

Creating the (next) bike revolution:

biking as a powerful tool for improving health, climate, society . . .



well-outfitted 8-speed fold-up (tern)



bike-based mail delivery [1]



bike parking at the 'forest kindergarten' (for ages 3-6)

Claim 1: Bicycles are the ideal choice for trips of a couple miles

Claim 2: More biking is better for us, both individually and collectively

Claim 3: Bike infrastructure is a powerful tool for social good

“A Revolutionary Machine” = title of an awesome bike history talk by W. G. Gayle (friend of friend)

*(slides by
E.V. Stenson
for a session
at virtual
SciFoo 2021)*

Where I'm coming from: transportation history

- Cleveland Hts ('81-'99): **car**
(+ feet, bike)
- New York City ('99-'04): **bus, subway, train, feet**
(+ car)
- Pasadena ('05-'12): **inline skates**
(+ car, motorcycle, bus, rail)
- Greifswald ('12-'16): **bike**
(+ feet, bus, train)
- Munich outskirts ('16+): **bike, train**
(+ car, feet)

my qualifications (or lack thereof):

- American in Germany
- relatively recent cyclist
(last ~9 years)
- pragmatic in transportation choices
- “bad” at bike maintenance
(time- & tool-constrained)
- parent of a 7yo
- nature enthusiast
- reasonably athletic
- not a social scientist or
civil engineer or . . .

Why bike?: efficiency

- highly energy-efficient way to transport people and cargo

"A bicycle's performance is extraordinarily efficient. In terms of the amount of energy a person must expend to travel a given distance, cycling is calculated to be the most efficient self-powered means of transportation. In terms of the ratio of cargo weight a bicycle can carry to total weight, it is also a most efficient means of cargo transportation."

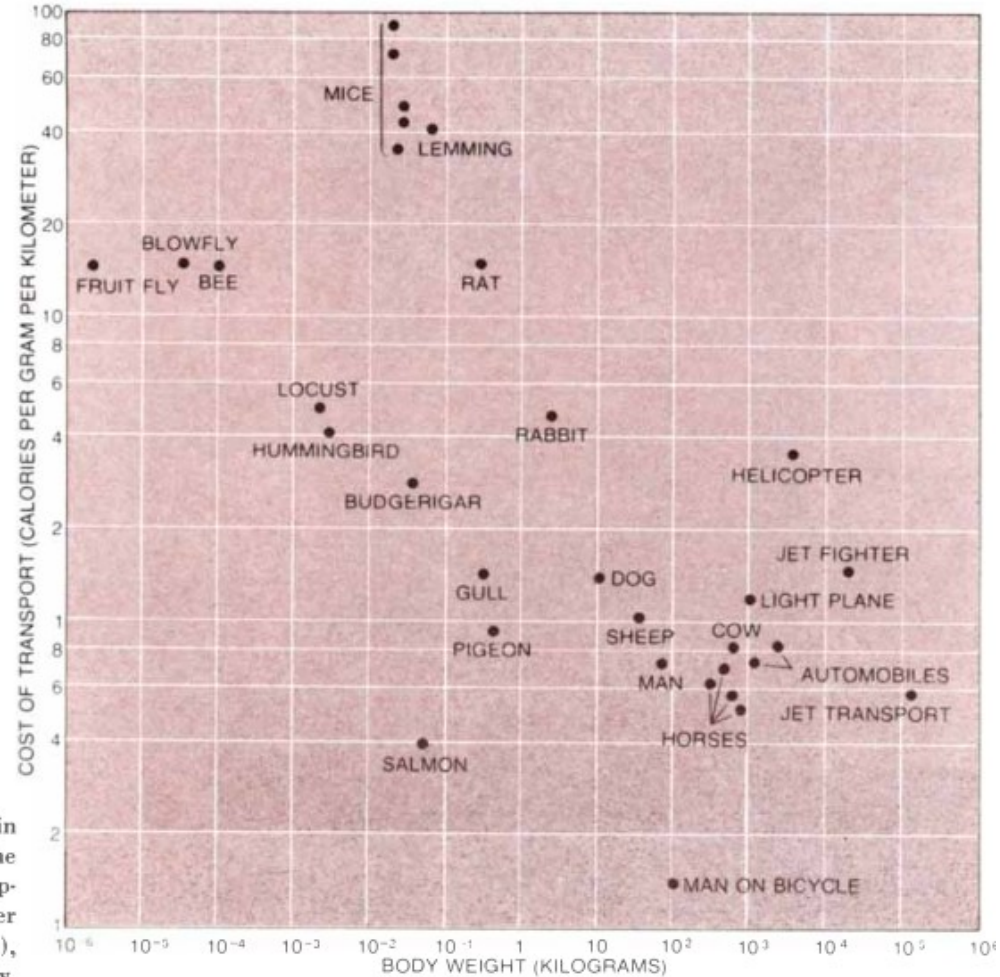
https://en.wikipedia.org/wiki/Bicycle_performance



S.S. Wilson (March 1973). "Bicycle Technology". *Scientific American*.

