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TRB TRANSPORTATION RESEARCH BOARD

TRB Webinar: Let's Catch a Bus— Understanding Health Impacts and Public Transit Equity

November 9, 2023

2:00 – 3:30 PM

NOVEMBER 2022 UPDATE



PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Andie Pitchford at TRBwebinar@nas.edu

The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.

ENGINEERING



REGISTERED CONTINUING EDUCATION PROGRAM

AICP Credit Information

1.5 American Institute of Certified Planners Certification Maintenance Credits

You must attend the entire webinar

Log into the American Planning Association website to claim your credits

Contact AICP, not TRB, with questions

Purpose Statement

This webinar will discuss evidence concerning the effects of bus transit on human and environmental health, efforts to increase bus transit access, and approaches to increasing transit equity. Presenters will share how the transit system can be improved and enhanced to promote the betterment of communities.

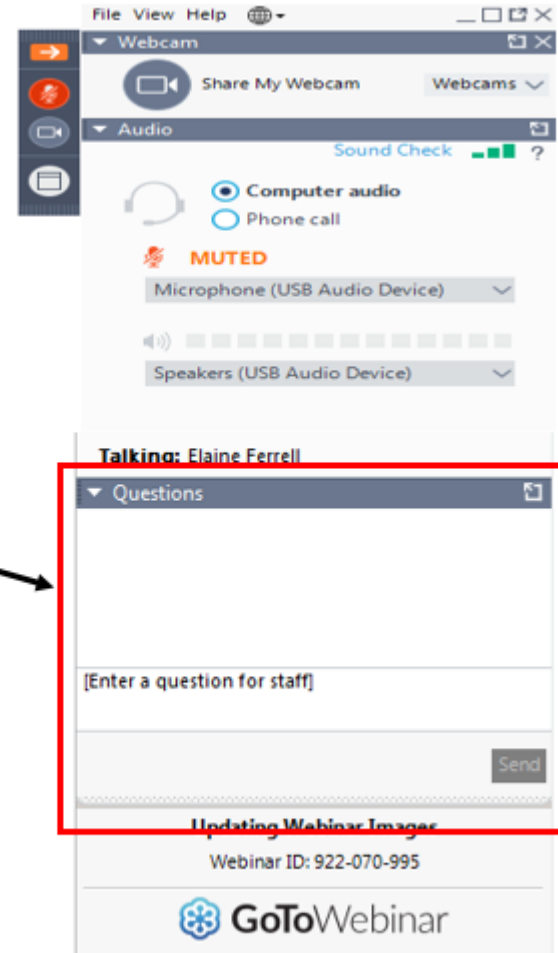
Learning Objectives

At the end of this webinar, you will be able to:

- (1) Understand the evidence-based research on the behavioral, health, and potential cost benefits of bus transit
- (2) Explore research methodologies that measure the impact of bus transit on behavior and health outcomes, including the concept of "natural experiments"
- (3) Understand the implications of research findings on future investments in public transportation, considering equity issues related to transit projects

Questions and Answers

- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows



Today's presenters



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Dr. Jannette Berkley-Patton
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Dr. Brian Saelens
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Children's Mercy
KANSAS CITY

**NATIONAL
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SCHOOL OF
PUBLIC HEALTH

Structural and programmatic effects of bus rapid transit (BRT) on physical activity in Seattle

Brian E. Saelens, Ph.D.

Professor of Pediatrics and Psychiatry & Behavioral Sciences

bsaelens@uw.edu

Collaborators: Carol Cooper, Philip Hurvitz, Anne Vernez Moudon, Maya Rowland,
Davene Wright, Chuan Zhou

NIH/NCI funding: R01CA178343

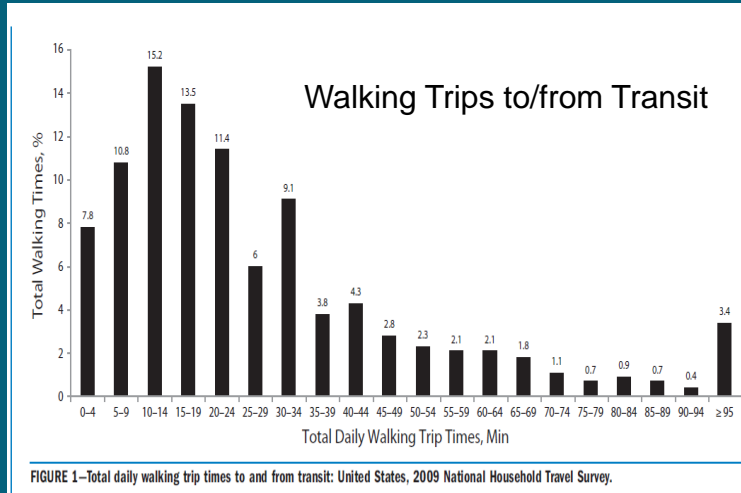


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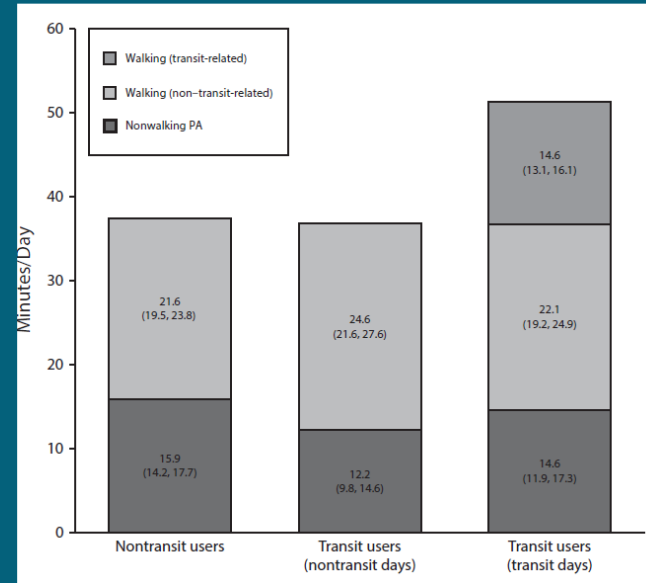
Background

- We and others have documented cross-sectional relationships between transit use/users and physical activity



Median = 21 minutes walking

Freeland 2013 *AJPH*



Saelens 2014 *AJPH*

Assessing Choices in Transportation in our Neighborhoods (ACTION)

A natural experiment in which transit service changed to bus rapid transit (BRT) in two areas in Seattle/King County area

- BRT 'E' line starting on February 15, 2014
- BRT 'F' line starting on June 7, 2014

- Examine behavior change in response to infrastructure change from before to soon after (1-2 years) and later (3-4 years) following BRT service beginning
- Define exposure based on proximity to new BRT stops (cases) and included a group matched control sample
- Use the best possible combination of methods to evaluate physical activity (type, purpose)

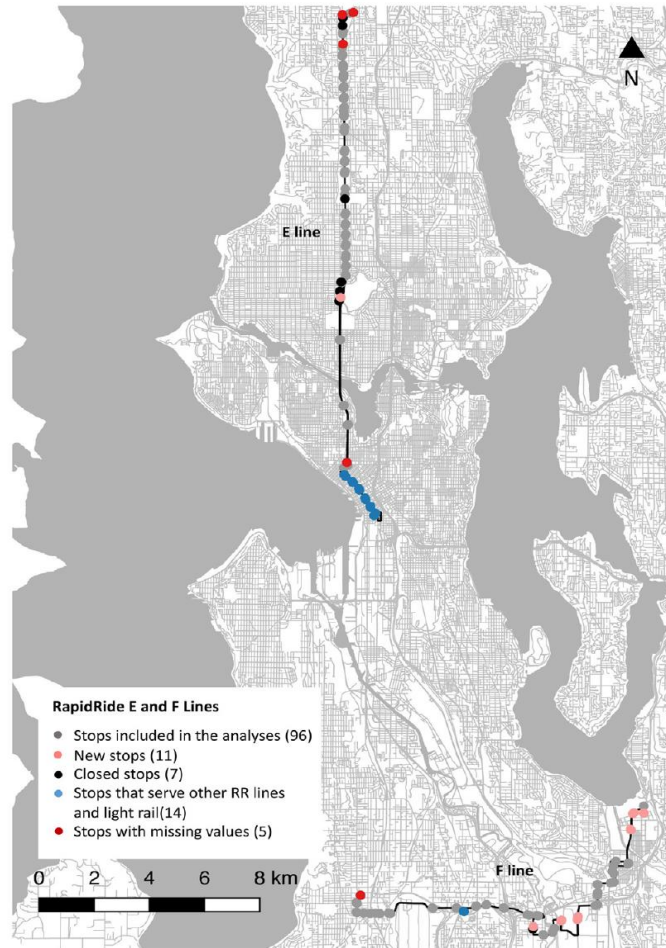
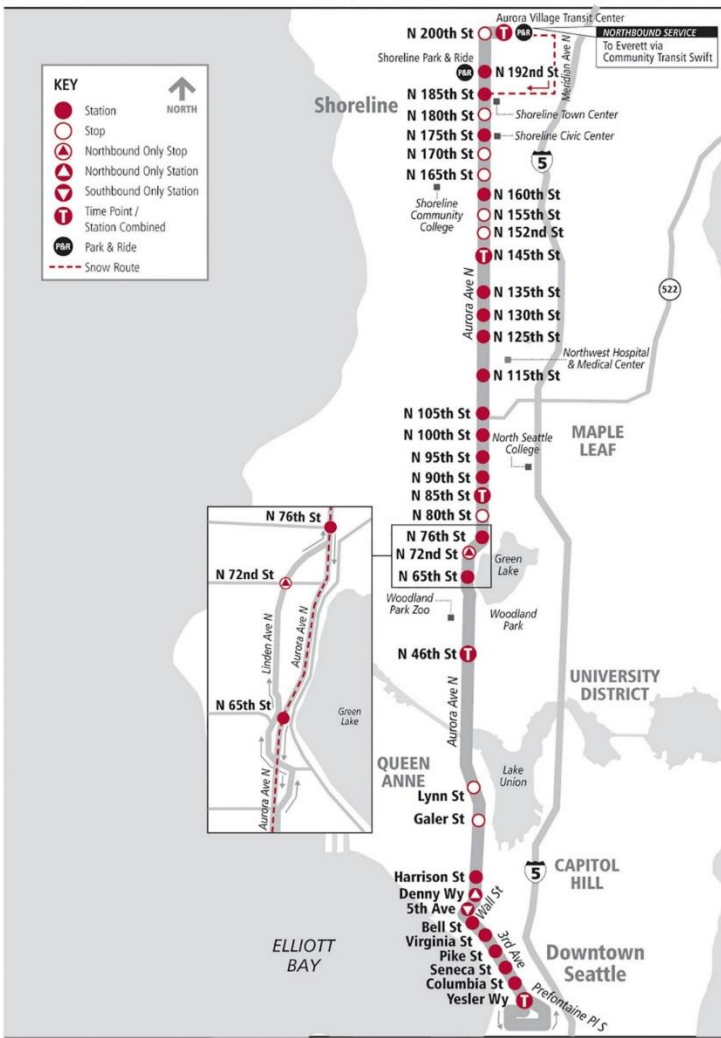
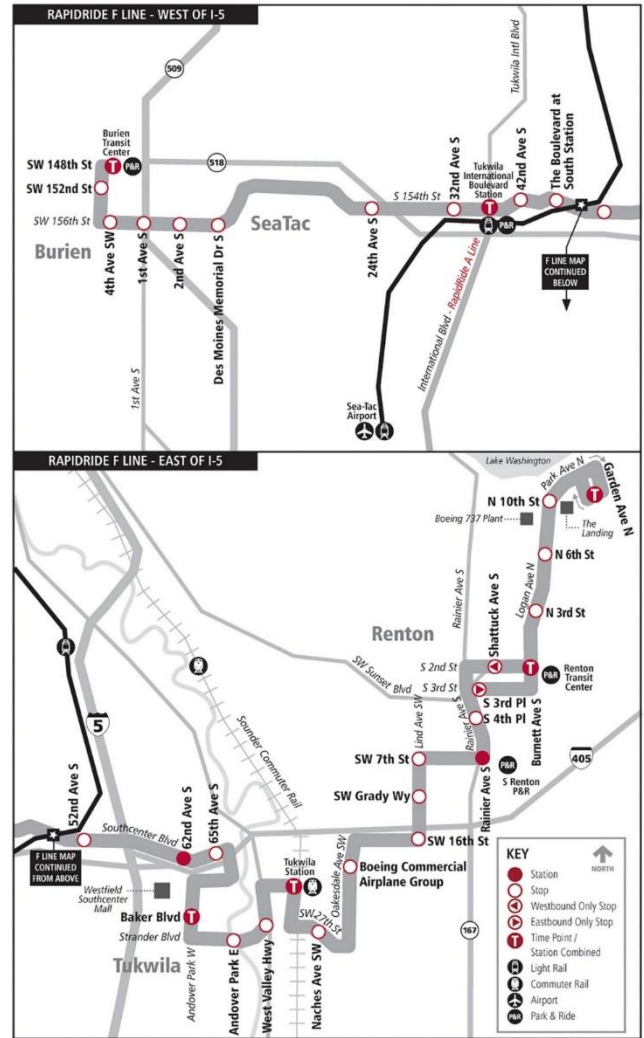


Fig. 1. Map of RapidRide E and F lines.

