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ORIGINAL

# Disability, zero-vehicle households, and commuting modes

## Discapacidad, hogares sin vehículo y modos de desplazamiento al trabajo

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**ABSTRACT**

Introduction: People with disabilities may face greater transport disadvantage than people without disabilities, but national estimates linking disability to carless households and commuting modes are scarce. Methods: Cross-sectional analysis of the 2024 American Community Survey 1-year Public Use Microdata Sample. The prevalence of living in zero-vehicle households among adults and of commuting by public transport, walking and taxi or ride-hailing among workers was estimated by disability status, with replicate-weight prevalence ratios and 95% confidence intervals. Results: Among 2,612,172 adults aged 18 years and over, 0.2% had a disability. Adults with disabilities were more likely to live in zero-vehicle households (0.1% vs 0.1%; PR = 2.45; 95% CI 2.41-2.48). Among commuters, walking (3.1% vs 2.3%; PR = 1.31; 95% CI 1.25-1.38) and taxi or ride-hailing (0.9% vs 0.4%; PR = 2.08; 95% CI 1.84-2.31) were more common with disability, while public transport use (4.4% vs 4.2%) and commute duration were similar. Conclusions: People with disabilities were more than twice as likely to live in zero-vehicle households and more dependent on walking and taxi or ride-hailing services to commute, supporting policies that prioritize walkable environments, accessible transit and affordable ride services.

Keywords: disabled persons; transportation; commuting; automobile ownership; travel.

**RESUMEN**

Introducción: Las personas con discapacidad pueden afrontar mayor desventaja de transporte que quienes no la tienen, pero faltan estimaciones nacionales que vinculen discapacidad, hogares sin vehículo y modos de desplazamiento al trabajo. Métodos: Análisis transversal de la American Community Survey 2024 (Public Use Microdata Sample, 1 año). Se estimó, según discapacidad, la prevalencia de residir en hogares sin vehículo y de desplazarse al trabajo en transporte público, a pie o en taxi o viaje compartido, con razones de prevalencia e intervalos de confianza del 95 % con pesos replicados. Resultados: De 2 612 172 adultos de 18 años o más, 0,2% tenía discapacidad. Quienes la tenían residían más en hogares sin vehículo (0,1% frente a 0,1%; RP = 2,45; IC 95 % 2,41-2,48). Entre quienes se desplazaban al trabajo, caminar (3,1 % frente a 2,3 %; RP = 1,31) y el taxi o viaje compartido (0,9 % frente a 0,4 %; RP = 2,08) eran más frecuentes, mientras que el transporte público (4,4 % frente a 4,2 %) y la duración eran similares. Conclusiones: Las personas con discapacidad tenían más del doble de probabilidades de residir en hogares sin vehículo y dependían más de caminar y del taxi o viaje compartido, lo que respalda políticas que prioricen entornos caminables, transporte accesible y servicios de viaje asequibles.

Palabras clave: personas con discapacidad; transporte; desplazamiento al trabajo; propiedad de automóvil; viajes.

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## INTRODUCTION

People with disabilities in the United States travel less often, make fewer trips and depend more heavily on others for mobility than people without disabilities.(1,2)

Disability affects a substantial share of the adult population, in part because its risk rises with age, and its intersection with transport therefore touches millions of workers and non-workers alike. This disadvantage is documented across the country in both rural and urban areas, where adults with travel-limiting disabilities report fewer trips and greater unmet travel need than the general population.(3)

The consequences extend beyond mobility itself, since difficulty reaching work, health care and social activities compounds the economic and health disadvantages that people with disabilities already face. The gap is not distributed evenly across the transport system. Fixed-route transit, paratransit, walking environments and ride services each impose different demands on physical, sensory and cognitive function, and the private automobile remains the default instrument of independent travel in most of the country.(4)

Where car access is absent, the constraints of disability are compounded by the constraints of being carless, a condition long associated with transport poverty and reduced access to work, health care and services.(5)

Zero-vehicle households are a small but persistent feature of the United States, concentrated in large central cities and among low-income, older and minority households.(6,7)

Vehicle ownership follows the life course, and recent evidence documents a widening rural-nonrural divide in car access and unmet travel need, as well as a renewed attention to voluntary and involuntary carlessness.(8-10)

Policy and structural conditions have also reshaped car ownership during and after the pandemic, particularly for already carless households.(11)

The American Community Survey, with its national scope, its disability recode and its commuting questions, is the natural instrument for estimating these relationships with a single consistent definition, and it is the source used here. For people with disabilities, the intersection of disability and carlessness is especially consequential because the alternative modes are not always usable.

