

Chapter 3 – Measurement and Description Statistics

Use the hsbdata.sav file from <http://www.psypress.com/ibm-spss-intro-stats/> (“Data Sets (ZIPS)” button) to do these problems with one or more of these variables: *math achievement, mother’s education, ethnicity, and gender*. Use Tables 3.2, 3.3, and the instructions in the text to produce the appropriate plots or descriptive statistics. Be sure that the plots and/or descriptive statistics make sense (i.e. that they are a “good choice” or “OK”) for the variable.

3.1 Create bar charts. Discuss why you did or didn’t create each.

- Select **Analyze => Descriptive Statistics => Frequencies**.
- Move *math achievement, mother’s education, ethnicity, and gender* into the **Variables** box.
- Select **Charts => Bar Charts => Continue => OK**.

Bar charts can be used with any of the four levels of measurements, but it is better to use frequency polygons or histograms if you have normally distributed data. Each of these types of plots displays the frequency or number of subjects on the Y or vertical axis and shows the levels or values of the variables on the X axis of the plot. In histograms and frequency polygons the bars or points are connected implying that the levels of the variable are ordered from low to high. In a bar chart the bars are separated implying that there might not be an order to the levels or categories of the variable.

3.3 Create Frequency polygons. Discuss why you did or didn’t create each. Compare the plots in 3.1, 3.2, and 3.3.

- Select **Graphs => Line**. Click **Simple** and **Summaries for groups of cases**
- Click **Define**.
- Move *math achievement* into the **Category Axis** box. => **OK**.
- Repeat the steps above, except this time instead of moving *math achievement*, move *mother’s education* in the **Category Axis** box. => **OK**.

Frequency polygons and histograms are similar. They are designed for normally distributed data but are okay to use with ordinal variables. A frequency polygon connects the midpoints of the top of each bar in a histogram. In other words, you can make a frequency polygon from a histogram by taking a straight edge and connecting the middle of each of the bars.

3.5 Compute the mean, median, and mode. Discuss which measures of central tendency are meaningful for each of the four variables.

- Select **Analyze => Descriptive Statistics => Frequencies**.
- Move the four variables into the **Variables** box.
- **Statistics => Mean, Median, Mode => Continue => OK**.

Although the mean, median, and mode are okay to use with ordinal or normal data, the mean is the most appropriate with normal data and the median is best with ordinal data.

Neither the mean nor the median are not meaningful with nominal data. If you ask SPSS to compute a mean or median for *ethnicity*, it will do so, but because the ethnic categories are not in any order, the result would not be interpretable. The mode would tell you which ethnic group was the largest. Similarly, the mode (and median) tell you which level of a dichotomous variable is most frequent. The mean of a dichotomous variable (*e.g.*, gender) is the percent of participants who have the higher value (*i.e.*, female, in this case).

