Using Health Behavior Theory and Relative Risk Information to Increase and Inform Use of Alternative Transportation

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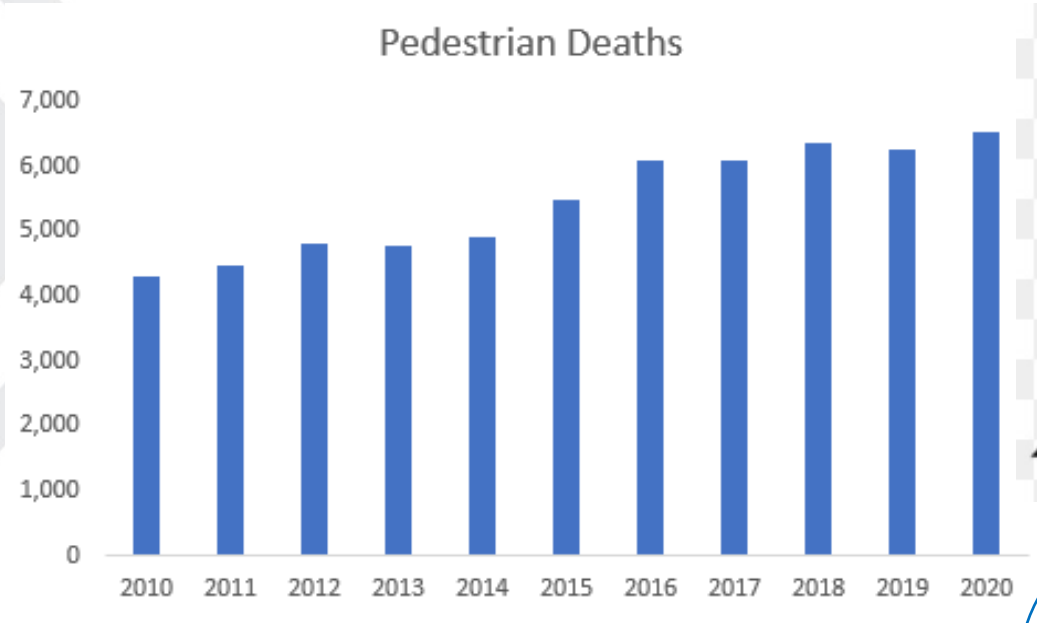
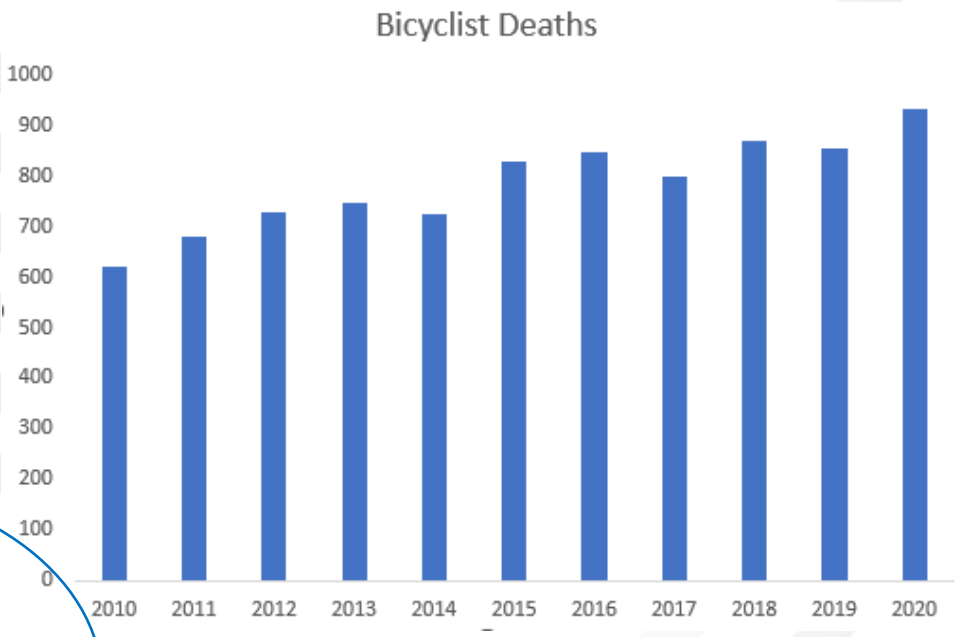
Introduction

Walking & Biking

- Increased activity – COVID
- Injury rate estimates key to safety interventions
- Not many estimates of exposure available beyond
  - Population
  - Sex
  - Age groups
  - Race/ethnicity

Pedestrian and Bicyclist Fatalities by Year (IIHS)





Does not account for exposure!!
Nothing about risk.
Sub-population comparisons hard.

Measure of Injury Risk/Rate

$$\frac{\text{Count of injuries (numerator)}}{\text{Population (or some other denominator)}}$$

Numerators

Data Sources	Strengths/ Limitations
FARS	↑ National – all fatalities ↕ Only MV
TX CRIS/ Crash Data	↑ Statewide – all severities ↕ Only MV
Specialized study/survey	↑Specific definition / population ↓Limited generalizability ↓No annual data; trends difficult
Public Health Surveillance	↑Non-MV + MV events ↓Not widely used ↓Little more difficult to use

Measure of Injury Risk/Rate

$$\frac{\text{Count of injuries (numerator)}}{\text{Population (or some other denominator)}}$$

Denominators

Data Sources	Strengths/ Limitations
Population	↑ Most common (easy) ↑ Demographic groups ↕ Estimate of burden not risk (Beck et al., 2007)
Number of person-trips (daily)	↓Not all trips the same
Trip duration (time)	↑Helps account for trip variation/time exposed ↑Useful for accounting for age differences
Trip distance (similar to VMT)	↑Helps account for trip variation/ distance exposed

Research Objective

- Identify candidate numerator data
  - Injury surveillance systems - EMS and Trauma Registry
- Estimate exposure-based denominator data from National Household Travel Survey (NHTS) and census
- Estimate injury rates for Texas based on exposure
  - Trip counts
  - Trip miles (distance)
  - Trip duration (time)

Texas (DSHS) Numerator Data
(EMS and Trauma Registry 2018-2020)

EMS "runs": a resulting action from a call for assistance where an EMS provider is dispatched to, responds to, provides care to, or transports a person. That includes trauma and medical, emergency and non-emergency, transport and non-transport runs.

Trauma registry: All traumatic brain injuries (TBI), spinal cord injuries (SCI), and submersions.
Plus:

- patient died; OR
- patient admitted for more than 48 hours; OR
- patient was transferred into your hospital; OR
- patient was transferred out to another hospital

Trauma Registry

Numerator Data (EMS and Trauma Registry) Variables Requested

EMS	Trauma Registry
Age	Patient's home county
Gender	Age
Race	Race / ethnicity
County of Incidence	Sex
Cause of Injury	Injury incident date
Hospital Disposition	Work related?
County of Residence	Icd-10 primary external cause code
Work Related Illness/ Injury	Icd-10 place of occurrence external cause code
Mechanism of Injury	Icd-10 injury diagnoses
Complaint reported dispatch	Incident location zip
Incident location type ICD-10	Incident county
-	Incident city

ICD-10 Codes for Injury Type Identification

Pedestrian injured in transport accident (V00 - V09)
V00 Pedestrian conveyance accident
V01 Pedestrian injured in collision with pedal cycle
V02 Pedestrian injured in collision with two- or three-wheeled motor vehicle
V03 Pedestrian injured in collision with car, pick-up truck or van
V04 Pedestrian injured in collision with heavy transport vehicle or bus
V05 Pedestrian injured in collision with railway train or railway vehicle
V06 Pedestrian injured in collision with other nonmotor vehicle
V09 Pedestrian injured in other and unspecified transport accidents
Pedalcycle rider injured in transport accident (V10 - V19)
V10 Pedal cycle rider injured in collision with pedestrian or animal
V11 Pedal cycle rider injured in collision with other pedal cycle
V12 Pedal cycle rider injured in collision with two- or three-wheeled MV
V13 Pedal cycle rider injured in collision with car, pick-up truck or van
V14 Pedal cycle rider injured in collision with heavy transport vehicle or bus
V15 Pedal cycle rider injured in collision with railway train or railway vehicle
V16 Pedal cycle rider injured in collision with other nonmotor vehicle
V17 Pedal cycle rider injured in collision with fixed or stationary object
V18 Pedal cycle rider injured in noncollision transport accident
V19 Pedal cycle rider injured in other and unspecified transport accidents

Denominator Data (Methodology)

- TTI developed the original approach for FHWA-SA-18-032 based on data from the American Community Survey and the National Household Travel Survey