RapidRide E Line



RapidRide F Line



Changes in Bus Ridership

Line(s)	N (stop places)	2010	2013	2014	Change, 2010–2013		Change, 2013–2014	
		Mean (SD)	Mean (SD)	Mean (SD)	Absolute	Percent	Absolute	Percent
A	32	326 (542)	667 (893)	693 (902)	342	105%	26	4%
B	23	562 (1223)	1217 (2802)	1197 (2681)	655	98%	-20	-2%
C	16	422 (523)	763 (958)	903 (1075)	341	81%	140	18%
D	22	862 (967)	1289 (1355)	1439 (1424)	427	50%	150	17%
ABCD Total	93	528 (871)	967 (1671)	1030 (1653)	439	83%	64	7%
E	31	1229 (2856)	1569 (2866)	1945 (3124)	340	28%	377	24%
F	26	641 (1325)	904 (2113)	973 (2139)	264	41%	68	8%
EF Total	57	960 (2289)	1266 (2550)	1502 (2740)	305	32%	236	19%

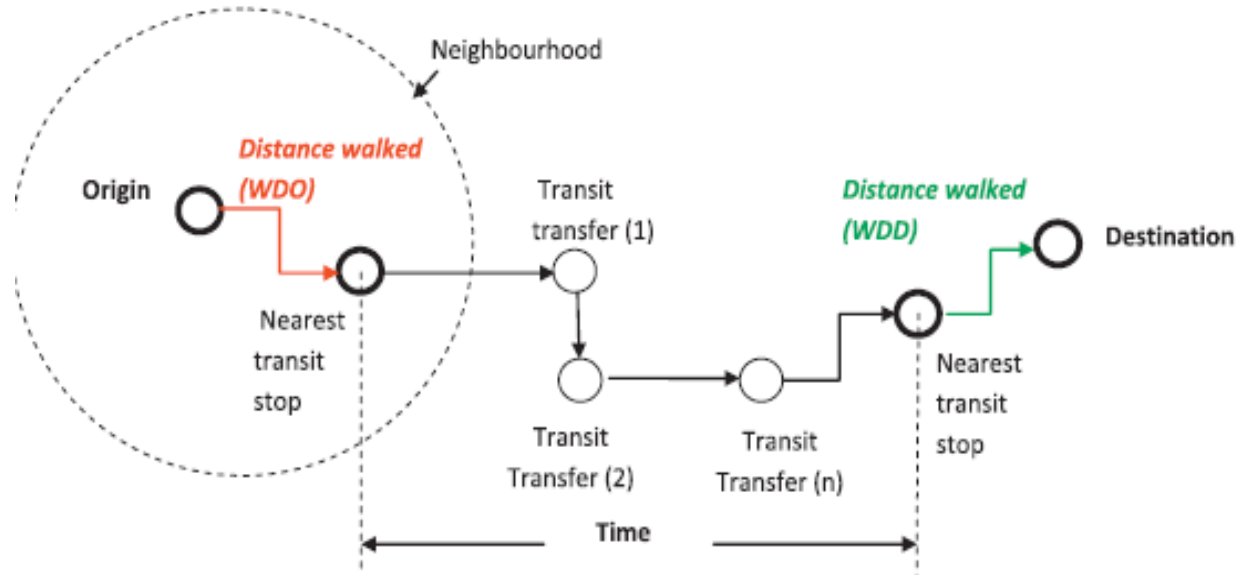


Fig. 2. Hypothetical model of walking trips associated with transit use.

Example: Mon Tues Wed Thurs Fri Sat Sun Date 6/5/08

Time you put the meter & GPS on: 7:34 am pm

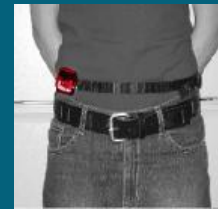
Start of Day <input checked="" type="checkbox"/> Home <input type="checkbox"/> Other: <input type="checkbox"/> Work <input type="checkbox"/> School		Place Name <u>Home</u>		Activity Code: <u>1</u>		
		Number or Nearest Intersection	Street	City	Zip	Time Left: <u>8:25</u> <u>am</u> pm
Place #1 <input type="checkbox"/> Other: <input type="checkbox"/> Home <input checked="" type="checkbox"/> School <input type="checkbox"/> Work <input type="checkbox"/> School		Place Name <u>SCHOOL</u>		Activity Code: <u>3</u>	Travel Mode: <u>8</u> ▶	If 1 or 2, # of people in vehicle:
Time Arrived: <u>9:06</u> <u>am</u> pm		Number or Nearest Intersection	Street	City	Zip	Time Left: <u>3:05</u> <u>am</u> pm
Place #2 <input type="checkbox"/> Other: <input type="checkbox"/> Home <input type="checkbox"/> School <input type="checkbox"/> Work <input type="checkbox"/> School		Place Name <u>Trader Joes</u> <u>4555 Roosevelt Way NE Seattle, 98105</u>		Activity Code: <u>3</u>	Travel Mode: <u>12</u> ▶	If 1 or 2, # of people in vehicle:
Time Arrived: <u>3:23</u> <u>am</u> pm		Number or Nearest Intersection	Street	City	Zip	Time Left: <u>3:48</u> <u>am</u> pm
Place #3 <input type="checkbox"/> Other: <input checked="" type="checkbox"/> Home <input type="checkbox"/> School <input type="checkbox"/> Work <input type="checkbox"/> School		Place Name <u>Home</u>		Activity Code: <u>3</u>	Travel Mode: <u>4</u> ▶	If 1 or 2, # of people in vehicle:
Time Arrived: <u>4:15</u> <u>am</u> pm		Number or Nearest Intersection	Street	City	Zip	Time Left: <u>7:15</u> <u>am</u> pm
Place #4 <input type="checkbox"/> Other: <input type="checkbox"/> Home <input type="checkbox"/> School <input type="checkbox"/> Work <input type="checkbox"/> School		Place Name <u>Tour</u>		Activity Code: <u>13</u>	Travel Mode: <u>100</u> ▶	If 1 or 2, # of people in vehicle:
Time Arrived: <u>7:15</u> <u>am</u> pm		Number or Nearest Intersection	Street	City	Zip	Time Left: <u>8:00</u> <u>am</u> pm

Time you took the meter & GPS off: 11:00 am pm **BE SURE TO PLUG IN YOUR GPS TO CHARGE!!!**

Time removed meter or GPS and reason: 8:15-8:30 pm Shower

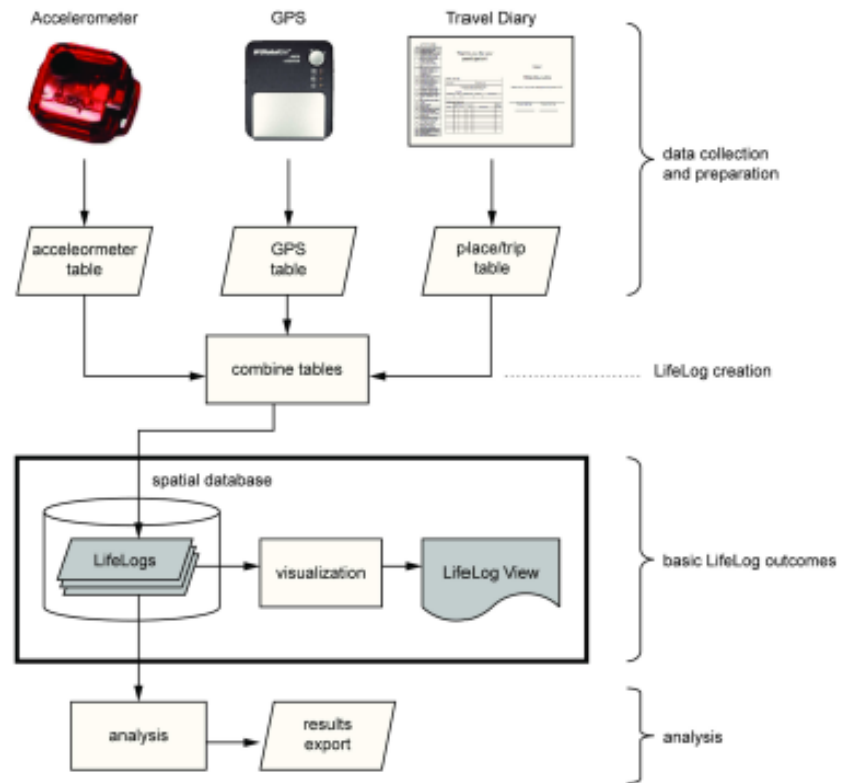


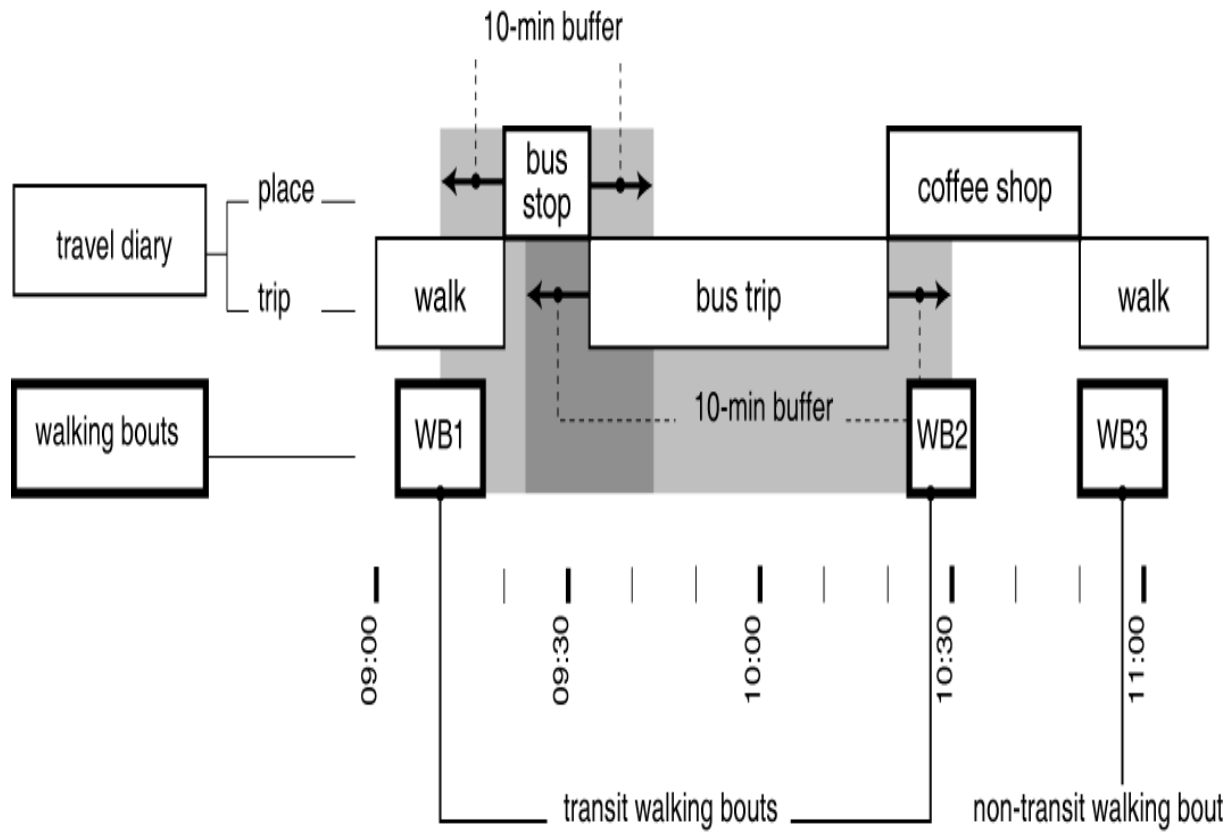
GP
S



Accelerometer

Travel Log





In Motion social marketing campaign



WHO IS ELIGIBLE?
 You must be 16 or older, and have at least one car in the household.

Don't have a car? Become a Car-Free Champion! Earn rewards by sharing your story. Instead of filling out this form, just contact us to learn more.

Get In Motion
 We are here to help you explore your neighborhood and beyond by walking, bicycling, riding the bus, and sharing rides. Sign up below and choose your transportation information, including an ORCA card good for two weeks of unlimited travel*, and we'll send it all right to your door at no cost to you. Pledge to shift two or more round trips per week from driving alone to another option. Log those trips online or by postcard, and you'll be entered into weekly reward drawings!

SIGN UP NOW & EARN REWARDS.

TEAR HERE AND MAIL

1. Pledge to Drive Less
Comprométase a Manejar Menos

I pledge to reduce my drive-alone trips by two or more trips each week.
 I will log my trips: online -OR- by postcard
If you're not ready to pledge, skip to Step 2.

Yo me comprometo a reducir mis viajes de manejar a solas por lo menos dos veces o más por semana.
 Yo registraré mis viajes: En Línea (en inglés) -O- Con un postal
Si no está preparado para comprometerse, pasese al Paso 2.

3. Select Your Resources
Seleccione Sus Recursos

ORCA Card* Walking Maps and Info
 In Motion Tote Bag Biking Maps and Info
 Recursos para Explorar sus Opciones Rideshare Information
 Bus Schedules Carshare Information
 Bus Schedules The Cost of Driving
 Bus and ORCA Information ACCESS - for people unable to take the bus

2. Tell Us Where to Send Your Information
Díganos Donde Mandar Su Información

NAME (PLEASE PRINT CLEARLY) / NOMBRE (POR FAVOR ESCRIBA CLARAMENTE) _____

HOME ADDRESS / DIRECCIÓN DE HOGAR _____ APT # / # DE APARTAMENTO _____

CITY / CIUDAD _____ ZIP / CÓDIGO POSTAL _____

PHONE / TELÉFONO _____ EMAIL / CORREO ELECTRÓNICO _____

*Offer available until October 10, 2014. * Oferta disponible hasta el 10 de Octubre, 2014.
 *Valid for two weeks from when you receive it, valid on regional buses, trains, streetcar, and ferries or a passenger.

