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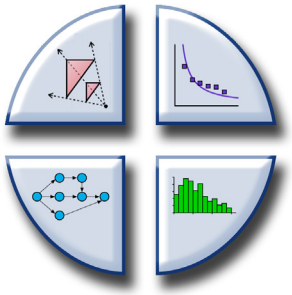

Health and Nutrition

Core-Plus Mathematics

Introduction:

At youcubed we are so excited to share this activity derived from a problem in *Core-Plus Mathematics*, Course 1. The problem included here is from Unit 3, Linear Functions, where students explore a small sample data set from the World Health Organization, Global Health Observatory Data Repository, faostat3.fao.org. We love the use of real data as students work, in this case, with linear functions and data.

Agenda:

Activity	Time	Description/Prompt	Materials
Data talk	5 min	Show the health and nutrition data table and ask students, "What do you notice? What do you wonder? What is going on in this data visual?" Summarize and record important ideas for the class to view. During the discussion make note of any content, vocabulary, or other ideas that may need to be discussed during the lesson.	Health and Nutrition Data Table on page 4
Investigation	30 - 40 min	Share the handout, Health and Nutrition. Ask students to read through the investigation and complete a - e in groups of 3-4 students. Students should work together in groups and discuss and share ideas. Students use technology to enter the data and produce scatterplots. They make a linear model for the data and use the model to predict results.	Handout from page 4, one per group of 4. Technology: Graphing calclulators, computers or tablets Excel, google sheets, or CODAP (we recommend CODAP for this activity)
Discussion	10 min	Ask student groups to share their findings. Linear models may vary since the intent of the lesson is to make a linear model and not necessarily use a regression line calculated by technology tools. Ask students to share their models. As a class discuss how they might determine which linear models are more accurate.	
Reflection	5 min	Ask students to reflect on the activity. "What did you learn from this activity?", "What questions do you have?", "How can you use algebra as a tool for answering questions with data?"	

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Data talk:
Share the table of Health and Nutrition data, on page 4, as a data talk. This is a great way to formatively assess where students may be with data as well as provide an opportunity to discuss the meaning of the data. Students should recognize that this is a small sample of a larger data set that can be found on the site listed below the data table. You may find topics or vocabulary that are important for understanding the context. This activity provides an opportunity to see where students are with interpreting data from a table, understanding that two-variable data can be represented as ordered pairs and plotted on a coordinate plane, and two data points can be used to determine the slope and equation of a line that fits the pattern in the data.

Investigation:
Share the Core-Plus Mathematics on page 4. Ask students to read the questions and discuss ways to complete the data study together, making sure all ideas are heard and valued. Have students work collaboratively through the problem before you discuss any methods or ways to solve it. This provides a time for students to engage together as data explorers and for you, a co-explorer to see where students make wonderful discoveries and encounter struggle. Remind students to embrace struggle and mistakes and engage with a growth mindset. For growth mindset resources and videos go to our WIM page at, https://www.youcubed.org/week-inspirational-math/ and select videos for your students.

We recommend students use CODAP (https://codap.concord.org/), although other technology tools can be used. Inside CODAP, https://codap.concord.org/app/static/dg/en/cert/index.html, students enter the data and generate graphs of the results . In the tools section of CODAP students can use a line to model the data. Here is a sample site where the data has been entered into CODAP, https://tinyurl.com/229v8rda. CODAP has many tutorials and is user friendly.

We recommend that you let students discover and share how they enter data, create a plot and fit a line. Figure 1 is an image of the scatterplot for Daily Calories and Life Expectancy genereated in CODAP. Figure 2 shows the "movable line" tool positioned as a linear model.

