

Thought: Waiting for the Subway

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By Kevin DeLuca

ThoughtBurner

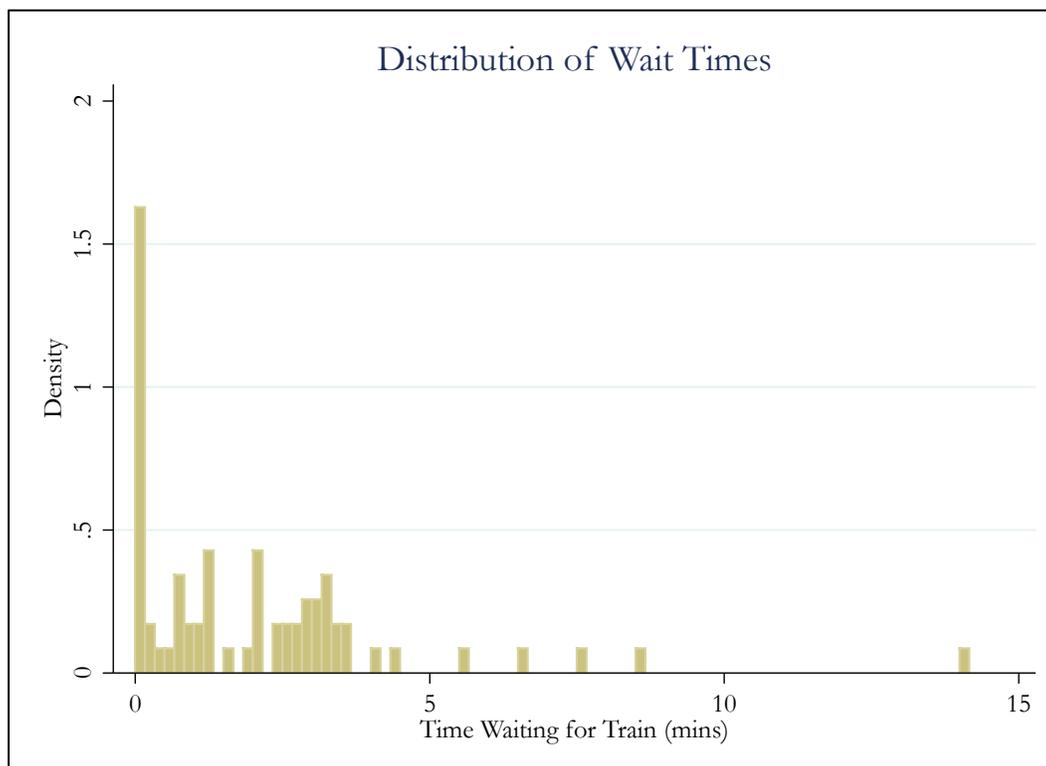
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You know how when you're waiting for something to happen, time feels like it goes by a lot slower? Like how a minute is super long when you're watching a clock. That's how I feel waiting for the subway to come. But the subway wait is even worse, because usually by the time I'm waiting for the subway I'm also quite eager to get home. This makes it feel like I wait *forever* for the train.

It really only takes about two minutes.

I know this because I started recording how long I wait for the subway on my way home. Weird? Yeah, I know. Worth it? Sure? Anyway, every day I take the uptown 1 train from Penn Station on my way home. I've been recording how long I wait for the train for a few months now (70 work days), and using this data I can finally answer the very very important question of how long I actually stand waiting for the train.