4. Tell Us How You Get Around

• How many drivers are in your household? _____

• How many cars are in your household? _____

• In general, how much of your travel around town is by:

_____ % Driving Alone	_____ % Bicycle
_____ % Walking	_____ % Carpool/Shared Rides
_____ % Bus or Light Rail	100% = Total

• Think about the trips you made yesterday (even if it was not a typical day for you). How many separate round trips did you take by:

_____ Driving alone	_____ Bicycle
_____ Walking	_____ Carpool/Shared Rides
_____ Bus or Light Rail	<input type="checkbox"/> No trips taken

Other (decoy) social marketing campaigns



**Smart Trips:
Main Street**

**Order Your
FREE
Pedometer
FREE
Flashing Light
FREE
Water Bottle
FREE
Bus Passes**




Smart Trips: Main Street

Get your **FREE** Travel Tools.

Let our program get you started with the travel tools you need to get walking, biking and taking transit more often. The Main Street area is full of wonderful parks, local businesses, and close to local bus routes, bike routes, trails, and walkable streets. Let our program help you get acquainted with it all!

Use the form below to choose whatever you need to get started. Within two weeks of your order, we will specially deliver your materials to you by mail. As a bonus, you can choose one of two rewards just for returning your order form (or ordering online). While supplies last!

Travel Tools

Check as many as you want

WALKING

- Walking Kit includes:
 - Pedestrian crosswalk information
 - Map detailing walking paths and routes in your neighborhood
 - Working Logs (keep track of your progress)
 - Free digital pedometer (count your steps)

BIKING

- BIKING Kit includes:
 - Be Smart Be Seen! - Tips on riding at night
 - Take Your Blue! - Tips on how to take your bike on the bus
 - Map detailing walking/biking paths and routes in your neighborhood
 - Free flashing light (be seen while riding your bike at night)

TRANSIT

- One week or passes of free bus passes

ACCESSIBILITY

- Transit Training: A service for older adults to learn the bus system
- EZ Access: A package of products and services provided for seniors and people with disabilities
- RideSource brochure

FOR CHILDREN

- School Solutions: Help to help your children walk, bike, or carpool to school safely
- A Reflective Vest and/or "Bike" Sign
- Reflective Slip Bracket

EVEN MORE TRANSPORTATION OPTIONS

- Drive Less Connect brochure: Job, bike and car needs
- Information on joining a vanpool or carpool
- Carsharing: Enterprise CarShare program has come to the region

REWARD

- Pick Your FREE reward (please choose one)
- Metal water bottle (BPA free)
- Reusable shopping bag

Ordene sus Herramientas de Viaje.

¡Deseo obtener! Cópulas de transporte para hacer viajes inteligentes. Venos a empujar con las herramientas de viaje que necesitas para caminar, ciclismo, tránsito, y más. El vecindario de Main Street está lleno de parques maravillosos, negocios locales y cerca de las rutas de autobuses, rutas de bicicleta, senderos y caminos caminables. ¡Que our Smart Trips te ayude familiarizarte con todo!

Utilice el formulario adjunto para elegir lo que necesite para empezar. Dentro de dos semanas de su orden, recibiremos entregamos sus materiales a usted sobre bicicleta. Como un beneficio, usted puede elegir uno de dos premios. ¡Mientras dure!

Las Herramientas de Viaje

Marque los que quiera

CAMINAR

- Equipo de Caminar, incluyendo:
 - Información de cruces peatonales
 - Mapa que detalla las rutas y caminos para caminar
 - Registro de caminata (Mantenga un registro de su progreso)
 - Pedometer digital gratis (contar sus pasos)

BICICLESA

- Equipo de Bicicleta, incluyendo:
 - Que mantengas Be Seen: consejos para manejar de noche
 - Tome Your Blue! - consejos para llevar la bicicleta en el autobús
 - Mapa que detalla las rutas y caminos para caminar
 - Luz intermitente gratis (luz en su bicicleta en la noche)

TRANSPORTE PÚBLICO

- Un pase para viajar por una semana (5) gratis

ACCESIBILIDAD

- Entrenamiento de Viaje: Un servicio para adultos mayores para aprender lo que el sistema de transporte
- EZ Access brochure: Un paquete de productos y servicios provistos para adultos mayores y personas con discapacidades
- Folleto de RideSource

PARA NIÑOS

- Escuela School Solutions: Como ayudar a sus niños a caminar, andar en bicicleta o compartir un autobús a la escuela con seguridad
- Un Casco de Casco Reflectivo
- Batacote Reflectante

MÁS OPCIONES DE TRANSPORTACIÓN

- Información para unirte a un carpool compartido
- Folleto Drive Less Connect (Te conecta a otras personas en la comunidad para el transporte compartido, por favor en el grupo)
- Carsharing: Autocool compartido Enterprise CarShare programa ha llegado al área

PREMIO

- Elige su premio GRATIS (por favor escoge uno)
- Botella de agua de metal BPA free
- Bolsa de compras reutilizable

Tell us where to deliver your travel tools and reward:

Please print/¡Por favor escriba

Name/Nombre: _____

Address/Dirección: _____

Phone/ Teléfono: _____

Email/Correo electrónico: _____

Díganos a dónde enviar sus herramientas de viaje y su premio:

ACTION Recruitment

- Group-matched cohort design
 - ‘Cases’ – adults living < .5 mile from (future) BRT stop
 - ‘Controls’ – adults in county living >.5 mile from (future) BRT stop
- Additional eligibility
 - ≥ 18 years old
 - Able to walk outside home
 - English-speaking or willing to speak through interpreter
 - Living at this residence for > 1 year (and residence built > 3 years ago) and no current intentions to move
 - Contacted via public record information (address/phone)

Baseline (before BRT)	Control (n=305)	Case (n=142)
Age	54 (13)	55 (13)
Female (%)	61%	61%
Median per capita income within household (approx.)	27.5K	27.5K
Race/ethnicity (% non-Hispanic white)	81%	80%
Education (% at least some college)	60%	69%
Married/partnered (%)	59.5%	41.1%
Weekly physical activity minutes (1000+ cpm, in bouts)	234 (244)	221 (207)
Weekly walking minutes (in bouts)	165 (199)	155 (163)
Weekly recreational walking minutes (in bouts)	51 (87)	39 (64)
Weekly utilitarian walking minutes (in bouts)	115 (152)	116 (138)
Weekly transit-related walking minutes (in bouts)	14 (38)	11 (32)
Transit use (trips per week)	1.8 (4.1)	2.3 (4.7)
<i>In Motion</i> exposure - weighted (0-34 possible range)	0.7 (1.3)	0.6 (1.3)

ACTION Methods

- Same individuals completed the same assessments before, 1-2 years after, and 3-4 years after the BRT lines started
- Wore accelerometer and GPS at the same time for 7 days
 - Targeted the same weeks/month each assessment period
- Completed a place-based travel diary corresponding to the device wearing days
- Completed the *social marketing campaign exposure* survey once soon after the BRT lines opened

- Outcomes of interest
 - Total physical activity
 - Total walking
 - Recreational walking
 - Utilitarian walking
 - Transit-related walking

Changes in Outcomes (relative to baseline)

	Post 1 (1-2 years post BRT)		Post 2 (3-4 years post BRT)	
	Controls	Cases	Controls	Cases
Δ PA minutes (week)	-25 (139)	-5 (151)	-36 (247)*	97 (303)*
Δ Walking minutes (week)	-2 (131)	-20 (112)	2 (183)*	85 (273)*
Δ Recreational walking (week)	9 (81)	0 (53)	4 (116)	39 (141)
Δ Utilitarian walking (week)	-11 (106)	-20 (97)	-2 (125)*	46 (169)*
Δ Transit-related walking (week)	-5 (57)	-8 (47)	-5 (45)	-3 (58)
Δ Transit trips (week)	0.4 (4.5)	-0.05 (4.1)	0.16 (4.7)	-0.54 (3.3)

Models adjusted for baseline value, age, sex, race/ethnicity, education, household income, marital/partner status, licensed driver, neighborhood preference

Summary

- Increase in ridership when BRT implemented
- No immediate differential change in physical activity or walking for those already living close versus farther away from BRT
- Differential change later with increases in physical activity, particularly utilitarian walking, among those living closer to BRT
 - Does not appear to be explained by transit use or related walking
- Limitations
 - Limited sample available for device-based measures (with some attrition over time)
 - BRT and its full implementation is gradual
 - Not clear how these findings apply to post-pandemic shifts in work locations, commuting, and transit use

Future Directions

- Continue to explore health and health behavior changes when environment/infrastructure changes
- Critical to examine impacts on marginalized and most potentially impacted populations
- Using technology to better and more precisely capture outcomes and mechanisms of change
 - Help establish better baseline trends
 - Better population-based estimates of change

Health impacts of city-wide zero-fare bus transit: A natural experiment in Kansas City (cont'd)

Jannette Berkley-Patton, PhD
Professor of Biomedical and Health Informatics
University of Missouri-Kansas City

Jordan Carlson, PhD
Associate Professor of Pediatrics
Children's Mercy Hospital Kansas City



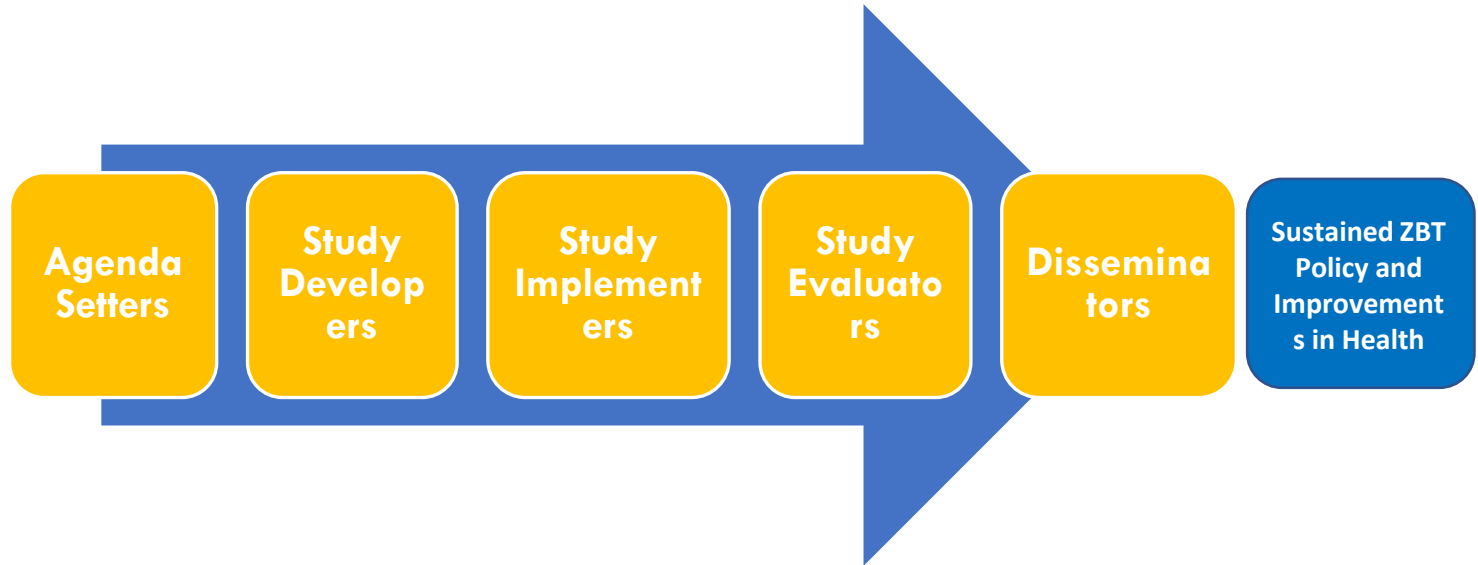
A Community-based Participatory Research Approach

- “Collaborative approach to research that **equitably involves all partners** in the research process and recognizes the **unique strengths** that each brings.
- CBPR begins with a research topic of importance to the community with the aim of **combining knowledge and action for social change** to improve community health and eliminate health disparities.”

- W.K. Kellogg Community Scholar’s Program (2001)

A Community-Based Participatory Research Approach

Engaging Community Partners Across the Research Process



Listening to the Kansas City Community: Importance of ZBT





Hearing from Community Stakeholders

- Approached by Black Health Care Coalition to address poor quality of sidewalks, and capacity to address environment concerns and transit policies for underserved Kansas City, MO areas
- Meetings with other community stakeholders
 - KC Area Transportation Authority, BikeWalkKC, KC FAITH Initiative, Calvary Community Outreach Network, Kansas City Forward Foundation, University Health Truman Medical Center, UMKC Center for Neighborhoods and more
- Major concerns about access to transportation and impact on health and quality of life



**GETTING
AROUND
KC**

Partnering with Health Systems

- University Health Truman Medical Center
- Patient population
 - Large proportion of low-income, ethnic minoritized groups, high chronic disease rates



Highlights on Preliminary Findings

- 1,200 patients enrolled to date
- Mean age = 56 (SD = 12) years
- 73% are Black adults
- 32% are bus users
- Bus users more likely than non-bus users to engage in walking for transportation (74% v 32%)
- 65% of bus users indicated zero fare had a positive impact on their employment or income
- Benefits and Challenges!

