Is my little brother a delinquent?

Raw Data

	Oldest	In-between	Youngest	Only Child
Most Delinquent	127	123	93	17
Least Delinquent	345	209	158	65

Using the above data, we want to know if birth order affects delinquency in boys. Looking at the raw data row proportions it appears that the oldest and only-child sons have a lower delinquency level, where as middle and youngest sons have a higher delinquency levels.

Row Proportions

	Oldest	In-between	Youngest	Only Child
Most Delinquent	0.353	0.342	0.258	0.047
Least Delinquent	0.444	0.269	0.203	0.084
Difference (Most - Least)	-0.091	0.073	0.055	-0.036

Bayesian

Difference in Proportion for Oldest : Most Delinquent - Least Delinquent

Iterations	10000	100000	1000000
Mean	-0.091	-0.091	-0.091
95% CI	(-0.150, -0.031)	(-0.152, -0.030)	(-0.151, -0.030)
pval	0.002	0.001	0.002

Difference in Proportion for In-Between : Most Delinquent - Least Delinquent

Iterations	10000	100000	1000000
Mean	0.072	0.073	0.073
95% CI	(0.014, 0.131)	(0.015, 0.131)	(0.015, 0.131)
pval	0.006	0.006	0.006

Difference in Proportion for Youngest : Most Delinquent - Least Delinquent

Iterations	10000	100000	1000000
Mean	0.055	0.055	0.055
95% CI	(0.003, 0.108)	(0.002, 0.109)	(0.002, 0.109)
pval	0.018	0.020	0.020

Difference in Proportion for Only : Most Delinquent - Least Delinquent

Iterations	10000	100000	1000000
Mean	-0.036	-0.036	-0.036
95% CI	(-0.065, -0.006)	(-0.065, -0.006)	(-0.065, -0.006)
pval	0.010	0.010	0.010

Combined p-values: $X = -2 \sum_{i=1}^{4} (p_i) \sim \chi^2_{df=8}$

Iterations	10000	1e+05	1e+06
Combined p-value	3.3350e-06	2.0124e-06	3.6503e-06

Using simulations, the results support the hypothesis that delinquency levels are higher in middle and younger sons but lower in oldest and only sons.

Frequentest Tests

Proportion Test for Specific Birth Order

Difference in Proportion for Only : Most Delinquent - Least Delinquent

X.squared	p.value	alternative
3.352	0.034	less

Difference in Proportion for Only : Most Delinquent - Least Delinquent

X.squared	p.value	alternative
3.138	0.038	greater

Difference in Proportion for Only : Most Delinquent - Least Delinquent

X.squared	p.value	alternative
2.477	0.058	greater

Difference in Proportion for Only : Most Delinquent - Least Delinquent

X.squared	p.value	alternative
3.781	0.026	less

Chi-Sq test for Independence

```
##
##  Pearson's Chi-squared test
##
## data:  parameters
## X-squared = 17.282, df = 3, p-value = 0.0006185
```

Using traditional frequentest test, the results are the same: delinquency levels are higher in middle and younger sons but lower in oldest and only sons.

Conclusion

Using the data provided, there is strong evidence that younger sons are more likely to be a delinquent. So even though my brother is not is a delinquent, there is a higher probably that he will become one.