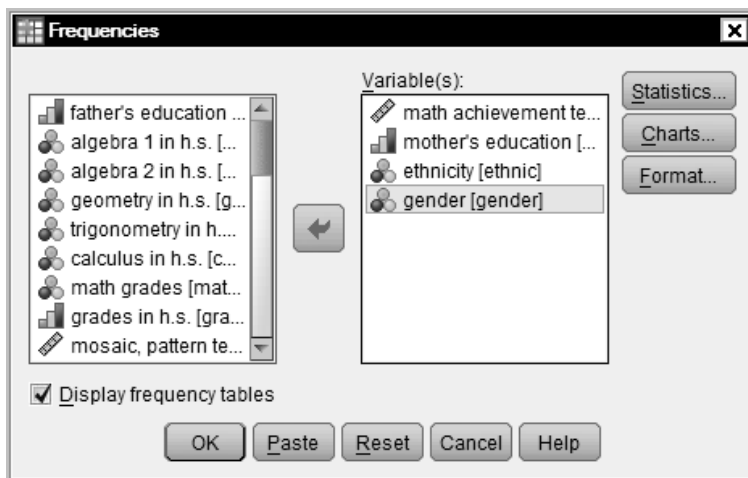


Fig. E.3

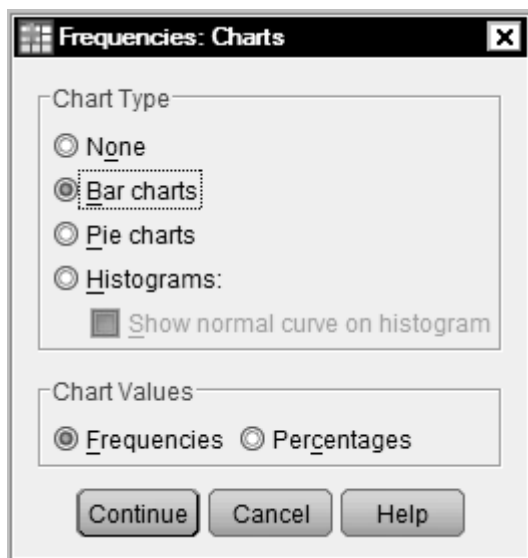


Fig. E.4

Ch.3 Output 2.0

Frequencies

Statistics					
		math achievement test	mother's education	ethnicity	gender
N	Valid	75	75	73	75
	Missing	0	0	2	0

Frequency Table

math achievement test					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-1.67	1	1.3	1.3	1.3
	1.00	2	2.7	2.7	4.0
	2.33	1	1.3	1.3	5.3
	3.67	3	4.0	4.0	9.3
	4.00	2	2.7	2.7	12.0
	5.00	5	6.7	6.7	18.7
	5.33	1	1.3	1.3	20.0
	6.33	2	2.7	2.7	22.7
	6.67	1	1.3	1.3	24.0
	7.67	4	5.3	5.3	29.3
	8.00	1	1.3	1.3	30.7
	9.00	4	5.3	5.3	36.0
	9.33	1	1.3	1.3	37.3
	10.33	4	5.3	5.3	42.7
	10.67	1	1.3	1.3	44.0
	11.67	2	2.7	2.7	46.7
	12.00	2	2.7	2.7	49.3
	13.00	3	4.0	4.0	53.3
	14.33	9	12.0	12.0	65.3
	14.67	1	1.3	1.3	66.7
	15.67	2	2.7	2.7	69.3
	17.00	5	6.7	6.7	76.0
	18.33	1	1.3	1.3	77.3
	18.67	1	1.3	1.3	78.7
	19.67	3	4.0	4.0	82.7
	20.33	1	1.3	1.3	84.0
	21.00	3	4.0	4.0	88.0
	22.33	2	2.7	2.7	90.7
	22.67	1	1.3	1.3	92.0
	23.67	6	8.0	8.0	100.0
	Total	75	100.0	100.0	

mother's education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< h.s.	17	22.7	22.7	22.7
	h.s. grad	31	41.3	41.3	64.0
	< 2 yrs voc	2	2.7	2.7	66.7
	2 yrs voc	5	6.7	6.7	73.3
	< 2 yrs coll	7	9.3	9.3	82.7
	> 2 yrs coll	5	6.7	6.7	89.3
	coll grad	3	4.0	4.0	93.3
	master's	3	4.0	4.0	97.3
	MD/PhD	2	2.7	2.7	100.0
	Total	75	100.0	100.0	

