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Original Article

Burden of Diseases and Injuries in Afghanistan, 1990–2016: Findings From the Global Burden of Disease 2016 Study

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Abstract
Background: Afghanistan is one of the low-income countries in the Eastern Mediterranean Region with young population and myriad of healthcare needs. We aim to report the burden of diseases and injuries in Afghanistan between 1990 and 2016.
Methods: We used the Global Burden of Disease (GBD) 2016 study for estimates of deaths, disability-adjusted life years (DALYs), years of life lost, years of life lived with disability, maternal mortality ratio (MMR), neonatal mortality rates (NMRs) and under 5 mortality rates (U5MR) in Afghanistan.
Results: Total mortality rate, NMR and U5MR have progressively decreased between 1990 and 2016.
Mortality rate was 909.6 per 100 000 (95% UI: 800.9–1023.3) and MMR was 442.8 (95% UI: 328.3–595.8) per 100 000 live births in 2016. Conflict and terrorism, ischemic heart disease (IHD) and road injuries were the leading causes of DALY among males of all ages in 2016 with 10.9%, 7.8% and 7.6% of total DALYs respectively, whereas among females of all ages lower respiratory infections (LRIs), IHD and congenital birth defects were the leading causes of DALY with 8.7%, 7.0% and 6.5% of total DALYs respectively.
Conclusion: Despite improvements in certain health indicators, our study suggests an urgent intervention to improve health status of the country. Peace and safety by means of stopping the conflict and terrorism are the mainstay of all other health interventions. Improving health infrastructures, boosting maternal and child health (MCH), battling infectious diseases as well as chronic disease risk factor modification programs can help to decrease burden of diseases.
Keywords: Afghanistan, DALY, Risk factor, Maternal mortality
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Introduction

The current population of Afghanistan is estimated to be over 35 million, with about 26% of the population living in urban areas.[1] It has a very young population with a median age of 17.6 years and fertility rate of 5.1.[1] Literacy rate for adult male population is 52% as opposed to 24% in adult female population. Access to an improved water source in urban areas (86%) is more than rural areas (58%) and nearly one quarter of households use an improved sanitation facility.[2] Afghanistan is one of the low income countries with under $2000 per-capita gross domestic product (GDP) based on purchasing power parity (PPP) in 2016.[3] In 2014, Afghanistan received US$490 million as development assistance for health (on average $15 per person).[4]

The constant political unrest, conflict (war) and terrorism have adversely affected health of people and health care infrastructures in Afghanistan. Previous global burden of disease (GBD) studies showed that life expectancy at birth in Afghanistan has increased in both males and females between 1990 and 2015.[5–7] However, the life expectancy in Afghanistan was still lower than other countries in Eastern Mediterranean Region (EMR). The leading GBD level 3 causes of disability-adjusted life years (DALYs) for Afghanistan were war, lower respiratory infections (LRIs), ischemic heart disease (IHD), congenital birth defects and cerebrovascular diseases in 2015.[5,6] In this study, we used GBD 2016 findings to present the burden of diseases and injuries in Afghanistan. These data can be used to set priorities for health programs and interventions in order to improve overall health of the Afghan people.

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Materials and Methods

GBD 2016 includes an annual assessment covering 195 countries and territories, 21 regions and 7 super-regions from 1990 to 2016 as well as estimated burden of 333 diseases and injuries, 2619 sequelae and 79 risk factors by age and sex. GBD also covers causes of deaths and morbidities and their risk factors for males and females of different age groups, as well as estimates for maternal mortality and age-specific mortality rates. The GBD uses three main indicators to calculate disease burden: Years of Life Lost due to premature Mortality (YLLs), years of life lived with disability (YLDs), and the sum of the two, which accounts for DALYs. Briefly, YLLs are calculated multiplying the number of deaths from a disease in each age group by the reference life expectancy at the average age of death for those who die in that age group. YLDs are computed by multiplying the disease prevalence by disease disability-weight (magnitude of health loss) in age, sex and year-specific strata. DALYs were calculated through summation of YLL and YLDs. Model-based epidemiological estimates in combination with disability weights were used to obtain data. Detailed descriptions of methodology and approach of GBD 2016 have been published in previous studies.[8–10] Institute for Health Metrics and Evaluation (IHME) has used near 150 resources to gather Afghanistan health data in Global Health Data Exchange (GHDx).[11]

In the current report, burden of different diseases is described as death and DALY cause by age and sex. We also included total mortality rates in males and females, age-specific mortality rates in males and females, maternal deaths per 100 000 live births (maternal mortality ratio or MMR), probability of dying during the first 28 days of life per 1000 live births (neonatal mortality rate or NMR) and probability of dying before the age of five years per 1000 live births (under-five mortality rate).

