Evaluating Driveway Cross Slopes and Social Equity in Cedar City, UT

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ABSTRACT
The Americans with Disabilities Act (ADA) is the most comprehensive law governing accessibility, and it requires local governments to develop transition plans to become compliant. Among the key ADA requirements is a continuous unobstructed pedestrian circulation network that consists of a sidewalk that has a cross slope of no more than two degrees. The primary objective of this research was to evaluate whether driveway cross slopes in Cedar City were ADA compliant, so a digital level was used to measure a random sample of driveway cross slopes. A secondary objective was to determine whether there is evidence of social inequities in Cedar City's pedestrian environment. The estimated value of each residential property (a proxy for income) was retrieved from Zillow® to evaluate the statistical relationship between incomes and driveway cross slopes. The results of this study indicate that there was no widespread evidence of social inequities. However, most driveway cross slopes (78.8 percent) were not ADA compliant and, thus, require retrofitting that should incorporate more widespread use of sidewalk buffer strips. The results also highlight priority areas for sidewalk improvements and can be used to inform a transition plan for sidewalk enhancements and funding.

KEYWORDS
Social Equity; ADA; Sidewalks; Advocacy Planning; Driveway Cross Slope; Walkability

INTRODUCTION

The design of our built environments has implications for accessibility (i.e., connecting people across a community network) and mobility (e.g., physical mobility and automobility), especially for those people who are living with physical mobility limitations or lack transportation options. Beyond the potential for our built environment to exclude people living with a physical disability, it is important that our communities are designed to be accessible and inclusive for everyone.[1, 2] Accessible built environments enable people of all ages and mobility levels to engage in the out-of-home activities that are required to meet their daily needs for services and social contact.[3] Engagement in out-of-home activities is an important aspect of daily living,[4] and is a key indicator of healthy aging[5] and quality of life.[6, 7, 8] Unfortunately, however, the design of far too many communities inherently imposes accessibility barriers (in both space and time) that hinder one's mobility, thereby preventing people from meeting their daily needs. Mobility can be hindered by physical mobility barriers, especially for those who are living with a physical disability, and by transport mobility barriers for those who lack reliable access to a car (i.e., automobility) or reliable public transit. Therefore, those people with mobility constraints and/or those who are especially tied to locality, such as children and older adults, are particularly vulnerable to these accessibility barriers.[9] Thus, the form and function of our communities have the potential to cause social inequities, which lead to a sense of isolation and exclusion, and in turn downgrade citizens' sense of independence, quality of life, and health.

Accessible built environments are expected to become increasingly important over the coming decades in the United States of America (USA) due to the increasing prevalence of adults living with a disability. More specifically, the number of adults ages 65 and older in the USA is expected to more than double over the next 40 years.[10] This so-called "gray tsunami"[11] will inevitably have serious implications for our society, our economy, and our communities.[12, 13] Moreover, the nationally representative panel Survey of Income and Program Participation (SIPP) indicates that 27 percent of adults aged 18 and older are living with a disability.[14] Notably, however, estimates from the SIPP exclude adults living in assisted living facilities, where 97 percent of adults aged 65 and older are living with a disability.[14] Because population aging is a global phenomenon,[15, 16] the World Health Organization[17] developed an "age-friendly cities" framework to promote the design of inclusive, healthy, and accessible urban environments that support active and healthy aging.

A continuous, unobstructed, accessible pedestrian network is an important component of an inclusive and age-friendly community for at least two reasons. Firstly, a community derives numerous social, economic, and environmental benefits from having an accessible pedestrian network.[18, 19, 20] Secondly, a community has a legal requirement to consider the needs of individuals who are living with a disability when designing the built environment.[21, 22, 23] This legal requirement began as narrow architectural standards, but it has evolved into the Americans with Disabilities Act (ADA), which guaranteed equal access to people living with disabilities and required local governments to develop transition plans to become compliant with the provisions of the Act.[24] The transition plan requires a self-evaluation to identify accessibility barriers and provide an opportunity to evaluate a community's compliance with accessible design guidelines. One of the primary goals of evaluating the pedestrian environment in Cedar City was to provide an initial assessment of compliance with ADA standards. An 'assessment of compliance' is the first step in the self-evaluation process required for an ADA transition plan. The significance of this process is to ensure that public services (i.e., businesses, employment, services) along a public street are accessible to people living with a disability.

