Data Source:

https://www.sheffield.ac.uk/mash/statistics/datasets.

Data Description: Birthweight

This dataset contains information on newborn babies and their parents. It contains mostly continuous variables (although some have only a few values e.g. number of cigarettes smoked per day) and is most useful for correlation and regression. The birthweights of the babies who mothers smoked have been adjusted slightly to exaggerate the differences between mothers who smoked and didn't smoke so students can see the difference more clearly in a scatterplot with gestational age and scatter colour coded by smoking status.

Research Question: Do smokers have lighter babies?

Independent T-Test

Group Statistics

	smoker	N	Mean	Std. Deviation	Std. Error Mean
Birthweight (kg)	Non-smoker	20	3.5095	.51849	.11594
	Smoker	22	3.1341	.63125	.13458

N is the sample size of newborn babies from non-smokers and smoker mothers which are 20 and 22 respectively. The mean is the average newborn Birthweight, 3.51 for non-smoker and 3.13, for smoker respectively. The standard deviation was .52 for non-smoker and .63, for smoker respectively.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Birthweight (kg)	Equal variances assumed	.305	.584	2.093	40	.043	.37541	.17933	.01298	.73784
	Equal variances not assumed			2.113	39.618	.041	.37541	.17764	.01629	.73453

The table above provided the F-value and the level of significance Levene's test of equality of variance, .584. The degree of freedom, df =40, was obtained by subtracting 1 from each sample sizes and summing both together. The mean difference on the test variable Birthweight, .375, was obtained by subtraction the mean of smokers from the mean of non-smokers. The positive value of the t value indicates that the mean amount of Birthweight for non-smoking mothers is significantly greater than the smoking mothers.

In this report, the variances are close, consequently, the standard t test, t(40) = 2.093, p = .043, and the t test value for unequal variances t(39.618) = 2.113, yield comparable results.

Independent Samples Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval Lower	95% Confidence Interval Upper
Birthweight (kg)	Cohen's d	.58043	.647	.021	1.265
	Hedges' correction	.59160	.635	.021	1.241
	Glass's delta	.63125	.595	-.043	1.220

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control group.

APA for Independent t test

An independent samples t test was conducted to evaluate if mother that smokes have lighter babies. The test was significant, t(40) = 2.093, p = .043. As hypothesized, the nonsmoking mothers [M=3.51, SD = .52] have newborn babies on average that weigh more than the newborn babies from mothers that smoke [M = 3.13, SD = .63]. The effect size of (d = .65) was intermediate and the 95% confident interval ranges from .021 to 1.265.

d	r^*	η^2	Interpretation sensu Cohen (1988)	Interpretation sensu Hattie (2009)
< 0	< 0	-	Adverse Effect	
0.0	.00	.000	No Effect	Developmental effects
0.1	.05	.003		
0.2	.10	.010	Small Effect	Teacher effects
0.3	.15	.022		
0.4	.2	.039		Zone of desired effects
0.5	.24	.060	Intermediate Effect	
0.6	.29	.083		
0.7	.33	.110		
0.8	.37	.140	Large Effect	
0.9	.41	.168		
≥ 1.0	.45	.200		

* Cohen (1988) reports the following intervals for r: .1 to .3: small effect; .3 to .5: intermediate effect; .5 and higher: strong effect

Figure 3: Effect Size Interpretation.

Mann-Whitney U test

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles 25th	Percentiles 50th (Median)	Percentiles 75th
Birthweight (kg)	42	3.3129	.60390	1.92	4.57	2.9150	3.2950	3.6800
smoker	42	.52	.505	0	1	.00	1.00	1.00

N is the total sample sizes of the dependent (newborn birthweight) and independent (smoking and non-smoking mothers) variables 42 respectively for both. The mean is the average of newborn Birthweight, 3.31 and of independent variable (smoking and non-smoking mothers) .52. The standard deviation was .604 for newborn birthweight and .505, for independent variables (smoking and non-smoking mothers) respectively. The minimum values were, 1.92 and 0 for dependent (newborn birthweight) and independent (smoking and non-smoking mothers) variables and the maximum values were, 4.57 and 1 for dependent (newborn birthweight) and independent (smoking and non-smoking mothers) variables respectively. The 25th, 50th and 75th percentiles of the dependent (newborn birthweight) and independent (smoking and non-smoking mothers) variables respectively were also provided on the table.

Ranks

	smoker	N	Mean Rank	Sum of Ranks
Birthweight (kg)	Non-smoker	20	25.25	505.00
	Smoker	22	18.09	398.00
	Total	42		

The table above provided N which is the sample size of newborn babies from non-smokers and smoker mothers which are 20 and 22 respectively. Their mean rank and sum of ranks were also provided.

Test Statistics[a]

	Birthweight (kg)
Mann-Whitney U	145.000
Wilcoxon W	398.000
Z	-1.889
Asymp. Sig. (2-tailed)	.059

a. Grouping Variable: smoker

The table above provided the Mann-Whitney U value, 145 and the p-value, .059 which are essential in finding the effect later.

APA for Mann-Whitney U test

A Mann Whitney U test was conducted to evaluate the hypothesis that mothers who smokes give birth to lighter babies compared to non-smoking mothers. The results of the test were nonsignificant ($p = 0.059$), $p>.05$. Even though, according to the mean rank, the smoking mother was ranked 18.09, which was less compared to 25.25 ranked for non-smoking mothers. The relationship between the two groups according to $\eta^2 = 0.085$ and $d_{cohen} = 0.609$ revealed a intermediate effect size. Therefore, it is evident that, the data was parametric and using non-parameter statistical analysis could result in a false interpretation in terms of statistical significances.