Specialization Gains in Health Care Evidence from U.S. Cancer Survival Data

Johannes Schoder[♢♣] and Frank Lichtenberg[♢]

[♢]Columbia University in the City of New York, United States
[♣]University of Zurich, Switzerland

js3582@columbia.edu

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Introduction

Background and Motivation:

- Idea: The more of the same procedures performed by one health care provider the better the outcome
- To our knowledge no study performed with data from the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER)
- Do geographical regions determine cancer survival rates?

Introduction cont'd

Literature on specialization gains in health care

- Birkmeyer et al. 2003 find lower mortality rates for high volume Surgeons for four cardiovascular and four cancer related surgeries (Heart: Coronary-artery bypass crafting, carotid endarterectomy, aortic-valve replacement, and elective repair of an abdominal aortic aneurysm; Cancer: Pancreatic resection, esophagectomy, lung resection, and cystectomy).
- Gillis and Hole 1996, Kingsmore et al. 2003, Allgood and Bachmann 2004 find that female breast cancer patients in Wales, Scottland, and Yorkshire (England) respectively, managed by higher volume surgeons survive significantly longer.

Introduction cont'd

Literature on Specialization gains in health care

- International studies on female breast cancer (Basnett et al. 1992, Iscoe et al. 1994, Lee-Feldstein et al. 1994, Samet et al. 1994, and Scorpiligone et al. 1995) confirm that women receive better care when management is concentrated in specialized centers with high level of expertise, skill, and organization.
- Verhoef et al. 2006 analyze the influence of surgeon-related expertise and hospital volume on the relative survival of operated esophageal cancer patients in the Netherlands. Three types of hospitals reflec surgeon-related expertise: University, Teaching Nonuniversity, and Nonteaching. Relative survival rates are significantly higher for patients treated in University hospitals compared to Teaching Nonuniversity, and Nonteaching hospitals

Introduction cont'd

Literature on Specialization gains in health care

- Vivian 2009 et al. analyze the effect of hospital and surgeon procedure volume on long term trends in cancer mortality for six cancer resections (colon, rectal, esophagectomy, pulmonary lobectomy, pneumonectomy, and whipple) in Florida, New Jersey, and New York. Highest impact of hospital and surgeon procedure volume is found for rectal cancer and pneumonectomy.
- Lichtenberg 2004, 2007a and 2007b finds postitve effects for new chemotherapy drugs on cancer survival rates but also for the number of diagnosed cases

Introduction cont'd

Application to one specific disease: Cancer

- Why cancer?
- Data availability (see below)
- Today cancer leading cause of years of potential life years lost before age 75 in the U.S. (Lichtenberg 2004 and CDC 2003)
- In 2001: Cancer caused 35 percent more premature mortality than heart disease (CDC 2003)

Hypothesis

- Are cancer survival rates in high volume U.S. regions higher than in low volume regions?

Data

- National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER): Covers 26 percent of the U.S. population
- 17 Registries for the time period 1973-2006:
  San Francisco-Oakland, Conneticut, Detroit, Hawaii, Iowa, New Mexico, Seattle (1974+), Utah, Atlanta (1975+), Alaska (1992+), San-Jose Monterey (1992+), Los Angeles (1992+), Rural Georgia (1992+), rem. California (2000+), Kentucky (2000+), Louisiana (2000-2004), New Jersey (2000+)

Data cont'd

Data contains information on:

- Diagnostic codes (ICD9, ICD10, here: site recode is used: 78 different sites), treatment (surgery, radiation), severity (cancer stage)
- Patient characteristics (age at diagnosis, gender, marital status, race)
- 385 Counties, type of reporting source (hospital, physician, laboratory)

Data cont'd

Table: Top ten cancer sites 2000-2004:

SiteRec	N	1-year Surv.	Surv. rate
Breast	309,386	291,734	0.94
Prostate	261,041	244,963	0.94
Lung and Bronchus	227,514	86,557	0.38
Melanoma of the Skin	111,993	104,706	0.93
Urinary Bladder	74,443	61,720	0.83
Lymphoma, NHL-Nodal	47,325	34,477	0.73
Kidney and Renal Pelvis	47,073	35,851	0.76
Corpus Uteri	45,012	40,026	0.89
Sigmoid Colon	41,684	33,986	0.82
Retroperitoneum	40,371	8,145	0.20

