

Weather and Cycling in Dublin : Perceptions and Reality

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Abstract

It is generally accepted that weather conditions and especially rainfall have an impact on cycling patterns in Dublin. For individuals who regularly cycle to work poor weather conditions can be a factor in the decision not to cycle on a particular day. For non cyclists and especially car commuters poor weather is frequently cited as a major reason for not cycling. The first objective of this paper is to explore the impact of weather on cycling patterns in Dublin using the results of a survey of both car commuters and cyclists and to examine the perceptions of both groups regarding the incidence of rainfall and the probability of getting wet. The paper then estimates the actual probability of cyclists who cycle to and from work in Dublin every day getting wet using historic rainfall data. It is hoped that this project will assist in the promotion of cycling in Dublin by quantifying the importance of poor weather/rainfall in the decision to cycle/not to cycle and then by highlighting the need to address the inaccurate perception of cyclists and non cyclists alike regarding the probability of getting wet.

'Everybody talks about the weather, but nobody does anything about it'

Mark Twain

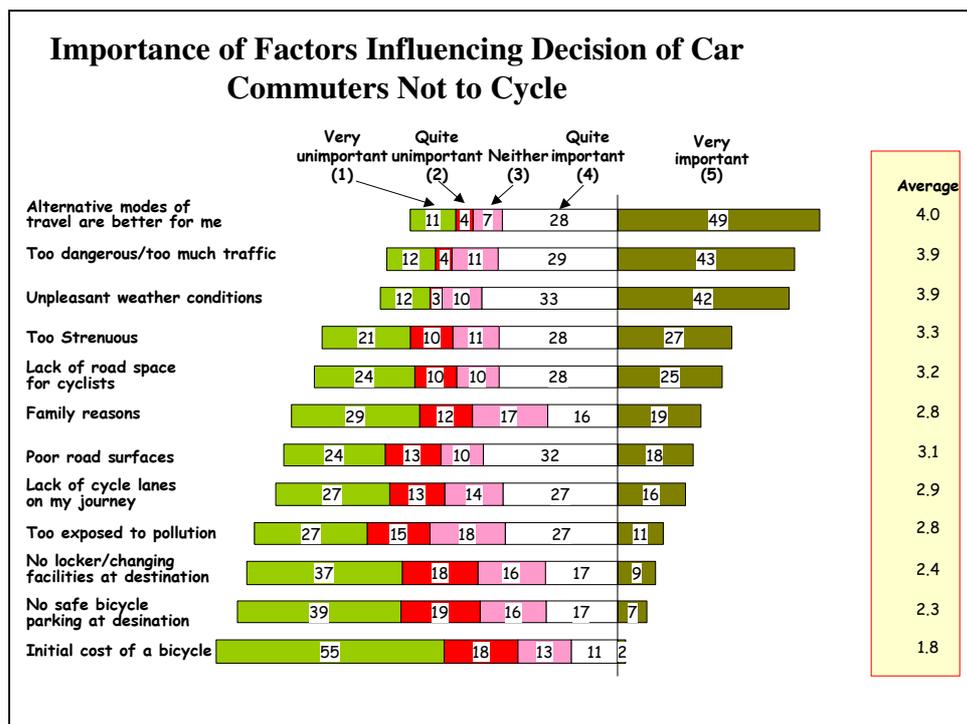
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1. The Impact of Weather on Cycling in Dublin : Analysis of Survey Results

A home interview survey was commissioned by Dublin City Council and carried out by Lansdowne Market Research in November 2004. 300 car commuters, resident in Dublin city and county, who live up to 8 miles from their place of work, were asked the following question:

How important is each of the following factors in influencing your decision not to cycle to work/college?

