Regional Accessibility of High Volume Gastric Cancer Surgery And Medical Use in South Korea

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BACKGROUND - Korean healthcare system

- Historical background (KHISA, 2014)
  - In 1970's national insurance service was adopted; expanding medical use was covered by the increase of supply from private sectors.
- Weak delivery system and functional overlapping; over competing under the fee-for-service payment system
- Oversupply of acute care; inefficient use of medical resources; low quality

BACKGROUND - Cancer surgery in South Korea

- Oversupply of cancer surgery hospitals, resulting numbers of low volume hospitals and low quality services
- Regional disparity in the sufficiency of high volume hospitals among patients' hospital service areas (HSA), causing inequality in regional accessibility of high-volume hospitals
  - Highly concentrated in Seoul metropolitan
- Patients travel to Seoul metropolitan for high quality hospitals; very low relevance index

BACKGROUND - high volume vs. accessibility

- Regionalization of cancer surgeries in high-volume hospitals (HVHs) is known to be beneficiary.
- Nevertheless, low-volume hospitals (LVHs) are used because HVHs are absent in HSA, which might be caused by either low cases in the area or enough cases but with oversupply of hospitals.
- Therefore, patients sometime travel long outside of their service area to use HVHs (Dimick, 2004) and this could undermine health outcomes.
- To reduce the suboptimal use, the cancer care supply system should be improved for regional accessibility of HVHs based on the investigation of the discrepancy of regional accessibility and its effect on medical use.

PURPOSES

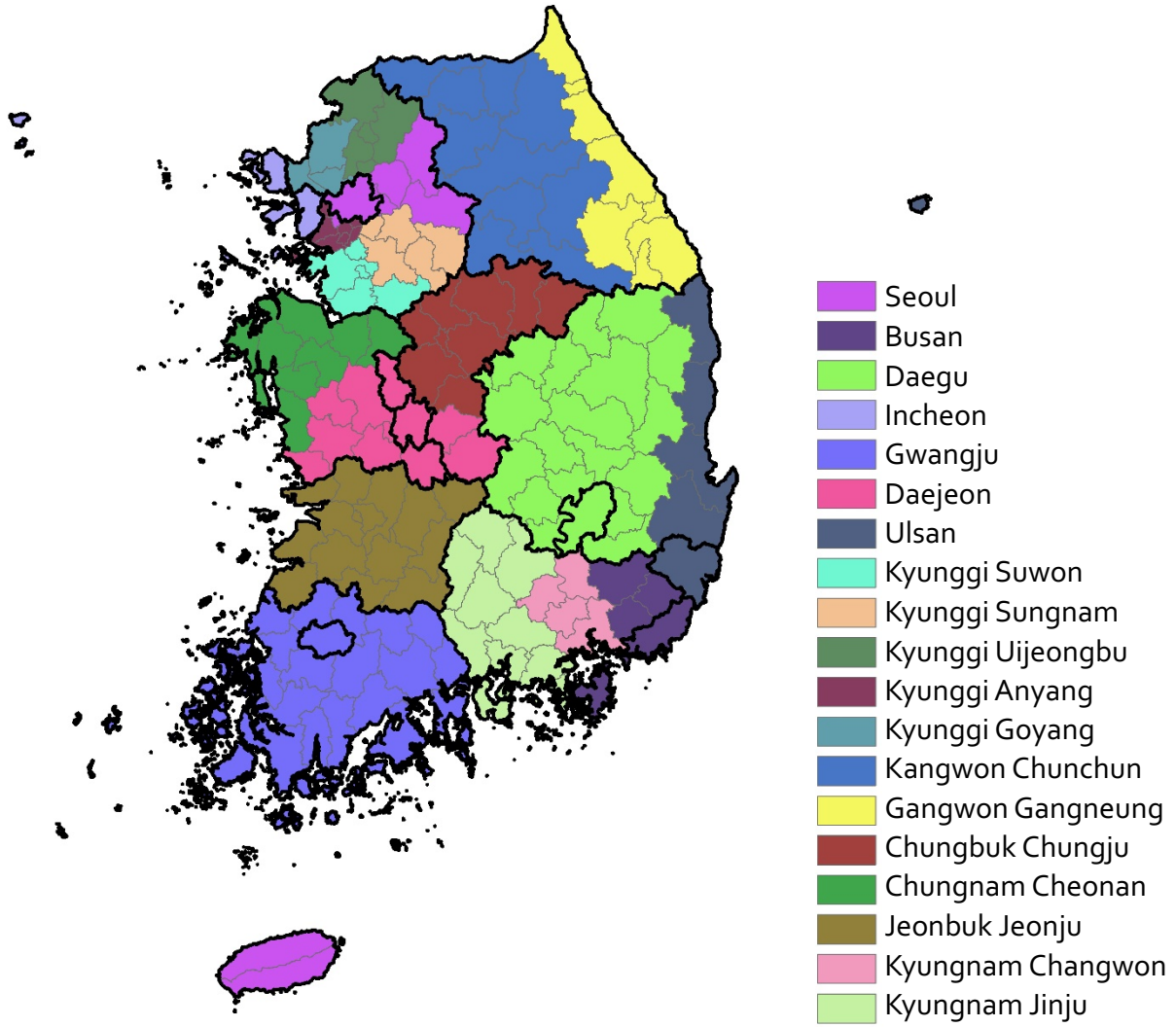
- To provide empirical evidence on the relationship between regional accessibility of high volume cancer surgery hospitals and a pattern of medical use of patients in South Korea.
  - Focused on gastrectomy and gastric cancer patients
- To provide implications for cancer care supply system enhancement in a way that high quality and regional accessibility is balanced.

