The Oncoshare Project

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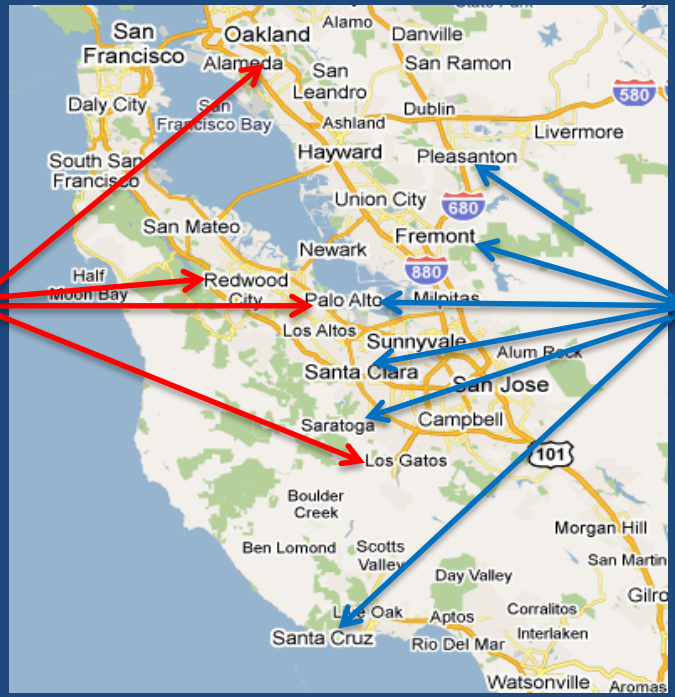
Background and Goals

- Cancer data sources are fragmented
  - Registries: demographics, survival; limited diagnostics, treatment
  - Electronic medical records: clinical details, but unstructured text
  - Send-out laboratory test results are not integrated into EMRs
- Most data sources do not span healthcare settings
- We aimed to integrate data sources across healthcare systems
- Goals: to enable quality assessment and inform interventions