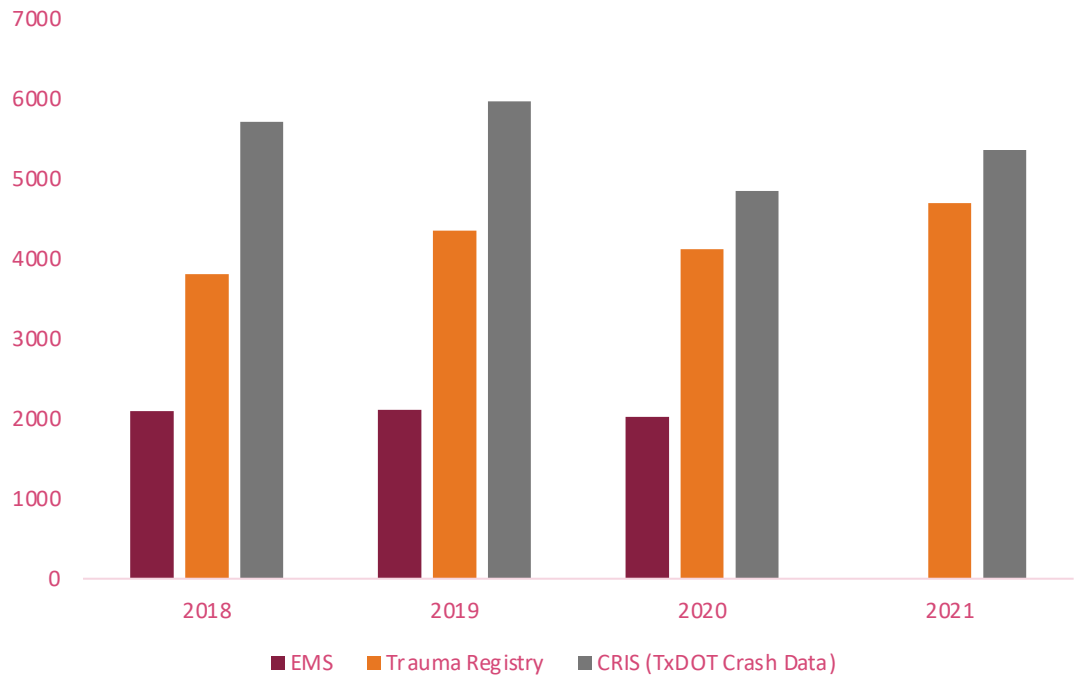
- Turner, S. M., Sener, I. N., Martin, M. E., White, L. D., Das, S., Hampshire, R. C., ... & Wijesundera, R. K. (2018). *Guide for scalable risk assessment methods for pedestrians and bicyclists* (No. FHWA-SA-18-032). United States. Federal Highway Administration. Office of Safety.

Denominator Data (Methodology)

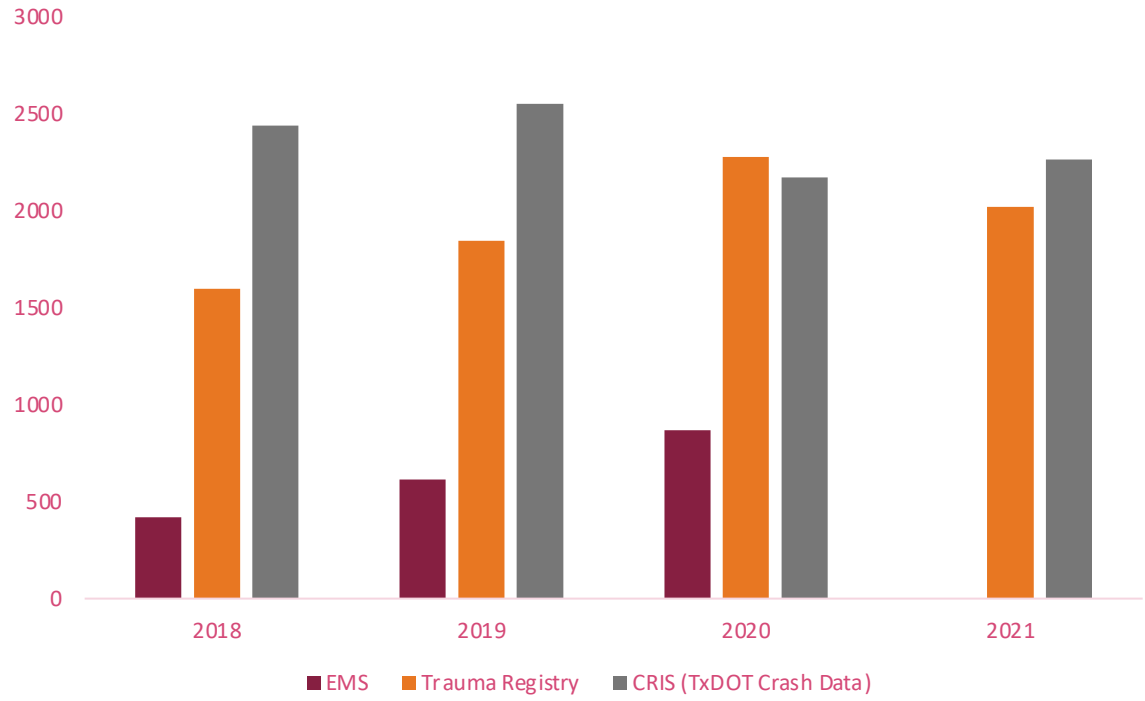
- Accordingly, three different exposure measures (denominators) were estimated
  - Total estimated annual trips
  - Total estimated annual miles travelled
  - Total estimated annual hours travelled
- Assume trip rate to be constant
- Apply American Community Survey Annual Population Estimates (2020 not final due to COVID)
- Extrapolate exposure estimates beyond 2017

RESULTS

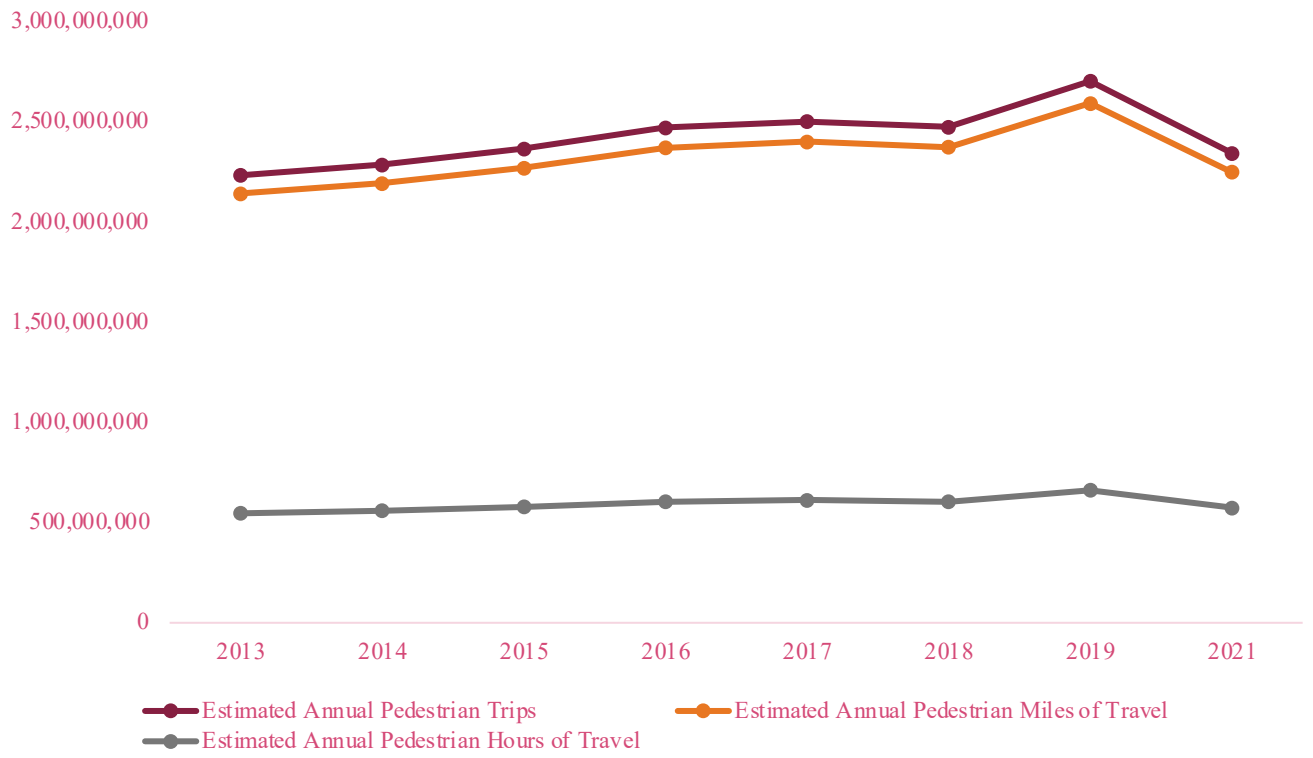
Numerator Data: Pedestrians (Texas)



