The case for bicycle infrastructure

comfortable

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To increase cycling for transport significantly in North America, build infrastructure that reduces interactions between people on bicycles and motor vehicles

To increase cycling for transport significantly ~~in North America,~~ build ~~infrastructure that reduces interactions between people on bicycles and motor vehicles~~

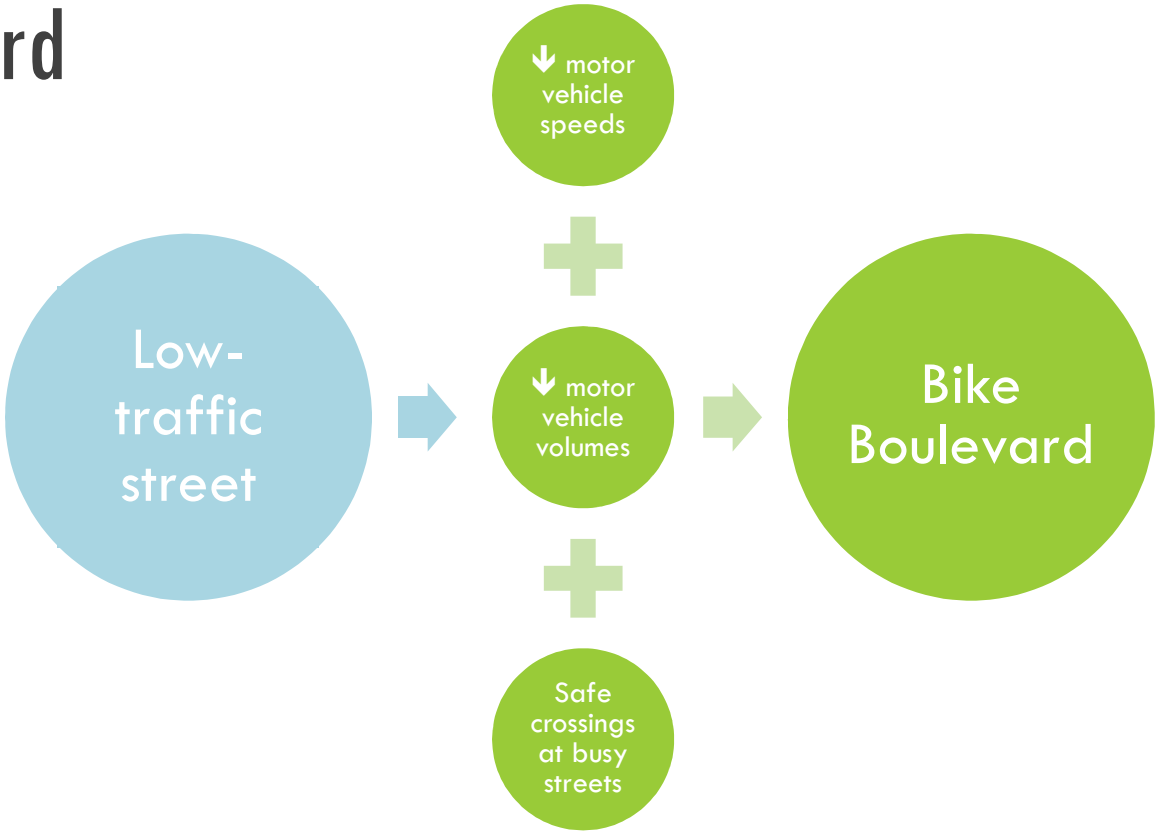
To increase cycling for transport significantly build

protected bike lanes and bike boulevards.

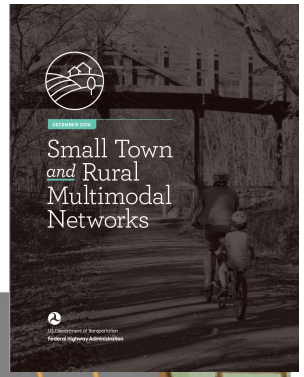
First, some definitions

Bicycle boulevard

- "Neighborhood Greenway"



