Do Bicycles Reduce Passenger Car Travel Speeds on Urban Roads without Bicycle Lanes? Evidence from Roadways in Portland

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Background

Additional bikeways will be needed to accommodate larger volumes of bicycles as cities seek to expand their bicycle mode share. Shared-use roads can be a safe and economical solution to this growing demand. Bikeway design guidance recommends shared roads may be appropriate for low traffic volumes and speeds.

Results of a simulated traffic study have raised concerns that increased bicycle volumes will impede motor vehicles and cause additional traffic congestion or travel time delay unless bike lanes are installed on roadways, however.

This research presents a comparative analysis using empirical data from six locations without bicycle lanes in Portland.

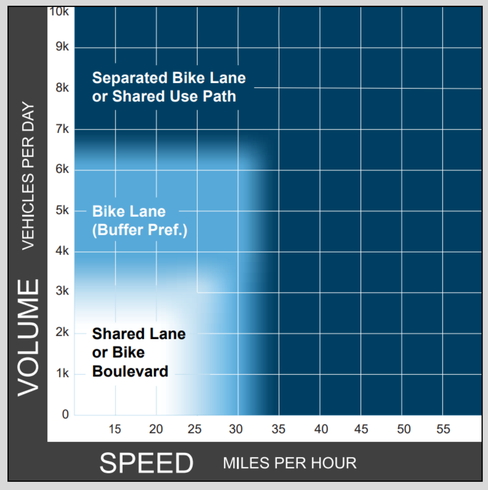
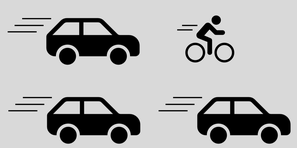


FIGURE 1—Preferred Bikeway Type for Urban, Urban Core, Suburban and Rural Town Contexts, Bikeway Selection Guide (FHWA, 2019)

Data Selection

Observations of class two vehicles (passenger cars) belonging to one of two vehicle configurations were selected for analysis based on the assumption that slower bicycle (class one vehicle) speeds may provoke reduced passenger car speeds before or during overtaking maneuvers when approaching a bicycle from behind.

Vehicle Configuration Scenarios



Scenario (i)

Scenario (ii)

TABLE 1—Data collection site characteristics. All sites had a 25 mph posted speed limit. Double yellow lines were placed within 40 ft. of a traffic control device at sites marked *.

Location	Road Markings	Grade %	Width (ft.)	ADT EB	ADT WB
Harrison W of 23rd	Sharrow	4.1	35.5	663	1084
Harrison W of 26th	Sharrow*	4.0	35.5	553	923
Harrison E of 27th	Sharrow*	4.3	35.5	1249	1462
Harrison W of 30th	Sharrow*	1.6	35.5	1594	1450
Lincoln E of 48th	Sharrow	1.4	34	642	719
Hawthorne E of 44th	Center left-hand turn lane	0	51 with 12 ft. center lane	NA	6568

Analysis

- Two-sample *t*-tests with the null hypothesis defined as scenarios (i) and (ii) having equal means.
- 95% confidence intervals for the 50th and 85th percentile speeds.
- Peak hour observations analyzed separately in addition to a 24-hour period.

FIGURE 2—Street view of Harrison, eastbound toward 30th.

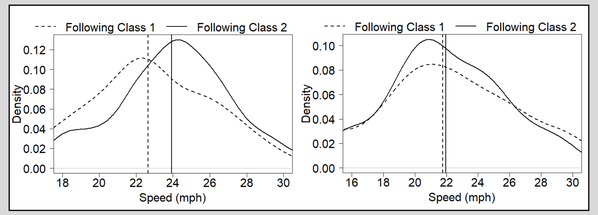


FIGURE 3—Empirical distributions with mean speeds for the 24-hour period at westbound Harrison east of 27th (left) and eastbound Harrison west of 23rd (right).

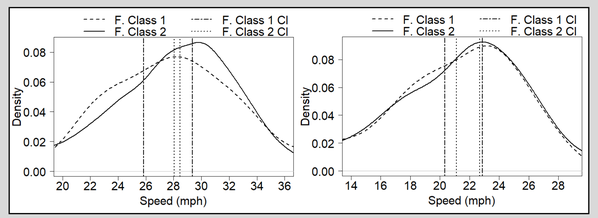


FIGURE 4—Peak hour 50th percentile confidence intervals for Hawthorne east of 44th, westbound (left) and Harrison west of 26th, eastbound (right).

TABLE 2—*t*-test between mean speeds for the 24-hour period.

Location		N Scenario (i)	N Scenario (ii)	Mean (mph) Scenario (i)	Mean (mph) Scenario (ii)	t-Statistic	p-Value
Harrison W of 23rd	EB	146	149	21.77	21.95	-0.34	0.731
	WB	462	379	24.54	24.88	-1.16	0.246
Harrison W of 26th	EB	220	471	21.22	21.39	-0.46	0.648
	WB	350	767	21.95	21.86	0.32	0.753
Harrison E of 27th	EB	148	591	22.95	23.32	-0.95	0.341
	WB	181	629	22.66	23.93	-4.07	6.0 E-05*
Harrison W of 30th	EB	496	1108	22.45	23.06	-3.02	2.6 E-03*
	WB	479	980	22.58	22.99	-1.99	0.047*
Lincoln E of 48th	EB	323	2720	22.24	22.05	0.68	0.495
	WB	286	2895	21.93	22.5	-2.21	0.027*
Hawthorne E of 44th	WB	28	9041	24.21	27.48	-2.59	0.015*

Key Findings

- Statistically significant differences in speed were found to be negligible from a practical perspective, on the order of one mile per hour or less in most instances (TABLE 2).
- A difference of approximately 3 mph was seen at one location serving traffic volumes well in excess of the recommended 2500 ADT for shared roads.
- Peak hour *t*-test results and the 95% confidence intervals did not support the statistically significant results of the 24-hour period *t*-tests.
- Scatterplots and correlation coefficients close to zero indicated the absence of a relationship between gap time and speed for both traffic scenarios at all sites
- Double yellow lines may inhibit overtaking behavior.
- High occupancy of street parking removes effective width for passing and may contribute to minor differences in speeds.
- The magnitude of speed differences was smaller at locations where sharrows were present.

Conclusion

The results of this research indicate that bicycles do NOT reduce passenger car speeds by a practically significant amount provided the recommended bikeway design parameters are followed.

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