Digital Interventions for Self-Management of Chronic Illnesses

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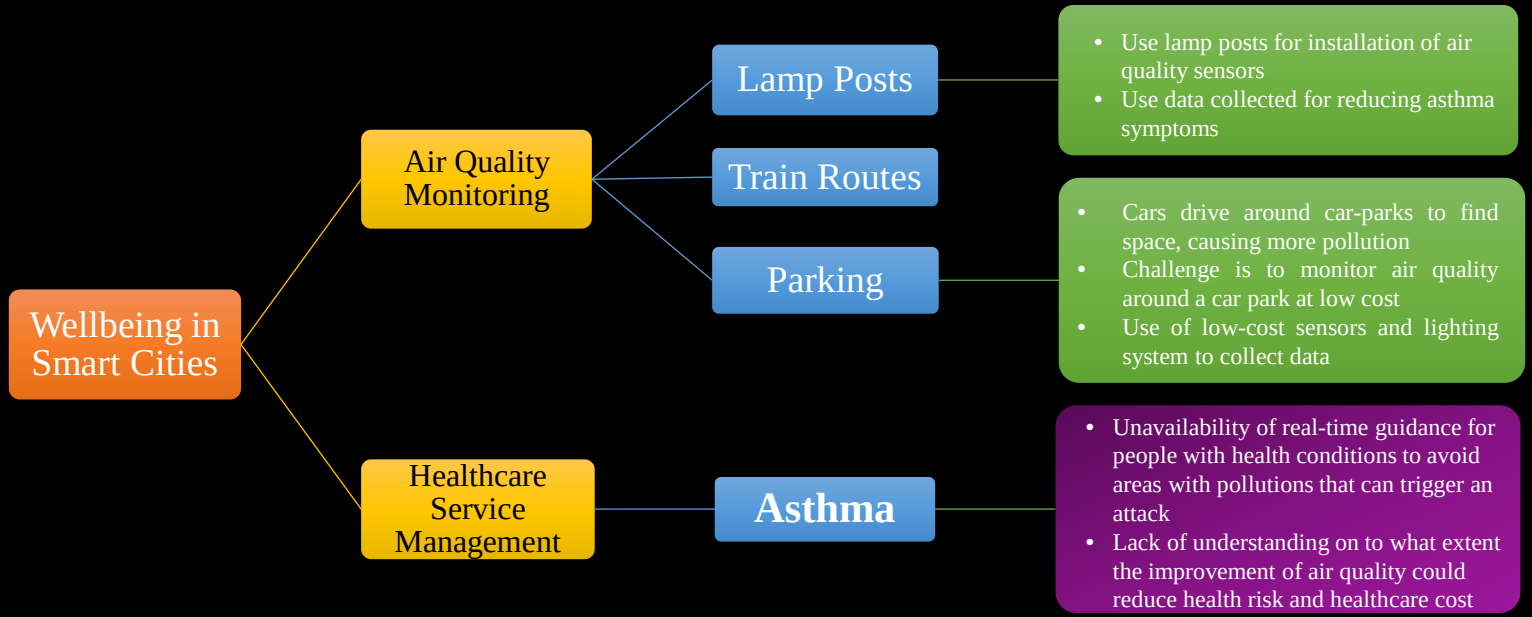
Self-Management of Chronic Illnesses

- Reducing healthcare costs, overcoming social stigma, and cultural differences
- Diabetes, depression, asthma, and heart condition are prevalent in both developed and developing countries
- A number of clinical and technological barriers need to be overcome to support self-management of chronic illnesses
- Requires understanding of personal and population level indicators (Sheth, 2017)
- Engagement with healthcare experts and local authorities in cities of Southampton and Manchester is key to this work!

