

1. Consider the Body Mass Index (BMI) in a population of 60 year old males in a nursing home. Suppose that the BMI follows a normal distribution with mean 29 and standard deviation 6.

(Example from [http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704\\_Probability/BS704\\_Probability8.html](http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_Probability/BS704_Probability8.html))

- (a) What is the probability that a randomly selected 60 year old male from this population would have a BMI of at least 45?
- (b) If nutritionists would like to intervene with the top 10% of BMIs in this population, what BMI would be the cutoff?
- (c) If those below the 15th percentile are at risk of malnutrition, what would be the smallest BMI someone in this population could have and not be at risk?
- (d) What is the probability that a randomly selected 60 year old male from this population would have a BMI of at least 55?

2. A study of the effects of pollution on sea urchins (“Effects of Chronic Nitrate Exposure on Gonad Growth in Green Sea Urchin *Strongylocentrotus Droebachiensis*”, *Aquaculture*, Vol. 242, No. 1-4, pp. 357-363) found that the weights of adult green sea urchins are normally distributed with mean 52.0 g and standard deviation 17.2 g. Answer the following questions using this information.
- (a) What is the probability that a random adult green sea urchin would have a weight of at least 40.0 g?
  - (b) Suppose that adult green sea urchins under 35.0 g are considered to be very sensitive to pollution. What is the probability that a sea urchin would fall in this category?
  - (c) If a biologist were to suggest that the smallest 12.5% of adult green sea urchins by weight should be considered very sensitive, what cutoff should be used?
  - (d) If the biologist in the previous question is correct, explain **briefly** whether the current cutoff (35.0) needs to be changed, and how you know. (Base your answer on the work in the previous questions. No new calculation should be needed.)