Figure 1

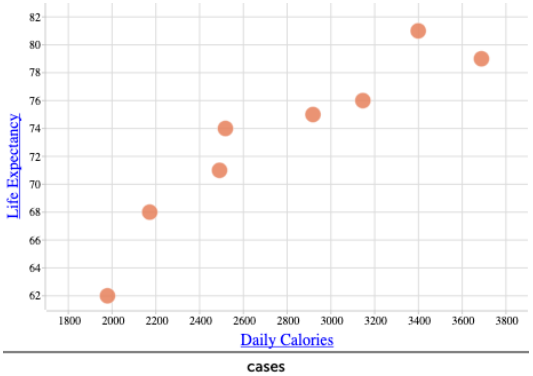
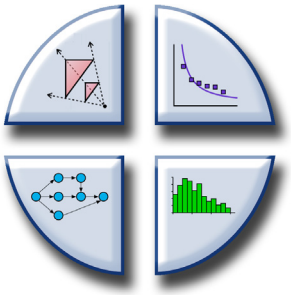


Figure 2



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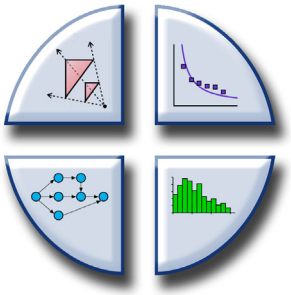
Discussion:

As groups of students are working on this problem pause and ask students to share where they are. These discussion points are not meant for answer sharing, they are meant for students to share ideas, questions and other findings they think are important. This is a way to reinforce the idea that the class is in this together, as data and technology explorers. The final discussion can be centered on group responses to the various problem parts and explanations of use of their linear models. One valuble discussion point is determining what a "good fit" might be. Some students may have discovered the "Least Squares" line in the tool section of CODAP. A conversation around this idea and how it compares to other methods for fitting lines to data can lead students into further exploration and study.

Reflection:

To summarize, ask students to reflect on this problem-solving activity by asking, "What did you learn from work on this problem? What questions do you have? How can you use algebra as a tool in helping to answer questions involving analysis of two-variable data?

2 Health and Nutrition Even if we do not always eat what is best for us, most Americans can afford nutritious and varied diets. In many countries of the world, life is a constant struggle to find enough food. This struggle causes health problems such as reduced life expectancy and infant mortality.



a. The data in the table below show how average daily food supply (in calories) is related to life expectancy (in years) and infant mortality rates (in deaths per 1,000 births) in a sample of countries. Make scatterplots of the (*daily calories*, *life expectancy*) and (*daily calories*, *infant mortality*) data.

Health and Nutrition

Country	Daily Calories	Life Expectancy	Infant Mortality
Argentina	2,918	75	13
Bolivia	2,172	68	39
Canada	3,399	81	5
Dominican Republic	2,491	71	21
Haiti	1,979	62	53
Mexico	3,146	76	13
Paraguay	2,518	74	19
United States	3,688	79	6

Sources: World Health Organization Global Health Observatory Data Repository; faostat3.fao.org

Study the patterns in the table and the scatterplots. Then answer these questions.

i. What seems to be the general relation between daily calories and life expectancy in the sample countries?

ii. What seems to be the general relation between daily calories and infant mortality in the sample countries?

iii. What factors other than daily calorie supply might affect life expectancy and infant mortality?

b. Economists might use a linear model to predict the increase of life expectancy or decrease of infant mortality for various increases in food supply.

i. Determine a linear model for calculating life expectancy from calories using the (*daily calories*, *life expectancy*) data pattern.

ii. Determine a linear model for calculating infant mortality from calories using the (*daily calories*, *infant mortality*) data pattern.

iii. What do the slopes of the graphs of your linear models say about the pattern relating life expectancy to daily calories in the sample countries? How about the relationship between infant mortality and daily calories?

c. Average daily calorie supply in Chile is 2,908. What life expectancy and infant mortality would you predict from the calorie data?

d. Brazil has a life expectancy of 73 years.

i. For what daily calorie supply would you predict this life expectancy?

ii. The actual daily calorie supply for Brazil is 3,173 calories. What does the difference between the value suggested by the model and the actual value tell about the usefulness of the model you have found?

e. What life expectancy does your model predict for a daily calorie supply of 5,000? How close to that prediction would you expect the actual life expectancy to be in a country with a daily calorie supply of 5,000?