METHODS - hospital service area (HSA)

- Patient HSA was defined in a previous research based on the use of high-morbidity inpatient care (Health Insurance Review and Assessment, 2018).
- Small administrative districts were combined as HSA where district X visits district Y the most (relevance index [RI]), and district Y was visited from district X the most (commitment index [CI]) (RI*CI).
- Followings were restrictions for combining
  - Time to travel for hospitalization ≤ 120 min
  - Population ≥100,000
  - Relevance index of hospitalization ≥40%

METHODS - hospital service area (HSA)

- Overall, 19 HSA were identified.



MTEHODS - defining high volume

- Two volume thresholds were used on the purpose to identify a quantity of high-volume hospitals in each HSA.
- Thresholds
  - 44 & more yearly
    - proposed by Health Insurance Review and Assessment (HIRA) Service of Korea by which hospital evaluation was conducted regularly (HIRA, 2007)
  - 66 & more yearly
    - proposed as one of possible thresholds along with 44 & more by a previous study (HIRA, 2018)
    - corresponding to a PhD. thesis (Park, 2008)

METHODS - data source

- National Health Insurance (NIH) claim data
  - Individual information as insurance subscribers
  - Death
  - Medical use
  - Hospital information
- National Cancer Registry (NCR)
  - Date of cancer diagnosis (YYYYMMDD)
  - SEER summary stage (0 [in situ],1 [localized]: low risk, 2-4 [regional]: moderate risk, 7 [distant]: high risk)