Why bike?: efficiency

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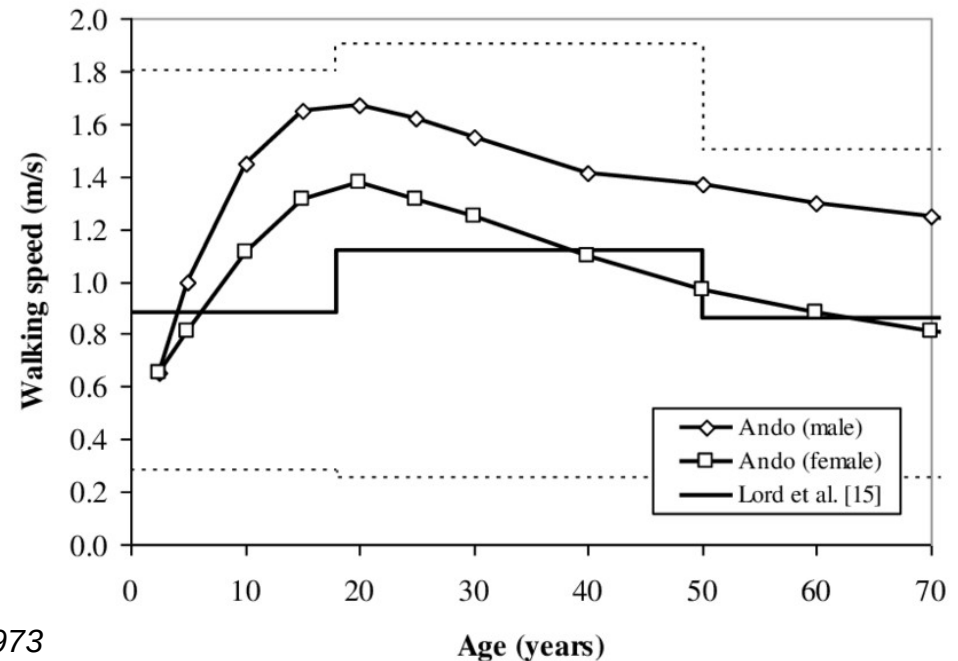
MAN ON A BICYCLE ranks first in efficiency among traveling animals and machines in terms of energy consumed in moving a certain distance as a function of body weight. The rate of energy consumption for a bicyclist (about .15 calorie per gram per kilometer) is approximately a fifth of that for an unaided walking man (about .75 calorie per gram per kilometer). With the exception of the black point representing the bicyclist (*lower right*), this graph is based on data originally compiled by Vance A. Tucker of Duke University.

Why bike?: efficiency

- highly energy-efficient way to transport people and cargo
- walking is slow! **(2-3 mph)**

"The preferred walking speed is the speed at which humans or animals choose to walk. Many people tend to walk at about 1.4 metres per second (5.0 km/h; 3.1 mph; 4.6 ft/s)."

