

# Equity Issues Associated with the Widespread Implementation of Autonomous Vehicles

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# Background

- Transportation options impact people's access to jobs, education, food, healthcare, and social relations
- Groups with limited transportation options include low-income persons, racial minorities, immigrants, women, people with disabilities, seniors, teenagers, and rural residents
- The introduction of autonomous vehicles (AVs) may increase or decrease inequities related to transportation access

# Equity Efforts in Washington State

- Equity is now considered in many statewide policies, not specific to AVs.
- The state Equity Office, created in 2020, has a 5-year plan addressing equity in areas such as school campuses, digital divide, financial literacy, and others.
- The state's 2021 Healthy Environment for All (HEAL) Act is designed to promote environmental justice and to reduce environmental and health disparities among communities of color and low-income households

# Methods

- Reviewed equity discussions in 7 known articles about public health impacts of AVs
- Used snowballing technique to identify AV and equity discussions in 60 other papers that cited these articles or were cited by these articles
- Focused on fully automated vehicles, SAE Levels 4 and 5
- Organized findings into ten areas in which AVs could positively or adversely impact equity

# Areas of Equity Concerns in AVs

## Initial development and deployment of AVs

- (1) Assessment of community mobility needs and priorities
- (2) Education and outreach
- (3) Disparities in infrastructure quality
- (4) Equitable provision of customer services

## Equitable access to AVs

- (5) Access by persons with low incomes
- (6) Access to smartphones and credit cards
- (7) Shared infrastructure services
- (8) Barriers to shared AV use, including women's safety
- (9) Access by disabled persons

## Long term impacts of widespread AV use

- (10) Loss of existing transport-related jobs

# 1. Community Mobility Assessment

## Importance

- Community needs should be assessed to tailor AV services to varied geographic and social requirements
- Community priorities may include improvement of existing public transit and sidewalks before AV improvements

## Possible policies

- Require community mobility needs assessments including active outreach to disadvantaged populations as part of AV planning process
- Promote fleets of shared AVs rather than individually owned AVs to enhance community benefits and reduce inequities

## 2. Education and Outreach

### Importance

- Persons with low education or limited English proficiency may be less aware of AV issues and less able to provide informed input in community participatory processes.

### Possible policies

- Increase public awareness by conducting active educational outreach about AVs to persons with low education before gathering community opinions.
- Provide outreach in multiple languages to assist persons who have limited English proficiency.



# 3. Infrastructure Quality Disparities

## Importance

- Improvements in existing roads to accommodate AVs may be disproportionately made in higher income areas



## Possible policies

- Prioritize improving lane markings and signals and overall road maintenance to benefit all road users
- Develop procedures to assure equitable distribution of roadway improvements and funding



# 4. Equitable Access to AVs Across All Neighborhoods

## Importance

- Enhanced access to AV services for persons in neighborhoods with racial and ethnic minorities helps prevent those areas from being isolated from the city



## Possible policies

- Review proposed AV geographic service areas and service times to ensure there is equitable access in all neighborhoods
- Develop a process to assess whether the data used for artificial intelligence algorithm training are collected equitably from minority populations

# 5. Access to AVs by Persons with Low Incomes

## Importance

- Access to AV services for persons with low incomes will help reduce unequal access to opportunities and daily needs services and will help improve quality of life

## Possible policies

- Provide targeted subsidies to support AV use by low-income persons
- Engage persons from disadvantaged communities in the development of AV policies
- Incentivize the implementation of affordable shared AVs

# 6. Access to Smartphones

## Importance

- Low-income persons and seniors may not have smartphones or credit cards needed to use AVs



## Possible policies

- Offer alternative communication and payment options for low-income persons
- Offer simpler methods for seniors to contact AVs



# 7. Shared Infrastructure Services

## Importance

- Sharing of infrastructure and services between AVs and other transport modes helps lower overall investment and maintenance costs
- Infrastructure investments are more equitable if they benefit multiple transport modes

## Possible policies

- Prioritize investments in filling potholes, improving lane markings, and providing pedestrian and bicycle infrastructure to help AVs and other transport modes
- Give lower priority to roadway-to-vehicle communication technologies, detailed mapping, and designated lanes that primarily help AVs



# 8. Barriers to shared AV Use: Safety

## Importance

- Women may be more concerned than men about sharing an AV ride with a stranger
- Vulnerable persons based on age, disability, gender, race, or ethnicity may be less comfortable sharing an AV with a stranger

## Possible policies

- Develop capacity for vulnerable persons to select AV ride-sharing partners without creating discrimination concerns
- Include camera surveillance & voice-activated emergency call buttons inside AVs
- Provide option for users to automatically notify emergency contact whenever riding in an AV

# 9. Access to AVs by Persons with Disabilities and Seniors

## Importance

- AVs may reduce inequities in access to transport mobility, increase personal independence, and reduce social isolation for persons with disabilities and for seniors



## Possible policies

- Provide AV services that exceed minimum ADA requirements for accommodating disabilities
- Require a percent of AVs to accommodate needs of wheelchair users
- Provide targeted subsidies and assistance for persons with disabilities and seniors
- Support research to understand factors affecting acceptance of AVs as a transportation choice

# 10. Potential Disruption of Existing Transport Jobs

## Importance

- Widespread AV use may lead to fewer jobs related to driving taxis, buses, and trucks which would disproportionately impact persons with low levels of education

## Possible policies

- Identify new jobs that may include AV maintenance and dispatching
- Develop job retraining targeted to transport-related workers whose jobs may become obsolete

# Policies for AV Implementation in a State or Local Jurisdiction

1. Include representatives of disadvantaged populations in AV policy and planning stages
2. Develop a framework to assess AV affordability for persons with low incomes
3. Develop a process to assess equity in funding AV infrastructure improvements



# Policies for AV Implementation in a State or Local Jurisdiction (cont.)

4. Develop strategies to encourage AV ride sharing with policy incentives
5. Develop job retraining programs for persons losing transport jobs
6. Develop ongoing monitoring and evaluation of AV services

# Policies for Permitting Processes for AV Service Providers in a State or Local Jurisdiction

1. Review how the company plans to accommodate AV accessibility for persons with mobility, vision, and hearing disabilities
2. Review the safety and security procedures for vulnerable AV users, especially women and minorities
3. Review the procedures for protecting the privacy of AV users, such as in-car videos and destination addresses

# Policies for Permitting Processes for AV Service Providers in a State or Local Jurisdiction (cont.)

4. Review the AV service area and service times proposed by the company
5. Review the artificial intelligence (AI) algorithms used to guide the AV services

# Study Limitations

- Field of AVs is growing rapidly - new studies now in progress may have been missed
- Unable to review potentially relevant proprietary information of AV companies
- Focused on passenger AVs and excluded other AV uses such as delivery vehicles and shuttles
- Impacts on equity of artificial intelligence algorithms used to guide AVs are difficult to ascertain
- Most recommendations relate to widespread AV use, not to AV testing pilot phase

# Conclusions

- Our suggested policies related to AVs are compatible with other existing Washington state policies to promote equity
- The current work is designed to increase the focus on equity in the ongoing efforts of the AV Work Group

# Conclusions (continued)

- Widespread use of AVs may have positive effects for disadvantaged persons, such as decreased motor vehicle injuries and increased transport options
- Potential negative impacts include inequitable AV access for disadvantaged persons and inequitable infrastructure investments
- Public sector policies informed by professionals in public health, social services, transportation, and other fields can help maximize the positive and minimize the adverse impacts on equity as AV use increases

# Questions or Comments

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