Contributing Healthcare Systems

STANFORD HOSPITAL & CLINICS
Stanford University Medical Center

Academic, Tertiary Care
Research-Centered
Knowledge Discovery

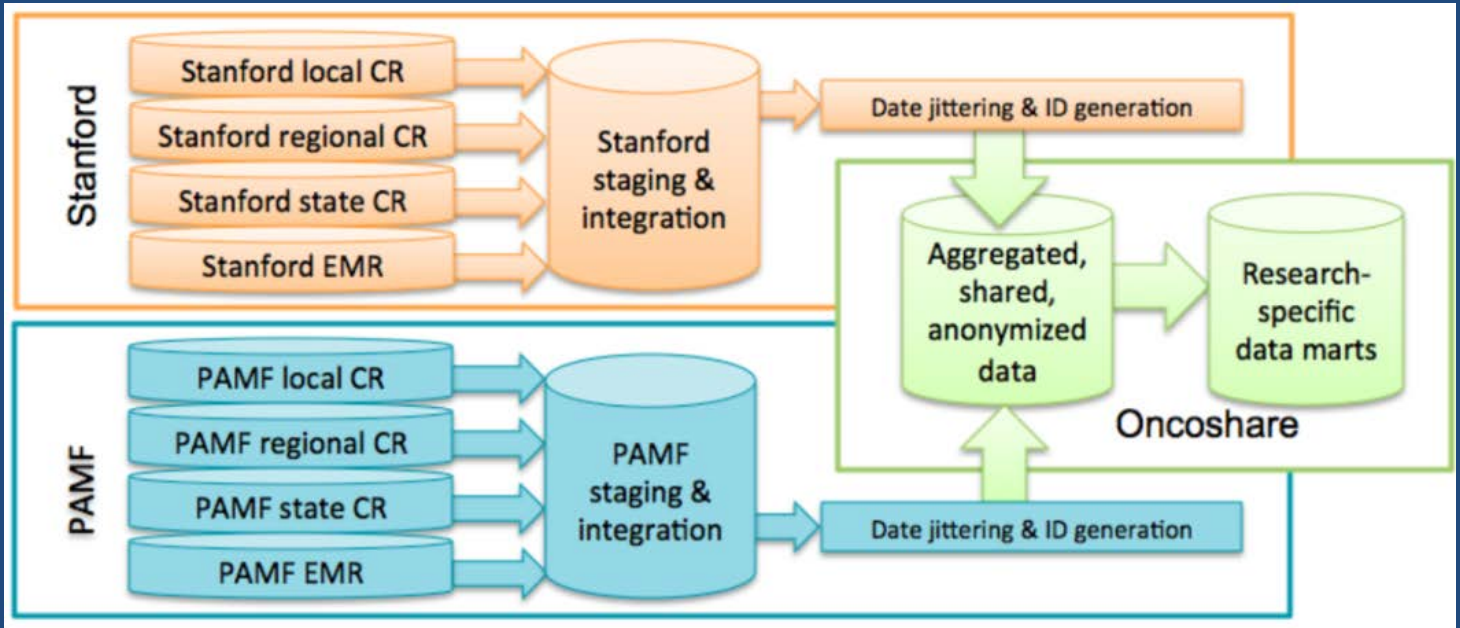


Palo Alto Medical Foundation
A Sutter Health Affiliate

Community-Based
Patient-Centered

- Two healthcare systems serving the San Francisco Bay Area

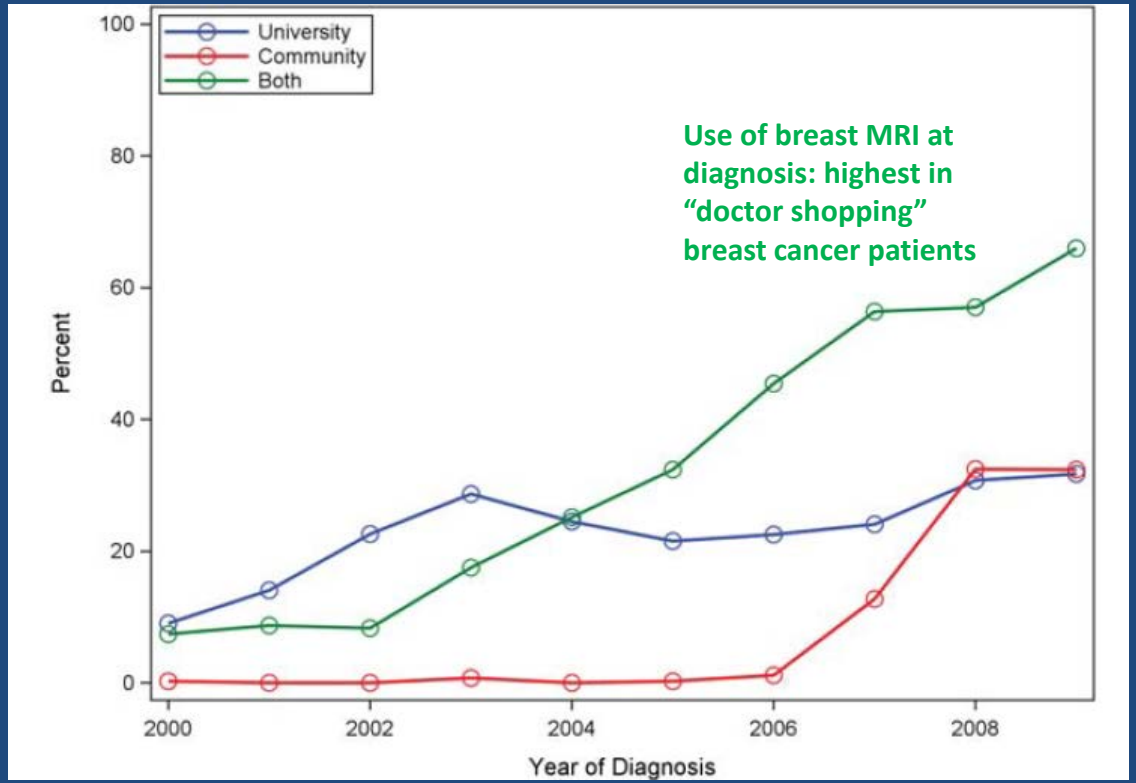
Design and Methods



Patient-level data from:
Statewide California Cancer Registry (SEER Program), EMRs from two healthcare systems and outside genomics labs

