Summarizing Statistical Measures including Rates, Ratios and proportions using Profile of Risk Factors for Noncommunicable Diseases in Afghanistan: A Teaching Case Study

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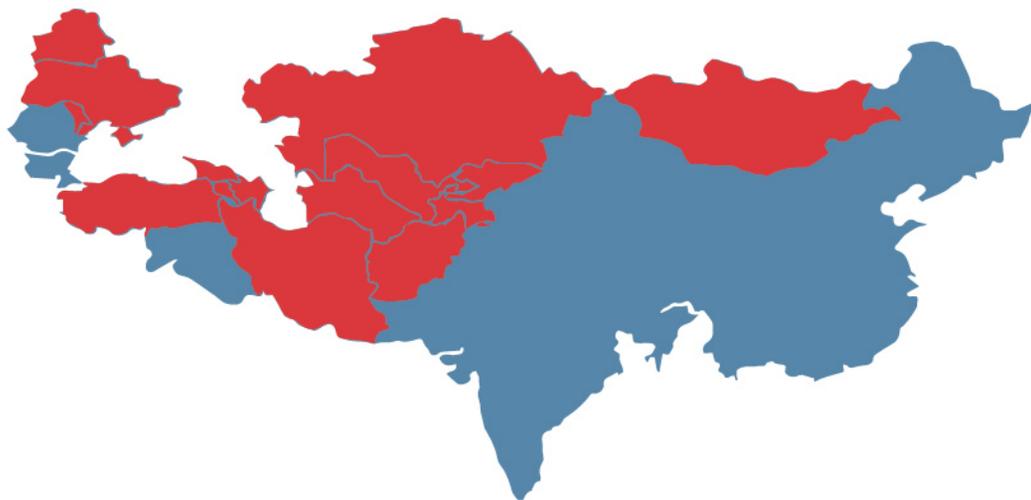
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Student Version

Field Epidemiology Training Program Teaching Case Study

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1

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Abstract

Noncommunicable diseases (NCDs), including cardiovascular diseases, cancer, chronic respiratory disease, and diabetes, are the leading cause of morbidity and mortality worldwide. NCDs kill 41 million people each year, equivalent to over 7 out of 10 deaths worldwide. Each year, 17 million people die from a NCD before age 70 of whom 86% occur in low- and middle-income countries. Similarly, Afghanistan suffering from double burden of disease including communicable and noncommunicable diseases. According to WHO, NCDs are estimated to account for 62% of total deaths in Tajikistan, 79% in Uzbekistan, 50% in Pakistan and 76% in the Islamic Republic of Iran and Turkmenistan, all countries neighboring, conversely NCDs account for 37% of total deaths in Afghanistan. Similar results were found in the 2010 Afghanistan mortality survey: 33.3% of all deaths in the country were attributed to NCDs. Risk factors associated with NCDs are modifiable such as tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol which all increase the risk of NCDs and metabolic risk factors that contribute to four key metabolic changes including raised blood pressure; overweight/obesity; hyperglycemia; and hyperlipidemia. Detection, screening and treatment of NCDs, as well as palliative care, are key components of the response to NCDs.

By this teaching case study, we aim to strengthen competencies and consolidate understanding of participants to develop summary measures of statistics including rate, ratio, and proportion. The baseline data for this case study is a published survey on risk factors of noncommunicable disease available in public domain. This case study stimulates the residents in field epidemiology training program to easily identify, calculate and compare summary statistics and plan and conduct surveys. The case study is designed for training novice field epidemiology trainees and could be administered in group of 4-6 residents in 2-3 hours. Used as adjunct training material, the case study provides the trainees with competencies in summarizing the data and calculating the measures.

Keywords: Afghanistan, Noncommunicable Diseases, Biostatistics, Rate, Ratio, Proportion, Case-study

How to Use the Case Study

General instructions: This is a teaching case study to be used as supporting raining materials for residents of field epidemiology training program at intermediated and advance level. Furthermore, the concept of biostatistics should have been clarified by facilitators in classroom ahead of working on this cases study. The case study could be practiced individually or in group of about 4-6 participants each. Participants are to take turns reading the case study, usually a paragraph per student. The facilitator should guide the discussion and calculation. The facilitator could use the flip charts or white board for making clarification and calculation if required.

Audience: Basically, this case study is very basic and developed for residents on first workshop of field epidemiology. However, other residents of the same discipline could use it easily. These participants are commonly health care workers working in the country departments of health whose background may be medical doctors, nurses, environmental health officers or laboratory scientists who work in public health-related fields. Most have a health science or biology background.

