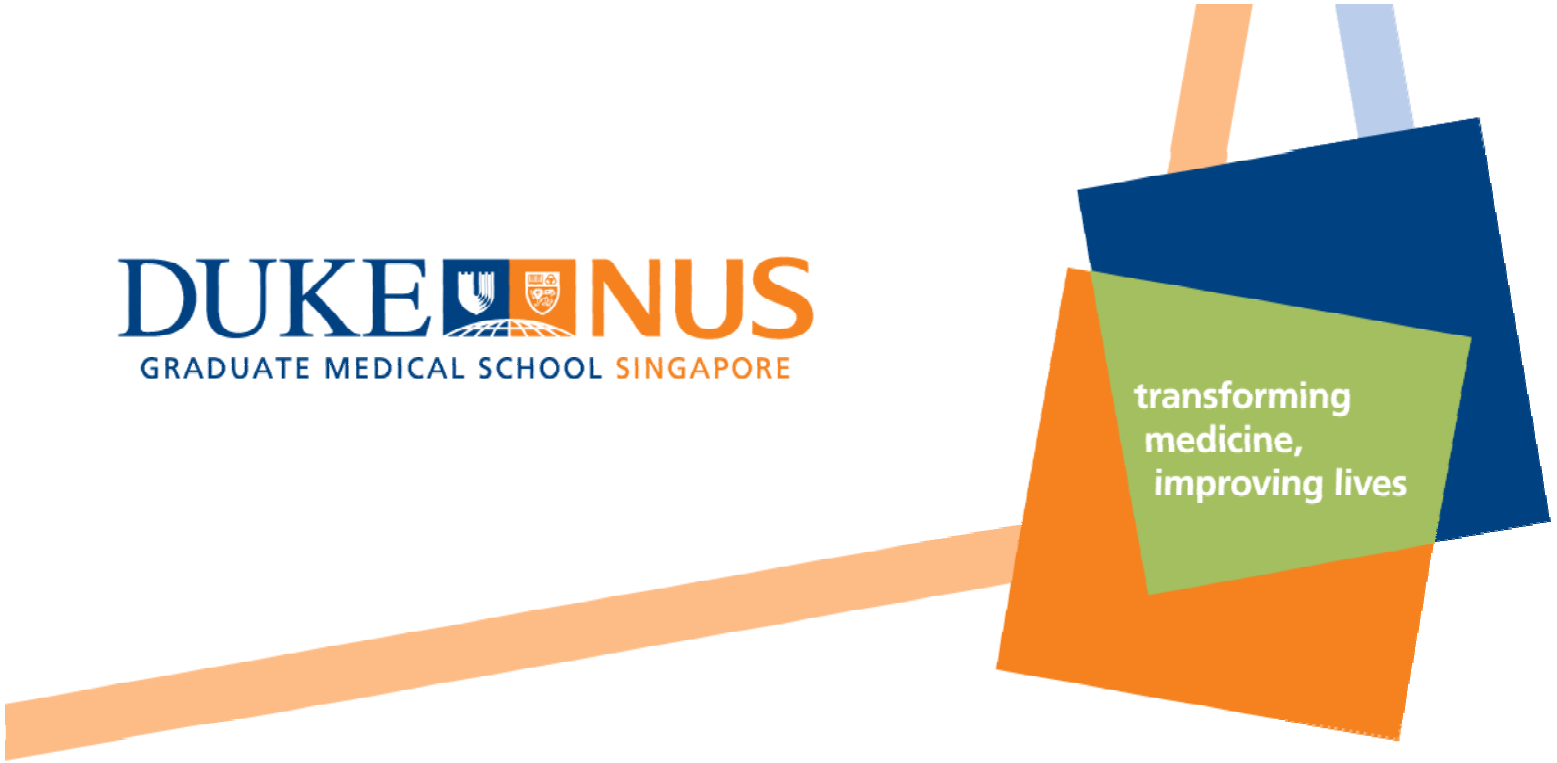


# Using System Dynamics Methodology to Generate Insights: An Example from Singapore

Crystal M Riley, James P Thompson, and David B Matchar
Health Services and Systems Research

