

Data Analysis Activity: Emergency Nutrition Calculations*

UNICEF workers need to use math to make important decisions when responding to emergencies. In this activity, you will apply your math skills to a situation UNICEF frequently faces.

SCENARIO: A flood in Pakistan has made food scarce. You and your team of UNICEF workers visit a small village to assess the situation. The only children in the village are 22 young boys.



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The boys look hungry, but it is your job to determine which children are actually undernourished and the nutritional status of the group as a whole. According to the *UNICEF Emergency Field Handbook*, the way to do this is to determine the *weight-for-height* for the children. This means measuring weights and heights and comparing them to the data in a chart of the mean, or average, weights of a healthy population for the same heights.

The comparison comes from looking at the mean absolute deviations (MADs)[†] for each weight-for-height line in the chart. These values are calculated by determining the absolute deviation (the distance) of each data value from the mean, and then finding the average of these deviations. Then, for each weight of a child measured, you look at how many MADs less it is than the mean weight-for-height. If it's between 1 and 2 MADs less, it indicates one level of undernutrition. If it's between 2 and 3 MADs less, it's a more severe level of undernutrition.

Your team measures the boys' height, and they all happen to be 77 centimeters (about 30 inches) tall. Then you remember: You left your weight-for-height chart back at the office! However, you can determine MAD from a data set of the weights of the boys from before the emergency. The data set is as follows:

11, 9, 10, 11, 9, 10, 11, 11, 9, 9, 11, 11, 9, 9, 9, 10, 9, 11, 11, 11, 10, 9

1. Calculate the mean, or average.
2. Using the MAD Calculation Table (see page 3), determine the MAD by
 - a. Finding the deviation (distance) between each data value and the mean from #1
 - b. Finding the absolute deviations (in other words, taking the absolute value of each deviation)
 - c. Finding the mean of the absolute deviations

Write the MAD here (rounded to the hundredths position): next page →

* This activity for grade 6 and above is aligned to [Standard 6.SP5.c](#) from the Common Core State Standards for Mathematics: *Summarize numerical data sets in relation to their context, by giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.*

† Modified slightly from the actual UNICEF Emergency Field Manual to include grade-appropriate math skills.

With the mean and the MAD in hand, you and your team go on to weigh each of the boys. The resulting data set is as follows:

9.2, 9.3, 7.7, 8.6, 8.8, 9, 8.5, 8.6, 8.5, 8.4, 8.9, 9.3, 9.2, 9.3, 8.7, 7.4, 9.4, 9.3, 9, 8.1, 9.1, 9.4

Looking again in the *UNICEF Emergency Field Manual*, you find the following table:

Classification of Undernutrition Using Weight-for-Height*

Mild Undernutrition	Moderate Undernutrition	Severe Undernutrition
1–2 MADs below the mean	2–3 MADs below the mean	> 3 MADs below the mean

3. If the MAD you calculated above is 1 MAD, what is
 - a. 2 MADs?
 - b. 3 MADs?

4. Using the data set of the weights of the boys during the emergency, write here how many boys are
 - a. Mildly undernourished:
 - b. Moderately undernourished:
 - c. Severely undernourished:

Now you can get these boys the right treatment. You still must determine the nutritional status of the entire group, though. According to the *UNICEF Emergency Field Manual*:*

In emergencies, estimates of a population’s nutritional status are based on the percentage of children with weight-for-height falling below two MADs:

Percentage of Young Children with Weight-for-Height > 2 MADs Below Mean	Severe Undernutrition
< 5%	Acceptable
5%–9.9%	Poor
10%–14.9%	Serious
> 15%	Critical

5. a. How many boys’ weights-for-height are greater than 2 MADs below the mean?
- b. What percentage of the total number of boys is your answer in #5a?
- c. According to the above table, what is the level of undernutrition of the group as a whole?
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With that information, you call in to the field office and secure the right support for this village. Your math skills literally saved lives!

MAD Calculation Table

Mean, or average, from #1:

Data Value	Deviation from Mean (distances above the mean are positive, and below the mean are negative)	Absolute Deviation (the deviations from the center column, with the minus signs removed)
11		
9		
10		
11		
9		
10		
11		
11		
9		
9		
11		
11		
9		
9		
9		
10		
9		
11		
11		
11		
10		
9		
MAD (mean of these absolute deviations) =		