We report 95% uncertainty interval (UI) for each quantity in this analysis. The UIs are based on taking 1000 samples of posterior distribution and report the 25th and 975th values of the distribution.

Results

Mortality

The total number of deaths in Afghanistan was 303,812 (95% UI: 267 520–341 795) in 2016. The number of deaths among males was 162 002 (95% UI: 138 821–186 814) and among females was 141 810 (95% UI: 125 287–159 013) in 2016. Total mortality rate has progressively decreased from 1356.3 per 100 000 (95% UI: 1181.9–1528.0) in 1990 to 909.6 per 100 000 (95% UI 800.9–1023.3) in 2016. The mortality rates among males and females have both decreased between 1990 and 2016 (Table 1). The rate of change in mortality between 1990 and 2016 for both sexes was 32.9%. The rate of change in mortality for males was 28.5% and for females was 37.4%. Female mortality rate was higher than male mortality rate in years 1990, 1995, 2000 and 2005, but this trend was reversed in years 2010 and 2016 (Table 1). Age-standardized mortality rate of both sexes in Afghanistan was 1971.1 deaths per 100 000. The most prominent decrease in mortality rate was observed among males and females below 5 years old with 56% and 60% respectively (Table S1).

NMR has progressively decreased from 52.6 per 1000 live births (95% UI 46.7–58.7) in 1990 to 25.9 per 1000 live births (95% UI 20.2–33.9) in 2016 (Figure 1). Under-five mortality rate was 154.8 per 1000 live births (95% UI 139.4–170.7) in 1990 and decreased to 66.6 per 1000 live births (95% UI 52.9–85.7) in 2016, showing a decreasing trend between 1990 and 2016 (Figure 1).

MMR was 543.6 per 100 000 live births (95% UI 421.1–689.3) in 1990 and increased to 596.7 per 100 000 live births (95% UI 461.1–765.0) in year 2005. However, it had a decreasing trend between 2005 and 2016. MMR was estimated to be 442.8 per 100 000 live births (95% UI 328.3–595.8) in year 2016 (Figure 1).

Causes of Death

Table 2 lists age-specific major causes of death among males and females in 2016. Table 3 shows the top 15 leading causes of death for all ages by sex in 2016 along with their percentage of total death and annual percent change between 1990 and 2016. Supplementary Tables S2–S6 show the top 15 causes of death in age-specific groups of males and females in 2016 as well as their percentage of total death and annual percent change between 1990 and 2016.

For both males and females less than 5 years old, LRIs

Table 1. Mortality Rates (Per 100 000) Among Males and Females, Global Burden of Disease 2016 study, Afghanistan, 1990–2016

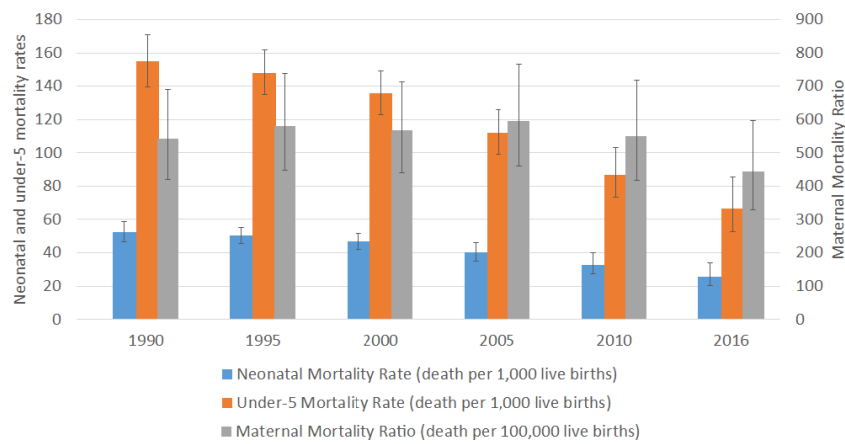| Year	Male			Female		
	Mortality Rate	95% Uncertainty Interval		Mortality Rate	95% Uncertainty Interval	
1990	1314.8	1125.2	1505.9	1399.9	1219.0	1578.6
1995	1343.2	1168.3	1508.3	1394.6	1227.0	1566.2
2000	1292.1	1134.5	1450.2	1333.0	1193.4	1473.4
2005	1133.5	1001.7	1270.8	1163.6	1046.3	1276.9
2010	996.3	880.4	1124.4	990.8	892.2	1099.5
2016	940.6	806.0	1084.6	876.6	774.5	982.9

