Speed Management in Small Rural Communities

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Moving Research into Practice
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Introduction

• Rural communities often located along major state or county highways
• Major roadway also serves as community main street
• High speeds outside + small community footprint lead to speeding within the community
• Lack of sidewalks result in main street serving as shared space
  • Pedestrians
  • school zones
  • Bicyclists
• Affects quality of life
Rural Challenges

• **31%** of fatalities are speeding-related

• **1.6 to 2 times** increased EMS response time in rural areas
  - increased distances
  - reliance on volunteer EMS

• 2 to 3 times higher fatal injury crash rate than urban

• Pedestrians **2x** as likely to be killed in a rural area than in an urban area

• Combination of high speeds and decreased access to EMS = more severe outcome
Rural Challenges

• Treatments used in urban areas not always appropriate
• Lack of engineering staff and resources
• Main road within community serves as common area (pedestrians, school zone, bicyclists)
• Different driver/vehicle mix
  • Higher proportion of older drivers
  • Farm vehicles
  • Driver expectations
Objectives in Rural Speed Management

- Reduce speeds as drivers enter communities
  - Appropriately set transition zones
  - Remind drivers of changing land use
- Maintain reduced speeds within community
What is the most significant safety problem in your small rural communities?

A. Speeding within the transition zone
B. Speeding within the rural community itself
C. Speeding at specific locations (for instance within school zones)
D. Speeding in all locations
E. Not applicable (I don’t work with small rural communities)
Types of Countermeasures

• Pavement markings
• Traffic control devices
• Gateway signing
• Horizontal physical displacement
• Vertical physical displacement
  • Vertical friction
  • Lane narrowing
  • Changes driving path
• Enforcement
Question 2

To what extent have you tried speed management in small rural communities (or within the transition zone)

A. Not used at all
B. Has been tested but not widely used
C. Limited use
Pavement Markings

• Low cost and easily installed
• Passive speed control
• Fulfils one or more functions
  • Get driver’s attention
  • Reinforce message (i.e. speed limit)
  • Perceptual measures: change driver's perception of what is an appropriate travel speed
• Are within driver’s line of sight
Lane Narrowing Using Pavement Markings

• Reduces lane width, creates feeling of constraint
• Pavement markings provide visual narrowing
• Increase center island median
• Widen shoulders

Mixed results, some sites increased while others had minor decreases
Reinforcing On-pavement Signing

- Reinforces regulatory or warning signs
  - speed limit
  - stop ahead
  - pedestrian crossing
- Should match corresponding signing
- Should supplement not replace signing

- Two sites had moderate decrease in mean speed while two sites had moderate increases
- Two sites had decreases of 2 mph in 85th percentile speed and two sites had no change
- Similar results for vehicles traveling >10mph over the speed limit
On-pavement messages

- Provides additional message
  - "SLOW"
- Effectives of "SLOW"

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Perceptual Pavement Markings

• Change driver's perception of what is an appropriate travel speed
• Spacing and size change to give feel that driver is speeding up
• Or provide illusion of other objects (i.e. speed table)
• Should not “startle” driver or create false hazard
Transverse or Optical Speed Markings

- Spaced at decreasing intervals to give sense of “speeding up”
- Also provides sense of lane narrowing
- Used in advance of point where drivers should slow
- Paint or thermoplastic

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- Mean: decrease ~ 1 mph
- 85th percentile: decrease of 1 to 2 mph
- >10mph: 1 to 6% decrease in fraction
- >15mph: 4 to 12% decrease in fraction of vehicles
Converging Chevrons

• Smaller in size and closer as driver progresses towards community

• Tested at 2 community entrances in 1 community

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- Mean: ~1 mph
- 85th percentile: 1-4 mph (1 and 12-months),
- >10 mph: 16% to 59% decrease
- >15 mph: 16 to 92% decrease in fraction of vehicles
Colored Entrance Treatment

- Commonly used in Europe
- Modified for rural US conditions
- Usually placed within transition zone to slow speeds entering
- Modified treatment
  - Used paint for Phase I (wore very quickly)
  - Used thermoplastic for Phase II
**Simple Colored Entrance Treatment**

- Modified treatment
  - Used paint for Phase I (wore very quickly)
  - Used thermoplastic for Phase II
- Tested at 6 locations in 3 communities

- **Mean:** 1-4 mph decrease
- **85th percentile:** 2 to 5 mph decrease
- **>10 mph:** 37 to 74% decrease in fraction of vehicles
- **>15 mph:** 0 to 100% decrease in fraction of vehicles
Dragon’s Teeth

• Used in Europe similar to transverse bars or converging chevrons

• Use
  • Usually as “gateway” treatment
  • In Sydney, Australia in advance of school zones
Modified Colored Entrance Treatment

• Added dragon’s teeth in one community at 12-months (as per MUTCD experimental approval request)

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Question 3

Have you tried any of the following for speed management in small rural communities? (check all that apply)

A. Lane narrowing using pavement markings or physical narrowing's
B. On pavement signing (speed limit, SLOW, etc.)
C. Perceptual markings (optical speed bars, converging chevrons, etc.)
D. Colored entrance treatments
E. None of the above
Signing

- Regulatory or warning
- Dynamic speed feedback signs
- Beacons
- Community entrance markers
- No information on effectiveness
Dynamic speed feedback signs (DSFS)

- Set to activate at certain threshold
  - Typically > 50th percentile speed
- Various types of displays
  - Speed feedback displays speed
  - Static message such as “Slow Down”
  - Alphanumeric
Dynamic speed feedback signs (DSFS)

- Tested 4 different sign message types

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Question 4

Enforcement is not a traffic engineering measure but how extensively have you used enforcement for speed management in small rural communities?