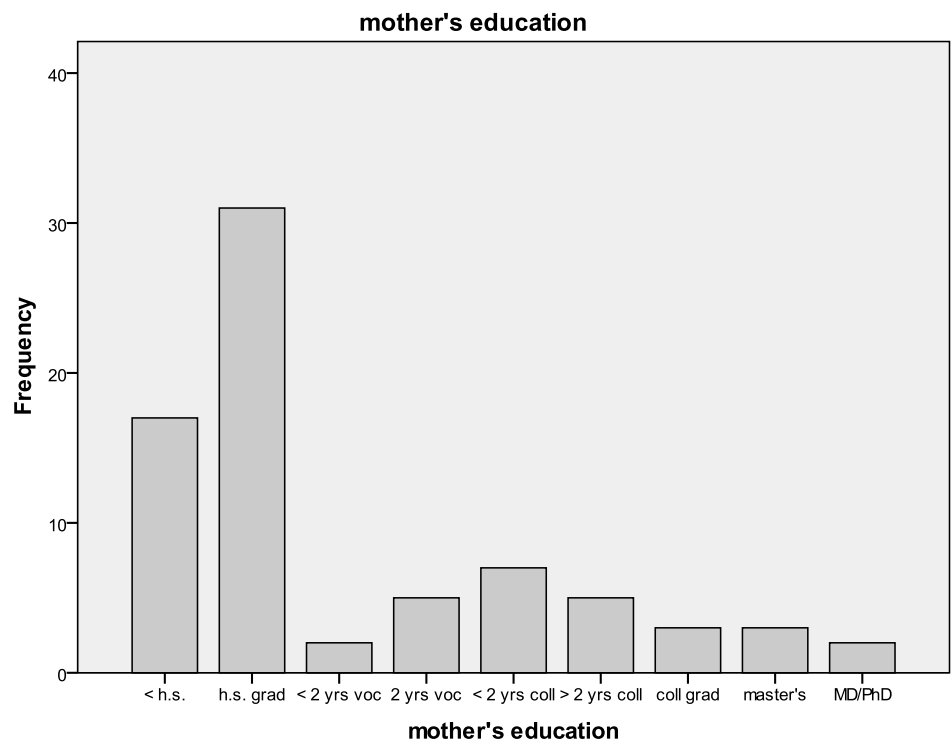
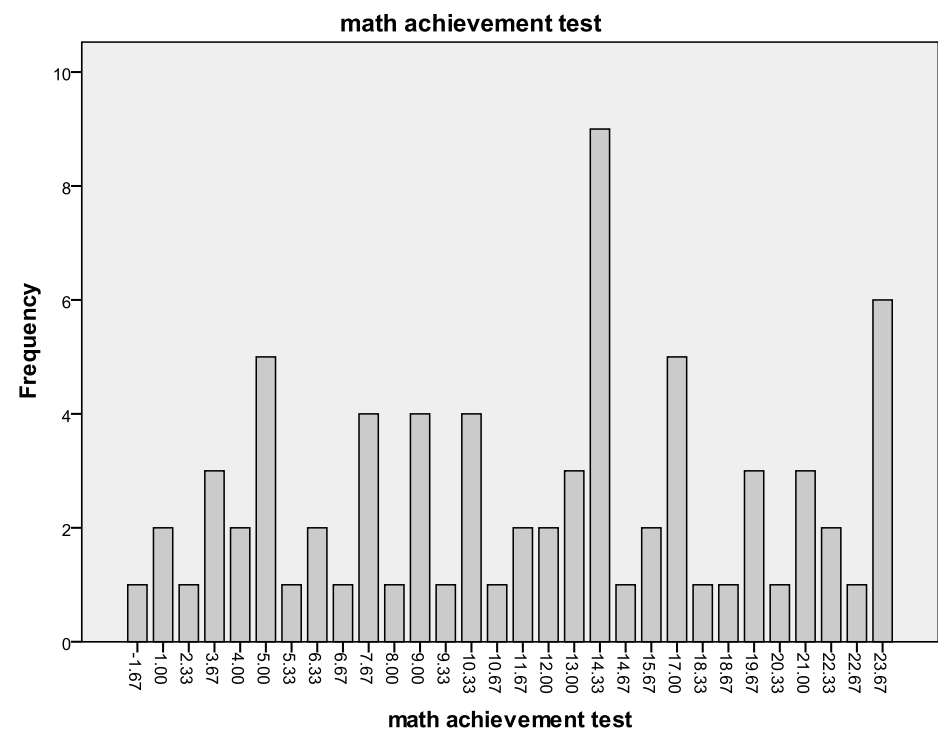
ethnicity

