not ultimate outcomes due to unavailability of data.

Despite these limitations the study can fill a gap in literature on the effects of incentive schemes and technical efficiency which is critical in guiding decision-making on the health system design in Afghanistan in the future.

5.4 Recommendations for policy makers and health managers

1- The descriptive analysis of output performance and full efficiency scores for health facilities indicated that improvements were made in the treatment arms of District Hospitals and Basic Health Centers compared to their respective control arms. Hence, policy makers should focus on strengthening the RBF intervention in the District Hospitals and Basic Health Centers, while considering reforms to the Comprehensive Health Centers and Sub-Centers facility-levels to improve health service provision.
2- The health provider managers should support the positive factors like quality of health service to increase the technical efficiency of health facilities.
3- The validity and reliability of Health Management Information System (HMIS) is a concern as inaccurate data can lead to incorrect interpretations of the impact of the intervention and the policy makers in the health sector and health mangers should pay more attention to improve the quality of HMIS data.

5.5 Recommendations for further study

This study should be used as a baseline for further investigation on efficiency of RBF and BPHS for providing better and efficient health services. Furthermore, it should be repeated in longer time period.

Lastly, a qualitative study should be conducted to find out the hidden factors behind efficiency and inefficiency of health facilities.

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APPENDICES

Appendix A Raw Output and Input data for DEA

HF Type	HF ID	Interv. Arm (Tr. =1, Co. =0)	OPD	ANC	PNC	Deliveries	DPT 3	TB + detection	Clinical Staff	non-clinical staff	Drug cost/$	Staff Incentive/$
Badakhshan Province												
BHC	2058	1	14455	125	37	105	369	5	5	2	4873	203
BHC	2486	0	9851	418	231	56	189	0	5	2	4497	0
BHC	1978	1	7697	271	143	34	135	2	5	3	2836	145
BHC	1563	0	7803	99	50	33	224	1	4	2	3720	0
BHC	1983	1	6897	234	177	57	265	5	5	3	3829	456
BHC	1561	0	10807	243	131	0	325	9	5	2	4381	0
BHC	1981	1	11381	472	211	17	491	5	5	2	4853	291
BHC	2036	0	10769	297	61	12	966	2	6	3	3720	0
BHC	1982	1	13026	252	152	6	317	0	5	2	4517	63
BHC	1980	0	11567	257	160	25	145	0	5	2	4416	0
BHC	1857	1	8888	361	152	27	584	0	5	2	3737	346
BHC	1986	0	11348	244	182	56	733	16	5	2	6482	0
BHC	1985	1	12112	829	481	74	513	5	5	2	5163	849
BHC	1560	0	12666	405	119	14	594	0	5	2	6142	0
BHC	2144	1	23749	1704	537	36	1088	0	5	2	9276	3520
BHC	1979	0	14053	254	87	41	234	0	5	2	5682	0
BHC	422	1	13862	252	165	72	610	2	6	3	7293	1214
BHC	2063	0	10566	336	170	86	171	6	6	3	4377	0
BHC	1562	1	9368	476	251	75	730	0	6	3	4058	1309
BHC	2174	0	15183	615	373	99	429	9	6	3	4328	0
BHC	416	1	21016	755	371	129	482	8	6	3	6554	1141
BHC	2120	0	15543	407	77	28	297	10	5	2	4568	0
BHC	2064	1	11668	698	208	114	445	3	6	3	4742	1229
BHC	1565	0	20049	496	277	87	462	3	6	3	13034	0
BHC	414	1	15680	681	321	93	320	2	8	2	5857	2706
BHC	1817	0	14546	411	169	43	445	6	6	2	5129	0
CHC	1713	1	21539	830	304	80	563	17	9	5	12950	926
CHC	1838	0	22373	397	222	109	361	15	10	5	8582	0
CHC	401	1	23321	1232	477	301	718	9	7	5	8185	3851
CHC	402	0	24411	1485	543	122	770	26	12	5	8184	0
CHC	424	1	29622	1358	722	167	1229	23	14	7	10820	3748
CHC	425	0	28491	1089	549	252	781	11	13	6	10574	0
CHC	1567	1	23792	1215	692	215	727	9	16	6	9673	1851
CHC	2050	0	30202	1176	727	249	797	16	11	5	8681	0
CHC	421	1	19861	866	475	309	506	15	16	9	8342	2060
CHC	417	0	29600	967	625	298	473	8	14	9	11986	0
SC	2529	1	9770	265	134	130	0	0	2	1	2005	2865
SC	2530	0	5082	125	57	26	0	0	2	1	6596	0
SC	2327	1	7271	458	157	17	291	0	3	1	2984	2010
SC	2568	0	7298	101	64	52	0	0	2	1	2609	0
SC	2572	1	9174	386	212	106	0	0	2	1	2824	1361
SC	2323	0	5165	229	120	64	0	0	2	1	2063	0
SC	2508	1	5471	122	99	72	33	0	2	1	1739	530
SC	2570	0	7287	253	202	85	0	0	2	1	3456	0
SC	2325	1	10177	546	300	89	0	0	2	1	4093	2496
SC	2324	0	3687	291	174	82	0	0	2	1	1538	0
SC	2569	1	5641	162	100	62	0	0	2	1	3062	1426
SC	2574	0	8943	309	188	74	0	0	2	1	4225	0
Balkh Province												
BHC	560	1	11494	475	231	68	534	0	5	2	2637	4021
BHC	2377	0	7475	541	183	95	479	0	5	1	2672	0

BHC	1831	1	7906	17	2	2	447	0	5	2	2246	1434
BHC	577	0	6745	619	266	115	268	14	5	2	2823	0
BHC	1830	1	9598	561	131	51	418	0	5	2	3313	4588
BHC	1823	0	14942	594	263	78	497	0	5	2	4961	0
BHC	550	1	27195	1849	462	74	1051	0	5	2	3117	2464
BHC	1827	0	13728	531	112	35	635	0	5	2	3548	0
BHC	573	1	15035	1504	545	215	651	0	5	2	2587	8701
BHC	1828	0	9693	1043	333	135	819	0	5	2	3464	0
BHC	1825	1	16705	1243	344	160	597	0	5	2	3182	5205
BHC	2194	0	24999	4081	895	168	614	0	5	2	3737	0
BHC	1540	1	18131	1039	448	181	640	0	5	2	3190	8157
BHC	1873	0	10060	952	451	173	454	2	5	2	5733	0
BHC	2371	1	10419	737	391	169	347	0	2	1	3361	1626
BHC	1070	0	26125	698	189	97	1016	0	5	2	3603	0
BHC	549	1	24605	1456	357	111	1429	0	5	2	5216	492
BHC	2582	0	17374	1256	385	107	665	0	5	2	5306	0
BHC	1810	1	33975	2749	386	135	1589	0	5	2	3829	4160
BHC	1755	0	14619	220	139	75	728	0	5	2	3787	0
BHC	1538	1	16706	1166	245	129	1008	0	5	2	3101	1339
BHC	558	0	32891	1269	277	202	765	0	5	2	4887	0
BHC	2182	1	16510	841	385	124	298	0	5	2	3630	1567
BHC	1826	0	19958	1345	548	76	461	0	5	2	3819	0
BHC	1760	1	13129	811	107	31	412	0	5	2	3190	1182
BHC	564	0	18257	962	306	182	986	0	5	2	4854	0
BHC	1541	1	17642	1198	253	153	783	0	5	1	2861	5011
BHC	2663	0	15692	1085	462	115	209	0	5	2	5497	0
BHC	1176	1	33174	2706	185	92	1144	0	5	2	4425	5501
BHC	1754	0	14713	537	197	112	443	0	5	2	3297	0
CHC	552	1	27378	946	468	244	638	10	5	2	5813	5836
CHC	1829	0	16222	526	196	138	263	8	10	6	4709	0
CHC	566	1	18280	418	188	85	308	19	11	6	3551	2458
CHC	1081	0	28609	2300	464	191	1304	26	11	6	5875	0
CHC	567	1	30344	2743	1580	423	900	62	9	6	6768	4957
CHC	1082	0	22432	2138	553	225	1281	21	11	6	3616	0
CHC	1180	1	27201	2091	689	153	1235	20	11	6	5870	5169
CHC	1762	0	22136	655	117	94	703	2	10	6	4673	0
CHC	574	1	47241	1983	912	663	729	8	13	6	6692	4316
CHC	1753	0	30964	2375	906	347	951	14	11	6	7108	0
CHC	576	1	19696	872	256	155	629	6	11	6	5073	4207
CHC	548	0	41224	2390	401	139	1697	43	11	6	22936	0
CHC	565	1	30719	983	287	111	721	16	12	6	6934	600
CHC	1756	0	27010	1381	442	276	467	20	13	6	9705	0
SC	2274	1	14172	85	22	4	0	0	1	1	1950	2303
SC	2372	0	5459	210	65	17	83	0	2	1	1467	0
SC	2271	1	5970	0	0	2	0	0	2	1	2180	724
SC	2383	0	3990	0	0	0	0	0	1	1	2082	0
SC	2263	1	7302	0	0	0	0	0	1	1	1043	540
SC	2378	0	10382	478	195	49	0	0	2	1	3264	0
SC	2270	1	7233	326	101	71	0	0	2	0	2806	5445
SC	2370	0	8675	876	269	85	0	0	2	1	3139	0
SC	2262	1	5294	0	0	0	0	0	2	1	1490	0
SC	2272	0	4388	22	7	0	0	0	1	1	1108	0
SC	2273	1	4178	0	0	0	0	0	1	1	2849	0
SC	2382	0	4063	352	123	82	0	0	2	1	3000	0
SC	2259	1	9624	619	193	74	0	0	2	1	2149	3888
SC	2258	0	9995	1072	370	155	0	0	2	1	2536	0
SC	2276	1	4063	216	57	55	0	0	2	1	1863	3620
SC	2261	0	7936	784	216	50	0	0	5	2	2325	0
SC	2266	1	8893	345	62	38	0	0	2	1	2082	1908

