Public Health Case Study

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Community issue
Early childhood development

Australian Social Health Atlas data indicated that as many as 23% of South Australian children in their first year of school are developmentally vulnerable on one or more domains (social, emotional, physical, language/cognitive and communication/general knowledge), as indicated by the Australian Early Development Index (AEDI). As a result, the estimated cost incurred by the State Government is up to $20m per year. There was therefore a clear and urgent need to:

- understand what factors influence the risk of early childhood developmental issues
- find the levers that could be used in a cost-effective and efficient way to improve the situation
- quantify the effect of each of the levers or their combinations
- recommend to the Government both actionable and defensible intervention steps.

We undertook this project during the Unleashed 2013 Open Data Competition.

Solution

We used various open data sources provided by State and Federal governments, among them:

- Social Health Atlas of Australia data
- Australian Early Development Index Data
- Health service locations
- Geographic boundary files for statistical local areas

After data preparation and pre-processing, we identified redundant variables and used data science modelling to identify the most important predictors of early childhood vulnerability.

We delivered the project as a geographic data visualisation application, where we aimed to not only visualise the magnitude of observed AEDI per geography, but also to allow the user to modify the loadings associated with the equation relating AEDI magnitude to its key drivers and thus visualise the modelled AEDI value. The application became a What-If decision making tool that allowed various intervention scenarios to be modelled, evaluated and explored.
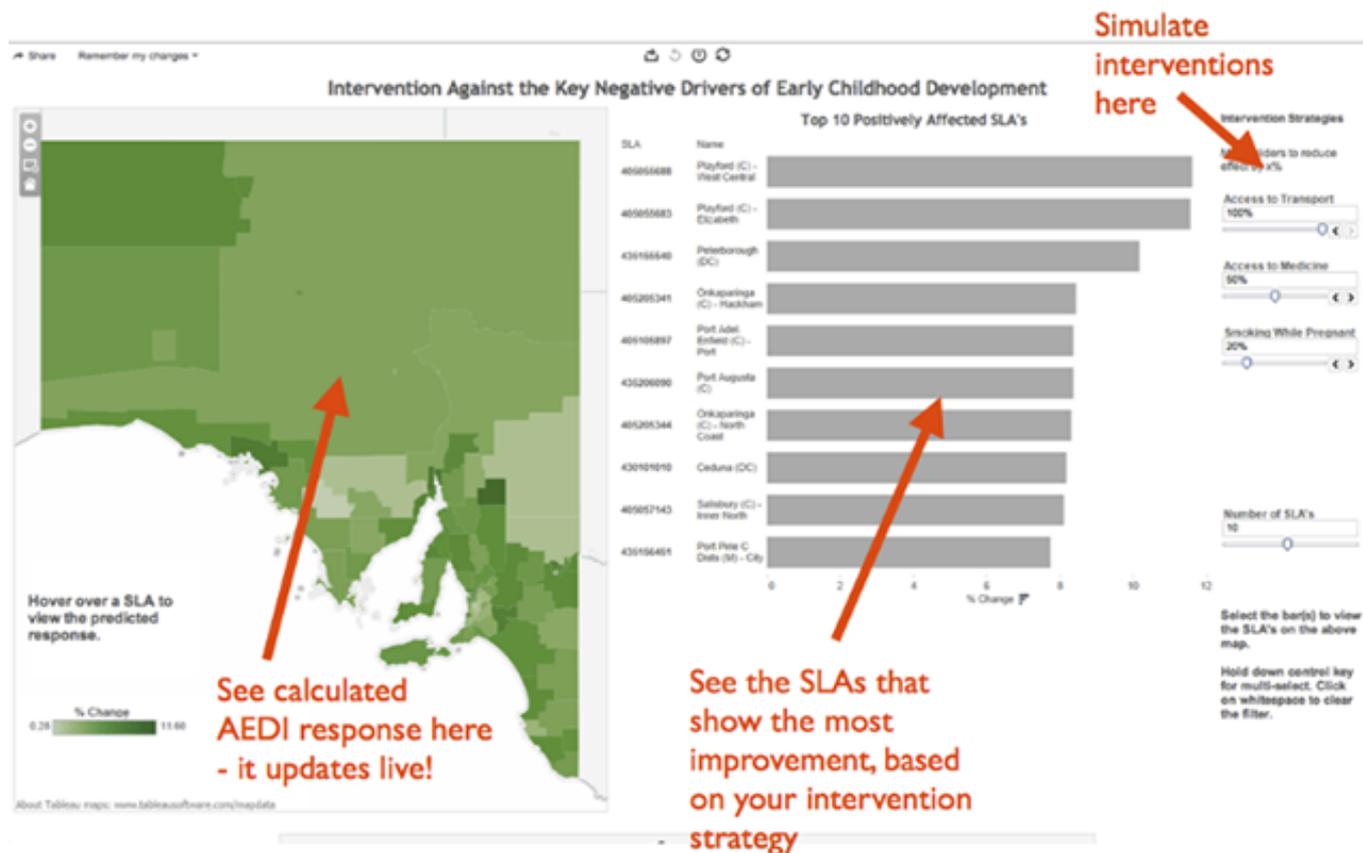
Findings