Figure 1. Neonatal Mortality Rate (Death Per 1000 Live Births), Under-Five Mortality Rate (Death Per 1000 Live Births), Maternal Mortality Ratio (Death Per 100 000 Live Births), Global Burden of Disease 2016 Study, Afghanistan, 1990-2016.

were the leading cause of death (albeit declining over the study period) followed by congenital birth defects and neonatal preterm birth complications (Table 2 and Supplementary Table S2). Among males and females between 5 and 14 years old, conflict and terrorism were the leading cause of death with an escalating trend during the study period. Road injuries and meningitis were the second and third causes of death among males, while LRIs and road injuries were the second and third causes of death among females between 5 and 14 years old (Table 2 and Supplementary Table S3). Conflict and terrorism were the leading cause of death among males between 15 and 49 years old, followed by deaths due to road injuries and IHD. On the other hand, IHD was the leading cause of death among females between 15 and 49 years old, followed by tuberculosis (TB) and cerebrovascular diseases (Table 2 and Supplementary Table S4). IHD was the leading cause of death followed by cerebrovascular diseases in males and females between 50 and 69 years old as well as those above 70 years old. In the aforementioned age group, TB and diabetes mellitus (DM) were the third cause of death among males and females respectively (Table 2 and Supplementary Tables S5–S6).

YLL

The measure for YLL rate for all causes of death was estimated 84,156.6 per 100,000 (95% UI 69,649.0–98,242.8) in 1990, which was 87.8% of total DALYs in that year. The main cause of YLL in 1990 was measles (18.6% of total YLLs) followed by LRIs (14.1%) and congenital birth defects (6.1%). The YLL rate decreased to 44,926.4 per 100,000 (95% UI 37,228.3–53,602.1) in 2016, which accounted for 80.9% of total DALYs. LRIs were the main cause of YLL (9.7% of total YLLs) in 2016 followed by conflict and terrorism (9.4%) and IHD (9.1%).

YLD

In Afghanistan, for all diseases or injuries YLD rate was 11,671.3 per 100 000 (95% UI 8574.0–15 378.7) in 1990, with conflict and terrorism causing most of the YLDs (10.4%), followed by low back and neck pain (7.2%) and sense organ diseases (6.4%). The YLD rate decreased to 10,639.3 per 100 000 (95% UI 7894.5–13 722.1) in 2016, with low back and neck pain causing most YLDs (8.3%), followed by skin and subcutaneous diseases (6.8%) and sense organ diseases (6.3%). YLD accounted for 12.2% and 19.1% of total DALYs in 1990 and 2016, respectively.

DALY

DALY rate for all diseases or injuries has progressively decreased between 1990 and 2016. Total DALY rate was 95 835.8 per 100 000 (95% UI 81 042.8–110 413.2) in 1990 and decreased to 55 565.7 per 100 000 (95% UI 47 293.9–64 657.7) in 2016.

Causes of DALY

Table 2 lists age-specific major causes of DALY among males and females in 2016. Table 4 shows the top 15 causes of DALY for all ages by sex in 2016 along with their percentage of total DALYs and annual percent change between 1990 and 2016. Supplementary Tables S7-S11 list the top 15 causes of DALY in age-specific groups of males and females in 2016 as well as their percentage of total DALYs and annual percent change between 1990 and 2016.

In children under 5 years old, LRIs were the first and main cause of DALY followed by congenital birth defects and neonatal preterm birth complications. Meningitis and diarrheal diseases were the fourth cause of DALY among males and females under 5 years old, respectively (Table 2 and Supplementary Table S7). In both sexes between 5 and 14 years old, conflict and terrorism were the leading cause of DALY with an escalating course over

Table 2. Age-Specific Major Causes of Deaths and DALYs Among Males and Females in Afghanistan in 2016, Global Burden of Disease 2016 Study