Among the key requirements of the ADA is a continuous unobstructed pedestrian circulation network that is comprised of a sidewalk that has a cross slope of no more than two degrees (i.e., 3.5 percent). As quoted in another source,[25] the Access Board[24] states that "excessive cross slope is the single greatest barrier to travel along sidewalks and shared-use paths for pedestrians who use wheelchairs and scooters, pedestrians who use walkers and crutches, pedestrians who have braces or lower-limb prostheses, and those with gait, balance, and stamina impairments". In addition to concerns about wheelchairs tipping over or people falling is the associated concern that such a loss of balance typically results in the person falling toward the vehicular traffic in the street. An added concern is that children living with a disability may be less able to compensate for cross slope than adults.[24, 25] Unfortunately, however, there is a dearth of research into the impact of cross slope on sidewalk accessibility for people living with disabilities,[26, 27] despite the call for such research dating back more than four decades.[28]

This research is grounded within the disciplinary framework of advocacy planning,[29, 30] which focuses on providing a 'voice' for the unmet mobility needs of both older and younger citizens, especially those living with a disability. Also, the current public health and climate crises urgently require the promotion of active transportation.[31, 32] Consequently, the results of this study have implications for social equity, age-friendly community design, plus economic, environmental, and public health. The primary objective of this research was to evaluate whether a random sample of Cedar City's driveway cross slopes was compliant with ADA standards, which means less than or equal to two degrees. A driveway cross slope is defined as the angle of the sidewalk perpendicular to the direction of pedestrian movement where driveways cross the sidewalk, and it is usually measured at the middle of the driveway. A secondary objective of this research was to determine whether there is evidence of social inequities in Cedar City's pedestrian environment. The results of this study highlight priority areas for sidewalk improvements and can be used to inform a transition plan for sidewalk enhancements and funding.

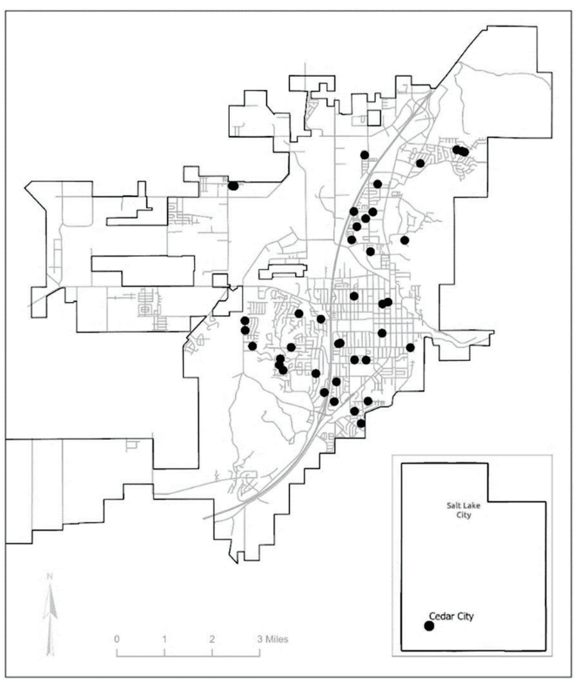

Figure 1. Map of randomly sampled 60 road segments within Cedar City, Utah.