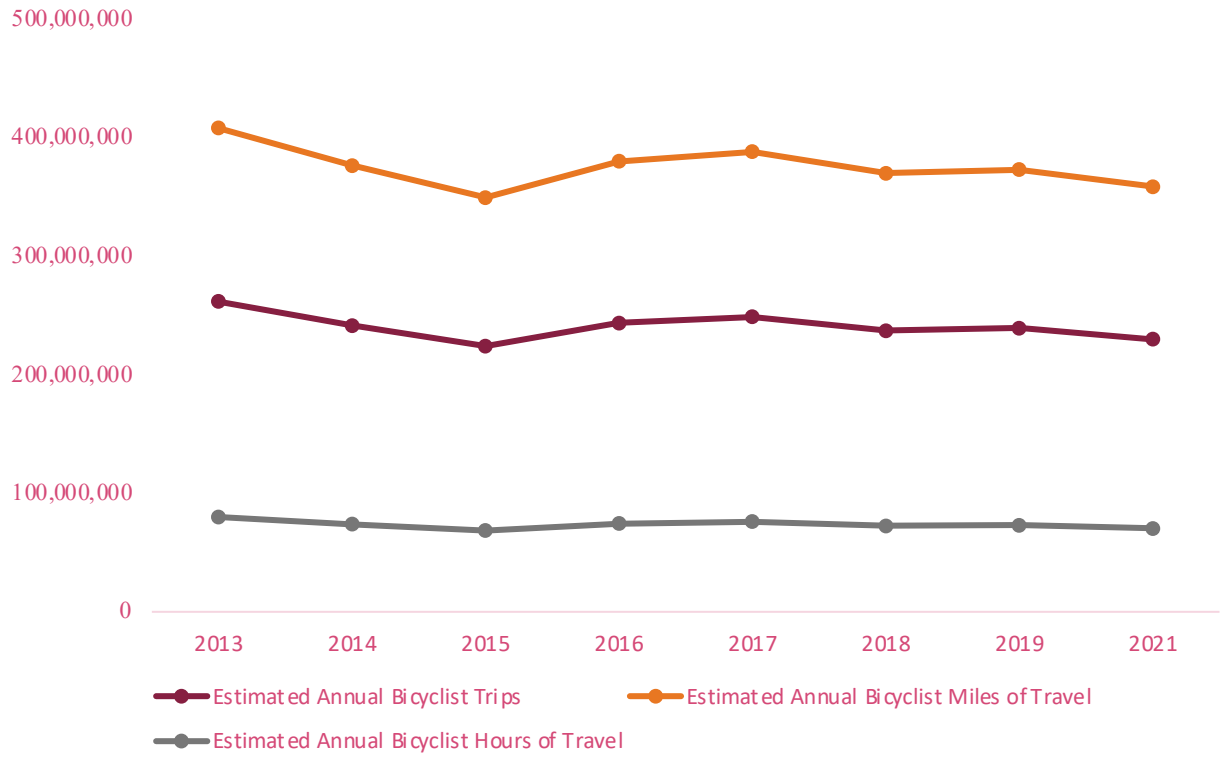
Numerator Data: Pedalcyclists (Texas)



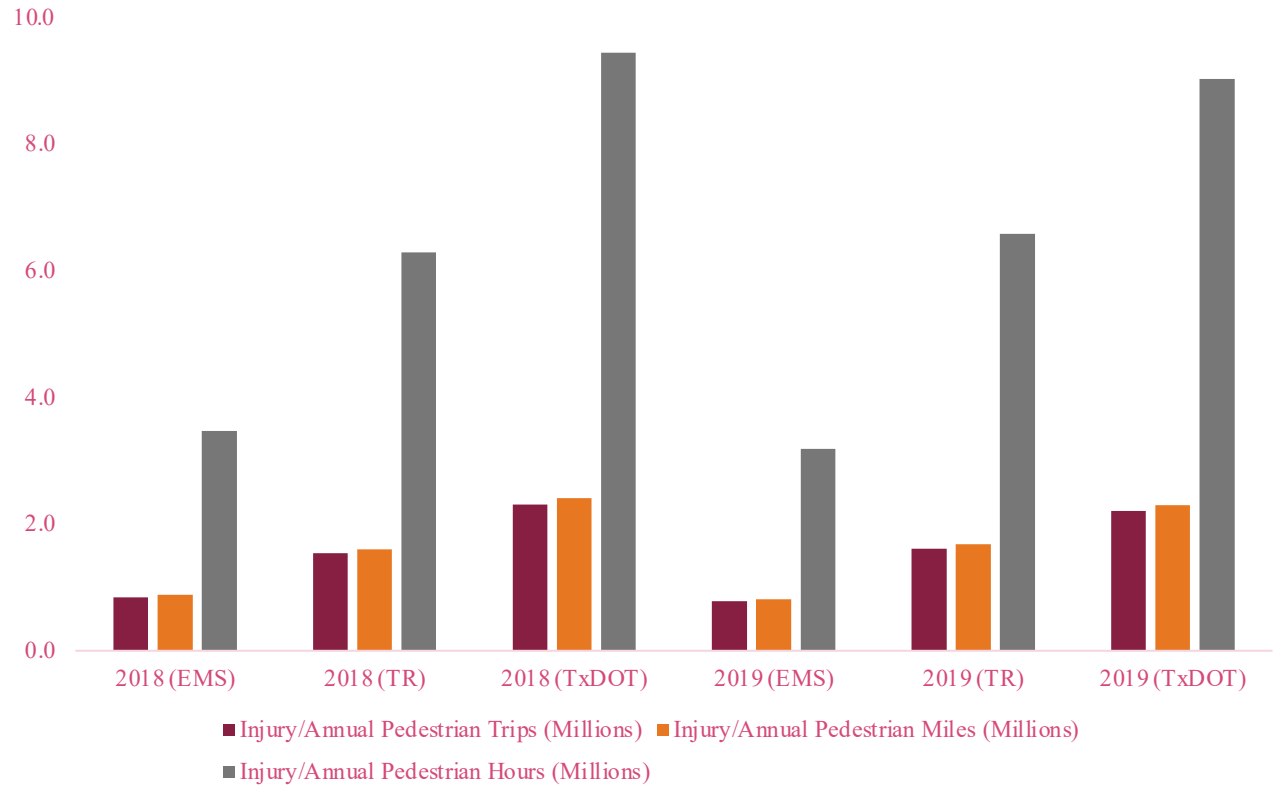
Denominator Data: Pedestrians (Texas)



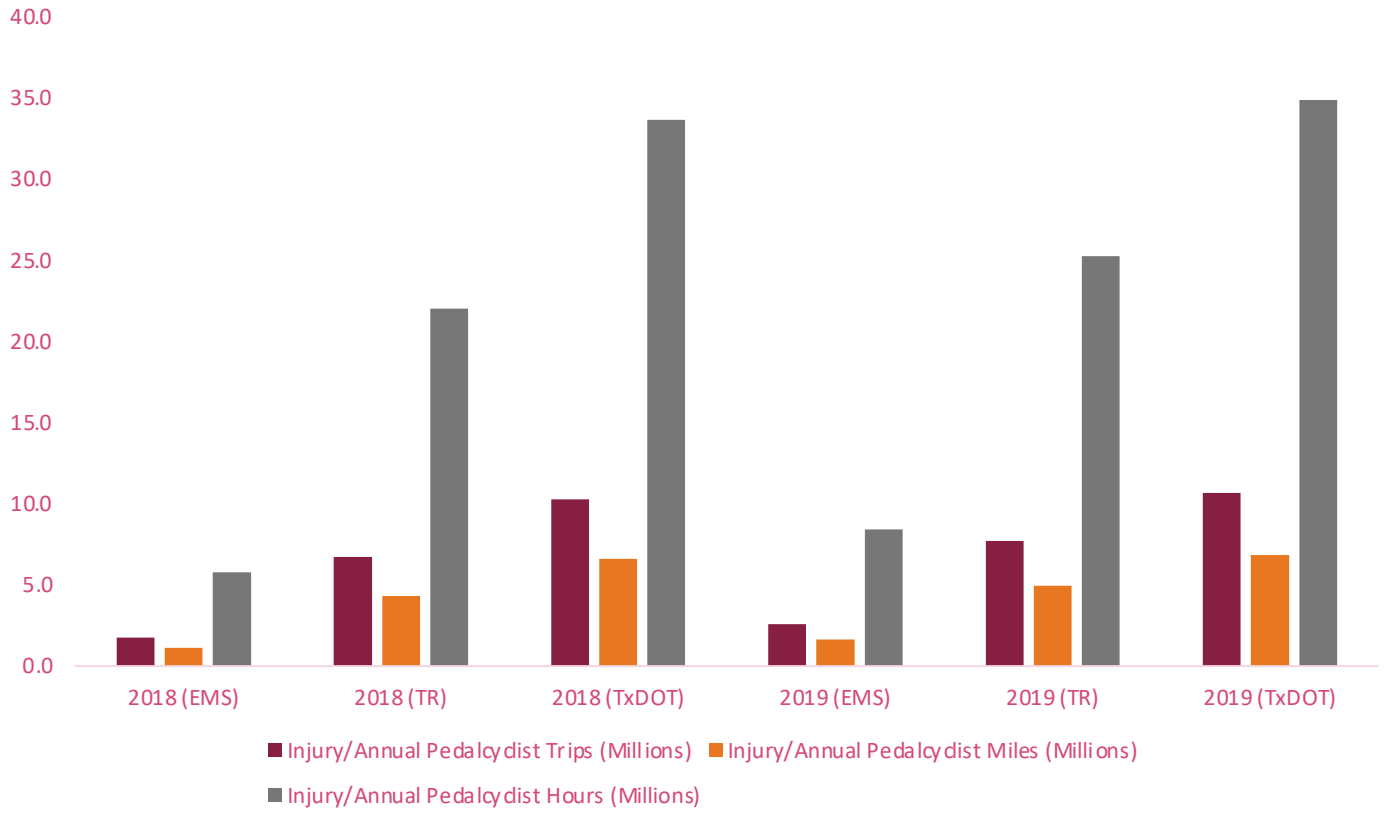
Denominator Data: Pedalcyclists (Texas)



Injury Rate: Pedestrians (Texas)