Age	Sex	Causes of Death					Causes of DALY				
		1st	2nd	3rd	4th	5th	1st	2nd	3rd	4th	5th
<5	Male	LRIs	Congenital birth defects	Neonatal preterm birth complications	Meningitis	Other neonatal disorders	LRIs	Congenital birth defects	Neonatal preterm birth complications	Meningitis	Other neonatal disorders
	Female	LRIs	Congenital birth defects	Neonatal preterm birth complications	Other neonatal disorders	Diarrheal diseases	LRIs	Congenital birth defects	Neonatal preterm birth complications	Diarrheal Diseases	Other neonatal disorders
5–14	Male	Conflict and terrorism	Road injuries	Meningitis	Drowning	LRIs	Conflict and Terrorism	Road injuries	Meningitis	Drowning	Skin and subcutaneous diseases
	Female	Conflict and terrorism	LRIs	Road injuries	Congenital birth defects	TB	Conflict and Terrorism	LRIs	Congenital birth defects	Skin and subcutaneous diseases	Road injuries
15–49	Male	Conflict and terrorism	Road injuries	IHD	Interpersonal violence	TB	Conflict and Terrorism	Road injuries	Interpersonal Violence	IHD	TB
	Female	IHD	TB	Cerebrovascular disease	Conflict and terrorism	Maternal Hemorrhage	Conflict and Terrorism	TB	IHD	Cerebrovascular disease	Maternal Hemorrhage
50–69	Male	IHD	Cerebrovascular disease	TB	DM	CKD	IHD	Cerebrovascular disease	DM	TB	Conflict and terrorism
	Female	IHD	Cerebrovascular disease	DM	TB	CKD	IHD	Cerebrovascular disease	DM	CKD	TB
70+	Male	IHD	Cerebrovascular disease	TB	COPD	DM	IHD	Cerebrovascular disease	DM	COPD	TB
	Female	IHD	Cerebrovascular disease	DM	TB	Alzheimer disease and other dementias	IHD	Cerebrovascular disease	DM	TB	CKD

Abbreviation: LRI, lower respiratory infection; IHD, ischemic heart disease; DALY, disability-adjusted life year; TB, tuberculosis; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; DM, Diabetes mellitus.

Table 3. Top 15 Causes of Deaths Among Males and Females of Aall Ages in 2016 With Their Average Annual Percent Change Between 1990 and 2016 in Afghanistan, Global Burden of Disease 2016 study

Rank	Male, All Ages			Female, All Ages		
	Cause of Death	Percent of Total Deaths (95% UI)	Annual % Change	Cause of Death	Percent of Total Deaths (95% UI)	Annual % Change
1	IHD	16.8 (14.1–19.5)	0.21	IHD	16.7 (14.0–19.7)	-0.2
2	Conflict and terrorism	9.7 (2.4–16.8)	6.6	Cerebrovascular disease	9.2 (6.5–11.9)	0
3	Road injuries	8.1 (6.9–9.6)	-0.1	LRIs	7.2 (5.1–9.8)	-3.7
4	Cerebrovascular disease	6.2 (5.1–7.5)	0.7	DM	5.4 (4.4–6.4)	1.9
5	LRIs	6.1 (4.3–8.4)	-3.2	TB	5.1 (1.8–7.3)	-2.7
6	TB	4.1 (1.3–5.5)	-2.2	Conflict and terrorism	4.69 (1.11–8.2)	6.12
7	Congenital birth defects	4.0 (1.6–7.5)	-1.6	Congenital birth defects	4.4 (1.6–8.2)	-1.9
8	Interpersonal violence	3.7 (1.7–4.8)	0.3	CKD	3.0 (2.2–4.4)	0.1
9	Neonatal preterm birth complications	3.2 (1.8–5.3)	-2.5	Neonatal preterm birth complications	3.0 (1.7–4.6)	-2.7
10	Meningitis	2.9 (1.8–4.9)	-2.3	COPD	2.4 (1.8–3.0)	0.6
11	CKD	2.4 (1.6–3.4)	0.4	Road injuries	2.0 (1.6–2.4)	-0.6
12	DM	2.2 (1.8–2.6)	1.5	Breast cancer	1.9 (0.7–3.5)	0.9
13	COPD	1.9 (1.2–2.5)	0.4	Diarrheal diseases	1.8 (1.1–3.0)	-3.6
14	Other Neonatal Disorders	1.8 (0.9–3.2)	-2.1	Meningitis	1.8 (1.0–3.8)	-2.7
15	Drowning	1.7 (1.4–2.1)	-1.1	Other neonatal disorders	1.6 (0.8–2.7)	-1.9

Abbreviation: UI, uncertainty interval; LRI, lower respiratory infection; IHD, ischemic heart disease; TB, tuberculosis; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; DM, Diabetes mellitus.