A. Use periodically for “trouble” locations
B. Use regularly within transition zones
C. Use regularly within community
D. have regular patrol within larger jurisdiction (for instance, officers patrol communities within county)
E. Do not widely use
Horizontal physical displacement

• Encourages speed reduction due to change in horizontal alignment
• Temporary or permanent
• Changes driving path
• Considerations for rural communities
  • typical vehicle
    • Farm vehicles
    • Truck route
  • driver expectation
  • winter and normal maintenance
• Typical measures
  • Physical road narrowing
  • Road diet
  • chicanes
Question 5

When considering treatments, what is the most important consideration (besides cost and effectiveness)?

A. Accommodation of specific vehicles (i.e. ag vehicles, large trucks)
B. Consideration of design drivers (i.e. older drivers)
C. Roadway characteristics (i.e. pavement type, cross section)
D. Other (put a note in comment box)
Vertical physical displacement

• Encourages speed reduction due to change in vertical alignment or sense of vertical friction

• Considerations for rural communities
  • typical vehicle
    • Farm vehicles
    • Truck route
  • driver expectation
  • winter and normal maintenance
  • Roadway speed

• Typical measures
  • Landscaping
  • Planned on-street parking
  • Physical devices
Vertical Deflection Island

- Channelizer posts to create island
- Narrows lane and provides vertical friction
- Maintenance was issue

- Mean speed: 2 to 3 mph @ 1-mo, 1-2 mph @ 12 months
- 85th percentile speed: 2-3 mph @ 1-mo, 1 mph @ 12-months
- >10mph over posted: 33 to 53% decrease @ 1-mo, 13-32% decrease @ 12-months
- >15mph over posted: 50% decrease @ 1 mo, 13-23% @ 12-months
Vertical Deflection Island

- Modified vertical island in Phase I to curbing in Phase II
  - Less intrusive
  - Less maintenance

- Mean: 0-2 mph decrease
- 85th percentile: 0 to 3 mph decrease
- >10 mph: 11 to 46% decrease in fraction of vehicles
- >15 mph: 0 to 71% decrease @ 1 mo and 13 to 23% @ 12-months
Speed Table

- Designed for 30 mph
- Within community
- Designed for removal if needed

- Mean: ~4 mph decrease
- 85th percentile: ~4 mph decrease
- >10 mph: ~90% decrease
- >15 mph: 83 to 91% decrease in fraction of vehicles
Have you tried any of the following for speed management in small rural communities? (check all that apply)

A. Static signing  
B. Gateway signing  
C. Dynamic speed feedback signs  
D. Flashing beacons  
E. Landscaping  
F. Vertical treatments  
G. Speed hump/speed table  
H. None of the above
Recommendations for Speed Management in Rural Communities

• Get community buy-in
• Consider design vehicles
• Consider maintenance especially for small communities with limited resources
• Consider more durable markings for on-pavement treatments
Recommendations for Speed Management in Rural Communities

• Ensure MUTCD compliance (many rural communities/enforcement not aware)
• Countermeasures at transition zones may not be sufficient
  • Need to reinforce within communities
InTrans/MTC Resources

- **Toolbox for rural speed management**
  - [www.intrans.iastate.edu/research/documents/research-reports/rural_traffic_calming_toolbox_w_cvr.pdf](http://www.intrans.iastate.edu/research/documents/research-reports/rural_traffic_calming_toolbox_w_cvr.pdf)

- **Phase I study on rural traffic calming treatments**
  - [www.intrans.iastate.edu/research/projects/detail/?projectID=226410767](http://www.intrans.iastate.edu/research/projects/detail/?projectID=226410767)

- **Phase I study on rural traffic calming treatments**
  - [www.intrans.iastate.edu/research/projects/detail/?projectID=43176957](http://www.intrans.iastate.edu/research/projects/detail/?projectID=43176957)
Question 7

What resources have you used to find information about speed management in rural communities?

A. MTC/InTrans resources (examples on previous slide)
B. Information from FHWA Speed Management Webpage
C. Reports, tech briefs from groups other than FHWA
D. Other (you may share if desired in the chat box)
Additional Resources

• FHWA Speed Management webpage
  • http://safety.fhwa.dot.gov/speedmgt/ref_mats/

• Speed Management: A Manual for Local Rural Road Owners
  • http://safety.fhwa.dot.gov/local_rural/training/fhwasa010413spmgmt/speedmanagementguide.pdf
• Neal Hawkins (Hawkins@iastate.edu)
• Shauna Hallmark (shallmar@iastate.edu)

• Road Safety Toolkit.  

• http://www.felmersham.net/images-netnews11/road-gate.jpg

  http://www.wiltshire.gov.uk/parkingtransportandstreets/roadshighwaysstreetcare/costwiltshighwaysworks.htm