Transit requires accessible stations and vehicles, walking requires usable sidewalks and crossings, and ride services require affordability and drivers able to accommodate wheelchairs and other aids, a set of conditions that has grown more complex as app-based ride-hailing has expanded across the country. Studies of commuting document lower labor force participation and distinctive travel patterns among workers with disabilities, including greater use of public transit, walking and paratransit where those services exist, and income modifies the modes that people with and without disabilities are able to choose.(12-14)

Active travel among people with disabilities has been quantified nationally, and commuting modes differ from those of workers without disabilities, with implications for how accessibility and equity are measured and planned.(15,16)

What remains less clear is how disability status is associated with living in a zero-vehicle household and with dependence on non-private modes for the journey to work, using a single national sample with comparable definitions across the whole country. Existing work has examined carlessness among specific groups, commuting in single regions, or travel barriers without a national denominator, and the intersection of disability with other dimensions of disadvantage remains underexplored.(17)

The journey to work deserves particular attention because it is the trip that connects disability with earnings, because it recurs daily, and because its mode is recorded consistently for every worker in the source data. National estimates of that relationship are also directly usable by transport and employment policy, which require denominators and comparable definitions that local case studies cannot provide. The objective of this study was to estimate the association between disability status and residence in zero-vehicle households among United States adults, and to compare dependence on public transport, walking and taxi or ride-hailing services for commuting between workers with and without disabilities. The hypothesis was that people with disabilities are more likely to live in zero-vehicle households and more likely to depend on public transport, walking or taxi and ride-hailing services to commute.

## METHODS

This cross-sectional study used the 2024 American Community Survey 1-year Public Use

Microdata Sample, a nationally representative household survey conducted by the United States Census Bureau.(18)

The American Community Survey is a continuous monthly survey of about 3.5 million housing units per year, and its 1-year Public Use Microdata Sample contains unaggregated records for persons and households, which allow disability status to be crossed with household vehicle availability and commuting behavior under a single set of definitions for the whole country. Person and household files were downloaded as comma-separated archives from the Census Bureau server without registration, together with the data dictionary used to code every variable.(19)

The 2024 files contain more than three million person records, of which roughly two and a half million belong to adults aged 18 years and over living in housing units, a size that supports stable estimates for relatively small subgroups such as commuters with disabilities who use each non-private mode. The analysis was restricted to persons living in housing units; persons in institutional and noninstitutional group quarters were excluded because vehicle availability is not defined for them and because the research question concerns households.

Adults were defined as persons aged 18 years and over, and all descriptive and household-level analyses used this adult population, which matches the convention in national disability statistics. Workers were persons aged 16 years and over who were civilian employed and at work during the reference week, and commuters were defined as those workers who did not work from home. The study is reported according to the Strengthening the Reporting of Observational Studies in Epidemiology statement, and all analyses were planned before the results were inspected.

Disability status came from the American Community Survey disability recode, which identifies persons reporting a hearing, vision, cognitive, ambulatory, self-care or independent-living difficulty.(19)

The recode combines the six difficulty questions into two categories, with a disability and without a disability, and it does not distinguish the type or severity of limitation, a choice that follows the standard practice in national disability statistics and matches the classification used in other studies built on the same microdata.(20)

Vehicle availability was measured at the household level as the number of passenger vehicles available to members of the household, and a zero-vehicle household was one with no vehicles available; households with one or more vehicles formed the reference category. Means of transportation to work classified each worker as using a car, truck or van; public transport, defined as bus, subway or elevated rail, long-distance or commuter rail, light rail, streetcar or trolley, or ferryboat; taxi or ride-hailing; motorcycle; bicycle; walking; working from home; or another method.

The taxi or ride-hailing category is defined in the source data as a single response option that covers both traditional taxis and app-based ride services, and it was retained as such. Commute duration was recorded in minutes for the journey to work, and journeys of 60 minutes or more were classified as long commutes for a secondary analysis of travel time burden.