# Research objectives

- Study care and treatment of dementia patients and develop care options to:
  - Increase caregiver options
  - Reduce burden on caregivers
  - Measure and control economic and social costs

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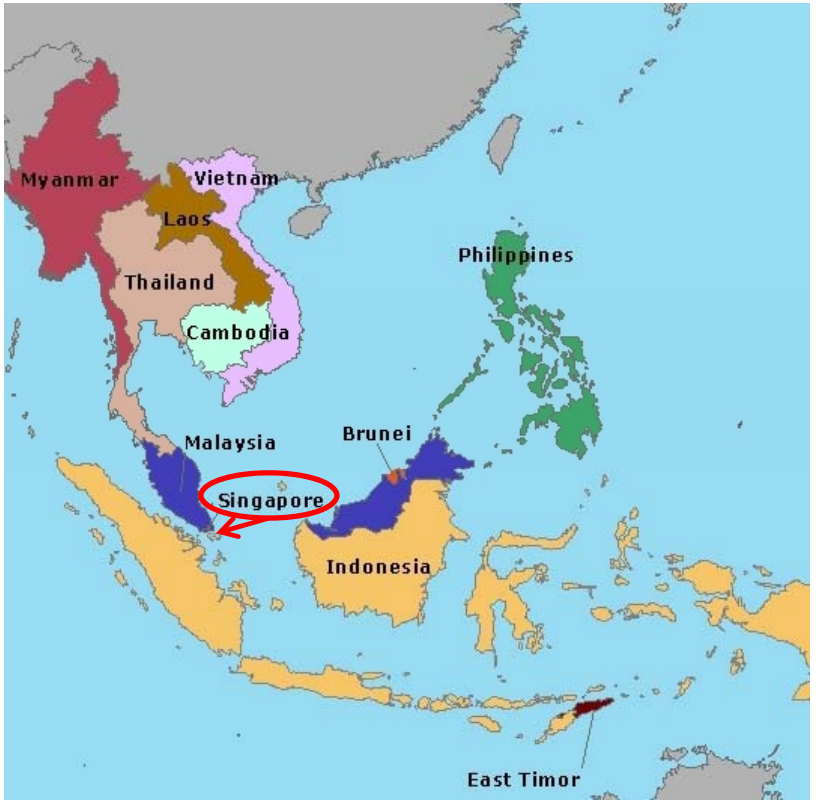
# What is the size of the population with dementia in the future?

- Need a good population model
- Singapore's population dynamics are unusual
  - Foreign labor
  - Ultra low fertility
  - High life expectancy

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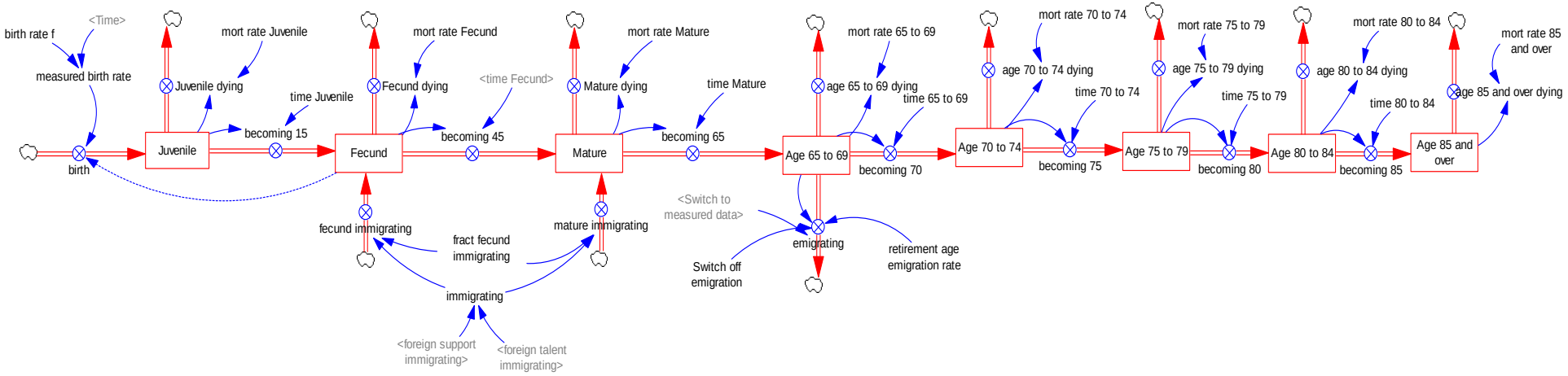
# The Model