https://en.wikipedia.org/wiki/Preferred_walking_speed

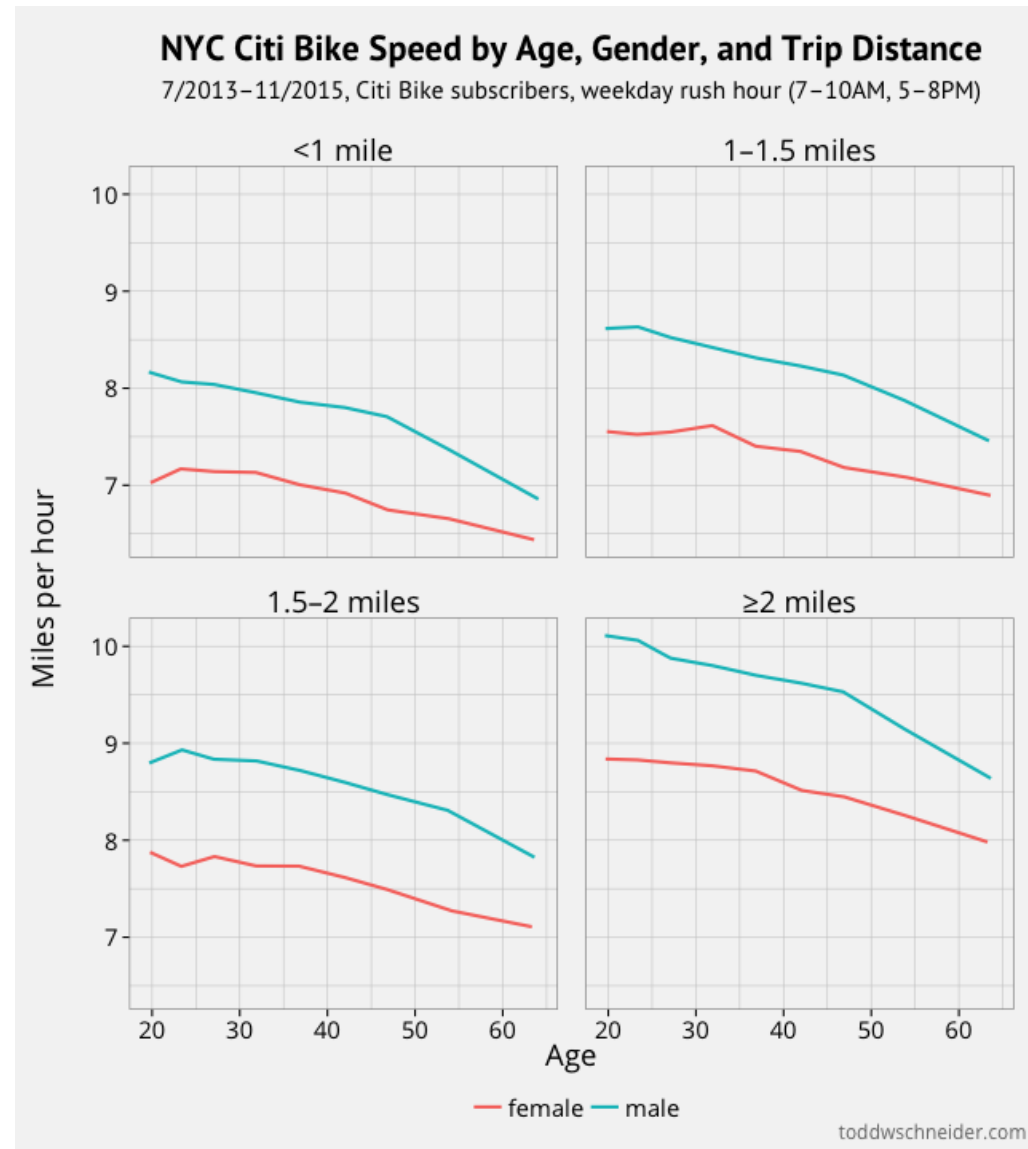


https://www.researchgate.net/figure/Comparison-of-walking-speed-as-a-function-of-sex-and-age-from-an-adaptation-of-Ando-et-al_fig6_241653973

Why bike?: efficiency

- highly energy-efficient way to transport people and cargo
- walking is slow! (2-3 mph)
- biking is at least 2x-3x as fast (*incl. non-riding time*), often way more

"A Tale of Twenty-Two Million Citi Bike Rides: Analyzing the NYC Bike Share System"
<https://toddschneider.com/posts/a-tale-of-twenty-two-million-citi-bikes-analyzing-the-nyc-bike-share-system/>