Smart Cities and Wellbeing

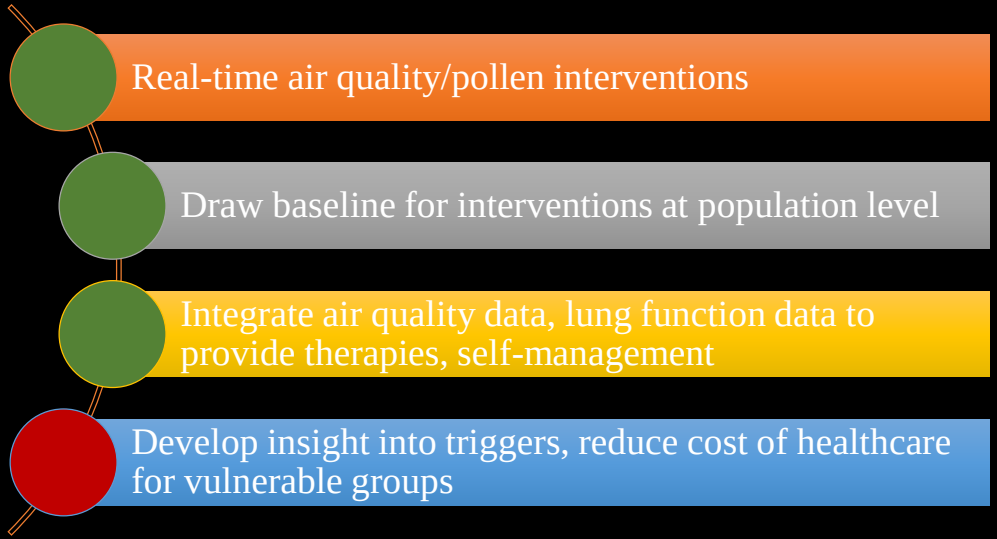
- Requirement gathering and use-case formation: Part of HEALTH-I project with Cisco Smart City demonstrator, CityVerve (Manchester) and Southampton City Council (SCC)



Acknowledgements: CityVerve, Manchester (PETRAS user partner)

Health Service Management

Case of Asthma



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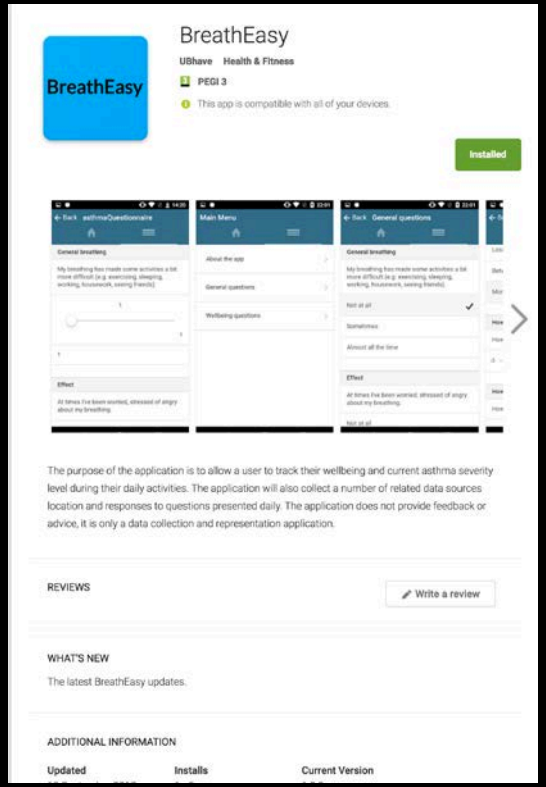
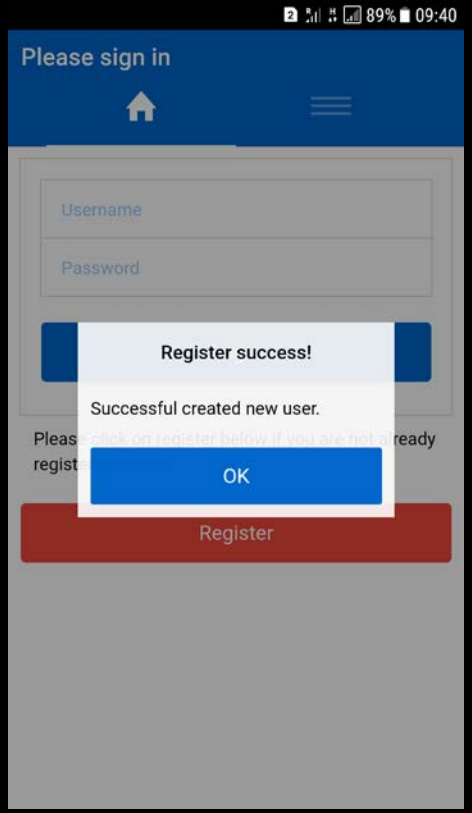
What We Have: Data Sources