Table 4. Top 15 Causes of DALYs Among Males and Females of All Ages in 2016 With Their Average Annual Percent Change Between 1990 and 2016 in Afghanistan, Global Burden of Disease 2016 Study

Rank	Male			Female		
	DALY Cause	Percent of Total DALYs (95% UI*)	DALYs Annual % Change	DALY Cause	Percent of Total DALYs (95% UI)	DALYs Annual % Change
1	Conflict and terrorism	10.9 (3.8–17.8)	3.5	LRIs	8.7 (5.9–12.3)	-4.1
2	IHD	7.8 (6.2–9.5)	0.2	IHD	7.0 (5.7–8.7)	-0.3
3	Road injuries	7.6 (6.2–9.3)	-0.2	Congenital Birth Defects	6.5 (2.7–11.9)	-1.9
4	LRIs	7.2 (4.9–10.2)	-3.6	Conflict and Terrorism	6.0 (2.0–10.1)	2.9
5	Congenital birth defects	6.0 (2.8–10.6)	-1.6	Neonatal Preterm Birth Complications	4.4 (2.6–6.6)	-2.6
6	Neonatal preterm birth complications	4.7 (2.8–7.4)	-2.4	Cerebrovascular Disease	4.3 (3.0–5.9)	-0.3
7	Meningitis	3.7 (2.2–6.2)	-2.5	TB	3.4 (1.3–4.8)	-2.8
8	Interpersonal violence	3.5 (1.7–4.7)	0.2	DM	3.3 (2.7–3.9)	1.2
9	Cerebrovascular disease	2.9 (2.3 - 3.5)	0.5	Diarrheal Diseases	2.7 (1.7–4.3)	-3.4
10	Other neonatal disorders	2.5 (1.2–4.4)	-2.1	Meningitis	2.4 (1.4–5.1)	-2.7
11	TB	2.5 (0.9–3.3)	-2.5	Other Neonatal Disorders	2.3 (1.2–3.8)	-1.9
12	Neonatal sepsis and other neonatal infections	2.1 (0.8–3.7)	-2.6	Road Injuries	2.0 (1.6–2.4)	-0.8
13	Drowning	1.9 (1.5–2.4)	-1.3	Chronic Kidney Disease	2.0 (1.5–2.8)	-0.2
14	Neonatal encephalopathy due to birth asphyxia and trauma	1.6 (0.8–2.7)	-1.7	Falls	1.9 (0.9–3.6)	-2.4
15	DM	1.5 (1.2–1.8)	1	Low Back and Neck Pain	1.9 (1.4–2.5)	0.2

Abbreviation: UI, uncertainty interval; LRI, lower respiratory infection; IHD, ischemic heart disease; DALY, disability-adjusted life year; TB, tuberculosis; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; DM, Diabetes mellitus.

the study period. Road injuries, meningitis and drowning were the second, third and fourth causes of DALY in males between 5 and 14 years old. On the other hand, LRIs, congenital birth defects, skin and subcutaneous diseases were the second, third and fourth causes of DALY among females of that age group (Table 2 and Supplementary Table S8). Furthermore, conflict and terrorism were the leading cause of DALY among both males and females between 15 and 49 years old. This was followed by road injuries, interpersonal violence and IHD in males, whereas TB, IHD and cerebrovascular diseases were the second, third and fourth causes of DALY in females of that age group (Table 2 and Supplementary Table S9). IHD, cerebrovascular disease and DM were the first, second and third causes of DALY among both males and females between 50 and 69 years old as well as those above 70 years old. TB and chronic kidney disease (CKD) were the fourth cause of DALY among males and females between 50 and 69 years old, respectively (Table 2 and Supplementary Table S10). Chronic obstructive pulmonary disease (COPD) was the fourth cause of DALY in males above 70 years old, whereas TB was the fourth cause of DALY among females of that age group (Table 2 and Supplementary Table S11).

DALYs Attributed to Risk Factors

Low birth weight and short gestation were the leading risk factors for DALYs among both males and females

of all ages in Afghanistan in 2016 followed by household air pollution, high fasting plasma glucose, child growth failure, high blood pressure, ambient particulate matter, high body-mass index, high total cholesterol and smoking (Figure 2). Among children less than 5 years old, the most important risk factors for DALYs were low birth weight and short gestation followed by child growth failure, household air pollution, ambient particulate matter, unsafe water, inadequate handwashing, unsafe sanitation, suboptimal breastfeeding, secondhand smoke, zinc deficiency, vitamin A deficiency and iron deficiency (Supplementary Figure S1). Iron deficiency was the leading risk factor for DALYs among males and females between 5 and 14 years old (Supplementary Figure S2). Occupational injury was the leading risk factor for DALYs in males between 15 and 49 years old, whereas high body-mass index was the foremost risk factor for DALYs in females of that age group (Supplementary Figures S3 and S4). High fasting plasma glucose was the most important risk factor for DALYs in both males and females between 50 and 69 years old as well as those above 70 years old (Supplementary Figures S5 and S6).