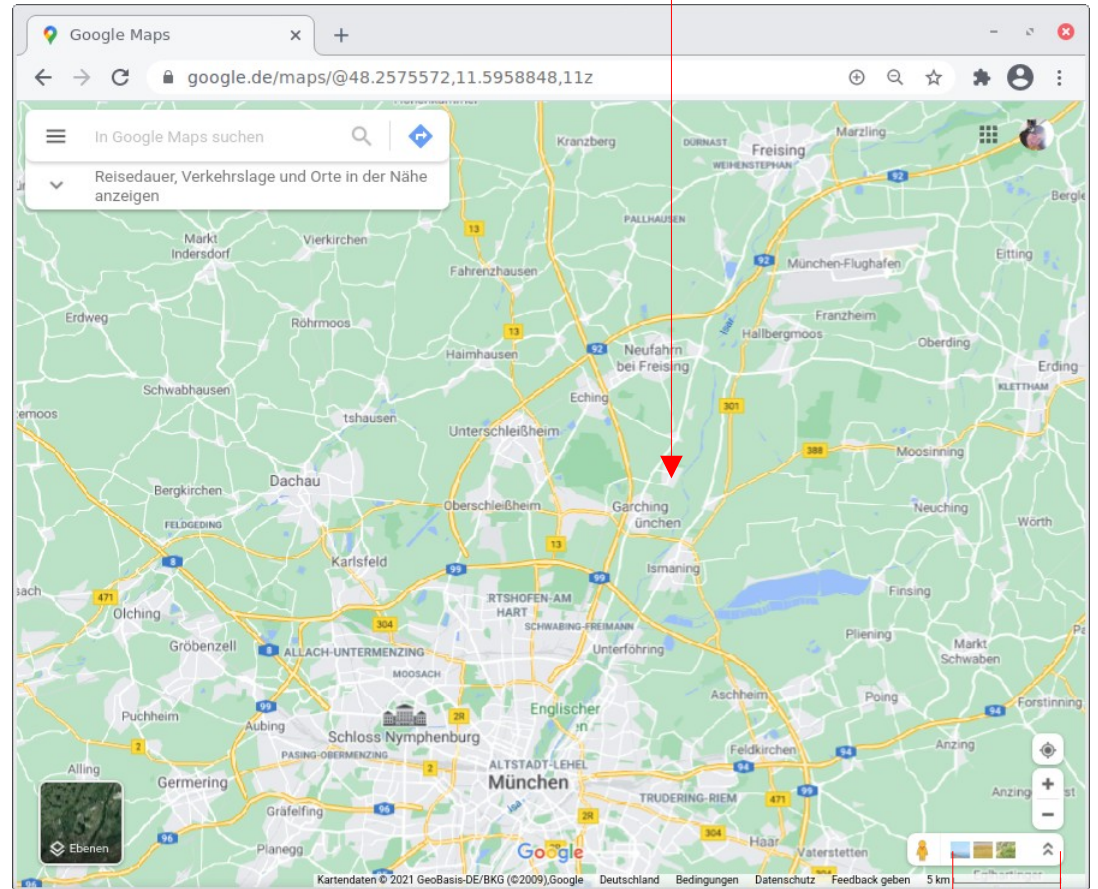
Why bike?: efficiency

Garching Research Center
(where I work)

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This translates into a much larger range for the same travel time!

For example, if I want to limit my daily commute to a half hour . . .