Injury Rate: Pedalcyclists (Texas)



FHWA-SA-18-032 Tool

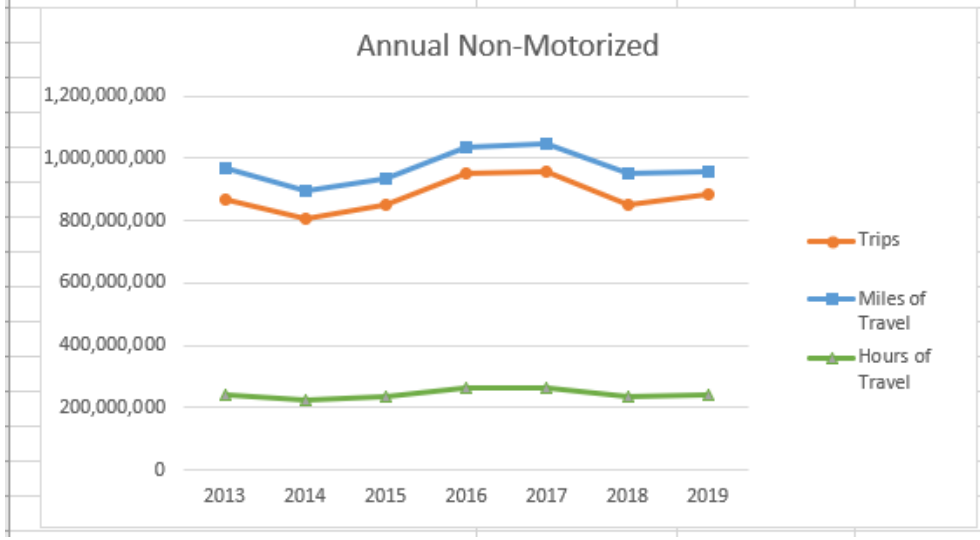
Guide for scalable risk assessment methods for pedestrians and bicyclists

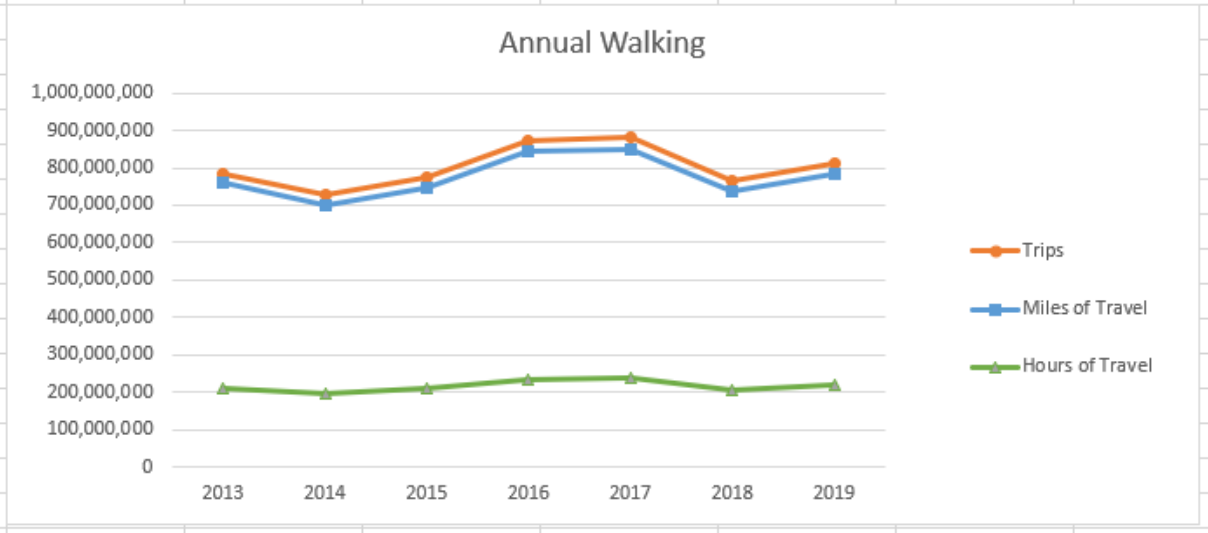
Statewide Area Exposure Estimates

1. Select **State** of interest
2. Select the source (Default or User Input) of the required inputs. For the User Input option, values are required in the cell below.

State: Virginia

Estimated Annual Non-Motorized Hours of Travel	240,547,674	222,885,750	234,782,340	201,454,211	205,850,320	253,228,700	242,343,584
Non-Motorized Fatalities	83	100	92	132	123	0	0
Non-Motorized Fatalities/Million Hours of Travel	0.345	0.449	0.392	0.505	0.466	0.000	0.000





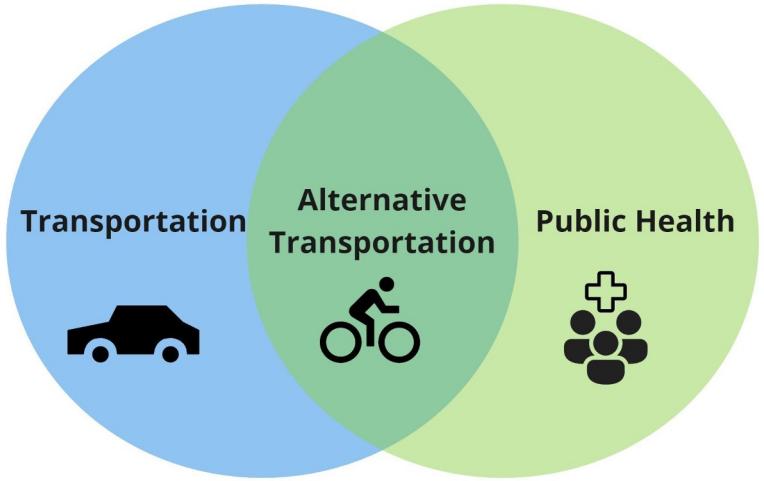
UNDERSTANDING THE ATTITUDES, PERCEPTIONS, AND BELIEFS OF ALTERNATIVE TRANSPORTATION WITHIN THE VIRGINIA TECH COMMUNITY

BACKGROUND

- Alternative transportation is comprised of using any method of transportation that does not include driving alone. This can include:
  - Walking
  - Biking
  - Busing
  - Scooter/skateboard
  - Carpooling

BACKGROUND-FORMATIVE EVALUATION

- Alternative transportation can be a solution to transportation gaps and can encourage better environmental and behavioral health choices.



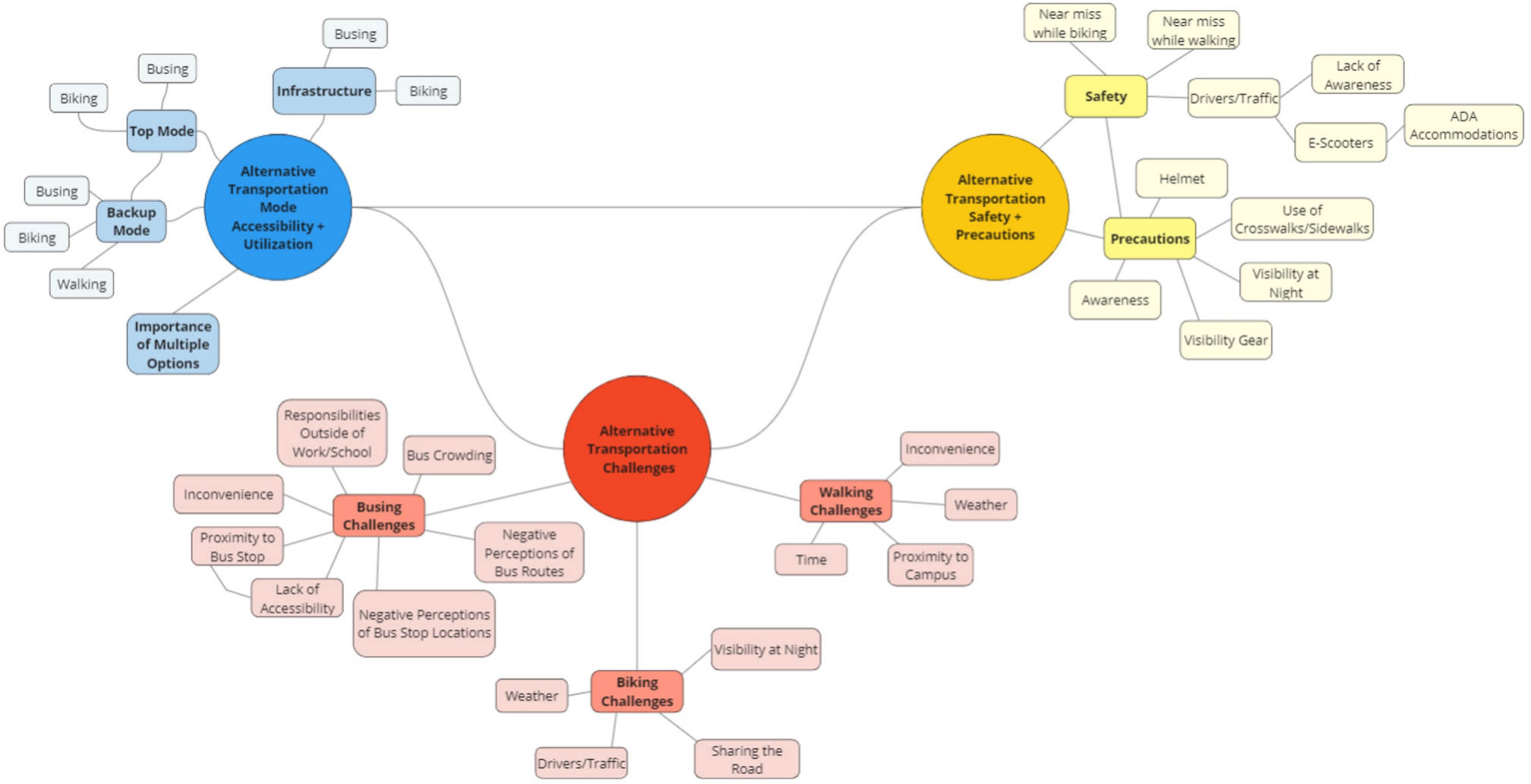
- The purpose of this project was to explore attitudes, perceptions, and beliefs involved in decisions regarding use of alternative transportation by faculty, staff, and students.