METHODS AND PROCEDURES

The study area for this research was Cedar City, Utah (see **Figure 1**). Cedar City is a micropolitan area located in the southwest portion of the state with a population of 35,235.[33] Both the municipal boundary and statewide roads data were downloaded from the Utah Geospatial Resource Center. The municipal boundary was used to select all road segments that exist within Cedar City limits. Then, IBM® SPSS® was used to select a random sample of 70 road segments from the population of roads within Cedar City. Each of these randomly sampled road segments was evaluated to ensure the presence of both sidewalks and driveways, which disqualified some road segments that were mostly located in undeveloped and industrial areas. The final set of 60 road segments that had both sidewalks and driveways included a total of 369 driveway cross slopes. The angle of each of these driveway cross slopes was measured by the lead author at the middle of each driveway using an M-D SmartTool™ ADA Digital Slope Walker, which is a digital level to measure slopes within one-tenth of a degree (see www.mdbuildingproducts.com). To enable spatial analysis and mapping, the location of each driveway cross slope was recorded by the lead author using ESRI's ArcGIS Field Maps, which is an app that allows real-time collection and editing of location data (see www.esri.com).

In addition to measuring the driveway cross slopes, the estimated value of each residential property (a proxy for income), was retrieved from Zillow®. The estimated values for residential properties were merged with the driveway cross slope measurements, which enabled correlation analysis of the statistical relationship between the two measures. The statistical relationship between estimated values and driveway cross slope was used to evaluate the hypothesis that social equity issues exist in Cedar City's pedestrian infrastructure.

RESULTS

The slope angles were recorded, in degrees, for 369 driveway cross slopes in Cedar City, UT. The statistical distribution of the 369 driveway cross slopes is illustrated in **Figure 2**. Summary statistics indicate that the driveway cross slopes range from a minimum of 0.1 degrees to a maximum of 14.4 degrees with a mean of 4.6 degrees (SD = 2.5). The results illustrated in **Figure 2** indicate that only 21.2 percent of the randomly sampled driveway cross slopes are ADA compliant (i.e., no more than two degrees) while more than 60 percent of the driveway cross slopes exceed 4 degrees.

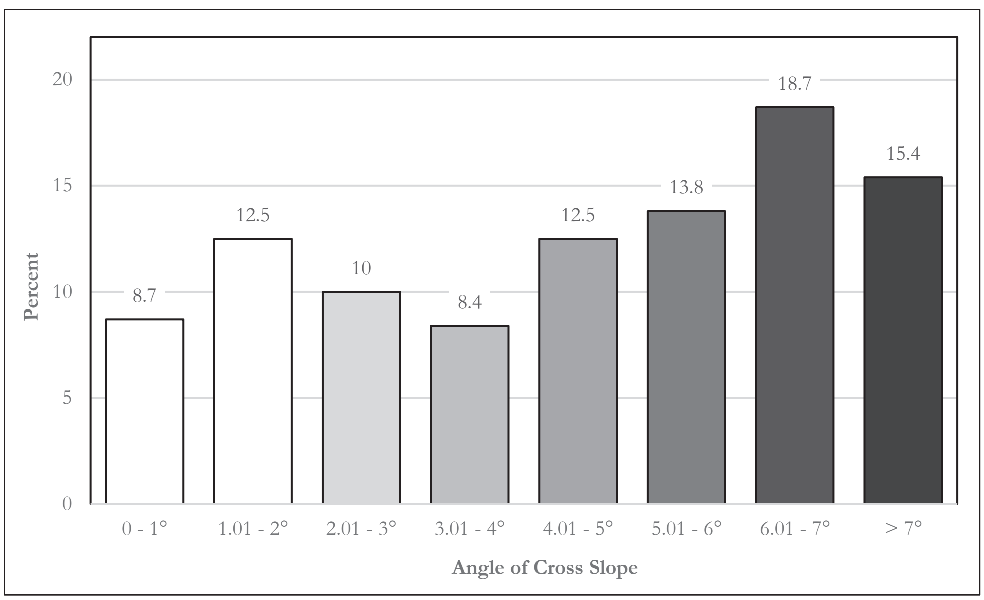

Figure 2. Frequency distribution of driveway cross slopes.

For mapping purposes, the mean driveway cross slope was calculated for each of the 60 randomly sampled road segments. Each road segment had between 5 and 31 driveway cross slopes, with a mean of 9.3 and, due to the positively skewed distribution, more appropriately, a median of 7 driveway cross slopes per road segment. The spatial distribution of mean driveway cross slopes by road segment is illustrated in **Figure 3**. The inset map illustrates the individual driveway cross slopes along a road segment. While this aggregation process of computing a mean driveway cross slope for each road segment obscures the spatial pattern of the full sample, the inset illustrates the need for aggregation for visualization purposes.