- **Social Media Datasets –** Twitter, health social machines, other social media datasets
- **Open government datasets –** weather, geospatial datasets
- **Local datasets** about people's behaviors, attitudes and preferences
- **U-BIOPRED** (Unbiased BIOmarkers in PREDiction of respiratory disease outcomes)
    - Asthma hand printing data
- **Sensor datasets about people and environments** from IoT Observatory and PETRAS community

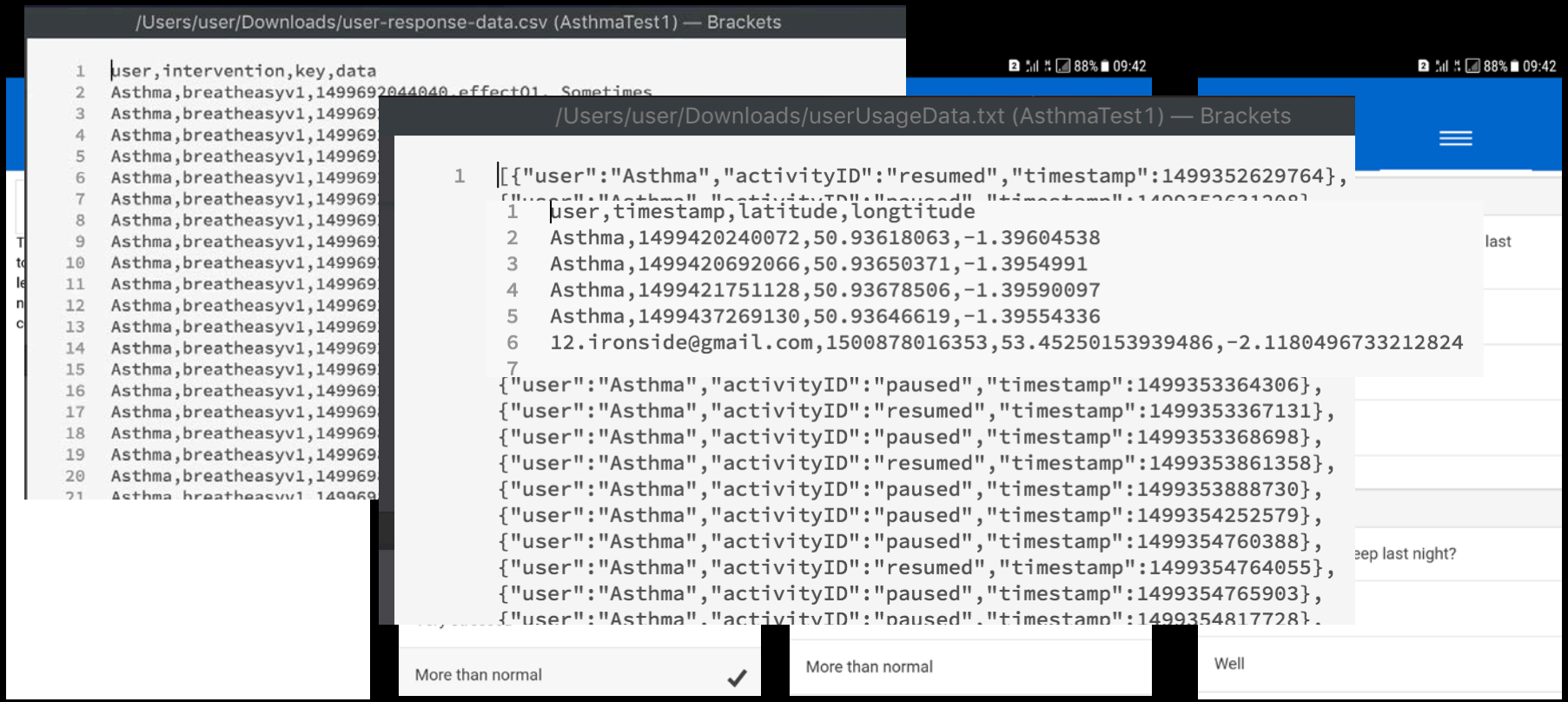
What We Have: BreathEasy Application





- Cross-platform wellbeing mobile application
- Captures general wellbeing of patients on a daily-basis
- *Personal data* captured– username, password and their geo-location