Prerequisites: Before using this case study, participants should have received lectures on introduction to biostatistics, basics of epidemiology and disease surveillance. The students should receive instruction on statistics including rates, ratios, proportions, prevalence, and incidence.

Materials needed: Calculators, paper sheets, flip charts, markers, computers with Microsoft Excel and Epi info software.

Level of training and associated public health activity: Intermediate and advance training, summary of statistics, surveys, and public health surveillance.

Time required: 2-4 hours.

Language: English, could be translated to local language

Goal of Case Study

This case study is designed to support residents in strengthening competencies and consolidation of their understanding on biostatistics, particularly summary measures. It is designed to provide practical application of the concepts included descriptive and analytic epidemiology, surveillance, and presentations on using rates, ratios, and proportions.

Learning Objectives

By the end of the teaching/tutorial session, participants will be able to:

- Calculate the requested ratios, proportions, and rates using the information provided in profile of non-communicable diseases in Afghanistan, a published article.
- Make comparison of rates, rations and proportion and provide description of them.
- Identify, pros and cons and use of each summary measures.

Getting preparation for launching case study

The facilitator for this exercise should have a general background of biostatistics and their applications in epidemiology. There are some points for facilitators to pay attention before practicing the case study.

- Read the article of profile of risk factors for non-communicable diseases in Afghanistan published in WHO EMRO journal. https://www.emro.who.int/emhj-volume-26-2020/volume-26-issue-4/profile-of-risk-factors-for-noncommunicable-diseases-in-major-cities-of-afghanistan-who-stepwise-approach.html
- Review the Introduction to Biostatistics lecture prior to conducting the activity along with reading any applicable instructor notes included with the presentation.
- Read through the entire Introduction to Statistics Exercise and Answer key to gain an understanding of the flow of the exercise and steps for calculations.
- Prepare the appropriate number of copies of the Statistical Question Sheet based upon the number of participants in the class.
- Contact representatives from the training facility to determine whether overhead or digital projectors are available for use during the instruction.
- Ensure that there is a calculator, pencil, and paper available for each of the participants.

Part 1: Introduction

Noncommunicable diseases (NCDs), such as cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes, are the leading cause of death worldwide and represent an emerging global health threat. Deaths from NCDs now exceed all communicable disease deaths combined. NCDs kill 41 million people each year, equivalent to over 7 out of 10 deaths worldwide [1]. Annually, 17 million people die from a NCD before age 70; and 86% of these deaths occur in low- and middle-income countries. Of all NCD deaths, 77% are in low- and middle-income countries. Cardiovascular diseases account for most NCD deaths, or 17.9 million people annually, followed by cancers (9.3 million), chronic respiratory diseases (4.1 million), and diabetes (2.0 million including kidney disease deaths caused by diabetes) [2].

Despite of being a big public health problem, NCDs are a neglected issue in Afghanistan context and the services are mostly only available at the tertiary-care level and through the private sector, which makes accessing the services challenging for patients [3]. According to WHO, data from neighboring countries are alarming; for instance, NCDs are estimated to account for 62% of total deaths in Tajikistan, 79% in Uzbekistan, 50% in Pakistan and 76% in the Islamic Republic of Iran and Turkmenistan, conversely, they account for 37% of total deaths in Afghanistan [4]. Similar results were found in the 2010 Afghanistan mortality survey reporting 33.3% of all deaths were attributed to NCDs [5].

Risk factors are modifiable such as tobacco use, physical inactivity, unhealthy diet, and the harmful use of alcohol, all increase the risk of NCDs and metabolic risk factors that contribute to four key metabolic changes that increase the risk of NCDs including raised blood pressure; overweight/obesity; hyperglycemia (high blood glucose levels); and hyperlipidemia (high levels of fat in the blood). Detection, screening and treatment of NCDs, as well as palliative care, are key components of the response to NCDs. So, an important way to control NCDs is to focus on reducing the risk factors associated with these diseases. To lessen the impact of NCDs on individuals and society, a comprehensive approach is needed requiring all sectors, including health, finance, transport, education, agriculture, planning and others, to collaborate to reduce the risks associated with NCDs, and to promote interventions to prevent and control them [2].

Questions 1: What is the difference between communicable and noncommunicable diseases?

Answer:
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Communicable Diseases	Non communicable Diseases

Question 2: What is the main risk factor for non-communicable diseases?