METHODS

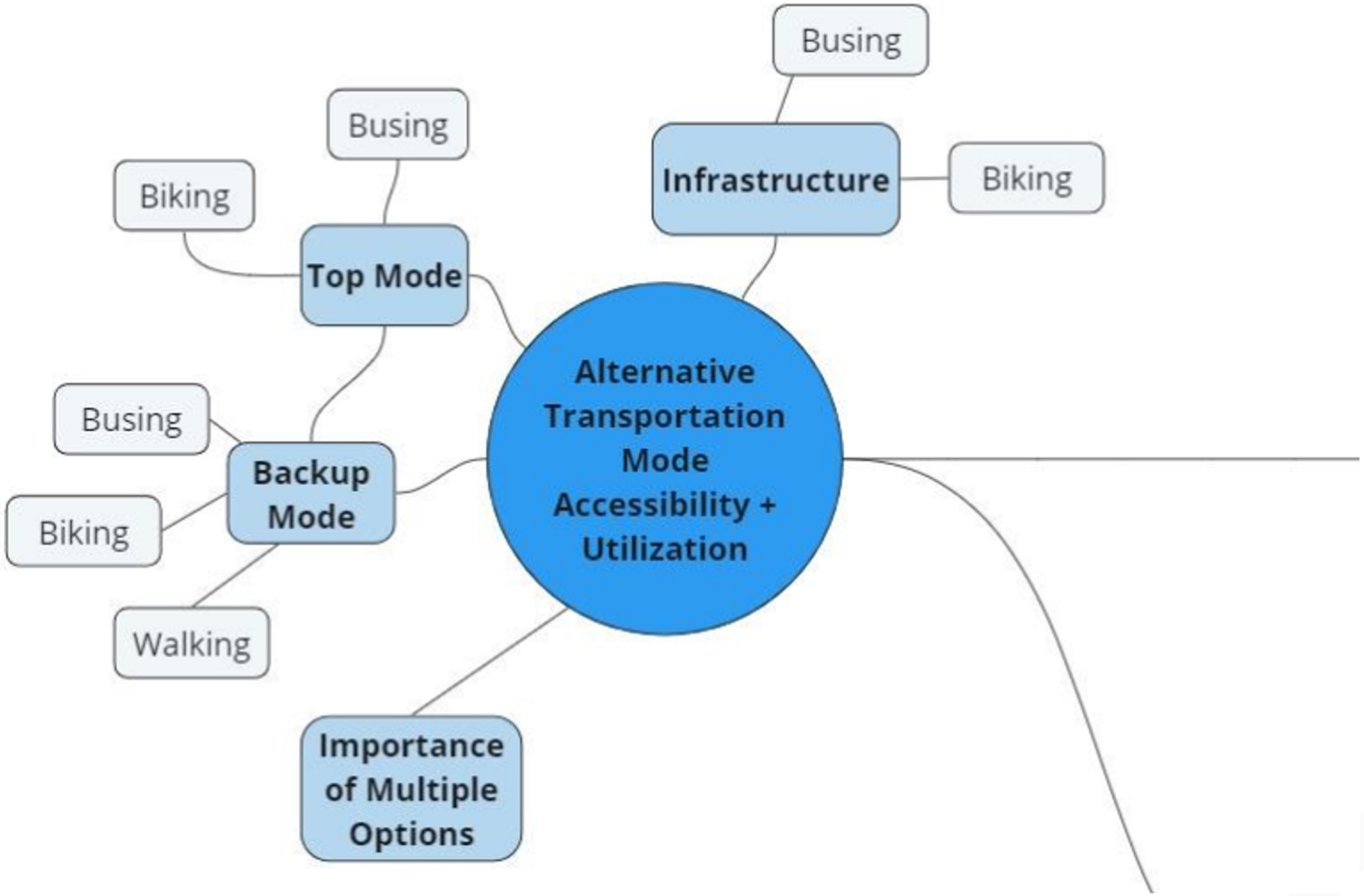
- Focus groups and interviews with faculty/staff and students were conducted to address issues related to transportation on and around the VT's campus:
  - description of various modes of transportation
  - use and safety of alternative transportation options
  - barriers and facilitators to use of alternative transportation options

- A thematic qualitative analysis using Braun and Clarke's multidirectional six-phase guide was conducted to identify, analyze, and report major themes and subthemes using an inductive approach.