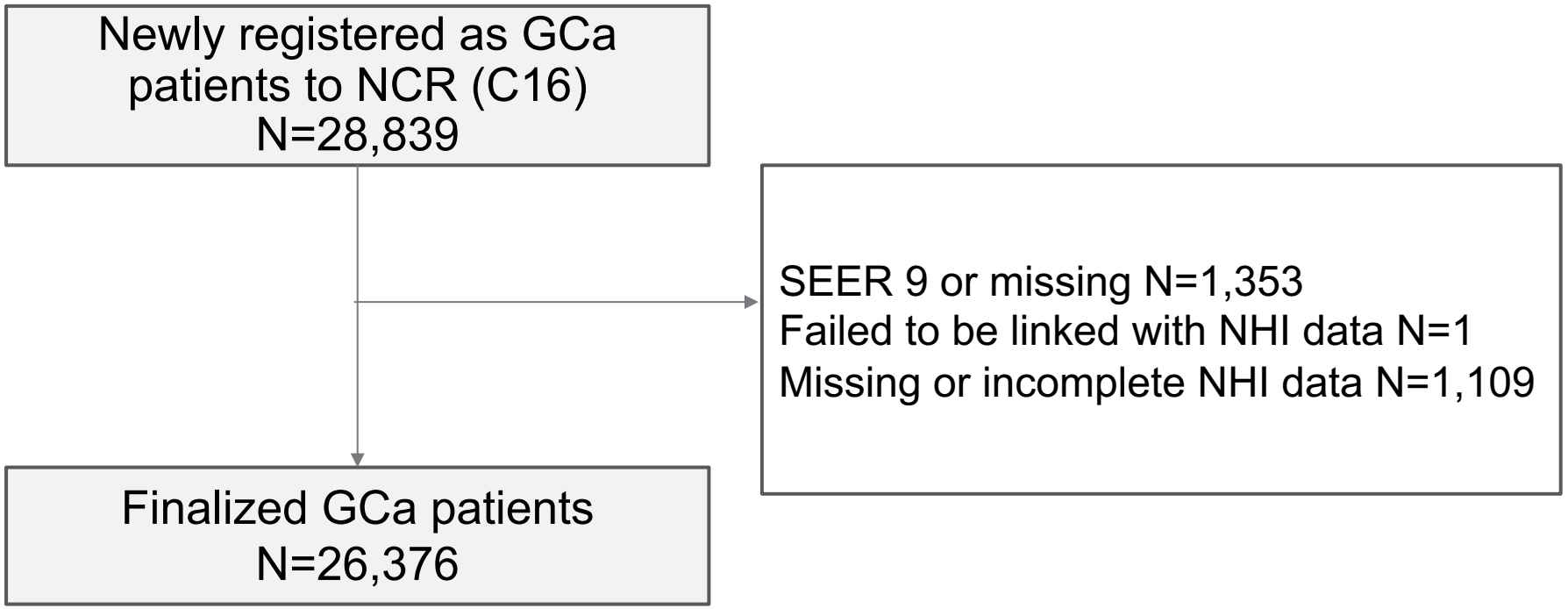
METHODS - variables

- Independent – high-quality supply
  - No. of over volume threshold hospitals (and hospital type in combine)
- Dependent - use
  - Relevance index (RI)
- Controlled – individual confounders
  - Age, gender, income (proxy), SEER stage (low/moderate/high risk), CCI score (0/1/2/3+)