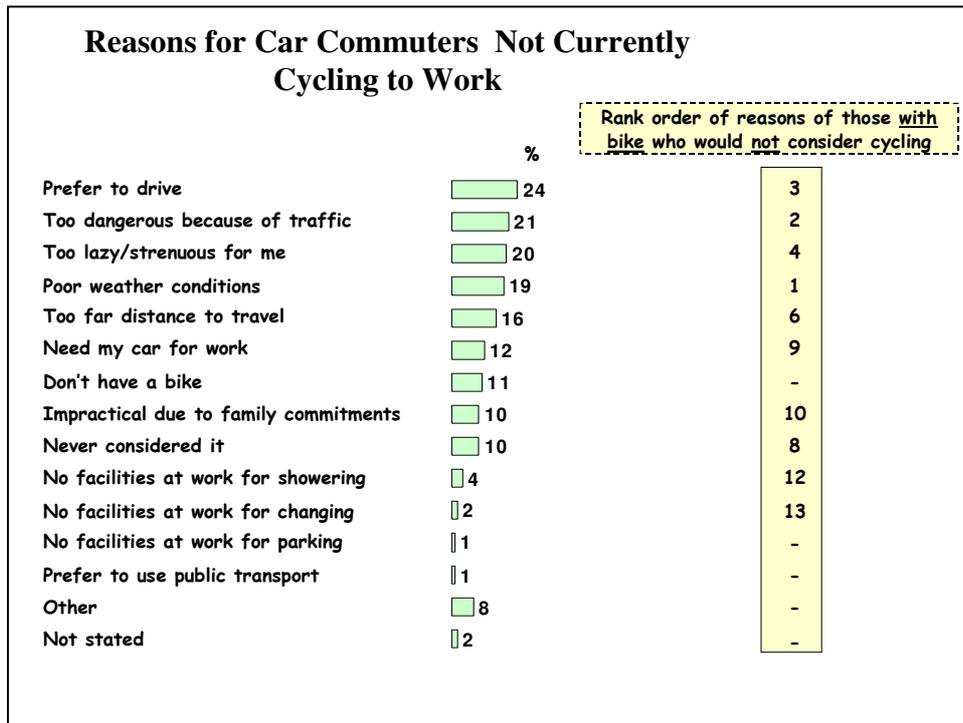
They were given 12 different factors and asked to assess whether each factor was 'very important', 'quite important', 'neither important nor unimportant', 'quite unimportant' or 'very unimportant'. Their responses are summarised in the chart below:



'Unpleasant Weather Conditions' was the third most significant factor given by car commuters as influencing their decision not to cycle. It ranked just behind 'Alternative modes of travel are better for me' and 'Too dangerous/too much traffic'. Car commuters were also asked the following question:

Why do you currently not cycle to work?

The unprompted responses are set out in the chart below:



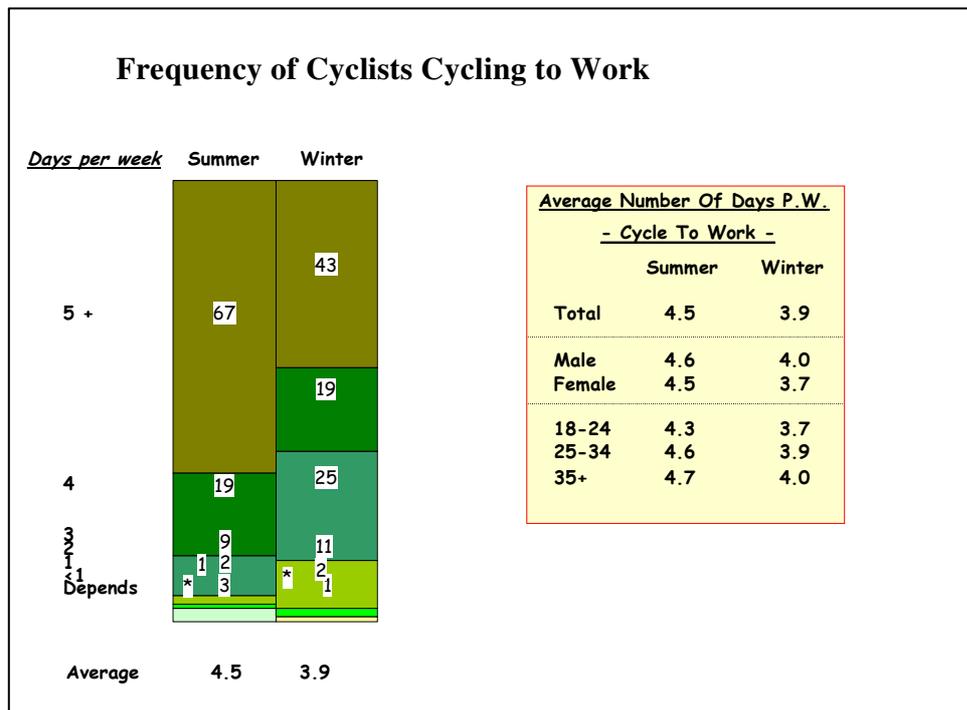
It is interesting that ‘*Poor weather conditions*’ was the fourth most frequently quoted reason given by car commuters for not cycling to work after ‘*Prefer to drive*’, ‘*Too dangerous because of traffic*’ and ‘*Too lazy/strenuous for me*’.