Bicycle boulevard



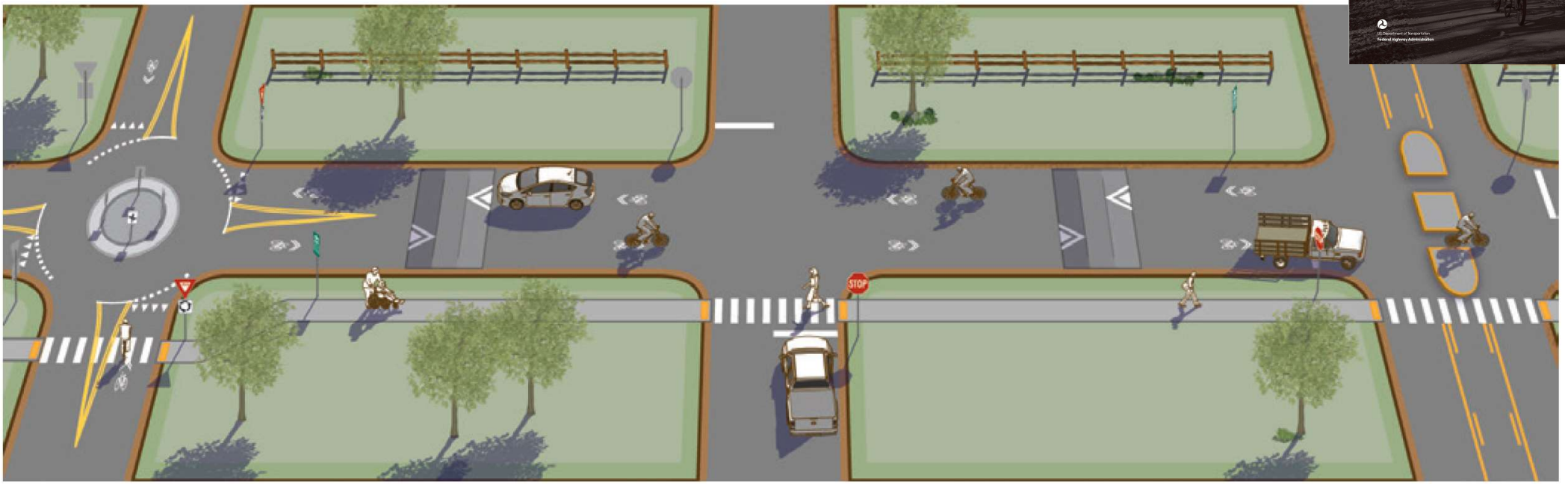


Figure 2-5. *Bicycle boulevards combine road markings, traffic-calming measures, and crossing improvements designed to enhance the comfort and priority of bicyclists traveling along the route.*


Bumps
(humps)
Sharrows


Traffic circle
DO NOT
ENTER
EXCEPT BICYCLES
Diverter

Diverter & pocket park

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Traffic signal

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Rectangular Rapid Flash Beacon
Crosswalk

Wayfinding Signage

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Protected bike lanes (cycle tracks)

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My evidence

Stated preference

Survey of 3,000 adults in the 50 largest metro areas in the U.S. (2015)

Surveys of residents in diverse neighborhoods in New York, Philadelphia, and Chicago (2017)

Surveys of cyclists and residents along new protected bike lanes in 5 U.S. cities

Revealed preference

2 studies in Portland, Oregon, USA using GPS

Study of 3 neighborhoods in Portland on bicycling behavior (recall survey)

Corroborating evidence

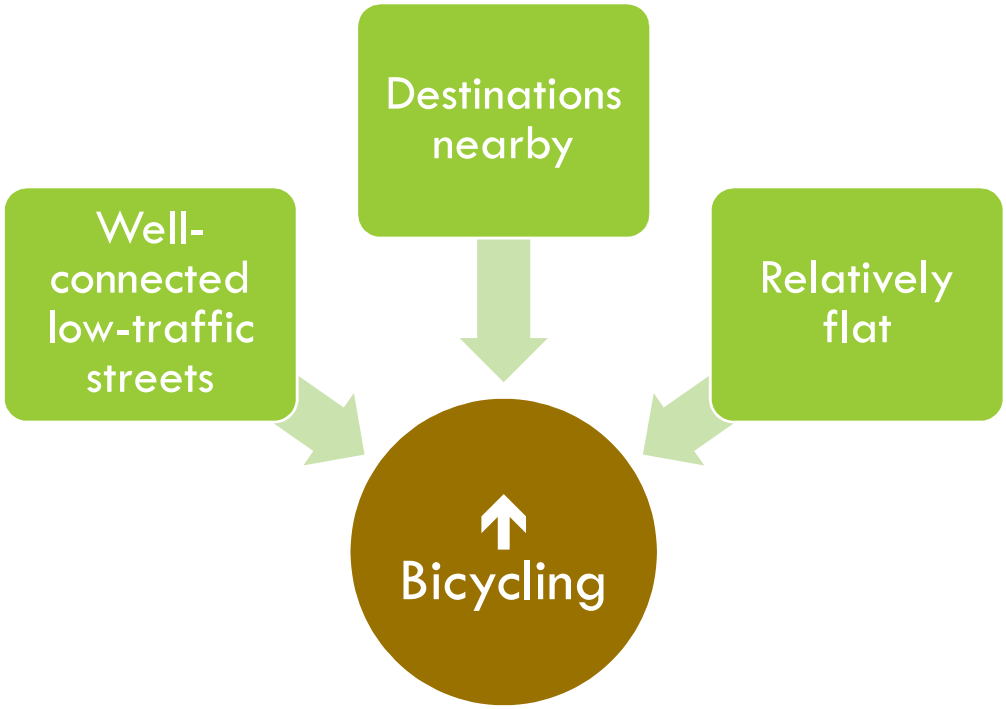
Studies by other researchers

Caveat: Bike infrastructure in an unsupportive environment will not work

A supportive environment is the starting point

Adults living in Portland neighborhoods with these three elements were more likely to ride a bicycle for transport

Dill, Mohr, & Ma, "How can Psychological Theory help Cities Increase Walking and Bicycling?" *Journal of the American Planning Association*, Volume 80(1): 36-51, 2014.