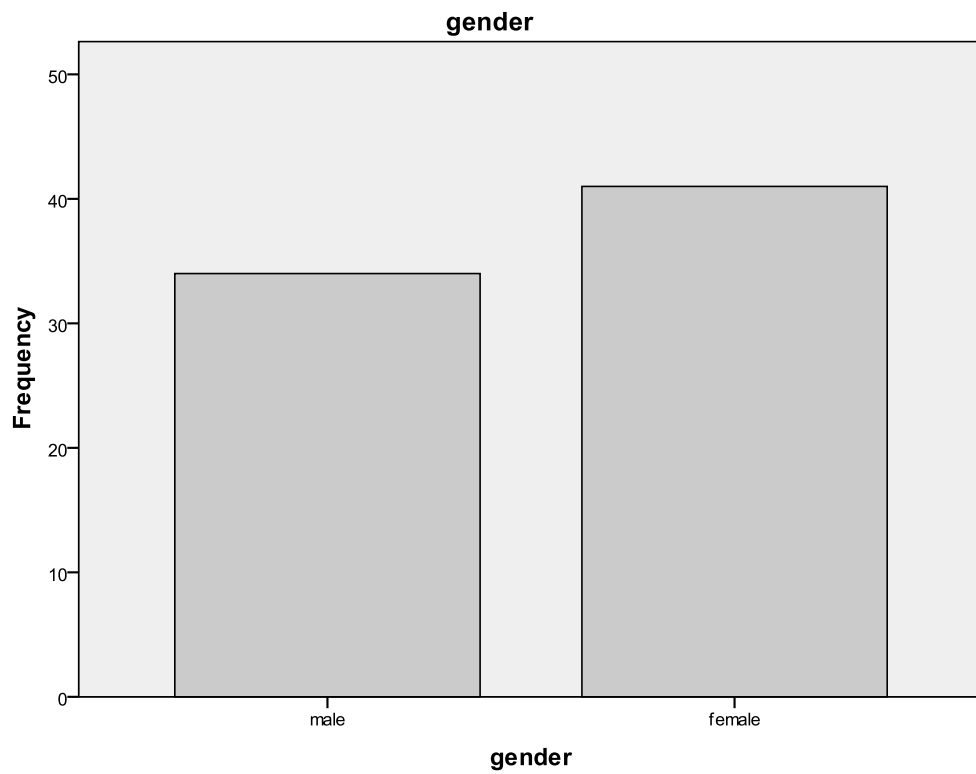
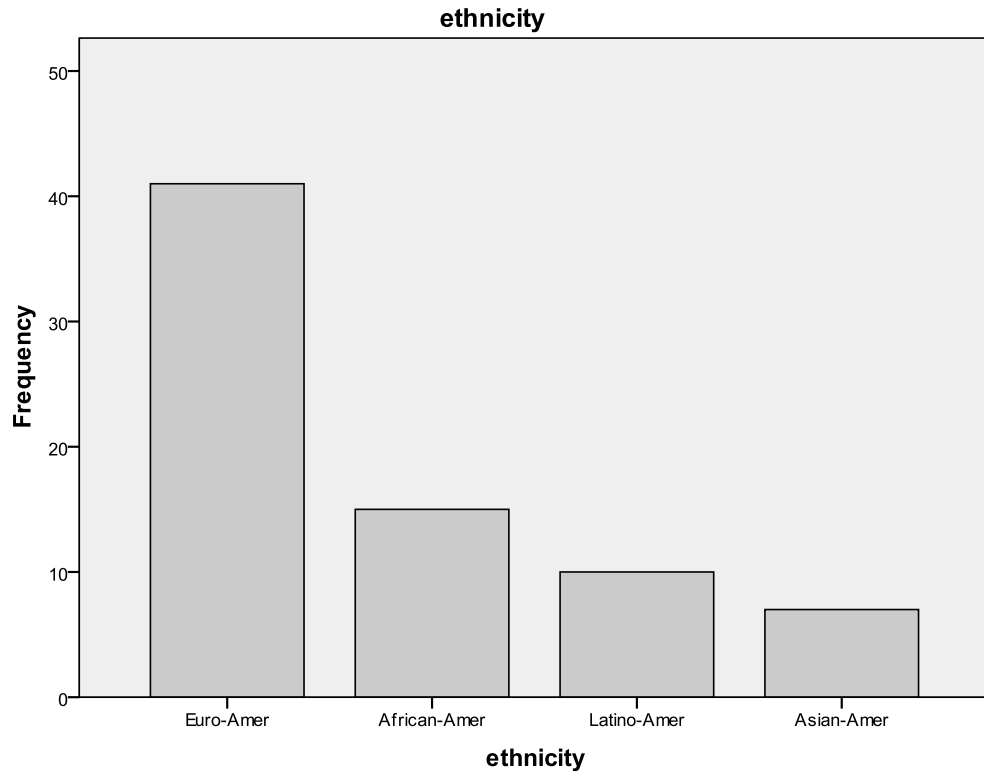
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Euro-Amer	41	54.7	56.2	56.2
	African-Amer	15	20.0	20.5	76.7
	Latino-Amer	10	13.3	13.7	90.4
	Asian-Amer	7	9.3	9.6	100.0
	Total	73	97.3	100.0	
Missing	multiethnic	1	1.3		
	blank	1	1.3		
	Total	2	2.7		
Total		75	100.0		

gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	34	45.3	45.3	45.3
	female	41	54.7	54.7	100.0
	Total	75	100.0	100.0	