SC	2264	0	5709	362	88	51	0	0	2	1	1989	0
SC	2381	1	5901	123	49	0	0	0	2	1	2678	1031
SC	2260	0	9070	1178	261	121	0	0	2	1	2296	0
SC	2375	1	7564	182	62	33	0	0	2	1	2791	1821
SC	2380	0	9792	10	5	2	0	0	2	1	2683	0
SC	2275	1	8956	280	111	62	0	0	1	1	2363	518
SC	2373	0	5800	860	335	161	0	0	5	2	962	0
SC	2376	1	7543	0	10	0	0	0	2	1	2879	215
SC	2265	0	7563	385	147	62	0	0	2	1	2859	0
SC	2267	1	8378	429	109	95	0	0	2	1	2371	2351
SC	1763	0	9081	303	110	38	0	0	5	2	2234	0
SC	2268	1	15451	544	210	105	17	0	3	0	2472	3236
SC	2374	0	9409	340	153	71	0	0	2	1	2549	0
DH	561	1	47934	2573	1578	811	1434	47	27	9	12678	4322
DH	575	0	37655	1929	1744	1147	746	5	25	9	15016	0
DH	1539	1	47905	2286	2141	2152	1338	51	28	9	21060	13136
DH	554	0	54554	488	319	723	966	27	23	9	21406	0
Bamyan Province												
BHC	1726	1	6471	264	99	54	205	0	6	2	3030	299
BHC	1062	0	8913	247	45	7	197	0	5	2	3896	0
BHC	1075	1	11156	303	100	44	156	0	5	2	3707	792
BHC	1773	0	7831	173	51	42	94	1	6	2	3473	0
BHC	1739	1	10799	281	98	36	206	2	6	1	3863	356
BHC	1878	0	5853	166	54	32	70	0	6	2	2770	0
BHC	1776	1	8622	470	124	46	260	0	6	2	3829	1056
BHC	1778	0	8271	295	103	39	383	2	5	2	3689	0
BHC	1777	1	9620	208	92	13	166	0	5	2	3524	109
BHC	1775	0	6847	358	202	49	330	0	6	2	4091	0
BHC	1741	1	14957	462	112	59	161	1	6	2	5079	1311
BHC	1727	0	8632	573	195	83	185	2	6	2	3897	0
BHC	801	1	14162	364	106	25	222	0	5	2	5046	458
BHC	496	0	10265	306	88	64	351	0	5	2	4174	0
BHC	2255	1	9653	335	124	51	230	0	5	2	3515	1442
BHC	1864	0	8925	491	174	86	478	0	5	2	3508	0
BHC	2257	1	22771	318	112	49	305	0	5	2	4129	3830
BHC	2256	0	10289	377	109	43	248	0	4	2	3868	0
CHC	1774	1	7465	235	76	32	105	0	9	5	5819	151
CHC	1076	0	19899	840	240	126	305	1	10	6	8227	0
CHC	1742	1	16278	519	189	129	361	6	10	8	7675	2343
CHC	1574	0	18426	1166	241	108	273	0	11	5	7344	0
CHC	1572	1	20545	1092	313	184	338	0	11	5	10292	1448
CHC	1063	0	16683	750	224	97	445	0	9	5	7498	0
CHC	1571	1	18839	1573	287	168	289	0	10	5	8814	3424
CHC	1163	0	20136	1068	222	157	305	2	9	6	6665	0
CHC	494	1	25607	1124	353	142	452	7	10	6	7305	1928
CHC	495	0	33681	838	374	280	428	8	11	6	7928	0
SC	1991	1	10406	372	135	46	26	0	3	2	3423	716
SC	1992	0	7659	245	91	21	120	0	3	1	4024	0
SC	2321	1	11095	435	98	24	213	0	3	2	3249	77
SC	2358	0	6608	199	79	36	72	0	3	1	2958	0
SC	2357	1	15346	223	54	31	254	0	2	1	5965	614
SC	2322	0	9374	222	71	30	99	0	3	2	3652	0
SC	2768	1	6859	149	23	17	69	0	3	1	2864	180
SC	2765	0	5970	174	56	23	91	0	3	1	2921	0
SC	2767	1	7407	92	39	21	62	0	3	1	2812	288
SC	2766	0	8680	521	162	51	134	0	2	2	2894	0
SC	2764	1	8676	363	153	62	119	0	3	1	3570	938
SC	2562	0	7726	308	189	80	0	0	3	1	3303	0
DH	810	1	25054	1433	508	379	387	7	25	12	19290	2410
DH	805	0	35348	1724	509	414	445	4	26	10	17308	0

Jawzjan Province												
BHC	1558	1	8955	701	175	46	374	0	5	2	3556	1248
BHC	1872	0	13394	1031	566	185	365	0	5	2	4974	0
BHC	2032	1	11037	886	248	96	640	0	5	2	3467	3658
BHC	1557	0	13005	316	88	68	371	0	5	2	3669	0
BHC	594	1	19304	1107	628	252	864	14	5	2	4289	4382
BHC	2147	0	11354	596	219	77	364	1	5	2	3449	0
BHC	1901	1	15819	799	391	203	770	1	5	2	4769	1217
BHC	1555	0	17881	1669	368	101	539	0	5	2	3666	0
BHC	591	1	17368	1062	466	196	653	6	5	2	4791	2908
BHC	1871	0	12107	112	47	9	1130	10	4	2	4148	0
BHC	2034	1	17188	865	227	57	458	1	5	2	3469	697
BHC	1556	0	17895	575	164	123	510	5	5	2	3338	0
BHC	1870	1	27126	1071	538	162	980	14	5	2	8042	4131
BHC	2033	0	18260	814	239	140	916	11	10	5	5608	0
CHC	585	1	39193	1655	453	344	773	2	11	5	7094	3764
CHC	587	0	32209	1295	762	448	885	10	6	5	7858	0
CHC	588	1	32872	896	570	424	698	13	13	6	14366	1889
CHC	592	0	29174	1317	791	370	1030	23	11	5	11390	0
CHC	593	1	39202	1878	985	480	1077	11	11	5	8871	10703
CHC	1035	0	28625	2114	1284	443	1576	9	9	5	7174	0
DH	586	1	53730	3099	1488	867	2227	27	24	8	22495	13070
DH	590	0	100121	3464	3697	3326	3520	60	29	9	22841	0
Panjshir Province												
BHC	82	1	7022	0	0	0	181	0	2	3	9893	64
BHC	87	0	7685	455	95	29	155	0	4	3	6160	0
BHC	1786	1	12269	581	270	9	331	0	4	4	8818	775
BHC	79	0	13100	371	49	22	336	1	4	3	8527	0
BHC	1114	1	16818	969	340	74	470	0	5	3	8195	2654
BHC	77	0	11119	397	80	31	178	0	4	4	8982	0
BHC	1112	1	13844	812	286	23	417	0	5	3	7633	1822
BHC	1111	0	16159	480	176	19	296	0	5	3	8407	0
SC	2288	1	3078	4	0	0	0	0	1	1	3832	0
SC	2285	0	4095	270	82	29	0	0	1	1	5182	0
SC	2290	1	4578	7	0	0	0	0	1	1	4351	0
SC	2286	0	5825	165	72	8	0	0	2	1	5059	0
Parwan Province												
BHC	2338	1	7070	829	95	18	527	0	5	2	3542	0
BHC	2334	0	11675	365	61	13	259	0	4	2	5682	0
BHC	1641	1	8859	404	104	26	330	0	2	3	3235	542
BHC	2020	0	8342	243	107	2	217	0	5	2	3664	0
BHC	1645	1	7118	0	0	0	329	0	3	3	4428	34
BHC	1644	0	9198	407	61	12	235	0	3	3	5260	0
BHC	1049	1	12802	499	271	21	541	11	4	3	2869	740
BHC	1958	0	10002	0	0	0	565	24	3	3	3987	0
BHC	1503	1	10633	338	89	130	482	0	2	3	3629	3488
BHC	1956	0	16725	1145	799	87	426	2	1	3	7171	0
BHC	1643	1	10077	464	85	23	343	0	5	3	4360	183
BHC	1504	0	8389	130	4	2	206	0	3	3	4858	0
BHC	1948	1	7690	0	0	0	416	0	1	3	2971	31
BHC	1044	0	11973	589	72	42	333	0	4	3	3844	0
BHC	1108	1	4305	0	0	0	315	0	0	2	3352	42
BHC	75	0	11286	384	76	8	438	1	6	3	6737	0
BHC	2019	1	11109	0	0	0	556	0	3	2	3698	74
BHC	1634	0	14708	835	363	32	317	0	4	2	6167	0
BHC	74	1	10371	0	0	0	373	3	5	3	6737	12
BHC	2346	0	10338	0	0	0	770	0	3	3	6562	0
BHC	66	1	13026	1010	180	72	528	0	4	3	4323	1256
BHC	1045	0	17476	960	219	112	529	0	5	3	5454	0
BHC	20	1	13073	0	0	0	425	1	6	5	8113	102
BHC	1957	0	14607	575	82	31	410	0	4	3	4387	0

BHC	19	1	17231	717	244	28	317	0	3	2	3901	943
BHC	63	0	16074	523	115	35	535	0	4	3	3085	0
BHC	1947	1	14922	463	55	20	563	0	3	3	3140	164
BHC	1633	0	23391	714	128	24	475	0	4	3	4064	0
BHC	62	1	25485	1323	323	70	521	8	8	5	2569	679
BHC	1635	0	17580	774	165	26	345	8	3	3	3399	0
CHC	68	1	12946	792	172	106	180	5	10	5	7645	2600
CHC	16	0	9960	529	146	46	376	1	5	5	4568	0
CHC	70	1	16552	1210	319	141	646	22	7	5	6188	2414
CHC	1043	0	15831	1138	177	113	463	1	7	5	2401	0
CHC	72	1	28888	2213	491	373	546	40	10	5	9615	7918
CHC	1949	0	21326	1151	226	71	696	19	7	5	2168	0
CHC	67	1	20707	1375	257	144	549	5	8	5	2660	1376
CHC	18	0	29572	1851	539	87	1101	10	9	5	4803	0
SC	2343	1	5575	147	60	4	0	0	1	1	1462	212
SC	2340	0	5167	0	0	0	0	0	0	1	2075	0
SC	2345	1	5352	0	0	0	0	0	0	1	1507	0
SC	2328	0	3389	0	0	0	0	0	1	1	1779	0
SC	2335	1	4569	144	30	16	0	0	2	1	1253	459
SC	2342	0	5241	0	0	0	0	0	2	0	1047	0
SC	2336	1	4779	134	38	0	0	0	2	1	2185	88
SC	2341	0	3200	0	0	0	0	0	0	1	1601	0
SC	2329	1	5469	295	144	28	0	0	2	1	2646	633
SC	2339	0	3150	0	0	0	0	0	0	1	1583	0
SC	2337	1	2935	15	0	0	0	0	4	2	1648	0
SC	2344	0	9791	262	56	0	0	0	1	1	1463	0
SC	2791	1	4570	306	62	5	0	0	2	1	1173	634
SC	2770	0	9472	515	107	15	0	0	2	1	1538	0
SC	2772	1	6915	0	95	0	0	0	1	1	1925	0
SC	2773	0	8225	76	9	0	0	0	2	1	1715	0
SC	2774	1	5827	271	15	1	0	0	1	1	1389	210
SC	2789	0	3684	0	0	0	0	0	1	1	1664	0
SC	2790	1	4278	0	0	0	0	0	2	1	1692	0
SC	2771	0	1334	5	1	0	0	0	1	1	1099	0
Samangan Province												
BHC	1920	1	12216	0	0	34	798	0	5	2	5884	1132
BHC	1921	0	6489	122	31	3	204	0	5	2	1659	0
BHC	1115	1	11520	3	0	0	425	3	5	2	5896	1828
BHC	2057	0	13384	123	22	59	652	0	5	2	6726	0
BHC	1885	1	7429	331	87	42	330	0	5	2	5897	1219
BHC	1922	0	12369	290	89	55	438	0	5	3	4778	0
BHC	1886	1	10435	245	89	64	543	0	5	2	4162	2970
BHC	2055	0	9992	238	67	24	188	0	4	2	5888	0
BHC	2056	1	16949	587	206	93	421	0	5	2	6765	1227
BHC	1923	0	14371	239	112	92	255	0	5	2	6701	0
BHC	1879	1	18498	601	291	204	578	0	5	2	13299	1630
BHC	535	0	21518	252	140	124	492	0	5	2	5912	0
CHC	538	1	16588	570	183	76	649	5	9	4	9453	822
CHC	1116	0	19381	755	389	381	1165	14	8	3	10698	0
CHC	534	1	25997	610	269	204	1094	17	9	5	10479	2419
CHC	1117	0	21413	893	344	261	553	2	9	4	9794	0
SC	2333	1	6930	273	44	27	0	0	2	1	2592	176
SC	2332	0	7409	79	30	14	0	0	2	1	2592	0
SC	2230	1	6896	130	23	21	0	0	2	1	5009	1295
SC	2330	0	8657	204	58	27	0	0	2	1	4778	0
SC	2225	1	8365	170	105	77	44	0	2	1	4397	1671