Partnering with Community-based Organizations to Hear from Bus Users: Focus Groups

- Partners: Community-based organizations including BikeWalkKC
- 2 of 4 Focus groups completed
 - Focus group meetings held at community partner locations
 - 21 of 40-50 participants to date
- Focus group discussion and brief survey
- Topics discussed
 - E.g., ZBT experiences, impact on ridership, and impact on health



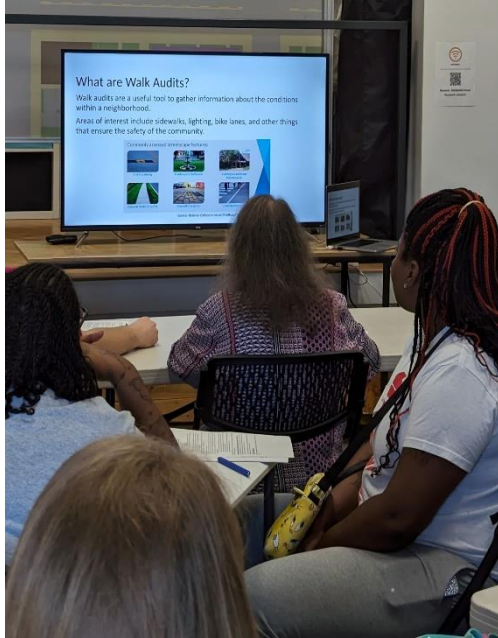
Exemplar Participant Comments:

"... Would not be able to complete school without free bus fare"

"Used to have to 4-5 bus passes just to get to store with kids ..."

"... Rely on bus to get to work and doctor's appointments"

Engaging Residents in a Citizen Scientist Academy: Walk Audits



- Partnership with UMKC Center for Neighborhoods
- Citizen Scientist Academy
 - Neighborhood residents
 - Assess conditions around bus stops
 - Goal: 10 routes in their neighborhoods
- Microscale Audit of Pedestrian Streetscapes (MAPS)
- **36 Persons trained!**

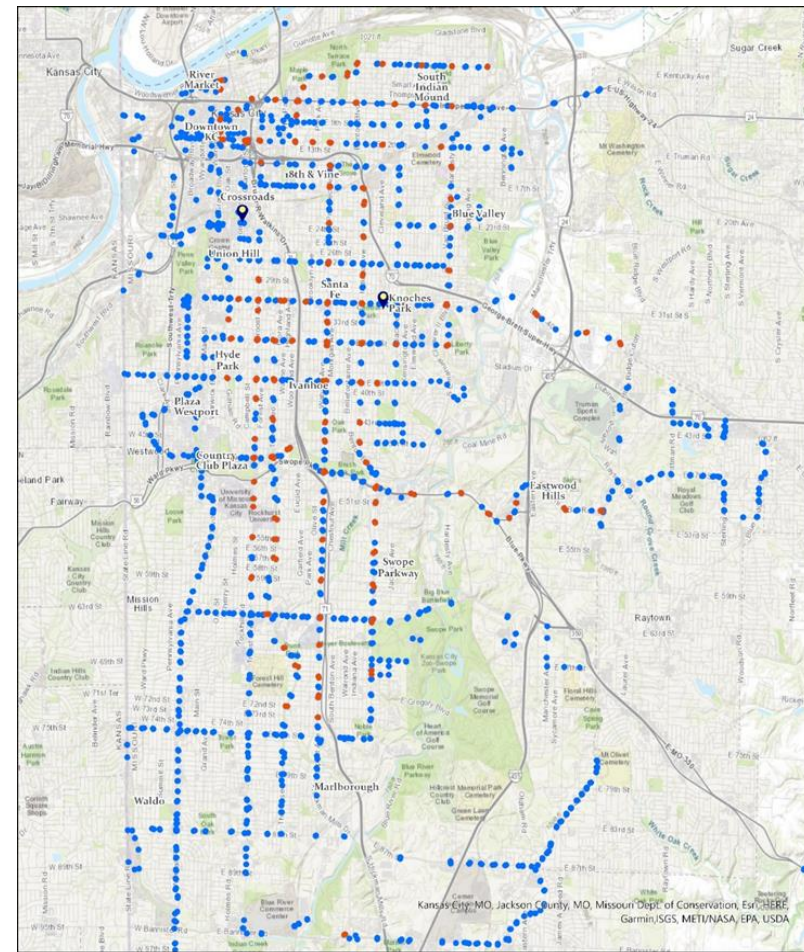
Microscale Audit of Pedestrian Streetscapes (MAPS)

Construct	Example items
Aesthetics/social	Gardens (positive), trash (negative)
Crossings	Crosswalks, crossing aids
Streetscapes	Bike racks, protection from cars
Sidewalks	Presence, width, condition
Surveillance	Lighting, eyes on street

Citizens Conducting Walk Audits



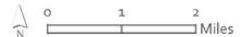
- Routes spanning 0.25-0.50 miles audited around each bus stop
- Audits completed around 290 total bus stops
 - 14.7% of all stops in the city in 2023
- Citizens Data Review and Community Forum meetings coming soon



Legend

- Walk Audit Bus Stops
- Kansas City, MO Bus Stops

📍 University Health Location



Getting Around KC: Implications

- Zero fare policies are fragile, but critical, especially for underserved, marginalized populations
- Importance of data to inform transit policies that can have health impact potential, including physical activity and access to healthy foods and health appointments
- Community partners and local residents with information, resources, and shared strategies essential to sustaining ZBT policies
- Need for multiple zero fare transportation options
- Potential for future bus stop and bus-based health interventions



Health impacts of city-wide zero-fare bus transit: A natural experiment in Kansas City

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Partners

University Health

UMKC Center for Neighborhoods

BikeWalkKC

Kansas City Public Works

Kansas City Area Transportation Authority

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Environmental Protection Agency (EC - 97791001-0)

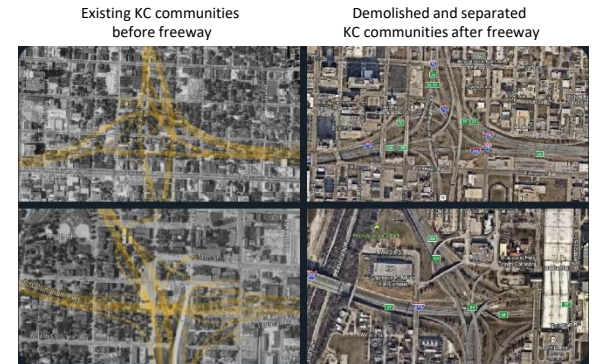
National Institutes of Health (R01DK132350)

Transportation and Health Equity

- Risk for type 2 diabetes and heart disease \uparrow in marginalized communities
 - Life expectancy is 20 years lower dependent on where you live in KC
- Policies that impact communities impact health
 - The way our communities are designed (eg, walkability, safety, access)
 - Access to housing and transportation opportunities
- Role of transportation policies in health equity
 - Can support community-wide opportunities
 - Often harm marginalized communities



KC urban core walled off from surrounding communities



Zero Fare Transit Policies

- Objectives

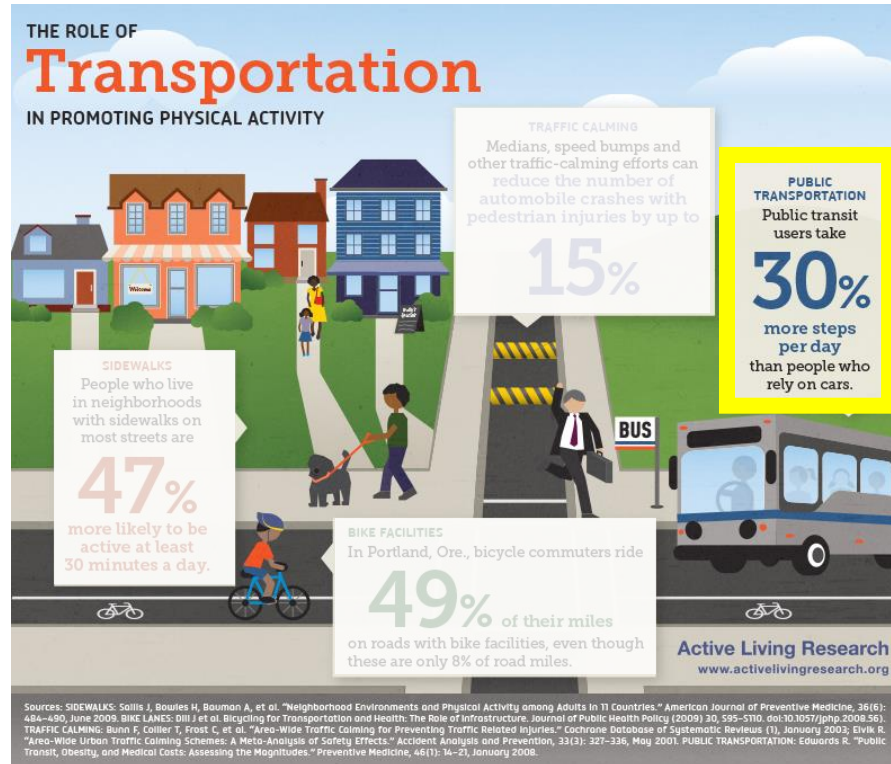
- Faster boarding
- Reduced burden
- Economic impacts
- Improved mobility
- Increase transit use?
- Improve health?



Zero Fare Transit Policies

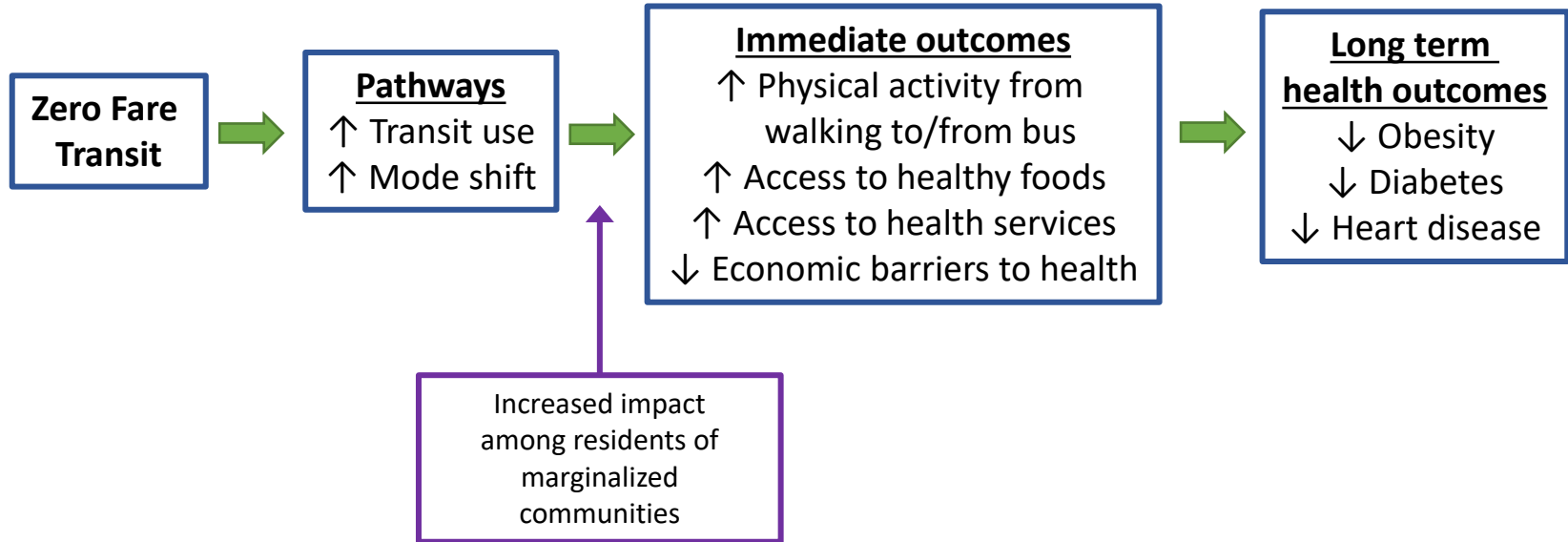
- Objectives

- Faster boarding
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- Improved mobility
- Increased transit use?
- Improved health?