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Part 2: Methods

A series of cross-sectional studies were conducted in urban settings of major cities in Afghanistan including Jalalabad, Mazar-e-Sharif, Herat, Kandahar, and Kabul cities. All permanent residents and household members aged 25–70 years, including men and women,

who gave consent to participate were included in the study. An adapted WHO STEPwise instrument containing 3 steps were used. Cluster sampling was used as a suitable strategy to approach the households. Totally, 1200 participants in Jalalabad, 1231 in Mazar-e-Sharif, 1129 in Herat, 1165 in Kandahar and 1172 in Kabul were included in the final analysis [6].

The study variables were sociodemographic characteristics such as age, sex, level of education, occupation, income, and marital status; behavioral factors such as physical activity, consumption of fruits and vegetables, use of cooking oil, smoking and Naswar (tobacco snuff) use; and physical measurements such as blood pressure, weight, height, waist circumference and body mass index (BMI), biological components such as blood sugar, triglycerides and cholesterol. Out of total interviewed in all five cities 2712 were males.

Question 3: What are the components of WHO STEPS Approach?
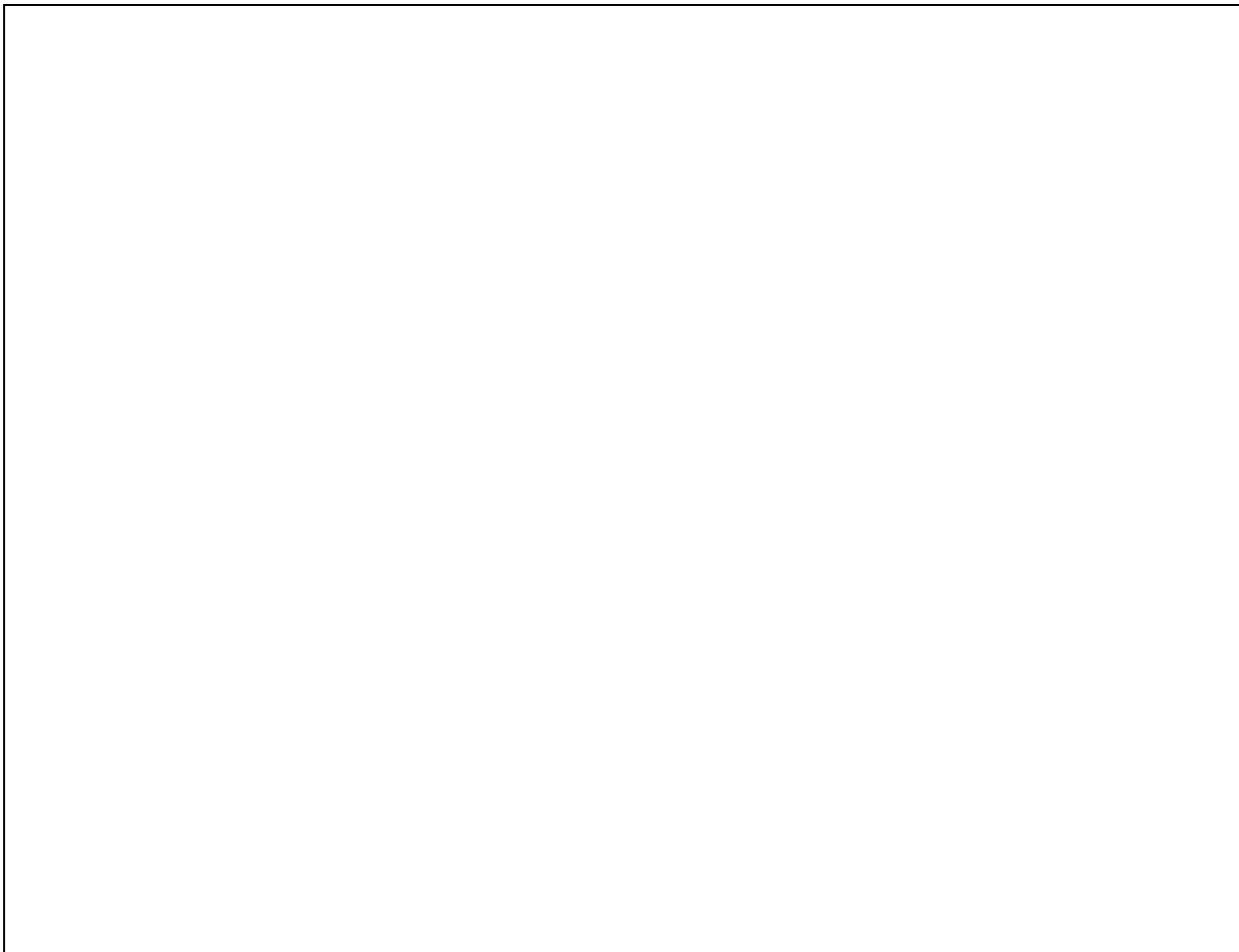
Question 4: Which types of variables were used in this survey?

