



## Get a Head Start on Data Analysis

### Student Activity

Name \_\_\_\_\_

Class \_\_\_\_\_

In this activity, you will analyze data from the Center for Disease Control and Prevention (CDC) to determine how the number of reported concussions has changed over the past few years and the causes of most sports related concussions, referred to as TBI by the CDC.

**Concussions** also referred to as Traumatic Brain Injuries (TBI) are caused when a person receives a bump, jolt or blow to the head. The bump or blow could also be to the body which causes the head to jerk. The brain is protected by spinal fluid and the skull. Spinal fluid acts as a cushion between the brain and the skull. If the head experiences a jolt, the brain can crash into the opposite side of the skull causing a brain injury.



1. List some possible causes of concussions.
2. The Center for Disease Control and Prevention (CDC) collects data about traumatic brain injuries. The data in the table shows the Rates of TBI-related Emergency Visits by Age Group in the United States between 2001-2010 per 100,000 US Population.

Years	5-14 Years Old	15-24 Years Old
2001-2002	498.8	576.9
2003-2004	529.8	827.5
2005-2006	591.4	648.3
2007-2008	590.2	811.3
2009-2010	888.7	981.9

3. Explain why the CDC reports the numbers as a rate per 100,000 US population rather than just raw numbers. What does the number 981.9 mean in the 15-24 Years Old column?



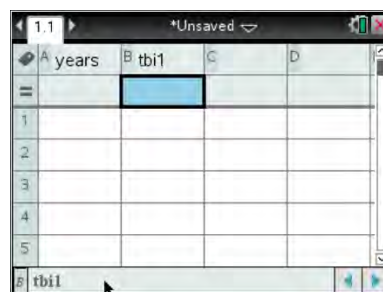
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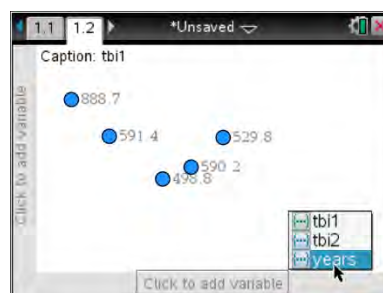
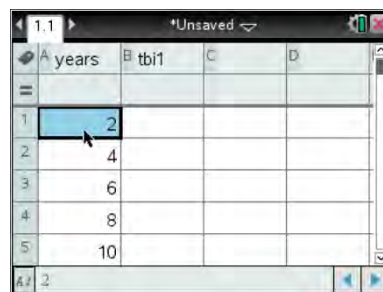
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4. To analyze the data, enter it into your TI-Nspire™ handheld.
  - Open a new document, and add a Lists & Spreadsheets page.
  - Move to the top of the first column, and type **years**. Move to the top of the second column, and type **tbi1** or **tbi2** depending upon which age group data you will analyze.

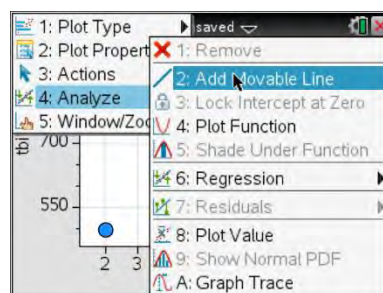


To make the analysis easier, we will use smaller numbers by analyzing how the concussions have changed since the year 2000. The years therefore will be in increments of 2 beginning with 2.

5. After entering the year data, enter the rate data for the age group you will analyze.
6. Create a plot of the data by adding a Data & Statistics page to the document.
  - Tab to or click on the x-axis, and select **years**.
  - Tab to or click on the y-axis, and select either **tbi1** or **tbi2**.
7. Find the average rate of change for your data by calculating the slope using just the first and last data points. Record your work below.

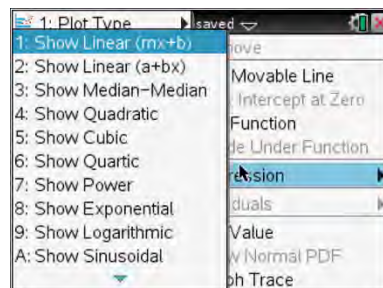


8. Add a Movable Line to the graph by selecting **Menu > Analyze > Add Movable Line**. Adjust the line so that it passes through the first and last points. Compare the slope of this line to the average rate that you found above.



The placement of the movable line passing through the first and last points shows the average rate of change for the time period. A linear regression finds the best fitting line using all of the data points.

9. Select **Analyze > Regression > Show Linear (mx + b)**.  
Record your equation for the linear regression below:





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10. Examine the two models with the data. How do they compare? Which do you think is more accurate? Explain your reasoning. Is there a better model for your data?