The survey showed that 23% of car commuters have a bicycle available to them for daily use and 21% would consider cycling to work. When the reasons for currently not cycling to work given by car commuters with a bicycle who would not consider cycling to work were analysed the most frequently quoted reason was ‘*Poor weather conditions*’.

Lansdowne Market Research also conducted home interviews of 300 cyclists who had cycled to work on the day of the interview. These cyclists were asked the following questions:

How often do you cycle on average to work during the Summer (i.e. May to October)?

How often do you cycle on average to work during the Winter (i.e. November to April)?



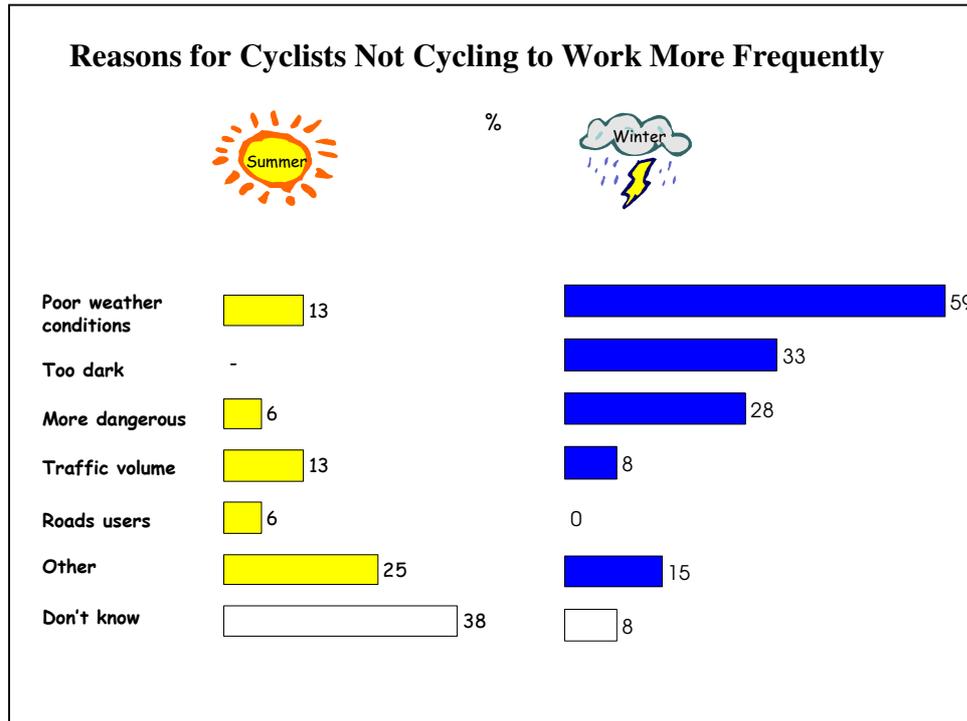
The results, which are set out in the chart above, show that 86% of the cyclists surveyed cycle to work on 4 or more days per week on average during the Summer. The corresponding percentage during the Winter is 62%. Cyclists cycle to work on average 4.5 days a week during the Summer and 3.9 days a week during the Winter. There appears to be little or no difference in the Summer/Winter cycling behaviour of cyclists across gender and age groups.