3 mi

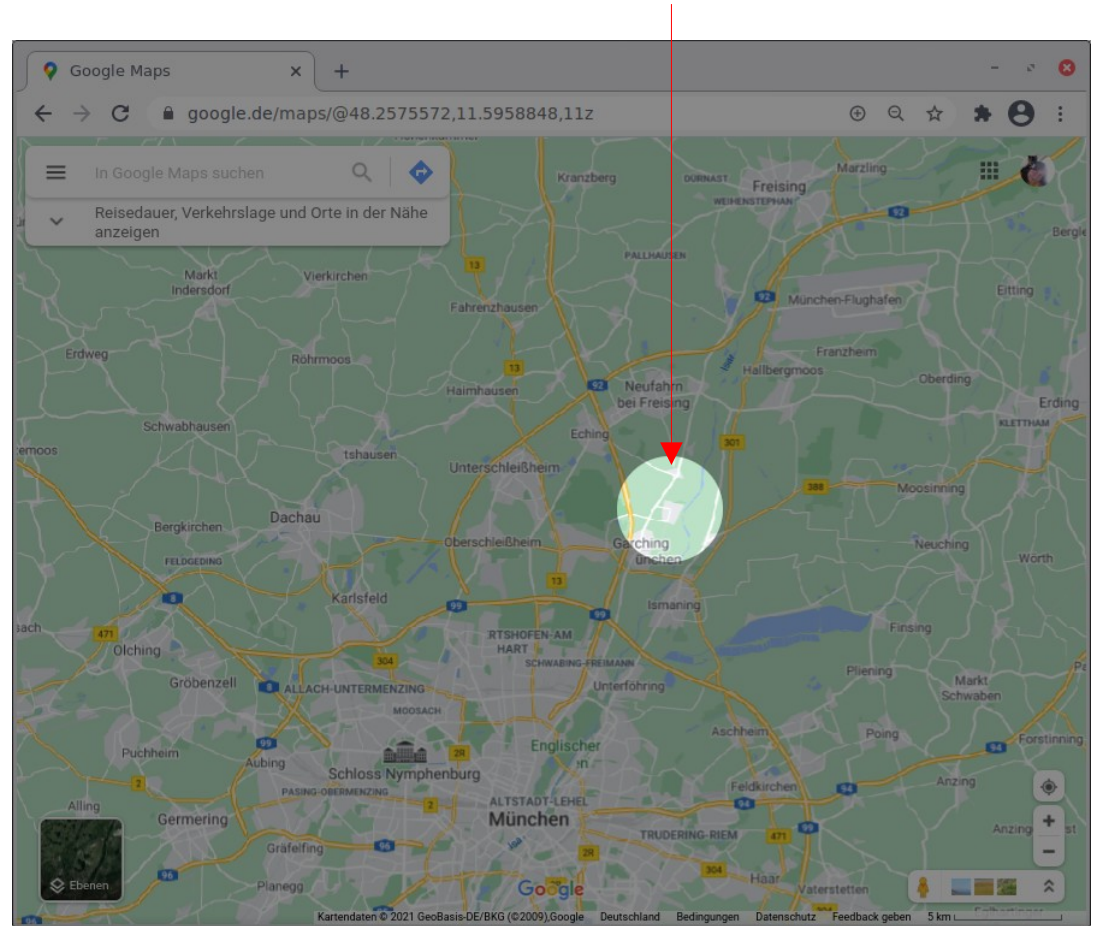
Why bike?: efficiency

2.5-km (1.6-mile) radius
(i.e., more than a half hour of walking)

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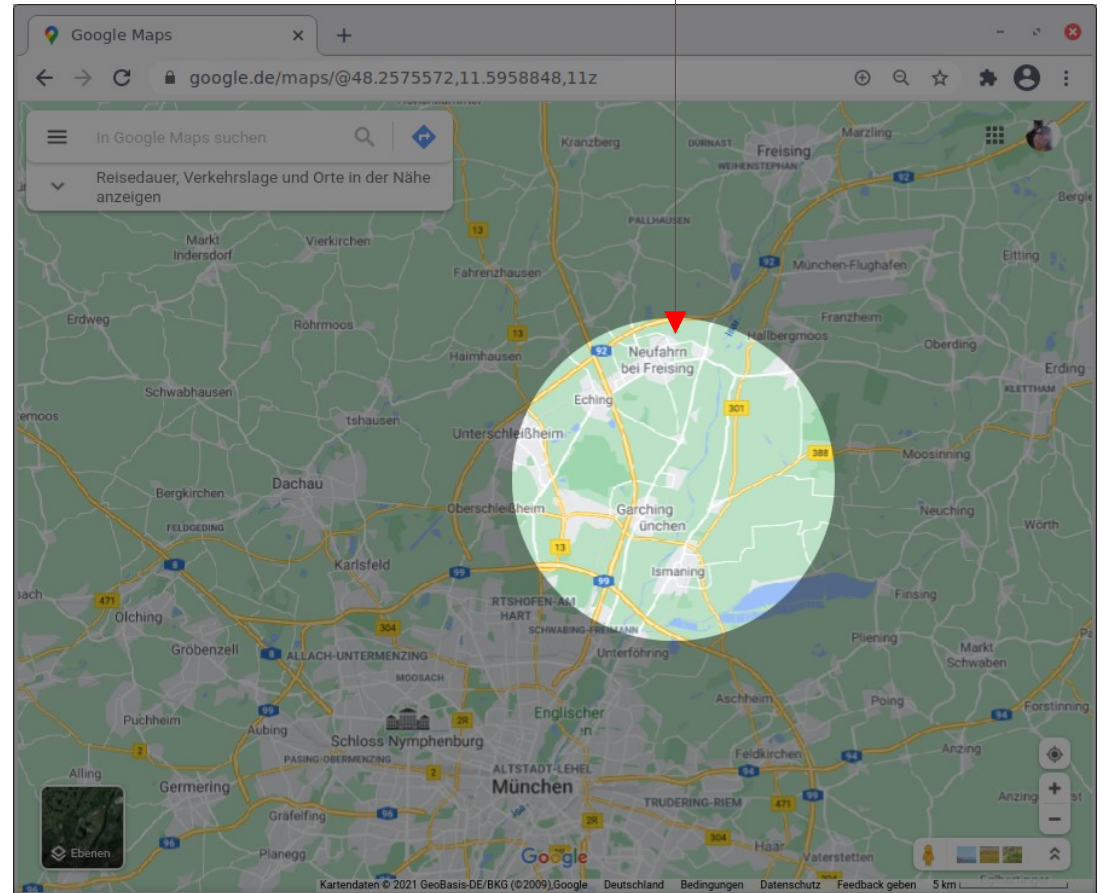
7.5-km (4.7-mile) radius
(i.e., less than a half hour of biking)

- highly energy-efficient way to transport people and cargo
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There are a lot more housing options if I bike instead of walk.



