

In order to demonstrate the kind of response expected, we exhibit some work taken from previous classes. These essays are actual examples of student writing, with some minor editorial changes.

Example 1.

Maternal Death Rates

This article is about the rate of maternal deaths during the last 15 years. This rate is a quantitative variable. According to the article, there are presently between 7 and 8 maternal deaths per 100,000 births in the United States.

The maternal death rate varies from country to country and from year to year. The Centers for Disease Control and Prevention (CDC) found the number of maternal deaths for a given year by checking death certificates. However, the information is not necessarily always correct on a death certificate. The cause of death might not be reported correctly.

This variable is a measure of the average health of a country in a given year. In some countries where overall health is not as good as it is in the United States, the rate is as high as 1,700 deaths per 100,000 births; in other countries it is about half that of the United States. The CDC believes that about half of the maternal deaths in the United States could be prevented.

Comments on Example 1: This is an example of a good essay on a quantitative variable. The newspaper article on which it was based is not available for you to see, but the essay is so well written that it stands on its own. (A) The variable is an interesting and significant one, and it is clearly the central focus of the article that was selected. (B.1) The first paragraph names the variable and includes several comments that help suggest what the variable means; the author has not actually provided a precise definition of the variable, however. This is a place where the essay could be improved. (For related information, see Section IV, below.) The second paragraph addresses points (B.2) and (B.4) very succinctly. Not much is said in response to question (B.3), but there is not a lot needed on this point. The last paragraph is a thoughtful and informative response to (B.5). Overall, the reader gets the sense that the student who wrote this has a clear understanding of the concept of a quantitative variable.

Example 2.

Political Variables

All groups of people in all fields have to deal with variables. There are attitude variables, weather variables, fashion variables, and all kinds of numerical variables. An article in the Monday Advocate shows how clearly aware of variables our leaders need to be. The focus of the article is the budget, a financial variable. The leaders of our city, and any city, have a certain amount of money to use. Sometimes the money comes from different sources. The leaders' job is to figure out what needs to be done in the city, prioritize these things, and appropriate the money. The amount of money is never the same. Also, the things that need to be done change. Another variable factor is how many unforeseen things will come up over the year. Will there be money left to pay for them? The leaders of our cities, states, and country have quite a checkbook to balance. This requires them to have to deal with one great big variable, the budget.

Comments on Example 2: This essay fails to meet criteria B.1–5. The language is entertaining, but the essay ignores the goals of the assignment and suggests a lack of conceptual understanding of the idea of a quantitative variable. The author does not bring a specific quantitative variable to the center of attention. Instead, he writes about “variation” or “variability” as general features of the world. At one point, he mentions “a certain amount of money” that the leaders of a city have to use. Here he had the opportunity to focus on a specific, clearly-defined variable and consider how it might be defined and measured (*e.g.*, city tax revenue minus expenditures as of a given date). But he did not do this. This essay leaves the budget undescribed and unanalyzed—a big, unknown, undifferentiated variable something-or-other.

III. Cooperative Classroom Work.

The following examples are neither as good as the first nor as bad as the second. They are included here in order to be used as a basis for a classroom discussion of the assignment.

Prostate Cancer and Pesticides, Current Medical News, July–September 1998

This article deals with the risk of prostate cancer due to exposure to pesticides. Previous studies suggested that farmers who have been exposed to pesticides and to cadmium seem to have an increased risk of developing cancer, as compared to men of similar age who have not been exposed to these substances. The study that this article reports used as a sample 20,025 Swedish men who had been exposed to pesticides. Of the men in the sample, only 401 had actually developed prostate cancer. This small portion of the sample actually developing cancer demonstrates that cadmium may indeed pose an increased risk of cancer. To determine whether or not pesticides do actually pose an increased risk, a sample of similarly aged men who had not been exposed to pesticides could be used. The quantitative variables in this study include the length of exposure to pesticides, the amount of pesticides handled by each individual, and the composition of the chemicals used in the pesticides.

Variables in the Bathroom

Quantitative variables can be found all around us. An example can be found in the article “Parents no longer rush to flush toddlers’ diapers” from the August 25, 1998 edition of USA Today. Here the variable is the age at which toddlers are potty trained. According to the article, this age is moving up. This could be a good thing, because there is research indicating that slow and steady potty training results in fewer health problems, such as bed-wetting and chronic constipation.

The authors cite a study from “Pediatrics” conducted in 1997. Of the toddlers taking part in the study, 97.7% were toilet-trained at 48 months. The article, however, does not refer to any study to back up its opinion that this is healthier. The article mentions the opinion of T. Berry Brazelton, a “child-development expert” who (conveniently) works for Pampers, a diaper manufacturer. He supports a training schedule determined by the disposition of the individual child. He mentions that the company he works for is now making diapers to support a growing number of larger babies still in diapers.