Cyclists who cycled on average 2 or less days per week (i.e. occasional cyclists) during either the Summer or the Winter were asked the following questions:

What prevents you from cycling more frequently during the Summer?

What prevents you from cycling more frequently in Winter?

The responses are shown in the chart on the next page. While 'Poor weather conditions' were only cited as a factor by 13% of occasional cyclists for not cycling more frequently in the Summer it was cited by 59% of occasional cyclists for not cycling more frequently in the Winter.



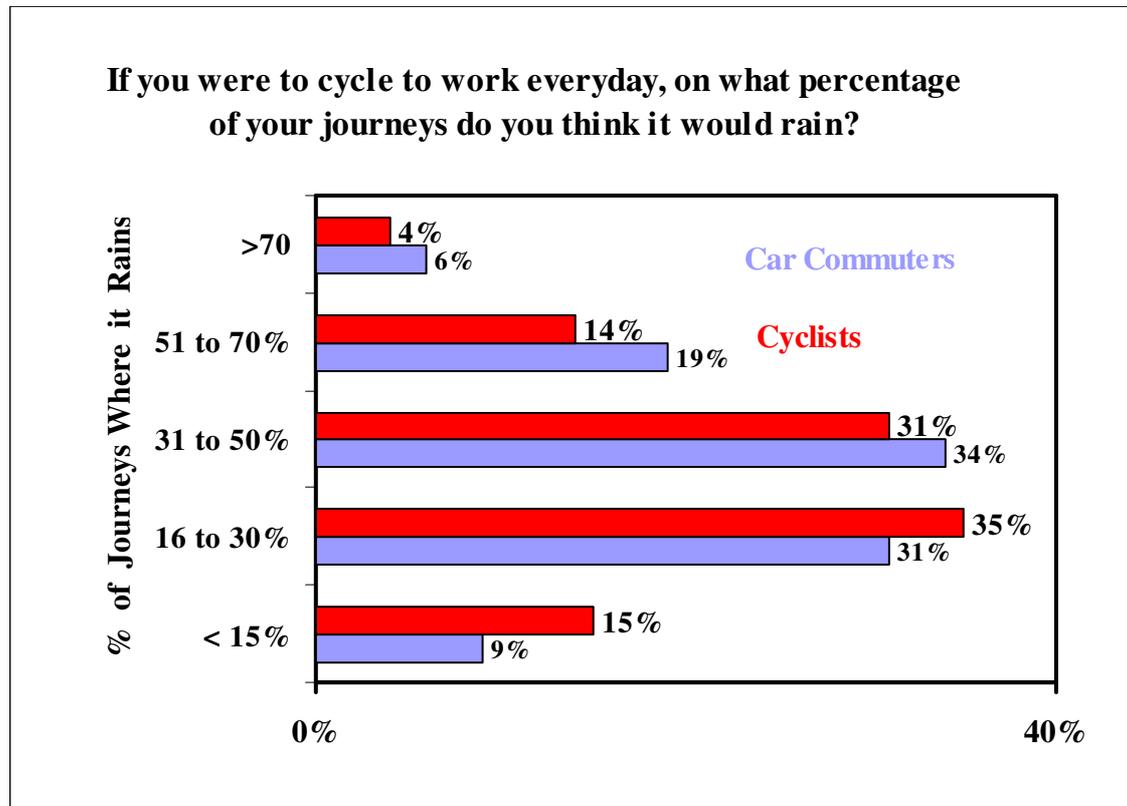
The interviews with cyclists were carried out between 8 and 22 November 2004, which is at the beginning of the Winter period. Cyclists were recruited for the survey on the basis of having cycled to work on the day of the interview. Given the timing of the survey and the basis on which survey participants were recruited it is probable that the sample of cyclists is over representative of cyclists who cycle during the Winter and who cycle more frequently compared with the general population of cyclists. This should be borne in mind when the results of the cyclists survey are being considered.

