

Cycling Research

ALWAYS TAKE THE WEATHER WITH YOU...

The days are getting shorter and cooler, and there you are battling away on the bike on a frosty morning or through a wild southerly storm. It's usually about this point that you (and everyone that you know...) start to question why you're biking in a country with not flash weather. This raises two interesting research questions: (1) how likely is it that the weather will turn sour when cycling, and (2) what effect does it have on the amount of cycling?

Bruce (2000) looked at the first question in some detail; as a MetService forecaster he certainly had some good data to work with. He studied the rain records of the four main NZ centres and found that the chance of rain in any given hour averaged < 10%, with the chance of more than light rain (>0.4mm/hr) < 5%. As you might expect, a relatively dry place like Christchurch was slightly better than a wet place like Auckland, generally only by 1-2% though. In winter your odds are slightly worse (except in Dunedin interestingly); e.g. 14% and 7% in Wellington for any rain and more-than-light rain respectively. It is important to remember though that for cycle trips of less than an hour, your odds of getting rained on are proportionately less. So in a typical fortnight for example, it is very likely that (say) no more than one of your daily commute trips might be significantly affected by rain. If you have some flexibility about your riding times, the chance may be even less.

Bruce also looked at wind and frosts around the country. Although some steady wind is common all year round in most places, few days suffer from bike-blasting gales, with the exception of Wellington, which encounters them on 13% of days (less so, away from the coast). Christchurch and Dunedin can expect to have about 90-100 frosty starts each year, but are fairly rare in the northern cities, except in certain suburbs.

So if the yucky stuff turns up, what do people do? A range of studies has tried to capture either what people say they would do, or what they actually do. For example, Wilde (2000) surveyed Canterbury University students and staff and found that they were roughly three times more likely to cycle on a "warm and dry" day, than a "cold and wet" day (with staff slightly higher than students). Separating out the individual effects, it seemed that cold weather caused about a 20% reduction in use, while rain resulted in a ~60% reduction.

Nankervis (1999) also considered this question in more detail, using commuter cyclists in Melbourne. Using a questionnaire distributed to cyclists commuting on a fine summer day, Nankervis was able to get more detailed information about the cyclists and their indicative behaviour under various weather situations. Over the year, stated cycling use per month dropped in winter to ~50% of summer levels. In a similar study of Melbourne students, the drop had not been quite so dramatic, falling to about 70% in winter.

When questioned about their commuting behaviour under various circumstances, the following stated actions were given:

Action taken	Heavy Rain	Light rain	High temp (>30deg)	Low temp (<10deg)	High wind (>15km/h)
No change	13.0%	17.4%	78.3%	32.6%	71.7%
Change clothes	19.6%	60.9%	17.4%	58.7%	8.7%
Alternative mode	60.9%	17.4%	4.3%	4.3%	17.4%
Don't go / other	6.5%	4.3%	0.0%	2.2%	2.2%

Clearly, heavy rain is most likely to drive cyclists completely away from their bike. It is interesting those cyclists who make no change; perhaps they already ride suitably attired for whatever the elements throw at them. It is also interesting that student commuters were less affected by weather than their working counterparts, perhaps reflecting both the higher dress standard often required at work, and the usually better shower/change facilities on campuses.

Other studies have used actual cycle count data and tried to relate them to relevant weather statistics. Emmerson *et al* (1998) for example, used data from special automated cycle count sites in five UK towns and compared them against rainfall and temperature data. They found that a 1°C rise in the maximum daily temperature gave an approximately 3% rise in daily cycle flows (presumably the UK doesn't commonly reach the point at which cyclist numbers might drop off again due to the heat!). Meanwhile the incidence of *any* rainfall during the day saw an 11-15% reduction in cycle numbers. It is notable though that the variation in daily cycle numbers *not explained* by the weather effects was considerably greater.

Niemeier (1996) carried out similar research on five bike routes in Washington state, US. Using an ongoing series of manual observation counts, it was found that average cycle counts were largely consistent until daily rainfall got above ~0.3 inches (8mm) of rain, then dropped away. Increasing average daily temperatures meanwhile caused cycle numbers to increase rather exponentially, with about three times the cycle volumes at 70°F (21°C) than at 50°F (10°C) or below.

Hanson & Hanson (1977) used travel survey diaries in a Swedish city to relate cycle trips for different purposes to the prevailing weather conditions (including snow). They found that "discretionary" cycle trips (i.e. those with a choice in timing, destination or completion) were affected far more by weather than commuting trips. It should be noted that, even on the days that it snowed, cycling accounted for 16-29% of work trips! It may be that a similar study can be done locally using data from the new LTSA Travel Surveys.

Research findings from overseas may not be directly translatable here, given differences in climate and cycling culture. Locally, Christchurch City has begun to collect continuous automatic cycle count data from some of its major pathways (e.g. Railway cycleway), as well as detailed weather information. In time, it is hoped that this can provide a very good dataset for relating weather effects with actual cyclist behaviour. The data may also be useful for scaling up isolated cycle counts, using seasonal factors, to get estimates of average annual use.

Overall, it appears that the likelihood of cyclists rushing to their cars and buses when the weather turns bad is rather dependent on what type of cyclists they are. Commuting cyclists are more likely to battle on than casual/recreational ("discretionary") cyclists, and more experienced cyclists are also likely to be less affected in their cycling use by weather. Trip-end facilities and dress standard requirements can play a factor in cycling decisions too.

Statistics aside, it's always important to remind to yourself that the worst that can happen to you this winter is that you will get a bit cold and wet. And if good weather-proof clothing can't prevent that, then a hot shower afterwards is a pretty good remedy too...

References

- Bruce P. 2000, "The perceptions of weather and its influence on biking comfort", Proceedings NZ Cycling Symposium, Jul 2000, pp.227-232.
- Emmerson P. *et al* 1998, "The impact of weather on cycle flows", *Traffic Engineering + Control*, Apr 1998, pp.238-243.
- Hanson S. & Hanson P. 1977, "Evaluating the Impact of Weather on Bicycle Use", (*US*) *Transportation Research Record* 629, pp.43-48.
- Nankervis M. 1999, "The Effects of Weather and Climate on Urban Bicycle Commuters' Decision to Ride: A Pilot Survey", *ARRB Road & Transport Research*, Vol.8, No.4, Dec 1999, pp.85-97.
- Niemeier D. 1996, "Longitudinal Analysis of Bicycle Count Variability: Results and Modelling Implications", *ASCE Journal of Transportation Engineering*, May/Jun 1996, pp.200-206.
- Wilde H. 2000, "Year 2000 Travel Survey", University of Canterbury, Dept of Civil Engineering, *ENCI 495 Project Report*.

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