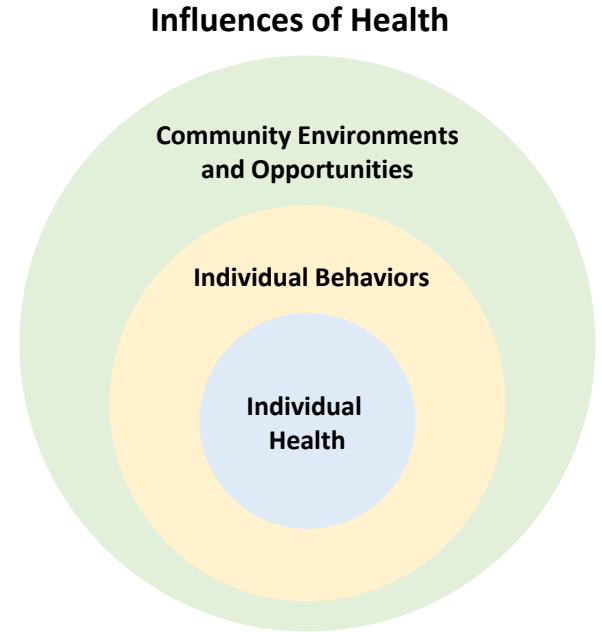
**+15-20
minutes
of walking**

Health Impacts of Zero Fare Bus Transit



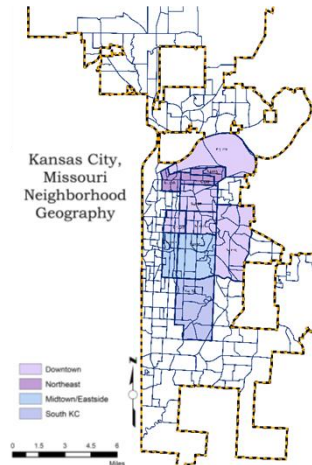
Goals of Research

- Health programs often fail because residents face barriers in their communities
- Public policies are needed that help remove health barriers in marginalized communities
- Zero fare transit could shape community health through multiple mechanisms
- Inform health considerations in public policy decision making



Zero Fare Kansas City

- Kansas City, MO
 - 500K residents
 - 5th most economically and racially segregated city in U.S.
 - Second highest miles of roadway per capita in U.S.
- Zero fare bus policy
 - Unanimous vote to approve policy in late 2019
 - Anticipated start summer 2020
 - Early start due to COVID-19 pandemic



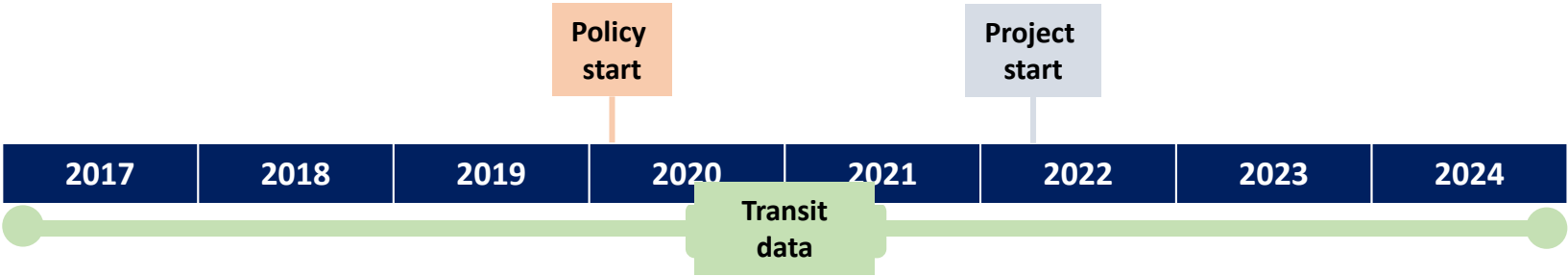
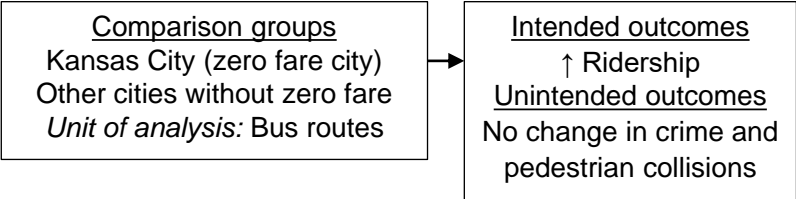
EDITORIALS

Will Kansas City become the first major city with **free bus** service?

NOVEMBER 12, 2019 AT 5:00 AM

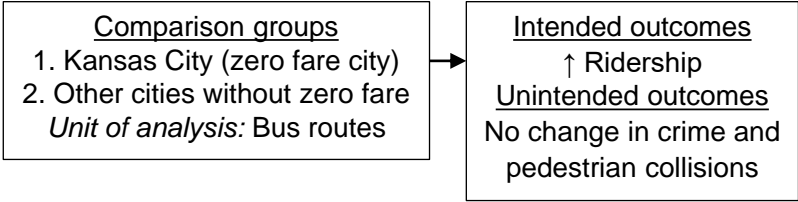
Study Objectives

Aim 1. Evaluate the impact of zero fare on changes in bus ridership, crime, and pedestrian-involved crashes

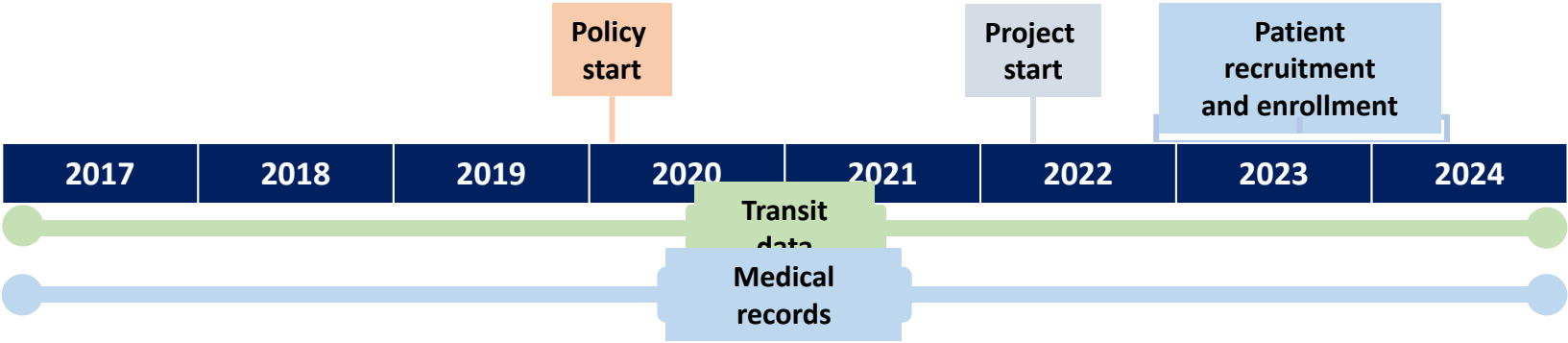
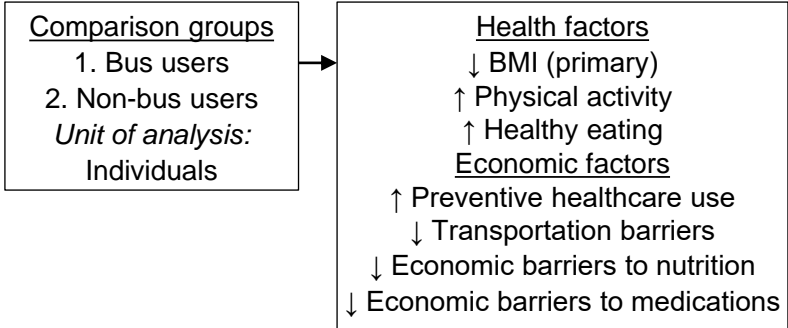


Study Objectives

Aim 1. Evaluate the impact of zero fare on changes in bus ridership, crime, and pedestrian-involved crashes



Aim 2. Evaluate the impact of bus use on health and economic factors within the zero-fare context



Cities included in the zero fare health research study

City	City population	Metro population	% White non-Hispanic	% Black non-Hispanic	% in poverty	Mean monthly ridership	Days >1 inch precipitation	Days <32° F	Days >90° F
Kansas City, MO	486K	2.12M	55.2%	27.9%	16.1%	39.6K	15	30	51
Austin, TX	951K	2.11M	48.3%	7.4%	13.2%	93.2K	11	0	143
Cincinnati, OH	301K	2.20M	48.2%	42.0%	26.3%	44.8K	18	18	38
Columbus, OH	879K	2.08M	55.1%	28.6%	19.5%	61.0K	8	28	31
Indianapolis, IN	864K	2.03M	54.5%	28.2%	18.0%	29.0K	13	31	26
Louisville, KY	618K	1.26M	64.5%	23.7%	15.2%	46.3K	21	10	80
Memphis, TN	652K	1.34M	25.7%	63.8%	25.1%	19.2K	27	2	90
Milwaukee, WI	595K	1.58M	35.1%	38.3%	25.4%	84.6K	10	54	10
Nashville, TN	664K	1.90M	55.3%	27.2%	14.4%	30.0K	19	4	99
Oklahoma City, OK	644K	1.38M	53.5%	14.1%	16.1%	10.4K	19	9	65

Other transit agencies with zero fare bus transit:

Albuquerque, NM Raleigh, NC Tucson, AZ
 New Haven, CT Richmond, VA

Patient Medical Records

- >1600 patients (~30% who are bus users)
- Complete additional measures
 - Healthy eating
 - Personal characteristics
- Linking physical activity to bus trips: Physical activity monitor and global positioning systems monitor
 - Minutes of physical activity
 - Trips (walking, cycling, vehicle)
 - Trip origins and destinations
 - 360 patients



Methodological Considerations – Aim 1

Challenges comparing cities

- No two cities alike

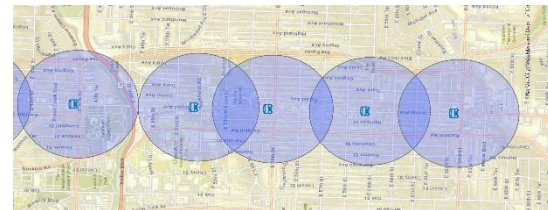
Approaches to improve comparisons

- Multiple cities
- Prior ridership trajectories
- Control for community factors

Control variables

Domain	Variables
Socioedemographics	Age; sex; education; race/ethnicity; racial/ethnic segregation; family households; female headed households with children; gentrification based on education and race/ethnicity (reflecting 10-year changes).
Economics	Median annual household income; poverty; households receiving public assistance; median home value; unemployment; income inequality; economic gentrification (reflecting 10-year changes).
Housing	Rented housing; owner occupied housing; crowding; vacant housing; living in residence ≥ 1 year.
Walkability	Residential density; retail/office/industrial/service/entertainment/health care density; land use mix; street connectivity; walkability index.
Transportation	Households with no vehicle; take public transit to work; proximity to transit stops.

Community characteristics along bus routes



Methodological Considerations – Aim 2

Challenges comparing bus users and non bus users

- Different backgrounds, characteristics

Approaches to improve comparisons

- Large sample
- Prior health trajectories
- Control for personal factors

Control variables

Age

Sex

Race/ethnicity

Marital status

of children in household

Education

Annual household income

Employment status

Access to vehicle

Barriers to using the bus

Diet/nutrition

Physical functioning

Pre-ZBT bus use level

Distance to nearest bus stop

Zip code



THE RIGHT OF WAY:

UNDERSTANDING TRANSIT INJUSTICE IN AMERICA

DR. JENNIFER D. ROBERTS

ASSOCIATE PROFESSOR

UNIVERSITY OF MARYLAND

NOVEMBER 9, 2023



SCHOOL OF
PUBLIC HEALTH





TRANSPORTATION IN AMERICA



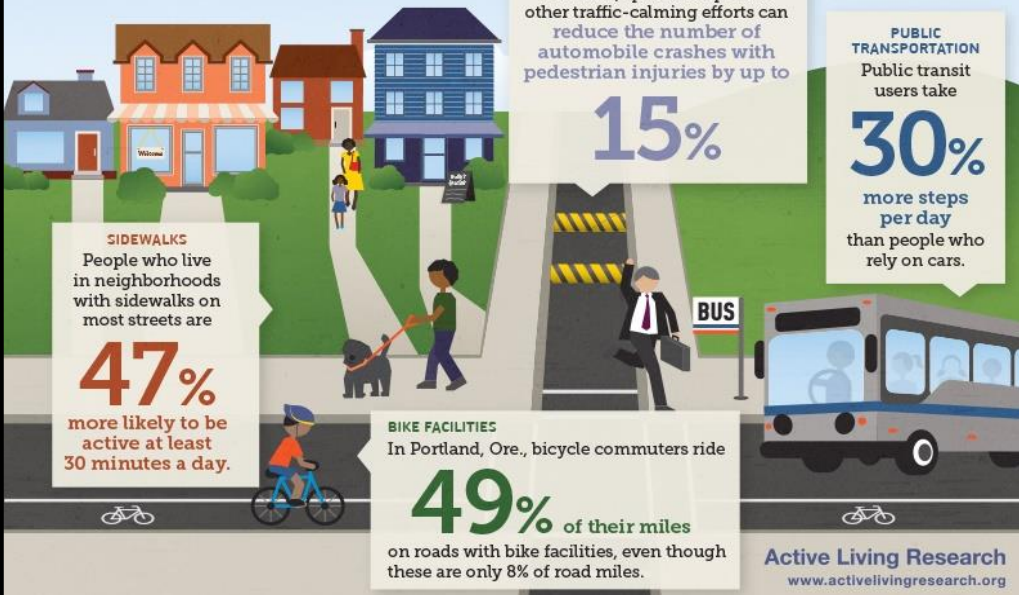
SCHOOL OF
PUBLIC HEALTH



BENEFITS OF PUBLIC TRANSPORTATION

THE ROLE OF Transportation

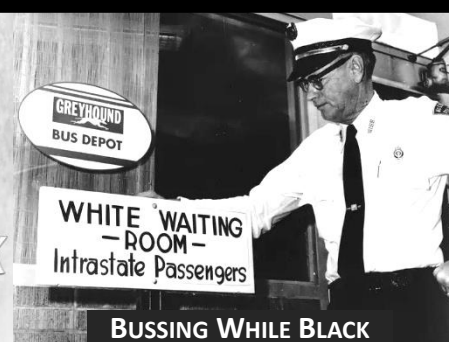
IN PROMOTING PHYSICAL ACTIVITY



DR. JENNIFER D. ROBERTS



SCHOOL OF
PUBLIC HEALTH



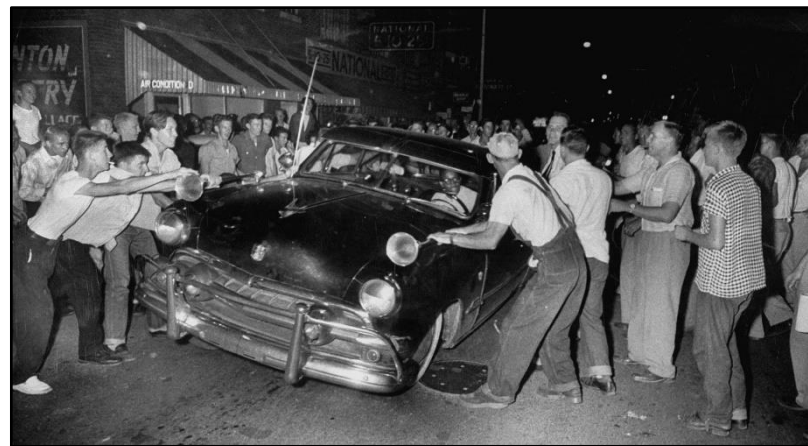
THE COLOR OF MOBILITY

NEGROES DRIVEN AWAY.
 The Last One Leaves Decatur, Ind.,
 Owing to Threats Made.