SC	2226	0	8943	188	76	61	0	0	2	1	4313	0
SC	2228	1	11333	239	135	90	0	0	2	1	5582	1825
SC	2331	0	9449	231	84	42	0	0	2	1	3890	0
SC	2227	1	11081	446	198	110	0	0	2	1	4400	2120
SC	2229	0	11364	708	218	110	0	0	3	1	5062	0
DH	532	1	48098	1641	810	512	1012	15	20	9	29880	6909
DH	2857	0	43819	978	369	335	674	11	20	9	43555	0
Saripul Province												
BHC	1720	1	9187	296	148	69	287	0	5	2	3575	2960
BHC	1897	0	11083	322	125	51	426	0	5	2	5927	0
BHC	1896	1	13540	472	107	25	446	0	5	2	6469	1057
BHC	1881	0	14890	435	246	60	560	0	4	2	5562	0
BHC	1895	1	13813	602	352	135	722	0	4	2	4988	2452
BHC	1731	0	7752	260	119	80	581	0	5	2	3260	0
BHC	1882	1	14028	702	286	195	729	0	5	2	5522	2689
BHC	1723	0	18910	749	352	130	392	0	5	2	5542	0
BHC	1839	1	13285	129	32	0	674	0	4	2	5562	343
BHC	1729	0	11313	537	183	48	415	0	5	2	5543	0
BHC	1724	1	13366	986	377	150	689	0	5	2	5542	3149
BHC	1898	0	14179	695	216	100	443	0	5	2	3435	0
BHC	1859	1	30344	1685	884	302	888	26	9	6	11918	5820
BHC	1505	0	16418	1233	539	152	443	0	5	2	5542	0
CHC	1055	1	24289	1165	604	663	823	21	11	6	8879	2988
CHC	1732	0	21391	696	337	179	1028	39	9	6	11673	0
CHC	1537	1	25516	1746	1089	364	1039	65	11	6	8902	8453
CHC	855	0	35160	1944	646	423	1163	16	12	6	8882	0
CHC	1057	1	25406	1477	646	249	876	7	10	5	4009	8524
CHC	860	0	18070	770	365	197	1051	15	9	6	8065	0
SC	2246	1	12452	263	136	65	0	0	2	1	2475	2193
SC	2251	0	7211	66	62	19	0	0	2	1	4110	0
SC	2248	1	10138	361	223	98	0	0	2	1	4033	2133
SC	2241	0	13838	47	15	4	0	0	2	1	4009	0
SC	2242	1	10134	751	295	76	0	0	2	1	4385	1887
SC	2240	0	9162	99	102	0	318	0	2	1	3185	0
SC	2254	1	11790	456	130	33	741	0	2	2	1997	1447
SC	2253	0	11186	447	94	54	0	0	2	1	4736	0
SC	2250	1	9701	212	85	51	0	0	2	1	840	970
SC	2247	0	12137	579	332	138	0	0	2	1	4009	0
SC	2238	1	14028	248	193	66	0	0	2	1	1860	121
SC	2245	0	11044	565	249	108	0	0	2	1	4009	0
SC	2249	1	6951	117	82	108	38	0	2	1	4009	6861
SC	2243	0	13001	490	176	109	0	0	2	1	4007	0
SC	2239	1	10644	300	177	62	433	0	5	2	4032	1459
SC	2244	0	18787	699	361	150	542	0	3	1	4009	0
Takhar Province												
BHC	1687	1	8361	307	172	63	468	1	5	2	3214	1596
BHC	1699	0	7794	275	105	38	453	0	6	1	3341	0
BHC	1696	1	13081	489	268	90	336	0	5	2	4121	1953
BHC	1698	0	7236	424	186	31	423	0	4	3	10318	0
BHC	1684	1	10115	507	165	84	557	0	5	2	3391	1323
BHC	1617	0	12370	590	264	29	413	4	5	2	4168	0
BHC	1710	1	10137	537	224	85	238	0	6	1	3742	2324
BHC	1688	0	10449	363	115	33	370	0	5	2	4044	0
BHC	1685	1	11521	586	210	115	426	0	8	0	3592	3563
BHC	1694	0	10052	357	191	18	684	0	6	1	4190	0
BHC	1706	1	10965	380	158	39	226	0	4	2	3477	216
BHC	1928	0	6260	278	118	46	223	0	6	2	2509	0
BHC	1931	1	9881	597	221	86	575	2	4	3	3575	2421
BHC	1697	0	20521	1303	567	165	412	3	10	4	5628	0

BHC	1693	1	12113	446	154	44	611	2	5	2	4271	1338
BHC	442	0	7943	444	238	20	339	0	4	3	3622	0
BHC	1689	1	15830	1197	365	145	926	0	2	7	5550	3390
BHC	1695	0	13620	807	273	30	489	0	5	2	4103	0
BHC	431	1	32702	1514	529	74	1252	2	5	2	7837	2354
BHC	1686	0	10127	277	129	18	607	0	4	4	3456	0
BHC	1927	1	14826	694	295	70	302	3	6	1	4733	1003
BHC	1690	0	5912	338	102	10	570	0	5	2	3349	0
BHC	1691	1	14290	1200	643	61	651	0	6	1	4500	1525
BHC	1708	0	17425	825	439	104	653	2	5	2	5140	0
BHC	432	1	17249	1446	571	50	748	0	5	2	5191	2799
BHC	456	0	11731	884	280	36	514	0	5	2	4866	0
BHC	428	1	27409	1852	872	82	1290	0	5	2	9383	3191
BHC	1692	0	13679	735	308	48	771	0	5	2	5577	0
BHC	1929	1	13164	1061	214	85	648	0	7	0	4268	1664
BHC	1930	0	16048	1198	573	161	347	4	7	0	6087	0
BHC	1711	1	18221	665	416	79	677	0	6	1	4673	2558
BHC	1707	0	14385	685	171	76	628	0	6	1	4673	0
CHC	446	1	34407	1216	577	326	1065	20	10	5	11604	4552
CHC	437	0	22675	1825	886	224	685	6	8	6	7264	0
CHC	436	1	22487	1006	564	311	1278	11	11	3	8181	3917
CHC	1161	0	16825	1361	532	223	557	8	10	3	7131	0
CHC	435	1	28861	2325	1049	789	2449	45	16	4	13669	7577
CHC	434	0	33687	1953	835	490	1395	26	11	5	11336	0
CHC	1709	1	25165	3099	1204	476	1167	33	13	2	10534	12688
CHC	452	0	33214	2773	1431	678	1701	28	10	6	12588	0
CHC	455	1	31244	1839	780	592	1020	27	12	4	11785	7558
CHC	451	0	39093	2063	1063	930	1897	37	9	7	17521	0
SC	2532	1	11177	327	161	44	0	0	2	1	4124	716
SC	2533	0	8112	207	97	31	59	0	2	1	3859	0
SC	2534	1	6852	215	119	55	0	0	2	1	3435	885
SC	2531	0	6428	57	16	6	0	0	2	1	3542	0
DH	439	1	44521	2737	966	622	983	23	23	9	21012	1739
DH	1162	0	40826	2341	1742	1374	1154	31	29	7	19468	0

Appendix B Health facility input and output orientated efficiency results

HF ID	Input Orientated DEA Results				Output Orientated DEA Results			
	TECRS	TEVRS	SE	Pattern of SE	TECRS	TEVRS	SE	Pattern of SE
District Hospitals								
561	1	1	1	-	1	1	1	-
575	0.847	1.00	0.847	IRS	0.85	1.000	0.847	IRS
1539	0.896	0.984	0.910	IRS	0.90	0.938	0.955	IRS
554	0.687	1	0.687	IRS	0.69	1	0.687	IRS
810	0.485	0.954	0.508	IRS	0.49	0.507	0.956	IRS
805	0.657	0.948	0.693	IRS	0.66	0.743	0.884	IRS
586	1	1	1	-	1	1	1	-
590	1	1	1	-	1	1	1	-
532	0.697	1	0.697	IRS	0.70	1	0.697	IRS
2857	0.635	1	0.635	IRS	0.64	1	0.635	IRS
439	0.985	1	0.985	IRS	0.99	1	0.985	IRS
1162	0.869	1	0.869	IRS	0.87	1	0.869	IRS
Comprehensive Health Centers								
1713	0.624	0.796	0.783	IRS	0.62	0.62	0.999	IRS
1838	0.717	0.81	0.884	IRS	0.72	0.72	1	-
401	0.727	0.822	0.885	IRS	0.73	0.73	0.993	DRS
402	1	1	1	-	1	1	1	-
424	0.658	0.659	0.999	DRS	0.66	0.8	0.826	DRS
425	0.728	0.751	0.97	IRS	0.73	0.8	0.912	DRS
1567	0.575	0.628	0.915	IRS	0.58	0.61	0.95	DRS
2050	0.941	0.955	0.985	IRS	0.94	0.94	1	-
421	0.514	0.569	0.903	IRS	0.51	0.56	0.917	DRS
417	0.53	0.541	0.979	IRS	0.53	0.81	0.654	DRS
552	1	1	1	-	1	1	1	-
1829	0.568	0.761	0.746	IRS	0.57	0.61	0.926	DRS
566	0.662	0.775	0.854	IRS	0.66	0.71	0.93	DRS
1081	1	1	1	-	1	1	1	-
567	1	1	1	-	1	1	1	-
1082	1	1	1	-	1	1	1	-
1180	0.892	0.893	0.999	DRS	0.89	0.94	0.947	DRS
1762	0.706	0.776	0.91	IRS	0.71	0.78	0.908	DRS
574	1	1	1	-	1	1	1	-
1753	0.986	1	0.986	DRS	0.99	1	0.986	DRS
576	0.576	0.686	0.84	IRS	0.58	0.6	0.963	DRS
548	1	1	1	-	1	1	1	-
565	0.85	0.85	1	-	0.85	0.91	0.933	DRS
1756	0.753	0.778	0.968	IRS	0.75	0.81	0.928	DRS
1774	0.242	0.834	0.29	IRS	0.24	0.24	0.999	-
1076	0.529	0.71	0.745	IRS	0.53	0.59	0.899	DRS
1742	0.388	0.567	0.684	IRS	0.39	0.41	0.94	DRS
1574	0.601	0.766	0.785	IRS	0.6	0.6	1	-
1572	0.564	0.687	0.82	IRS	0.56	0.57	0.992	DRS
1063	0.524	0.813	0.645	IRS	0.52	0.52	1	-
1571	0.615	0.731	0.842	IRS	0.62	0.62	0.996	DRS
1163	0.58	0.765	0.759	IRS	0.58	0.64	0.914	DRS
494	0.631	0.687	0.918	IRS	0.63	0.66	0.96	DRS
495	0.902	0.993	0.908	DRS	0.9	1	0.904	DRS