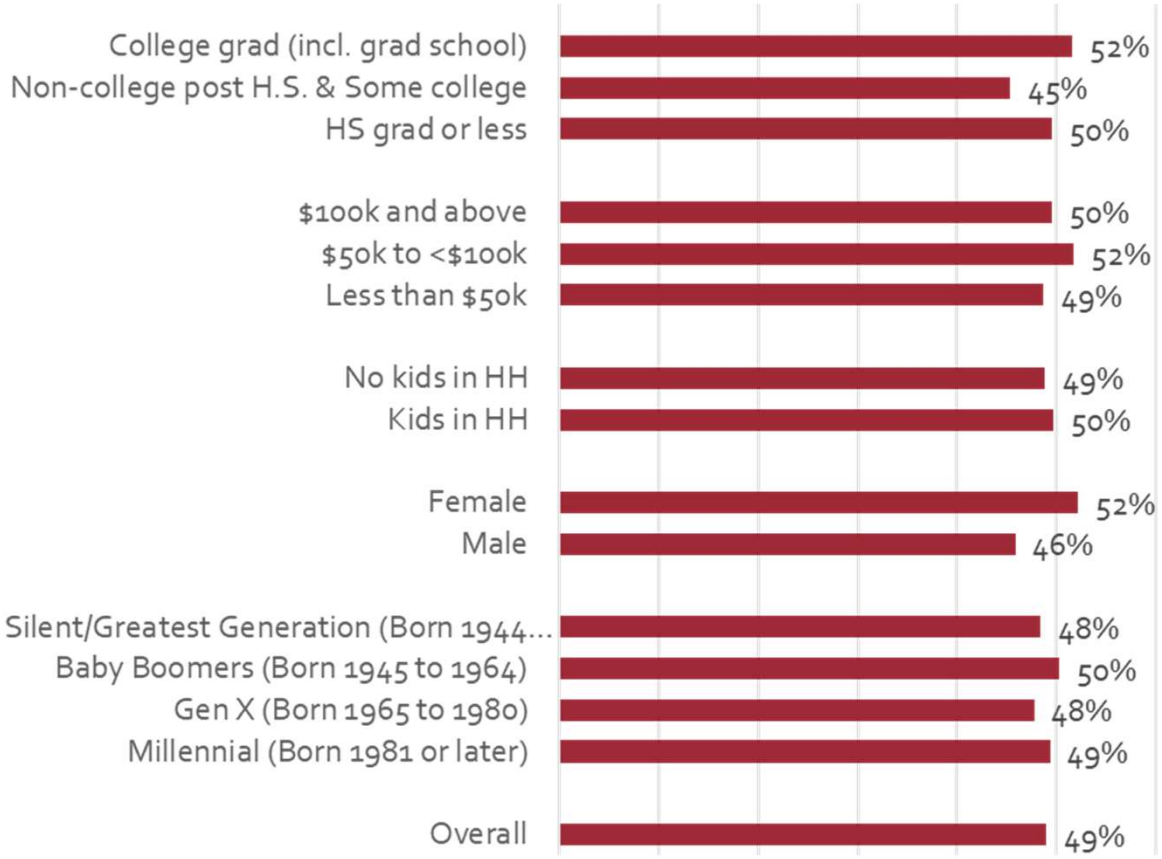
Stated reason for not biking: **Places are too far away**

Data from survey of 50 largest metro areas in the U.S.

About half of the adults say that the places they need to get to are too far away to bicycle. This is generally true for all the demographic groups.

Only higher barrier was needing a car for work/school (51%), which also relates to the environment

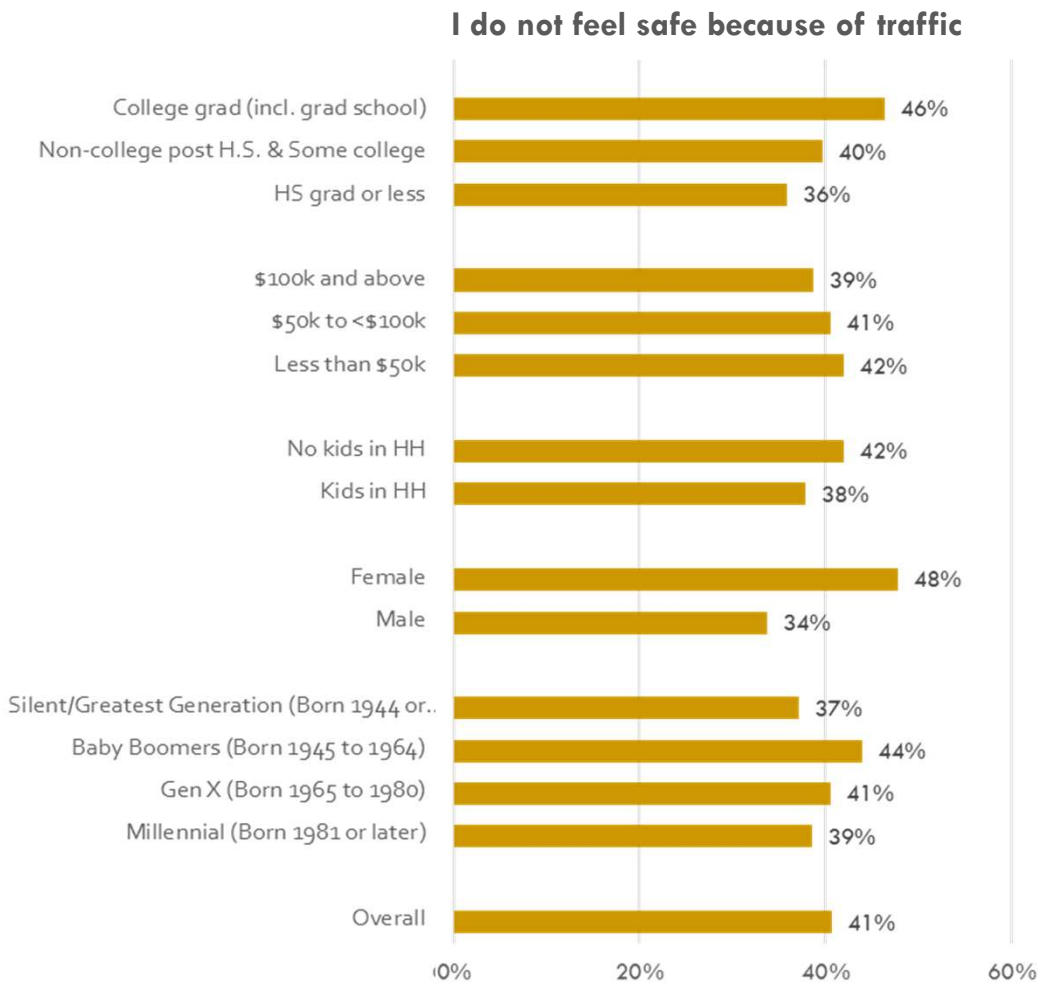
Q84 (If able to ride bicycle and know how in bike or temporary condition) Now, I'd like you to think about things that may keep you from doing more biking. Please tell me yes OR no, if any of these keep you from doing more biking?