Only four road segments have a mean driveway cross slope that conforms to ADA requirements. The spatial distribution of mean driveway cross slopes by road segment suggests the presence of a clustered spatial pattern of high mean values in the north and south, while lower mean values tend to be located in the central part of the city. To confirm the presence of a spatial pattern among the full sample of 369 observations, the Getis-Ord General G tool in ESRI's ArcGIS Pro (v. 2.8.3) was used to test the null hypothesis that mean driveway cross slope values for road segments are randomly distributed. The results indicate significant clustering driveway cross slope values (z-score = 13.4, p = 0.00) within the study area.

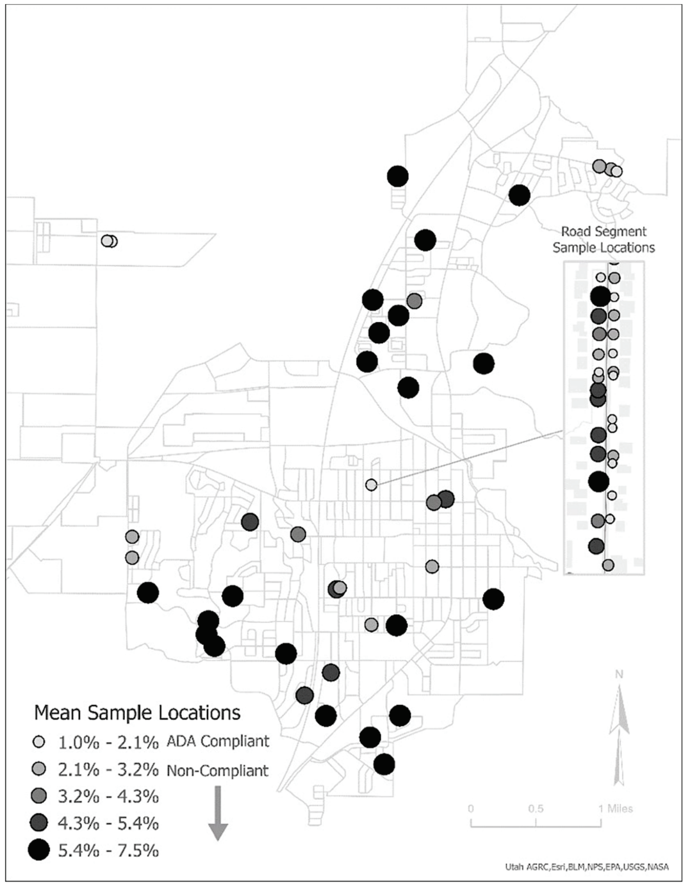

Figure 3. Spatial distribution of mean driveway cross slopes by road segment.

Of the 369 driveway cross slopes measured in this study, the estimated value was retrieved from Zillow® for 279 residential properties only, which excludes industrial and commercial properties. Notably, residential properties represent more than three-quarters of the randomly sampled driveway cross slopes in this study. The minimum assessed value of the residential properties was $158,000 and the maximum value was $948,000 with a mean of $402,681 (SD = $130,599).