- Eight-stock population aging-chain
- Immigration to reach *population planning value* of 6.5 million

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# Calibration

- Unexplained difference between the simulation and the population measured over 10 years

- Difference only emerged in elderly cohorts

**What causes that?**

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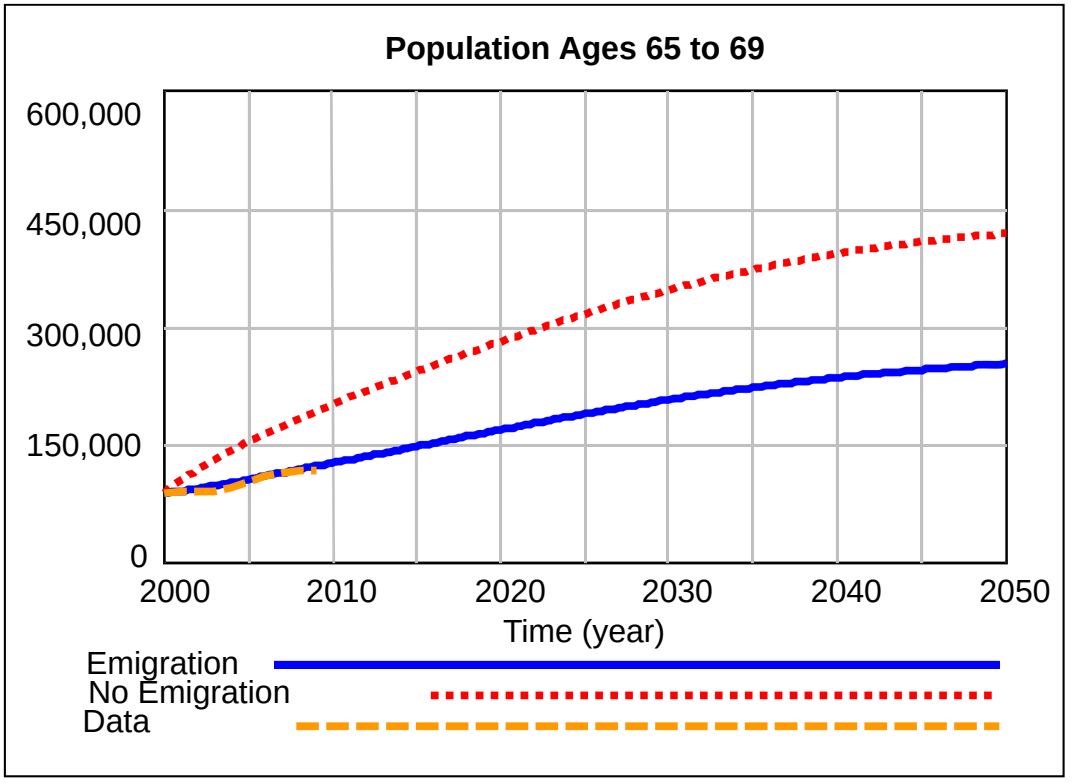
# Emigration?