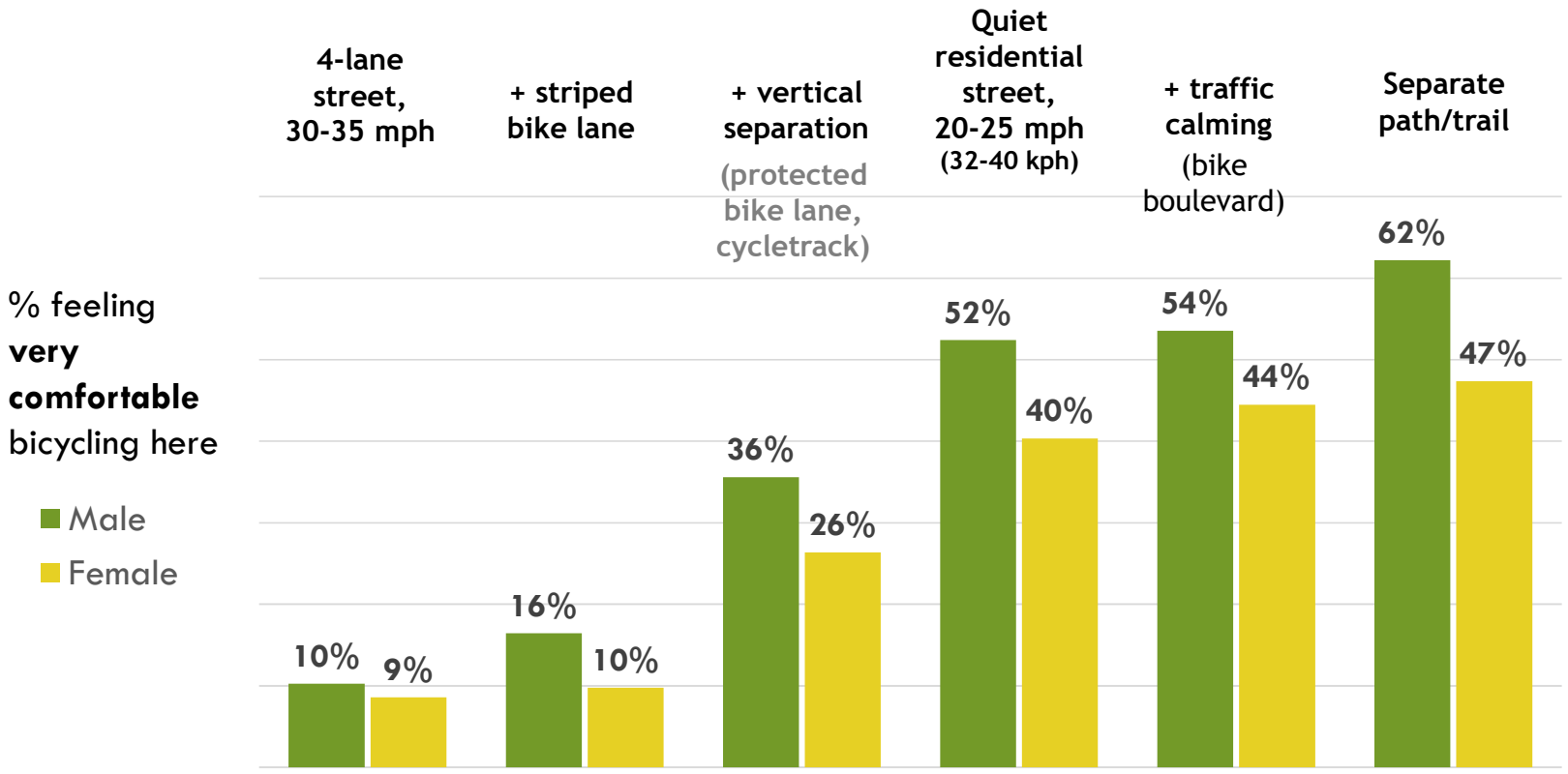
Reason for not biking: **Traffic**

Not feeling safe because of traffic is a barrier particularly for women

Q85, 89 (If able to ride bicycle and know how in bike or temporary condition) Now, I'd like you to think about things that may keep you from doing more biking. Please tell me yes OR no, if any of these keep you from doing more biking?



US adults feel more comfortable with less traffic nearby



Source: NAR®-PSU Transportation & Community Priorities Survey, 2015

Similar findings in Canada & beyond

Kay Teschke, Meghan Winters

Cycling in Cities
University of British Columbia
https://cyclingincities.spph.ubc.ca/motivating-cycling/opinion-survey/

In a review of 44 studies, Aldred et al. (2017) found that women preferred more separation from motor vehicle traffic while cycling.

Aldred, R., Elliott, B., Woodcock, J., Goodman, A. (2017) Cycling provision separated from motor traffic: a systematic review exploring whether stated preferences vary by gender and age. *Transport Reviews* 37, 29-55.

route preferences: top 5 of 16

paved off-street cycle paths for bikes only
(85% likely to choose; average score = +0.6)