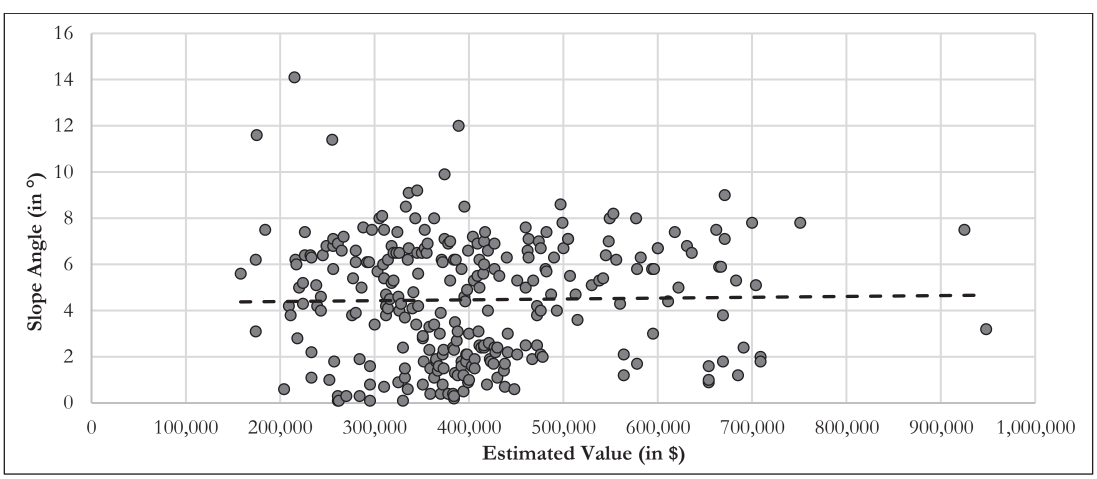

Figure 4. Scattergram of estimated value against driveway cross slopes (n = 279).

Pearson correlation was performed to evaluate the statistical relationship between estimated value (i.e., a proxy for income) and driveway cross slopes. The results of this correlation analysis are illustrated in **Figure 4,** and the results indicate a weak association ($r = 0.019$, $p = 0.378$) between estimated value and driveway cross slope, and that association is statistically insignificant (two-tailed). However, the results in **Figure 4** appear to indicate that the highest slope angles appear to be associated with lower assessed values. To test this apparent association, driveway cross slopes in excess of 7 degrees ($n = 279$) were selected and then Pearson correlation analysis was performed. The results confirm a significant (two-tailed) statistical association ($r = -0.306$, $p = 0.048$) between the highest driveway cross slopes (i.e., > 7°) and estimated value of residential properties.

DISCUSSION

The primary objective of this study was to measure a random sample of driveway cross slopes in Cedar City that would enable an objective evaluation of whether the sidewalk infrastructure, namely driveway cross slopes, were compliant with ADA standards. The results clearly indicate significant ADA non-compliance issues that are widespread throughout the study area, which has the potential to contribute to unmet mobility. The pervasiveness of non-compliance issues associated with driveway cross slopes is evidenced by the fact that 78.8 percent of the randomly sampled driveway cross slopes exceeded the two-degree standard established by the ADA. The results of this research highlight the extent of the problem associated with excessive driveway cross slopes, which represents one of the key barriers to accessibility and mobility,[25] especially for those people who are living with physical mobility limitations or lack transportation options (e.g., older and younger people).

Much of the problem of driveway cross slopes appears to stem from the sidewalk design, which in Cedar City has most sidewalks built at the edge of the street. This design necessitates a steep slope between the street and the driveway, which is therefore directly across the sidewalk. An alternative sidewalk design, which was used extensively throughout the historic district of Cedar City, uses sidewalk buffers (i.e., setbacks, planting strips, or park strips) that allow the sidewalk to be separated from the curb. This separation between the street and the sidewalk, often by two to three feet, enables the driveway cross slope to level off by the time the driveway meets the sidewalk. These sidewalk buffers can provide a host of other benefits to pedestrians and the environment. For example, the increased space between pedestrians and motor vehicles provides increased safety for pedestrians,[34, 35] especially if the buffer areas include large trees. Sidewalk buffers also provide space for planting street trees, which can improve microclimate conditions (e.g., shade) along sidewalks that has been recognized as a major deterrent to walking.[36] Given the excessively wide streets throughout the study area specifically, and in Utah generally, there is more than enough space to build buffer strips that are wide enough to easily accommodate street trees. The argument for the construction of ADA-compliant sidewalks and sidewalk buffer strips becomes even more important within the context of the potential costs associated with ADA lawsuits and forced compliance. Furthermore, the benefits of effective sidewalk design extend well beyond ADA compliance to improve mobility options for the entire community. Notably, several other microscale sidewalk design elements were not included in this study, such as sidewalk quality, street lighting, intersection crossings, and others.[35, 37, 38, 39]