Bar Charts





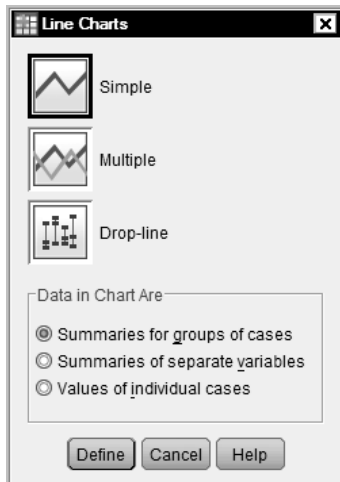


Fig. E.5

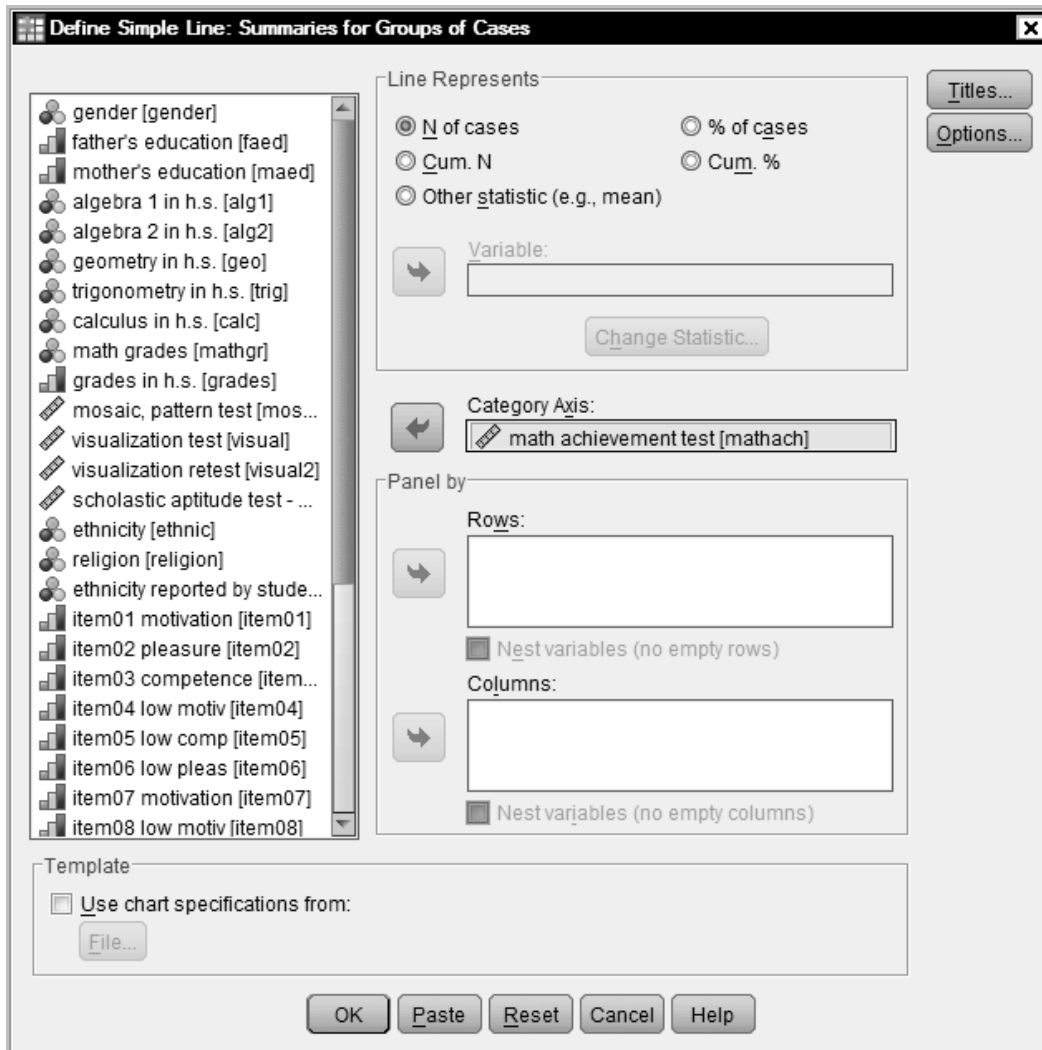
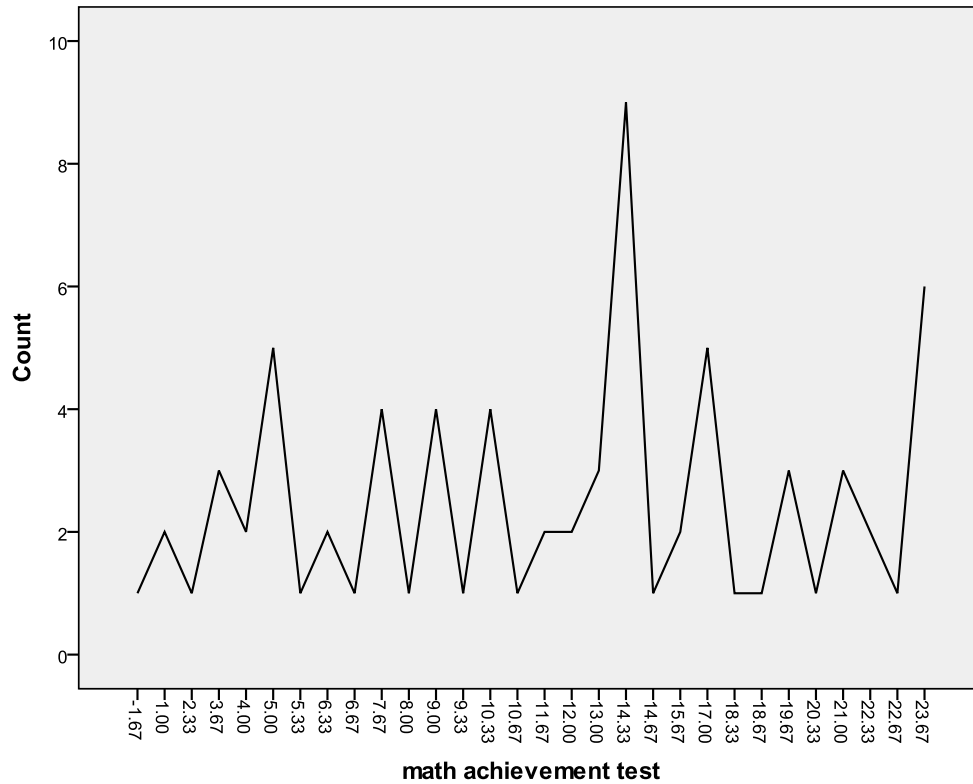