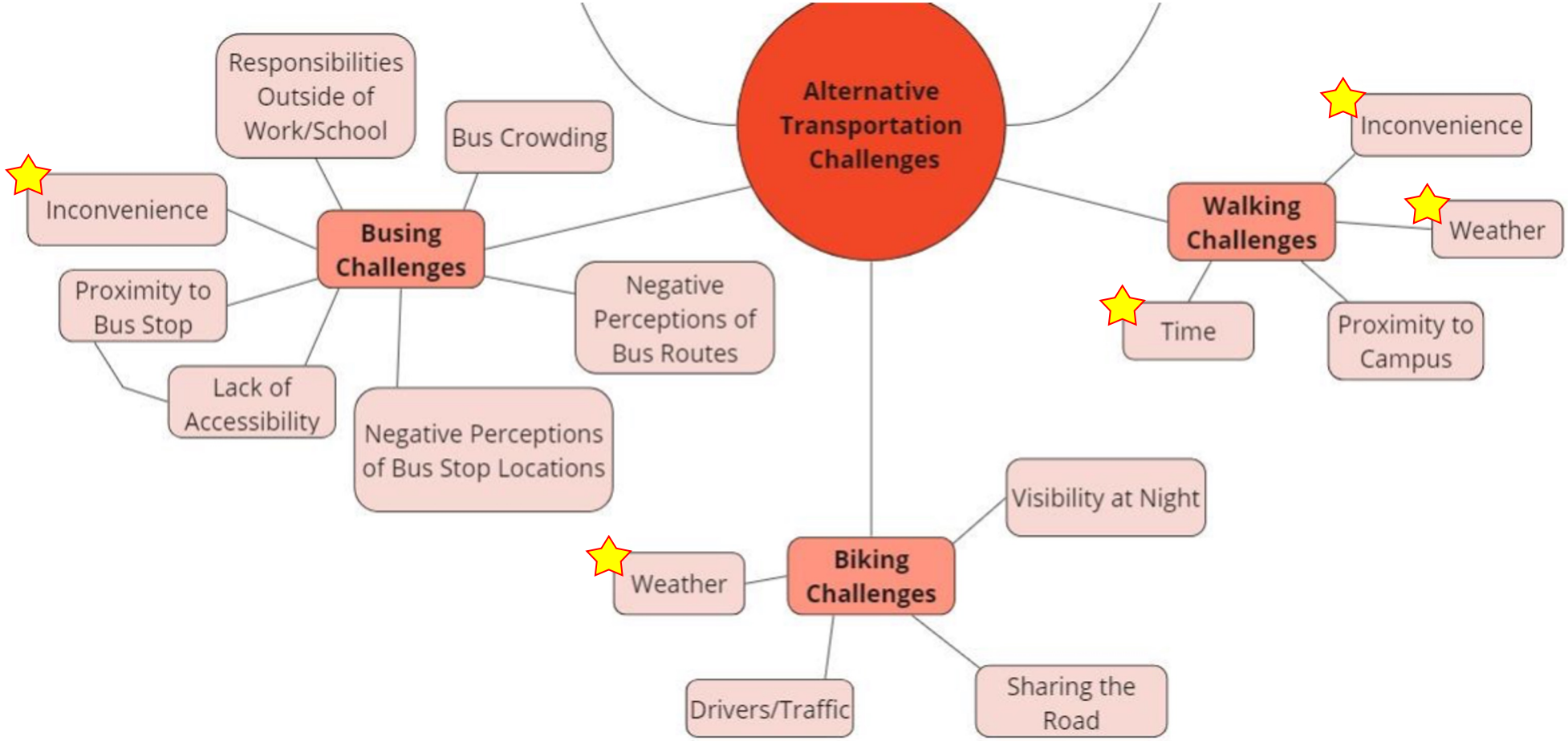
RESULTS - OVERALL



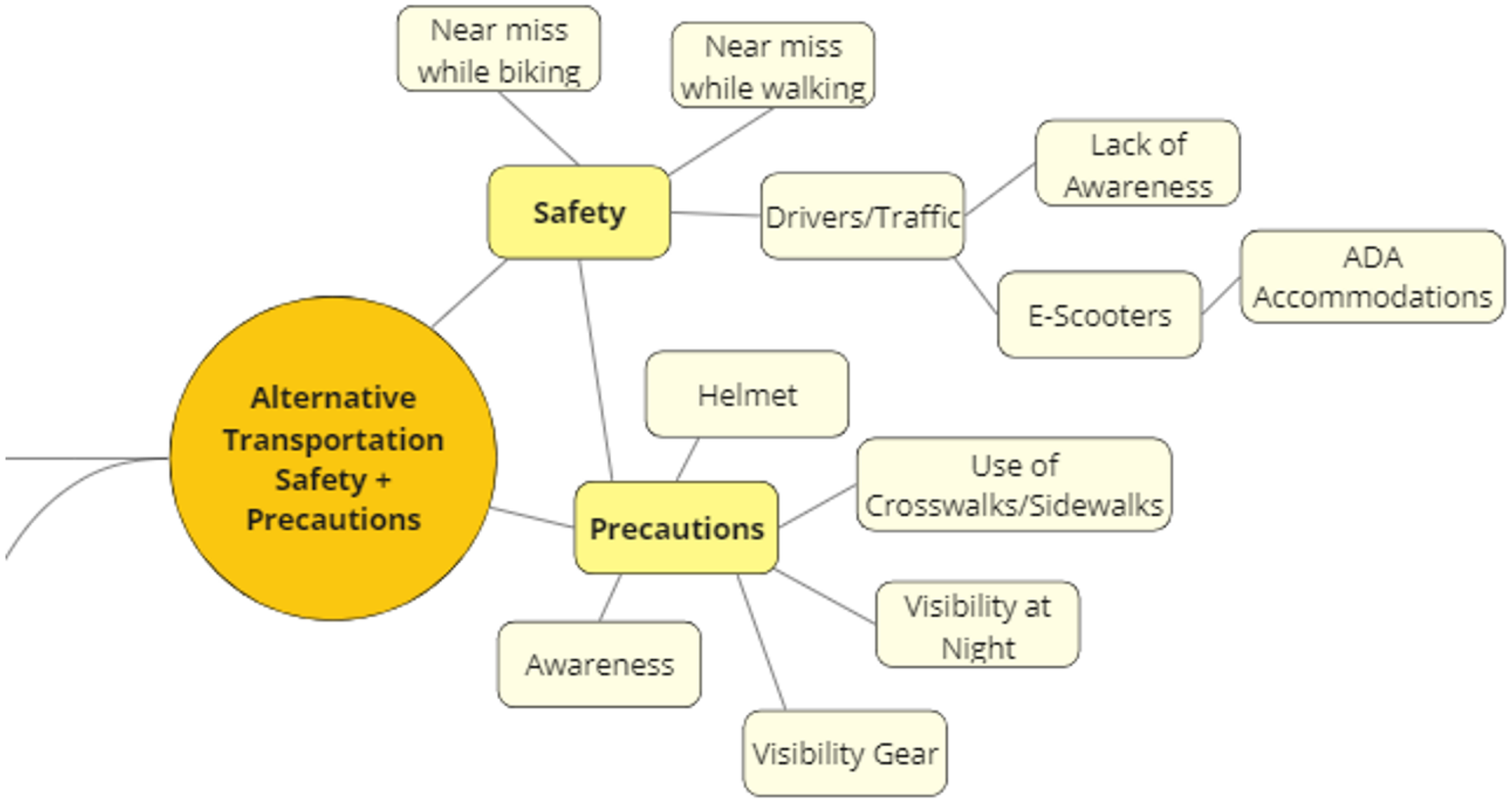
RESULTS


Busing
Infrastructure
Biking
Busing
Biking
Top Mode
Alternative Transportation Mode Accessibility + Utilization
Busing
Backup Mode
Biking
Walking
Importance of Multiple Options

RESULTS


Alternative Transportation Challenges
Busing Challenges
Responsibilities Outside of Work/School
Bus Crowding
Inconvenience
Proximity to Bus Stop
Lack of Accessibility
Negative Perceptions of Bus Routes
Negative Perceptions of Bus Stop Locations
Walking Challenges
Inconvenience
Weather
Time
Proximity to Campus
Biking Challenges
Visibility at Night
Weather
Drivers/Traffic
Sharing the Road

RESULTS


Alternative Transportation Safety + Precautions
Safety
Near miss while biking
Near miss while walking
Drivers/Traffic
Lack of Awareness
E-Scooters
ADA Accommodations
Precautions
Helmet
Use of Crosswalks/Sidewalks
Visibility at Night
Visibility Gear
Awareness

CONCLUSION/RECOMMENDATIONS

- Findings revealed that faculty/staff members and students not only use alternative transportation, but having multiple transportation options is essential.

- Safety issues and precautions must be addressed in order to advocate for increased use of alternative transportation.

CONCLUSION/RECOMMENDATIONS

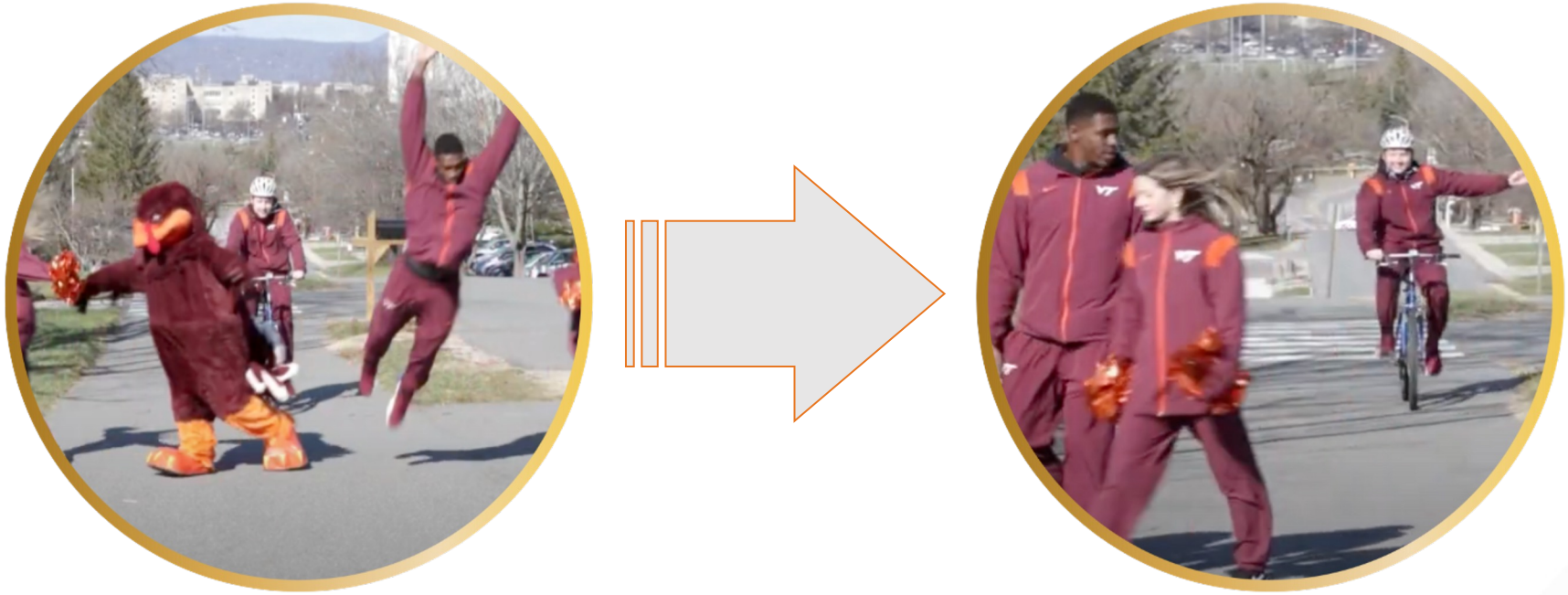
- This formative evaluation should be replicated and include unconventional methods like skateboarding or electric scooters to further assess their usage among faculty/staff and students.

- Education concerning alternative transportation options should be provided widely and emphasized to university community members to create a more sustainable-focused campus.