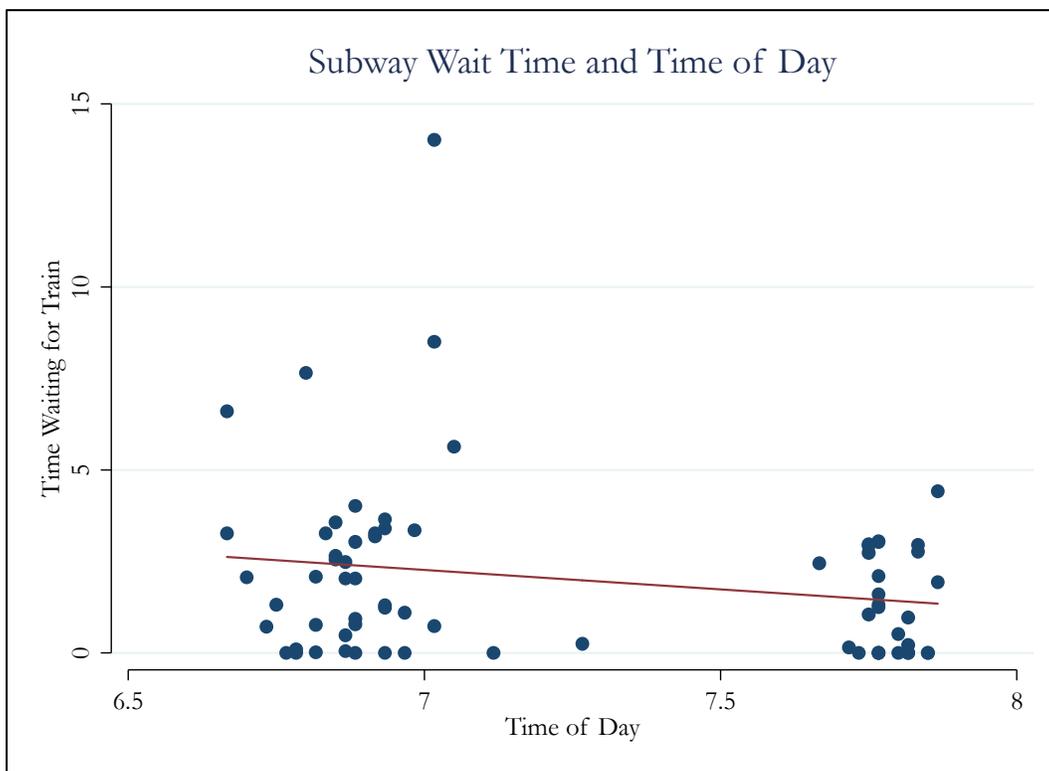
Here is the distribution of wait times:



Most of my wait times are under five minutes, and there is one true outlier that took 14 minutes (I remember that time, it was the worst). The average wait time is 2.01 minutes – not as long as I would have thought. For a perhaps surprising number of days, I get there right as the train is arriving at the station – close to 20% of the time.

But I don't always *arrive* at the subway stop at the same time. Depending on when I leave work, I either get to the stop right before 7pm or right before 8pm (I usually take one of the NJ Transit trains that are scheduled to arrive at Penn Station at 6:35pm, 6:48pm or 7:43pm). The time I spend waiting for the train might depend on what time I actually get to Penn Station to begin this whole waiting ordeal.

Below is each wait time depending on the time of day I get to the station:



The line shows the best linear fit through all of the observations. There is a slight decrease in the time I wait for the train if I get to the stop later in the day. When I get to the station close to 8pm, the average wait time is 1.37 minutes. When I get there closer to 7pm, however, the average wait time is 2.43 minutes – a whole minute and 3.6 seconds more! The decrease in average wait times later in the day seems to be mostly due to a higher chance that the 1 train will take a really long time to come if I get to the station closer to 7pm.

In fact, of the wait times that are in the top 10% of the distribution (i.e. my top 10% wait time lengths – more than 3.8 minutes), only one occurs at times closer to 8pm. Of those in the top 5% – which is more than 6.5 minutes – all of them occur at times closer to 7pm.

The table below shows the average wait time for all days, for days when I get to the station closer to 7pm, for days when I get to the station closer to 8pm, and the difference between the 7pm and 8pm wait times. It also shows the odds of getting to the station right when the train is arriving (wait time = 0) and the odds of having to wait for the train for more than 6.5 minutes (the 95th percentile).

Subway Wait Times

	All Days	Close to 7pm	Close to 8pm	Difference (7pm - 8pm)
<i>Average Wait Time (mins)</i>	2.01	2.43	1.37	+1.06
<i>Odds of Not Having to Wait</i>	21.4%	14.3%	32.1%	-17.9%
<i>Odds of Wait Time Over 6.5 Minutes</i>	5.7%	9.5%	0.0%	+9.5%
<i>n</i>	70	42	28	

Not only is the train more likely to be very late at 7pm, I'm also about half as likely to get to the station right as the train arrives – 14.3% chance at 7pm vs. a 32.1% chance at 8pm.

So what's the big takeaway from all of this? I guess if I was perfectly indifferent in regards to which train to Penn Station I took home, I could save about a minute in expected waiting time by choosing the later time. One minute less waiting isn't a huge difference, but I could always frame it as 'cutting your subway wait time in half' since the average is two minutes. Also, the one minute of waiting time I save is one of those "long" minutes that takes a long time to go by, so subjectively it feels nicer than saving a "normal" minute of doing something else.

For a way cooler analysis of NYC subways and waiting times, see [Erik Bernhardsson's web article](#) on the topic.ⁱ His analysis also shows evidence that average wait times are slightly decreasing between 7 and 8 (see the "Waiting time by time of day" section). Or rather, my "field work" confirms his analysis.

ⁱ <https://erikbern.com/2016/04/04/nyc-subway-math.html>

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