

Assessment Schedule – 2015**Mathematics and Statistics (Statistics): Evaluate statistically based reports (91584)****Evidence Statement**

One	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
(a)	<p>The explanatory variable is the colour of the car.</p> <p>The response variable is the involvement in a car crash (that results in serious injury).</p> <p><i>Accept “the number” or “the proportion” or “likelihood” or “risk” of car crashes that result in serious injury.</i></p>	<p>The explanatory variable is described.</p> <p>AND</p> <p>The response variable is partially described, e.g. car crash (resulting in serious injury).</p>		
(b)(i)	<p>This is an observational study, as the participants were not forced or told which colour car to drive.</p>	<p>Study is identified as being observational study with explanation.</p>	<p>Study is identified as being observational, (using a specific contextual example as part of the explanation).</p>	
(ii)	<p>Because it is an observational study, causal relationship claims should not be made, so you could not claim that the colour of car alone determines the risk of the car crashing.</p>	<p>Example given of what can't be claimed (implication).</p>	<p>AND</p> <p>Example given of what can't be claimed (implication).</p>	
(c)(i)	<p>Comparison made between crash colours and drive colours. (You could see a higher percentage of a car colour in the crash data just because it is a popular car colour to drive.)</p> <p>e.g. if 25% of cars are white you would expect to see 25% of crashes to involve white cars.</p> <p>A comparison between the two data sets to illustrate similarities and differences (Silver ▼, Yellow and Brown ▲)</p>	<p>Partial explanation given as to why a comparison (control) variable is made.</p>	<p>Full explanation given as to why a comparison (control) variable is needed.</p>	
(ii)	<p>You could use road locations as clusters, e.g. intersections, rural, urban and inner city roads.</p> <p>Random selections of road locations across Auckland would need to be the clusters so that the sample can be representative of all roads in Auckland.</p>		<p>A relevant example of clusters described.</p>	<p>A relevant example of clusters described.</p> <p>AND</p> <p>The need for random selection of clusters discussed in terms of representativeness.</p>

(d)	<p>The study was conducted on Auckland roads only. Auckland roads could be very different from roads in the rest of the country.</p> <p>Auckland is largely an urban area, with a lot of road lighting.</p> <p>As the colour of a car could be linked to visibility of that car, the findings may not be transferred to rural roads, where there is less road lighting.</p> <p>[N.B. Using the past as a source of data: Car safety features are different now (2015), traffic dynamics and NZ’s population base has grown in the 16 years since the study was undertaken.] → ‘c’</p> <p><i>Accept discussion of other relevant potential issues with extending the results based on a specific difference between Auckland and the rest of the country (roads, cars, drivers), but not based on confounding variables as these were taken into account in the analysis.</i></p>	<p>A potential difference between Auckland and the rest of the country in terms of the relationship investigated is described.</p>	<p>A potential difference between Auckland and the rest of the country in terms of the relationship investigated is described.</p> <p>AND</p> <p>Justify why it is a potential issue with extending the results.</p>	<p>A potential difference between Auckland and the rest of the country in terms of the relationship investigated is described.</p> <p>AND</p> <p>Justify why it is a potential issue with extending the results.</p> <p>AND</p> <p>How this difference could limit transferability of results in discussed.</p>
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NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Attempt at one part of the question.	1 of c	2 of c	3 of c	2 of j	3 of j	1 of i	2 of i

