Everyday Mobility in German Cities: A Research Proposal for a Smartphone-Based Assessment of Activity Spaces and their Effect on Social Inequalities

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Introduction

This presentation outlines a work-in-progess research proposal

- everyday mobility/activity spaces $\rightarrow$ social support; intergroup contact
- smartphone data

Spatial Segregation/Inequality and Social Inequality

- mainly focus on residential location
- how to incorporate other spatial contexts

Spatial Segregation/Inequality and Social Inequality

Main focus: residential lens

- mechanisms (Small & Newman, 2001; Jencks & Mayer, 1990)
  - socialization, norm orientation (Wilson, 1987)
  - network composition (Nast & Blokland, 2014)
  - physical and social infrastructure (Small, 2006, 2009; van Eijk, 2010)
- container-conception of space (Wimmer & Glick Schiller, 2003; Knoblauch & Löw, 2020; Million et al., 2022)

Spatial Segregation/Inequality and Social Inequality

Research on segregation beyond the residential context

- segregation in "domains" of everyday life (Boterman & Musterd, 2016; Tammaru et al., 2016)
- everyday mobility segregation (Candipan et al., 2021; Krivo et al., 2013; Phillips et al., 2021; Wang et al., 2018)
- activity spaces (White et al., 2021; Järv et al., 2014, Sugie & Lens, 2017; Xu, 2022)
- (mostly) qualitative work on activity or infrastructure hubs (Hanhörster & Weck, 2016; Zhou, 2009; El-Kayed, 2018, under review)

→ mostly focus on segregation *patterns*

Study aims

Study Aims

1. Going beyond the residential context in research on spatial segregation/inequalities
2. How do disparities in everyday activity spaces affect dimensions and mechanisms of social inequality?
   - social support (El-Kayed et al., forthcoming; Sugie & Lens, 2017)
   - intergroup contact (Xu, 2022)
3. What is the quality of smartphone data for measuring activity spaces?

Research design

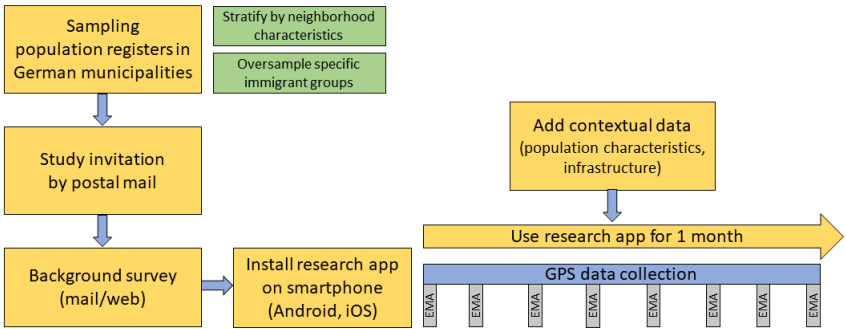


Figure 1. Research design

Research design

Analysis

- Do activity space patterns vary by socio-demographic characteristics?
- How do these patterns affect access to social support and intergroup contact?
- What is quality of smartphone data for measuring activity spaces?

Smartphones as data collection tools

- Integrate active and passive data collection
- Ecological Momentary Assessment (EMA)
  - *In situ* measurement of attitudes and behaviors
    - Reduced recall error
    - More detailed information
- Passive measurement of location and movement
  - More detailed data
    - High measurement frequency
    - Collect information that is difficult to self-report
  - Data with potentially higher quality
    - No recall error
    - Less social desirability
    - More accurate data

Photo: Tamas Tuzes-Katai

What is the quality of smartphone data?

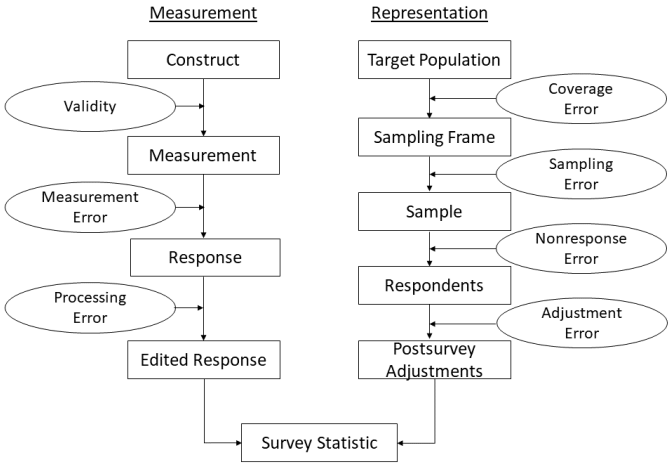


Figure 2. Total Survey Error Framework (Groves et al., 2009)

What is the quality of smartphone data?