- Foreigners leaving for “home”
- S’poreans leaving for lower cost of living
- Draining 17% of 65-69 cohort resulted in well-calibrated model
- Yay!

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# But Wait…

- Doesn’t 17% seem excessive??
- Back to the drawing board
  - Ask reviewers to look over our model
- Aha!
  - Eight-stock aging chain generates a blending problem
  - People were being “left behind” and “piling up” in younger stocks

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# Reworking the Model

- Population was disaggregated into individual birth-year cohorts and aging - “birthday” - made discrete event
- Emigration and immigration indirectly measured by calibrating population levels and outflow (deaths)
- About 1% of population emigrating
- Emigration still there, but spread out over the entire population
  - No mass exodus at age 65

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# What Does It Mean?

- Original result had a huge impact on future dementia population
- New result has a large impact but in a less obvious way
- All models are flawed…
- …some are more useful than others
  - First iteration → insight about emigration
  - Second iteration → higher confidence in estimate

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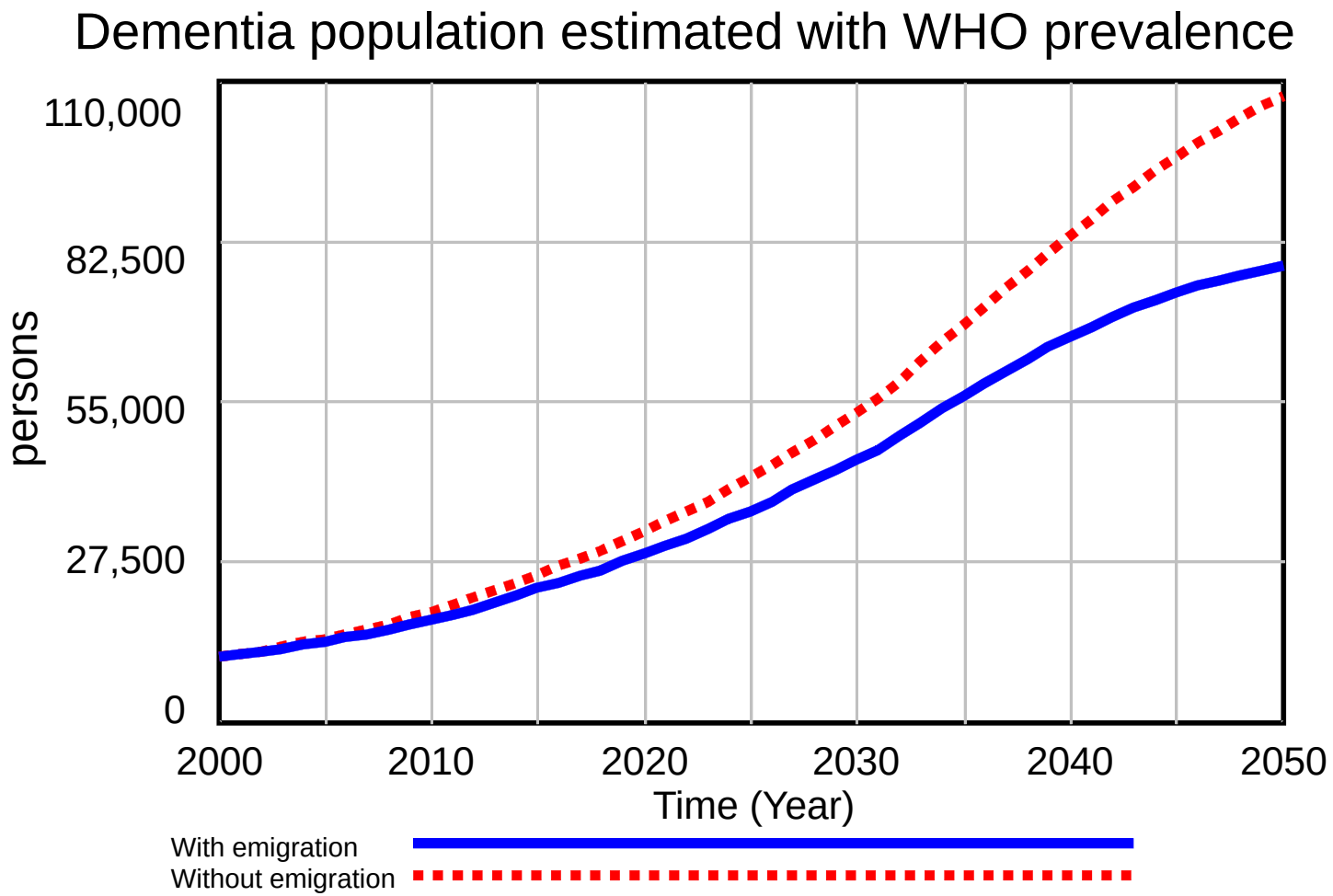