585	0.97	0.971	0.999	IRS	0.97	0.97	1	-
587	1	1	1	-	1	1	1	-
588	0.732	0.734	0.998	DRS	0.73	0.78	0.944	DRS
592	0.893	0.937	0.953	IRS	0.89	0.9	0.99	IRS
593	0.895	1	0.895	DRS	0.9	1	0.895	DRS
1035	1	1	1	-	1	1	1	-
68	0.368	0.692	0.533	IRS	0.37	0.38	0.977	DRS
16	0.497	1	0.497	IRS	0.5	1	0.497	IRS
70	0.684	0.93	0.735	IRS	0.68	0.78	0.873	IRS
1043	0.908	1	0.908	IRS	0.91	1	0.908	IRS
72	0.83	0.833	0.996	DRS	0.83	0.89	0.928	DRS
1949	1	1	1	-	1	1	1	-
67	0.987	1	0.987	IRS	0.99	1	0.987	IRS
18	1	1	1	-	1	1	1	-
538	0.574	0.832	0.69	IRS	0.57	0.59	0.977	IRS
1116	1	1	1	-	1	1	1	-
534	0.754	0.796	0.948	IRS	0.75	0.77	0.974	DRS
1117	0.793	0.886	0.895	IRS	0.79	0.82	0.963	IRS
1055	1	1	1	-	1	1	1	-
1732	1	1	1	-	1	1	1	-
1537	1	1	1	-	1	1	1	-
855	0.967	1	0.967	DRS	0.97	1	0.967	DRS
1057	1	1	1	-	1	1	1	-
860	0.737	0.818	0.902	IRS	0.74	0.74	0.999	DRS
446	0.805	0.842	0.956	DRS	0.81	0.9	0.896	DRS
437	0.929	0.998	0.931	IRS	0.93	1	0.932	IRS
436	0.956	1	0.956	IRS	0.96	1	0.956	IRS
1161	0.993	1	0.993	IRS	0.99	1	0.993	IRS
435	1	1	1	-	1	1	1	-
434	1	1	1	-	1	1	1	-
1709	1	1	1	-	1	1	1	-
452	1	1	1	-	1	1	1	-
455	0.922	0.933	0.989	DRS	0.92	0.95	0.969	DRS
451	1	1	1	-	1	1	1	-
Basic Health Centers								
2058	0.66	0.802	0.823	IRS	0.66	0.672	0.983	DRS
2486	0.351	0.803	0.438	IRS	0.351	0.351	1	-
1978	0.408	0.816	0.5	IRS	0.408	0.463	0.881	IRS
1563	0.333	0.952	0.349	IRS	0.333	0.482	0.691	IRS
1983	0.436	0.703	0.62	IRS	0.436	0.45	0.969	DRS
1561	0.685	0.866	0.791	IRS	0.685	0.695	0.985	IRS
1981	0.576	0.757	0.762	IRS	0.576	0.589	0.978	DRS
2036	0.928	0.951	0.976	IRS	0.928	0.928	1	-
1982	0.423	0.747	0.567	IRS	0.423	0.423	1	-
1980	0.386	0.818	0.472	IRS	0.386	0.386	1	-
1857	0.555	0.785	0.707	IRS	0.555	0.555	1	-
1986	1	1	1	-	1	1	1	-
1985	0.725	0.768	0.943	IRS	0.725	0.733	0.989	DRS
1560	0.568	0.804	0.706	IRS	0.568	0.581	0.978	DRS
2144	0.79	0.825	0.958	IRS	0.79	0.79	1	-
1979	0.427	0.805	0.531	IRS	0.427	0.427	1	-

422	0.413	0.505	0.817	IRS	0.413	0.507	0.815	DRS
2063	0.528	0.714	0.74	IRS	0.528	0.62	0.852	DRS
1562	0.602	0.711	0.846	IRS	0.602	0.608	0.99	DRS
2174	0.756	0.765	0.988	IRS	0.756	0.87	0.869	DRS
416	0.674	0.686	0.981	IRS	0.674	0.803	0.839	DRS
2120	0.855	0.919	0.93	IRS	0.855	0.862	0.991	IRS
2064	0.52	0.626	0.831	IRS	0.52	0.554	0.94	DRS
1565	0.552	0.629	0.878	IRS	0.552	0.738	0.748	DRS
414	0.469	0.59	0.795	IRS	0.469	0.547	0.856	DRS
1817	0.645	0.784	0.823	IRS	0.645	0.675	0.955	DRS
560	0.593	0.916	0.647	IRS	0.593	0.693	0.855	IRS
2377	0.967	1	0.967	IRS	0.967	1	0.967	IRS
1831	0.553	0.953	0.58	IRS	0.553	0.772	0.715	IRS
577	1	1	1	-	1	1	1	-
1830	0.351	0.767	0.458	IRS	0.351	0.361	0.973	IRS
1823	0.581	0.827	0.703	IRS	0.581	0.581	1	-
550	1	1	1	-	1	1	1	-
1827	0.646	0.891	0.725	IRS	0.646	0.651	0.992	IRS
573	1	1	1	-	1	1	1	-
1828	1	1	1	-	1	1	1	-
1825	0.82	0.9	0.911	IRS	0.82	0.82	1	-
2194	1	1	1	-	1	1	1	-
1540	0.887	0.914	0.97	IRS	0.887	0.888	0.999	-
1873	0.952	0.96	0.992	DRS	0.952	0.968	0.983	DRS
2371	1	1	1	-	1	1	1	-
1070	1	1	1	-	1	1	1	-
549	1	1	1	-	1	1	1	-
2582	0.771	0.869	0.887	IRS	0.771	0.776	0.994	DRS
1810	1	1	1	-	1	1	1	-
1755	0.716	0.898	0.797	IRS	0.716	0.716	0.999	DRS
1538	1	1	1	-	1	1	1	-
558	1	1	1	-	1	1	1	-
2182	0.691	0.836	0.827	IRS	0.691	0.691	1	-
1826	0.77	0.936	0.823	IRS	0.77	0.77	1	-
1760	0.519	0.826	0.628	IRS	0.519	0.534	0.972	IRS
564	1	1	1	-	1	1	1	-
1541	1	1	1	-	1	1	1	-
2663	0.646	0.828	0.78	IRS	0.646	0.646	1	-
1176	0.979	0.984	0.995	IRS	0.979	0.979	1	-
1754	0.77	0.948	0.812	IRS	0.77	0.814	0.946	IRS
1726	0.388	0.752	0.516	IRS	0.388	0.437	0.889	IRS
1062	0.322	0.832	0.387	IRS	0.322	0.322	1	-
1075	0.4	0.75	0.533	IRS	0.4	0.4	1	-
1773	0.357	0.768	0.465	IRS	0.357	0.357	0.999	-
1739	0.606	0.899	0.674	IRS	0.606	0.736	0.823	IRS
1878	0.306	0.809	0.378	IRS	0.306	0.356	0.858	IRS
1776	0.305	0.671	0.454	IRS	0.305	0.307	0.994	IRS
1778	0.433	0.843	0.513	IRS	0.433	0.433	1	-
1777	0.375	0.781	0.48	IRS	0.375	0.378	0.99	IRS
1775	0.38	0.738	0.515	IRS	0.38	0.39	0.974	DRS
1741	0.46	0.659	0.699	IRS	0.46	0.468	0.983	DRS

1727	0.502	0.753	0.667	IRS	0.502	0.502	1	-
801	0.429	0.708	0.606	IRS	0.429	0.429	1	-
496	0.411	0.818	0.502	IRS	0.411	0.411	1	-
2255	0.36	0.733	0.492	IRS	0.36	0.369	0.975	IRS
1864	0.617	0.88	0.702	IRS	0.617	0.62	0.995	IRS
2257	0.672	0.809	0.831	IRS	0.672	0.672	1	-
2256	0.402	0.942	0.426	IRS	0.402	0.605	0.663	IRS
1558	0.37	0.746	0.496	IRS	0.37	0.371	0.997	IRS
1872	0.995	0.996	0.999	IRS	0.995	0.995	1	-
2032	0.585	0.809	0.723	IRS	0.585	0.585	1	-
1557	0.51	0.865	0.589	IRS	0.51	0.51	1	-
594	1	1	1	-	1	1	1	-
2147	0.557	0.867	0.642	IRS	0.557	0.565	0.985	IRS
1901	0.942	0.942	1	-	0.942	0.956	0.985	DRS
1555	0.713	0.919	0.776	IRS	0.713	0.715	0.998	IRS
591	0.794	0.806	0.985	IRS	0.794	0.842	0.943	DRS
1871	1	1	1	-	1	1	1	-
2034	0.687	0.878	0.783	IRS	0.687	0.694	0.99	IRS
1556	0.97	0.991	0.979	IRS	0.97	0.973	0.997	IRS
1870	1	1	1	-	1	1	1	-
2033	0.818	1	0.818	DRS	0.818	1	0.818	DRS
82	0.325	0.575	0.564	IRS	0.325	0.34	0.954	DRS
87	0.263	0.746	0.353	IRS	0.263	0.277	0.949	DRS
1786	0.352	0.449	0.783	IRS	0.352	0.448	0.784	DRS
79	0.431	0.7	0.615	IRS	0.431	0.48	0.898	DRS
1114	0.461	0.513	0.898	IRS	0.461	0.555	0.831	DRS
77	0.321	0.602	0.533	IRS	0.321	0.385	0.833	DRS
1112	0.384	0.477	0.806	IRS	0.384	0.452	0.85	DRS
1111	0.439	0.659	0.666	IRS	0.439	0.505	0.869	DRS
2338	0.584	0.874	0.668	IRS	0.584	0.591	0.988	IRS
2334	0.419	0.875	0.479	IRS	0.419	0.48	0.872	IRS
1641	0.597	0.904	0.661	IRS	0.597	0.662	0.903	IRS
2020	0.32	0.844	0.379	IRS	0.32	0.32	1	-
1645	0.394	0.67	0.588	IRS	0.394	0.414	0.953	DRS
1644	0.398	0.88	0.452	IRS	0.398	0.413	0.964	IRS
1049	1	1	1	-	1	1	1	-
1958	1	1	1	-	1	1	1	-
1503	0.896	0.951	0.942	IRS	0.896	0.93	0.963	IRS
1956	1	1	1	-	1	1	1	-
1643	0.353	0.635	0.555	IRS	0.353	0.353	1	-
1504	0.37	0.903	0.409	IRS	0.37	0.395	0.937	IRS
1948	0.986	1	0.986	IRS	0.986	1	0.986	IRS
1044	0.491	0.854	0.574	IRS	0.491	0.521	0.942	IRS
1108	1	1	1	-	1	1	1	-
75	0.343	0.602	0.57	IRS	0.343	0.452	0.759	DRS
2019	0.69	0.878	0.785	IRS	0.69	0.693	0.995	IRS
1634	0.601	0.889	0.677	IRS	0.601	0.622	0.966	IRS
74	0.366	0.613	0.597	IRS	0.366	0.442	0.826	DRS
2346	0.83	0.847	0.98	IRS	0.83	0.86	0.965	DRS
66	0.541	0.704	0.767	IRS	0.541	0.541	0.999	IRS
1045	0.605	0.765	0.79	IRS	0.605	0.636	0.951	DRS