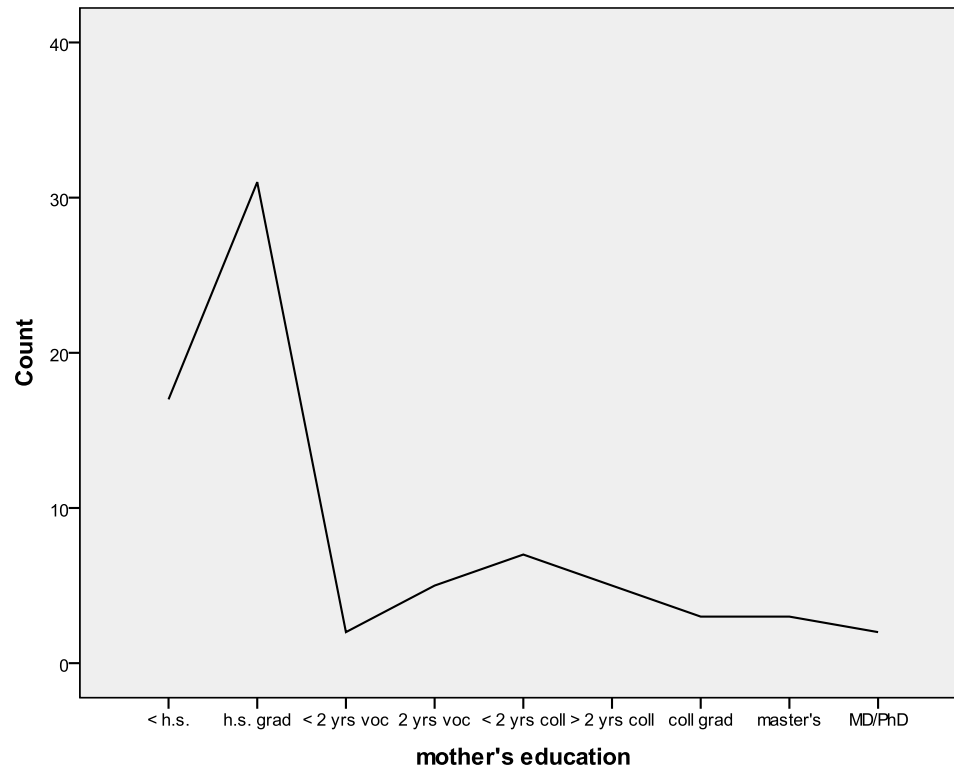
Fig. E.6

Ch. 3 Output 3.3

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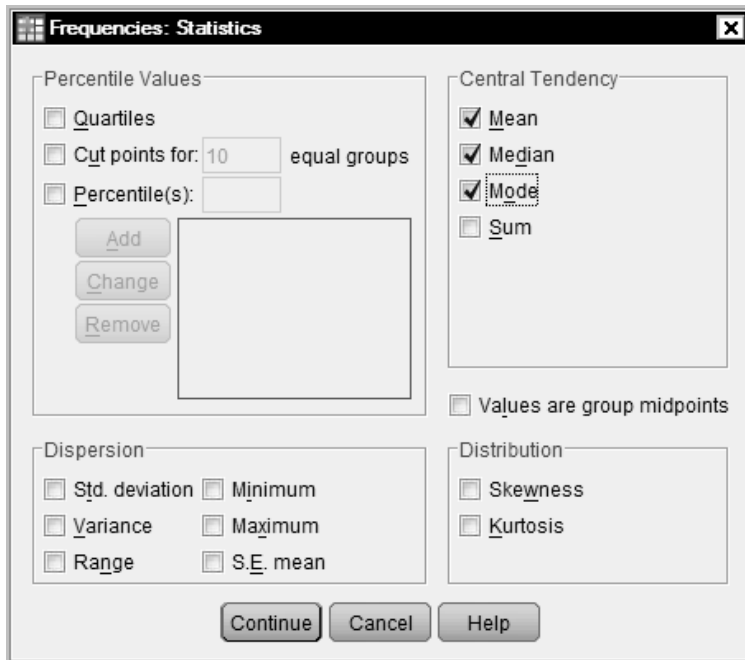


Fig. E.7

Ch. 3 Output 1.1

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FREQUENCIES
  VARIABLES=mathach maed ethnic gender
  /STATISTICS= MEAN MEDIAN MODE
  /ORDER= ANALYSIS
```

Frequencies

Statistics					
		math achievement test	mother's education	ethnicity	gender
N	Valid	75	75	73	75
	Missing	0	0	2	0
Mean		12.5645	4.11	1.77	.55
Median		13.0000	3.00	1.00	1.00
Mode		14.33	3	1	1

Frequency Table

math achievement test

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	-1.67	1	1.3	1.3	1.3
	1.00	2	2.7	2.7	4.0
	2.33	1	1.3	1.3	5.3
	3.67	3	4.0	4.0	9.3
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	8.00	1	1.3	1.3	30.7
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	9.33	1	1.3	1.3	37.3
	10.33	4	5.3	5.3	42.7
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mother's education

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	> 2 yrs coll	5	6.7	6.7	89.3
	coll grad	3	4.0	4.0	93.3
	master's	3	4.0	4.0	97.3
	MD/PhD	2	2.7	2.7	100.0
	Total	75	100.0	100.0	

ethnicity

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	African-Amer	15	20.0	20.5	76.7
	Latino-Amer	10	13.3	13.7	90.4
	Asian-Amer	7	9.3	9.6	100.0
	Total	73	97.3	100.0	
Missing	multiethnic	1	1.3		
	blank	1	1.3		
	Total	2	2.7		
Total		75	100.0		

gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	34	45.3	45.3	45.3
	female	41	54.7	54.7	100.0
	Total	75	100.0	100.0	