Progress to Date (July 2020): >28,000 breast cancer patients, diagnosed 2000-18
40 publications and presentations to date; website: http://med.stanford.edu/oncoshare.html

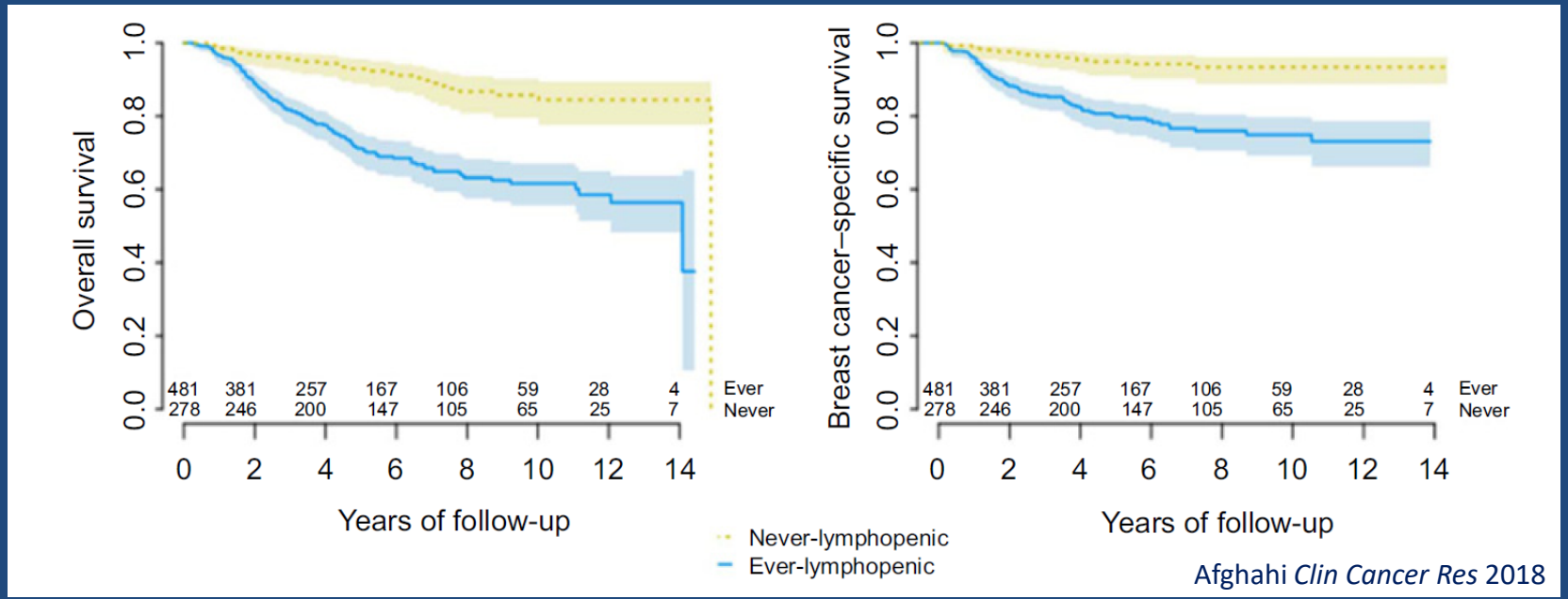
Results Example: Unwarranted Variation in Care