20	0.333	0.409	0.814	IRS	0.333	0.46	0.725	DRS
1957	0.569	0.828	0.687	IRS	0.569	0.588	0.967	IRS
19	0.785	0.917	0.856	IRS	0.785	0.839	0.936	IRS
63	0.733	1	0.733	IRS	0.733	1	0.733	IRS
1947	0.835	0.981	0.851	IRS	0.835	0.95	0.879	IRS
1633	0.88	0.961	0.916	IRS	0.88	0.942	0.934	IRS
62	1	1	1	-	1	1	1	-
1635	1	1	1	-	1	1	1	-
1920	0.548	0.712	0.769	IRS	0.548	0.548	1	-
1921	0.539	1	0.539	IRS	0.539	1	0.539	IRS
1115	0.424	0.604	0.703	IRS	0.424	0.429	0.988	DRS
2057	0.619	0.815	0.76	IRS	0.619	0.629	0.984	DRS
1885	0.266	0.568	0.468	IRS	0.266	0.271	0.98	DRS
1922	0.435	0.728	0.597	IRS	0.435	0.454	0.957	DRS
1886	0.403	0.695	0.579	IRS	0.403	0.403	1	-
2055	0.358	0.875	0.41	IRS	0.358	0.405	0.886	IRS
2056	0.526	0.645	0.816	IRS	0.526	0.527	0.999	DRS
1923	0.455	0.79	0.577	IRS	0.455	0.455	1	-
1879	0.732	0.854	0.857	DRS	0.732	0.925	0.792	DRS
535	0.654	0.871	0.751	IRS	0.654	0.654	1	-
1720	0.379	0.718	0.527	IRS	0.379	0.379	1	-
1897	0.441	0.778	0.567	IRS	0.441	0.441	1	-
1896	0.423	0.615	0.688	IRS	0.423	0.423	1	-
1881	0.691	0.916	0.754	IRS	0.691	0.729	0.947	IRS
1895	0.704	0.724	0.972	IRS	0.704	0.772	0.912	DRS
1731	0.706	0.924	0.764	IRS	0.706	0.739	0.956	IRS
1882	0.767	0.789	0.972	DRS	0.767	0.849	0.903	DRS
1723	0.688	0.853	0.806	IRS	0.688	0.688	1	-
1839	0.603	0.778	0.774	IRS	0.603	0.609	0.99	IRS
1729	0.457	0.781	0.585	IRS	0.457	0.46	0.995	DRS
1724	0.624	0.633	0.986	IRS	0.624	0.698	0.893	DRS
1898	0.688	0.909	0.756	IRS	0.688	0.71	0.969	IRS
1859	0.781	1	0.781	DRS	0.781	1	0.781	DRS
1505	0.836	0.896	0.934	IRS	0.836	0.836	1	-
1687	0.489	0.812	0.602	IRS	0.489	0.495	0.988	IRS
1699	0.724	0.901	0.804	IRS	0.724	0.809	0.895	IRS
1696	0.476	0.706	0.674	IRS	0.476	0.476	0.999	-
1698	0.395	0.7	0.564	IRS	0.395	0.473	0.834	DRS
1684	0.578	0.808	0.715	IRS	0.578	0.578	1	-
1617	0.6	0.852	0.704	IRS	0.6	0.604	0.993	DRS
1710	0.545	0.81	0.673	IRS	0.545	0.549	0.993	IRS
1688	0.394	0.825	0.477	IRS	0.394	0.394	1	-
1685	1	1	1	-	1	1	1	-
1694	0.998	1	0.998	IRS	0.998	1	0.998	IRS
1706	0.457	0.845	0.54	IRS	0.457	0.521	0.876	IRS
1928	0.446	0.849	0.525	IRS	0.446	0.602	0.741	IRS
1931	0.587	0.815	0.721	IRS	0.587	0.611	0.961	IRS
1697	0.662	0.679	0.975	DRS	0.662	0.984	0.673	DRS
1693	0.501	0.737	0.68	IRS	0.501	0.508	0.986	DRS
442	0.469	0.889	0.528	IRS	0.469	0.573	0.819	IRS
1689	1	1	1	-	1	1	1	-

1695	0.565	0.852	0.663	IRS	0.565	0.569	0.992	DRS
431	1	1	1	-	1	1	1	-
1686	0.672	0.963	0.698	IRS	0.672	0.862	0.78	IRS
1927	0.723	0.876	0.825	IRS	0.723	0.746	0.969	IRS
1690	0.604	0.885	0.682	IRS	0.604	0.626	0.963	IRS
1691	1	1	1	-	1	1	1	-
1708	0.786	0.87	0.903	IRS	0.786	0.805	0.976	DRS
432	0.74	0.769	0.963	IRS	0.74	0.74	1	-
456	0.571	0.803	0.711	IRS	0.571	0.586	0.975	DRS
428	1	1	1	-	1	1	1	-
1692	0.783	0.845	0.927	IRS	0.783	0.819	0.957	DRS
1929	1	1	1	-	1	1	1	-
1930	1	1	1	-	1	1	1	-
1711	0.804	0.867	0.927	IRS	0.804	0.804	1	-
1707	0.909	0.942	0.965	IRS	0.909	0.914	0.994	IRS
Sub-Centers								
2529	1	1	1	-	1	1	1	
2530	0.355	0.584	0.608	IRS	0.355	0.355	1	-
2327	0.701	0.775	0.904	IRS	0.701	0.707	0.991	IRS
2568	0.564	0.681	0.829	IRS	0.564	0.565	0.999	IRS
2572	0.783	0.815	0.961	IRS	0.783	0.783	1	-
2323	0.561	0.796	0.704	IRS	0.561	0.576	0.973	IRS
2508	0.656	0.895	0.732	IRS	0.656	0.741	0.884	IRS
2570	0.61	0.774	0.787	IRS	0.61	0.61	1	-
2325	0.878	0.91	0.965	IRS	0.878	0.878	1	-
2324	0.726	1	0.726	IRS	0.726	1	0.726	IRS
2569	0.467	0.66	0.708	IRS	0.467	0.467	1	-
2574	0.67	0.779	0.86	IRS	0.67	0.67	1	-
2274	1	1	1	-	1	1	1	-
2372	0.685	1	0.685	IRS	0.685	1	0.685	IRS
2271	0.394	0.561	0.702	IRS	0.394	0.405	0.972	DRS
2383	0.406	0.667	0.61	IRS	0.406	0.406	1	-
2263	0.903	1	0.903	IRS	0.903	1	0.903	IRS
2378	0.78	0.844	0.924	IRS	0.78	0.78	1	-
2270	1	1	1	-	1	1	1	-
2370	0.846	0.897	0.943	IRS	0.846	0.846	1	-
2262	0.533	0.745	0.716	IRS	0.533	0.535	0.996	DRS
2272	0.592	1	0.592	IRS	0.592	1	0.592	IRS
2273	0.425	0.667	0.638	IRS	0.425	0.425	1	-
2382	0.529	0.765	0.692	IRS	0.529	0.529	1	-
2259	0.829	0.867	0.956	IRS	0.829	0.833	0.995	DRS
2258	1	1	1	-	1	1	1	-
2276	0.45	0.777	0.58	IRS	0.45	0.468	0.962	IRS
2261	0.648	0.652	0.995	IRS	0.648	0.776	0.836	DRS
2266	0.658	0.748	0.879	IRS	0.658	0.683	0.963	DRS
2264	0.581	0.783	0.742	IRS	0.581	0.586	0.991	IRS
2381	0.368	0.561	0.656	IRS	0.368	0.373	0.987	DRS
2260	1	1	1	-	1	1	1	-
2375	0.456	0.594	0.768	IRS	0.456	0.473	0.963	DRS