Covariables were age group, sex, race and Hispanic origin, educational attainment, household income and employment status. Age was grouped as 18 to 44, 45 to 64 and 65 years or over for adults, and as 16 to 44, 45 to 64 and 65 years or over for workers, because commuting behavior and vehicle availability differ systematically across the life course. Educational attainment was grouped as less than high school, high school or equivalent, some college or associate degree, and bachelor’s degree or higher. Household income was grouped into four bands with boundaries at $25,000, $50,000 and $100,000, and race and Hispanic origin into Hispanic, non-Hispanic White, non-Hispanic Black, non-Hispanic Asian and non-Hispanic other.

Employment status distinguished employed, unemployed and not in labor force among adults aged 18 to 64 years, and it was summarized for the descriptive table only, since the commuting analyses were restricted to workers who were employed and at work.

All estimates used person-level replicate weights, which were applied to every statistic in the full sample and in each of the 80 replicate weights supplied by the Census Bureau. Point estimates were weighted proportions, and standard errors were obtained with the successive difference replication formula, in which the variance is four eightieths of the sum of squared differences between the replicate estimates and the full-sample estimate.

This approach propagates the survey design through proportions, ratios and quantiles without assuming simple random sampling, and it yields confidence intervals that reflect the complex sample rather than the nominal sample size. Prevalence ratios and prevalence differences between people with and without disabilities were reported with 95% confidence intervals, and two-sided p values were obtained from the replicate-based standard errors with a normal approximation.

A prevalence ratio above one indicates a higher outcome prevalence among people with disabilities, and a prevalence difference expresses the same contrast in percentage points. Age-specific

prevalence ratios were computed within the three age groups, and age-standardized prevalence ratios were obtained by direct standardization to the pooled study population age distribution, so that the older age structure of the disability population did not by itself explain the observed differences.

Commute duration was summarized with weighted means and standard deviations and with weighted medians and interquartile ranges, because the distribution of travel time is right-skewed, and the proportion of commuters with a journey of 60 minutes or more was estimated with its confidence interval. Weighted medians and quantiles were computed from the cumulative weighted distribution of travel time, with the same replicate procedure applied to obtain design-based uncertainty. No imputation was performed for the small number of records with not-applicable codes on a given variable, which were excluded from the analysis that used that variable. Statistical significance was assessed throughout with two-sided tests at the 0.05 level, and confidence intervals rather than p values were treated as the primary basis for inference.

## RESULTS

The sample comprised 2,612,172 adults aged 18 years and over, of whom 444,143 (0.2%) had a disability (Table 1).

Adults with disabilities were older and less educated than adults without disabilities. The share aged 65 years or over reached 46.7%, against 18.5%, and 21.7% held a bachelor's degree or higher, against 37.5%. Household income below $25,000 was three times as frequent with disability (20.9% versus 7.9%), and employment among adults aged 18-64 was 47.1% versus 79.9%. The sex distribution was similar in both groups, and the disability population was disproportionately non-Hispanic White.

**Table 1. Characteristics of adults aged 18 years and over by disability status, United States, 2024.**

| Characteristic | Subgroup | With disability | Without disability |
|---|---|---|---|
| Sex | Male | 47.2 (210,528) | 49.0 (1,040,961) |
| Sex | Female | 52.8 (233,615) | 51.0 (1,127,068) |
| Age group (years) | 18-44 | 24.9 (87,120) | 49.6 (920,118) |
| Age group (years) | 45-64 | 28.5 (118,969) | 31.9 (719,206) |
| Age group (years) | 65+ | 46.7 (238,054) | 18.5 (528,705) |
| Race and Hispanic origin | Hispanic | 14.8 (52,009) | 18.9 (323,899) |
| Race and Hispanic origin | Non-Hispanic White | 62.9 (308,060) | 58.4 (1,429,179) |
| Race and Hispanic origin | Non-Hispanic Black | 12.7 (40,954) | 11.0 (159,439) |
| Race and Hispanic origin | Non-Hispanic Asian | 4.0 (16,754) | 7.0 (148,591) |
| Race and Hispanic origin | Non-Hispanic other | 5.5 (26,366) | 4.7 (106,921) |
| Educational attainment | Less than high school | 16.0 (65,512) | 9.0 (170,811) |
| Educational attainment | High school or equivalent | 33.0 (149,031) | 25.6 (545,206) |
| Educational attainment | Some college or associate | 29.3 (130,364) | 27.9 (603,399) |
| Educational attainment | Bachelor's or higher | 21.7 (99,236) | 37.5 (848,613) |
| Household income | < $25,000 | 20.9 (86,257) | 7.9 (161,516) |
| Household income | $25,000-$49,999 | 19.8 (88,685) | 12.1 (254,480) |
| Household income | $50,000-$99,999 | 28.7 (130,795) | 27.6 (591,134) |
| Household income | $100,000 or more | 30.6 (138,406) | 52.4 (1,160,899) |
| Employment status (18-64) | Employed | 47.1 (94,327) | 79.9 (1,306,817) |
| Employment status (18-64) | Unemployed | 5.1 (9,677) | 3.4 (51,019) |
| Employment status (18-64) | Not in labor force | 47.5 (101,596) | 16.2 (274,124) |
| Vehicle availability | Zero vehicles | 12.9 (47,031) | 5.3 (93,371) |
| Vehicle availability | One or more vehicles | 87.1 (397,112) | 94.7 (2,074,658) |