Why bike?: efficiency

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- contingent on infrastructure, bikes can be competitive with cars for door-to-door time for trips of several miles

According to Google Maps, this is the alleged time in minutes it takes to get from the house where I grew up to my [family's] common destinations . . .

	walk	bike	car
Giant Eagle (1.1 mi)	21	6	4
Heights High (3.0 mi)	56	15	8
Gymnastics Training Center (6.5 mi)	132	38	21*

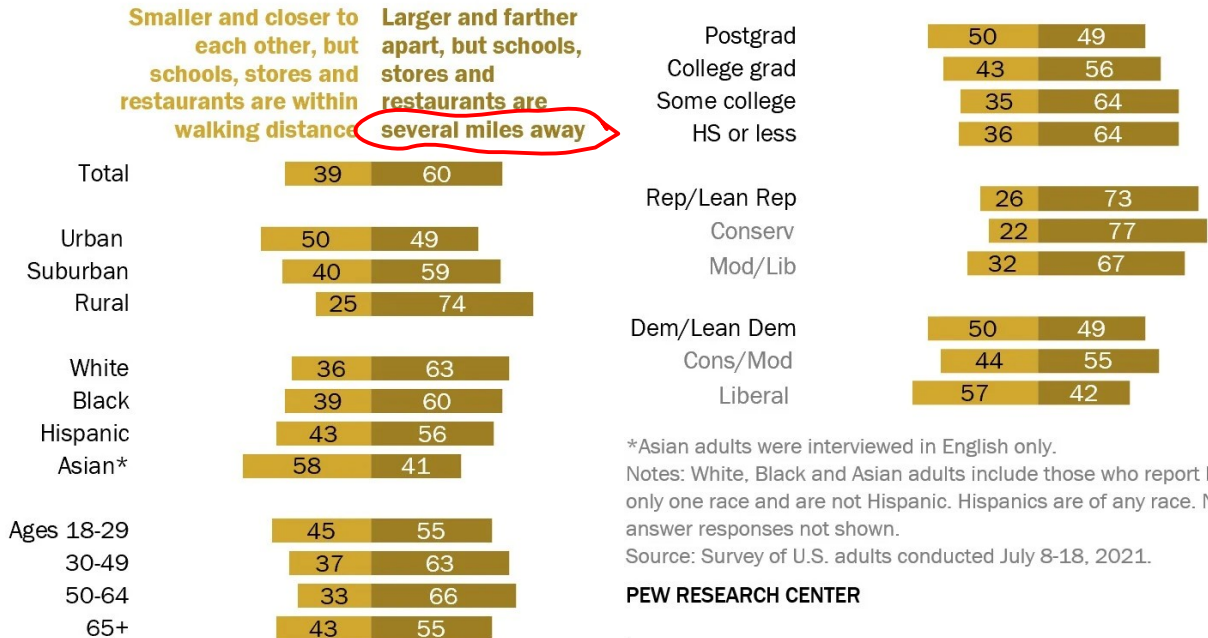
** for the route we actually took*

'Several miles' should = 'bikeable'

- recent Pew survey about housing density
- commentary about the effect of the pandemic, the effect of politics . . .
- inherent assumption that we transition straight from "walkable" to "drivable" (!)

Liberal Democrats prefer walkable communities, conservative Republicans prefer drivable communities

% who say they would prefer to live in a community where the houses are ...



*Asian adults were interviewed in English only.

Notes: White, Black and Asian adults include those who report being only one race and are not Hispanic. Hispanics are of any race. No answer responses not shown.

Source: Survey of U.S. adults conducted July 8-18, 2021.