2380	0.692	0.75	0.922	IRS	0.692	0.694	0.996	DRS
2275	0.984	0.987	0.997	IRS	0.984	0.984	1	-
2373	1	1	1	-	1	1	1	-
2376	0.513	0.611	0.84	IRS	0.513	0.513	1	-
2265	0.583	0.709	0.823	IRS	0.583	0.583	1	-
2267	0.739	0.828	0.893	IRS	0.739	0.741	0.999	DRS
1763	0.621	0.627	0.992	DRS	0.621	0.73	0.851	DRS
2268	1	1	1	-	1	1	1	-
2374	0.751	0.81	0.927	IRS	0.751	0.753	0.998	IRS
1991	0.476	0.492	0.967	IRS	0.476	0.597	0.798	DRS
1992	0.408	0.563	0.723	IRS	0.408	0.408	1	-
2321	0.644	0.692	0.93	IRS	0.644	0.677	0.952	DRS
2358	0.434	0.561	0.774	IRS	0.434	0.438	0.991	DRS
2357	0.992	0.994	0.998	IRS	0.992	0.992	1	-
2322	0.444	0.489	0.909	IRS	0.444	0.535	0.83	DRS
2768	0.398	0.511	0.778	IRS	0.398	0.422	0.943	DRS
2765	0.386	0.569	0.679	IRS	0.386	0.4	0.967	DRS
2767	0.426	0.521	0.818	IRS	0.426	0.459	0.928	DRS
2766	0.683	0.781	0.875	IRS	0.683	0.703	0.972	DRS
2764	0.468	0.605	0.774	IRS	0.468	0.504	0.93	DRS
2562	0.528	0.607	0.87	IRS	0.528	0.528	1	-
2288	0.313	0.669	0.468	IRS	0.313	0.313	1	-
2285	0.523	0.83	0.631	IRS	0.523	0.523	1	-
2290	0.466	0.671	0.694	IRS	0.466	0.466	1	-
2286	0.407	0.597	0.682	IRS	0.407	0.407	1	-
2343	0.63	0.944	0.667	IRS	0.63	0.728	0.865	IRS
2340	0.965	1	0.965	IRS	0.965	0.965	1	-
2345	1	1	1	-	1	1	1	-
2328	0.346	0.733	0.472	IRS	0.346	0.346	1	-
2335	0.446	0.826	0.54	IRS	0.446	0.448	0.995	IRS
2342	1	1	1	-	1	1	1	-
2336	0.346	0.611	0.566	IRS	0.346	0.346	1	-
2341	0.598	1	0.598	IRS	0.598	0.598	1	-
2329	0.457	0.689	0.664	IRS	0.457	0.458	0.999	-
2339	0.589	1	0.589	IRS	0.589	0.589	1	-
2337	0.266	0.627	0.425	IRS	0.266	0.281	0.947	DRS
2344	1	1	1	-	1	1	1	-
2791	0.579	0.938	0.617	IRS	0.579	0.75	0.773	IRS
2770	1	1	1	-	1	1	1	-
2772	0.769	0.872	0.882	IRS	0.769	0.769	1	-
2773	0.744	0.765	0.973	IRS	0.744	0.77	0.966	DRS
2774	0.719	1	0.719	IRS	0.719	1	0.719	IRS
2789	0.376	0.767	0.49	IRS	0.376	0.376	1	-
2790	0.391	0.652	0.6	IRS	0.391	0.404	0.969	DRS
2771	0.181	1	0.181	IRS	0.181	1	0.181	IRS
2333	0.502	0.634	0.792	IRS	0.502	0.503	0.997	DRS
2332	0.532	0.618	0.861	IRS	0.532	0.538	0.989	DRS
2230	0.414	0.551	0.752	IRS	0.414	0.418	0.989	DRS
2330	0.605	0.693	0.873	IRS	0.605	0.605	1	-
2225	0.63	0.72	0.876	IRS	0.63	0.631	1	-

2226	0.625	0.742	0.842	IRS	0.625	0.625	1	-
2228	0.806	0.821	0.982	IRS	0.806	0.808	0.998	DRS
2331	0.66	0.734	0.899	IRS	0.66	0.66	1	-
2227	0.861	0.876	0.982	IRS	0.861	0.861	0.999	DRS
2229	0.756	0.761	0.993	IRS	0.756	0.783	0.965	DRS
2246	0.816	0.829	0.984	IRS	0.816	0.832	0.98	DRS
2251	0.504	0.615	0.819	IRS	0.504	0.504	1	-
2248	0.779	0.81	0.961	IRS	0.779	0.779	0.999	DRS
2241	0.967	0.974	0.993	IRS	0.967	0.967	1	-
2242	0.883	0.902	0.978	IRS	0.883	0.883	1	-
2240	0.88	0.94	0.936	IRS	0.88	0.88	1	-
2254	1	1	1	-	1	1	1	-
2253	0.812	0.865	0.939	IRS	0.812	0.812	1	-
2250	1	1	1	-	1	1	1	-
2247	1	1	1	-	1	1	1	-
2238	1	1	1	-	1	1	1	-
2245	0.873	0.914	0.955	IRS	0.873	0.873	1	-
2249	0.734	0.828	0.887	IRS	0.734	0.734	1	-
2243	0.961	0.974	0.987	IRS	0.961	0.961	1	-
2239	0.52	0.57	0.913	IRS	0.52	0.686	0.757	DRS
2244	1	1	1	-	1	1	1	-
2532	0.728	0.783	0.93	IRS	0.728	0.728	1	-
2533	0.567	0.676	0.838	IRS	0.567	0.567	1	-
2534	0.489	0.653	0.749	IRS	0.489	0.49	0.998	DRS
2531	0.449	0.563	0.798	IRS	0.449	0.449	1	-

Appendix C Summary of output slacks

No	Province	Facility Type	Facility ID	Arm	OPD	ANC	PNC	Deliveries	DPT3	TB + detection
1	Badakhshan	BHC	2058	Tr.	0	578	431	176	0	0
2	Badakhshan	BHC	2486	Co.	0	1810	0	22	134	0
3	Badakhshan	BHC	1978	Tr.	0	1151	0	0	156	1
4	Badakhshan	BHC	1563	Co.	0	442	22	6	0	0
5	Badakhshan	BHC	1983	Tr.	0	912	0	0	0	0
6	Badakhshan	BHC	1561	Co.	0	2	169	326	63	0
7	Badakhshan	BHC	1981	Tr.	0	0	57	218	0	0
8	Badakhshan	BHC	2036	Co.	7866	476	147	77	0	7
9	Badakhshan	BHC	1982	Tr.	0	1019	0	167	33	0
10	Badakhshan	BHC	1980	Co.	0	1203	0	113	390	0
11	Badakhshan	BHC	1857	Tr.	10503	535	0	58	0	0
12	Badakhshan	BHC	1986	Co.	0	0	0	0	0	0
13	Badakhshan	BHC	1985	Tr.	6486	539	0	171	0	0
14	Badakhshan	BHC	1560	Co.	0	0	16	83	0	4
15	Badakhshan	BHC	2144	Tr.	0	0	0	70	19	0
16	Badakhshan	BHC	1979	Co.	0	675	73	106	217	0
17	Badakhshan	BHC	422	Tr.	0	1286	127	156	0	3
18	Badakhshan	BHC	2063	Co.	0	97	0	104	331	0
19	Badakhshan	BHC	1562	Tr.	8124	1026	0	0	0	5
20	Badakhshan	BHC	2174	Co.	0	454	0	197	31	0
21	Badakhshan	BHC	416	Tr.	0	422	0	80	195	0
22	Badakhshan	BHC	2120	Co.	0	8	296	287	252	0
23	Badakhshan	BHC	2064	Tr.	0	0	0	0	0	0
24	Badakhshan	BHC	1565	Co.	0	539	0	215	132	0
25	Badakhshan	BHC	414	Tr.	0	0	0	362	319	4
26	Badakhshan	BHC	1817	Co.	0	59	231	360	0	0
27	Badakhshan	CHC	1713	Tr.	0	535	376	444	350	0
28	Badakhshan	CHC	1838	Co.	0	565	588	663	711	0
29	Badakhshan	CHC	401	Tr.	0	571	21	0	506	0
30	Badakhshan	CHC	402	Co.	2601	0	0	274	394	0
31	Badakhshan	CHC	424	Tr.	0	603	440	848	0	0
32	Badakhshan	CHC	425	Co.	0	0	373	740	180	0
33	Badakhshan	CHC	1567	Tr.	0	183	0	673	0	0
34	Badakhshan	CHC	2050	Co.	0	0	0	513	256	0
35	Badakhshan	CHC	421	Tr.	0	187	295	235	167	0
36	Badakhshan	CHC	417	Co.	0	194	333	789	870	7
37	Badakhshan	SC	2529	Tr.	0	0	0	0	0	0
38	Badakhshan	SC	2530	Co.	0	114	80	27	361	0

39	Badakhshan	SC	2327	Tr.	1515	245	0	84	0	0
40	Badakhshan	SC	2568	Co.	0	216	82	0	239	1
41	Badakhshan	SC	2572	Tr.	0	36	0	0	166	1
42	Badakhshan	SC	2323	Co.	0	32	0	0	60	1
43	Badakhshan	SC	2508	Tr.	1351	52	0	0	32	1
44	Badakhshan	SC	2570	Co.	0	215	0	0	43	0
45	Badakhshan	SC	2325	Tr.	0	16	0	0	195	0
46	Badakhshan	SC	2324	Co.	0	0	0	0	0	0
47	Badakhshan	SC	2569	Tr.	0	31	0	0	179	1
48	Badakhshan	SC	2574	Co.	0	54	0	6	203	0
49	Balkh	BHC	560	Tr.	2089	1133	0	0	0	0
50	Balkh	BHC	2377	Co.	8436	0	0	0	0	1
51	Balkh	BHC	1831	Tr.	4201	680	181	75	0	5
52	Balkh	BHC	577	Co.	0	0	0	0	0	0
53	Balkh	BHC	1830	Tr.	0	173	0	0	0	1
54	Balkh	BHC	1823	Co.	0	0	0	113	0	2
55	Balkh	BHC	550	Tr.	0	0	0	0	0	0
56	Balkh	BHC	1827	Co.	4347	0	41	45	0	0
57	Balkh	BHC	573	Tr.	0	0	0	0	0	0
58	Balkh	BHC	1828	Co.	13804	200	0	0	0	1
59	Balkh	BHC	1825	Tr.	0	218	0	0	0	2
60	Balkh	BHC	2194	Co.	0	0	0	0	0	0
61	Balkh	BHC	1540	Tr.	0	843	0	0	0	1
62	Balkh	BHC	1873	Co.	8752	0	0	84	0	1
63	Balkh	BHC	2371	Tr.	0	0	0	0	0	0
64	Balkh	BHC	1070	Co.	0	0	0	0	0	0
65	Balkh	BHC	549	Tr.	0	0	0	0	0	0
66	Balkh	BHC	2582	Co.	0	0	0	59	0	4
67	Balkh	BHC	1810	Tr.	0	0	0	0	0	0
68	Balkh	BHC	1755	Co.	3957	333	0	0	0	2
69	Balkh	BHC	1538	Tr.	0	0	0	0	0	0
70	Balkh	BHC	558	Co.	0	0	0	0	0	0
71	Balkh	BHC	2182	Tr.	0	1495	0	0	402	1
72	Balkh	BHC	1826	Co.	0	1470	0	60	101	0
73	Balkh	BHC	1760	Tr.	0	0	197	15	93	0
74	Balkh	BHC	564	Co.	25	0	73	0	0	8
75	Balkh	BHC	1541	Tr.	0	0	0	0	0	0
76	Balkh	BHC	2663	Co.	0	1543	0	0	302	0
77	Balkh	BHC	1176	Tr.	0	0	0	0	0	0
78	Balkh	BHC	1754	Co.	0	137	0	0	0	1
79	Balkh	CHC	552	Tr.	0	366	48	0	259	0
80	Balkh	CHC	1829	Co.	0	351	131	100	428	0
81	Balkh	CHC	566	Tr.	0	970	306	81	308	0
82	Balkh	CHC	1081	Co.	0	0	0	0	0	0