Granted, driveway cross slopes are only one aspect of sidewalk infrastructure, and more information is needed to identify sidewalk gaps, missing curb ramps, running slopes, and other priority areas for sidewalk network improvements. Based on observational evidence over the past few years, it appears that Cedar City has prioritized curb ramps as the largest accessibility barrier and has been actively implementing accessibility improvements over the past decade. However, now that most curb ramps have been improved, it appears that excessive driveway cross slopes may pose the most significant accessibility barrier along Cedar City's pedestrian network. For example, the co-author has slipped and fallen on the 12-degree driveway cross slope on their property when fetching the mail and opts to use the road when jogging. Also, the authors have observed numerous citizens, including young and able-bodied people, opting to use the road in lieu of the sidewalk. These citizens include the public schools' and university's running teams, who mostly choose to run on the road instead of the sidewalk. Presumably, these behaviors are due to excessive driveway cross slope and will be part of our further inquiry into this issue. More specifically, plans for future research involve a series of interviews and focus groups to gain a better understanding of the impacts of driveway cross slopes on pedestrian behaviors.

A secondary objective of this study was to evaluate whether there is evidence of social inequities in Cedar City's pedestrian environment that are associated with ADA non-compliant driveway cross slopes. The results indicate a weak and insignificant association between the estimated value and driveway cross slope, which support the null hypothesis of no relationship. However, the results did find a moderate and statistically significant difference among those driveways with the highest slope angles and lower assessed values. Overall, this research suggests that there may be evidence of social inequities within the historical part of the study area, but those inequities are masked by the high driveway cross slopes for many of the newer, peripheral high-value residential properties. Perhaps there is a need to control for age of the residential properties, and perhaps race, to better understand the spatial distribution of social inequities in pedestrian infrastructure. This assertion is supported by the recent findings that issues associated with "sidewalk quality were significantly associated with older homes, poverty, and race of the block group".[35]

CONCLUSIONS

Driveway cross slopes in Cedar City pose a significant barrier to active transportation, especially for those people who are living with physical mobility limitations. While there does not appear to be evidence of widespread social inequities in the sidewalk infrastructure pertaining to income, the pervasiveness of excessive driveway cross slopes raises serious concerns about the quality of the pedestrian network throughout the study area. This research illuminates the severity and extent of non-compliance with ADA standards and raises further questions about other macro- and microscale sidewalk design elements throughout the study area. This research can also be used to help inform a transition plan for much-needed sidewalk maintenance, enhancements, and funding to improve mobility options and promote an age-friendly community design.

