This example question and answer are provided in order to facilitate discussion of the requirements for Part 1 of the assessment for the module ‘Quantitative Methods for Quality and Safety in Healthcare’.

**This not a ‘model’ or perfect solution to this question**. Rather, it should be seen as an example of a possible approach to some of the questions in Part 1 of the assessment for the module Quantitative Methods for Quality and Safety in Healthcare.

**Question**

Through the use of appropriate statistical methods, tables and graphical output:

1. Describe and quantify the relationship between the incidence of bronchopulmonary dysplasia (*bpd*) and gestational age at birth (*gest*).

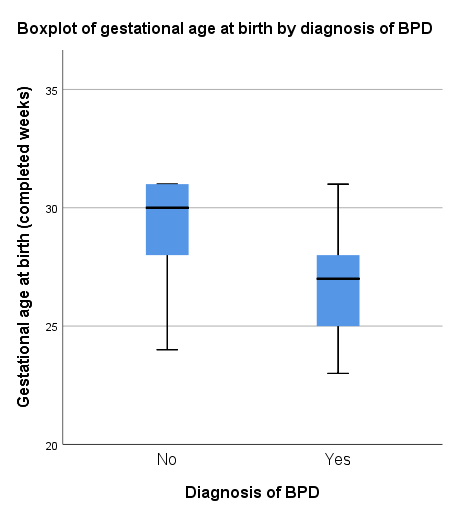
**Answer**

NOTE – Bar charts might probably has been just as useful – or perhaps a table.

The data were visually inspected using a boxplot (Figure 1). A boxplot was chosen as it allows the location (mean, median), spread, and symmetry of the observed data for each BPD group to be easily seen. (Williamson et al, 1989)

**It is helpful to summarise the data – if this hasn’t been done elsewhere in your report.**

**Figure 1**



**Provide some interpretation of your descriptive output. This might have been clearer as a table.**

**Any graph shown should have informative title and axes. Don’t just show the default output.**

The spread of gestational ages is similar between the two groups. However, on average, those babies subsequently diagnosed with BPD (n=63) tended to be born earlier that those who did not develop BPD (n=142): i.e. mean=26.6 weeks (sd=2.1 weeks) versus mean=29.4 weeks (sd=1.8 weeks).

The difference in gestational age between the two groups was tested using a two-sided independence samples t-test. (Driscoll & Flecky, 2001) The assumptions of the t-test test are:

**State any test you are going to use, together with the assumptions that the test requires.**

1. The two groups are random samples from the whole population.
2. The observations are independent from each other.
3. The data are measured on continuous scale.

NOTE – This is a matter of judgement and other people might have a different opinion. Back it up with a citation.

1. Samples from both groups come from populations that follow Normal distributions with equal variance.

These assumption seemed to be met for these data, except that the cut-off at 31 weeks likely leads to an asymmetrical distribution of the data in the ‘no BPD’ group. However, the t-test is robust to departures from this assumption. (Havlicek and Peterson, 1974)

**State any hypotheses you will test.**

The test hypotheses are:

* null hypothesis (H0) is that the mean difference in gestational age at birth is 0.
* alternative hypothesis (H1) is that the mean difference in gestational age at birth is not 0

From the t-test test, there was strong evidence that the mean gestation at birth for those with no diagnosis was 2.7 weeks (95% CI: 2.1 to 3.3 weeks) earlier that those with no diagnosis of BPD: p <0.001 (SPSS output shown in Appendix). In this population, babies diagnosed with BPD are born on average 2 to 3 weeks earlier that those who do not develop BPB.

**State your conclusion.**

**References**

Driscoll P and Flecky F. Article 6. An introduction to hypothesis testing. Parametric comparison of two groups – 1. Emergency Medicine Journal 2001;18:124-130.

Havlicek LL and Peterson NL. Robustness of the t test: a guide for researchers on effect of violations of assumptions. Psychological Reports 1974;34:1095-1114.

Williamson F, Parker RA and Kendrick JS. The box plot: a simple visual method to interpret data. Ann Intern Med 1989;110(11):916-21.

**Appendix**

**Selected SPSS output for independence sample t-test:**

**T-Test**

[DataSet1] X:\Health Sciences\Courses\PGT\MScQSH\Modules\2020-21 Academic Year\MD7461 Quant\Assessment\Assessment1\MD7461\_Assessment\_data.sav

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Group Statistics** | | | | | |
|  | bpd | N | Mean | Std. Deviation | Std. Error Mean |
| gest | N | 142 | 29.38 | 1.809 | .152 |
| Y | 63 | 26.65 | 2.057 | .259 |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Independent Samples Test** | | | | | | | | | | |
|  | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| Lower | Upper |
| gest | Equal variances assumed | 1.396 | .239 | 9.549 | 203 | .000 | 2.729 | .286 | 2.166 | 3.293 |
| Equal variances not assumed |  |  | 9.088 | 106.350 | .000 | 2.729 | .300 | 2.134 | 3.325 |