Life Expectancy and HALE

Life expectancy at birth (for both sexes) in Afghanistan increased from 51.6 years (95% UI 50.3–52.9) in 1990 to 58.0 years (95% UI 56.3–59.5) in 2016.
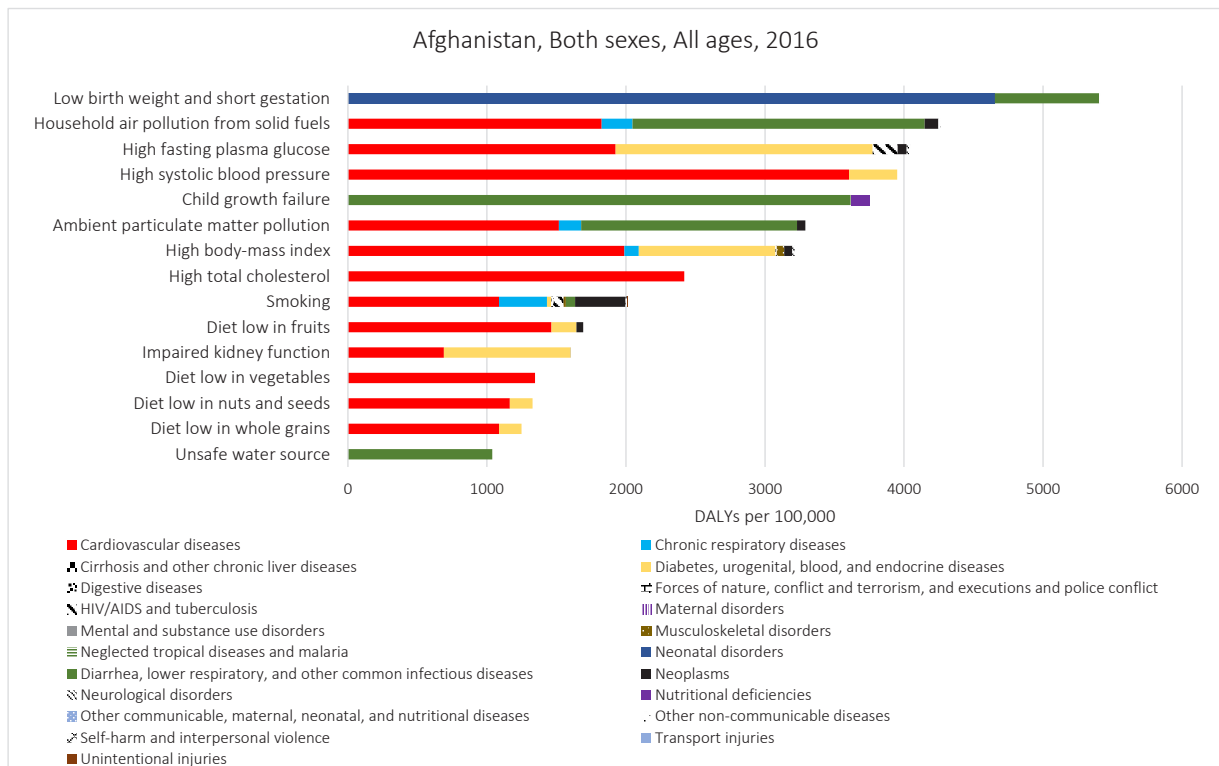Health-adjusted life expectancy (HALE) at birth for both

Figure 2. Rate of Disability-Adjusted Life-Years (DALYs) attributable to Top 15 Risk Factors in Both Males and females of All Ages in Afghanistan in 2016, Global Burden of Disease 2016 Study.

sexes in Afghanistan increased from 43.6 years (95% UI 40.9–46.0) in 1990 to 49.5 years (95% UI 46.7–52.1) in 2016.

Discussion

Mortality rate in Afghanistan has decreased between 1990 and 2016. However, age-standardized mortality rate of both sexes in Afghanistan is still much higher than age-standardized global mortality rate, which is partly due to large proportion of young population.

Estimates for MMR in Afghanistan vary based on the subnational region (higher in certain locations and rural areas in comparison with urban areas).[14] While the world is trying to reach Sustainable Development Goal 3.1 (reduce the global MMR to less than 70 per 100 000 live births by 2030), Afghanistan is still lagging behind the Fifth Millennium Development Goal (reduction of 75% in the MMR between 1990 and 2015).[15] Our study did not show any improvement in MMR between 1990 and 2005. However, MMR had a decreasing trend between 2005 and 2016. Maternal Mortality Estimation Inter-Agency Group reported a decreasing trend in MMR continuously between 1990 and 2015.[16] The discrepancy between MMR reports from diverse resources is partly due to insufficiency of accurate information and different models used for estimation. Antenatal care is an important step in improving maternal and child health (MCH). In 2015, only 32% of pregnant women in Afghanistan had four antenatal care visits, while about 38% had no antenatal care visit at all. Furthermore, only 45% of pregnant women gave birth under the supervision of a skilled birth attendance in 2015.[17] According to Afghanistan Ministry of Public Health (MoPH), there is considerable difference in access to antenatal care between urban and rural areas.[18] This calls for improving MCH through universal health care as well as working on social determinants. Women empowerment and education are necessary tools to improve MCH.