Adults with disabilities were more than twice as likely to live in a zero-vehicle household (12.9% versus 5.3%; PR = 2.45; 95% CI 2.41-2.48), a difference of 0.1% percentage points (Table 2).

The gap was narrower at ages 18-44 years (PR = 1.70) and wider at ages 45-64 (PR = 3.02) and 65 years or over (PR = 2.90).

**Table 2. Prevalence of living in zero-vehicle households by disability status and age group, United States, 2024.**

| Group | With disability % (95% CI) | Without disability % (95% CI) | PR (95% CI) | p |
|---|---|---|---|---|
| All adults (18+) | 12.9 (12.8-13.1) | 5.3 (5.2-5.3) | 2.45 (2.41-2.48) | 0.0000 |
| 18-44 | 10.4 (10.1-10.8) | 6.1 (6.1-6.2) | 1.70 (1.65-1.76) | 0.0000 |
| 45-64 | 12.5 (12.2-12.8) | 4.1 (4.0-4.2) | 3.02 (2.94-3.11) | 0.0000 |
| 65+ | 14.6 (14.3-14.8) | 5.0 (4.9-5.1) | 2.90 (2.83-2.97) | 0.0000 |

Note: CI = confidence interval; PR = prevalence ratio (with vs without disability).

Among 1,537,097 workers, the private car was the dominant commute mode in both groups, used by 77.2% of workers with disabilities and 78.8% of workers without disabilities. Working from home was equally common, at 13.2% and 13.5%, and the residual category of other methods was slightly more frequent with disability (1.7% versus 1.0%) (Table 3).

Public transport use among commuters was similar by disability (4.4% versus 4.2%; PR = 1.04; 95% CI 1.00-1.09). The prevalence ratio reached 1.07 at ages 16-44 and 1.10 at ages 45-64 (Table 4).

Walking was more frequent with disability (3.1% versus 2.3%; PR = 1.31; 95% CI 1.25-1.38).

**Table 3. Means of transportation to work among workers by disability status, United States, 2024.**

| Mode | With disability % (n) | Without disability % (n) |
|---|---|---|
| Car, truck or van | 77.2 (88,403) | 78.8 (1,110,289) |
| Public transport | 3.8 (3,522) | 3.7 (44,246) |
| Taxi or ride-hailing | 0.8 (737) | 0.4 (4,232) |
| Motorcycle | 0.2 (195) | 0.1 (1,841) |
| Bicycle | 0.5 (546) | 0.5 (6,517) |
| Walked | 2.7 (2,902) | 2.0 (27,278) |
| Worked from home | 13.2 (15,354) | 13.5 (197,371) |
| Other method | 1.7 (1,808) | 1.0 (13,279) |

Taxi or ride-hailing was also more frequent (0.9% versus 0.4%; PR = 2.08; 95% CI 1.84-2.31).

Age standardization left these patterns unchanged, with prevalence ratios of 1.08 for public transport, 1.35 for walking and 2.23 for taxi or ride-hailing. The age-standardized prevalence ratio for living in a zero-vehicle household was 2.29.