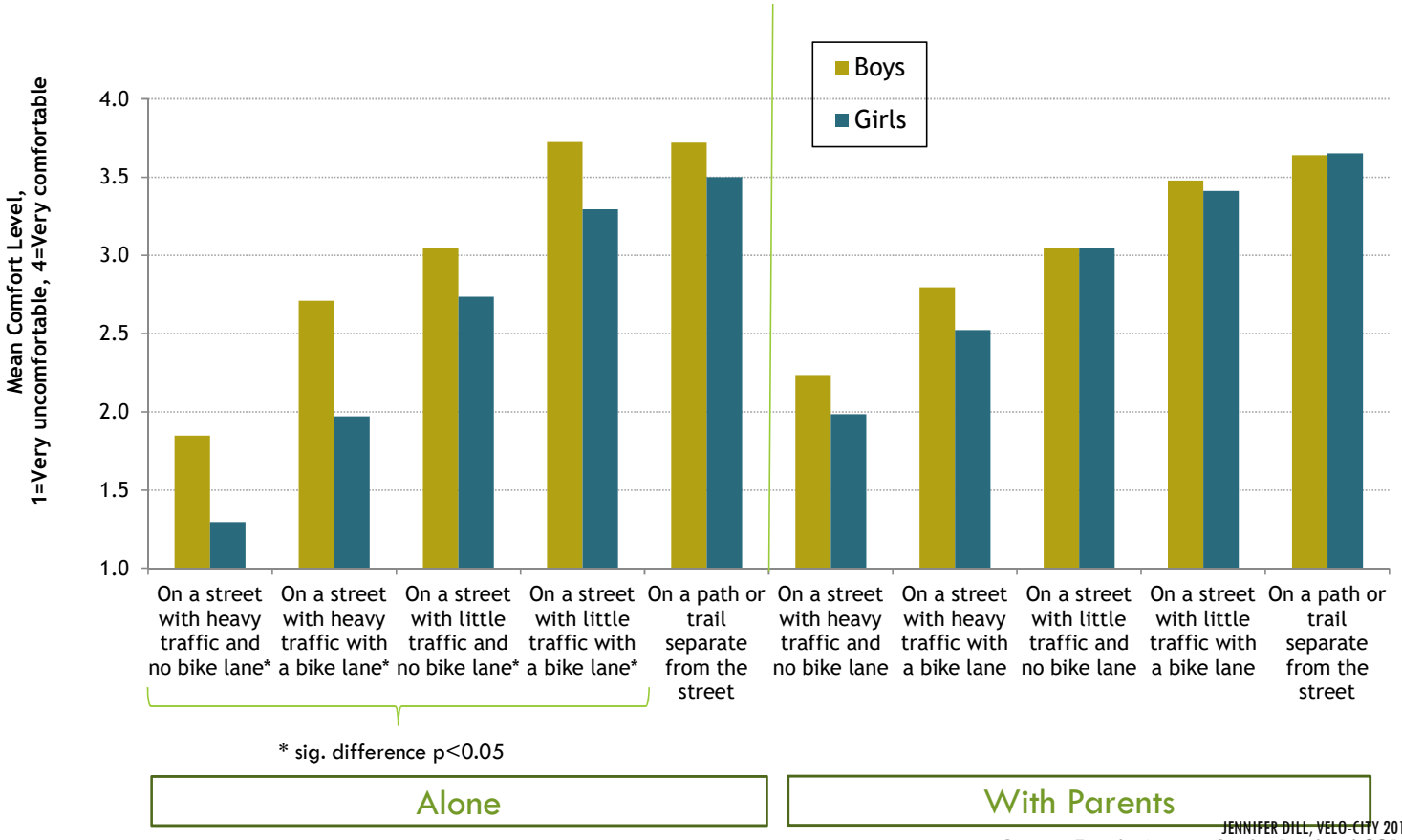
paved off-street multi-use paths
(77% likely to choose; average score = +0.5)

unpaved off-street multi-use paths
(71% likely to choose; average score = +0.4)

cycle paths next to major city streets separated by a barrier
(71% likely to choose; average score = +0.4)

residential street bicycle routes with traffic calming
(65% likely to choose; average score = +0.4)

Similar among tweens/teens in Portland



Source: Family Activity Study, Portland 2012-13 (Dill)