RICHMOND, Ind., July 12.—The last negro has left Decatur, Ind. His departure was caused by the 'anti-negro feeling. About a month ago a mob of fifty men drove out all the negroes who were then making that city their home. Since that time the feeling against the negro race has been intense, so much so that an Anti-Negro Society was organized.

The colored man who has just left came about three weeks ago, and since that time received many threatening letters. When he appeared on the streets he was insulted and jeered at. An attack was threatened and he made a hasty exit.

The anti-negroites declare that as Decatur is now cleared of negroes they will keep it so, and the importation of any more will undoubtedly result in serious trouble.



DR. JENNIFER D. ROBERTS



SCHOOL OF
 PUBLIC HEALTH

“WATCH YOUR SPEED”



Source: Lovecraft Country (TV Series 2020)

DR. JENNIFER D. ROBERTS



SCHOOL OF
PUBLIC HEALTH

“DON'T LET THE SUN GO DOWN ON YOU IN THIS TOWN”

☐ SUNDOWN TOWNS

- Towns with no African Americans on their census
 - African American live-in servants exempt
- Municipalities that banned African Americans and others (e.g., Jewish Americans) after dark
 - The South had very few sundown towns

☐ WAVE OF VIOLENCE

- Sundown towns were created in waves of violence in the early decades of 20th century
 - Thousands of communities kept out African Americans by force, law, or custom

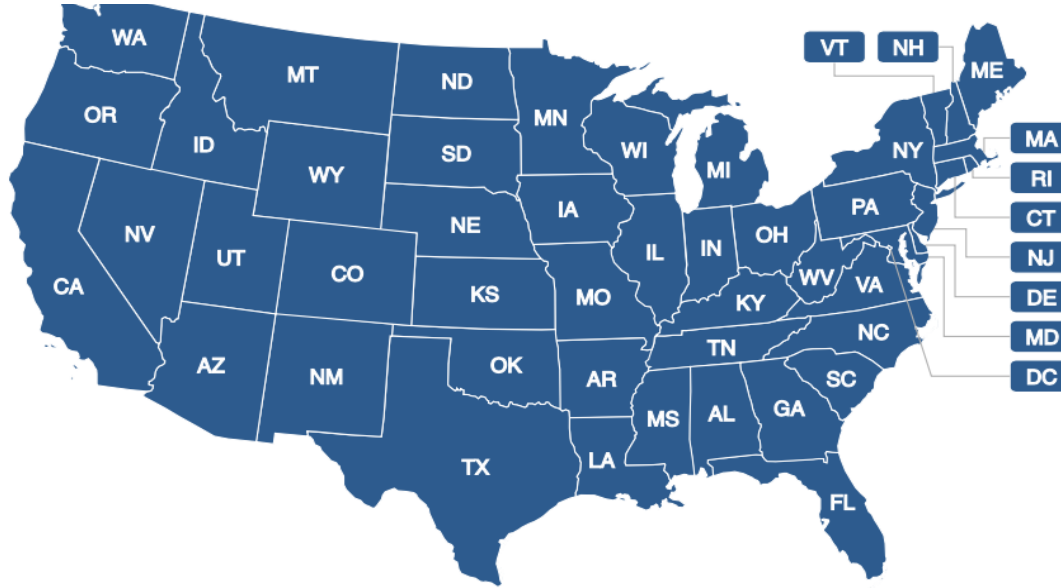


Source: Loewen, James W. "Sundown towns and counties: racial exclusion in the South." Southern Cultures, vol. 15, no. 1, 2009, p. 22+.

SUNDOWN TOWNS IN MARYLAND

Historical Database of Sundown Towns

WEBSITE: [HTTPS://JUSTICE.TOUGALOO.EDU/SUNDOWN-TOWNS/USING-THE-SUNDOWN-TOWNS-DATABASE/STATE-MAP/](https://justice.tougaloo.edu/sundown-towns/using-the-sundown-towns-database/state-map/)



MARYLAND SUNDOWN TOWNS

BRENTWOOD	OAKLAND
CALVERT COUNTY	PRINCESS ANNE
CHEVY CHASE	SAVAGE
CROFTON	SCIENTISTS CLIFF
FRIENDSVILLE	SMITH ISLAND
GARRETT COUNTY	TIGHMAN ISLAND
GREENBELT	UNIVERSITY PARK
LONACONING	WASHINGTON GROVE
MAYO	WESTERNPORT
MOUNT RAINIER	WOODLAND BEACH

EVEN STILL, THE CAR WAS STILL BETTER

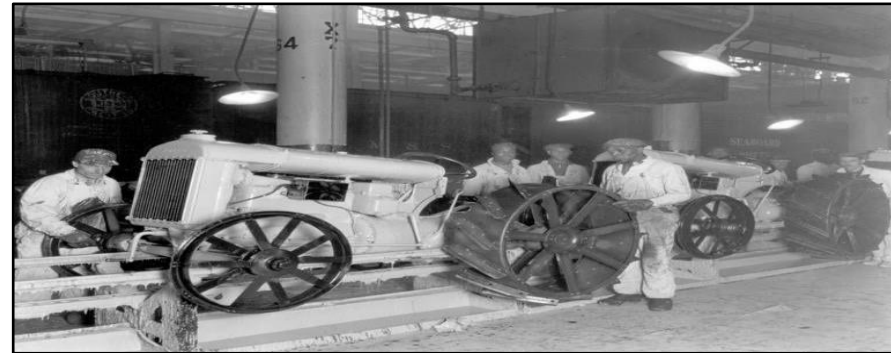
- SEGREGATION PUBLIC TRANSIT**
 - Car avoided everyday humiliation (e.g., sitting at the back of bus), assault or death
- SUBVERT JIM CROW**
 - Driving African Americans a freedom that they did not have on public transportation
- NEW MOBILITY**
 - Cars offered means of getting to work, travelling, or visiting family and friends
- “MAKING IT”**
 - For African Americans cars became a symbol of economic success

“THE COMING OF THE CHEAP AUTOMOBILE HAS MEANT FOR SOUTHERN NEGROES, WHO CAN AFFORD ONE, A PARTIAL EMANCIPATION FROM JIM CROWISM”

- GUNNAR MYRDA -

“RACE IS MOST COMPLETELY IGNORED ON THE PUBLIC HIGHWAY.... EFFECTIVE EQUALITY SEEMS TO COME AT ABOUT TWENTY-FIVE MILES AN HOUR OR ABOVE”

- GUNNAR MYRDA -



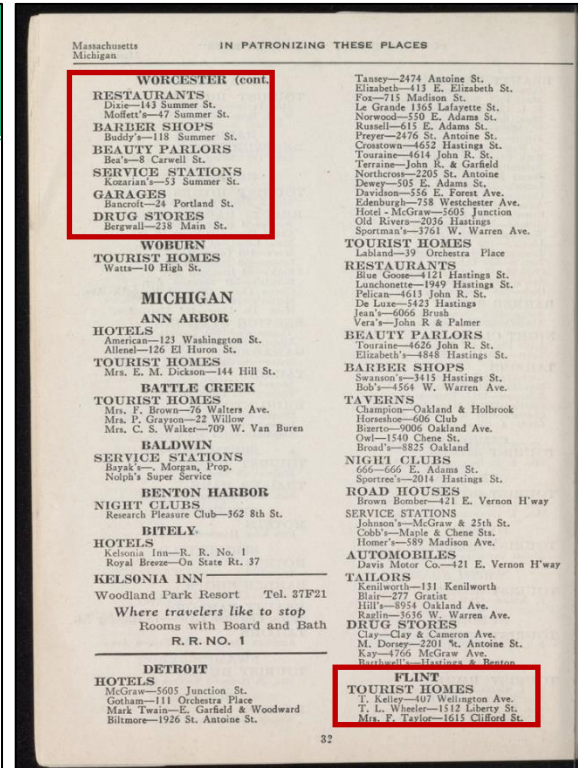
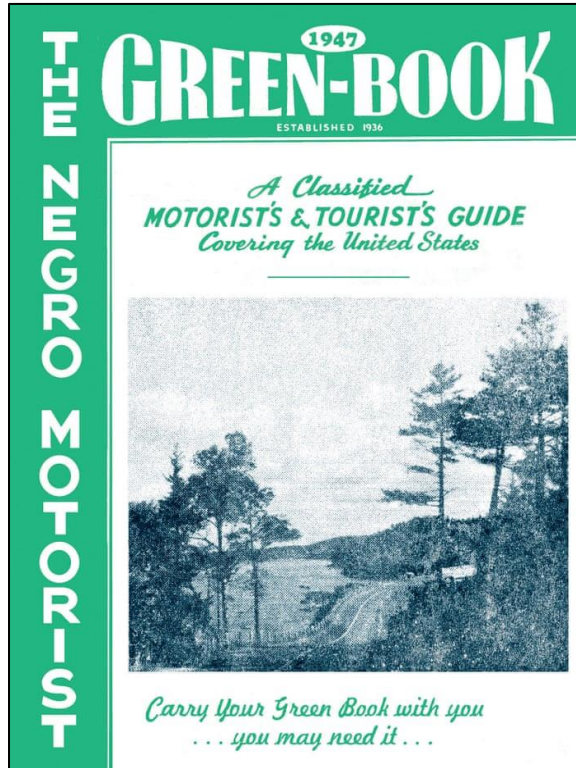
Source: Myrdal, G. (1944). An American dilemma. United Kingdom: Transaction Publishers.; Sugrue, T.J. (2010). Driving While Black: The Car and Race Relations in Modern America. At:

http://www.autolife.umd.umich.edu/Race/R_Casestudy/R_Casestudy1.htm

THE NEGRO MOTORIST GREEN BOOK

"CARRY YOUR GREEN BOOK WITH YOU... YOU MAY NEED IT"

- First published in 1936 by Victor Hugo Green
- Listings organized by state and city
 - Homeowners were listed for accommodations
- Used by migrant northerners to visit relatives in the South





SUBURBANIZATION IN AMERICA



DR. JENNIFER D. ROBERTS



SCHOOL OF
PUBLIC HEALTH

'SEGREGATION BY DESIGN'

“IT IS INCREASINGLY CLEAR TO ME THAT WHITE FLIGHT WAS NOT A MYSTICAL PROCESS FOR WHICH WE HAVE NO REAL EXPLANATION OR UNDERSTANDING. WHITE FLIGHT WAS THE POLICY OF OUR FEDERAL, STATE, AND LOCAL GOVERNMENT. THAT POLICY HELD THAT AMERICANS SHOULD ENJOY EASY ACCESS TO THE CITIES VIA THE AUTOMOBILE AND LIVE IN SUBURBS WITHOUT BLACK PEOPLE, WHO BY THEIR VERY NATURE DEGRADED PROPERTY AND HUMANITY.”