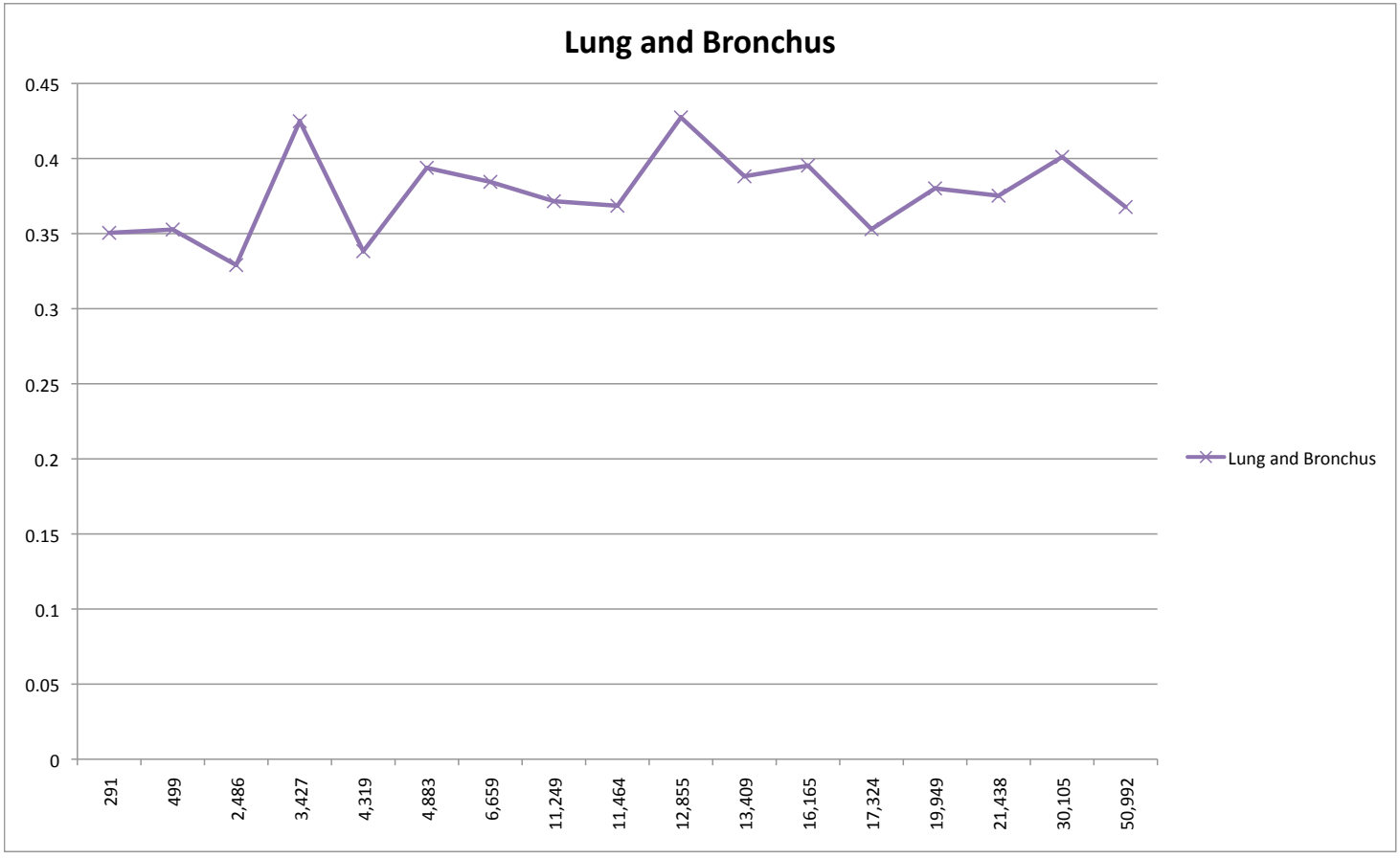
Data cont'd

Table: Lung and Bronchus cancer 2000-2004 by Registry:

RID	N	1-year Surv.	Surv. Rate
AK	291	102	0.35
GA	499	176	0.35
UT	2,486	818	0.33
HI	3,427	1,456	0.42
NM	4,319	1,461	0.34
San Jose	4,883	1,923	0.39
Atlanta	6,659	2,560	0.38
IA	11,249	4,180	0.37
San Franc.	11,464	4,225	0.37
CT	12,855	5,494	0.43
Seattle	13,409	5,205	0.39
Detroit	16,165	6,390	0.40
LA	17,324	6,115	0.35
Los Ang.	19,949	7,583	0.38
KY	21,438	8,045	0.38
NJ	30,105	12,074	0.40
CA	50,992	18,750	0.37