PEW RESEARCH CENTER

<https://www.pewresearch.org/fact-tank/2021/08/26/more-americans-now-say-they-prefer-a-community-with-big-houses-even-if-local-amenities-are-farther-away/>

Why bike?: health (mental & physical)

- exercise incorporated into daily life
- pedaling instead of sitting
- contact with community / nature
- less stressful
- people who bike commute like their commute
- drunk biking less dangerous than drunk driving



Journal of Transport & Health

Volume 14, September 2019, 100569



Why are cyclists the happiest commuters? Health, pleasure and the e-bike

Kirsty Wild  , Alistair Woodward 

<https://doi.org/10.1016/j.jth.2019.05.008>

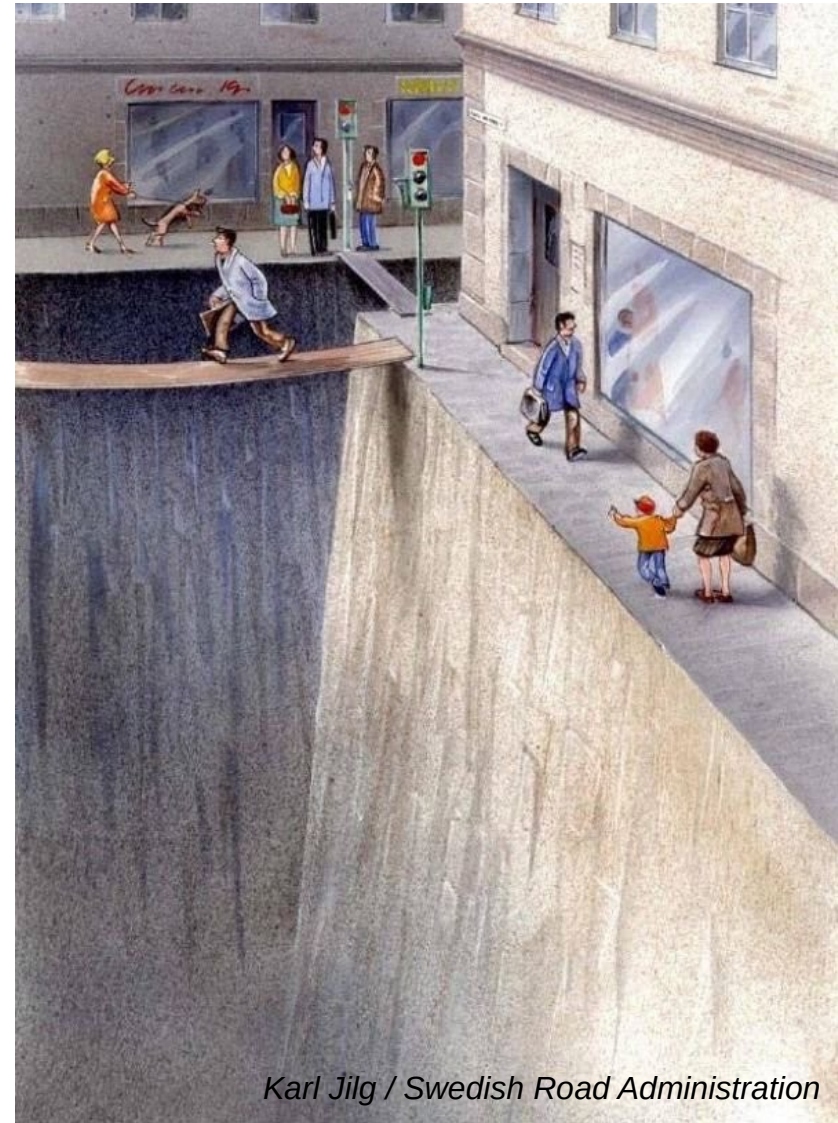
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Highlights

- Qualitative research with cyclists identifies four reasons for high mode satisfaction.
- Active transport pleasures receive less research attention than safety concerns.
- Understanding cyclist satisfaction can help us promote cycling more effectively.
- Electric bicycles may further enhance cyclist mode satisfaction.

Why bike?: community + climate

- more compatible with pedestrian/kid zones (also motorized scooters)
- a more social activity (vs. “steel cages”)
- there exist bikes suitable for the young, the elderly, those with disabilities
- short trips are especially inefficient for vehicles using internal combustion engines
- less of one’s city “lost” to streets and parking
- decarbonization calculation (coming up!)



Karl Jilg / Swedish Road Administration

FAQ: what about . . . babies? shopping? longer trips? those who are old? who have disabilities?

- not all of us are elite road-bikers (but props to those who are!)
- many different varieties of bikes and accoutrements, including
 - ebikes
 - cargo bikes
 - trailers for kids, dogs, shopping
 - adult trikes, "old-person" bikes
 - fold-up bikes



biking to work + daycare on a 'Feldweg' (literally "field road", used by tractors, cyclists, and dog-walkers, but not cars)

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- many different varieties of bikes and accoutrements, including
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 - cargo bikes
 - trailers for kids, dogs, shopping
 - adult trikes, "old-person" bikes
 - fold-up bikes
- combine with other transportation



rack for full-sized bikes (with their tickets) on a regional train (Fold-up bikes go on luggage racks and don't need tickets.)