11. What does the slope tell us about the data set? Why do you think the rate of reported concussions is rising?

**For more information:** The Center for Disease Control and Prevention (CDC) has a new educational program, "Heads Up," to provide more information and training about concussions. In a search engine, search for "Center for Disease Control Traumatic Brain Injury." Then, at the CDC web site, search "Heads Up."



## Examination of Categorical Data on Traumatic Brain Injuries

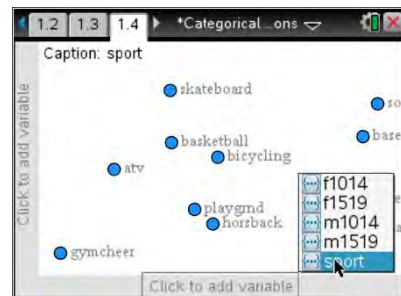
**Concussions** are caused by many different events. The following information shows how the numbers of concussions (TBIs) vary according to sports for males and females. Examine the information for the top 5 causes by age groups of middle and high school students. The number after the sport shows the total number of TBIs for each sport from 2001-2010 based upon emergency room visits.

	Males		Females	
Rank	Age 10-14	Age 15-19	Age 10-14	Age 15-19
1	Football 8988	Football 13667	Bicycling 2051	Soccer 2678
2	Bicycling 8302	Bicycling 4377	Basketball 1863	Basketball 2446
3	Basketball 4009	Basketball 4049	Soccer 1843	Gymnastics/Cheer 1513
4	Baseball 3061	Soccer 3013	Horseback Riding 1301	Softball 1171
5	Skateboarding 2613	ATV Riding 2546	Playground 1041	Horseback Riding 1028
Other	Other 16476	Other 17488	Other 8724	Other 7872

- To analyze this data further, you will use the categorical data features of the TI-Nspire handheld. Begin by opening the document, *Categorical\_Concussions.tns*.
- Move to page 1.3 of the document.
  - The data from the table is summarized in the Lists & Spreadsheets page. Note that only the top 5 sports and other are listed for each sex and age group.
  - The fact that there is no value in a cell does not mean that no concussions were categorized there. It means that that sport was not in the top 5 categories of concussions reported in emergency rooms for that age group.



- Move to page 1.4 of the document, a Data & Statistics page. Select **Sport** on the x-axis. This will show all of the sports from the spreadsheet.





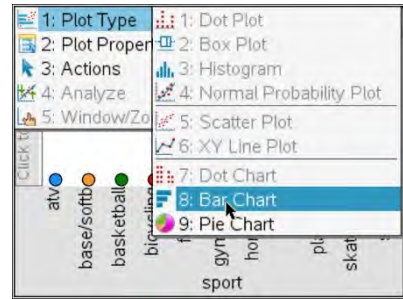
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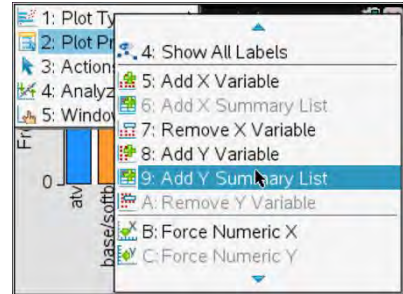
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4. Select **Menu > Plot Type > Bar Chart**.

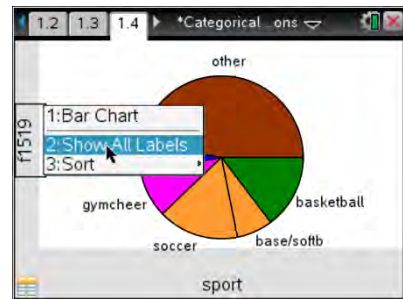


5. To see the group that you want, select **Menu > Plot Properties > Add Y Summary List**.

- Then choose the group that you want to view.
- Click on the y-axis variable to make a change.
- Hover over an individual bar to see the number and percentage.



6. From the Menu, choose **Menu > Plot Type > Pie Chart** to see the data transformed into a pie chart.
- To show the sports on the pie chart select **Menu > Plot Properties > Show All Labels** to see the percentage for each section of the pie chart.
  - You can change back to the Bar Chart from the Menu and show the labels for this chart as well.



7. Analyze the data from the pie and bar charts.
- Which sports have the most concussions? Does this vary by age and sex?
  - Write at least 3 summary statements that you can make from analyzing the categorical data.
8. If the Director of the CDC asks you to make recommendations based upon this data, what would you recommend? Write a paragraph, and support your recommendations with data.