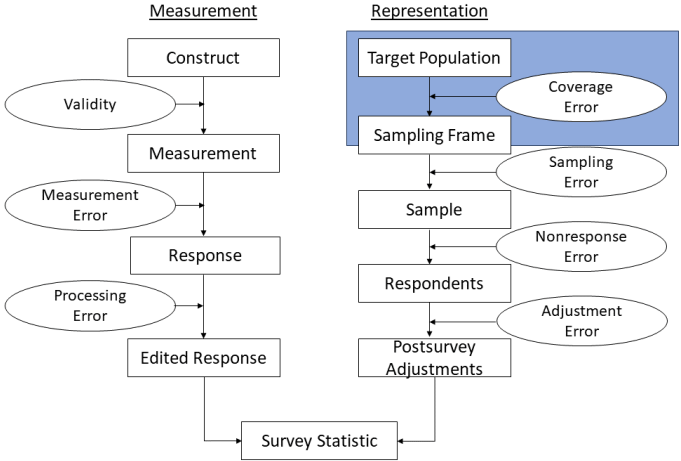


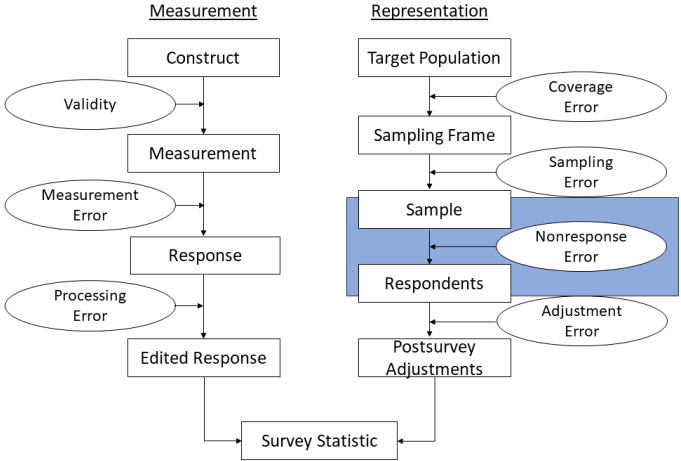
Figure 2. Total Survey Error Framework (Groves et al., 2009)

Coverage error

Undercoverage: error due to limited smartphone access

- 83% of people aged 16+ in Germany use a mobile phone or smartphone for Internet access (Eurostat, 2023)
- Smartphone ownership varies by age, education, and income (Keusch et al., 2023)
- Smartphone usage patterns vary by age, gender, and education (Wenz & Keusch, 2023)

What is the quality of smartphone data?



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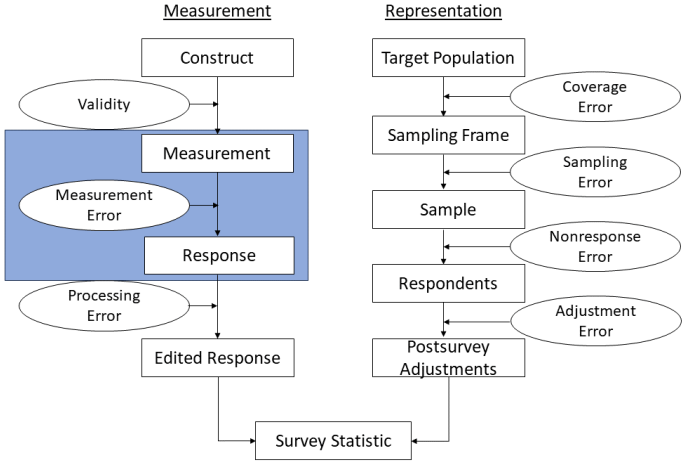
Nonresponse error

Nonresponse: error due to limited willingness to participate

- Participation rates in general population samples are rather low
  - e.g., IAB-SMART Study, Germany: 16% (Kreuter et al., 2020)
- Willingness varies by data type and respondent characteristics
  - e.g., UKHLS Innovation Panel, Great Britain (Wenz et al., 2019)
  - Very willing to complete survey on smartphone: 32% vs. track GPS: 18%
  - Privacy and security concerns (−)
  - Variety of smartphone use (+)

What is the quality of smartphone data?



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Measurement error

Sensor-based error

- Differences between devices
- Erroneous measurements, e.g., missing data

Error due to device handling (Keusch, Wenz, & Conrad, 2022)

- 32% do not always have their smartphone turned on
- 17% do not take their smartphone when leaving their home
- 2% share their smartphone with another person

Hawthorne effect

- Study participants change behavior due to being observed

What is the quality of smartphone data?