Discussion groups may consider the following questions: 1) To what extent are the goals of the assignment met in these essays? 2) How would you grade them on the rubric, and how would you justify the grades assigned? 3) How could these essays be improved? The class as a whole, together with the instructor, should examine the conclusions reached by the discussion groups, and the instructor should use this as an opportunity to provide more detailed guidance and input for the assignment, as required by the class.

IV. Reading: “Maternal Mortality Rate”

The following discussion is intended to show how more and more detail emerges as the meaning of the variable is probed. In general, people who are preparing to be teachers should realize that almost every variable needs to be thought about with great caution and care. Being prepared to dig deeply into the meaning of the terms we use is part of the scientific temperament. To prepare students to perform well in science or math, we need to foster this critical attitude.

“Maternal mortality rate” is a good example of a quantitative variable. This variable is measured for a given population during a given time period. It is defined to be the total number of maternal deaths in the population during the given time period divided by the total number of births in the same population and time period. Both of the terms “maternal death” and “birth” are open to many interpretations. To be perfectly clear about what the variable means, one needs to know precisely how to count the births and the maternal deaths. Should we count only live births? Should the birth of twins count as one or two births? Similarly, what deaths count as maternal deaths? How much time may elapse between the end of the pregnancy and the death? Different choices of meaning will affect the maternal mortality rate.¹

¹ See: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00000801.htm>) for an example of how confusions of meaning can arise.

The National Center for Health Statistics has a web page that provides the “official” definition of **maternal mortality rate** (and of many other important health-related variables).² Here, you will find the following passage:

Maternal mortality rate is defined as the number of maternal deaths per 100,000 live births. The maternal mortality rate is a measure of the likelihood that a pregnant woman will die from maternal causes. The number of live births used in the denominator is a proxy for the population of pregnant women who are at risk of a maternal death. Maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy. Maternal death is one for which the certifying physician has designated a maternal condition as the underlying cause of death. Maternal conditions are those assigned to Complications of pregnancy, childbirth, and the puerperium, ICD-9 codes 630-676.

Maternal mortality rates are often measured in a given country and a given year. For example, in 1997 the maternal mortality rate in the U.S. was 8.4 per 100,000.³ In addition to measuring the maternal mortality rates for a whole country, we can also measure maternal mortality rates for sub-populations. Doing this for sub-populations of the U.S. population reveals some very disturbing facts. Black women in the U.S. had a pregnancy-related death rate of 29.6 deaths per 100,000 live births between 1991 and 1997, according to a May 2001 press release by the Centers for Disease Control and Prevention.⁴ The pregnancy-related death rate for white women over the same period was 7.3 deaths per 100,000 live births, while Hispanic women suffered 10.3 deaths per 100,000 live births, and Asian women 11.3. Note that the pregnancy-related death rate is not exactly the same as the maternal death rate. The press release cited contains the statement: “A pregnancy-related death is defined as a death that occurred to women during their pregnancy or within one year after the end of the pregnancy, resulting from pregnancy complications or effects.” An article in the *Seattle Times* confuses the maternal mortality rate and the pregnancy-related death rate.⁵

The history of maternal mortality rates is also interesting. Below is a table I found on the web.⁶ There are some curious entries on the first line. These aside, students ought to think about what this table says about the way life has changed in the last 80 years.

**Maternal Deaths Per 100,000 Live Births
Five Year Average, 1921–1990
Canada, Quebec and Ontario**

Period	Canada	Qubec	Ontario
1921–1925	501.8	388.6	540.2
1926–1930	564.0	523.6	578.4
1931–1935	499.0	513.4	530.2
1936–1940	460.8	511.6	453.8
1941–1945	292.4	327.6	254.0
1946–1950	150.0	197.0	123.6
1951–1955	85.2	116.6	65.4
1956–1960	54.4	75.0	42.4
1961–1965	36.8	47.0	37.2
1966–1970	25.4	36.4	20.4
1971–1975	12.4	15.8	10.8
1976–1980	6.6	5.2	7.8
1981–1985	4.0	1.8	5.4
1986–1990	3.6	4.8	2.6

² <http://www.cdc.gov/nchs/datawh/nchsdefs/list.htm>

³ Reported in *Chronic Disease Notes and Reports*, **13**:2 (2000), page 2.

⁴ <http://www.cdc.gov/od/oc/media/pressrel/fs010511.htm>

⁵ http://seattletimes.nwsourc.com/html/nationworld/134304760_momsdie090.html

⁶ See: http://members.nbci.com/history_1/his951/stats/momdeath.htm; the citation at the web page is: Selected Mortality Statistics, Canada, 1921–1990, Statistics Canada, Catalogue 82–548, pp 100–101.