Introduction & Methodology:

The topic that I have decided to cover is whether the CBD of Cambridge has a traffic problem. My aim is to prove that Cambridge does have a traffic problem and that there is not enough public transport. The reason that I have chosen to analyse the traffic of Cambridge is that I have thought for a long time that there is too much traffic in Cambridge and that there is not enough public transport. I have chosen two different places to collect my data from, which are on separate sides of the CBD and so they have their own individual traffic flows and are unconnected. This is useful as I might collect data for the same vehicle twice if I did the survey of the two places closer together. They are also suitable because they are two of the main routes which traffic is most likely to travel into and out of the CBD. The two places are Trumpington road and the A10 from Milton. I will count the number of vehicles that go into the CBD and also the number of vehicles that are going out of the CBD. I will also record the type of vehicle so that I can find out the most frequent mode of transport. I will do this for three different times of the day, 8:00am, 1:00pm and 6:30pm. The reason I've chosen these times is that during these times people go to work, go home for lunch or come home from work.
(hand drawn map here)

My Hypotheses to be investigated:

- 1. The bus service will be at its busiest in the mornings
- 2. The public think that there's a poor public transport service in and around Cambridge.
- 3. The majority of lorries going in and out of the CBD will be in the morning
- 4. The average amount of time of some ones journey coming into the CBD of Cambridge is about 20 minutes, by car.
- 5. Most people in Cambridge don't feel that their bikes are safe even when locked up
- 6. People that leave earlier the morning have a longer journey time to enter Cambridge.

1. The reason that I think that the bus service is likely to be busiest in the morning is that the bus's usually go out to the smaller villages early in the morning and then come back into the CBD to drop off their passengers.

2. I think that the public will think that the public transport is poor because I also think that the service is poor, and I am a member of the public. I think it will also be interesting to see the publics personal opinion on public transport to see how it compares to mine.

3. The majority of lorries will be in the morning as this is when most lorries make their deliveries to shops and supermarkets because they want to get rid of their stock in the lorry, especially the frozen food.

4. My estimate is that most people's journeys into the CBD take 20 minutes as the majority of the commuters live in or near the city.

5. The reason I have included this hypothesis is that two of my friends have had their bikes stolen in Cambridge and when I cycle to Cambridge I don't feel that my bike is very safe either. I also want to see other people's opinions on bike safety in the city and if they have ever had their bike stolen.

6. I think that his will be the case as people that leave earlier in the morning tend to live further away from the city so that they can get to work at the normal time. And the people that live close to or in Cambridge are able to leave much later as their journey times are going to be shorter.

To ensure that I didn't waste any time when collecting my data I constructed a table before hand which I could fill in when I was at my destination. It looked very similar to this, however I used one A4 page for each separate time so that I ended up with 6 separate sheets, 3 for each place. This ensured that I had enough space to count all the separate modes of transport. I used a tally to count each vehicle which was quick and easy. Here is a picture of me doing the survey in Trumpington:

8:00am Trumpington Road

Cars	Buses	Bikes	Pedestrians	Lorries

Leaving the CBD:

Cars	Buses	Bikes	Pedestrians	Lorries

6:30pm A10 From Milton

Cars	Buses	Bikes	Pedestrians	Lorries

Leaving the CBD:

Cars	Buses	Bikes	Pedestrians	Lorries

To find out peoples opinions on the public transport as well as the average journey length I constructed a questionnaire. I tried not to ask any questions, which may be too personal, and also to keep the number of questions too as small as possible so that I could let people get on their way. My sample size was 30 people so that I could have a reasonable range of data which to work with. Here is a copy of the questionnaire that I used.

Questionnaire:

Male ☐ Female ☐

By what means of transport did you get into Cambridge today?

What time did you leave your place of residence this morning?

What time did you arrive in Cambridge?

What is your personal opinion on the public transport of Cambridge?

If you were to cycle to Cambridge, would you feel that your bike was safe if you chained it to a railing somewhere?