METHODS - analysis

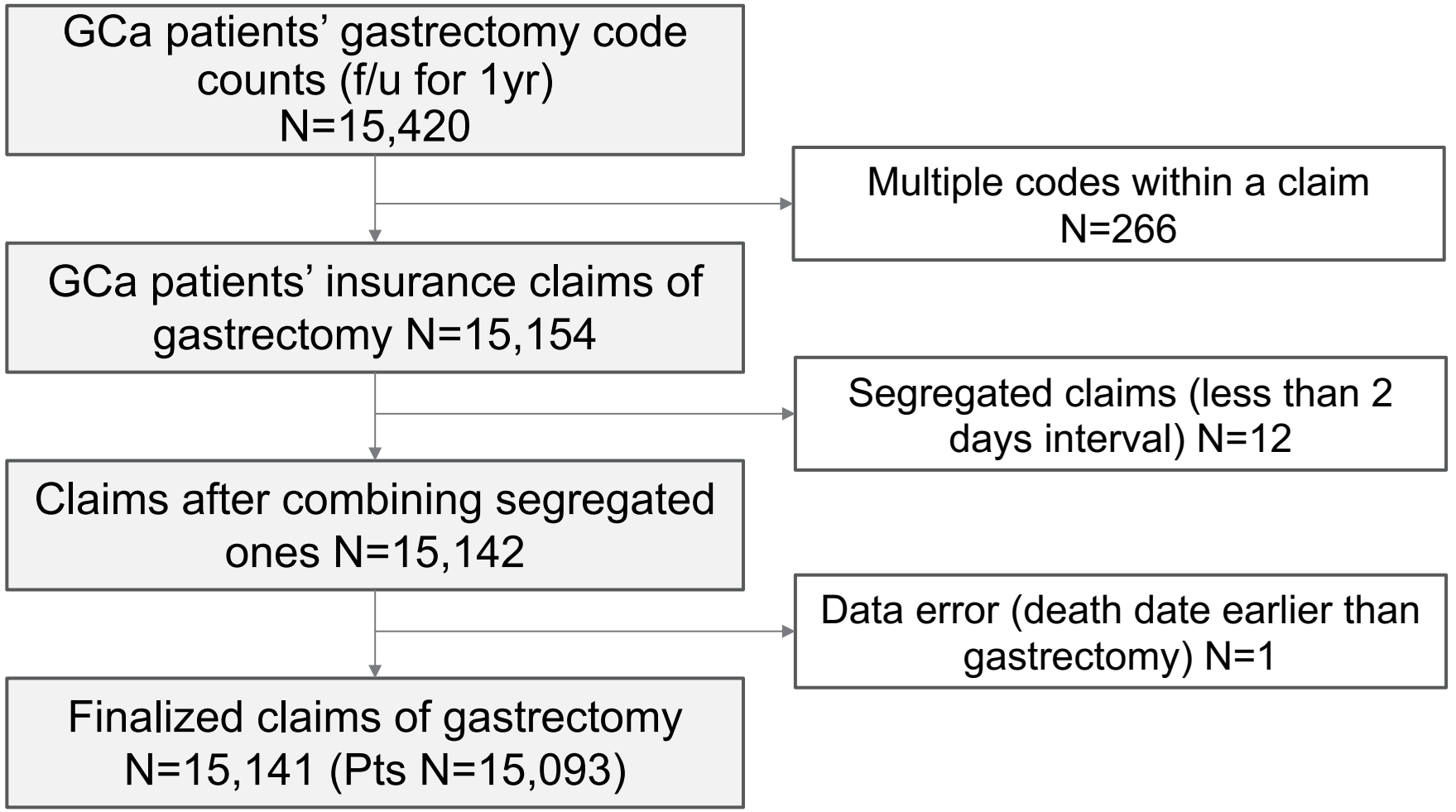
- The simple relationship between high-quality supply in patients HSA and RI was examined using correlation analysis
- The multiple regression was conducted to observe the effect of high-quality supply on RI after controlling individual level confounders
  - Multilevel regression model was not converged.

Gastric Cancer Patient



NCR: National Cancer Registry, NHI: National Health Insurance; SEER: ; Gca: Gastric Cancer

Gastrectomy Insurance Claims



Gastrectomy Patients Profile

		Freq	%
Total		15,093	100
Gender			
	Male	10,053	66.6
	Female	5,040	33.4
Age			
	55-	3,928	26.0
	55~65	4,612	30.6
	65~75	4,064	26.9
	75+	2,489	16.5
Income (proxy)			
	Medical care	819	5.4
	Health insurance premium level 1	2,208	14.6
	Health insurance premium level 2	2,147	14.2
	Health insurance premium level 3	2,447	16.2
	Health insurance premium level 4	3,218	21.3
	Health insurance premium level 5	4,254	28.2
SEER			
	0-1 (Low risk)	9,826	65.1
	2~4 (Moderate risk)	4,760	31.5
	7 (High risk)	507	3.4
CCI score			
	0	7,677	50.9
	1	2,721	18.0
	2	2,626	17.4
	3	2,069	13.7