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REFERENCES

1. Malloy, R. P. (2009) Inclusion by Design: Accessible Housing and Mobility Impairment, 60 *Hastings L.J.*, 699–748
2. World Health Organization and World Bank. (2011) World Report on Disability. Geneva, Switzerland: World Health Organization.
3. Roberts, P., and Babinard, J. (2005) Transport strategy to improve accessibility in developing countries. Washington, World Bank.
4. Lawton, M. P., and Brody, E. M. (1969) Assessment of Older People: Self-monitoring and Instrumental Activities of Daily Living. *The Gerontologist*, 9(3), 179–186.
5. Satariano, W. A., Guralnik, J. M., Jackson, R. J., Marottoli, R. A., Phelan, E. A., and Prohaska, T.R. (2012) Mobility and Aging: New Directions for Public Health Action. *American Journal of Public Health*, 102, 1508–1515. *https://doi.org/10.2105/AJPH.2011.300631*
6. Banister, D., and Bowling, A. (2004) Quality of Life for the Elderly: The Transport Dimension. Transport Policy, 11, 105–115. *https://doi.org/10.1016/S0967-070X(03)00052-0*
7. Schwanen, T., Banister, D., and Bowling, A. (2012) Independence and mobility in later life. *Geoforum*, 43(6), 1313–1322.
8. Spinney, J. E., Scott, D. M., & Newbold, K. B. (2009). Transport mobility benefits and quality of life: A time-use perspective of elderly Canadians. *Transport policy*, 16(1), 1-11. *https://doi.org/10.1016/j.tranpol.2009.01.002*
9. Spinney, J. E. L., Newbold, K. B., Scott, D. M., Grenier, A., and Vrkljan, B. (2020) The Impact of Driving Status on Out-of-home and Social Activity Engagement Among Older Canadians. *Journal of Transport Geography*, 85, 102698.
10. Vespa, J. (2018) The Graying of America: More Older Adults Than Kids by 2035. (2017 Census Briefs; issued March 2018). Washington, DC: U.S. Census Bureau.
11. Ryan, B. L., Bray, J. K., Shariff, S. Z., Allen, B., Glazier, R. H., Zwarenstein, M., Fortin, M., and Stewart, M. (2018) Beyond the Grey Tsunami: A Cross-Sectional Population-Based Study of Multimorbidity in Ontario. *Can J Public Health*. 109(5–6), 845–854. *https://doi.org/10.17269/s41997-018-0103-0*
12. Paz, A., Doron, I., and Tur-Sinai, A. (2018) Gender, Aging, and the Economics of "Active Aging": Setting a New Research Agenda, *Journal of Women & Aging*, 30(3), 184–203, *https://doi.org/10.1080/08952841.2017.1295677*
13. Walker, A. (2008) Commentary: The Emergence and Application of Active Aging in Europe, *Journal of Aging & Social Policy*, 21:1, 75–93. *https://doi.org/10.1080/08959420802529986*
14. Taylor, D. M. (2018) Americans With Disabilities: 2014, Current Population Reports, P70–152, U.S. Census Bureau, Washington, DC, 2018. *https://www.census.gov/library/publications/2018/demo/p70-152.html*
15. Beard, J., Biggs, S., Bloom, D., Fried, L., Hogan, P., Kalache, A., and Olshansky, S. (2012) Global Population Ageing: Peril or Promise? *PGDA Working Papers*, Program on the Global Demography of Aging. *https://EconPapers.repec.org/RePEc:gdm:wpaper:8912*
16. United Nations, Department of Economic and Social Affairs, Population Division. (2019) World Population Ageing 2019: Highlights (ST/ESA/SER.A/430).
17. World Health Organization. (2007) Global Age-Friendly Cities: A Guide. WHO: Geneva
18. Baobeid, A., Koç, M., and Al-Ghamdi, S. G. (2021) Walkability and its Relationships with Health, Sustainability, and Livability: Elements of Physical Environment and Evaluation Frameworks. *Frontiers in Built Environment*, 7. *https://doi.org/10.3389/fbuil.2021.721218*
19. Jabbari, M., Ahmadi, Z., and Ramos, R. (2022) Defining a Digital System for the Pedestrian Network as a Conceptual Implementation Framework. *Sustainability*, 14, 2528. *https://doi.org/10.3390/su14052528*
20. Morales-Flores, P., and Marmolejo-Duarte, C. (2021) Can We Build Walkable Environments to Support Social Capital? Towards a Spatial Understanding of Social Capital; a Scoping Review. *Sustainability*, 13, 13259. *https://doi.org/10.3390/su132313259*
21. ADA.gov. (2017) Information and Technical Assistance on the Americans with Disabilities Act. *https://www.ada.gov*