Kurian *Cancer* 2014; Afghahi *JCO Oncology Practice* 2016

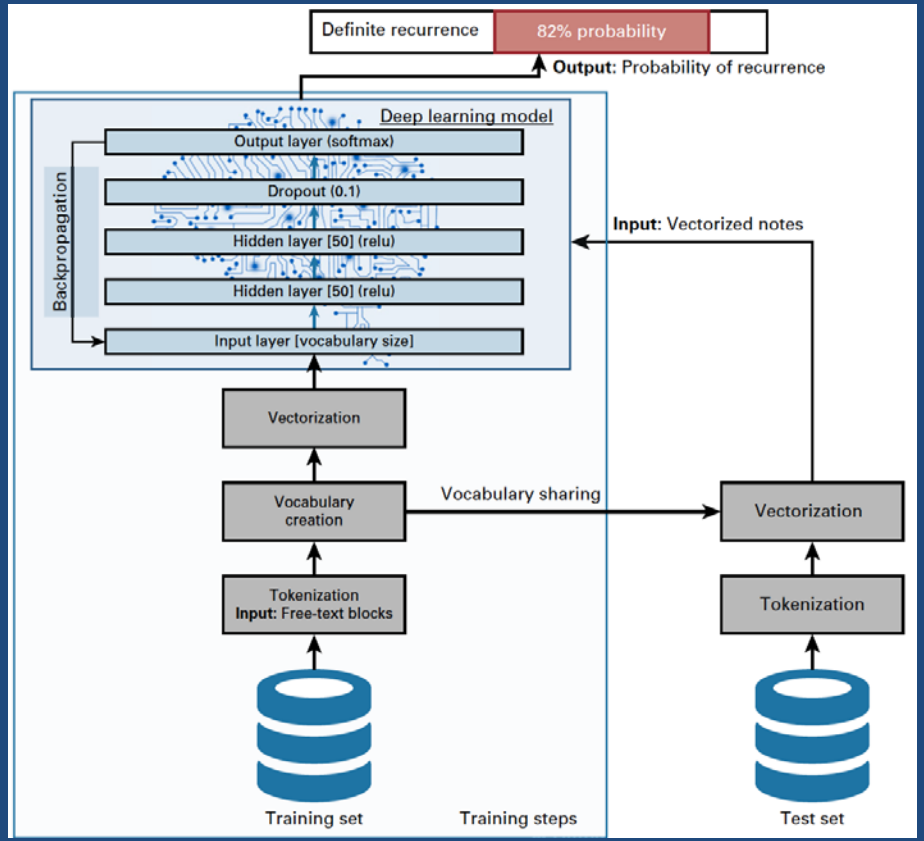
- 15% of patients seek care at both institutions in same area
- "Both" patients: no difference in prognostic factors vs. others
- "Both": more MRI, PET, bilateral mastectomy, chemotherapy, radiotherapy ($p<0.001$), but no survival difference ($p=0.66$)
- A hot spot of unwarranted variation in care; may inform targeted interventions

Results Example: Immune Function and Survival



- Triple-negative breast cancer cohort in Oncoshare: n>1,500, 1/4 died within five years of diagnosis
- Investigated peripheral absolute lymphocyte count (ALC), a measure of immune function
- Significantly worse survival if ever lymphopenic; could ALC enhance treatment effect?

Results Example: Identifying Metastatic Recurrence



Banerjee *JCO Clinical Informatics* 2019

- Distant recurrence: a clinically important endpoint not tracked by registries
- Manually annotated 894 randomly selected patient records: recurrence yes/no, date
- Used natural language processing to develop rule-based and neural network models
- Neural network model: 83% sensitivity, 73% specificity for detecting recurrence and date
- Adaptable for cancer types other than breast

Future Plans

- Integration of novel data sources
  - Tumor sequencing data from outside laboratories
  - Imaging data from EMR
  - Patient-reported data from EMR portals
- Partnering with other healthcare systems to validate approaches
  - Collaborations with Emory, MIT, Vanderbilt in U.S.
  - Koo Foundation Sun Yat Sen Cancer Center in Taiwan
- Consulting with Surveillance Epidemiology and End Results program
  - Sharing approaches that may inform SEER registry data integration

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