		Freq	%
Total		15,093	100
Health Service Area			
	Seoul	3,035	20.1
	Busan	1,553	10.3
	Daegu	1,356	9.0
	Incheon	775	5.1
	Gwangju	1,106	7.3
	Daejeon	815	5.4
	Ulsan	656	4.4
	Kyunggi Suwon	626	4.2
	Kyunggi Sungnam	700	4.6
	Kyunggi Uijeongbu	271	1.8
	Kyunggi Anyang	772	5.1
	Kyunggi Goyang	413	2.7
	Kangwon Chunchun	270	1.8
	Gangwon Gangneung	215	1.4
	Chungbuk Chungju	522	3.5
	Chungnam Cheonan	493	3.3
	Jeonbuk Jeonju	731	4.8
	Kyungnam Changwon	388	2.6
	Kyungnam Jinju	396	2.6

Gastrectomy Hospital Profiles

- Overall, 182 hospitals claimed for insurance money for conducted gastrectomy
  - General hospital was the most hospital type, whereas more than 75% of gastrectomy were conducted in upper class hospitals

	No. of hospital (n, % among total hospitals)	Sum of gastrectomy (n, % among total counts)	Death within 30 days (n, % of deaths among gastrectomy counts in each hospital type)
Upper class general hospital	43(23.6)	11,490(75.9)	31(0.3)
General hospital (beds 500+)	45(24.7)	2,834(18.7)	14(0.5)
General hospital (beds 300~500)	51(28.0)	587(3.9)	12(2.0)
General hospital (beds 300-)	31(17.0)	186(1.2)	2(1.1)
Hospital	11(6.0)	43(0.3)	1(2.3)
Local	1(0.5)	1(0)	0(0)
Total	182(100)	15,141(100)	60(0.4)

Upper class general hospital=tertiary, general hospital and hospital=secondary, local=primary

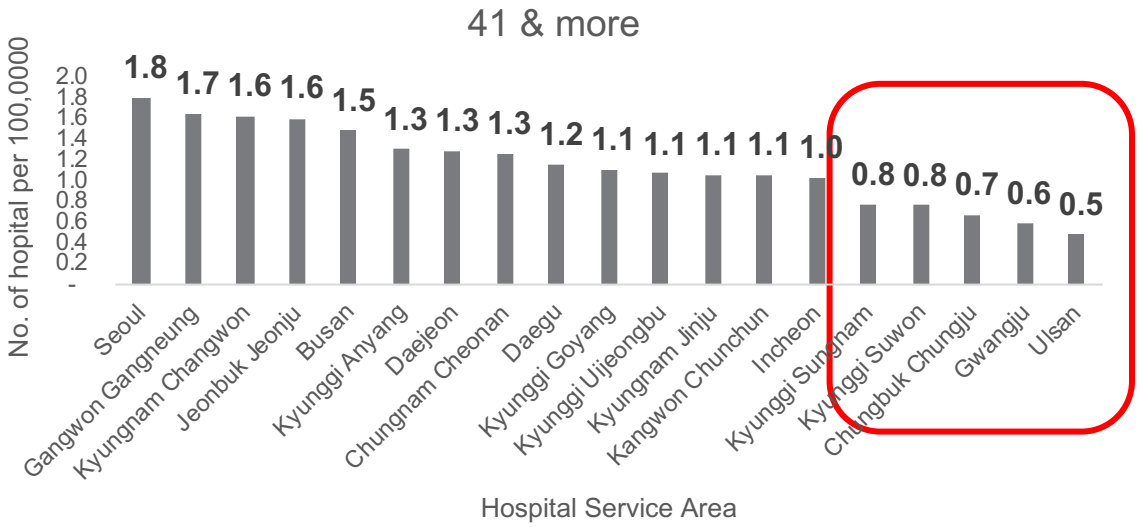
Gastrectomy Hospital Profiles - volume threshold