It is apparent that the perception of poor/unpleasant weather conditions is an important factor in influencing the decision of car commuters who live within cycling distance of work (i.e. up to 8 miles) not to cycle. There is also a significant difference in the Winter/Summer cycling frequency of cyclists. While 'Poor weather conditions' were only cited as a factor by 13% of occasional cyclists (i.e. those who cycle less than 2 days per week on average) for not cycling more frequently in the Summer it was cited by 59% of occasional cyclists for not cycling more frequently in the Winter.

Both survey groups (i.e. car commuters and cyclists) were asked the following question in the survey:

'If you were to cycle to work everyday, on what percentage of your journeys do you think it would rain?'

The responses by the two groups to this question are summarised in the chart below:



The survey results reveal a rather pessimistic assessment by both cyclists and car commuters of the probability of rainfall with only 15% of cyclists and 9% of car commuters indicating that it would rain on less than 15% of journeys.

2 Data and Methodology

Data from the Census 2002 indicates that 8.15am is the modal time for leaving home for cyclists in Dublin city & county cycling to work and that the average journey time is 22 minutes. In this Section using detailed minute by minute rainfall data for the two year period 1 April 2003 to 31 March 2005 we estimate the actual probability of a cyclist who undertakes a cycling journey of 22 minutes every working day (departing at 08.15hrs in the morning and returning at 17.00hrs) in the evening getting wet.

Since March 2003, Met Eireann has been collecting data, minute by minute, on rainfall at a new automatic weather station in the Phoenix Park. While the data has not been subject to formal quality control by the Met Eireann it is considered that data

from this station is reasonably representative of rainfall in the Dublin city area. Just two years data are now available from this station. (It is acknowledged that in the world of meteorology two years data would be considered much too short to calculate climatological norms - the standard minimum period is 30 years.)

The Met Eireann rainfall data is derived from tipping bucket recorders. These devices emit an electronic pulse each time the bucket tips. Minutes with less than the detection threshold of rainfall (i.e. 0.1mm) are not recorded as such but any rainfall is retained in the bucket and is augmented by rainfall in the following period or periods.

It is worth noting that 0.1mm is a very small quantity of rain. However, if rainfall at this level is sustained over a period of time it can be considered moderate or even heavy. Meteorological observers generally classify rainfall as follows:

| Classification of Rainfall | Instantaneous Intensity | |
|-----------------------------------|--------------------------------|------------------|
| | mm/hour | mm/minute |
| Light | >2 | <0.033 |
| Moderate | >2 & <6 | >0.033 & < 0.1 |
| Heavy | >6 | >0.1 |

Typically to the average person drizzle or very light rain falling during a period of say 30 minutes would need to amount at least 0.2mm to appear to be falling at all. Something in the order of 1mm or more in an hour would be considered disruptive to farming activities.

A simple algorithm to calculate the probability of getting wet on a particular journey was derived as follows:

| | |
|----------|---|
| t | journey start time |
| s | journey duration in minutes |
| R(i) | rainfall in minute i |
| CR(t, s) | cumulative rainfall between time t and time t +s $CR(t, s) = \sum R(i)$ where i ranges from t to t +s -1 |
| K | cumulative rainfall over a period that corresponds to getting wet |
| IW | Incidence of getting wet |

The incidence of getting wet (1 = wet, 0 = not wet) for a journey starting at time t and a journey length of s minutes is given by

$$IW = \begin{cases} 1 & \text{if } CR(t, s) \geq K \\ 0 & \text{otherwise} \end{cases}$$

For the purpose of this study we have used the following cumulative rainfall thresholds:

$$\begin{aligned} CR(t, s) &> 0.2\text{mm}, \\ CR(t, s) &> 0.6\text{mm} \text{ and} \\ CR(t, s) &> 1.0\text{mm}. \end{aligned}$$

4 The Actual Probability of Getting Wet in Dublin

Using the minute by minute rainfall data for the two year period 1 April 2003 to 31 March 2005 the following questions have been answered:

If a cyclist departed for work at 08.15hrs and for home at 17.00hrs every working day between 1 April 2003 and 31 March 2005 on what proportion of days would he/she have encountered more than 0.2mm of rain, more than 0.6mm of rain and more than 1.0mm of rain assuming a 22 minute journey time (a) on the morning journey into work and (b) on the evening journey home?