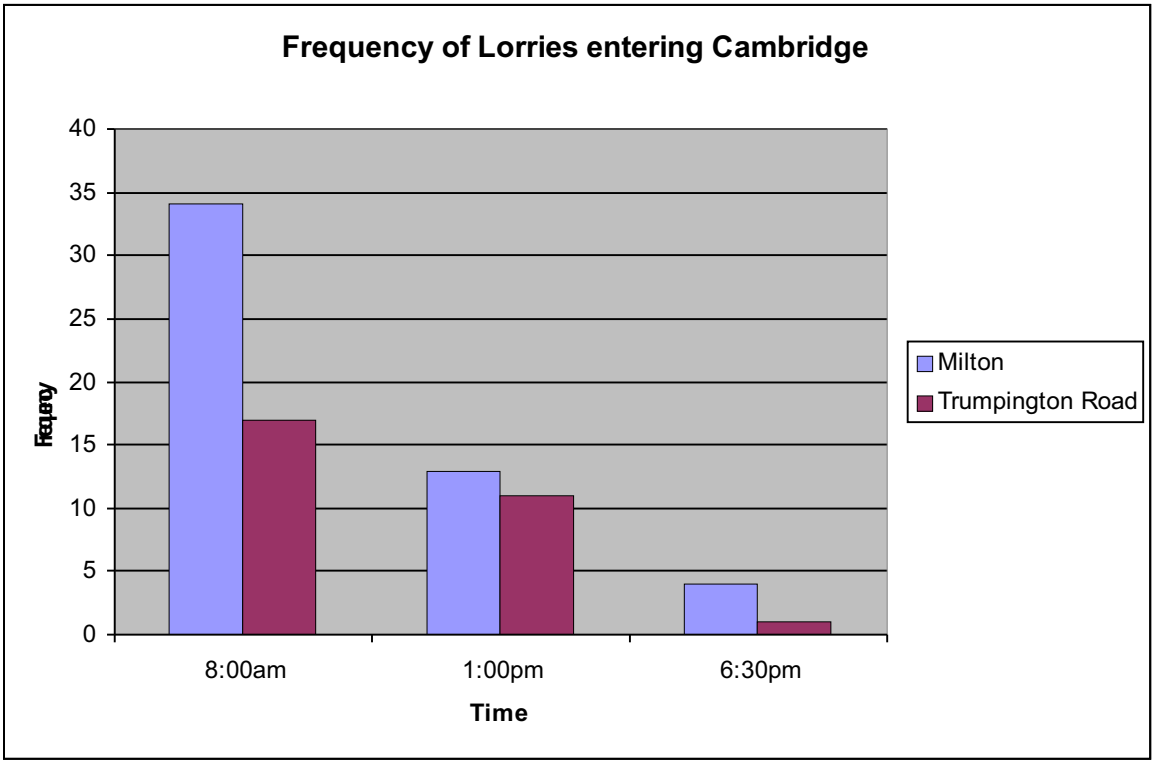
Data Presentation:

Here is the traffic data that I collected at Trumpington road and the A4 from Milton.

8:00am Trumpington Road	**Entering**	**Leaving**
Cars	598	371
Buses	10	10
Bikes	133	61
Pedestrians	15	7
Lorries	17	16
1.00pm Trumpington Road		
Cars	576	515
Buses	19	6
Bikes	43	49
Pedestrians	10	6
Lorries	11	13
6:30pm Trumpington Road		
Cars	443	742
Buses	14	18
Bikes	65	184
Pedestrians	2	20
Lorries	1	7