22. Brennan, J. (2015) The ADA national network disability law handbook. *ADA National Network*. *https://adata.org/guide/ada-national-network-disability-law-handbook*
23. U.S. Department of Justice. (2020) A Guide to Disability Rights Laws. *https://www.ada.gov/cguide.htm*
24. Access Board. (1998) Accessible Rights-of-Way: A Design Manual (Review Draft). Washington, D.C., November 1998.
25. Kockelman, K., Zhao, Y., Heard, L., Taylor, D., & Taylor, B. (2000). Sidewalk cross-slope requirements of the Americans with Disabilities Act: Literature review. *Transportation research record*, *1705*(1), 53-60. *https://doi.org/10.3141/1705-09*
26. Kockelman, K., Heard, L., Kweon, Y., and Rioux, T. (2002) Sidewalk Cross-Slope Design: Analysis of Accessibility for Persons with Disabilities, Transportation Research Record: *Journal of the Transportation Research Board*, 1818, 108–118, 2002. *https://doi.org/10.3141/1818-17*
27. Taylor, D., Kockelman, K., Heard, L., Taylor, B., and Zhao, Y. (1999) Review of methods for meeting the American with Disabilities Act sidewalk cross-slope requirement. *Center for Transportation Research*, The University of Texas at Austin, for the Texas Department of Transportation.
28. Brown, J. W., and Redden, M. R. (1979) A Research Agenda on Science and Technology for the Handicapped. *American Association for the Advancement of Science* (Report No. 79-9-15).
29. Davidoff, P. (1965) Advocacy and Pluralism in Planning. *Journal of the American Institute of Planners*, 31(4): 331–8.
30. Ejlali, P. (2011) Advocacy Planning Theory: Revisited. *Social Development and Welfare Planning*, 2(5), 1–14. *https://www.sid.ir/en/journal/ViewPaper.aspx?id=208468*
31. Abu-Omar, K., Gelius, P., and Messing, S. (2020) Physical activity promotion in the age of climate change. *F1000Research*, 9, 349. *https://doi.org/10.12688/f1000research.23764.2*
32. Figueiredo, N., Rodrigues, F., Morouço, P., and Monteiro, D. (2021) Active Commuting: An Opportunity to Fight Both Climate Change and Physical Inactivity. *Sustainability*, 13, 4290. *https://doi.org/10.3390/su13084290*
33. U.S. Census Bureau. (n.d.). QuickFacts: Cedar city, Utah. U.S. Department of Commerce. Retrieved April 4, 2022 from https://www.census.gov/quickfacts/cedarcitycityutah
34. Abou-Senna, H., Radwan, E., and Mohamed, A. (2022) Investigating the correlation between sidewalks and pedestrian safety, *Accident Analysis & Prevention*, 166. *https://doi.org/10.1016/j.aap.2021.106548*.
35. Rajaee, M., Echeverri, B., Zuchowicz, Z., Wiltfang, K., and Lucarelli, J. F. (2021) Socioeconomic and racial disparities of sidewalk quality in a traditional rust belt city. *SSM - Population Health*, 16, 100975. *https://doi.org/10.1016/j.ssmph.2021.100975*
36. Kim, Y. J., Lee, C., and Kim, J. H. (2018) Sidewalk Landscape Structure and Thermal Conditions for Child and Adult Pedestrians. *International journal of environmental research and public health*, 15(1), 148. *https://doi.org/10.3390/ijerph15010148*
37. Cain, K. L., Millstein, R. A., and Geremia C. M. (2012) Microscale audit of pedestrian streetscapes (MAPS): Data collection & scoring manual. University California San Diego. *http://sallis.ucsd.edu/Documents/Measures_documents/MAPS%20Manual_v1_010713.pdf*
38. Centers for Disease Control and Prevention. (2015) The built environment: An assessment tool and manual. Retrieved from *https://www.cdc.gov/nccdphp/dnpao/state-local-programs/built-environment-assessment/pdfs/BuiltEnvironment-v3.pdf*
39. Dannenberg, A. L., Kraft, K., and Alvanides, S. (2017) Special issue editorial: Tools and practices for understanding and promoting walking and walkability. *J. Transport. Health*. 5(May), 1–4. *https://doi.org/10.1016/j.jth.2017.05.365*

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PRESS SUMMARY

This research used a digital level to measure a random sample of driveway cross slopes in Cedar City, UT, to evaluate whether they were compliant with the Americans with Disabilities Act, which means the slope should not exceed two degrees. This research also collected the estimated value of each residential property (a proxy for income) from Zillow® to evaluate whether there was evidence of social inequities. The results of this study indicate that most driveway cross slopes (78.8 percent) exceeded ADA standards and there was no convincing evidence of widespread social inequities. The results highlight priority areas for sidewalk improvements and can be used to inform a transition plan for sidewalk enhancements, namely sidewalk buffer strips.