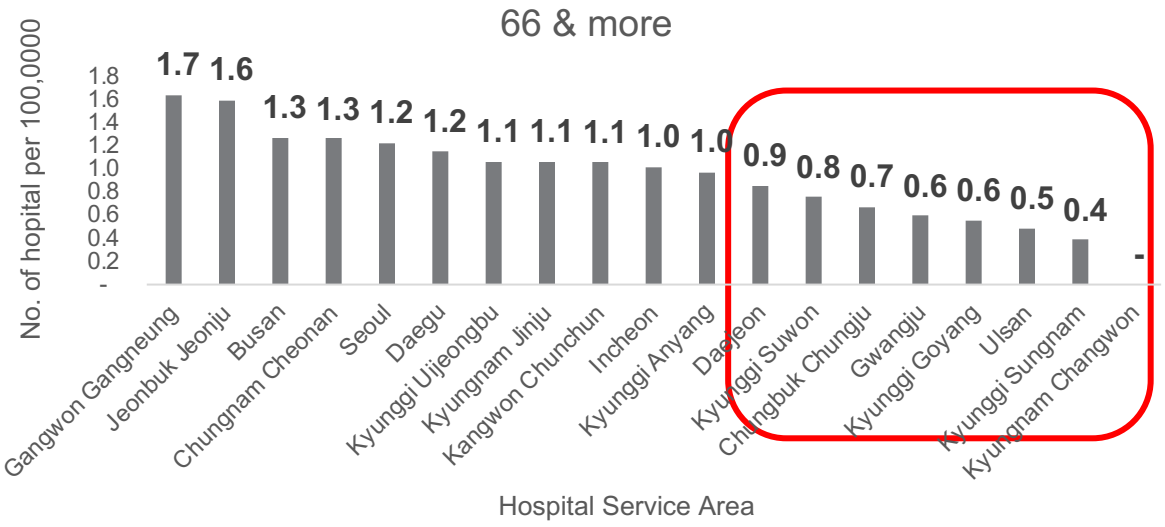
- Less than half of hospitals were over volume thresholds
  - Only upper-class general hospitals mostly were over thresholds
  - Less than half of general hospitals were over threshold; also, substantial variation was observed (beds 500+ vs. the rest)

	No. of hospital	Volume threshold (yearly)	
		41&over (n, % among hospitals by type)	66&over (n, % among hospitals by type)
Upper class general hospital	43	42(97.7)	40(93.0)
General hospital (beds 500+)	45	19(42.2)	10(22.2)
General hospital (beds 300~500)	51	2(3.9)	1(2.0)
General hospital (beds 300-)	31	2(6.5)	0(0)
Hospital	11	0(0)	0(0)
Local	1	0(0)	0(0)
Total	182	65(35.7)	51(28.0)

