**The potential of mobile phone data against malaria: A source/sink map for Senegal and the potential for incidence surfaces**

**Background:**

With the impressive success in malaria control programs over the last years, many countries re-orientate towards elimination.1 2 Movement of the population is one factor making elimination challenging, as the eradication attempts in the 60s have shown.3 Targeting strategies that take human movement into account are required.

The amazing growth in mobile phone ownership in Sub-Sahara Afrika over the last years holds the potential of Call Detail Records (CDRs) providing information on mobility behaviour on an unprecedented scale.4 The Orange D4D Data for Development Challenge Senegal made one such dataset available for research.5

**Priority 1: Malaria Risk Connectivity Matrix Senegal**

Effective targeting requires knowledge about transmission foci and importation/exportation risk. Tatem et al. 2014 have suggested an integrated risk mapping approach to these challenges.6 They calculated source/sink maps for Namibia using mobility patterns derived from mobile phone data to identify areas exporting/importing infections.

Goal:

Create a source/sink map for Senegal and explore possibilities to extend the approach.

**Priority 2: Improving Malaria Maps Through Mobile Phone Derived Behavioural Indicators**

Mobile phone data has contributed to successfully predict poverty, literacy, disease and many other things.7 8 9 Despite this success, to the best of my knowledge, there have been no studies exploring the potential contribution of mobile phone data to malaria maps.

Goal:

Explore the usefulness of a range of indicators computed from CDR’s to improve malaria mapping. Indicators of importation risk computed for Malaria Risk Connectivity Matrices under Priority 1 are one promising example. The process could also indicate a new way of quantifying the number of imported malaria cases, making an integration of the separated modes of previous methods possible.6

The Thesis will be written in collaboration with Dr. Kenneth Harttgen (Chair for Development Economics), Dr. Ewan Cameron (Malaria Atlas Project) and Prof. Feuerriegel (Chair for Management Information Systems).

**Bibliography**

1. O’Meara WP, Mangeni JN, Steketee R, Greenwood B. Changes in the burden of malaria in sub-Saharan Africa. *Lancet Infect Dis*. 2010;10(8):545-555. doi:10.1016/S1473-3099(10)70096-7

2. World Health Organization. *World Malaria Report 2018*.; 2018.

3. Nájera JA, González-Silva M, Alonso PL. Some lessons for the future from the global malaria eradication programme (1955-1969). *PLoS Med*. 2011;8(1). doi:10.1371/journal.pmed.1000412

4. UN Global Pulse, GSMA. The state of mobile data for social good report. 2017;(June). http://unglobalpulse.org/sites/default/files/MobileDataforSocialGoodReport\_29June.pdf.

5. de Montjoye Y-A, Smoreda Z, Trinquart R, Ziemlicki C, Blondel VD. D4D-Senegal: The Second Mobile Phone Data for Development Challenge. 2014;(August). http://arxiv.org/abs/1407.4885.

6. Tatem AJ, Huang Z, Narib C, et al. Integrating rapid risk mapping and mobile phone call record data for strategic malaria elimination. *Malar J*. 2014.

7. Steele JE, Sundsøy PR, Pezzulo C, et al. Mapping poverty using mobile phone and satellite data. *J R Soc Interface*. 2017;14(127). http://rsif.royalsocietypublishing.org/content/14/127/20160690. Accessed August 10, 2017.

8. De Cordes N. Data for Development Challenge Senegal Book of Abstracts : Scientific Papers.

9. Wesolowski A, Qureshi T, Boni MF, et al. Impact of human mobility on the emergence of dengue epidemics in Pakistan. *Proc Natl Acad Sci*. 2015;112(38):11887-11892. doi:10.1073/pnas.1504964112