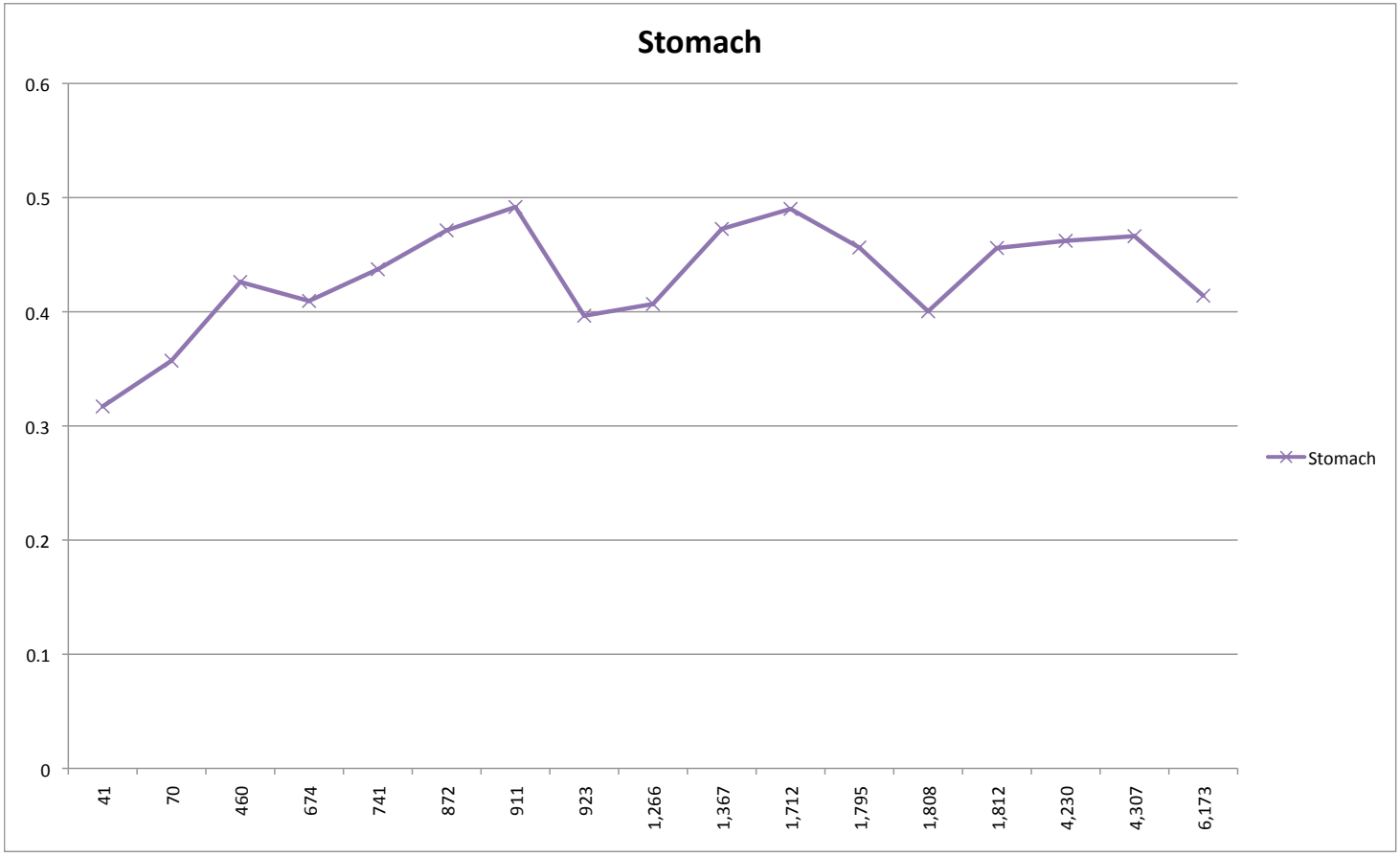
Data cont'd

Figure: Survival rates for cancer site lung and bronchus by Registry



Data cont'd

Figure: Survival rates for cancer site stomach by Registry



Econometric Model

$$\begin{aligned} SurvRate_{ic} &= \beta_1 lnDIAG_{ic} + \beta_2 Age_{ic} + \beta_3 Rad_{ic} + \beta_4 Surg_{ic} \\ &\quad + \beta_5 Loc_{ic} + \beta_6 Dist_{ic} + \beta_7 Hosp_{ic} + \alpha_i + \delta_c \quad (1) \end{aligned}$$

SurvRate: Survival rate

lnDIAG: Log number of incidences

Age: Age at diagnosis

Rad: Share of population having radiation

Surg: Share of population having surgery
Loc: Share of cancer stage 1 or 2
Dist: Share of cancer stage 4
Hosp: Share of incidences reported by hospital

c: County; i: Cancer site
α_i: Site fixed effects δ_c: County fixed effects

Preliminary Estimation Results

Table: Logit estimation, one-year survival rate

Deviance	1455800.317			
Pearson	1512158.763			
AIC	8.559957			
BIC	-7192506			
Log likelihood	-2767463.44			
SurvRate	Coef.	Std. Err.	z	P>z
lnDiag	0.447983	0.0008565	523.01	0.0000
MeanAge	-0.0003015	0.0000154	-19.6	0.0000
shareHospital	-0.005334	0.0003923	-13.6	0.0000
shareSurg	0.0139056	0.0003821	36.39	0.0000
shareRad	0.0155968	0.0004259	36.62	0.0000
shareLoc	0.0087118	0.0004504	19.34	0.0000
shareDist	0.0077311	0.0006852	11.28	0.0000
cons	1.968082	0.0135596	145.14	0.0000
Observations	646676			

Limitations

- Are patients treated in the same county where they were diagnosed?
- No information about chemotherapy treatment
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