Source: Coates, Ta-Nehisi, (2013). The Ghetto, Public Policy, and the Jewish Exception. The Atlantic. At: <https://www.theatlantic.com/national/archive/2013/02/the-ghetto-public-policy-and-the-jewish-exception/273592/>

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U.S. SUBURBANIZATION: GI BILL

The end of WWII led to an era of wealth & spending in the 1950s:

The war stimulated the economy & ended the Great Depression

High wages, service pay for soldiers, & war bond investments gave Americans money to spend

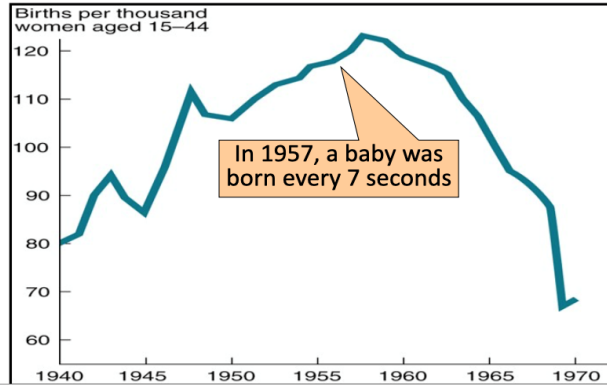


Americans produced a “baby boom” in the 1950s, leading to the largest generation in U.S. history

The return of soldiers from war led to an increase in marriages & a rise in the birthrate



Americans produced a “baby boom” in the 1950s, leading to the largest generation in U.S. history



The GI Bill of Rights offered returning soldiers cheap loans for new homes & tuition for college



Consumerism returned in the 1950s because for the 1st time since the 1920s Americans had money and access to consumer goods

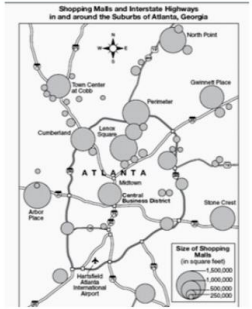
People rushed to buy new goods like cars, TVs & hi-fi record players



Suburbs changed American life

Suburbs increased America’s need for cars & highways

Churches, schools, grocery stores, & shopping centers were built to service the suburbs



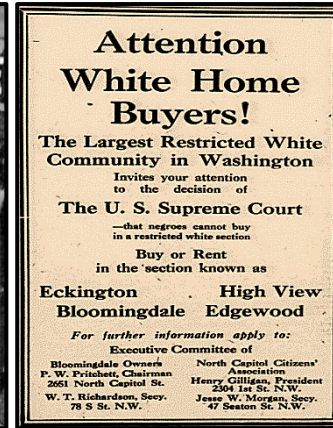
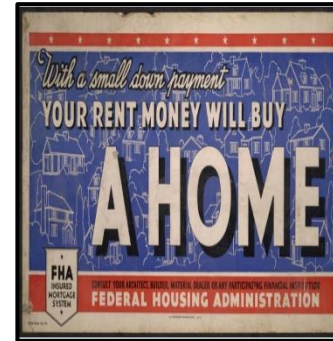
U.S. SUBURBANIZATION: U.S. GOVERNMENT'S ROLE

HOME MORTGAGES

- Government agreed to under-write mortgages for suburban single family homes
 - Encouraging transfer of the White middle-class population out of inner city and into the suburbs

RESIDENTIAL SEGREGATION

- **Racist Housing and Land Use**
 - Redlining
 - Blockbusting
 - Covenants
 - Zoning



Source: Rutgers. At: <https://crab.rutgers.edu/~glasker/FHADMIN.htm>

U.S. SUBURBANIZATION: HIGHWAYS

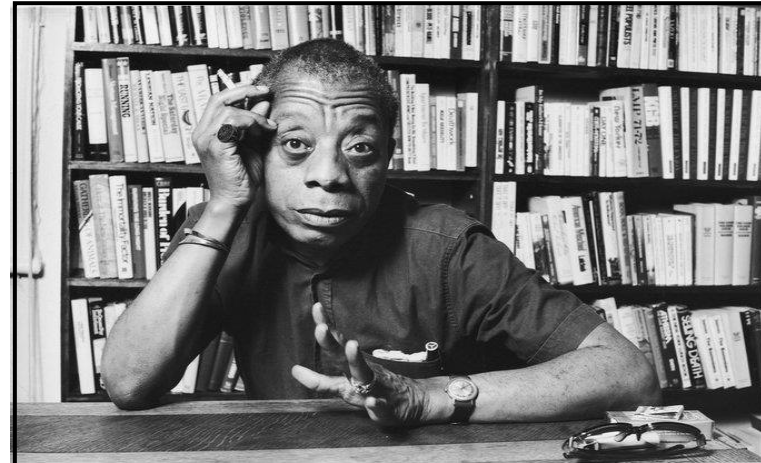
□ HIGHWAY CONSTRUCTION

- “the greatest single element in the cure of city ills”
- 1944 and 1956 Federal Highway Act
 - Initially covered 50% of construction costs and by 1956 covered 90%

□ URBAN RENEWAL

- “using highways to “redeem” urban areas”
 - Build highways and get rid of “slums”
 - Displaced and decimated close-knit African American communities throughout the U.S.
- Many residents lost fully paid homes

Source: The Atlantic. At: <https://www.theatlantic.com/business/archive/2016/03/role-of-highways-in-american-poverty/474282/>

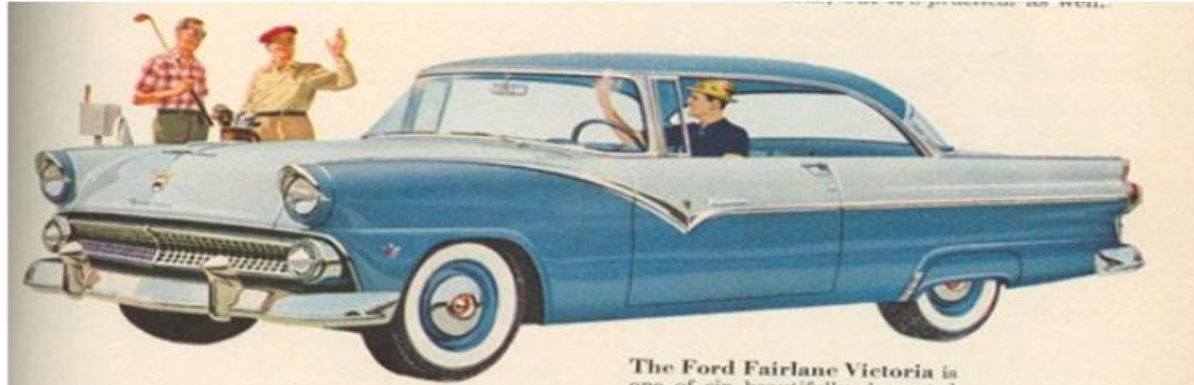


“THEY WERE TEARING DOWN HIS HOUSE, BECAUSE SAN FRANCISCO IS ENGAGING — AS MOST **NORTHERN CITIES** NOW ARE ENGAGED — IN SOMETHING CALLED **URBAN RENEWAL**, WHICH MEANS MOVING THE NEGROES OUT. IT MEANS **NEGRO REMOVAL**, THAT IS WHAT IT MEANS. THE FEDERAL GOVERNMENT IS AN ACCOMPLICE TO THIS FACT.”

— JAMES BALDWIN (1963) —

U.S. SUBURBANIZATION: AUTOMANIA

In the 1950s, Americans bought cars in record numbers



The Ford Fairlane Victoria is one of six beautifully decorated Fairlane models. Like all 1955 Fords, its styling is inspired by the Thunderbird, America's only on-the-road dream car.



The Ford Custom Ranch Wagon is one of five station wagon models. Whether you prefer two doors or four . . . six passengers or eight . . . there's a Ford wagon for you.

America's
"worth more" car . . . **FORD**



AMERICANS WERE MORE MOBILE, TOOK LONG-DISTANCE VACATIONS, AND LIVED FURTHER FROM THEIR JOBS



CARS LED TO DRIVE-THRU RESTAURANTS



TRANSIT INJUSTICE



DR. JENNIFER D. ROBERTS



SCHOOL OF PUBLIC HEALTH

TRANSIT INJUSTICE - SERVICE

❑ LESS RELIABLE TRANSIT

- Low income communities and communities of color endure
 - Longer, costlier and less reliable commutes
 - Fewer mobility options

❑ TRANSPORTATION RELATED POLLUTION

- Low income communities and communities of color suffer
 - Disproportionately from transportation pollution

❑ ECONOMIC BIAS

- U.S. transportation policies and funding
 - Directed at highways vs. public transportation



Source: Bell, D. (2022). New Report: Decades of Injustice in Transportation Systems Exacerbates Climate Disasters in Communities of Color. At: <https://greenlining.org/2022/achieving-resilient-mobility-in-transportation/>; Sen, B. (2022). How the U.S. Transportation System Fuels Inequality. At: <https://inequality.org/research/public-transit-inequality/>

TRANSIT INJUSTICE - GENTRIFICATION

☐ GENTS STUDY OBJECTIVE

- Evaluate perceived transit induced gentrification (TIG) and associated health outcomes and determinants

HEALTH OUTCOMES	HEALTH DETERMINANTS
Heart Health	Walkability
Anxiety	Crime

☐ GENTS STUDY METHODOLOGY

- Panel of Prince George's County, MD residents complete online questionnaire
 - Wave 1 - Spring/Summer 2021 (n=465)
 - Wave 2 - Spring/Summer 2023 (n= 811)
 - Wave 3 - Spring/Summer 2025 (n=TBD)

GENTS

GAUGING THE EFFECTS OF NEIGHBORHOOD TRENDS ON

SICKNESS:

EXAMINING PERCEPTIONS OF TRANSIT-INDUCED GENTRIFICATION

STUDY

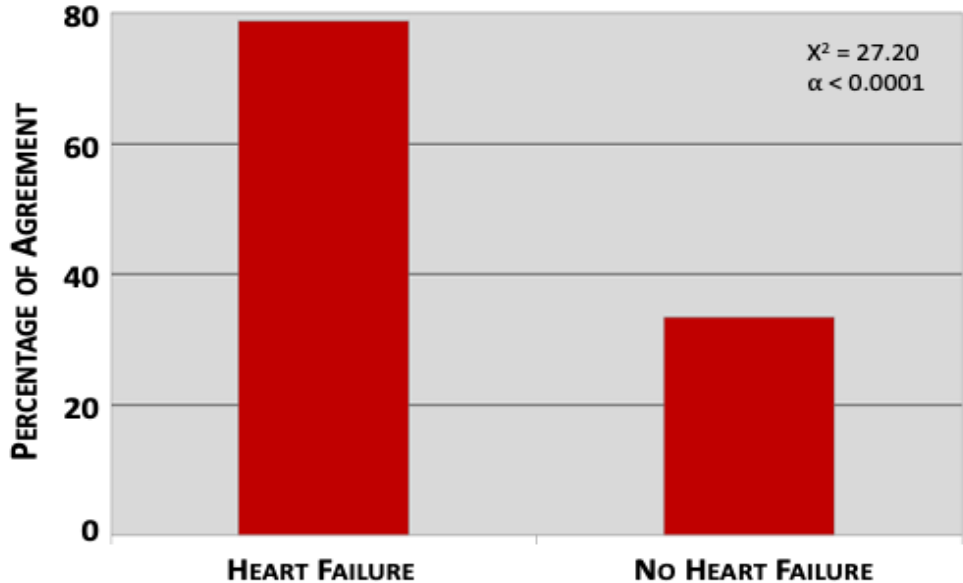


Source: Roberts, JD., Tehrani, SO., Isom, R., Stone, EA., Garcia, VN. (2020). A Case-Comparison Study Protocol for Gauging Effects of Neighborhood Trends and Sickness: Examining the Perceptions of Transit-Induced Gentrification in Prince George's County. BMJ Open. doi:10.1136/bmjopen-2020-039733.

TRANSIT INJUSTICE - GENTRIFICATION

WAVE 1 – HEART HEALTH

“I HAVE FEARED BEING ‘PUSHED OUT’
OF MY NEIGHBORHOOD”



GENTS

GAUGING THE EFFECTS OF NEIGHBORHOOD TRENDS ON
SICKNESS:

EXAMINING PERCEPTIONS OF TRANSIT-INDUCED GENTRIFICATION

STUDY



Source: Tehrani, SO., Jaffe, A., Roberts, JD. (In Progress) Gentrification, Walkability, and Crime: An Examination of the Purple Line Light Rail Transit in Prince George's County, Maryland.

DR. JENNIFER D. ROBERTS

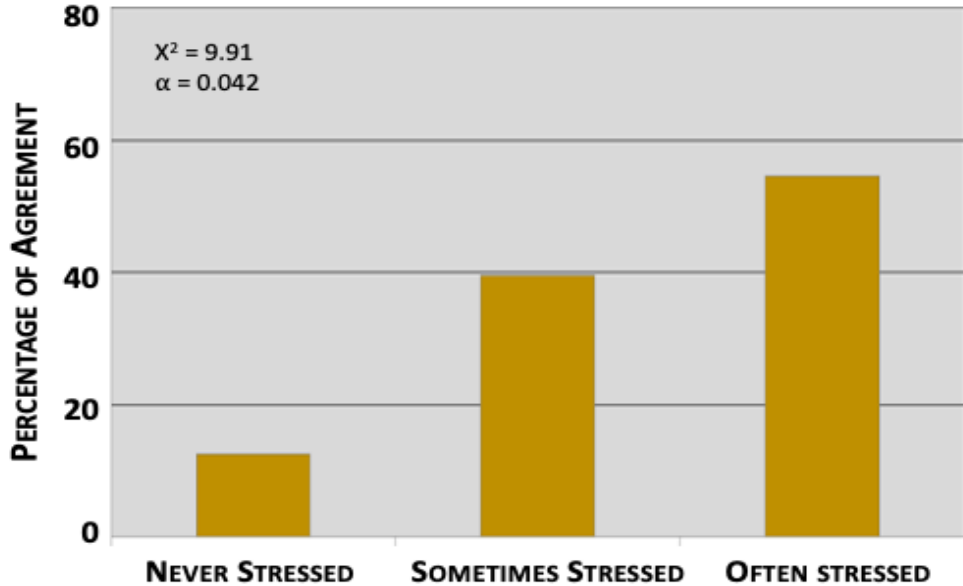


SCHOOL OF
PUBLIC HEALTH

TRANSIT INJUSTICE - GENTRIFICATION

WAVE 1 – ANXIETY

“I HAVE FEARED BEING ‘PUSHED OUT’
OF MY NEIGHBORHOOD”



GENTS

GAUGING THE EFFECTS OF NEIGHBORHOOD TRENDS ON
SICKNESS:

EXAMINING PERCEPTIONS OF TRANSIT-INDUCED GENTRIFICATION

STUDY



Source: Tehrani, SO., Jaffe, A., Roberts, JD. (In Progress) Gentrification, Walkability, and Crime: An Examination of the Purple Line Light Rail Transit in Prince George's County, Maryland.