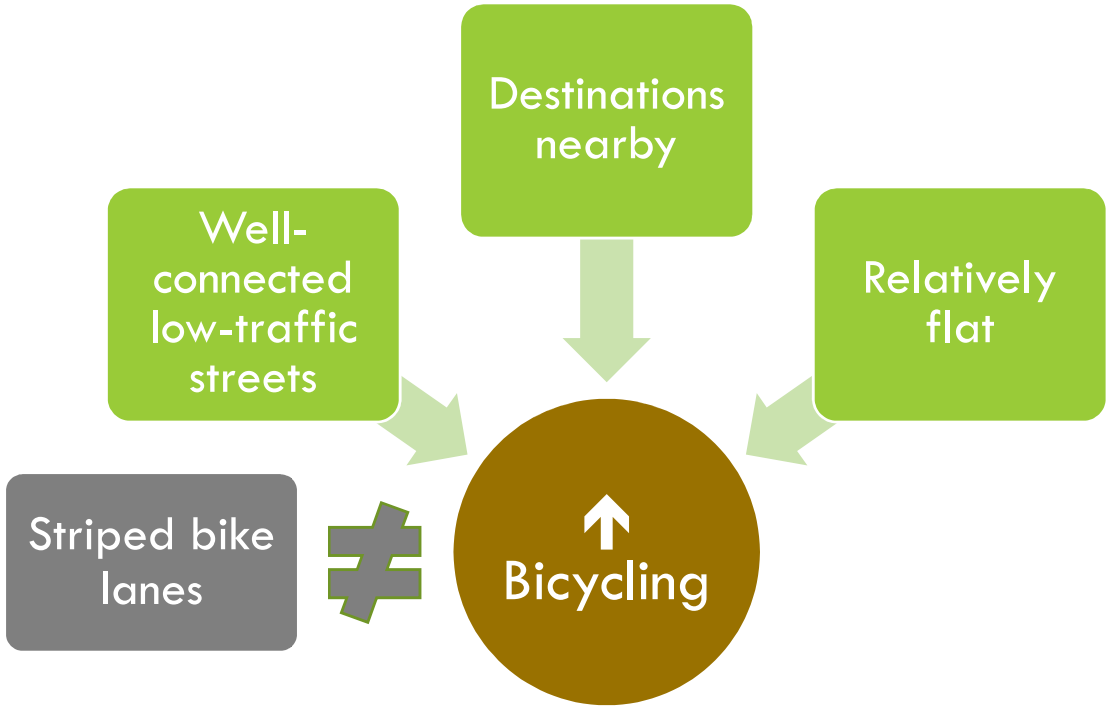
Revealed preference data

Striped bike lanes had no effect

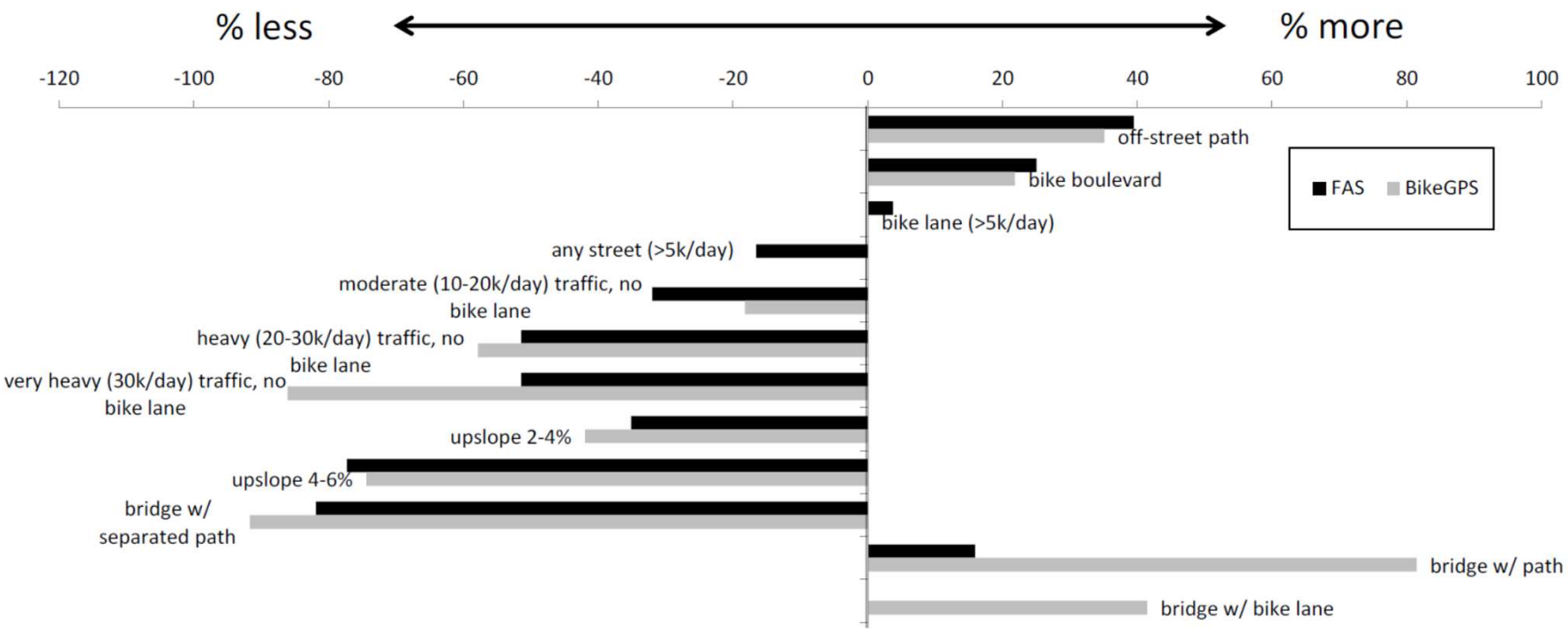
Adults living in Portland neighborhoods with these three elements were more likely to ride a bicycle for transport

Striped bike lanes had no effect on bicycling behavior.

Dill, Mohr, & Ma, "How can Psychological Theory help Cities Increase Walking and Bicycling?" *Journal of the American Planning Association*, Volume 80(1): 36-51, 2014.



Revealed preferences: Route choice (GPS data)



Revealed preference: Mode choice

Used the route characteristics to predict mode choice.

Gender matters for decisions of **whether** to bike

Bike boulevards can close the gender gap

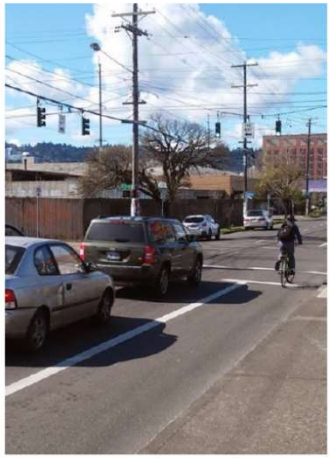
Broach, J. (2016). *Travel Mode Choice Framework Incorporating Realistic Bike and Walk Routes*. Portland State University. Retrieved from http://archives.pdx.edu/ds/psu/16897

Broach, J., Dill, J. (2016) Using Predicted Bicyclist and Pedestrian Route Choice to Enhance Mode Choice Models. *Transportation Research Record: Journal of the Transportation Research Board*, 52-59