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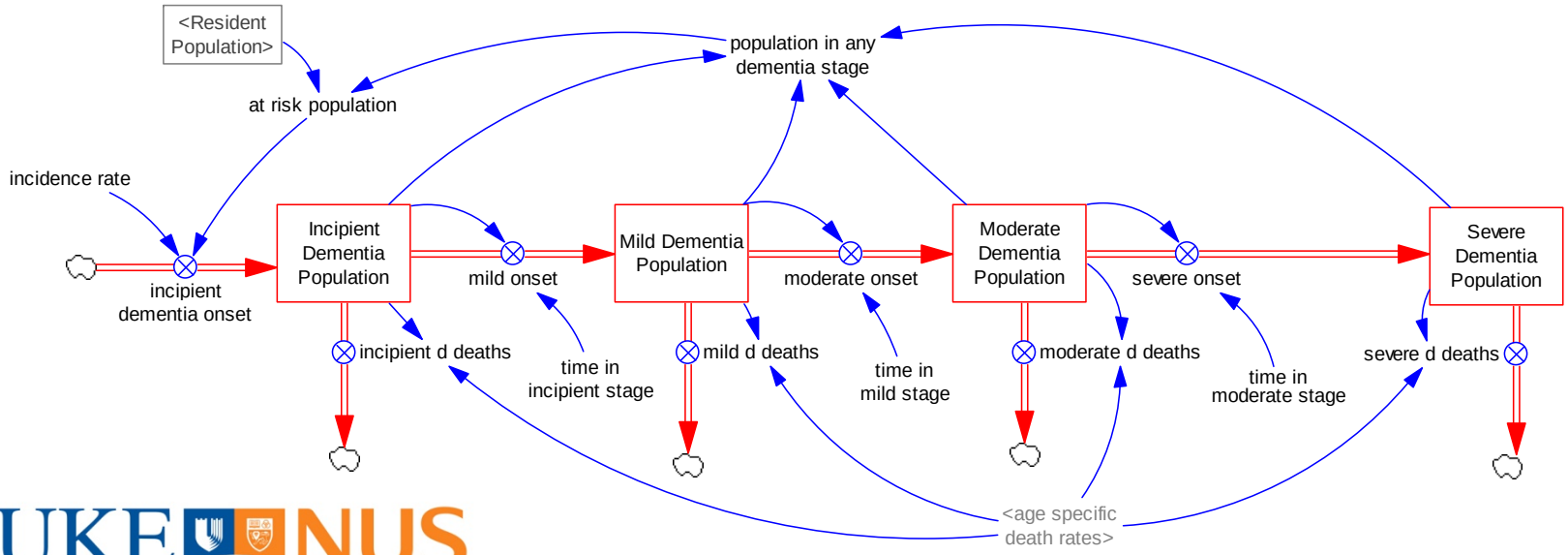
# Moving Forward

- Population: disaggregate by gender
- Dementia prevalence: at each level of severity
- Structure: Simulate currently observed patterns of care, to help develop programs of care based on severity

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# Thank you!

# Questions?

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