Answer:			
Qualitative		**Quantitative**	
Nominal	**Ordinal**	**Discrete**	**Continuous**

Question 5: What is the ratio of male and female and what is the ratio of female to males?

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Part 3: Results- Prevalence of Risk Factors for NCDs

Of the total of 5897 respondents recruited in 5 cities, 2712 were male (46%). The average age of respondents was 39.6 [standard deviation (SD) 12.3] years. Overall, 38% of participants were literate. The study collected data based on variable definitions on blood pressure, obesity, raised blood sugar, smoking and snuff use. Following table shows the data based on five big cities.

Table 1: Frequency of adults' population with differentiation of specific NCD variables

Categories	Subcategories	Jalalabad	Mazar Sharif	Herat	Kandahar	Kabul	Total
Blood Pressure Raised	Normotensive	826	851	727	789	793	3986
	Hypertensive	374	380	402	376	379	1911
Total		1200	1231	1129	1165	1172	5897
Blood Sugar	Nondiabetic	1037	1118	1017	896	1065	5133
	Diabetes	139	113	112	259	107	730

Raised							
Total		1176	1231	1129	1155	1172	5863
Obesity Status	Non-Obese	795	1041	948	979	930	4693
	Obese	299	190	177	186	242	1094
Total		1094	1231	1125	1165	1172	5787
Smoking Status	Nonsmoker	1072	1109	1055	1052	1075	5363
	Smoker	71	122	63	113	95	464
Total		1143	1231	1118	1165	1170	5827
Snuff Use Status	No Snuff user	1027	1129	994	973	1052	5175
	Snuff user	123	102	120	189	114	648
Total		1150	1231	1114	1162	1166	5823

Questions 7: Using the table 1 calculate the prevalence of all five variables (left column) in each city as well as in general population in percentages?

Answer:

Here the answers are calculated in table.

Variables	Subcategories	Jalalabad	Mazar Sharif	Herat	Kandahar	Kabul	Total
Blood Pressure Raised	Normotensive						
	Hypertensive						
Total							
Blood Sugar Raised	Nondiabetics						
	Diabetes						
Total							
Obesity Status	Non-Obese						
	Obese						
Total							
Smoking	Nonsmoker						

Status	Smoker					
Total						
Snuff Use Status	No Snuff user					
	Snuff user					
Total						

Question 8: Is it ratio or proportions? How do you compare rate, ratios, and proportions?

Answer:			
	Ratio	**Proportion**	**Rate**
Definition			
Characteristics (numerator and denominator)			
Reporting			
Use			

11

Part 4: Incidence Rate and numbers affected.

According to IDF-Atlas-Factsheet-2021 data total number of cases of diabetes in 2011 in age group of 25-79 years were estimated to be 818,300 while this estimation raised to 1,606,700 in 2021. This shows a double increase in cases in one decade. In addition, the number of deaths has risen to 31,743 in 2021 [7-8].