The 57.0% decline in under-five mortality rate as well as 50.8% decline in NMR between 1990 and 2016 is a welcoming news showing progress in the right direction. This shows that efforts to reduce under-five mortality and NMRs through programs such as vaccination are effective.[19] These are promising results to continue improvement and investment in Afghanistan healthcare.

Deaths and DALYs due to infectious diseases among Afghan children under 5 years old need special attention. Child growth failure was the main risk factor for common infectious diseases among children under 5 years old. Malnutrition causes immunodeficiency, which results in mortality and morbidity due to infection.[20] Risk of dying from diarrhea, measles and malaria in children with vitamin A deficiency is increased. Vitamin

A supplementation has shown to reduce all-cause mortality among children under 5 years old by 24%.[21,22] Childhood vaccination is also important in decreasing deaths and DALYs due to infectious diseases. The WHO recommends routine childhood pneumococcal vaccination.[23] Pneumococcus vaccine is not currently incorporated into the childhood immunization schedule in Afghanistan despite high mortality and morbidity due to LRIs. Rotavirus infection (the most common cause of diarrhea in infants and young children) can also be prevented through vaccination, whereas the vaccine was not available in Afghanistan. Afghan MoPH aimed to introduce rotavirus vaccine by 2017.[24] Afghanistan is one of only three countries–alongside Pakistan and Nigeria–where polio is still endemic.[25] Despite incorporation of polio vaccine in childhood immunization schedule, poliomyelitis is still affecting Afghan children due to low coverage of vaccination in certain parts of the country.[26] On the other hand, the rapid decrease in deaths and DALYs due to measles and tetanus among children was mainly due to increasing vaccination coverage.[19] Basic vaccination coverage varies a lot by province (1% of children in Nooristan province versus 75% in Paktika) and one of the main reasons for partial vaccination is long distance to child vaccination centers.[2,19,27] Access to clean air and water, personal hygiene education, safe sanitation and hand washing can also help with reducing deaths and DALYs due to common infectious diseases among children. Suboptimal breastfeeding was also a risk factor for childhood infections. Based on 2015 AfDHS, only 43% of children under 6 months were exclusively breastfed.[2]

Iron-deficiency anemia (IDA) as the leading risk factor for DALYs among both males and females 5–14 years old is mainly due to malnutrition (nutrition deficiency) but can also have other causes. IDA can present with different clinical manifestations depending on the cause and severity (e.g. asymptomatic or behavioral and physical problems affecting learning, education and overall cognitive and performing ability in childhood as well as later in life).[28,29] Iron supplementation through strategic plans have been recommended by WHO guideline.[30]

Among 22 countries of EMR, Afghanistan had the largest proportion of adolescents aged 10-24 years (34.8%) in 2015. Decreased burden of infectious diseases among adolescents between 1990 and 2015 have largely been offset by the health impacts of war and terrorism, non-communicable diseases (NCDs) (including mental health disorders), unintentional injury and self-harm. Mental health, sexual health, substance use, unintentional injuries and self-harm are the most important health issues among adolescents, which have been overlooked given religious and cultural sensitivities.[31]

In 2015, Afghanistan had the highest mortality rate due to transport injuries in the EMR.[32] Less than 11.0% of seriously injured people in road accidents of Afghanistan were transferred to emergency health care centers by ambulance.[33] Safety of the vehicles and roads, enforcement of driving rules (e.g. speed surveillance and observance of traffic signs) and emergency medical service quality improvement are imperative to decrease deaths and DALYs due to road accidents.