83	Balkh	CHC	567	Tr.	0	0	0	0	0	0
84	Balkh	CHC	1082	Co.	0	0	0	0	0	0
85	Balkh	CHC	1180	Tr.	985	0	101	308	0	0
86	Balkh	CHC	1762	Co.	0	480	414	283	0	17
87	Balkh	CHC	574	Tr.	0	0	0	0	0	0
88	Balkh	CHC	1753	Co.	0	0	92	332	22	0
89	Balkh	CHC	576	Tr.	0	115	279	235	0	10
90	Balkh	CHC	548	Co.	0	0	0	0	0	0
91	Balkh	CHC	565	Tr.	0	421	615	622	238	0
92	Balkh	CHC	1756	Co.	0	0	392	386	829	0
93	Balkh	SC	2274	Tr.	0	0	0	0	0	0
94	Balkh	SC	2372	Co.	0	87	0	0	0	0
95	Balkh	SC	2271	Tr.	0	517	90	29	266	0
96	Balkh	SC	2383	Co.	0	242	101	35	127	0
97	Balkh	SC	2263	Tr.	0	0	0	0	0	0
98	Balkh	SC	2378	Co.	0	0	0	30	290	0
99	Balkh	SC	2270	Tr.	0	0	0	0	0	0
100	Balkh	SC	2370	Co.	0	0	0	7	58	0
101	Balkh	SC	2262	Tr.	0	265	57	2	16	0
102	Balkh	SC	2272	Co.	0	0	0	0	0	0
103	Balkh	SC	2273	Tr.	0	233	120	50	181	0
104	Balkh	SC	2382	Co.	2251	0	78	0	59	1
105	Balkh	SC	2259	Tr.	0	0	0	0	22	0
106	Balkh	SC	2258	Co.	0	0	0	0	0	0
107	Balkh	SC	2276	Tr.	1167	0	34	0	0	0
108	Balkh	SC	2261	Co.	0	340	0	0	379	3
109	Balkh	SC	2266	Tr.	0	0	61	0	76	0
110	Balkh	SC	2264	Co.	0	0	27	0	55	1
111	Balkh	SC	2381	Tr.	0	152	0	49	251	0
112	Balkh	SC	2260	Co.	0	0	0	0	0	0
113	Balkh	SC	2375	Tr.	0	0	0	0	181	1
114	Balkh	SC	2380	Co.	0	460	192	69	262	0
115	Balkh	SC	2275	Tr.	0	0	35	0	99	0
116	Balkh	SC	2373	Co.	0	0	0	0	0	0
117	Balkh	SC	2376	Tr.	0	384	148	72	241	0
118	Balkh	SC	2265	Co.	0	0	8	0	233	0
119	Balkh	SC	2267	Tr.	0	0	58	0	74	1
120	Balkh	SC	1763	Co.	0	289	0	0	495	4
121	Balkh	SC	2268	Tr.	0	0	0	0	0	0
122	Balkh	SC	2374	Co.	0	0	7	0	199	1
123	Balkh	DH	561	Tr.	0	0	428	547	222	0
124	Balkh	DH	575	Co.	14309	897	0	356	1239	28
125	Balkh	DH	1539	Tr.	23912	288	473	0	1292	0
126	Balkh	DH	554	Co.	0	2170	2355	1441	1356	4

127	Bamyan	BHC	1726	Tr.	0	103	0	0	0	2
128	Bamyan	BHC	1062	Co.	0	62	69	99	347	0
129	Bamyan	BHC	1075	Tr.	0	379	0	0	678	0
130	Bamyan	BHC	1773	Co.	0	385	43	0	294	0
131	Bamyan	BHC	1739	Tr.	0	179	172	194	48	0
132	Bamyan	BHC	1878	Co.	0	160	36	0	464	1
133	Bamyan	BHC	1776	Tr.	0	496	0	0	0	0
134	Bamyan	BHC	1778	Co.	0	102	0	24	0	0
135	Bamyan	BHC	1777	Tr.	0	393	0	65	510	0
136	Bamyan	BHC	1775	Co.	8315	1102	0	49	0	1
137	Bamyan	BHC	1741	Tr.	0	610	177	153	623	0
138	Bamyan	BHC	1727	Co.	0	128	0	55	95	0
139	Bamyan	BHC	801	Tr.	0	583	42	136	338	0
140	Bamyan	BHC	496	Co.	0	25	47	0	0	1
141	Bamyan	BHC	2255	Tr.	0	878	0	0	172	1
142	Bamyan	BHC	1864	Co.	7608	151	0	0	0	1
143	Bamyan	BHC	2257	Tr.	0	1954	124	40	1130	0
144	Bamyan	BHC	2256	Co.	0	281	0	34	0	0
145	Bamyan	CHC	1774	Tr.	0	304	190	267	417	7
146	Bamyan	CHC	1076	Co.	0	0	433	510	588	9
147	Bamyan	CHC	1742	Tr.	0	1057	531	411	702	0
148	Bamyan	CHC	1574	Co.	0	0	499	447	545	10
149	Bamyan	CHC	1572	Tr.	0	0	482	515	915	15
150	Bamyan	CHC	1063	Co.	0	0	295	428	40	9
151	Bamyan	CHC	1571	Tr.	0	0	592	417	731	13
152	Bamyan	CHC	1163	Co.	0	0	350	241	454	3
153	Bamyan	CHC	494	Tr.	0	214	309	467	655	0
154	Bamyan	CHC	495	Co.	0	542	371	367	674	0
155	Bamyan	SC	1991	Tr.	0	481	0	0	449	0
156	Bamyan	SC	1992	Co.	0	98	138	98	493	0
157	Bamyan	SC	2321	Tr.	0	0	0	47	0	0
158	Bamyan	SC	2358	Co.	0	186	0	3	171	0
159	Bamyan	SC	2357	Tr.	0	246	92	25	0	0
160	Bamyan	SC	2322	Co.	0	261	17	52	233	0
161	Bamyan	SC	2768	Tr.	0	145	71	42	125	0
162	Bamyan	SC	2765	Co.	0	76	3	26	84	0
163	Bamyan	SC	2767	Tr.	0	331	28	32	152	0
164	Bamyan	SC	2766	Co.	0	183	0	0	57	0
165	Bamyan	SC	2764	Tr.	0	70	0	0	174	0
166	Bamyan	SC	2562	Co.	0	287	0	0	341	1
167	Bamyan	DH	810	Tr.	0	0	1078	881	1170	14
168	Bamyan	DH	805	Co.	0	0	1685	1398	1610	32
169	Jawzjan	BHC	1558	Tr.	2337	463	0	1	0	0
170	Jawzjan	BHC	1872	Co.	3347	1559	0	0	0	2

171	Jawzjan	BHC	2032	Tr.	7511	761	0	0	0	1
172	Jawzjan	BHC	1557	Co.	0	256	57	0	93	0
173	Jawzjan	BHC	594	Tr.	0	0	0	0	0	0
174	Jawzjan	BHC	2147	Co.	0	525	0	0	0	0
175	Jawzjan	BHC	1901	Tr.	3717	519	0	0	0	2
176	Jawzjan	BHC	1555	Co.	0	0	19	0	0	0
177	Jawzjan	BHC	591	Tr.	0	240	0	0	0	0
178	Jawzjan	BHC	1871	Co.	0	0	0	0	0	0
179	Jawzjan	BHC	2034	Tr.	0	173	0	44	0	0
180	Jawzjan	BHC	1556	Co.	0	33	71	48	0	0
181	Jawzjan	BHC	1870	Tr.	0	0	0	0	0	0
182	Jawzjan	BHC	2033	Co.	0	415	374	217	0	0
183	Jawzjan	CHC	585	Tr.	0	516	425	293	500	7
184	Jawzjan	CHC	587	Co.	0	65	0	22	65	0
185	Jawzjan	CHC	588	Tr.	0	1192	521	513	928	0
186	Jawzjan	CHC	592	Co.	0	0	0	334	84	0
187	Jawzjan	CHC	593	Tr.	0	468	0	340	649	1
188	Jawzjan	CHC	1035	Co.	0	0	0	0	0	0
189	Jawzjan	DH	586	Tr.	13654	0	1080	1332	0	10
190	Jawzjan	DH	590	Co.	0	0	0	0	0	0
191	Panjshir	BHC	82	Tr.	0	1207	685	122	0	2
192	Panjshir	BHC	87	Co.	0	0	153	64	100	1
193	Panjshir	BHC	1786	Tr.	0	12	0	159	94	3
194	Panjshir	BHC	79	Co.	0	475	376	161	0	1
195	Panjshir	BHC	1114	Tr.	0	324	0	105	424	3
196	Panjshir	BHC	77	Co.	0	208	200	93	218	1
197	Panjshir	BHC	1112	Tr.	0	0	0	213	203	4
198	Panjshir	BHC	1111	Co.	0	320	0	192	177	1
199	Panjshir	SC	2288	Tr.	0	220	120	50	181	0
200	Panjshir	SC	2285	Co.	0	0	0	0	28	0
201	Panjshir	SC	2290	Tr.	0	218	120	50	181	0
202	Panjshir	SC	2286	Co.	0	61	64	80	361	0
203	Parwan	BHC	2338	Tr.	13017	0	176	80	0	0
204	Parwan	BHC	2334	Co.	0	238	158	136	20	0
205	Parwan	BHC	1641	Tr.	0	17	0	2	0	0
206	Parwan	BHC	2020	Co.	0	639	0	108	250	0
207	Parwan	BHC	1645	Tr.	0	577	253	60	0	2
208	Parwan	BHC	1644	Co.	0	0	283	95	0	1
209	Parwan	BHC	1049	Tr.	1216	503	0	53	0	0
210	Parwan	BHC	1958	Co.	0	0	0	0	0	0
211	Parwan	BHC	1503	Tr.	0	141	137	0	0	2
212	Parwan	BHC	1956	Co.	0	0	0	0	0	0
213	Parwan	BHC	1643	Tr.	0	0	61	80	0	0
214	Parwan	BHC	1504	Co.	0	609	363	119	0	1