Question 9: How can you calculate the incidence rate of diabetes as person-years, when the total population of the country estimation is 34,971,517 and half of it would be more than 25 years.
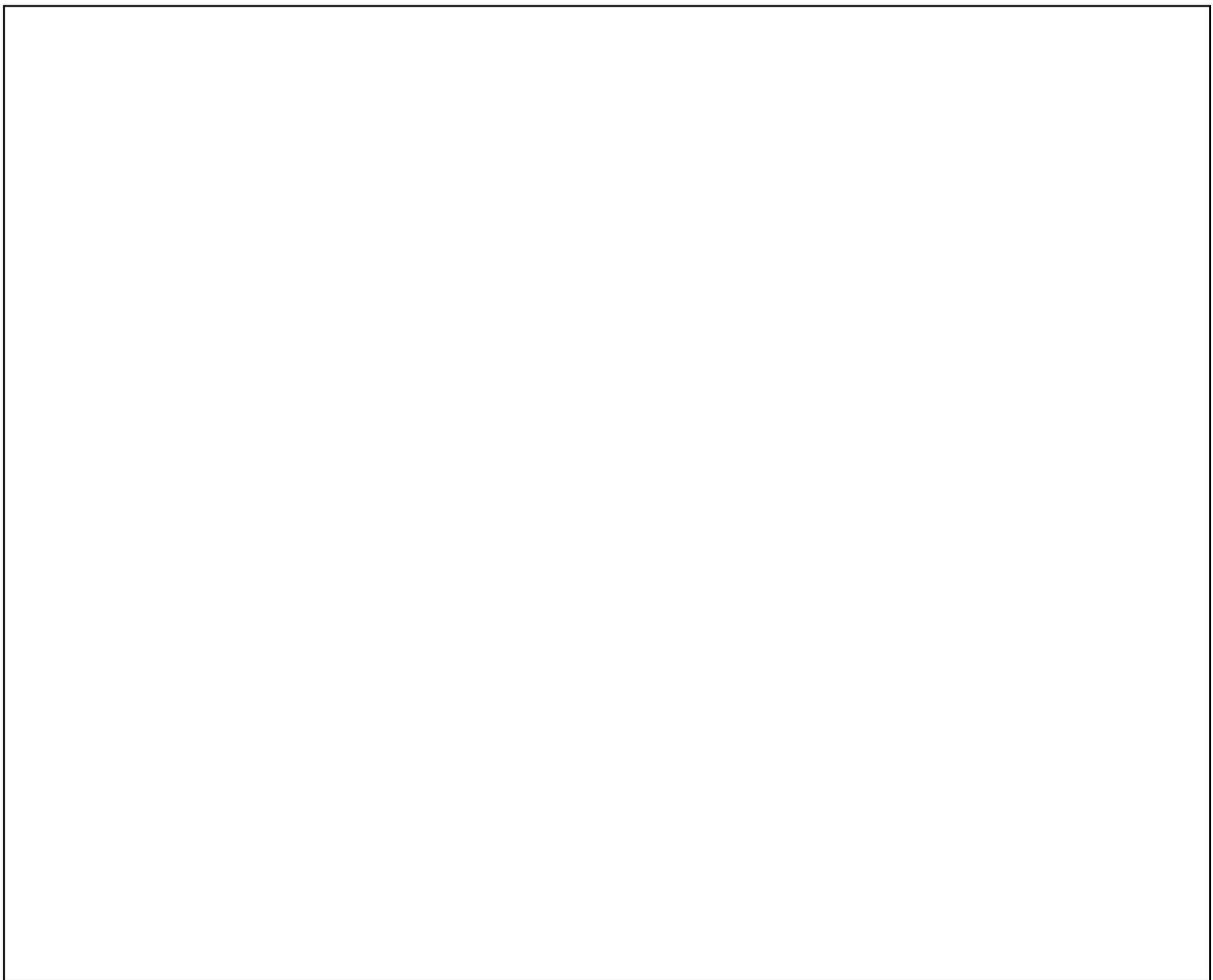
Part 5: Conclusion

Lack of information on risk factors for NCDs in Afghanistan has been a crucial challenge impeding policymakers in generating advocacy and developing interventions for prevention and control. In this study, it was found that the modifiable risk factors of NCDs were prevalent in the major cities, Kabul, Kandahar, Herat, Jalalabad and Mazar-e-Sharif. High priority is given to infectious diseases, maternal health and nutrition while the burden of NCDs is gradually encumbering the fragile economy of the country and its newly fledged health system.

Question 10: As an epidemiologist, if you are asked by Public Health Director how many adult populations are affected by blood pressure, diabetes, and obesity, what will be your answer? The population structure is given in the following table.

Provinces /Cities	Total	Rural	Urban	≥ 25 years (50%)
Jalalabad	1805087	1500092	304995	152,498
Mazar sharif	1525690	946845	578845	289,423
Herat	2283146	1567674	715472	357,736
Kandahar	1498666	922918	575748	287,874
Kabul	5766181	706136	5060045	2,530,023

Answer: for each province by multiplying each prevalence to population of 25 years and above.

1. Blood Pressure

Provinces /Cities	≥ 25 years (50%)	Prevalence BP	Numbers Affected
Jalalabad			
Mazar sharif			
Herat			
Kandahar			
Kabul			
Total			

2. Diabetes

Provinces /Cities	≥ 25 years (50%)	Prevalence diabetes	Numbers Affected
Jalalabad			

Mazar sharif			
Herat			
Kandahar			
Kabul			
Total			

3. Obesity

Provinces /Cities	≥ 25 years (50%)	Prevalence Obesity	Numbers Affected
Jalalabad			
Mazar sharif			
Herat			
Kandahar			
Kabul			
Total			

Question 11: Considering all said above, do you think noncommunicable diseases are really a public health problem in Afghanistan, and why?

Acknowledgements

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8. Estimation for 2023 (1402) is 34971517 based on NSIA.

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