

Multi-Level Networks in Cancer Care

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Health Policy and Management

Cancer Outcomes Breakfast

Sep. 15, 2015

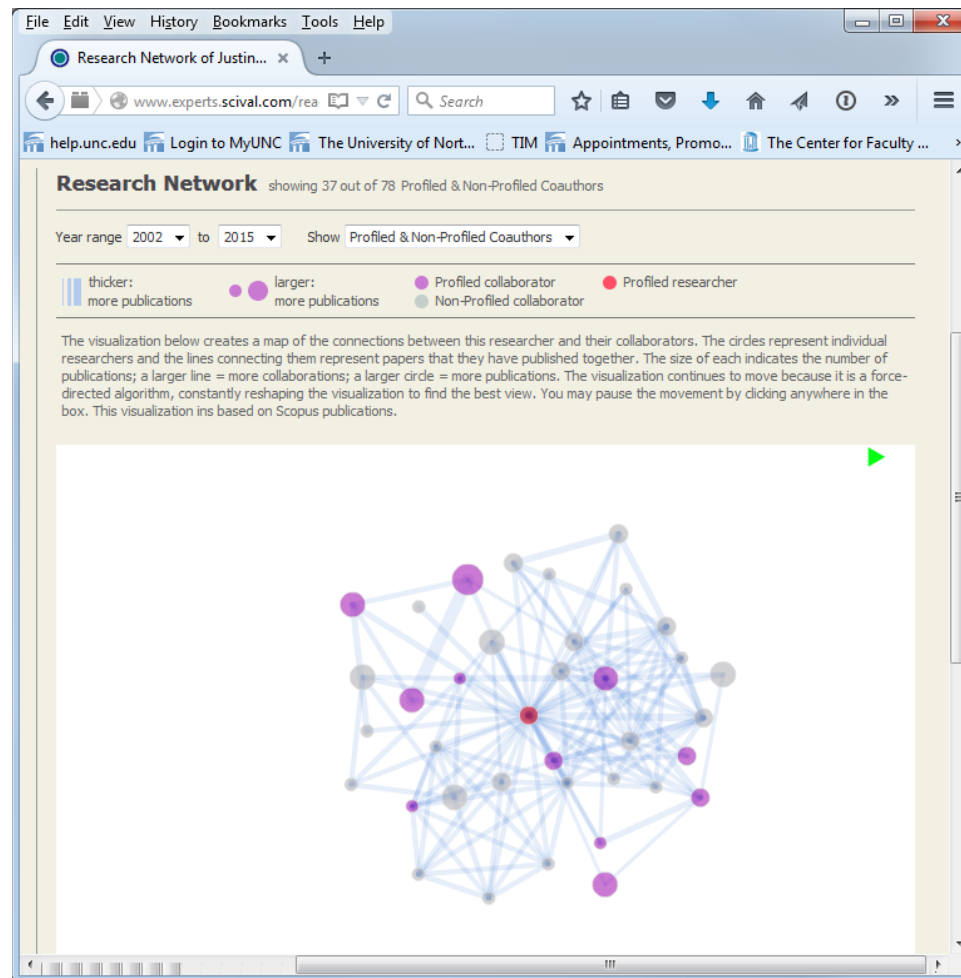


UNC
LINEBERGER

UCRF Innovation Award

- Team Science
- Co-Investigators
 - Anne-Marie Meyer (ICISS)
 - Peter Mucha (Applied Physical Sciences)
 - Karyn Stitzenberg (Surgery)

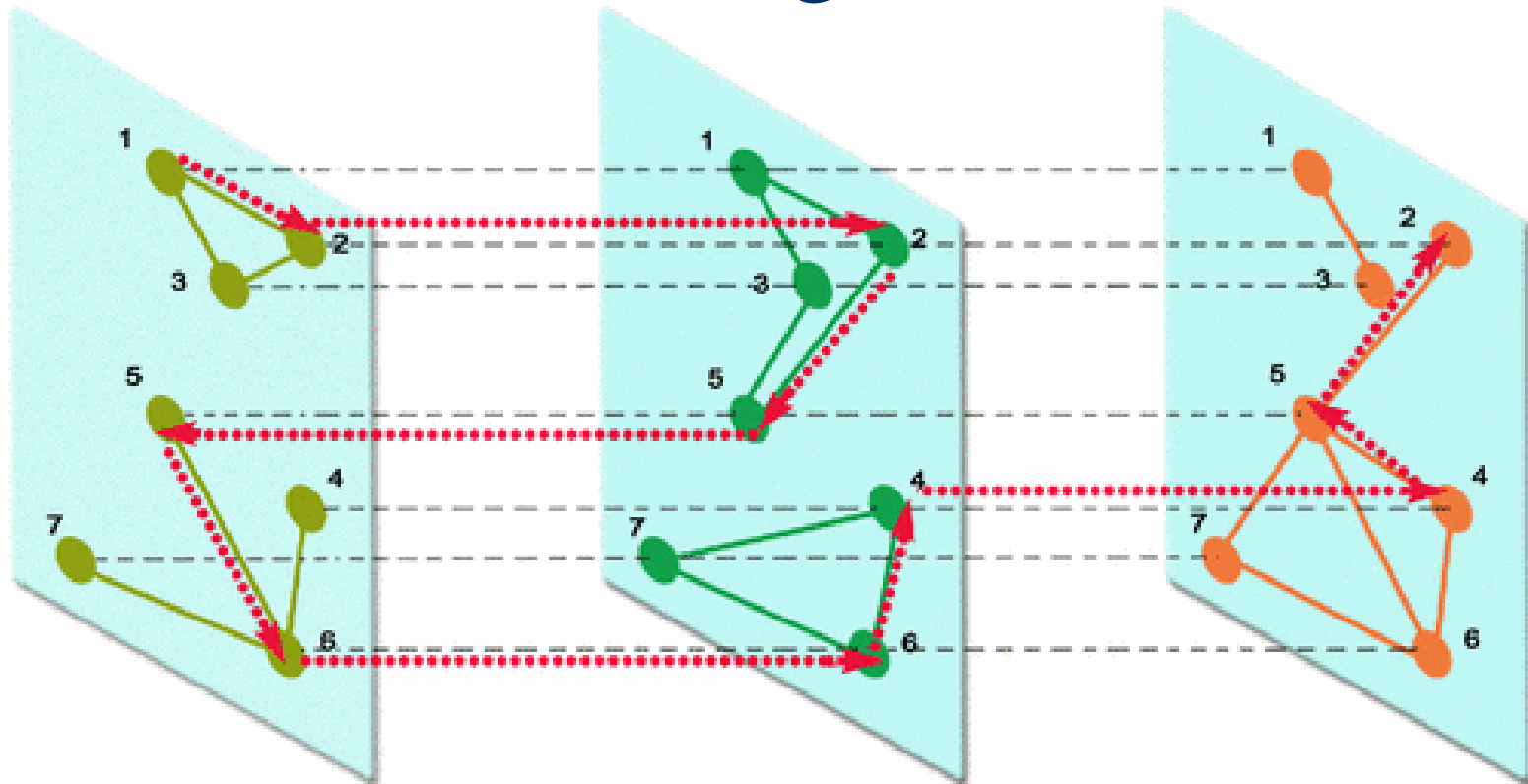
Networks You Know



Cancer Care as a Network

- Multiple layers →
 - Multiple actors (physicians and patients)
 - Multiple relationships (physician-patient, physician-physician)
 - Changes over time

Ex: Evolving Networks



Manlio De Domenico, Albert Solé-Ribalta, Emanuele Cozzo, Mikko Kivelä, Yamir Moreno, Mason A. Porter, Sergio Gómez, and Alex Arenas. "Mathematical Formulation of Multilayer Networks" *Phys. Rev. X* 3, 041022 – Published 4 December 2013.



Why are Networks Important?

- Accountable Care Organizations
- Variation in practice patterns
- Team/provider organization and experience
- Diffusion of innovation and guidelines
- Development of practice norms
- Physician learning
- Access to care/disparities

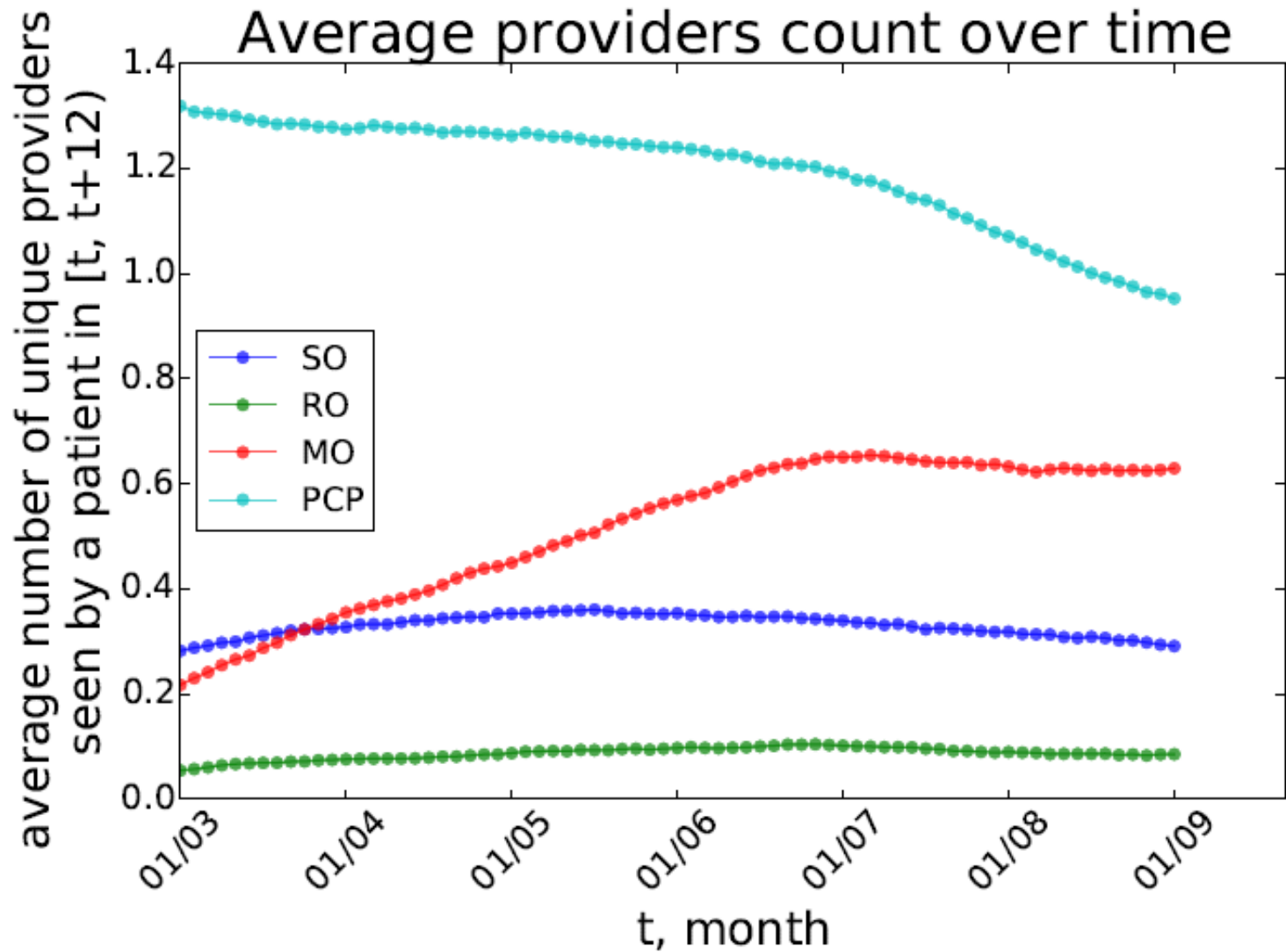


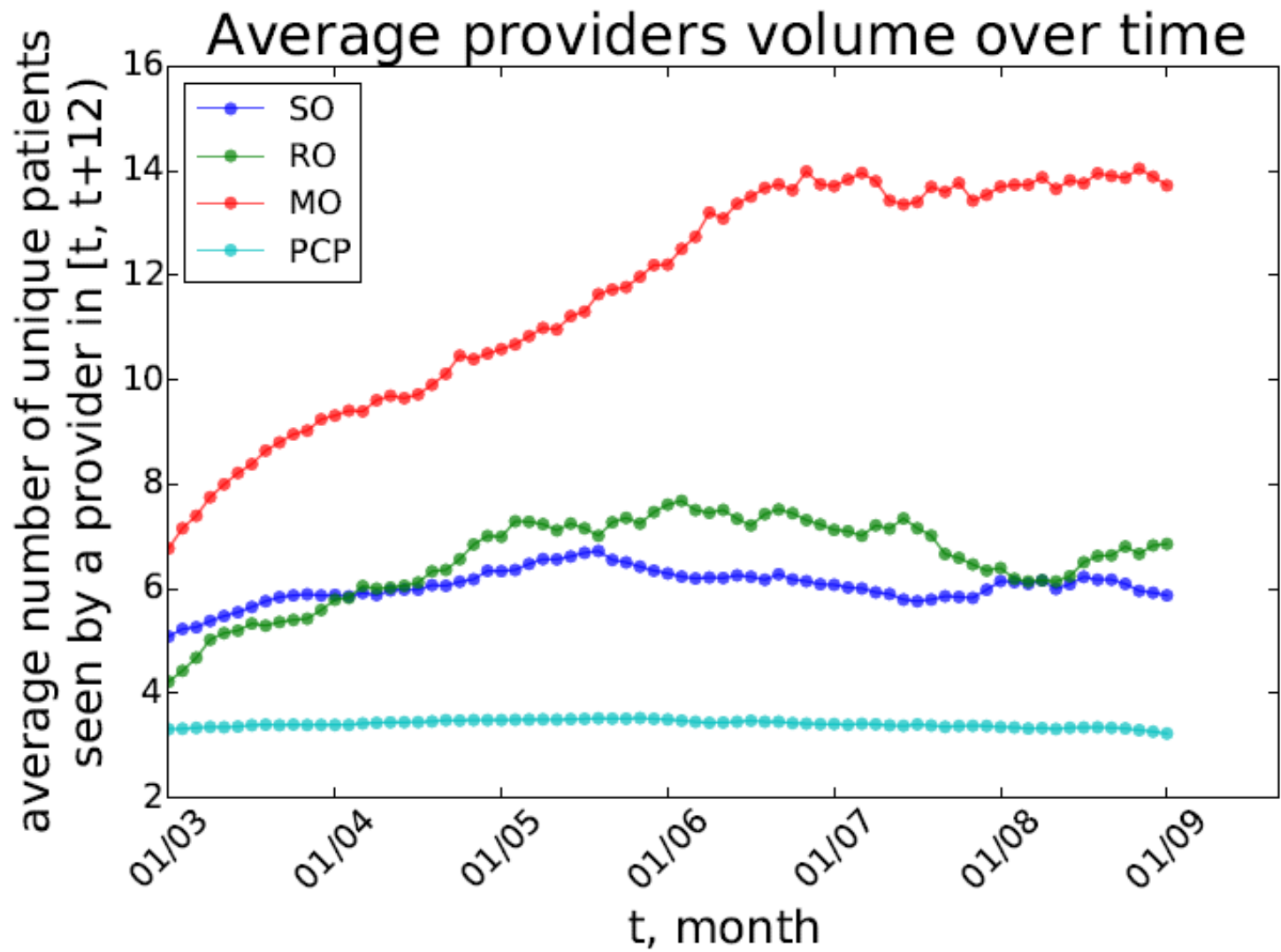
Three Projects

1. Link providers across payers in NC
2. Apply new analysis tools for multi-layer networks
3. Investigate the influence of care coordination on colorectal cancer patient outcomes and costs

Colorectal Cancer Networks in NC

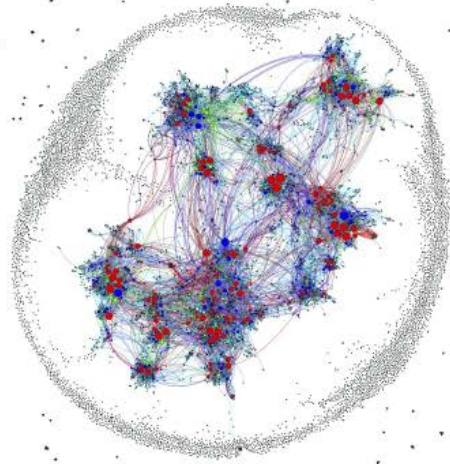
- Medicare, Jan. 2003 through Dec. 2009
- All *prevalent* cases of colorectal cancer
- Provider are divided into 4 types:
 - Surgeon (SO, blue)
 - Radiation Oncologist (RO, green)
 - Medical Oncologist (MO, red)
 - Primary Care Physician (PCP, cyan)
- Rolling 12-month windows



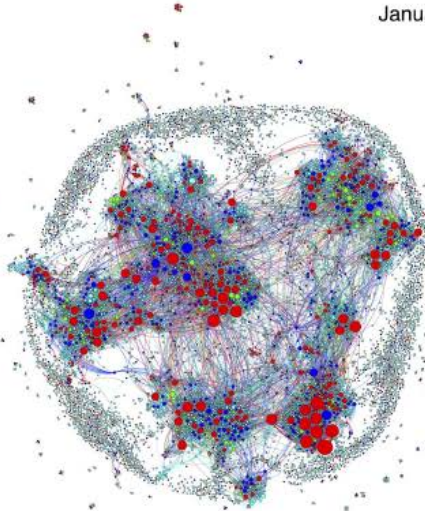


Network Evolution

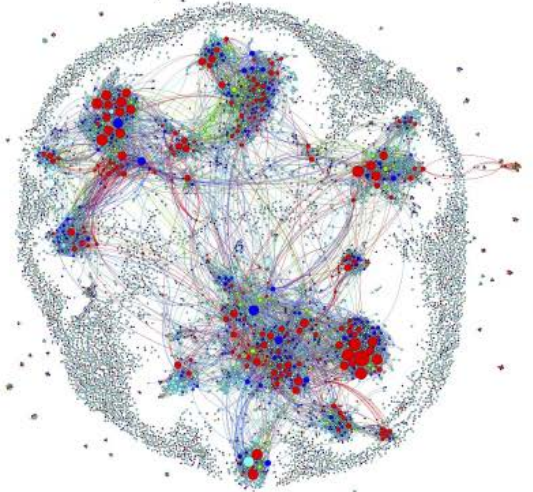
January 2004



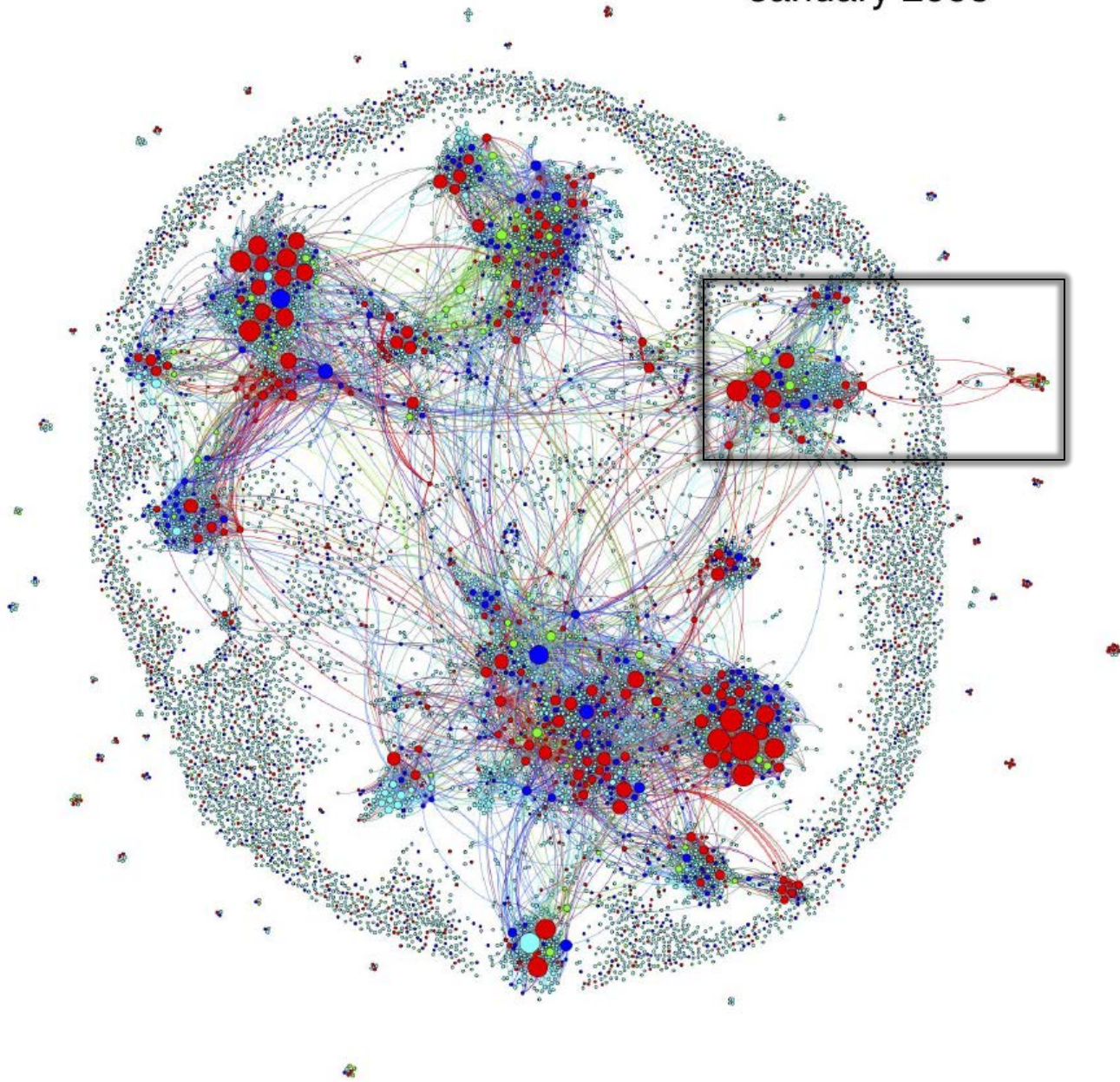
January 2006

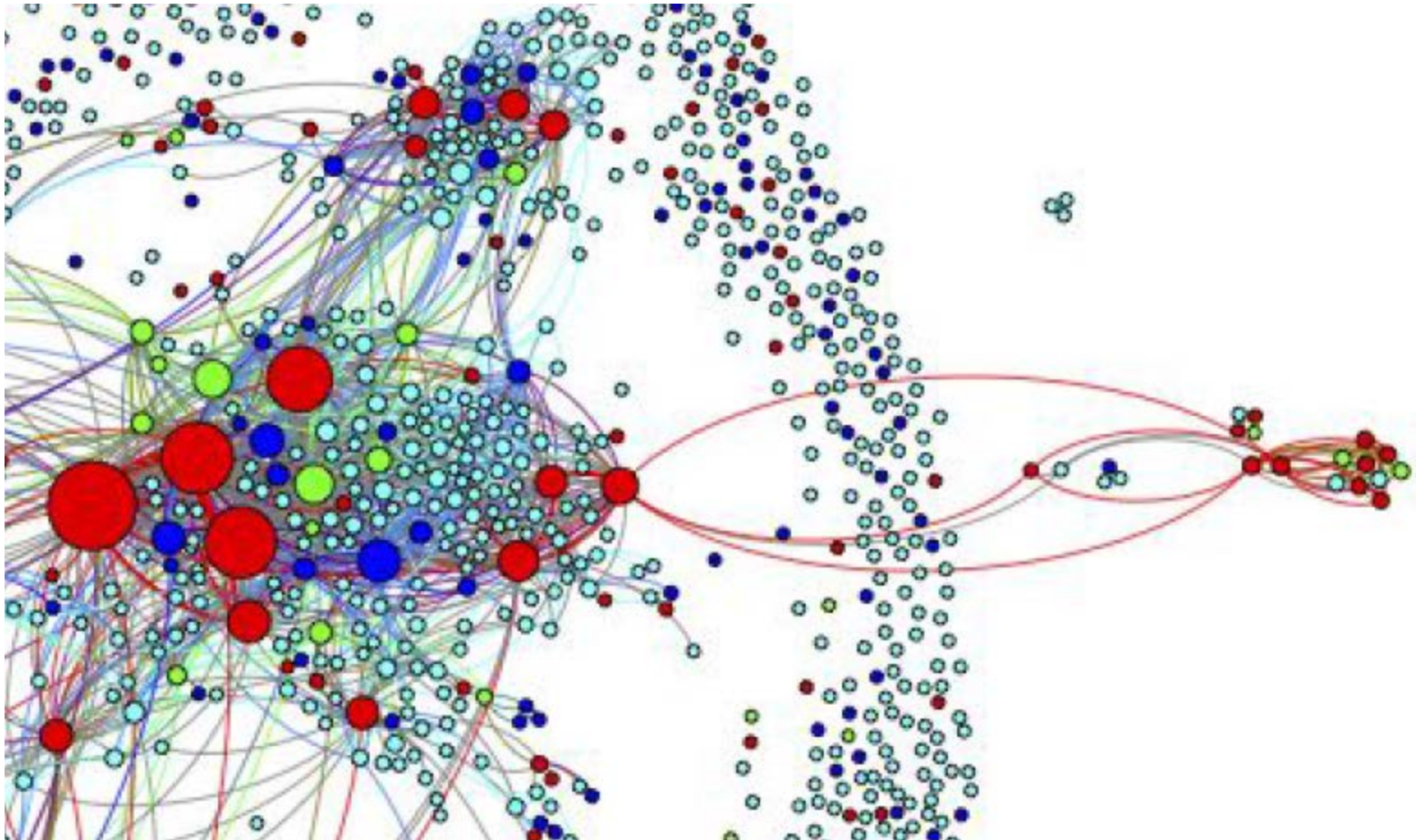


January 2008

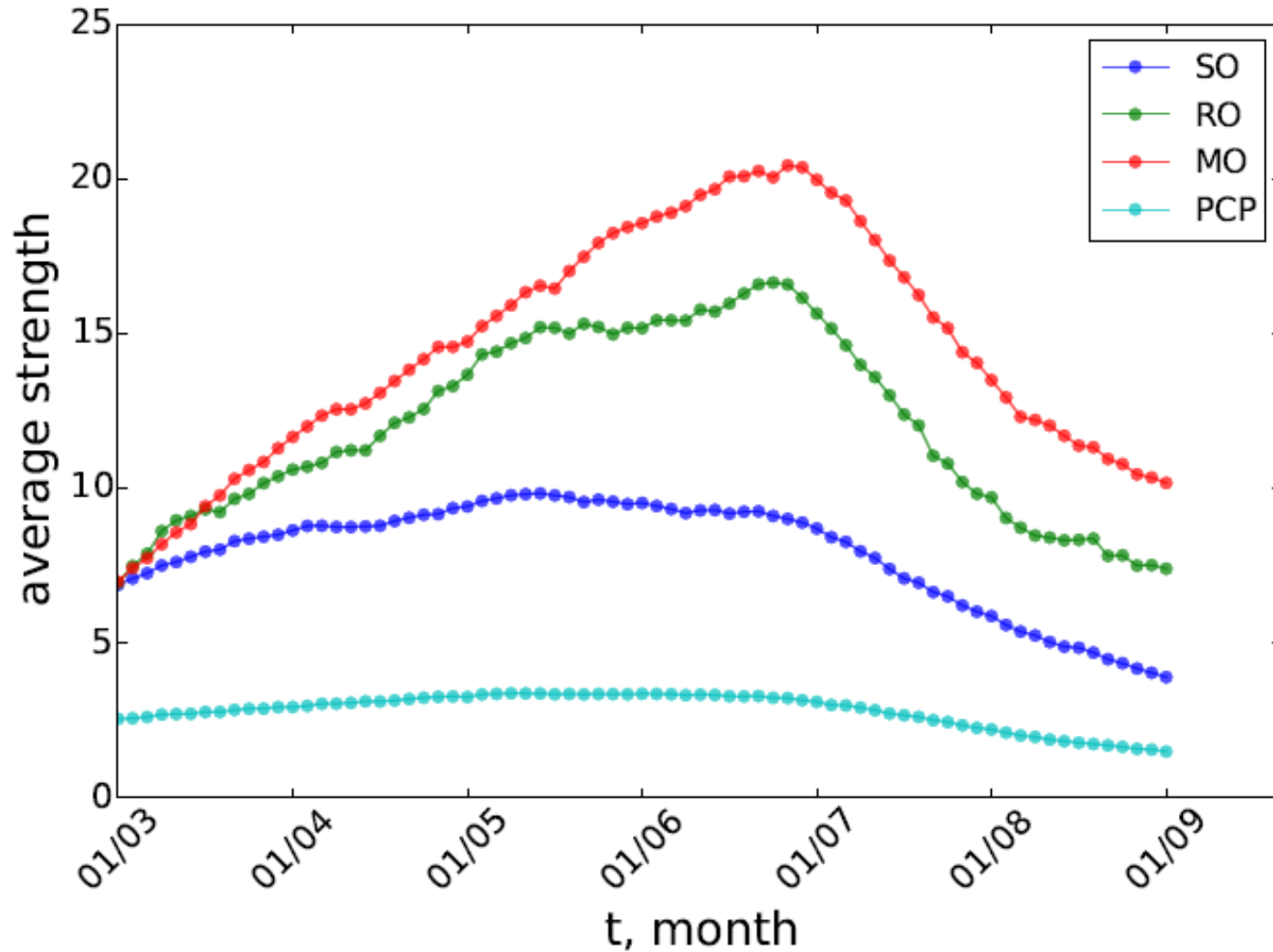


January 2008

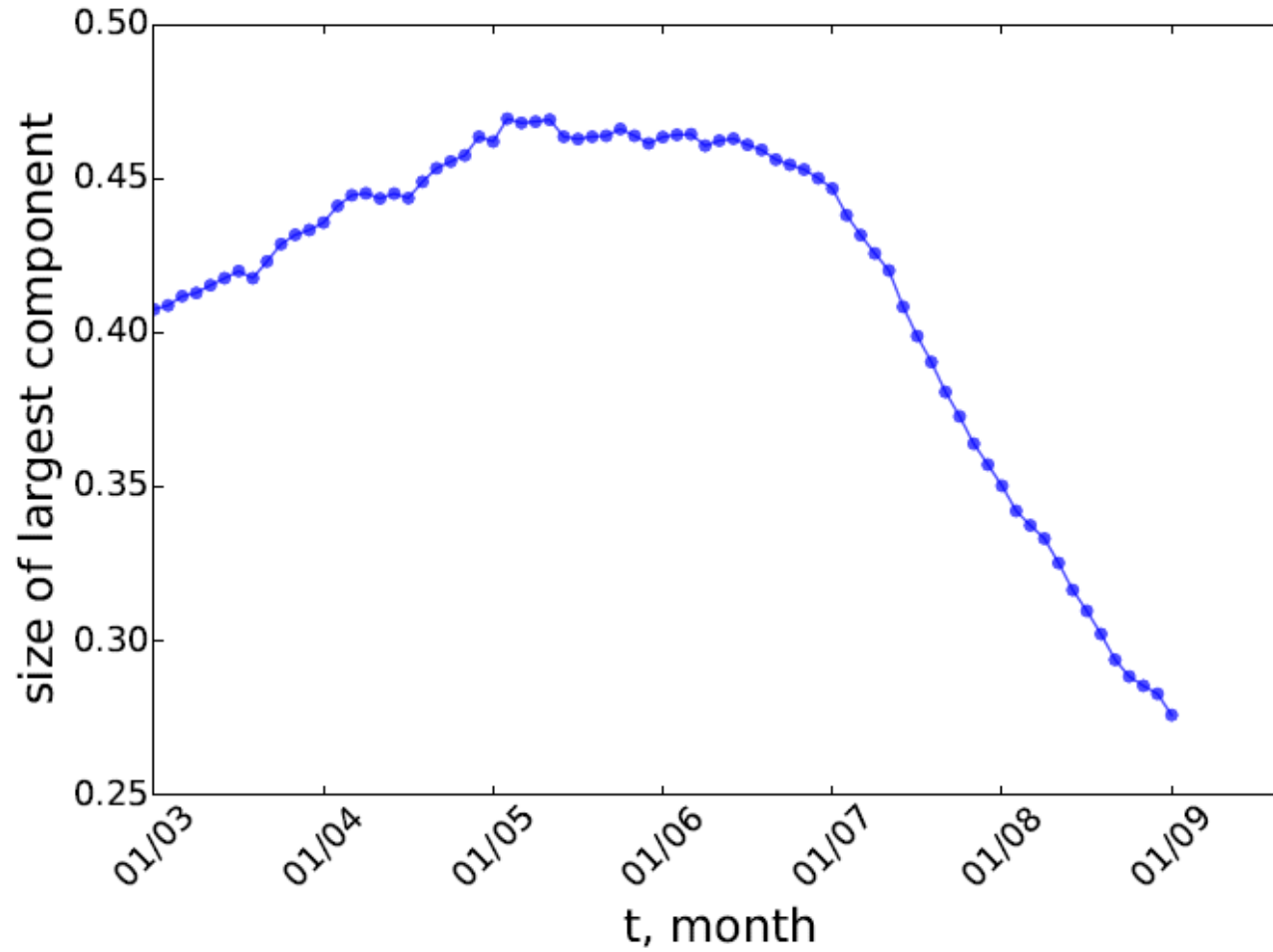




patients shared with other providers



Size of Largest Connected Component





Outcomes for Incident Stage II & III CRC Cases

Outcome		Colorectal Cancer Patients (N=4,122)
Surgery		3,838 (93%)
Consultation with RO		468 (11%)
Surveillance colonoscopy		1,182 (29%)
Survival (months from Dx)	Mean (s.d.)	44.0 (28.0)
	Median (Q1, Q3)	45 (19, 67)



Number Providers Seen Since Dx (N=8,641)

Provider Type	Mean	Std Dev
Total	4.13	2.46
SO	1.26	0.72
RO	0.25	0.64
MO	1.18	1.49
PCP	1.43	1.32



Next Steps

- Network measures of care team and connections within
 - Correlate those measures with quality and cost outcomes
- Apply multi-level analysis tools
- Pull in linkages outside of Medicare

Thank you

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