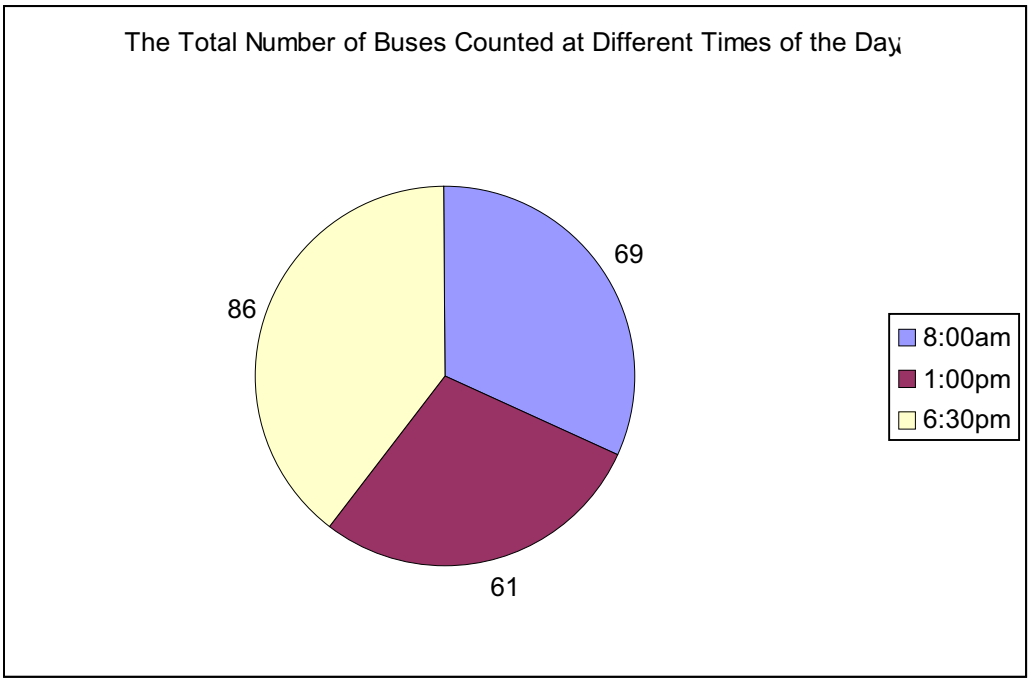
8:00am A10 from Milton	**Entering**	**Leaving**
Cars	489	504
Buses	22	27
Bikes	51	66
Pedestrians	25	18
Lorries	34	29
1.00pm A10 from Milton		
Cars	456	619
Buses	25	11
Bikes	26	35
Pedestrians	11	16
Lorries	13	27
6:30pm A10 from Milton		
Cars	392	641
Buses	20	34
Bikes	37	122
Pedestrians	8	24
Lorries	4	17

Hypothesis 3



This graph is a graphical illustration to show that the majority of lorries enter Cambridge in the morning. This proves my hypothesis to be correct as I thought that this would be the case, as most lorries would be making their deliveries to shops first thing in the morning. The lorries predominately go into Cambridge at Milton, I think that this is due to the fact that they probably come down the A14 and then come up the slip road and into Cambridge. This is indicated in this map that I've drawn:

Hypothesis 1



This pie graph shows the number of buses at different times of the day. I took the sum of the number of buses that enter Cambridge in Trumpington and also the number of buses that leave Cambridge. I then did the same with the buses in Milton and added to two totals together. So that I was left with the overall total number of buses that were counted over the 6 hour period.

I predicted in my hypothesis that the majority of the buses would be found in the mornings as I thought that they would be travelling out to the smaller villages and then come back into Cambridge with their passengers between 8 and 9. However I did my traffic count during the holidays and so some of the buses would not be on their usual school run and so the results maybe slightly skewed. I think that the reason most of the buses go in and out of Cambridge in the evening is that between 6:30 and 7:30 the traffic is very concentrated and the people who have gone to work in the morning need to get back home again. Another factor is that in the early morning most people only catch a bus if they need to go to work, but in the evening there are people who want to go out for a meal or do something in the town. The bus service then needs to meet the demand of the people who want to go out and so more buses are put on the roads in the evening.

Hypothesis 4

Using my questionnaire I was able to work out the length of time that people take to commute to Cambridge. Here are the results in descending order, in minutes.

