Subproject 3: Exploring potential measurement and modelling techniques for estimating human exposure to airborne pollutants

Milestone 17 Report and/or publications on Aim 3: Exposure Estimates	Due 31 December 2016 UWA

Activity 3a: Estimate Exposure Levels from Air Quality Models and Link to Health Outcomes (UWA, CSIRO, UoM, OEH)

Current activity/Achievements:

- We have reached an agreement with NHMRC Centre for Air quality and health Research and evaluation (CAR), Woolcock Institute of Medical Research regarding how to progress this work, optimising both CAUL and CAR resources. In December 2016 four Postdoctoral fellowships were awarded by CAR for project that directly relate to the aims of project one. CAUL resources will be used to provide additional resources (e.g. research assistance) to progress this work over the next year.

Research Task	Timeline
1. Develop the satellite based PM$_{2.5}$ LUR for Western Sydney and Australia as a whole.	By May 2017- Dr Luke Knibbs leading)
2. Set- up a platform/ database so that the satellite based LURs can be updated regularly (at least every 5 years)	By October 2017-D.r Ivan Hanigan and Luke Knibbs)
3. Evaluate the LURs models based upon campaign measurements (this may be limited to the Perth 2012 PM2.5 measurements)	By December 2017 – Dr. Luke Knibbs
4. Blending of the Satellite PM2.5 LUR with CTM models for Western Sydney	By December 2017 –Dr. Ivan Hanigan
5. Analyse the relationship between PM$_{2.5}$ exposure and hospitalisations in the 45 and up cohort with a focus on Western Sydney.	By December 2017 Dr. Farid Salimi
6. Analyse the relationship between PM2.5 exposure and cardiovascular events in the 45 and up cohort , with a focus on Western Sydney.	By December 2017 Dr. Gayan Bowatte
7. Analyse the relationship between PM2.5 exposure and respiratory events in the 45 and up cohort , with a focus on Western Sydney.	By December 2017 Dr .Gayan Bowatte

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- A joint session on the potential to use satellite data to produce LUR model of air quality variability was held ANZAA in Brisbane in August. The key outcomes were :
    - A workshop on Bayesian Maximum Entropy or other statistical methods to blend air pollution data is needed
    - AURIN (Australian Urban Research Infrastructure Network) database, managed by Richard Sinnott at the University of Melbourne, should be explored as a repository for the air pollution data
    - There is a need to raise community understanding of air pollution exposures and health effects
    - In developing our models of exposure we need to consider people's movements and indoor and outdoor exposures.
    - There may be a greater role for personal sensors once their sensitivity and specificity have improved
    - An on-going dialogue between epidemiologists, modellers and air pollution scientists is needed
- Two papers have been published:
    - Knibbs LD, Coorey CP, Cowie C, Dirgawati M, Heyworth JS, Marks GB, Morawska L, Pereira G, Hewson MG. 2016. Independent validation of a national satellite-based land-use regression model for nitrogen dioxide using passive samplers, Environmental Science & Technology accepted 22 October 2016.
    - Dirgawati M, Heyworth JS , Wheeler AJ, McCaul KA , Blake D , Boeyen J, Cope M , Yeap BB, Nieuwenhuijsen M, Brunekreef B, Hinwood A. 2016. Development of Land Use Regression Models for Particulate Matter and Associated Components in an Area with Low Air Pollutant Concentration Airshed. Atmospheric Environment, 144:69-78.

- UOW has undertaken work investigating methods to sample PM2.5 over a wide area, in order will inform future sampling to capture the spatial variability of PM2.5 throughout Sydney suburbs (Attachment 1). Two methods of sampling were employed to assess the spatial variability of PM 2.5 in Randwick and Casula. At Randwick the sampling was conducted using a Mobile Air Quality Station (MAQS) which comprised a DustTrak DRX aerosol monitor (DustTrak) and a weather station to monitor wind speed and direction. At Casula PM2.5 was sampled via a DustTrak fitted inside a vehicle that was driven around the suburb. The MAQS worked well in discriminating PM2.5 variations, however sampling area covered was less. Sampling via vehicle allowed a larger sampling area to be covered, but sacrificed resolution and did not have the ability to measure wind conditions. This data will be used to start future projects and to validate traffic modelling for Randwick.

Future planned activities:

- To incorporate modelled air quality data within the NSW Government Centre for Health Record Linkage (CHeReL) in order that a broader range of health outcomes can be investigated.