Regional Distribution of Over Threshold Hospitals

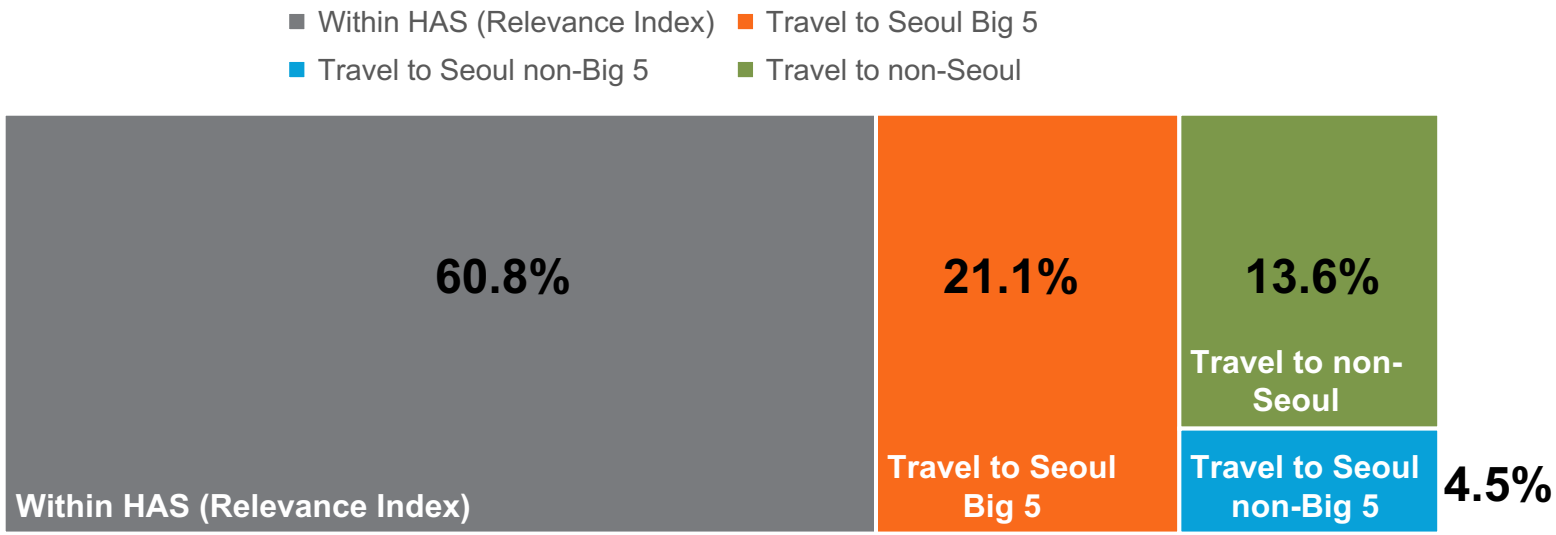
- Some HSA had less than one over threshold hospital per a million population, indicating low accessibility of high-quality hospitals.
  - Four HSA with low accessibility under threshold 41 cases/year; additional two HSA with low accessibility under threshold 66 cases/year





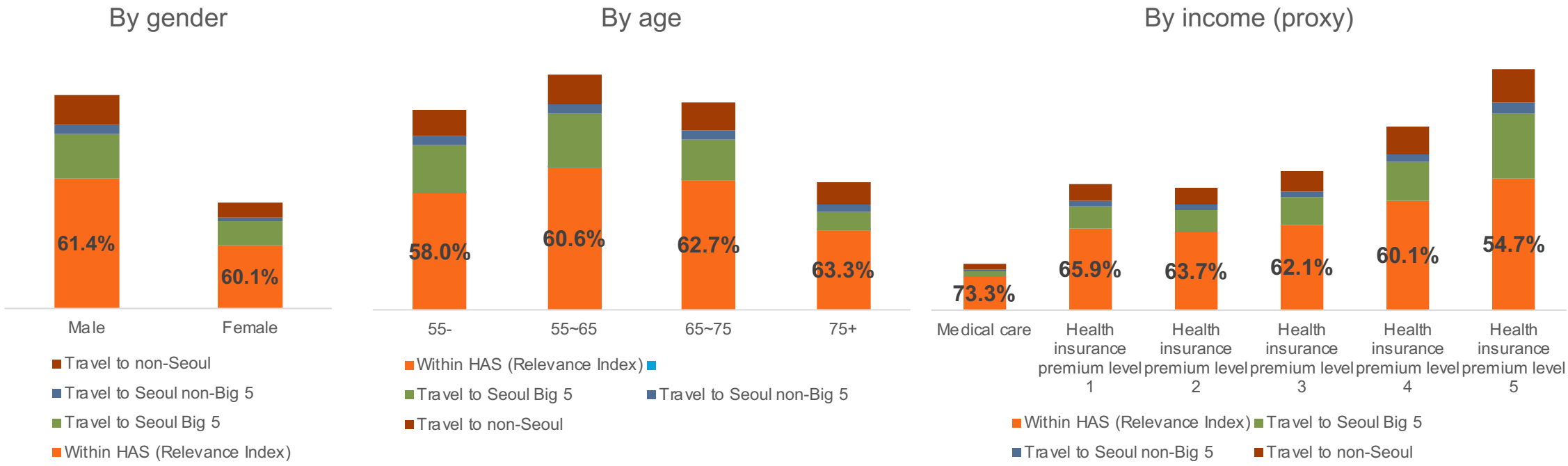
Medical Use – travelling (unit: claims)