Women vs. men, probability of biking for the trip

-38%

Overall, for similar trip



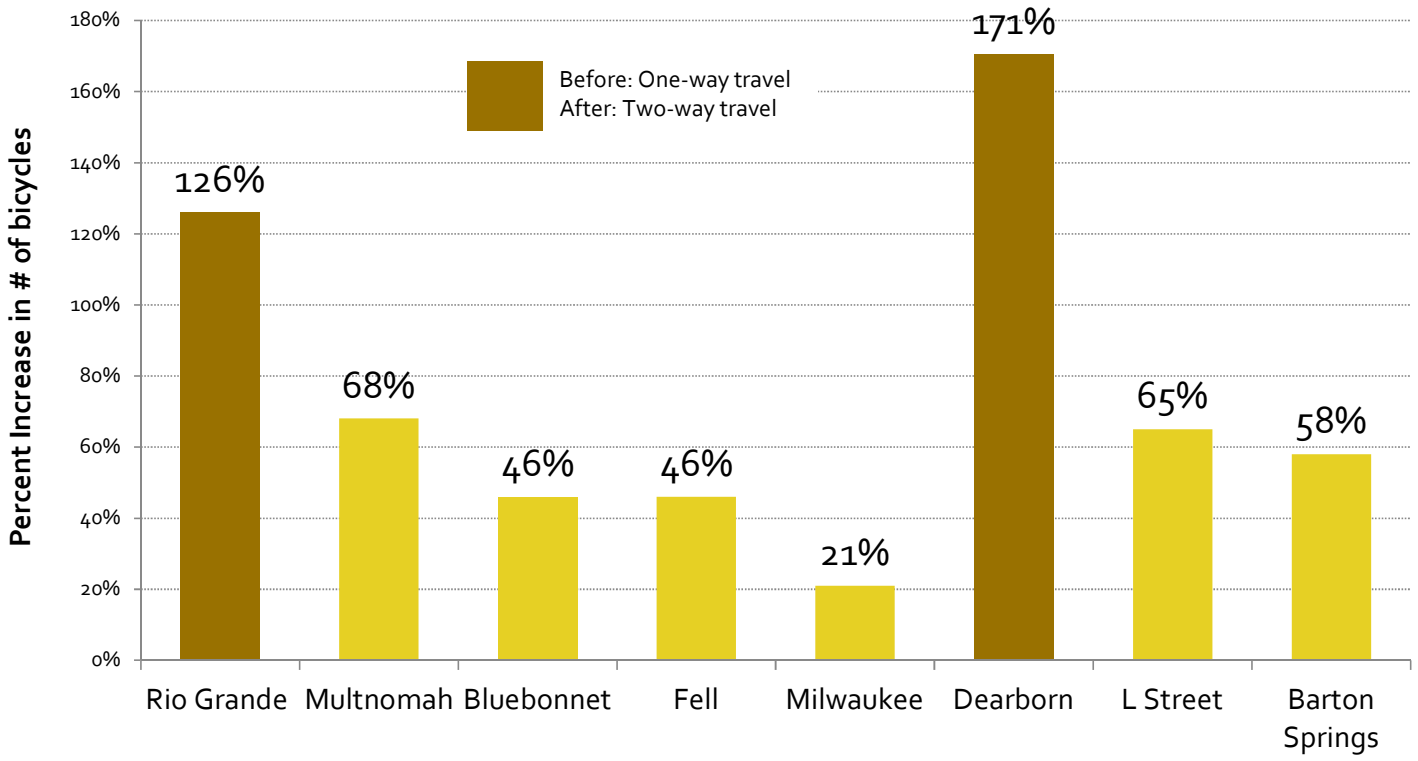
-70%

When "best" route entirely along moderate traffic streets (ADT 5-20k)

+68%

When "best" route entirely along low-traffic bike boulevard

Protected Lanes in 5 U.S. Cities

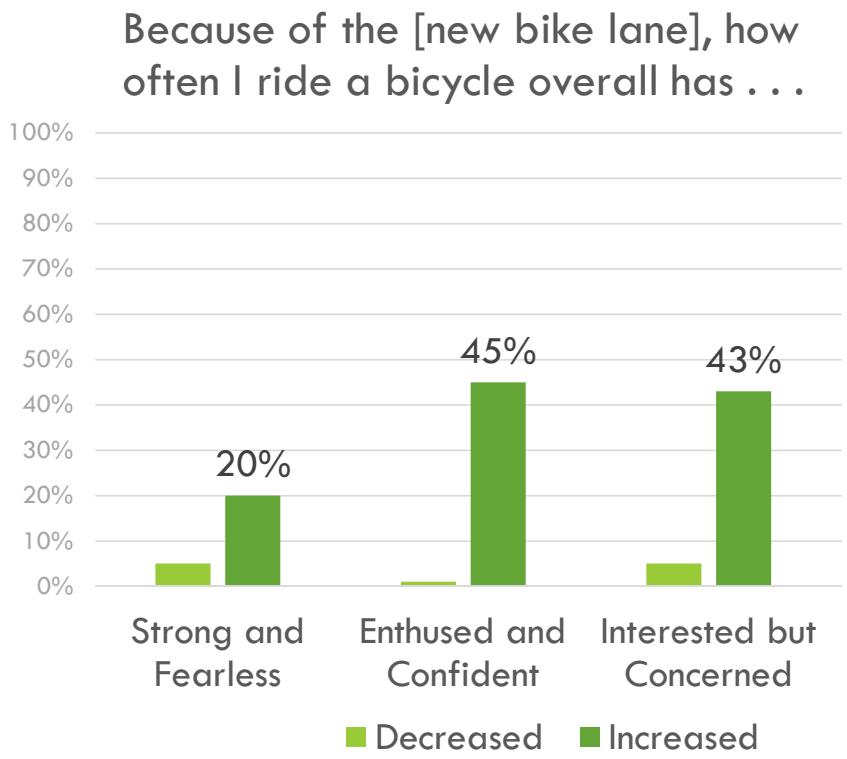


Lessons from the Green Lanes: Evaluating Protected Bike Lanes, NITC Final Report, http://bit.ly/nitc_583

Biggest effect on those who are not fearless

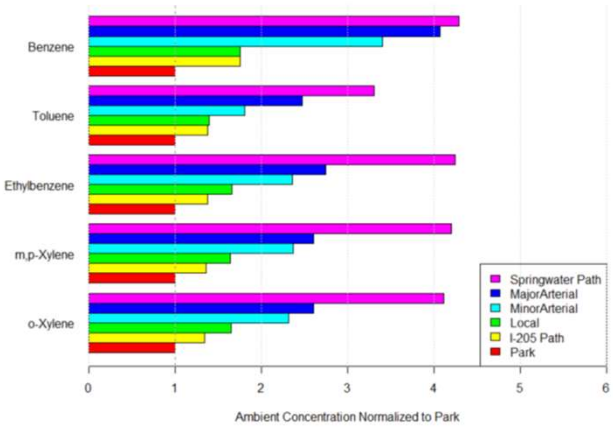
Enthused and Confident and Interested but Concerned cyclists say they are bicycling more because of the new protected bike lane