FAQ: weather?

- “no bad weather, only bad clothing”
- suitable tires, brakes, maintenance; kid trailers with screens + covers
- weather also affects cars (e.g., scraping off frost in the winter, dangerously hot temperatures in the sun/summer, . . .)
- one warms up faster when pedaling than when sitting in a cold car
- Bike paths should be cleared and sanded, just like roads and sidewalks!
- It doesn't have to be all or nothing!
(Bike some days, take the bus/car others!)



kid trailer with covers, providing excellent protection from elements + tire spray

FAQ: safety?

- bike lanes really need to be physically separated from car lanes
- bike highways (separated from pedestrians) for long-distance routes (e.g., high-speed commuters and distance-riders)
- sensible, location-dependent speed limits for all parties
- appropriate protective gear for the speeds and skill levels in question



above: Seven-year-old cyclist on a path that is wide (good!), shared by bikes and pedestrians (OK), and separated from the street --- which has a speed limit of 100 kph --- by only a curb (not so good!).

left: Same cyclist, ~5 years earlier, with helmet, balance bike, and plenty of outwear (which also provides padding).

Action items

- bike paths and bike highways
 - separate from cars
 - as ubiquitous as roads
 - urban and rural
- bike parking (e.g., at shopping areas and train stations)
- bike maintenance stations
- bike-friendly traffic systems
- bike shops that cater to everyone who wants to bike
- community support



left: overpass for bikes, pedestrians, and wildlife (so that none of those have to cross the two-lane highway below)



right: view from the top of that overpass, showing the highway and separated bike path, both of which go over the Autobahn (where the truck is)

Some references and further reading

- 1) cover photo: <https://www.dpdhl.com/de/presse/medienservice-regional/2021/04/postzustellung-per-fahrrad.html>
- 2) Atlantic article about how driving cars is incentivized:
<https://www.theatlantic.com/ideas/archive/2019/07/car-crashes-arent-always-unavoidable/592447/>
- 3) Article about the "perfect street" and how it is not car-centric:
<https://citu.co.uk/citu-live/what-does-the-perfect-street-look-like>
- 4) Johannesburg tried to get people to give up driving for a month — here's what happened:
<https://www.businessinsider.com/johannesburgs-experiment-with-no-cars-2015-12>
- 5) Take Back the Streets From the Automobile
<https://www.nytimes.com/2020/06/20/opinion/pandemic-automobile-cities.html>
- 6) <https://trec.pdx.edu/research/project/583/>
[Lessons_from_the_Green_Lanes:_Evaluating_Protected_Bike_Lanes_in_the_U.S._](#)
- 7) The impact of transportation infrastructure on bicycling injuries and crashes: a review of the literature
<https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-8-47>
- 8) <https://roadswerenotbuiltforcars.com/>

Some references and further reading/viewing

- 9) *Bicycle infrastructure: can good design encourage cycling?*
<https://www.tandfonline.com/doi/full/10.1080/21650020.2014.955210>
- 10) *Bike Lanes by Casey Neistat*: <https://www.youtube.com/watch?v=bzE-IMaegzQ>
- 11) *How our daily travel harms the planet*
<https://www.bbc.com/future/article/20200317-climate-change-cut-carbon-emissions-from-your-commute>
- 12) *Revolutionising the commute is key to reducing CO2 emissions*
<https://airqualitynews.com/2020/09/22/revolutionising-the-commute-is-key-to-reducing-co2-emissions/>
- 13) *Barcelona bike bus*:
<https://www.npr.org/2021/10/22/1047341052/barcelona-bicibus-kids-parents-bike-ride-to-school>
- 14) *„Das Auto ist ein Geldgrab“* (German article about how much less expensive a bike is than a car, per mile)
<https://www.faz.net/aktuell/gesellschaft/menschen/kosten-fuer-die-gesellschaft-auto-und-fahrrad-im-vergleich-17434085.html>
- 15) *German article about bike tours through the countryside, with photos*:
<https://www.spiegel.de/reise/deutschland/rad-fernwege-mit-dem-fahrrad-raus-aus-der-vollen-stadt-ab-ins-gruene-a-2526b2ef-0410-4142-855c-7fd8cb57cddd>