Two	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
(a)	<p>Margin of error = $\frac{1}{\sqrt{1000}} = 3.2\%$</p> <p>CI = 59% ± 3.2% or (55.8%, 62.2%)</p> <p>I'm pretty sure that the percentage of all NZ drivers who rate changing the radio / iPod / MP3 player while driving as distracting, is somewhere between 55.8% and 62.2%</p> <p>There is evidence to support a claim that the majority of NZ drivers are distracted by changing the radio / iPod / MP3 player while driving.</p> <p><i>Accept other correctly calculated confidence intervals e.g. using norm-based formulae or graphics calculator.</i></p> <p>Also accept: $1.96 \times \sqrt{\frac{0.59 \times 0.41}{1000}} = 0.0305$</p> <p>or $2 \times \sqrt{\frac{0.59 \times 0.41}{1000}} = 0.0311$</p> <p><i>Accept other expressions of some uncertainty with the confidence interval provided such as "It's a fairly safe bet..." or "With 95% confidence..."</i></p>	<p>Confidence interval correctly calculated.</p>	<p>Confidence interval correctly calculated.</p> <p>AND</p> <p>EITHER</p> <p>Used to write inference statement in context (with target population).</p> <p>OR</p> <p>Used to make a majority claim in context.</p>	
(b)	<p>Texting while driving is an illegal activity. Which means that respondents may not be truthful about whether they have texted or not while driving.</p> <p>Resulting in a lower survey percentage result. (20% is an under estimate).</p> <p><i>Accept other valid potential issues e.g. they are customers of an insurance company and might not want to admit they text while driving, as this could affect any claims they might make.</i></p>	<p>Potential issue identified.</p>	<p>Potential issue identified.</p> <p>AND</p> <p>Why this could be an issue described in context.</p>	

<p>(c)</p>	<p>Margin of error for 18 – 24 group $= \frac{1}{\sqrt{234}} = 6.5\% (= 0.0654)$ Margin of error for 25 – 34 group $= \frac{1}{\sqrt{288}} = 5.9\% (= 0.0589)$ Average margin of error = 6.2% Comparing two subgroups, so margin of error for comparison = $1.5 \times 6.2\% = 9.3\%$. The difference between the two survey percentages is $40\% - 33\% = 7\%$. The 95% confidence interval for the difference between the two percentages is: (-2.3%, 16.3%). Examples: I'm pretty sure that the percentage of NZ drivers aged 18 – 24 who will admit to talking on a mobile phone while driving (without a hands-free kit) is somewhere between 2.3% lower and 16.3% higher than the corresponding percentage of NZ drivers aged 25 – 34. This 95% Confidence Interval would not support a claim that a higher percentage of NZ drivers aged 18 – 24 will admit to talking on a mobile phone while driving (without a hands-free kit) because the confidence interval is not entirely positive. <i>Note: Accept other correctly calculated confidence intervals e.g. using norm-based formulae or graphics calculator.</i> $1.96 \sqrt{\frac{p_1q_1}{n_1} + \frac{p_2q_2}{n_2}}$ to calculate the margin of error for the confidence interval. [1.96×m.o.e. = 8.27% or 2×m.o.e. = 8.43%]</p>	<p>Margin of error for comparison is 9.3%.</p>	<p>The confidence interval for the difference between the two percentages is constructed. OR 9.3% > 7% so claim cannot be made. OR 2 CI's constructed, compared and interpreted correctly. e.g. $40\% \pm 4.4\%$ and $33\% \pm 4.9\%$, overlapping CI's CI#1 = (28.1%, 37.9%) CI#2 = (35.6%, 44.4%)</p>	<p>The confidence interval for the difference between the two percentages is constructed AND Is interpreted as part of the explanation as to whether the claim can be supported or not.</p>
<p>(d)</p>	<p>The report does not present any survey percentages for the rating of distractions specifically for younger drivers, only for all drivers. The evidence presented is concerning the percentage of young drivers that sent texts while driving (nearly 50%). This is not the same as being distracted while driving. [Need something to illustrate insufficient or inadequate.] Note: Both required → i</p>		<p>Response explains what evidence has not been provided. OR Response explains that the evidence presented is insufficient or inadequate.</p>	<p>Response explains what evidence has not been provided. AND Response explains that the evidence presented is insufficient or inadequate.</p>
<p>(e)</p>	<p>Selection bias (or non-representative sampling) could be an issue if only customers from AA Insurance were used as the sampling frame (or the sample was taken only from AA Insurance customers). This is an issue, as this means only drivers with car insurance (with AA) can be selected for the sample. Drivers who have car insurance (with AA) may drive differently than drivers without car insurance (or drivers with insurance with other companies).</p>	<p>Issue is identified e.g. selection bias or non-representative sampling.</p>	<p>Issue is identified. AND Is described in context.</p>	