**Table 4. Dependence on public transport, walking and taxi or ride-hailing among commuters by disability status, United States, 2024.**

| Outcome | With disability % (95% CI) | Without disability % (95% CI) | PR (95% CI) | p |
|---|---|---|---|---|
| Public transport (all commuters) | 4.4 (4.2-4.6) | 4.2 (4.2-4.3) | 1.04 (1.00-1.09) | 0.0589 |
| Public transport (16-44) | 5.1 (4.8-5.4) | 4.7 (4.7-4.8) | 1.07 (1.01-1.13) | 0.0167 |
| Public transport (45-64) | 4.0 (3.7-4.2) | 3.6 (3.5-3.6) | 1.10 (1.03-1.18) | 0.0066 |
| Public transport (65+) | 3.5 (3.1-3.9) | 3.3 (3.2-3.5) | 1.06 (0.94-1.18) | 0.3397 |
| Walking (all commuters) | 3.1 (2.9-3.2) | 2.3 (2.3-2.4) | 1.31 (1.25-1.38) | 0.0000 |
| Taxi or ride-hailing (all commuters) | 0.9 (0.8-1.0) | 0.4 (0.4-0.5) | 2.08 (1.84-2.31) | 0.0000 |

Note: CI = confidence interval; PR = prevalence ratio (with vs without disability).

(Table 5) Commute duration did not differ between commuters with and without disabilities, with weighted means of 27.0 and 27.3 minutes and identical medians of 20 minutes. The interquar-

tile range was slightly narrower with disability, at 12 to 30 minutes against 15 to 35 minutes, and long commutes of 60 minutes or more were equally common, at 9.3% and 9.5%.

**Table 5. Commute duration among commuters by disability status, United States, 2024.**

| Measure | With disability | Without disability |
|---|---|---|
| Commute time (min), weighted mean | 27.0 (24.0) | 27.3 (22.9) |
| Commute time (min), median (P25-P75) | 20.0 (12.0-30.0) | 20.0 (15.0-35.0) |
| Long commute (>= 60 min), % (95% CI) | 9.3 (9.0-9.6) | 9.5 (9.4-9.5) |

Note: SD = standard deviation; CI = confidence interval.

## DISCUSSION

This study set out to estimate the association between disability status and residence in zero-vehicle households, and to compare commuting dependence on non-private modes between workers with and without disabilities. The main finding is that adults with disabilities in the United States were more than twice as likely as adults without disabilities to live in a zero-vehicle household, and that among commuters they depended more on walking and on taxi or ride-hailing services, while public transport use and commute duration were broadly similar.

The objectives are answered directly: the first and second objectives are met by the household-level estimates and their age gradients, the third by the full distribution of commuting modes, and the fourth by the prevalence ratios for each non-private mode. The hypothesis was confirmed for zero-vehicle households, walking and taxi or ride-hailing, but not for public transport, whose use was statistically indistinguishable between the two groups.

The zero-vehicle result is consistent with a long literature on carlessness and transport poverty in the United States, which associates the absence of a household vehicle with low income, older age, central-city residence and reduced access to opportunities.(5,6)

The finding also extends the national picture of zero-vehicle households among older Americans, who show the highest prevalence of carlessness, and it quantifies how much more common carlessness becomes when disability is added to age.(7)

Understanding voluntary carlessness has sharpened this literature by showing that some households forgo a car by choice, whereas others are carless by constraint, and the disability gradient observed here places people with disabilities firmly in the constrained group.(10)

Disability appears to concentrate several of the conditions that predict carlessness, since adults with disabilities in this sample were older, had lower educational attainment and lower household income, and were far less often employed. The pandemic era added a further shock, when policy and structural changes reshaped car ownership for car-owning and already carless households alike, a reminder that vehicle access is not fixed over time.(11)

Because the association persists after age standardization, the higher carlessness of people with disabilities cannot be reduced to their older age structure, which is consistent with the interpretation that disability, together with its correlates in driving, income and employment, contributes to lower vehicle access.

The age gradient, with a prevalence ratio below two at ages 18-44 and around three at older ages, mirrors the life-course pattern of vehicle ownership reported in longitudinal work on older Americans.(8,9)

Older adults with disabilities face a double burden, since aging itself reduces driving and since disability among older people often arrives together with retirement, widowhood and income loss. The household context of disability, previously documented with the same microdata source, offers a further explanation: adults with disabilities more often live in household structures with fewer economic resources to support a vehicle, and their carlessness is therefore entangled with the composition of the household rather than with individual preference alone.(20)

Geography adds a second layer to this picture. Car access and its absence are not uniform across the country, and the rural-nonrural divide in vehicle ownership means that a zero-vehicle household means something different in a dense central city, where walking and transit are viable substitutes, than in a rural county, where a car is nearly indispensable.(8)

Adults with travel-limiting disabilities in rural areas report distinctive transportation patterns and fewer alternatives when they cannot drive, which is likely to make the same absence of a

vehicle more punishing outside urban cores.(3,21)

The national estimates reported here average across those settings, and the local severity of carlessness is therefore understated in the places where it matters most. This geographic variability also cautions against reading a single national prevalence ratio as a fixed quantity, because the same disability confers different mobility penalties depending on where a person lives.

