CSC2552: Review 2, Paper 1

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499 words

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Paper 1

This paper, by Althoff, Sosic et. al. aims to analyse data from a step-counting app, Argus, which was installed on over 700 000 iPhone devices over the course of multiple years. The main result of this paper is the revelation that activity inequality is better correlated with obesity rates than total volume of daily average steps, followed by the suggestion that improving walkability of cities could help better fight obesity.

The main weakness of this paper is its underwhelming concluding claims. Indeed, due to the fact the that data is ready-made observational big data, the authors have had to make a lot of compromises, especially in the breadth of the analysis that they can provide. Acquiring this large dataset, in order to avoid ethical issues of custom-made data, has meant that many aspects relating mobility to obesity could not be investigated (e.g. corresponding change in BMI/weight over time). Another notable weakness is the statement that smartphone data provides accurate step counts based on a two-page research letter from 2014 that did 28 trials on treadmills and concluded that iPhones were currently the most accurate mobile device (roughly 5% error in step counting) under treadmill-based laboratory conditions [1]. This study was later refuted by a much larger scale and wider encompassing study [2] that found that the error rises to roughly 20%, with a bias to under-count free-living condition steps. Indeed, this could mean women that are statistically more likely to be in free-living conditions could have their steps under-counted creating an artificial activity inequality. Finally the dataset is prone to common characteristic issues of big datasets such as being dirty (users cycling rather than walking), non-representative (mostly data from young people who are interested in their health and can afford an iPhone) and incomplete (metrics like location were guessed from IP address).

Conversely, a significant strength of this paper is the strong substantiated and cautious claims. Indeed, many cautionary measures were taken such as comparing with a benchmark population study (ED Fig 2) [3], verifying trends across gender, age, BMI and location as well as publishing all the data and code on GitHub [4] in an easily verifiable format. This contributes to the compromise of using this dataset and is an effective method against limitations and potential future criticism.

The implications of this paper are more important than they may seem at first. Although cautiously stated, the two main recommendations of improving the walkability of cities and decreasing activity inequity has not gone unnoticed. Indeed this study funded by the Chan Zuckerberg, NIH and Stanford Data Science initiatives was highly publicised in mainstream media [5] and may influence urban planning for future generations. Something that could have been done in this paper would be the use of another dataset from a different app (on non-Apple devices) to complement the results. This would also help increase the breadth of conclusions reached without decreasing the strength of the argument presented.

[1] Case, M. A., Burwick, H. A., Volpp, K. G., & Patel, M. S. (2015). Accuracy of Smartphone Applications and Wearable Devices for Tracking Physical Activity Data. JAMA, 313(6),625. doi:10.1001/jama.2014.17841

[2] Duncan, M. J., Wunderlich, K., Zhao, Y., & Faulkner, G. (2017). Walk this way: validity evidence of iPhone health application step count in laboratory and free-living conditions. Journal of Sports Sciences, 36(15), 16951704. doi:10.1080/02640414.2017.1409855

[3] World Health Organization. Prevalence of Insufficient Physical Activity among Adults: Data by Country. http://apps.who.int/gho/data/node.main.A893?lang=en (Global Health Obs., accessed 19 May 2016).

[4] GitHub. Activity Inequality Repository. https://github.com/timalthoff/activityinequality (Tim Althoff, accessed 25 Jan 2019).

[5] MinnPost. U.S. and other countries with high rates of activity inequality also have high rates of obesity, study finds. https://www.minnpost.com/second-opinion/2017/07/us-and-other-countries-high-rates-activity-inequality-also-have-high-rates-ob/ (Susan Perry, accessed 25 Jan 2019)