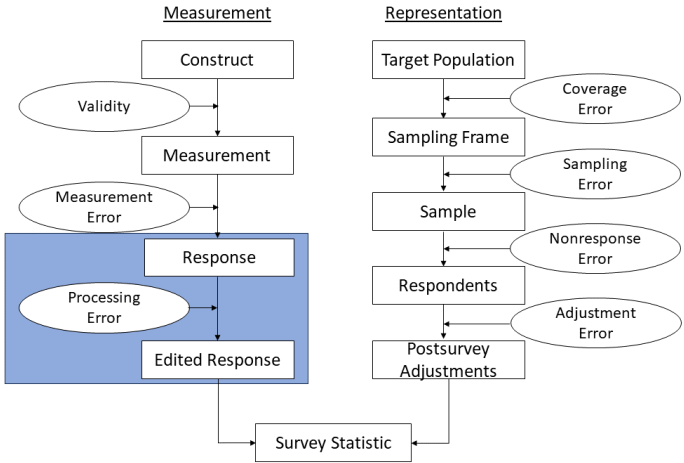

Figure 2. Total Survey Error Framework (Groves et al., 2009)

Processing error

- Processing of raw data on user's device vs. server
- Aggregation of raw data on geographical and time level
- Linkage to contextual data

Data protection

- Ethical approval from Ethics Committee
- Collecting GDPR-conforming consent
  - Inform participants fully about the data that will be collected
  - Allow participants to revoke permission to collect data at any time
- Setting up a protected server for data storage
  - Data protection policies
  - Data security meaures
- Data archiving
  - Anonymize data to minimize the risk of re-identification of participants

Next steps

Data collection in the DeZIM.panel in March 2024: willingness to participate in smartphone-based research

- Probability-based, offline-recruited online panel in Germany, with oversampling of specific immigrant groups (Dollmann et al., 2023)

- What proportion of the population has a compatible smartphone to participate in the data collection and is willing to download a research app?
- How do smartphone usage patterns, privacy concerns, migration history, year of immigration, language proficiency, and socioeconomic status influence willingness?

Next steps

Data collection in the DeZIM.panel in June 2024: social support

- questions on social support, who provided it (personal networks or institutions) where (relative to residential place) in which language
- Does access to social support vary among population groups, regions or Gemeindegrößenklassen?

Thank you.

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References

Boterman W. & Musterd S. (2016): Cocooning urban life: Exposure to diversity in neighbourhoods, workplaces and transport. *Cities, 59*, 139–147. doi: 10.1016/j.cities.2015.10.018

Candipan J., Phillips, N., Sampson, R, & Small M. (2021). From residence to movement: The nature of racial segregation in everyday urban mobility. *Urban Studies, 58*(15), 3095–3117. doi: 10.1177/0042098020978965

Dollmann, J., Mayer, S. J., Lietz, A., Siegel, M., & Köhler, J. (2023). DeZIM.panel - Data for Germany's Post-Migrant Society. *Jahrbücher für Nationalökonomie und Statistik, 243*(1), 93-108. doi: 10.1515/jbnst-2022-0025

El-Kayed, N. (2018). *Local Conditions of Democracy – The Relevance of Neighborhoods for Political Participation of First and Second-Generation Immigrants.* Dissertation. Humboldt-Universität zu Berlin.

El-Kayed, N., Keskinkilic, L., Serbedzija, V., & Wiegand, A. (forthcoming). Peripheral neighbourhoods as context of arrival? In D. Templin (Ed.), *Arrival Neighbourhoods: Migration and Urban Space in European Cities* (pp. 1870-2020). Routledge.

Eurostat (2023). *Statistics Explained: Digital Economy and Social Statistics – Households and Individuals*

References

Groves, R. M., Fowler, F. J., Couper, M. P., Lepkowski, J. M., Singer, E., & Tourangeau, R. (2009). *Survey Methodology*. Hoboken, NJ: Wiley.

Hanhörster, H. & Weck, S. (2016). Cross-local ties to migrant neighborhoods: The resource transfers of out-migrating Turkish middle-class households. *Cities, 59*, 193– 199. doi: 10.1016/j.cities.2015.11.004

Järv, O., Müürisepp K., Ahas, R., Derudder, B., & Witlox F (2015). Ethnic differences in activity spaces as a characteristic of segregation: A study based on mobile phone usage in Tallinn, Estonia. *Urban Studies 52*(14), 2680-2698. doi: 10.1177/0042098014550459

Jencks, C., & Mayer, S. E. (1990). The social consequences of growing up in a poor neighborhood. In L. E. Lynn & M. G. H. McGeary (Eds.), *Inner-City Poverty in the United States* (pp. 111–186). Washington, D.C.: National Academy Press.