The commuting results refine that picture. Workers with disabilities used the private car almost as often as workers without disabilities, which is expected in a country where most workers of all groups drive to work, and working from home was equally common in the two groups. The differences appeared instead in the alternative modes, and they were modest in absolute terms because the private car dominates the commute for both groups.

The absence of an overall difference in public transport use is meaningful because transit is often framed as the primary alternative for people who cannot drive.(22,23)

Public transport dependence was, however, somewhat higher among working-age commuters with disabilities after accounting for the older age structure of the disability population, which is consistent with evidence that transit dependence among people with disabilities is concentrated in cities with dense, accessible networks and that first- and last-mile barriers suppress transit use elsewhere.(4,22)

High-resolution transit studies likewise show that usage by people with mobility disabilities tracks the accessibility of the network rather than the mere presence of a stop, so a national average that shows parity can conceal large local disparities in both directions.(22)

The finding that overall transit use did not differ while walking and taxi use did suggests that the modes people with disabilities actually adopt are the ones closest to the trip origin, a pattern that points to the accessibility of the built environment and of door-to-door services rather than to the fixed-route network alone.

The higher prevalence of walking among commuters with disabilities, an association that persists after age standardization, agrees with national estimates of active travel among people with disabilities and with work showing that walking is a fallback mode for low-income and carless populations.(15,24)

Walking is also the mode most sensitive to the built environment, and the result is consistent with the observation that people with disabilities who do commute by active modes do so over short distances and often because no motorized alternative is usable or affordable. The absolute share remains small in both groups, which reflects the geography of American employment more than the preference of commuters, but the relative excess among people with disabilities signals that walking absorbs trips that other modes cannot serve.

This interpretation is reinforced by the higher reported use of walking among carless and car-owning low-income populations, for whom walking functions as the cheapest available option rather than as a health choice.(24)

The strongest modal difference concerned taxi and ride-hailing services, whose use among commuters with disabilities was twice the rate observed among commuters without disabilities. This result is consistent with studies of ride-sourcing demand in metropolitan areas, which find that people with disabilities rely on ride services to fill the gaps left by fixed-route transit and paratransit.(25,26)

Qualitative and survey work in rural and urban settings likewise describes ride-hailing and taxis as a pragmatic response to the failure of other modes to meet the travel needs of non-drivers with disabilities, and lived-experience accounts from other regions reinforce that these services are adopted precisely where fixed networks fall short.(21,27,28)

Because ride services are paid per trip, this dependence also converts a modal difference into a financial one, and it concentrates among commuters who are, on average, poorer than their peers without disabilities. The parity in commute duration is in line with commuting studies that report similar travel times once employment location and mode are accounted for, although the cost and reliability of each minute differ between groups.(12,16)

Read as a whole, the mode pattern is consistent with the systematic reviews of disability and daily travel, which find that people with disabilities concentrate their travel on a narrower set of modes and destinations than the general population and that the barriers they report are modal rather than temporal.(1,2)

The national estimates reported here quantify that concentration for the journey to work and show that it coexists with a commute duration that is statistically indistinguishable from that of workers without disabilities. This separation between mode dependence and time is the point that matters for policy, because instruments that measure transport equity only by travel time will miss the cost, unreliability and effort embedded in the modes that people with disabilities actually use.

These patterns are best understood within the broader framework of transport-related social exclusion among people with disabilities. Travel behavior is constrained not only by impairment but by income, built environments and the availability of services, and the systematic reviews in this field document consistent disadvantages in trip frequency, mode availability and destination access.(1,2)

Income is a central mediator, since disability and low income together restrict vehicle ownership and push travelers toward walking and lower-cost services, a mechanism that operationalizes the capability approach to travel mode choice.(14)

Transportation needs are also heterogeneous across disability types, and measurement studies warn against treating a single disability flag as a sufficient descriptor of travel need, because a commuter with a cognitive limitation faces different barriers from one with a mobility impairment.(29)

The implications extend to employment, because transport is repeatedly identified as a barrier to work for people with disabilities, and the commuting dependence documented here is one of the channels through which that barrier operates.(30,31)

The low employment rate observed among working-age adults with disabilities, together with their concentration in zero-vehicle households, suggests that vehicle access and employment reinforce each other, so that a person without a car faces fewer job openings and a person without a job cannot afford a car.

The absence of a commute-duration penalty does not contradict this reading; it indicates that people with disabilities who reach employment do so by trading mode and destination for time, an adjustment that narrows the pool of jobs they can reach. Taken together, the results indicate that the transport disadvantage of people with disabilities operates less through commute duration than through mode dependence and vehicle access, and that the disadvantage is as much economic and environmental as it is physical.

The study has several strengths. It used a large, nationally representative sample with a single disability definition applied across the country, and it reported replicate-weight confidence intervals for all estimates, including age-standardized prevalence ratios, which accounts for the design of a complex survey. The use of a single data source with one disability recode avoids the definitional inconsistencies that arise when disability and commuting are measured in different surveys, and the analysis was fully reproducible from the raw microdata.

Several limitations should be weighed. The design is cross-sectional, so the direction of the association between disability and carlessness cannot be established, and longitudinal designs would be needed to distinguish selection into carlessness from the effect of disability. Disability is self-reported and aggregated across six domains, which may conceal heterogeneity between mobility, sensory and cognitive limitations; future work could disaggregate by disability type.

The taxi or ride-hailing category does not separate traditional taxis from app-based services, and the analysis did not distinguish trip purpose beyond the commute, so the full scope of daily travel dependence is underestimated; household travel surveys would complement these microdata.

The 1-year microdata describe the United States as a whole and do not support fine-grained local inference, and residential location and local transit supply were not modeled, so residual confounding by urban form remains plausible; future analyses could link the microdata to transit and land-use measures. Further, the commuting questions apply only to workers, so the results understate the mode dependence of the many adults with disabilities who are outside the labor force; trip-based surveys would capture their travel as well.

The results also carry implications for measurement. The finding that commute duration did not differ between groups while mode dependence did implies that time-based indicators of transport equity will systematically miss the disadvantage that people with disabilities face, which lies in the cost, effort and reliability of the modes they use rather than in the length of the journey.

Equity assessments built on travel time, or on the presence of any transit line, should therefore be complemented by indicators of mode choice, vehicle access and door-to-door connectivity for people with disabilities, a point consistent with the call for inclusive mobility metrics that do not average away the experience of the most disadvantaged groups.(2,17)

The findings carry practical implications. Because people with disabilities are overrepresented in zero-vehicle households, policies that reduce the cost of car ownership are unlikely to reach them, and investment should instead favor walkable environments, reliable fixed-route transit with first- and last-mile connections, and affordable ride-hailing subsidies where transit is not viable.(23,32)

Planning that treats mobility for non-drivers as a first-order objective rather than an afterthought would align service provision with the mode dependence observed here, and employment programs that pair transportation support with job placement may address the commuting

barriers that persist even among workers with disabilities.(17,31)

For the large share of adults with disabilities who are outside the labor force, the same investments in walking, transit and door-to-door services would extend mobility to the daily trips that commuting statistics cannot see, and would reduce the isolation that accompanies both disability and carlessness. In that sense, the commuting estimates reported here are a lower bound on the true transport disadvantage of this population.

## CONCLUSIONS

This cross-sectional analysis of the 2024 American Community Survey characterized adults with disabilities as older, less educated, lower income and less often employed than adults without disabilities, and it showed that adults with disabilities were more than twice as likely to live in zero-vehicle households, with the largest gaps at ages 45 years and over.

The distribution of commuting modes confirmed the dominance of the private car in both groups, while among commuters people with disabilities were more dependent on walking and on taxi or ride-hailing services, and public transport use and commute duration were similar. These findings indicate that the transport disadvantage of people with disabilities operates through vehicle access and mode dependence rather than through longer journeys, and they support transport policy that treats walkable environments, accessible transit and affordable ride services as central to the mobility and employment of people with disabilities.

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