Improving Veteran Access to Eye Care Using Facility Location Models

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Problem Statement

Patients in Veterans Affairs (VA) are screened for four major chronic visual diseases to minimize long-term negative outcomes, including blindness. In 2015, the VA initiated screenings performed by ophthalmic technicians in primary care clinics as part of their Technology-based Eye Care Services (TECS) program.

This project aims to guide decision-makers in the VA on **where to place eye care facilities** and **how to staff those facilities** with the available providers to improve patient access to care.

Lab tech eye screening (cheaper, more accessible)

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Where to offer eye care and with what provider type(s)?

How do these decisions impact VA costs/operations and patient access?

Models

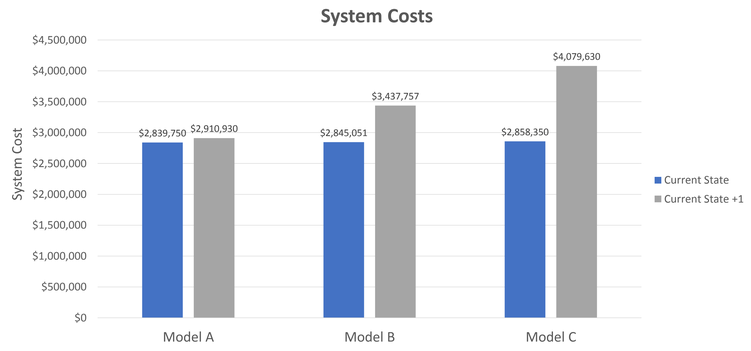
In partnership with clinical collaborators, we developed several deterministic mixed-integer programs with varying objective functions.

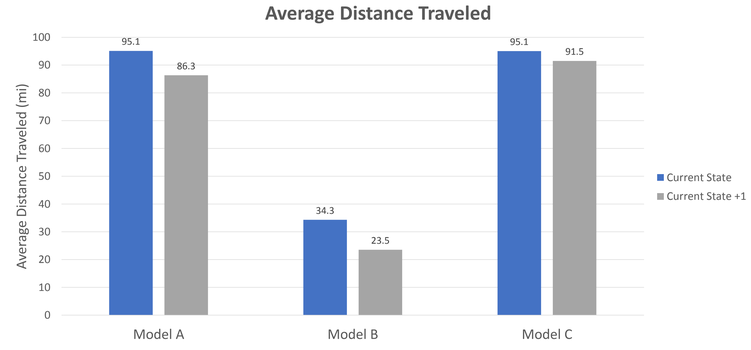
	Minimize Cost	Minimize Avg. Travel Distance	Maximize Patients Screened
Constraints			
Patient Capacity	X	X	X
Patient Demand	X	X	
Provider Capacity	X	X	X
Budget		X	X
Travel distance	X		X
Utilization	X	X	X

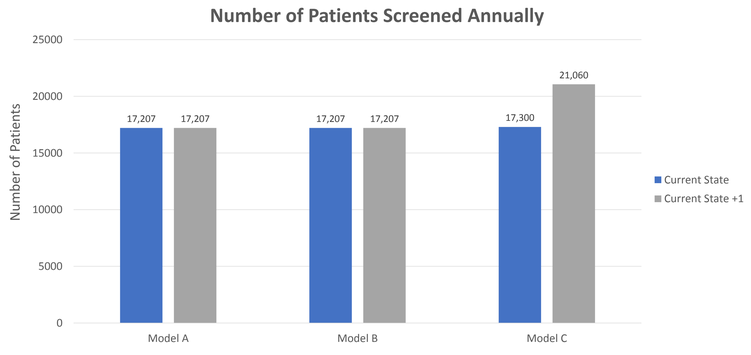
We are currently focusing our attention on maximizing the number of patients screened. We chose this objective because the VA sets a fixed budget, and we're interested in exploring how varying the upper bound on travel distance affects the number of patients who can access to care.

Results

We compare outcomes of interest from each model under different scenarios. Our outcomes of interest are costs, number of patients screened, and average distance traveled. Each model is run evaluating scenarios of our current state (12 VA eye care locations) and adding one location.

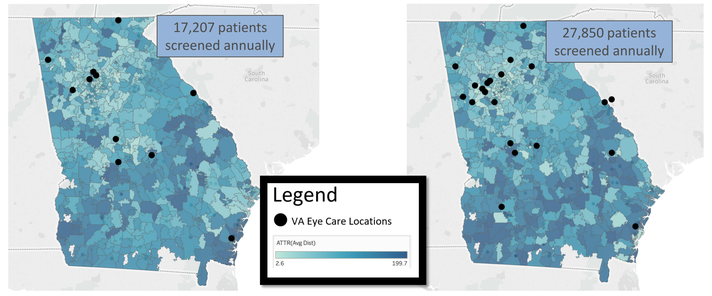






Results, cont'd

Current State (12 Eye Care Locations) ***Consider All Clinics (23 Locations)***



These figures show the average distance traveled by patients in each zip code under the current state of VA eye care with 12 clinic locations, and when we run Model A (minimizing cost) but consider all clinic locations. We see that patients do not travel a significantly further distance on average and we are able to screen over 10,000 more patients annually. This is one example of several comparative analyses our models can facilitate.

Conclusions and Next Steps

We find that while our models yield slightly different results based on the objective function, each provides valuable insight to better understand where to locate and how to staff clinics in the VA. Compared to the current state, our models inform decision-makers of the quantitative impact that adding eye care facilities has towards patient access (both in terms of how far patients travel and how many patients can be seen) and VA system costs.

Next steps for this analysis include to:

- Incorporate care dynamics following screening. We are planning to use a basic Markov model to "follow" patients as they progress through follow-up treatment if they screen positive.
- Incorporate stochasticity. Namely, we will consider different distributions of populations of veterans in each zip code.
- Continue review with clinicians and decision-makers in the VA to ensure model accuracy and applicability.
- Develop a tool using Excel and OpenSolver so that our clinical collaborators can run the models and make decisions on their own.

Acknowledgements

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