

Williams-Beuren syndrome (WBS) is a rare neurodevelopmental disorder which is caused by the deletion of more than 25 genes from region q11.23 of chromosome 7. Subjects with WBS display smaller brain volumes than normal; however, they often show an excess of volume in the right occipital cortex region of the brain. There are many documented effects of WBS, e.g., increased risk of cardiac problems, higher risk of diabetes, etc. The study presented here is concerned with the left-handedness of people with WBS.

Number of Males in Study with WBS that were Left-Handed	Left-Handedness Rate for Males in the General Population
8 out of 25	12.4%

Right Occipital Cortex Region of Brain



Source: Van Strien, J.W., Lagers-van Haselen, G.C, van Hagen, J.M, de Coo, I.F.M, Fens, MA, van der Geest, JN. (2005). "Increased prevalences of left-handedness and left-eye sighting dominance in individuals with Williams-Beuren syndrome." *Journal of Clinical and Experimental Neuropsychology*. 2005 Nov;27(8):967-76.

Research Question: Do males with Williams-Beuren syndrome have a greater chance of left-handedness than males in the general population?

1. Identify the smallest possible value, largest possible value, label for number line, location of the pyramid, and the outcome from the study for this situation on the number lines below. (5 pts)

- Smallest possible value
- Largest possible value
- Label for number line
- Location of pyramid
- Outcome from study



2. Identify the following parameters for your investigation. (3 pts)

Edit data ✕

Please select values for count and sample size.

count:

sample size:

Define Null Hypothesis ✕

Enter the null hypothesis as a decimal between 0.0 and 1.0.

Null Hypothesis

3. Use JMP to obtain the list of binomial probabilities for this example. Answer the following regarding what you did in JMP (4 pts)

a. What name should be used for the sequence of numbers in the 1st column?

Left-Handed

	# Left-Handed	Probability Values
1	0	0.0365260454
2	1	0.1292588363
3	2	0.2195629549
4	3	0.2382776055

b. What arguments, i.e. values, did you put in the Binomial Probability() function?

Binomial Probability (0.124 , 25 , # Left-Handed)

$p = 0.124$ $n = 25$ $k = \# \text{ Left-Handed}$

4. Complete the following.

P-Value (3 pts)	<p>P-Value = the probability of observing an outcome as extreme or more extreme than the observed outcome</p> <p>P-Value = Probability of 8 and above = 1 - Probability of 7 or less = 1 - 0.9915 = 0.0085</p>
Decision (1 pt)	<p>Decision Rule: If the p-value less than 0.05, then the data is said to provide enough evidence for research question. (1 pt)</p> <p><input checked="" type="radio"/> Data provides enough evidence for the research question</p> <p><input type="radio"/> Data does not provide enough evidence for research question</p>
Conclusion (4 pts)	<p>Write a conclusion in laymen's terms.</p> <p>There is enough statistical evidence to say that males with Williams-Beuren syndrome have a greater chance of left-handedness than males in the general population (p-value = 0.0085).</p>

Getting the p-value in JMP:

Probability of 8 and above = 1 – probability of 7 or less
 = 1 – 0.9915
 = 0.0085

# Left-Handed	Probability Values	Cumulative Probability ...
1	0	0.0365260454
2	1	0.1292588363
3	2	0.2195629549
4	3	0.2382776055
5	4	0.1855083641
6	5	0.1102885343
7	6	0.05203873
8	7	0.0199940065
9	8	0.0063679541
10	9	0.0017026443
11	10	0.0003856217
12	11	0.0000744351
13	12	0.0000122926
14	13	1.7400414e-6
15	14	2.1112048e-7
16	15	2.1915399e-8
17	16	1.9388623e-9
18	17	1.452975e-10
19	18	9.140989e-12
20	19	4.76711e-13
21	20	2.024389e-14
22	21	6.822795e-16
23	22	1.755971e-17
24	23	3.242114e-19
25	24	3.824411e-21
26	25	2.16542e-23

Note: The Cumulative Probability Column in JMP was obtained using the following in JMP.

Binomial Distribution (0.124, 25, # Left-Handed)

The output in JMP:

