Workforce Supply/Demand Forecast Modeling in the US: Can Microsimulation Help Us Break Out of Our Siloes?

CHWC
Optimizing the Canadian Health Workforce

Ottawa, Ontario

October 4, 2016

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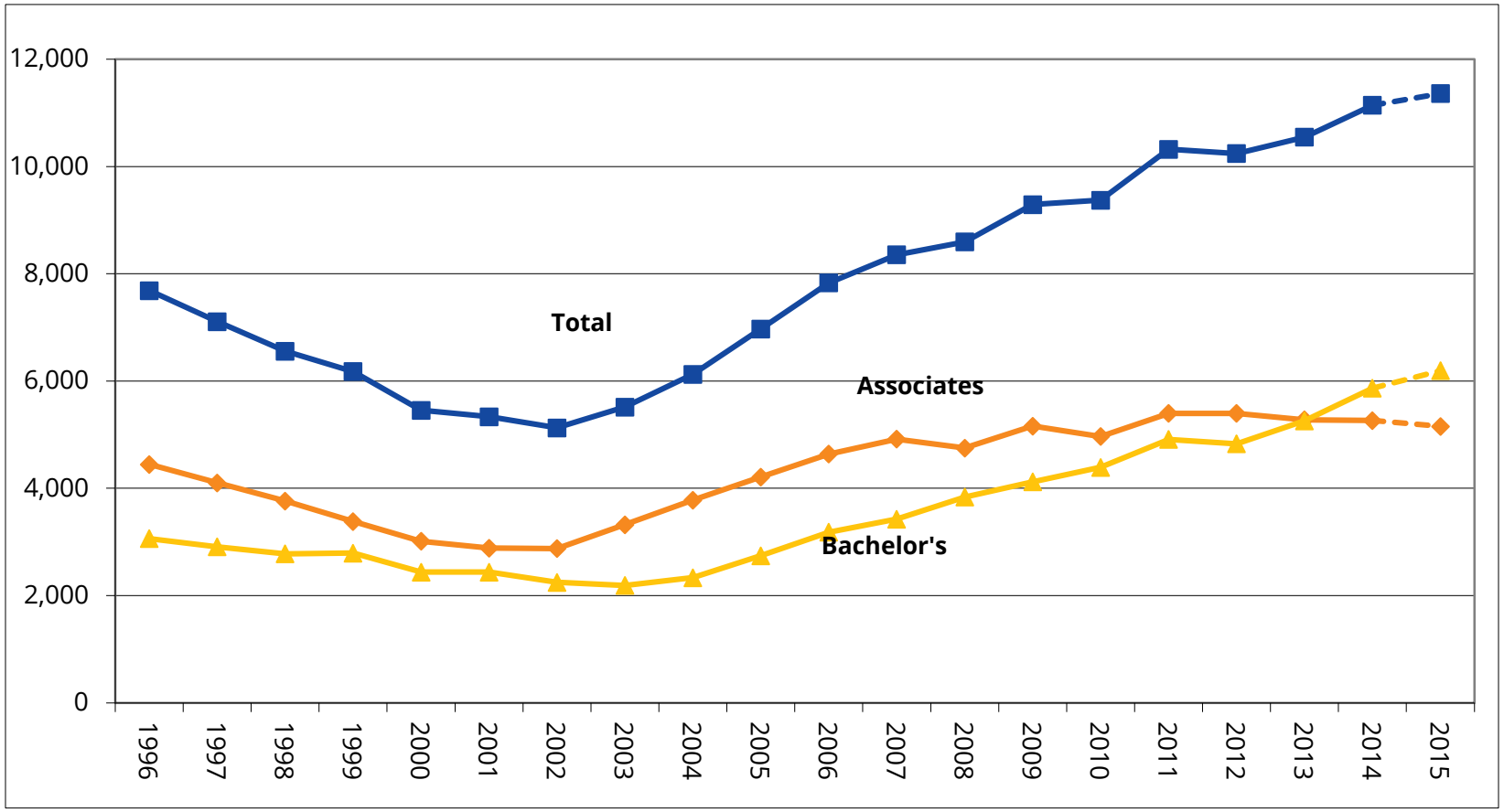
The Power of Projection Models…

New York RN Graduations, by Degree Type, 1996-2015



Source: Center for Health Workforce Studies

Historical Background on the Federally Supported Workforce Supply/Demand Models

- Siloed models (separate models for different occupations)
- Different contractors built different models using different platforms, methods and assumptions
- Static models—parameters constant over time and across states
- Separate supply and demand models
- Infrequently updated
- Limited capability to analyze policy or emerging care delivery models
- Limited ability to capture geographic variation in population risk factors

Federally Funded National & State Modeling for (2012-present)

- Physicians, APRNs, PAs (recently completed)
- Behavioral health (recently completed)
- Nursing http://bhpr.hrsa.gov/healthworkforce/supplydemand/nursing/workforceprojections/nursingprojections.pdf
- Oral health http://bhpr.hrsa.gov/healthworkforce/supplydemand/dentistry/nationalstatelevelprojectionsdentists.pdf
- Pharmacists http://bhpr.hrsa.gov/healthworkforce/supplydemand/usworkforce/projections/pharmacists.pdf
- Therapists http://bhpr.hrsa.gov/healthworkforce/supplydemand/usworkforce/projections/occupationalphysicaltherapy.pdf
- Vision http://bhpr.hrsa.gov/healthworkforce/supplydemand/usworkforce/projections/visionoccupations.pdf
- Chiropractors and podiatrists http://bhw.hrsa.gov/healthworkforce/supplydemand/usworkforce/projections/chiropractorspodiatristsapril2015_.pdf
- Dieticians and nutritionists http://bhw.hrsa.gov/healthworkforce/supplydemand/usworkforce/projections/dieticiansnutritionistsapril2015_.pdf
- Health technologist and technician occupations http://bhw.hrsa.gov/healthworkforce/supplydemand/usworkforce/projections/healthtechnologisttechniciansapril2015.pdf
- Healthcare support occupations http://bhw.hrsa.gov/healthworkforce/supplydemand/usworkforce/projections/healthcaresupportoccupationsapril2015.pdf
- Psychologists http://bhw.hrsa.gov/healthworkforce/supplydemand/usworkforce/projections/psychologistsapril2015.pdf
- Respiratory therapists http://bhw.hrsa.gov/healthworkforce/supplydemand/usworkforce/projections/respiratorytherapistsapril2015_.pdf

Other IHS Health Workforce Studies Using the Microsimulation Model

States

2016/ongoing: **New York, South Carolina, Georgia, Texas, Vermont**
Florida state & regional physicians, 2015
http://safetynetsflorida.org/wp-content/uploads/Jan-28-IHS-Report-PDF.pdf

Hawaii health workforce demand, 2014
Maryland health workforce assessment, 2014
Arkansas primary care, 2013
http://www.achi.net/Docs/30/

Associations

- National physician supply and demand (AAMC, 2015 & 2016) https://www.aamc.org/download/426242/data/ihsreportdownload.pdf
- Neurologists (AAN, 2013) http://www.neurology.org/content/early/2013/04/17/WNL.0b013e318294b1cf.short
- Veterinarians (AVMA, 2013) http://avmajournals.avma.org/doi/pdf/10.2460/javma.242.11.1507

Hospitals/Health Systems

- 8 health systems in New York as part of Medicaid Delivery System Reform Incentive Payment (DSRIP) Program

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Health Workforce Simulation Model: Design Criteria

- Built on solid theoretical underpinnings
- Dynamic model that can integrate professions and link supply with demand
- Can account for both current and future availability of data
- Can be adapted for analysis at state or local levels
- Easy to maintain/update as new data become available
- Supports scenario modeling

Health Workforce Simulation Model:

Demand Component

Microsimulation Approach for Modeling Workforce Demand

- Individual patients are the unit of observation
  - Predict use of health care services by individual
  - Determine how care will be provided to individuals
  - Sum across individuals to produce aggregate statistics
- Approach
  - Develop population health database with health profile for representative sample of the population
  - Develop predictive equations (using regression analysis) to model health care use
- Translate health care encounters into demand for practitioners
  - Use data on how practitioners divide their time between care delivery settings and patient encounters to create estimates of patient encounters per full time equivalent

Health Profile for Each Person in Stratified Random Sample

Demographics & Socioeconomics

- Demographics
  - Age
  - Sex
  - Race/ethnicity
- Socioeconomics
  - Household income
  - Insurance (private, public non-Medicare, Medicare, uninsured)

Risk Factors & Chronic Conditions

- Obese/overweight*
- Smoking status *
- Diagnosed with
  - Hypertension *
  - High cholesterol *
  - Coronary heart disease *
  - Diabetes *
  - History of stroke *
  - History of cancer *
  - Asthma
  - Arthritis *

* Information available for adults only

Key Data Sources

- Center for Disease Control and Prevention: Behavioral Risk Factor Surveillance System (2011-2013 data); NY EpiQuery
- Census Bureau: American Community Survey and population projections (2013)
- Medical Expenditure Panel Survey and National Inpatient Sample (2013)

Example: Use of Cardiology Services

[1] Rate ratios from Poisson regression analysis using 2009-2013 MEPS/2013 NIS.
[2] Odds ratios from logistic regression analysis using 2009-2013 MEPS.
Statistically significant at the 0.05 (*) or 0.01 (**) level.

Demographics

Health Risk & Behavior

Economic & Policy

Care Delivery

		Cardiologist		Cardiology-related Primary Diagnosis		
	Parameter	Office Visits[1]	Outpatient Visits[1]	Emergency Visits[2]	Hospital-ization[2]	Inpatient Days[1]
Race-Ethnicity	Non-Hispanic White	1.00	1.00	1.00	1.00	1.00
	Non-Hispanic Black	0.79**	0.97	1.36**	1.32**	1.14**
	Non-Hispanic Other	0.90**	0.75**	0.86	0.94	1.10**
	Hispanic	0.79**	0.68**	0.93	0.84**	1.07**
	Male	1.13**	1.59**	0.89*	1.11	0.97**
Age	18-34 years	0.11**	0.24**	0.66**	0.40**	0.84**
	35-44 years	0.22**	0.63**	0.95	0.76**	0.80**
	45-64 years	0.50**	0.86**	1.05	1.10	0.86**
	65-74 years	0.83**	1.21**	1.11	1.50**	0.93**
	75+ years	1.00	1.00	1.00	1.00	1.00
	Smoker	0.73**	0.84**	1.22**	1.11	
Diagnosed with	Hypertension	1.55**	1.13**	3.86**	2.66**	
	Heart disease	8.50**	10.73**	2.93**	3.84**	
	History of heart attack	1.63**	1.36**	2.36**	2.60**	
	History of stroke	1.08**	1.26**	2.92**	3.04**	
	Diabetes	1.15**	1.34**	1.01	1.19**	1.02**
	Arthritis	1.10**	1.24**	0.96	0.96	
	Asthma	1.04*	1.08**	1.00	1.07	
	History of cancer	1.06**	1.11**	1.01	0.99	
Body Weight	Normal	1.00	1.00	1.00	1.00	
	Overweight	1.04**	1.09**	0.87**	0.82**	
	Obese	1.11**	1.18**	1.01	1.02	
Insured	Has insurance	2.61**	2.09**	0.92	1.09	0.99*
	In Medicaid	1.36**	1.30**	1.59**	1.71**	1.23**
	In managed care plan	1.00	1.24**	0.99	0.99	
Household Income	<$10,000	0.90**	0.97	1.23**	1.19**	
	$10,000 to <$15,000	0.92**	0.91**	1.16*	1.20**	
	$15,000 to < $20,000	0.93**	0.93*	0.82	0.99	
	$20,000 to < $25,000	0.89**	0.73**	1.15	1.06	
	$25,000 to < $35,000	0.92**	0.96	1.16*	1.05	
	$35,000 to < $50,000	0.88**	1.07*	0.91	0.93	
	$50,000 to < $75,000	0.96*	1.17**	0.93	0.82**	
	$75,000 or higher	1.00	1.00	1.00	1.00	
	Metro Area	1.31**	1.09**	1.07	0.91	1.03**

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Care Delivery Patterns: Converting Service Demand to Health Profession FTEs

- 1,000 ambulatory visits to a pediatrician equates to approximately 0.23 FTE pediatrician; 1,000 hospital rounds equates to approximately 0.48 FTE pediatrician
- Every 4,469 visits to a physician's office translates to 1 full time equivalent RN

	Registered Nurse	Licensed Practical Nurse
Office visits	4,469	15,258
Outpatient visits	382	1,065
Inpatient days	106	802
Emergency visits	612	
Home Health Visits	63	246
Nursing Home Residents	125	86
School Health	900	
Residential	389	2,021

Health Workforce Simulation Model:

Supply Component

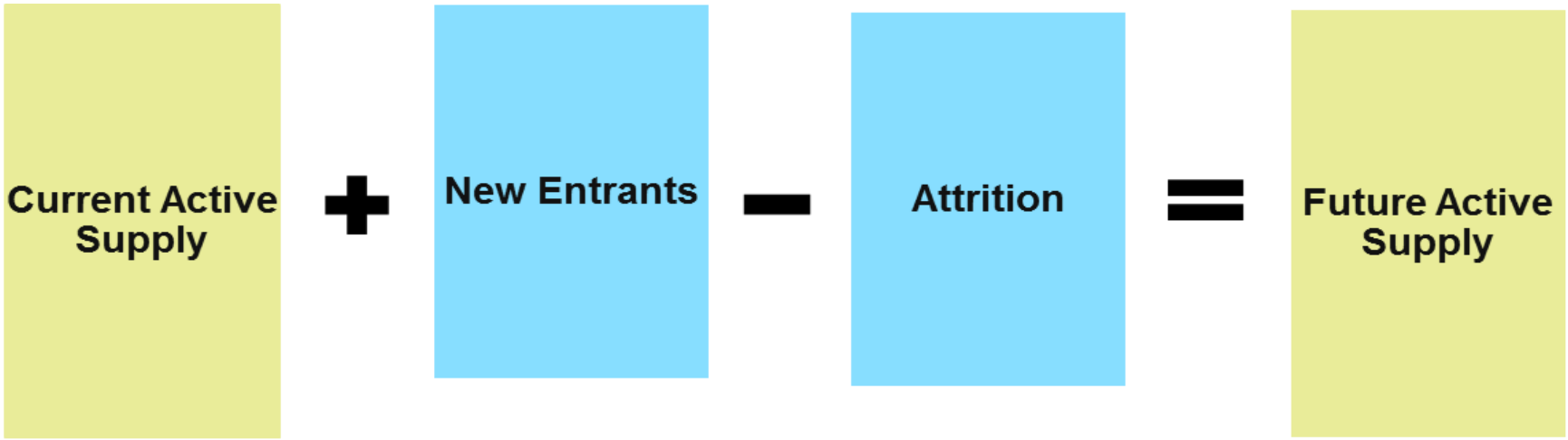
Microsimulation Approach to Workforce Supply Modeling

- Individuals are the unit of observation
- Modeling process
  - Starts with database containing starting year workforce supply
  - Each year to 2030, model:
    - New entrants to the workforce
    - Workforce attrition (retirement, mortality, out migration)
    - Other activities (labor force participation, hours worked, geographic mobility by occupation/specialty and provider demographics)
  - End of year supply = starting supply for subsequent year
- Influencing factors
  - Demographics of the workforce
  - Economic and policy factors (e.g., earnings, payment system)

Nursing Workforce Simulation Model: Supply Component

- Simulate likely career choices of individual clinicians
  - Microsimulation—modeling workforce decisions of individual clinicians, rather than stock-and-flow models that simulate groups of clinicians
- Dynamic modeling
  - Environmental and market factors—clinicians respond to changes in the economy, healthcare operating environment, and policy
  - Shortages/surpluses affect clinician workforce decisions
- Workforce activities: what, where, how, when
  - What type of work will I do?
  - Where will I work (eg, state of practice)?
  - How many hours will I work?
  - When will I retire?

Conceptual Model for Nurse Workforce Supply



Workforce Participation

Hours Worked

Change in Occupation, Specialty, or Education Level

Scenario Modeling Capability

- What if….
  - Supply declines? (fewer new grads, early retirements)
  - Supply increases? (more new grads, delayed retirements)
- What if….
  - Demand changes
    - Increase in the number of people with health insurance
    - Improved chronic disease management
    - Used new technology supports better access to services (eg, telehealth)
    - Reduced the number of unnecessary emergency room visits or hospitalizations
- Can model a wide range of scenarios—reflecting uncertainties in future trends in both supply and demand

Can This Be Used to Model Team Based Care?

- Can estimate demand across professions with similar clinical roles and responsibilities
  - physicians, nurse practitioners, physician assistants
  - dentists, dental therapists
- Can't easily track which team member provided which clinical service to a patient
- Can't account for non-clinical services provided by non-licensed workers (ie, community health workers, care coordinators) that provide non-clinical services

Limitations

- Lack of data
  - Supply data of any kind on most professions challenging to find
  - Detailed demand data to better understand impacts of team based models of care
- Lack of consistency in membership on team based care delivery models
- National and state level assessments fail to account for local supply/demand imbalances
- Doesn't account for state-to-state scope of practice variation
- No consensus on the right benchmark to use

Looking Ahead

- Continued federal funding over the next four years to use the microsimulation model to forecast workforce supply/demand imbalances in:
  - Long-term care
  - Allied health
  - Oral health
  - Primary care

Questions?

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