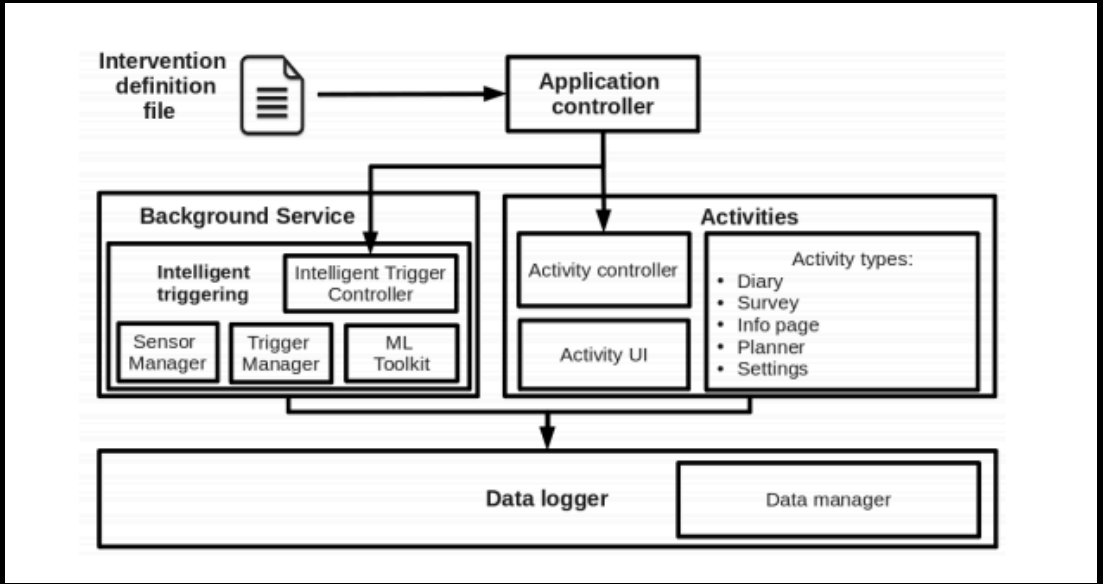
BreathEasy: Wellbeing Questionnaire



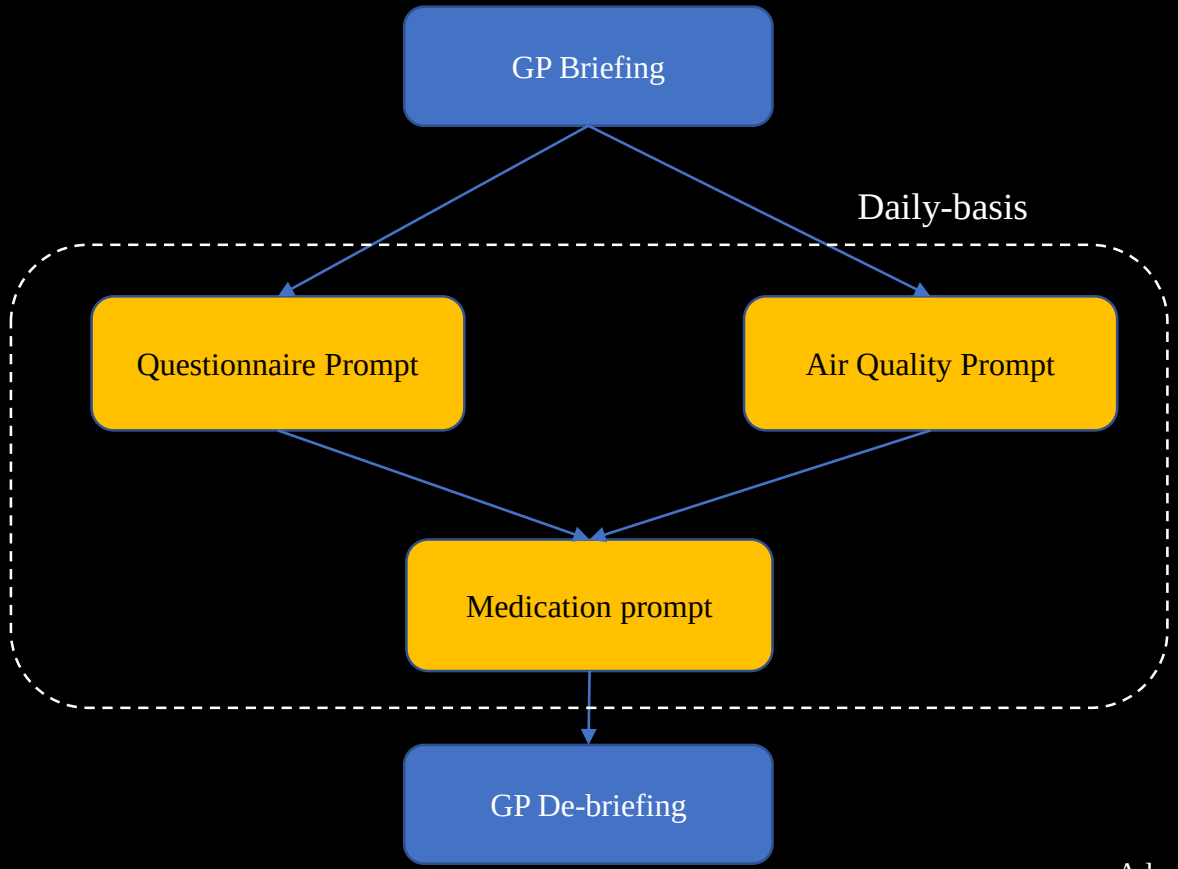
BreathEasy: Application Design

- Extends the UBhave framework for designing behavioral interventions (Hargood et al., 2014)
- Intervention for any behavioral condition can be designed using the framework

- An intervention can be loaded from a *json* file
- The mobile application is built using Apache *Cordova* and front-end using *Ionic* framework