120, 75, 65, 60, 60, 55, 55, 50, 45, 45, 45, 40, 40, 40, 35, 30, 30, 30, 30, 30, 30, 30, 25, 20, 20, 20, 1 5, 15, 10, 5, 5,

Max: 120
Median: 30
Min: 5
Range: 115
Mean: 39

This means that the average journey time is 38 minutes. This is much longer than I anticipated as I thought that most of the people that enter Cambridge would live very close or actually in it. However it seems that some of the commuters travel for over an hour every morning to get to work. When collecting this data I encountered various anomalies, as some of the people that I surveyed were students in Cambridge and so they didn't go home. Also I found that quite a few people took the train and cycled and so I marked a cross on these questionnaires so that I didn't include them in my results as my hypothesis states cars only. The 31 results above are from the people that drove their car to the city from wherever they live.

One of the reasons that most people take such a long time to get into Cambridge is probably because of all the speed limiting factors that the council have introduced such as putting bollards up in Bridge Street (see picture). As well as the four sets of traffic lights in Newnham, which is supposed, to make the area more pedestrianised and give cyclists complete freedom of movement through the junction.

Hypothesis 6

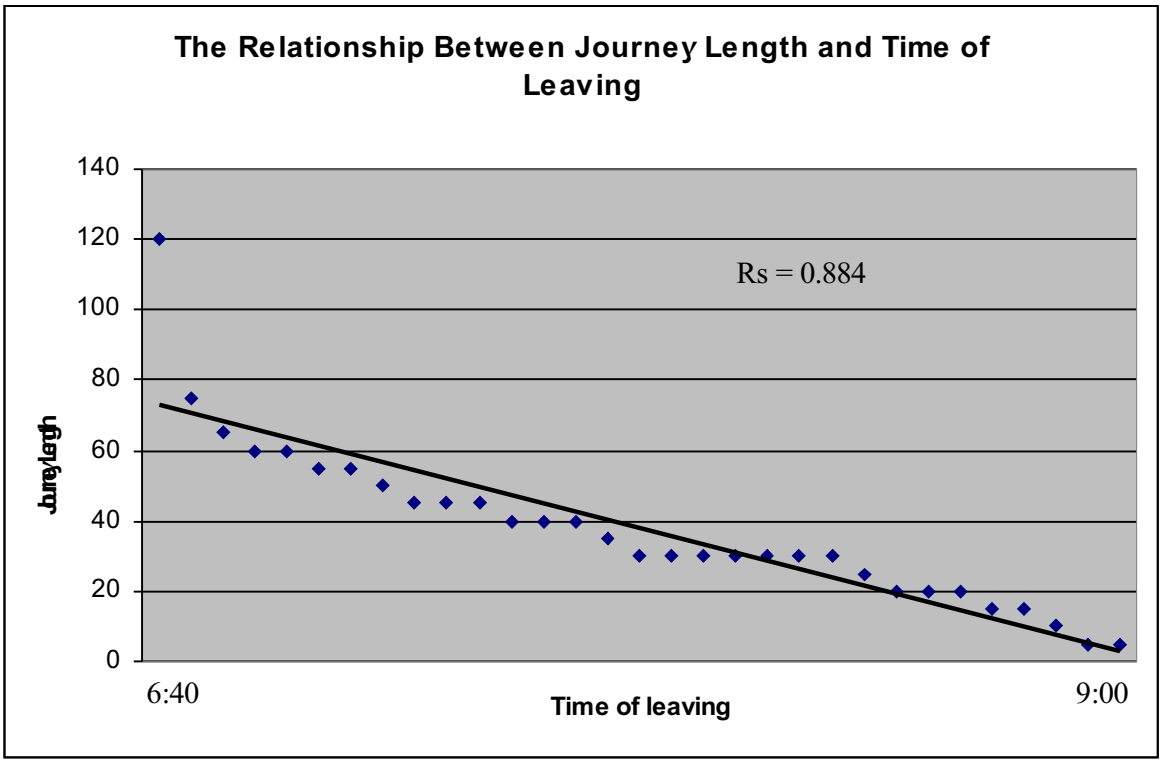
From my questionairre I used the time that the person left home and compared it to their journey length. In order to check whether there is a correlation between the two sets of data I used spearmans rank.