Keusch, F., Bähr, S., Haas, G.-C., Kreuter, F., & Trappmann, M. (2023). Coverage error in data collection combining mobile surveys with passive measurement using apps: Data from a German national survey. *Sociological Methods & Research, 52*(2), 841-878. doi: 10.1177/0049124120914924

References

Keusch, F., Wenz, A., & Conrad, F. G. (2022). Do you have your smartphone with you? Behavioral barriers for measuring everyday activities with smartphone sensors. *Computers in Human Behavior, 127*, 107054. doi: 10.1016/j.chb.2021.107054

Kreuter, F., Haas, G.-C., Keusch, F., Bähr, S., & Trappmann, M. (2020). Collecting survey and smartphone sensor data with an app: Opportunities and challenges around privacy and informed consent. *Social Science Computer Review, 38*(5), 533-549. doi: 10.1177/0894439318816389

Knoblauch, H. & Löw, M. (2020). The re-figuration of spaces and refigured modernity–concept and diagnosis. *Historical Social Research/Historische Sozialforschung, 45*(2), 263-292. doi: 10.12759/hsr.45.2020.2.263-292

Krivo, L., Washington, H., Peterson, R., Browning, C., Calder, C., & Kwan, M. (2013). Social isolation of disadvantage and advantage: The reproduction of inequality in urban space. *Social Forces, 92*(1), 141–164. doi: 10.1093/sf/sot043

Million, A., Haid, C., Castillo Ulloa, I., & Baur, N. (2022). *Spatial Transformations: Kaleidoscopic Perspectives on the Refiguration of Spaces*. Taylor & Francis.

Nast, J. & Blokland, T. (2014). Social mix revisited: Neighborhood institutions as setting for boundary work and social capital. *Sociology 48*(3), 482–499. doi: 10.1177/0038038513500108

Phillips N., Levy B., Sampson R., Small M., & Wang, R. (2021). The social integration of American cities: Network measures of connectedness based on everyday mobility across neighborhoods. *Sociological Methods & Research, 50*(3), 1110–1149. doi: 10.1177/0049124119852386

References

Small, M. L. & Newman, K. (2001). Urban poverty after the truly disadvantaged: The rediscovery of the family, the neighborhood, and culture. *Annual Review of Sociology 27*, 23–45. doi: 10.1146/annurev.soc.27.1.23

Small, M. L. (2006). Neighborhood institutions as resource brokers: Childcare centers, interorganizational ties, and resource access among the poor. *Social Problems 53*(2), 274–292. doi: 10.1525/sp.2006.53.2.274

Small, M. L. (2009). *Unanticipated Gains: Origins of Network Inequality in Everyday Life*. Oxford: Oxford University Press.

Sugie, N. F. & Lens M. C. (2017). Daytime locations in spatial mismatch: Job accessibility and employment at reentry from prison. *Demography 54*(2), 775-800. doi: 10.1007/s13524-017-0549-3

Tammaru, T., Strömgren, M., Van Ham, M., & Danzer, A. (2016). Relations between residential and workplace segregation among newly arrived immigrant men and women. *Cities, 59*, 131-138. doi: 10.1016/j.cities.2016.02.004

van Eijk, G. (2010). *Unequal Networks: Spatial Segregation, Relationships and Inequality in the City*. Amsterdam: IOS Press BV.

Wang, Q., Phillips, N. E., Small, M. L., & Sampson, R. J. (2018). Urban mobility and neighborhood isolation in America's 50 largest cities. *Proceedings of the National Academy of Sciences, 115(30)*, 7735-7740. doi: 10.1073/pnas.1802537115

References

Wenz, A., Jäckle, A., & Couper, M. P. (2019). Willingness to use mobile technologies for data collection in a probability household panel. *Survey Research Methods, 13*(1), 1-22. doi: 10.18148/srm/2019.v1i1.7298

Wenz, A., & Keusch, F. (2023). The second-level smartphone divide: A typology of smartphone use based on frequency of use, skills, and types of activities. *Mobile Media & Communication, 11*(3), 459-483. doi: 10.1177/20501579221140761

White R. M. B., Witherspoon D. P., Wei, W., Zhao, C., Pasco, M. C., Maereg, T. M., & PLACE Development Working Group (2021). Adolescent development in context: A decade review of neighborhood and activity space research. *Journal of Research on Adolescence 31*(4), 944- 965. doi: 10.1111/jora.12623

Wilson, W. J. (1987). *The Truly Disadvantaged. The Inner City, the Underclass, and Public Policy*. The University of Chicago Press, Chicago.

Wimmer, A. & Glick Schiller, N. (2003). Methodological nationalism, the social sciences, and the study of migration: An essay in historical epistemology. *International Migration Review 37*(3), 576–610. doi: 10.1111/j.1747-7379.2003.tb00151.x

Xu, W. (2022). The contingency of neighbourhood diversity: Variation of social context using mobile phone application data. *Urban Studies 59*(4), 851-869. doi: 10.1177/00420980211019637