

# The (In)Equalities of Human Mobility for Work and Play

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## Key Words

Human Mobility, Social Infrastructure, Built Environment, Urban Development, Remote Sensing

## JEL Codes

O18, R40, Z13

## Abstract

### Background:

In recent years, the ubiquity and pervasiveness of personal mobile phones has resulted in an explosion of human mobility (big) data becoming available for use by academics, researchers, governments, and organisations alike. Mobility data allows much more fine-grained analysis of human behaviour and activity like never before. With it, a great opportunity to gain deeper understandings of how society moves over time and space, and what (if anything) contributes to the diversity (or not) of interactions between people from different sociodemographic groups – a key indicator for an innovative and inclusive society. Mobility data can inform us how and where different groups in the society choose to spend their time and how the mobility (or not) of one group can affect the mobility of another. Less well explored is how recent COVID-19 lockdowns and public health measures have impacted different sociodemographic groups. The challenges and opportunities that lockdowns and cities present for different groups of people are not the same as people have different work flexibilities, life circumstances, and social or environmental resources and/or affordances (opportunistic and enduring) in order to adapt to or respond to environmental cues (e.g., a pandemic). Assuming, the total benefits of the lockdown outweigh its costs (e.g., from its public health benefits and in protection of the most vulnerable or at-risk populations, from a COVID-19 perspective), lockdowns will still make some people worse off (e.g., see Figure 1 for some examples of lockdown costs/benefits). Arguably, lockdowns are effective measures to counter the spread of COVID-19. But are they efficient?

*Figure 1: Possible benefits and costs of COVID-19 lockdown and pandemic policies.*

- shorter travel time due to less traffic on the road,
- adjustment of work-leisure mix or career change,
- increase in contractual/WFH hours,
- less environment/accident risk or exposure from weather, climate, and other road traffic,
- and switching to a more optimal route or moving home.
- costs associated with switching from WFH vs working from the office or travelling,
- fines for non-essential travel making leisure relatively more expensive,
- relative high risk of public vs private transportation modes,
- and loss of utility in leisure from home vs leisure from travel (e.g., Netflix vs meeting friends).

### Research Aim and Questions:

In this paper, we aim to identify groups of people that are made worse (better) off by lockdown and other pandemic policies introduced in Queensland, Australia. In other words, we aim to document various costs and benefits afforded by COVID-19 lockdowns and other pandemic policies.

In doing so, we shed light on the following questions:

- How have the costs and benefits of pandemic policies (proxied via human mobility measures) been allocated within society?

- Is there heterogeneity of the (pre-/post-) lockdown effects along socio-economic and geographic factors (e.g., point of interest, land use, weather/climate)?
- What (if any) are the more enduring or longer-lasting lockdown effects, and where (if at all) do we see a return or recovery to pre-lockdown levels?

### Methods and Data:

We analysed (daily) data on human mobility (origin-destination trips and staypoints, via DSpark Pty Ltd) in response to COVID-19 lockdown and pandemic policies between 513 SA2-level (approx. 3-10k population) and 82 SA3-level (approx. 30-130k population) statistical areas across the state of Queensland, Australia. The mobility data comprises the December 2018 to December 2021 (inclusive) period. We supplement the mobility data with administrative data (SEIFA indices), weather statistics (rainfall, minimum/maximum temperature), state land-use (meshblock) classifications, area-level traffic incident and crime rates, and point-of-interest (POI) data from Google's Places API. We apply regression analysis to examine the lockdown effects, costs, and benefits, as proxied by human mobility and other area-level social/physical infrastructure and institutional metrics. We check for heterogeneity of lockdown effects between socio-economic group. We undertake robustness checks with point-level house/unit rentals and sales metrics across the Queensland state providing the alternate measure of socio-economic status (SES). This rental/sales data (via AURIN portal) comprises the January 2017 to December 2021 (inclusive) period.

### Results:

Our preliminary (descriptive) analysis indicates that we are seeing benefits flowing to all from less traffic on the road especially for higher SES during work (same distance, less travel time). In other words, we return discretionary time to all from reduced COVID traffic, but disproportionately so. Median duration and distance falls for all but more so for lower SES in play/leisure mobility, more for higher SES in work mobility. There are also positive lockdown effects in trips per person for play (non-work/leisure) reasons indicate the presence of "short and sweet" (local) trips, travel, and mobility. However, it seems it is harder for lower SES to WFH – we observe less variation in work mobility pre-/post-lockdown– but trips per person (i.e., how active each person is), they are more compliant for work reasons (not play/leisure ones). Higher SES appears to take stay at home orders more seriously (or are more able to) for both work and play/leisure reasons. Further, lockdown effects are rampant but there are lingering effects post lockdown.

### Conclusions:

We present a study with high policy relevance which is one of few (the first?) of its kind for Australia. By integrating the unique human mobility data (high temporal granularity over varied spatial scales) with forms of administrative, land use, and point of interest data, this paper explores the costs and benefits of lockdowns and other pandemic policies (proxied by human mobility) on different socio-economic groups. In particular, we see how residents from different socioeconomic groups in Queensland, Australia have moved and interacted, benefited, or been impacted by, the introduction and enduring of various COVID-19 lockdowns and pandemic policies. Teasing out the deep-rooted regularities or patterns in human mobility data provides empirical grounding, improves understanding, and informs response to future crises. By identifying groups that are worse (better) off, we can quantify and/or characterise their losses (wins) and design appropriate compensation policies. On an equal footing, we can also understand better the positive externalities of pandemic policies for different groups in different settings/regions. Too often public policy analysis ignore the human dimension, this paper looks to close this gap and contributes a detailed case study of quantitative social science and evidence-based public policy in practice.

## **Biography**

**Steve J. Bickley** is a final-year PhD candidate in the School of Economics and Finance, Queensland University of Technology (QUT), Australia who also holds an engineering (electrical) bachelor's degree with honours and an economics bachelor's degree from QUT. He is also affiliated with the Centre for Behavioural Economics, Society and Technology (BEST Centre) in Brisbane, Australia. His primary research interest lies in the area of behavioural economics, complexity science, artificial intelligence and society, and quantitative social science. He has also published in journals with a health and safety focus.