Lessons from the Green Lanes: Evaluating Protected Bike Lanes, NITC Final Report, http://bit.ly/nitc_583



Among residents living nearby who had ridden a bicycle on the new protected bike lane

Comfortable infrastructure ➔ cleaner air to breathe

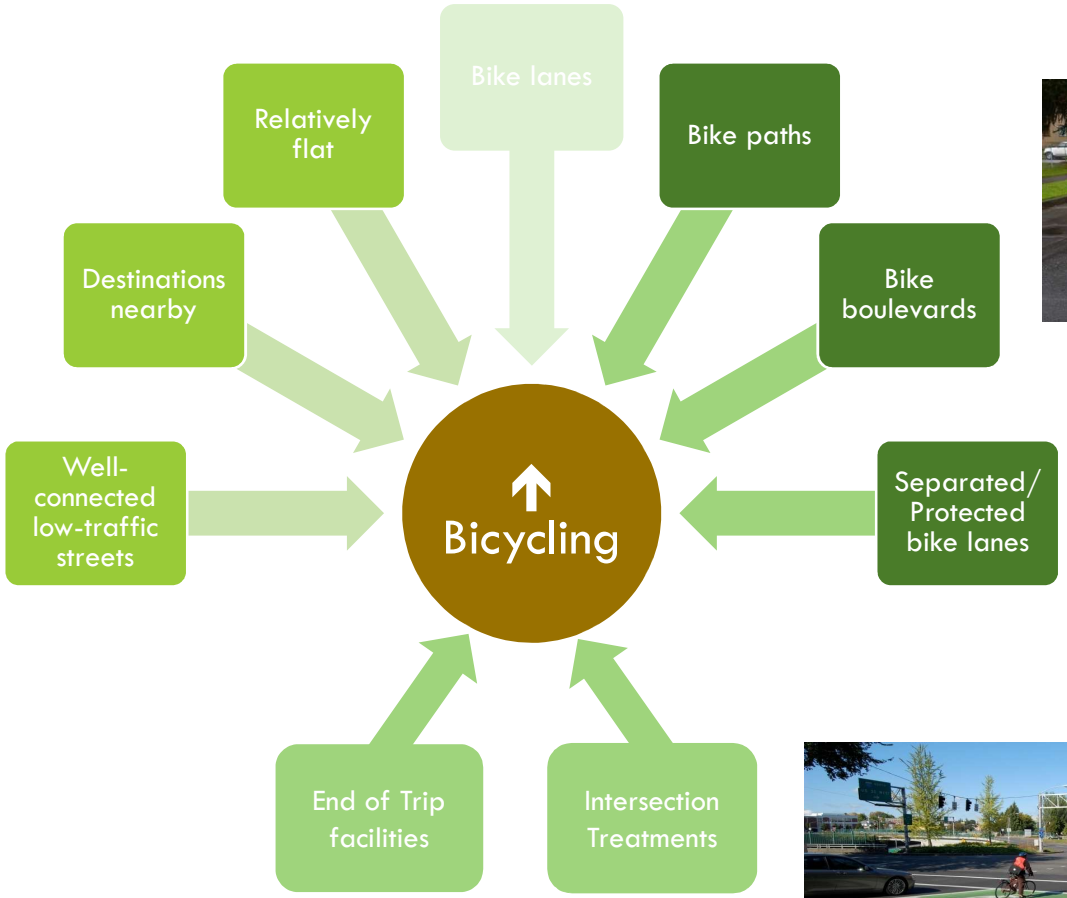


Evaluation of Bicyclists Exposure to Traffic-related Air Pollution Along Distinct Facility Types
https://trec.pdx.edu/research/project/560/

Bicyclists' Uptake of Traffic-Related Air Pollution: Effects of the Urban Transportation System
https://trec.pdx.edu/research/project/849/

Bigazzi, Alexander Y., Joseph Broach, and Jennifer Dill. "Bicycle route preference and pollution inhalation dose: Comparing exposure and distance trade-offs." *Journal of Transport & Health* 3.1 (2016): 107-113.

Facility	Air Pollution Considerations
Bike lane	• Bike lanes on high-volume streets lead to high exposure concentrations; each 10,000 ADT is associated with ~20% higher BTEX exposure concentrations • Provides some lateral separation, with concentration benefits versus in-lane riding • Dedicated right-of-way can reduce exposure duration during motor-vehicle congestion (exposure concentrations are 20-30% higher during stop-and-go riding)
Bike boulevard/ Neighborhood greenway	• Low exposure concentrations due to low ADT (only ~40% higher BTEX exposure than background) • Additional exposure concentration benefits from traffic calming/volume reductions • Fewer stops leads to lower inhalation doses (e.g., turning stop signs)
Cycle track	• Lateral separation reduces exposure ○ 8-38% lower UFP exposure concentrations than in the position of a bicycle lane (Kendrick et al., 2011) ○ ~30% lower CO for a three-meter increased distance from roadway centerline (Grange et al., 2014) • Fewer stops leads to lower inhalation doses
Off-street path	• Generally low exposure concentrations ○ ~50-60% higher BTEX than background for the I-205 and Springwater Paths, similar to mixed-traffic facilities of 0-5,000 ADT ○ ~25% lower BC and NO_2 than bike lanes (MacNaughton et al., 2014) • Nearby industrial land use can increase exposure dramatically (by 300% in a 2.5-kilometer industrial area of the Springwater Path) • Fewer stops leads to lower inhalation doses



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A place for the strong & fearless

A comfortable place for all ages, all abilities

More Information

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