We identified the following key levers that could be used for time- and cost-efficient interventions:

- maternal smoking during pregnancy
- inadequate access to transport
- inadequate access to medication.

Based on these insights, potential intervention programmes included:

- Community and nurses to deliver anti-smoking education to women of child-bearing age.
- Provision of taxi vouchers or mini buses to health centres on a regular basis, particularly for pregnant women and women with young children.
- Provision of subsidies for medication specific to pregnant women, mothers and young children.

Benefits

The project delivered clear and actionable insight into the key drivers of early childhood development vulnerability, using only publicly-available open data. Moreover, the insights were delivered in a form that made it easy for decision makers to evaluate the effectiveness of various intervention scenarios. For example, what should the relative resource allocation be across the identified key levers? The interactive visualisation tool allowed decision makers to explore this and other questions.

Approach

The approach used the power of contemporary Data Science methods and was transparent, repeatable, scientifically valid and accurate.

Data Science, also referred to as Advanced Analytics or Predictive Analytics, is an analysis approach that provides businesses with accurate What-If scenarios and evidence-based proactive decision-making tools.

- It is based on predictive analysis of domain-specific organisational data. If an outcome of interest to the business can be measured, then Data Science methods can determine which factors influence it and to what extent - and based on the delivered insights, suggest the call to action.
- It has been proven and pressure-tested globally across many industries. It has been a key to the success of Google and Amazon. It is used by leading banks, insurers, telcos, retailers, manufacturers, utilities and governments to gain insight into how to efficiently improve business outcomes including:
  - community well-being indices
  - optimisation of Government and agency KPIs
  - rates of economic and health-related issues

Awards

This project won a number of awards in the 2013 Unleashed Open Data Competition.

National awards	SA awards	SA Honourable Mentions
Best analysis (awarded by CSIRO)	Unleashed Strategic Priorities Prize	MEGA entrepreneurship program scholarship
Greatest potential for research impact (awarded by Intersect)	Every Chance for Every Child Prize	Distillery commercial mentoring
Best data visualisation highlighting SA (awarded by SA Office of CIO)	Best Data Visualisation – SA Only	DataSpark Most promising developer

Publications

Details of this project were presented at the IEEE International Conference on Data Mining 2013 in Dallas, Texas, and published in the conference proceedings.

Kolyshkina, I., Brownlow, M. and Taylor, J. (2013) Improving every child's chance in life. In Melli, G., Kitts, B. (2013) (editors), Proceedings of the Fifth Workshop on Data Mining Case Studies and Data Mining Practice Prize, IEEE International Conference on Data Mining 2013 (ICDMW 2013), IEEE Press.