215	Parwan	BHC	1948	Tr.	0	0	0	0	0	0
216	Parwan	BHC	1044	Co.	0	0	147	40	0	0
217	Parwan	BHC	1108	Tr.	0	0	0	0	0	0
218	Parwan	BHC	75	Co.	0	28	197	278	0	5
219	Parwan	BHC	2019	Tr.	0	454	120	51	0	1
220	Parwan	BHC	1634	Co.	0	813	0	107	78	0
221	Parwan	BHC	74	Tr.	0	1100	420	253	0	0
222	Parwan	BHC	2346	Co.	1626	456	298	35	0	7
223	Parwan	BHC	66	Tr.	0	0	101	0	0	1
224	Parwan	BHC	1045	Co.	0	0	83	27	0	3
225	Parwan	BHC	20	Tr.	0	1508	486	380	0	7
226	Parwan	BHC	1957	Co.	0	0	156	78	0	0
227	Parwan	BHC	19	Tr.	0	368	0	61	175	0
228	Parwan	BHC	63	Co.	0	0	23	29	0	0
229	Parwan	BHC	1947	Tr.	0	0	74	35	0	0
230	Parwan	BHC	1633	Co.	0	188	73	125	29	0
231	Parwan	BHC	62	Tr.	0	0	0	0	0	0
232	Parwan	BHC	1635	Co.	0	0	0	0	0	0
233	Parwan	CHC	68	Tr.	0	0	522	400	1103	0
234	Parwan	CHC	16	Co.	0	0	6	33	0	0
235	Parwan	CHC	70	Tr.	0	0	404	74	0	0
236	Parwan	CHC	1043	Co.	0	0	140	0	16	13
237	Parwan	CHC	72	Tr.	0	0	865	129	488	0
238	Parwan	CHC	1949	Co.	0	0	0	0	0	0
239	Parwan	CHC	67	Tr.	0	0	80	0	72	2
240	Parwan	CHC	18	Co.	0	0	137	318	0	6
241	Parwan	SC	2343	Tr.	0	135	0	17	43	0
242	Parwan	SC	2340	Co.	0	0	0	0	0	0
243	Parwan	SC	2345	Tr.	0	0	0	0	0	0
244	Parwan	SC	2328	Co.	0	252	79	18	65	0
245	Parwan	SC	2335	Tr.	0	0	38	2	36	1
246	Parwan	SC	2342	Co.	0	0	0	0	0	0
247	Parwan	SC	2336	Tr.	0	0	0	46	127	0
248	Parwan	SC	2341	Co.	0	0	0	0	0	0
249	Parwan	SC	2329	Tr.	0	167	0	47	42	0
250	Parwan	SC	2339	Co.	0	0	0	0	0	0
251	Parwan	SC	2337	Tr.	0	420	99	18	178	5
252	Parwan	SC	2344	Co.	0	0	0	0	0	0
253	Parwan	SC	2791	Tr.	2574	0	30	36	54	0
254	Parwan	SC	2770	Co.	0	0	9	6	79	1
255	Parwan	SC	2772	Tr.	0	324	0	41	51	0
256	Parwan	SC	2773	Co.	0	181	55	14	149	0
257	Parwan	SC	2774	Tr.	1329	0	46	10	41	0
258	Parwan	SC	2789	Co.	0	255	71	11	41	0

259	Parwan	SC	2790	Tr.	0	285	66	13	135	0
260	Parwan	SC	2771	Co.	0	0	0	0	0	0
261	Samangan	BHC	1920	Tr.	3937	690	88	18	0	0
262	Samangan	BHC	1921	Co.	642	359	77	42	0	7
263	Samangan	BHC	1115	Tr.	0	1183	370	115	0	0
264	Samangan	BHC	2057	Co.	0	346	158	9	0	4
265	Samangan	BHC	1885	Tr.	0	409	42	0	0	0
266	Samangan	BHC	1922	Co.	0	260	85	38	0	2
267	Samangan	BHC	1886	Tr.	5209	1245	72	0	0	3
268	Samangan	BHC	2055	Co.	0	446	116	99	115	0
269	Samangan	BHC	2056	Tr.	0	412	0	0	210	1
270	Samangan	BHC	1923	Co.	0	717	37	0	186	0
271	Samangan	BHC	1879	Tr.	0	469	7	0	0	4
272	Samangan	BHC	535	Co.	0	884	63	12	13	0
273	Samangan	CHC	538	Tr.	0	575	462	537	0	2
274	Samangan	CHC	1116	Co.	2799	0	187	48	0	0
275	Samangan	CHC	534	Tr.	0	1582	649	399	13	0
276	Samangan	CHC	1117	Co.	0	0	187	189	89	6
277	Samangan	SC	2333	Tr.	0	0	96	0	192	0
278	Samangan	SC	2332	Co.	0	315	126	41	246	0
279	Samangan	SC	2230	Tr.	0	40	38	0	137	0
280	Samangan	SC	2330	Co.	0	129	145	55	361	0
281	Samangan	SC	2225	Tr.	0	13	0	0	49	2
282	Samangan	SC	2226	Co.	0	165	119	2	361	0
283	Samangan	SC	2228	Tr.	0	0	0	0	124	1
284	Samangan	SC	2331	Co.	0	116	113	36	361	0
285	Samangan	SC	2227	Tr.	0	0	20	0	240	1
286	Samangan	SC	2229	Co.	0	0	60	0	357	0
287	Samangan	DH	532	Tr.	0	626	1187	1328	1211	14
288	Samangan	DH	2857	Co.	0	969	1784	1582	1335	19
289	Saripul	BHC	1720	Tr.	0	1274	0	0	90	2
290	Saripul	BHC	1897	Co.	0	0	0	42	0	2
291	Saripul	BHC	1896	Tr.	0	40	0	58	0	0
292	Saripul	BHC	1881	Co.	0	104	0	50	0	2
293	Saripul	BHC	1895	Tr.	4566	939	0	0	0	2
294	Saripul	BHC	1731	Co.	11521	328	44	0	0	0
295	Saripul	BHC	1882	Tr.	4657	751	91	0	0	3
296	Saripul	BHC	1723	Co.	0	1195	0	0	99	0
297	Saripul	BHC	1839	Tr.	0	1060	363	110	0	0
298	Saripul	BHC	1729	Co.	0	0	0	79	0	2
299	Saripul	BHC	1724	Tr.	4962	445	0	0	0	2
300	Saripul	BHC	1898	Co.	0	113	0	0	0	1
301	Saripul	BHC	1859	Tr.	0	279	0	354	540	0
302	Saripul	BHC	1505	Co.	33	1011	0	31	0	2

303	Saripul	CHC	1055	Tr.	1765	0	524	0	0	0
304	Saripul	CHC	1732	Co.	0	0	0	0	0	0
305	Saripul	CHC	1537	Tr.	0	0	0	0	0	0
306	Saripul	CHC	855	Co.	0	0	536	470	0	0
307	Saripul	CHC	1057	Tr.	0	1226	0	0	0	0
308	Saripul	CHC	860	Co.	1914	0	190	294	0	0
309	Saripul	SC	2246	Tr.	0	141	0	0	87	1
310	Saripul	SC	2251	Co.	0	335	118	62	361	0
311	Saripul	SC	2248	Tr.	0	71	0	0	218	1
312	Saripul	SC	2241	Co.	0	417	225	96	361	0
313	Saripul	SC	2242	Tr.	0	0	0	4	139	0
314	Saripul	SC	2240	Co.	0	311	81	100	177	0
315	Saripul	SC	2254	Tr.	0	0	0	0	0	0
316	Saripul	SC	2253	Co.	0	0	92	1	248	0
317	Saripul	SC	2250	Tr.	0	0	0	0	0	0
318	Saripul	SC	2247	Co.	0	0	0	0	0	0
319	Saripul	SC	2238	Tr.	0	0	0	0	0	0
320	Saripul	SC	2245	Co.	0	0	7	0	131	0
321	Saripul	SC	2249	Tr.	2687	85	33	0	113	3
322	Saripul	SC	2243	Co.	0	0	90	0	233	0
323	Saripul	SC	2239	Tr.	0	1374	0	0	0	1
324	Saripul	SC	2244	Co.	0	0	0	0	0	0
325	Takhar	BHC	1687	Tr.	3426	872	0	0	0	0
326	Takhar	BHC	1699	Co.	2758	0	9	0	0	4
327	Takhar	BHC	1696	Tr.	0	1475	0	0	231	2
328	Takhar	BHC	1698	Co.	1139	0	27	104	0	11
329	Takhar	BHC	1684	Tr.	2122	392	0	0	0	1
330	Takhar	BHC	1617	Co.	0	288	0	186	0	0
331	Takhar	BHC	1710	Tr.	0	530	0	0	0	2
332	Takhar	BHC	1688	Co.	0	17	0	66	0	1
333	Takhar	BHC	1685	Tr.	0	0	0	0	0	0
334	Takhar	BHC	1694	Co.	0	0	0	0	0	0
335	Takhar	BHC	1706	Tr.	0	786	0	33	0	1
336	Takhar	BHC	1928	Co.	1167	383	0	0	0	2
337	Takhar	BHC	1931	Tr.	4020	364	0	0	0	0
338	Takhar	BHC	1697	Co.	0	489	0	256	344	10
339	Takhar	BHC	1693	Tr.	0	436	0	20	0	0
340	Takhar	BHC	442	Co.	1542	1284	0	51	0	3
341	Takhar	BHC	1689	Tr.	0	0	0	0	0	0
342	Takhar	BHC	1695	Co.	0	284	0	117	0	2
343	Takhar	BHC	431	Tr.	0	0	0	0	0	0
344	Takhar	BHC	1686	Co.	4791	334	0	40	0	3
345	Takhar	BHC	1927	Tr.	0	0	59	209	5	0
346	Takhar	BHC	1690	Co.	14235	150	22	77	0	1

347	Takhar	BHC	1691	Tr.	0	0	0	0	0	0
348	Takhar	BHC	1708	Co.	0	0	0	154	0	2
349	Takhar	BHC	432	Tr.	4141	989	0	0	0	1
350	Takhar	BHC	456	Co.	0	0	0	137	0	6
351	Takhar	BHC	428	Tr.	0	0	0	0	0	0
352	Takhar	BHC	1692	Co.	1418	0	0	142	0	8
353	Takhar	BHC	1929	Tr.	0	0	0	0	0	0
354	Takhar	BHC	1930	Co.	0	0	0	0	0	0
355	Takhar	BHC	1711	Tr.	0	1039	0	0	0	2
356	Takhar	BHC	1707	Co.	1517	0	132	9	0	2
357	Takhar	CHC	446	Tr.	0	1037	422	449	527	0
358	Takhar	CHC	437	Co.	1617	784	0	308	16	1
359	Takhar	CHC	436	Tr.	2848	929	0	119	0	0
360	Takhar	CHC	1161	Co.	128	0	64	199	0	0
361	Takhar	CHC	435	Tr.	0	0	0	0	0	0
362	Takhar	CHC	434	Co.	9	0	0	68	0	0
363	Takhar	CHC	1709	Tr.	0	0	0	0	0	0
364	Takhar	CHC	452	Co.	0	0	0	0	0	0
365	Takhar	CHC	455	Tr.	0	0	432	83	148	0
366	Takhar	CHC	451	Co.	0	0	0	0	0	0
367	Takhar	SC	2532	Tr.	0	0	0	11	212	0
368	Takhar	SC	2533	Co.	0	101	70	45	257	0
369	Takhar	SC	2534	Tr.	0	1	0	0	116	1
370	Takhar	SC	2531	Co.	0	339	205	87	361	0
371	Takhar	DH	439	Tr.	3418	0	1043	976	794	0
372	Takhar	DH	1162	Co.	20886	0	427	521	1075	0
Mean					**830**	**278**	**111**	**108**	**143**	**1**

BIOGRAPHY

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