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Three	Expected Coverage	Achievement (c)	Merit (j)	Excellence (i)
(a)	<p>This was done in an attempt to make the sample representative of all New Zealand adults, so the findings could be applied or generalised to all New Zealand adults.</p> <p>For example, gender could be used to weight the data, if there were a higher proportion of female respondents in the sample than the proportion of female adults in New Zealand.</p> <p><i>Accept other examples of how the census data could be used to weight the sample so it is representative of all NZ adults.</i></p>	<p>The need to have a representative sample identified.</p>	<p>The need to have a representative sample identified.</p> <p>AND</p> <p>One example of how the data may have been adjusted.</p>	
(b)(i)	<p>The vertical lines represent the margin of errors, and the margin of errors for survey percentages lower than 30% will be smaller than the rule of thumb $\frac{1}{\sqrt{n}}$ (or smaller than the MOE for 53%) for the same sized samples).</p> <p>The number of respondents in the “never smokers” and “ex-smokers” may have been a higher number than in the “current smokers” group, which will have contributed to the MOE being smaller.</p>	<p>Size of survey percentage identified as reason for shorter error bars.</p> <p>OR</p> <p>Sample size identified as a reason for the shorter error bars.</p>	<p>Size of survey percentage explained as reason for shorter error bars.</p> <p>AND</p> <p>Sample size explained as a reason for the shorter error bars.</p>	
(ii)	<p>The MOE for the supplied confidence interval is 9% or 0.09.</p> $\frac{1}{\sqrt{n}} = 0.09$ <p>$n = 123$ or 124</p> <p>Estimate that 123 or 124 of the people in the sample were current smokers.</p> <p>[Also accept:</p> $\text{MoE} = 0.09 = 1.96 \times \sqrt{\frac{0.53 \times 0.47}{n}}$ <p>$n = 118$ or 119]</p>	<p>Margin of error is determined from the confidence interval.</p>	<p>Correct estimate for number of current smokers stated.</p>	
(c)	<p>A potential confounding variable could be income.</p> <p>People who have a lot of money could afford to buy both cigarettes and a lot of alcohol. Which could explain why being a smoker and drinking a lot of alcohol have a relationship – the more money you have, the more cigarettes and alcohol you can buy.</p> <p>[N.B. Not accepting recall as a potential confounding variable.].</p> <p><i>Accept other relevant potential confounding variables e.g. social setting, (Christmas, New year).</i></p>		<p>A relevant potential confounding variable is identified, with a clear reason given as to why this variable may be confounding.</p>	<p>A relevant potential confounding variable is identified, with a clear reason given as to why this variable may be confounding.</p> <p>AND</p> <p>How it would interact with the two variables (smoker, risky alcohol behaviour).</p>

(d)	<p>As people may not be completely honest with their responses concerning risky behaviours with alcohol consumption.</p> <p>The survey was conducted face-to-face, so people had to answer the questions with the interviewer present. This could cause interviewer bias.</p> <p>Producing an over or under estimate for the true proportion of behaviours linked to alcohol consumption of smoking behaviours to reflect what the interviewer would want to hear.</p> <p><i>Accept other relevant potential behavioural considerations.</i></p>	<p>A relevant behavioural consideration is identified.</p>	<p>A relevant behavioural consideration is identified</p> <p>AND</p> <p>A clear reason given as to why this could be a non-sampling error.</p>	<p>A relevant potential behavioural consideration is identified with a clear reason given as to why this could be a non-sampling error.</p> <p>AND</p> <p>How it could cause bias.</p>
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Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 12	13 – 18	19 – 24