DEVELOPMENT AND PILOT OF THE ALTERNATIVE TRANSPORTATION EDUCATIONAL MODEL

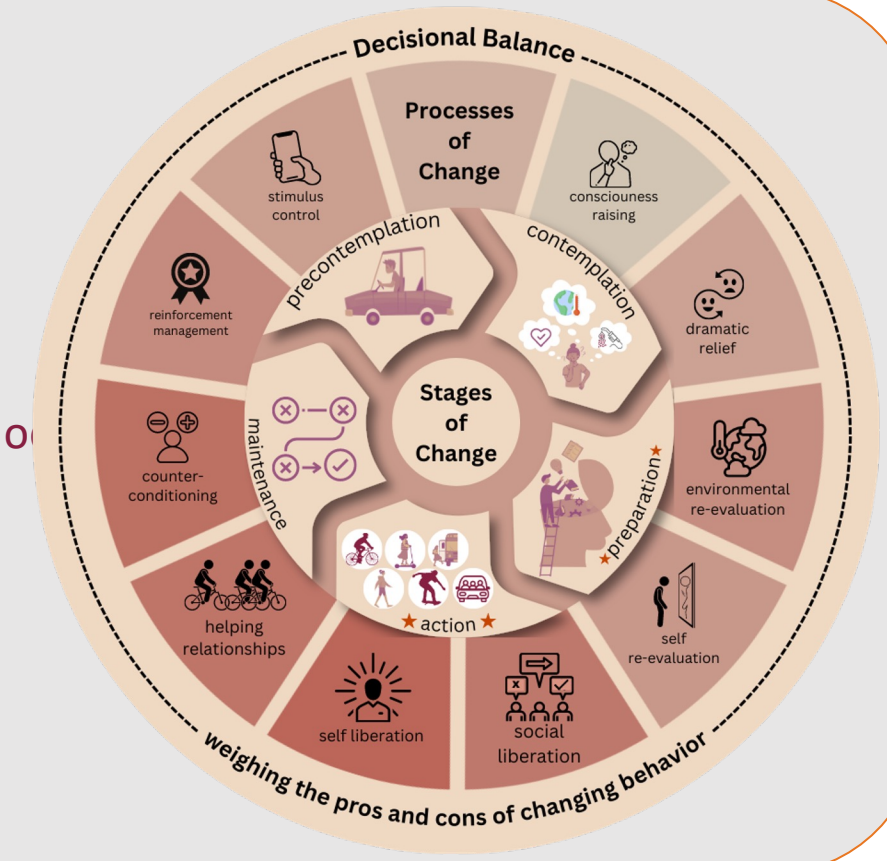
DEVELOPMENT AND PILOT OF THE EDUCATIONAL MODULE

- Goal: To increase safe alternative transportation use in and around the Virginia Tech campus

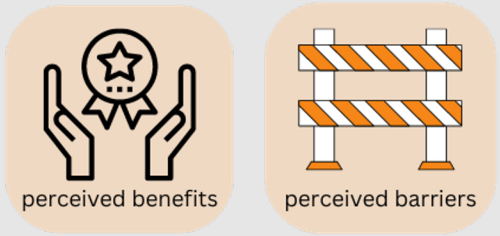


THE EDUCATIONAL MODULE: HEALTH BEHAVIOR THEORY

Transtheoretical Mo

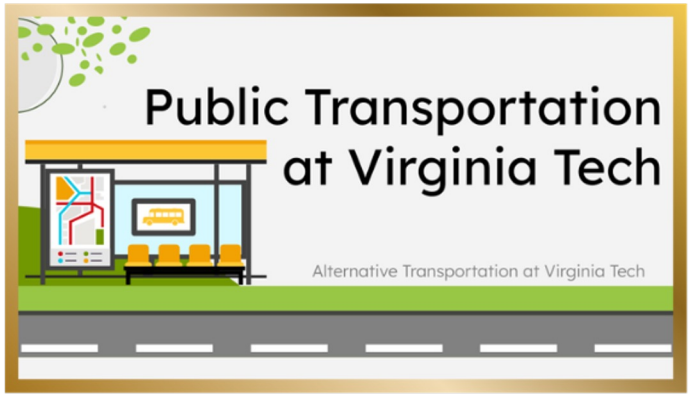


Health Belief Model

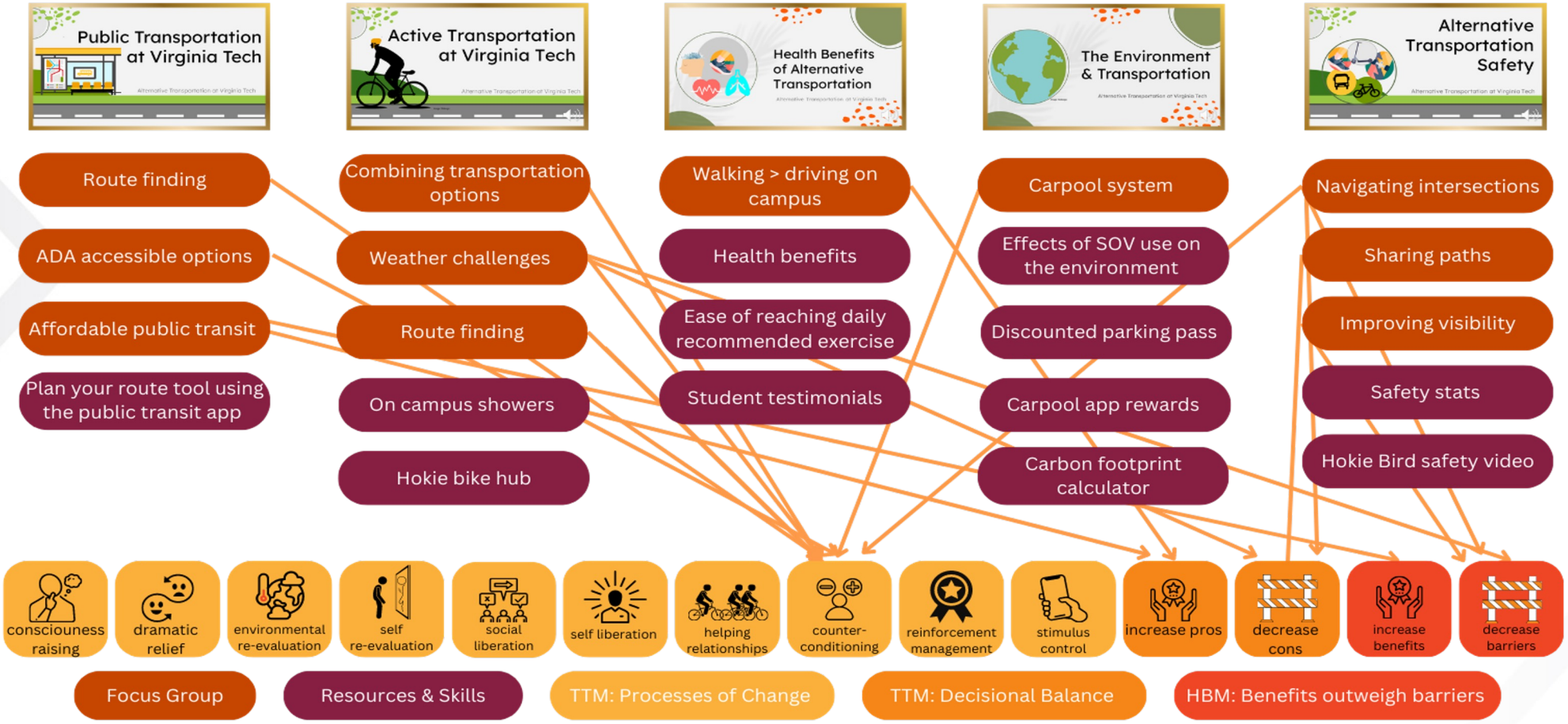


The perceived benefits of performing a behavior must outweigh the perceived barriers