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SCHOOL OF
PUBLIC HEALTH


TRANSIT INJUSTICE - PROFILING

☐ “MOVING WHILE BLACK”

- Expression derived from U.S. “driving while intoxicated” criminal offense

☐ RACIAL PROFILING

- Endured by many Black Americans
 - Pedestrians, Runners
 - Cyclists, Scooterist



PBOT
PORTLAND BUREAU OF TRANSPORTATION

2018 E-SCOOTER FINDINGS REPORT

While many East Portlanders and Black Portlanders expressed enthusiasm for e-scooters, some focus group participants also expressed an **overall concern for traffic safety and the risk that Black e-scooter riders would be targeted for racial profiling and harassment.**

Source: PBOT. At: <https://www.portlandoregon.gov/transportation/article/709719>

Los Angeles Times

BY: ALENE TCHEKMEDYIAN, BEN POSTON, JULIA BARAJAS

NOVEMBER 4, 2021

L.A. sheriff's deputies use minor stops to search bicyclists, with Latinos hit hardest



Source: PBOT. At: <https://www.portlandoregon.gov/transportation/article/709719>

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SCHOOL OF
PUBLIC HEALTH


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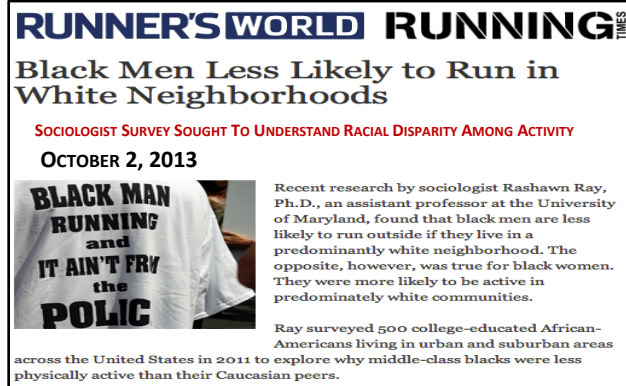
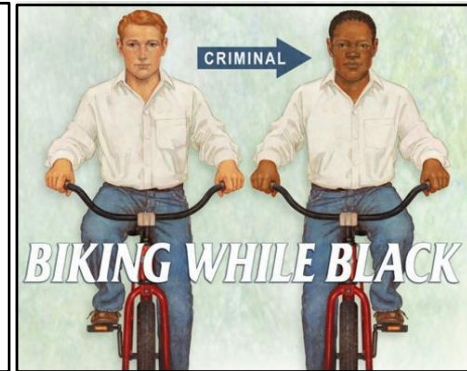
Source: PBOT. At: <https://www.portlandoregon.gov/transportation/article/709719>



Chicago Tribune
March 17, 2017

'Biking while black': Chicago minority areas see the most bike tickets


BY: MARY WISNIEWSKI
CHICAGO TRIBUNE



RUNNER'S WORLD RUNNING TIMES

Black Men Less Likely to Run in White Neighborhoods

SOCIOLOGIST SURVEY SOUGHT TO UNDERSTAND RACIAL DISPARITY AMONG ACTIVITY
OCTOBER 2, 2013



Recent research by sociologist Rashawn Ray, Ph.D., an assistant professor at the University of Maryland, found that black men are less likely to run outside if they live in a predominantly white neighborhood. The opposite, however, was true for black women. They were more likely to be active in predominately white communities.

Ray surveyed 500 college-educated African-Americans living in urban and suburban areas across the United States in 2011 to explore why middle-class blacks were less physically active than their Caucasian peers.



The Florida Times-Union

WALKING WHILE BLACK

Jacksonville's enforcement of pedestrian violations raises concerns



TRANSIT INJUSTICE - SAFETY

SAFETY AND PERCEPTION

– Research Findings

- Overall, pedestrian deaths increased
 - 1.7/100K in 2009 to 2.2/100K in 2018
- Drivers less likely to brake for Black American pedestrians
 - Cars passed through crosswalk with Black American pedestrians
- Compared to White (1.8) pedestrians, the age-adjusted pedestrian death rate
 - 2 Times Higher for Black Americans (3.6)
 - 1.5 Times Higher for Hispanics (2.9)

The Washington Post
Democracy Dies in Darkness

‘Walking while black’ can be dangerous too, study finds

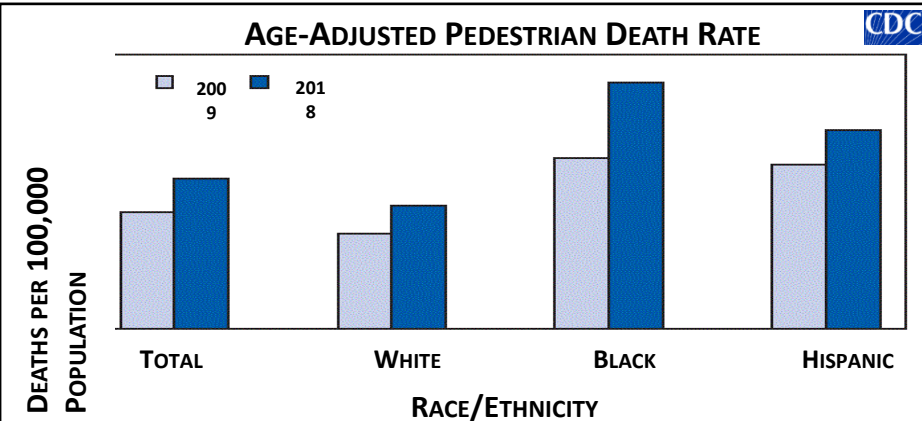
BY FREDRICK KUNKLE

OCTOBER 26, 2015

Study finds more evidence for ‘walking while black’

BY FREDRICK KUNKLE

MARCH 22, 2017



Source: Goddard. 2014. At: <http://dx.doi.org/10.15760/trec.130>; Coughenour. 2017. At: doi.org/10.1016/j.aap.2016.09.031; CDC. 2020. At: <https://www.cdc.gov/mmwr/volumes/69/wr/mm6939a7.htm>

TRANSIT INJUSTICE - SAFETY

SAFETY AND PERCEPTION

– Research Findings (2021 Data)

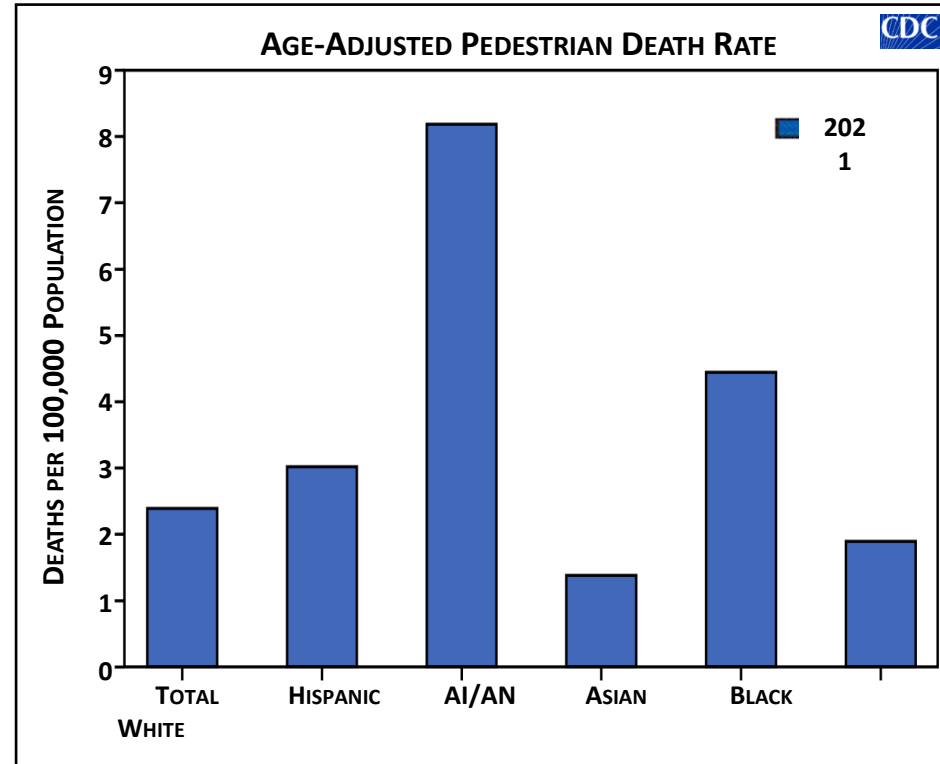
- Compared to White (1.9) pedestrians, the age-adjusted pedestrian death rate

➤ 4 Times Higher (8.2)
• American Indian/Alaska Native

➤ 2 Times Higher (4.4)
• Black Americans

➤ 1.5 Times Higher (3.0)
• Hispanics

➤ 0.7 Times Lower (1.4)
• Asians



Source: CDC. 2023. At: <https://www.cdc.gov/mmwr/volumes/72/wr/pdfs/mm7224-H.pdf>

Page 45 University

ACHIEVING TRANSIT JUSTICE

☐ INCREASE SERVICE

- Increase transit so more people and jobs are within walking distance of routes that arrive frequently all and every day

☐ S.E.A.S

- Safe, Equitable, Affordable, Sustainable

☐ NEW NARRATIVE

- New branding of transit benefits and use among all income levels to encourage more people to use public transit





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THANK YOU!

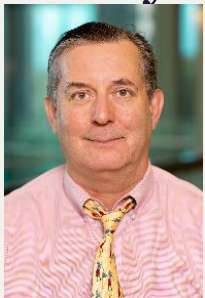
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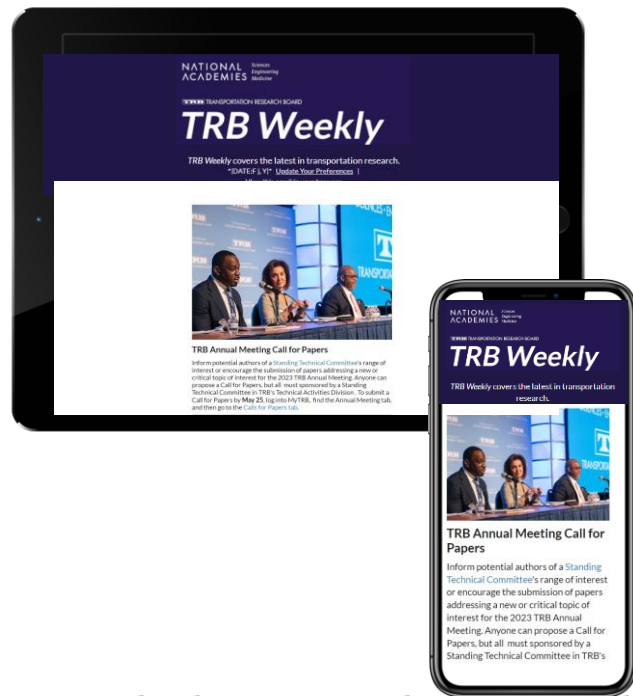
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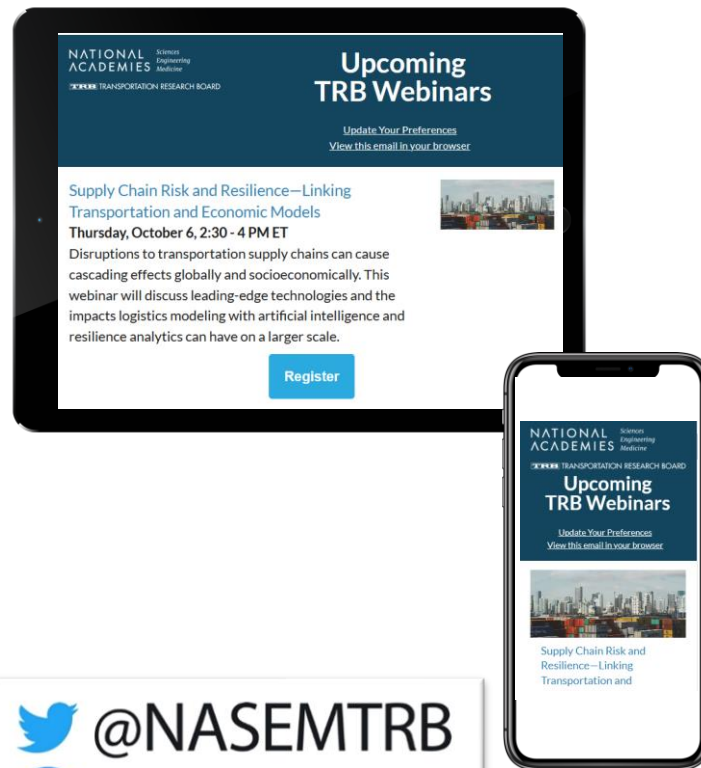
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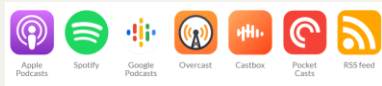
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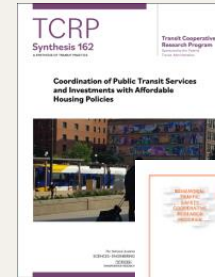
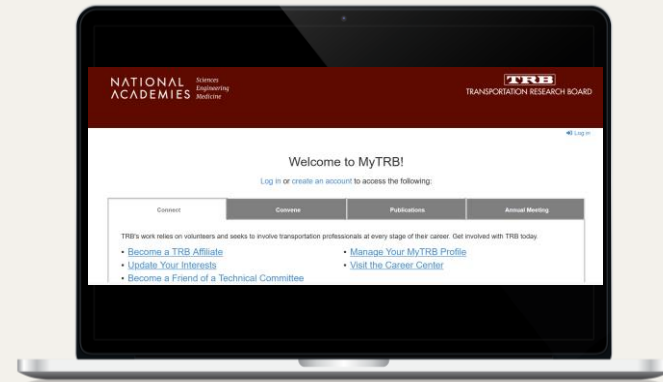
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