

Results

Below are the results of three Chi-square tests to test the following associations:

1. Being Dutch and stroopwafel preference
2. Being Dutch and drop preference
3. Being Dutch and bitterbal preference

Each test lists the observed and expected counts in the "contingency table" and the chi-square hypothesis test is in the table below. For every significance test, we will use an alpha level of 0.01.

Contingency Tables

First, we test whether Dutch people are more or less likely to love stroopwafels (i.e., there is an association between the categorical variables). There are some slight differences between what we observed and what is expected if nationality and stroopwafel-loving are independent, but when we look at the chi-squared value and its p-value, we see that these differences are not big enough to warrant rejecting the null hypothesis. Here, we fail to reject the null hypothesis: we cannot conclude that being dutch is related to stroopwafel preference.

Contingency Tables

What is your nationality?		What is your opinion on Stroopwafels?		
		Love	Hate	Total
Dutch	Count	96.000	3.000	99.000
	Expected count	92.487	6.513	99.000
Non-Dutch	Count	117.000	12.000	129.000
	Expected count	120.513	8.487	129.000
Total	Count	213.000	15.000	228.000
	Expected count	213.000	15.000	228.000

Chi-Squared Tests

	Value	df	p
X ²	3.585	1	.058
N	228		

Second, we look at the association between being Dutch, and whether you love or hate drop (liquorice). In this case, we see that the differences between the observed and expected cell counts are quite big. When we look at the chi-square statistic and its p-value, we indeed see that the differences between observed and expected are big enough to reject the null hypothesis for an alpha of 0.01.

We can compare the observed and expected counts to see how the data deviate from the null hypothesis. We see that the null hypothesis expected 59.313 Dutch people to hate drop, but in our data we observed 29 Dutch drop-lovers: far fewer than expected! Conversely, non-Dutch people turned out to hate drop more often than expected (since O > E; 107 > 76.687).

If we want to express an effect size, we can look (for instance) at the proportions of drop-lovers amongst the Dutch/non-Dutch.

$$P(\text{Love drop} \mid \text{Dutch}) = 70/99 = 0.707$$

$$P(\text{Love drop} \mid \text{non-Dutch}) = 21/128 = 0.164$$

So the conditional proportion for Dutch people is $0.707 / 0.164 = 4.31$ times as high as the conditional proportion for non-Dutch people (= relative risk).

Contingency Tables

		What is your opinion on Drop?		Total
What is your nationality?		Love	Hate	
Dutch	Count	70.000	29.000	99.000
	Expected count	39.687	59.313	99.000
Non-Dutch	Count	21.000	107.000	128.000
	Expected count	51.313	76.687	128.000
Total	Count	91.000	136.000	227.000
	Expected count	91.000	136.000	227.000

Chi-Squared Tests

	Value	df	p
χ^2	68.534	1	< .001
N	227		

Lastly, we have the association between being Dutch and liking bitterballen. Similarly to the drop data, we see here that Dutch people were more likely to love bitterballen than non-Dutch people (or the other way around, they were less likely to hate bitterballen). Again the differences between expected and observed counts are big enough to warrant a rejection of the null hypothesis (since $p < \alpha$). We can conclude that being Dutch is significantly associated with loving bitterballen - who says we have no culinary culture?!

Contingency Tables

What is your nationality?	What is your opinion on Bitterballen?			Total
	Love	Hate		
Dutch	Count	96.000	3.000	99.000
	Expected count	82.863	16.137	99.000
Non-Dutch	Count	94.000	34.000	128.000
	Expected count	107.137	20.863	128.000
Total	Count	190.000	37.000	227.000
	Expected count	190.000	37.000	227.000

Chi-Squared Tests

	Value	df	p
X ²	22.659	1	< .001
N	227		

Contingency Tables - Conclusion: Click here to add text