High blood pressure was the leading risk factor for DALYs due to cardiovascular diseases in females between 15 and 49 years old. Population interventions to reduce salt consumption (e.g. population-wide and targeted information campaigns, decreasing salt content of processed foods, declaration of salt content of food through labelling, taxation of processed foods with high salt content, subsidization of foods with low salt content) are effective in controlling blood pressure.[34]

Afghanistan is among twenty-two countries in the world that suffer from a high burden of TB. More than 13 000 Afghans die each year because of TB, whereas it is a completely preventable and curable disease. Two-thirds of all TB patients are women. Children, elderly, poor and malnourished persons, refugees and internally displaced people are those at higher risks. Stigma associated with TB, failure to complete treatment course, and multidrug-resistant TB (due to poor management and low quality medicines) are some barriers for successful diagnosis and treatment.[35]

The deaths and DALYs due to IHD will escalate even more with ageing and increasing life expectancy. Afghanistan had the highest age-standardized DALY rate of cardiovascular diseases among all countries of the EMR in both 1990 and 2015.[36] There is a serious need to increase efforts to tackle NCDs through prevention programs and policies. High blood pressure, high total cholesterol, high fasting plasma glucose, high body-mass index, household air pollution, ambient particulate matter, nutritional deficiencies (low fruit, low vegetables, low nuts and seeds, low omega-3, low whole grains), smoking, impaired kidney function, high sodium, low fiber, low legumes and low physical activity are the most important risk factors for cardiovascular diseases. Based on the Package of Essential Non-communicable (PEN) Disease Interventions for primary health care in low-resource settings, the considerable number of deaths and DALYs imposed by IHD and other NCDs, necessitates risk factor assessment, early screening, lifestyle modification and early treatment of population at risk.[37,38]

Deaths and DALYs due to Chronic obstructive pulmonary disease (COPD) among elderly Afghan population are also noteworthy. Smoking is the first and foremost risk factor for COPD. Other important risk factors for COPD include household air pollution, ambient particulate matter, occupational particulates, ozone, secondhand smoke and occupational exposure to secondhand smoke. Household and indoor air pollution are due to solid fuels (biomass for cooking, heating and other usages) which are used by majority of Afghan population.[2,24] Smoking cessation is the most effective strategy to decrease deaths and DALYs due to COPD. Providing cleaner energies for cooking and household usages is another strategy to decrease indoor air pollution.[38]

There are different reports of life expectancy in Afghanistan based on separate resources. Diverse estimations for death rates in early ages of life (neonatal, infant, under 5 years old) mainly contribute to the different estimations in life expectancy.[39]

Conflict and terrorism not only directly cause deaths and disabilities, but also indirectly affect health by resurgence of some communicable diseases that were previously under control; hence regression from achieved health care goals.[38] The continued war in Afghanistan has led to shortage of health care professionals due to out-migration and unequal distribution in rural compared with urban areas. There were only 7.3 health care professionals (doctors, nurses, and midwives) per 10 000 population in 2011, which was expected to increase to 9.1 by 2016 (Afghanistan National Health Workforce Plan 2012-2016 (Draft), 2011),[12] whereas minimum of 23 health care professionals (doctors, nurses and midwives) per 10 000 population was established by WHO to deliver essential maternal and child healthcare.[13] The escalating trend of deaths and DALYs imposed by war and terrorism in addition to major shifts in burden of diseases, calls for an urgent multi-group action to provide peace and safety as well as improving healthcare infrastructures in Afghanistan.[38,40]

This is the first comprehensive report on the burden of disease in Afghanistan. We used GBD standard methodology to estimate the required health indicators and provided uncertainty intervals for each estimate. IHME has used almost 150 resources including national surveys such as Afghanistan Demographic and Health Survey (AfDHS), Afghanistan Health Survey (AHS) and Afghanistan Mortality Survey (AMS) to gather Afghanistan health data. However, health data and information in Afghanistan are limited in certain provinces and unsafe rural areas. Therefore, our data might not reflect exactly the true status of the country. We acknowledge this as a limitation of this study, which calls for planning to improve the accuracy of health data.

In conclusion, conflict and terrorism have adversely affected health in Afghanistan. The economic

ramifications of the war are detrimental to all aspects of the society including overall health care and access to health facilities. Quality health care across the country is challenging due to financial problems as well as shortage of health care professionals. Infectious diseases are still the main causes of deaths and DALYs among children under 5 years old. NCDs (such as cardiovascular diseases, cerebrovascular diseases, DM, COPD and CKD) are surging rapidly among adults. Furthermore, TB is still an important cause of death and DALY in Afghanistan. There is an urgent need for a national health plan by the government and support from donors to implement regulations and policies with the goal of reducing the burden of both communicable and NCDs. It is crucial to have a balanced approach between dealing with infectious diseases and preventing NCDs through comprehensive risk factor modification programs. Our findings can help Afghanistan government and international community to prioritize healthcare needs and monitor the progress.

Supplementary Materials
Online supplementary data contains Tables S1-S11 and Figures S1-S6.

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