Time that they left	Length of Journey	Rank Time	Rank Length	Difference (d)	Difference² (d^2)
6:40	120	1	1	0	0
6:45	75	2	2	0	0
7:00	65	4	3	1	1
7:00	60	4	4.5	0.5	0.25
7:10	60	6.5	4.5	2	4
7:00	55	4	6.5	2.5	6.25
7:15	55	8.5	6.5	2	4
7:15	50	8.5	8	0.5	0.25
7:35	45	11	10	1	1
7:30	45	10	10	0	0
7:10	45	6.5	10	3.5	12.25
7:45	40	12.5	13	0.5	0.25
7:55	40	14.5	13	1.5	2.25
8:10	40	23.5	13	10.5	110.25
8:00	35	17	15	2	4
9:00	30	29.5	19	10.5	110.25
8:00	30	17	19	2	4
8:05	30	20	19	1	1
8:10	30	23.5	19	4.5	20.25
8:05	30	20	19	1	1
7:55	30	14.5	19	4.5	20.25
8:00	30	17	19	2	4
8:10	25	23.5	23	0.5	0.25
8:15	20	26	25	1	1
8:10	20	23.5	25	1.5	2.25
8:05	20	20	25	5	25
8:30	15	27.5	27.5	0	0
7:45	15	12.5	27.5	15	225
9:15	10	31	29	2	4
8:30	5	27.5	30.5	3	9
9:00	5	29.5	30.5	1	1
				$\sum d^2$	574

$$r_s = 1 - \frac{n^3 - n}{6\sum d_r} = 1 - \frac{31^3 - 31}{6 \times 2244} = 1 - \frac{30240}{34344} = 1 - 1.884 = \underline{\underline{0.884}}$$

Now that I have the computed value we can compare it to the critical value. For a sample of 31, these values are 0.30 for 95% significance and 0.40 for 99% significance. From these results it is clear that there is a very strong relationship. It is over double the critical value at 99%, which is almost a perfect positive correlation. It means that there is less than a 1% probability that it is chance.

I can accept that my hypothesis is correct as spearmans rank proves that there is definitely a relationship between the time someone leaves in the morning and the length of their journey.



Hypothesis 2

Looking back on my questionnaire I now realise that I should've probably done a scale so that a number from 1-10 could have been chosen rather than just a verbal response. This would have made is much easier to statistically analyse because now I only have what they said. Here are the replies that I got from the public on their opinions.

"Not enough buses to the villages"
"Quite Good"
"Very Bad"
"Good most of the time"
"Totally Crap"
"Needs a improvement"
"Awful train service"
"The buses are always too crowded"
"Dirty Buses and trains"
"Sometimes doesn't turn up!"
"Abysmal"
"Reasonable"
"Trains are good, buses are bad"
"Timetables are inefficient and inaccurate"
"Not too bad"
"Taxi drivers charge too much"
"Appalling"
"So So"
"Persistently Late"
"Very Good"
"Train services are unreliable"

From these 21 responses that I got,

5 are positive

4 are neutral

12 are negative

This proves my hypothesis that the public think the public transport of Cambridge is poor. I strongly agree with some of these responses such as "Taxi drivers charge too much" and "Not enough buses to the villages". I live in a small village called Haslingfield with about 2,800 people and only 6 buses come in the day. Starting at 8am every 2 hours and the last bus leaves at 4pm.

Hypothesis 5

From my questionnaire I received many different varied responses, I have ignored the long winded answers and have 23 yes/no answers.

14 people said that they feel their bikes would be safe and 9 felt that they wouldn't. I was quite surprised at these results as I didn't think that they would be so trusting.

Conclusion & Evaluation