Nuts and Bolts

What is a *p* value?

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The *p* value is the observed significance level. The p value is calculated assuming the null hypothesis is true then asking how likely it would be to observe a large or larger result under that assumption. It answers the question: how sure are we that the results of our study are real and not just a coincidence? Because, after all, the research results may show a difference but this might be a coincidence of random sampling rather than a real difference. And, statistical analysis cannot tell whether this coincidence occurred but it can tell how rare this would be.

For example, to test whether blood pressure is different between two groups of people that are following a special diet we begin by randomly selecting a sample of individuals from each group and obtaining their blood pressure. Results may show that the blood pressure of group 1 is lower than that of group 2 by about 25 mmHg. This difference may be just a coincidence – we happened to choose individuals in group 2 with higher blood pressure. Or, it might be that individuals in group 2 really are experiencing higher blood pressure while following the special diet. The question is then what is the probability that the difference (25 mmHg between group 1 and group 2) will be as large or larger than the results observed? The p value is the answer to this question.

The assumptions to calculate a p value are: random sampling, working (null) hypothesis is that there is no difference between study groups, and assume null hypothesis is true. This last one can be confusing because it is the opposite of what the actual researcher's question is.

In the example above the null hypothesis is that there is no difference in blood pressure between group 1 and group 2. But results showed otherwise. There are several methods to calculate a p value. If we use a t test and results showed a p = 0.26 this means that if the null hypothesis were true then there is only a 2.6% chance of randomly selecting samples with blood pressure means as large or larger than the actual results. In other words, in choosing a sample there is a 2.6% chance of choosing by coincidence individuals with higher blood pressure if there is no real difference in the blood pressure between these two groups of individuals.

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determine any statistical significance ($p \leq 0.05$) in breastfeeding rates at hospital discharge and at 6 months newborn well visits over the three study years.

Results

Our study of breastfeeding rates in the El Paso area revealed that the overall breastfeeding rates decreased from the time of discharge to the time of the 6-month well child visit, while the percentage of formula-fed infants increased (Table 2).

Table 2 Breastfeeding rates in El Paso, Texas (compound data for mothers of all ethnicities)

Year	Exclusive Breastfeeding		Mixed Breastfeeding		Formula	
	At Discharge	At 6-month Well Visit	At Discharge	At 6-month Well Visit	At Discharge	At 6-month Well Visit
2006	18%	10%	68%	16%	14%	74%
2007	17%	8%	64%	13%	19%	79%
2008	16%	11%	51%	17%	33%	72%

The percentages of infants exclusively breastfed or receiving mixed and exclusive breastfeeding at hospital discharge decreased by the time of the 6-month well visit, and that decrease was continued over the period of the study. The difference in decrease was statistically significant over the three study years ($p \leq 0.01$). At the time of the 6-month newborn well visit, the percentage of infants exclusively breastfed remained stable at about 10% during the study period, while the percentages of Formula-fed infants continuously increased by the time of the 6-month well visit over the

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