The answers are set out in Table 2.

Rainfall of 0.5mm per hour would typically be viewed as drizzle/very light rain. Using this low rainfall threshold (i.e. cumulative rainfall of 0.2mm on the 22 minute journey) the cyclist would have got wet on only 5% of trips in the morning and on 4% of trips in the evening. When higher rainfall thresholds are applied the proportion of trips where the cyclist gets wet declines very dramatically. With a threshold of 1mm over the 22 minute journey, which would be classified as moderate rainfall, the cyclist gets wet on average on only 0.6% of trips in the morning and on 0.4% in the evening.

| Table 2 : Probability of Getting Wet | | | |
|---|--|----------------|----------------|
| Journey Duration | 22 minutes | | |
| Morning Departure Time | 08:15hrs | | |
| Evening Departure Time | 17:00hrs | | |
| Time Period | 1 April 2003 to 31 March 2005 | | |
| | Proportion of Trips Where Cyclist Got Wet | | |
| Cumulative Rainfall Threshold | 0.200mm | 0.600mm | 1.000mm |
| Equivalent Hourly Rainfall | 0.545mm | 1.636mm | 2.727mm |
| Morning Trip | 4.8% | 1.5% | 0.6% |
| Evening Trip | 3.8% | 1.1% | 0.4% |

The impact of variation in trip duration on the probability of getting wet was also examined using the same two year data set. The results are set out in Table 3. The probability of getting wet increases with the duration of the trip – from 4.4% in the case of a 15 minute trip to 7.5% in the case of a 60 minute trip (using a cumulative rainfall threshold value of 0.2mm). It increases from 0.8% to 4.6% where the 0.6mm threshold is used.

All in all the analysis suggests that the actual probability of cyclists who commute on a daily basis getting wet is very low and that the perceptions of both car commuters and cyclists alike regarding the probability of getting wet is unduly pessimistic.

| Table 3 : Impact of Trip Duration on Probability of Getting Wet | | |
|--|--|----------------|
| Morning Departure Time | 08:15hrs | |
| Time Period | 1 April 2003 to 31 March 2005 | |
| Cumulative Rainfall Threshold | 0.200mm | 0.600mm |
| Trip Duration | Hourly Equivalent | |
| 15 Minute | 0.80 | 2.40 |
| 30 Minute | 0.40 | 1.20 |
| 45 minute | 0.27 | 0.80 |
| 60 minute | 0.20 | 0.60 |
| | Proportion of Trips Where Cyclist Got Wet | |
| 15 Minutes | 4.4% | 0.8% |
| 30 Minutes | 5.5% | 1.9% |
| 45 Minutes | 6.1% | 3.8% |
| 60 Minutes | 7.5% | 4.6% |

5 Conclusions

The survey results indicate that the perception of poor/unpleasant weather conditions is an important factor in influencing the decision of car commuters who live within cycling distance of work (i.e. up to 8 miles) not to cycle. It is also an important factor in influencing the decision of occasional cyclists not to cycle more frequently in the Winter. There is a significant difference in the Winter/Summer cycling frequency of cyclists.

The survey results also show that car commuters and cyclists alike have a pessimistic view of the probability of getting wet in Dublin which is very inaccurate when viewed against actual data. There is a case for measures to address the misperception of occasional cyclists and car commuters alike regarding the true incidence of rainfall in Dublin and the probability of getting wet. This might form part of any new policy to promote cycling in Dublin

The next stage of this research will consider how the probability of getting wet can be further reduced by the different rainfall avoidance strategies including delaying the start of a journey when it is raining at the normal start time and taking breaks during the journey when it rains.

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Responsibility for any errors rests with the author.