THE EDUCATIONAL MODULE



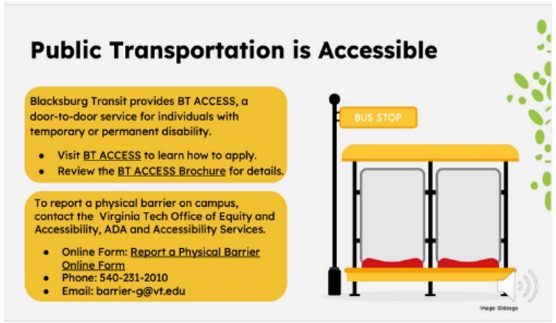
THE EDUCATIONAL MODULE: CONNECTION TO THEORY & FOCUS GROUPS



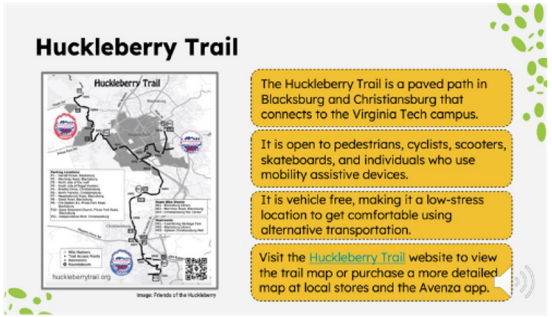
THE EDUCATIONAL MODULE: CONNECTION TO THEORY & FOCUS GROUPS

Focus Group

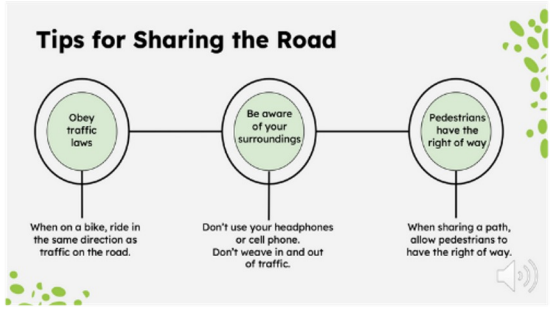
Looking Professional



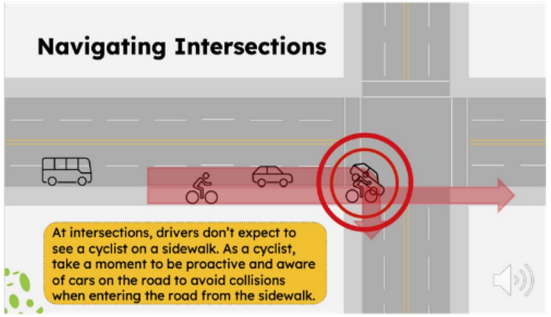
ADA Accessible options



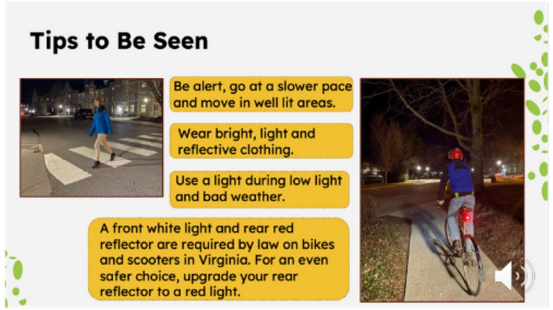
Safe Route Finding



Sharing Paths

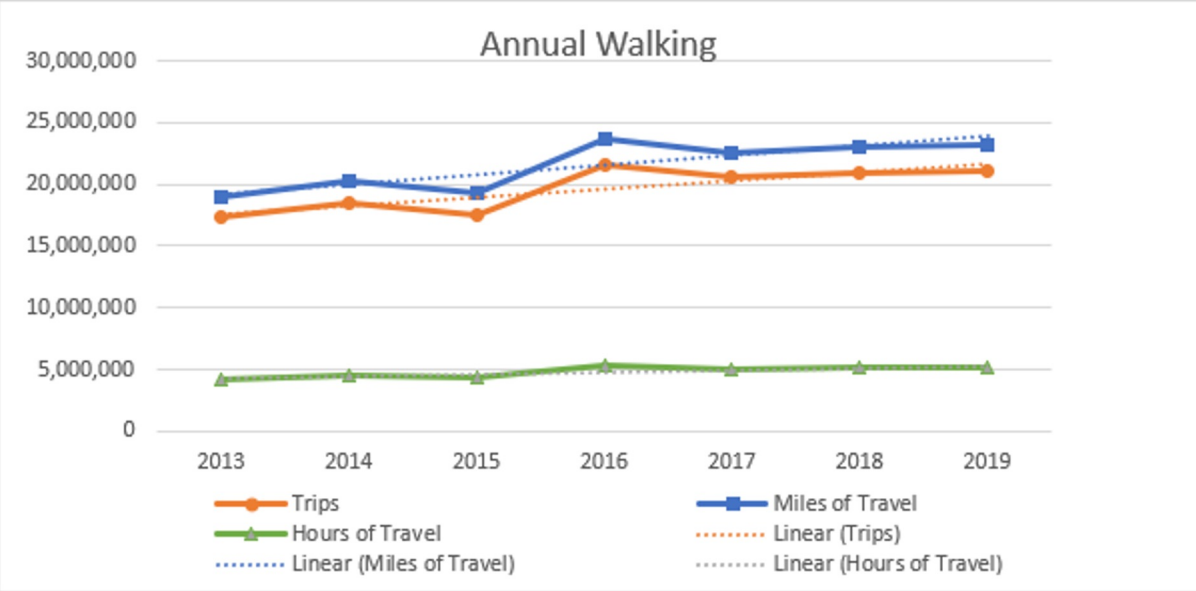


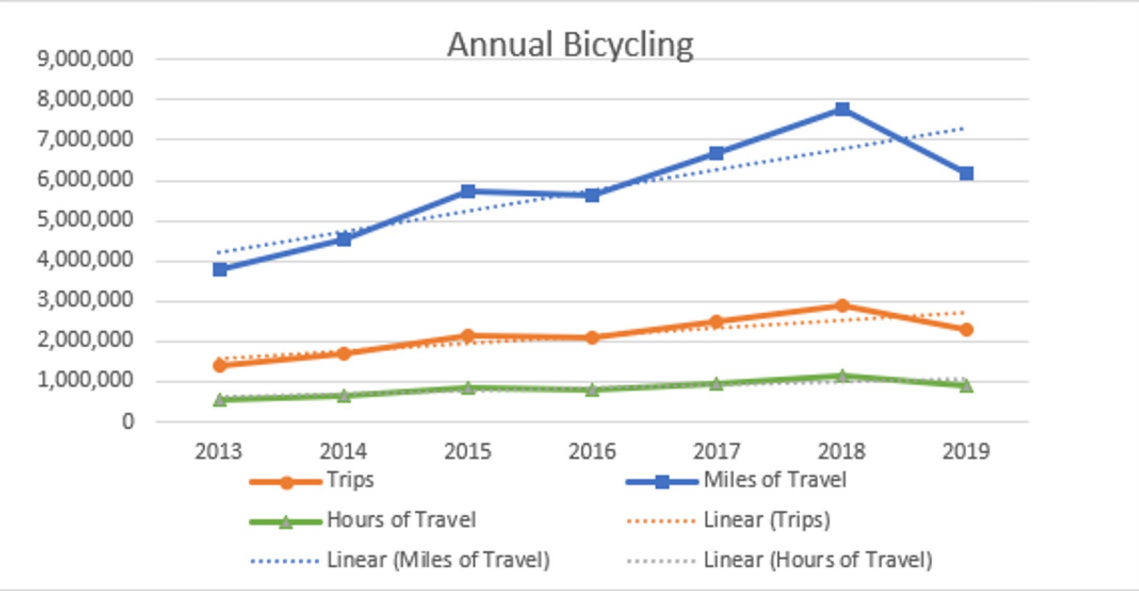
Navigating Intersections



Improving Visibility

BLACKSBURG-CHRISTIANSBURG-MONTGOMERY AREA MPO





Blacksburg-Christiansburg-Montgomery Area MPO
that houses Virginia Tech

THE EDUCATIONAL MODULE: CONNECTION TO THEORY & FOCUS GROUPS

Plan your route tool using the public transit app
ADA accessible options
Affordable public transit
Route finding

Hokie Bike Hub
On campus showers
Route finding
Combining transportation options
Weather challenges

Student testimonials
Health benefits
Ease of reaching daily recommended exercise
Walking > driving on campus

Effects of SOV use on the environment
Carbon footprint calculator
Discounted parking pass
Carpool app rewards
Carpool system

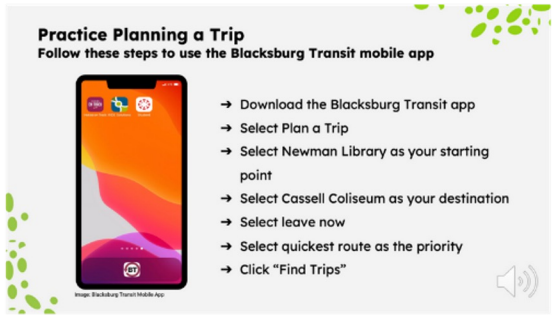
Hokie Bird safety video
Safety stats
Improving visibility
Navigating intersections
Sharing paths

consciouness raising
dramatic relief
environmental re-evaluation
self re-evaluation
social liberation
self liberation
helping relationships
counter-conditioning
reinforcement management
stimulus control
increase pros
decrease cons
increase benefits
decrease barriers

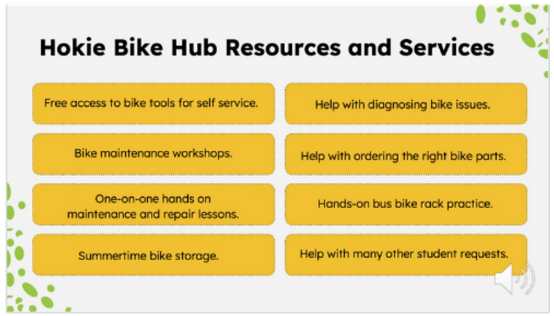
Focus Group
Resources & Skills
TTM: Processes of Change
TTM: Decisional Balance
HBM: Benefits outweigh barriers

THE EDUCATIONAL MODULE: CONNECTION TO THEORY & FOCUS GROUPS

Resources & Skills

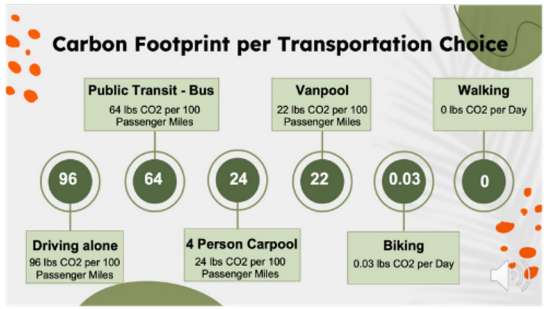


Plan Your Route

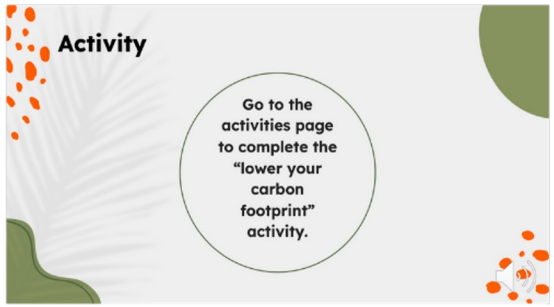


Hokie Bike Hub

Student Testimonials



Effects on SOV Use on the Environment



Carbon Footprint Calculator

Hokie Bird Video

EDUCATIONAL MODULE: PILOT & EVALUATION

Change in Knowledge

Change in Behavior

Student Feedback

Questions

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