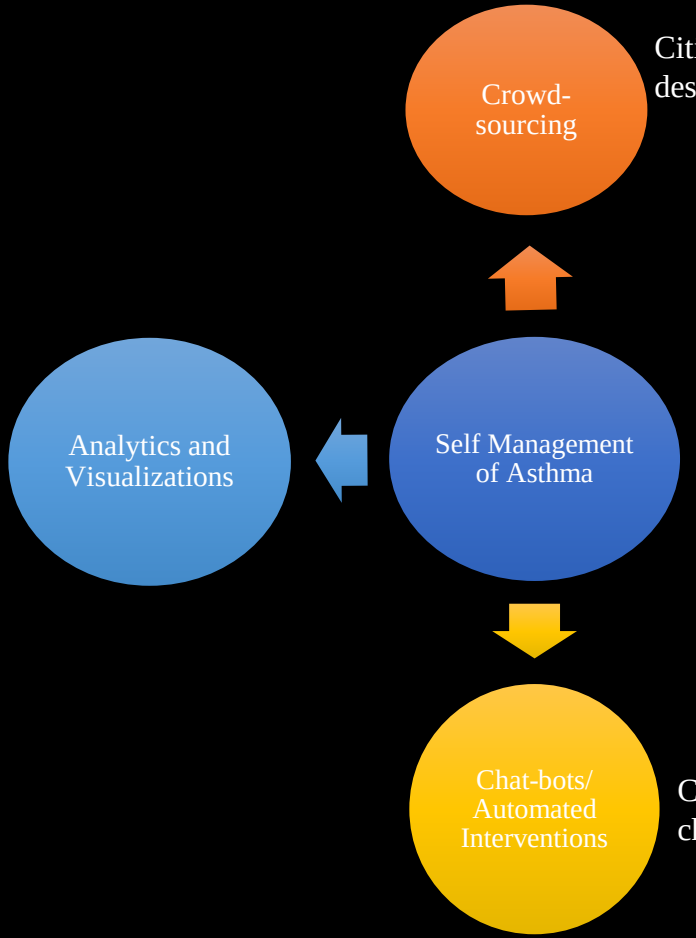


An Example Intervention



Adapted from (Burnett, 2013)

Research Map



Citizen engagement for crowd-sensing, design their privacy profiles, trust evaluation

Real-time observation and analyses of data and geo-spatial data visualizations, prescription patterns to understand public health

Link personal parameters with environmental and other contextual data

Can “pollen robo” and “Pepper” talk to chat-bot what intervention is needed

References

- Hargood, Charlie, et al. "The UBhave framework: Developing dynamic mobile applications for digital behavioural interventions." *Poster presented at: 11th International Conference on Mobile and Ubiquitous Systems: Computing, Networking and Services*. 2014.
- Download BreathEasy application: https://play.google.com/store/apps/details?id=ac.soton.breatheasy&hl=en_GB
- Burnett, Chris, et al. "Trump: A trusted mobile platform for self-management of chronic illness in rural areas." *International Conference on Trust and Trustworthy Computing*. Springer, Berlin, Heidelberg, 2013.
- Sheth, A., Jaimini, U., Thirunarayan, K., & Banerjee, T. (Sept. 11-13, 2017.) Augmented Personalized Health: How Smart Data with IoTs and AI is about to Change Healthcare. In: IEEE 3rd International Forum on Research and Technologies for Society and Industry (RTSI 2017). Modena, Italy.
- Mengfan Tang, Pranav Agrawal, and Ramesh Jain. 2015. Habits vs Environment: What Really Causes Asthma?. In *Proceedings of the ACM Web Science Conference* (WebSci '15). ACM, New York, NY, USA, Article 30, 5 pages. DOI: https://doi.org/10.1145/2786451.2786481
- Lal, Miss Anumeha, and Mr Girish A. Kulkarni. "Detection and Monitoring of Asthma Trigger Factor using Zigbee." *management* 3.7 (2016).
- Honkoop PJ, Simpson A, Bonini M, *et al*. MyAirCoach: the use of home-monitoring and mHealth systems to predict deterioration in asthma control and the occurrence of asthma exacerbations; study protocol of an observational study, *BMJ Open* 2017;**7:**e013935. doi: 10.1136/bmjopen-2016-013935
- Sage, A., Roberts, C., Geryk, L., Sleath, B., Tate, D., & Carpenter, D. (2017). A Self-Regulation Theory–Based Asthma Management Mobile App for Adolescents: A Usability Assessment. *JMIR Human Factors*, *4*(1), e5. http://doi.org/10.2196/humanfactors.7133
- Do, Q., Robinson, K., Tran, S. (2015). Big data analysis: Why not an asthma app? Proceedings of Informing Science & IT Education Conference (InSITE) 2015,155-170. Retrieved from http://Proceedings.InformingScience.org/InSITE2015/InSITE15p155-170Do1931.pdf
- M. Tang, X. Wu, P. Agrawal, S. Pongpaichet and R. Jain, "Integration of Diverse Data Sources for Spatial PM2.5 Data Interpolation," in *IEEE Transactions on Multimedia*, vol. 19, no. 2, pp. 408-417, Feb. 2017. doi: 10.1109/TMM.2016.2613639, URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7576703&isnumber=7820230