- Among 15,141 gastrectomy claims, 60.8% were conducted within patients' HSA; others were conducted outside patients' HSA, thereby; patients travelled for surgery
  - Travelling to Seoul HSA was observed in 21.1%



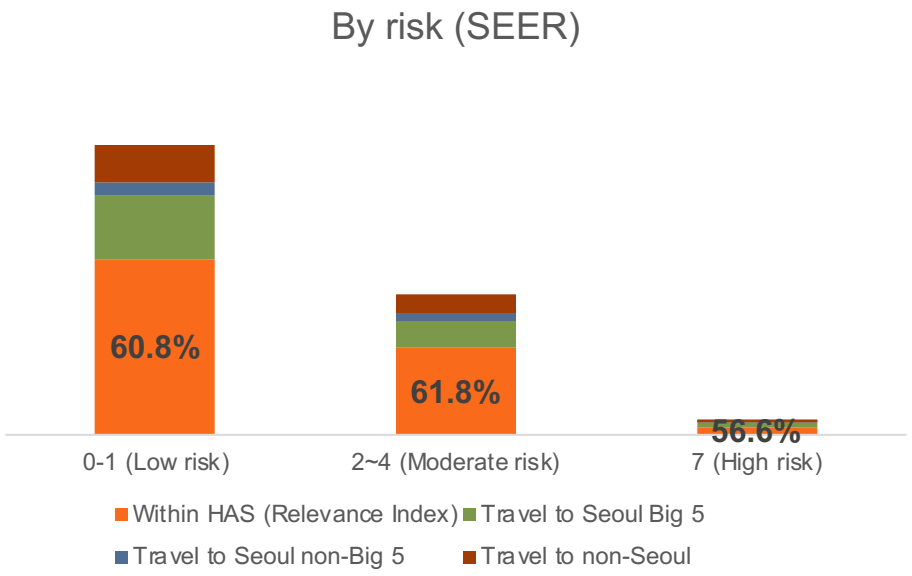
Medical Use-traveling (unit: claims)

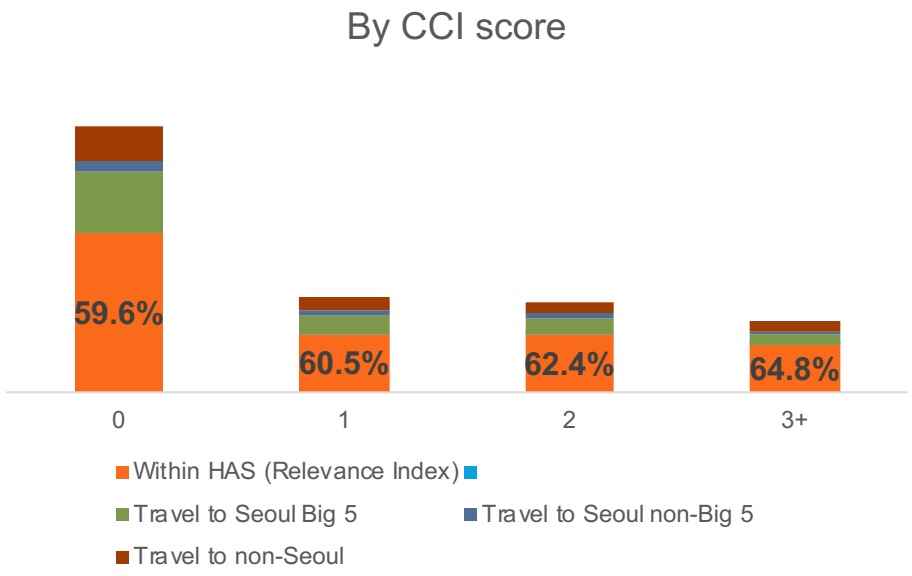
- By patients' general characteristics, income was affective to travel for surgery
  - Compared to medical care patients, patients with the highest insurance premium level were more likely to travel for surgery



Medical Use-traveling (unit: claims)

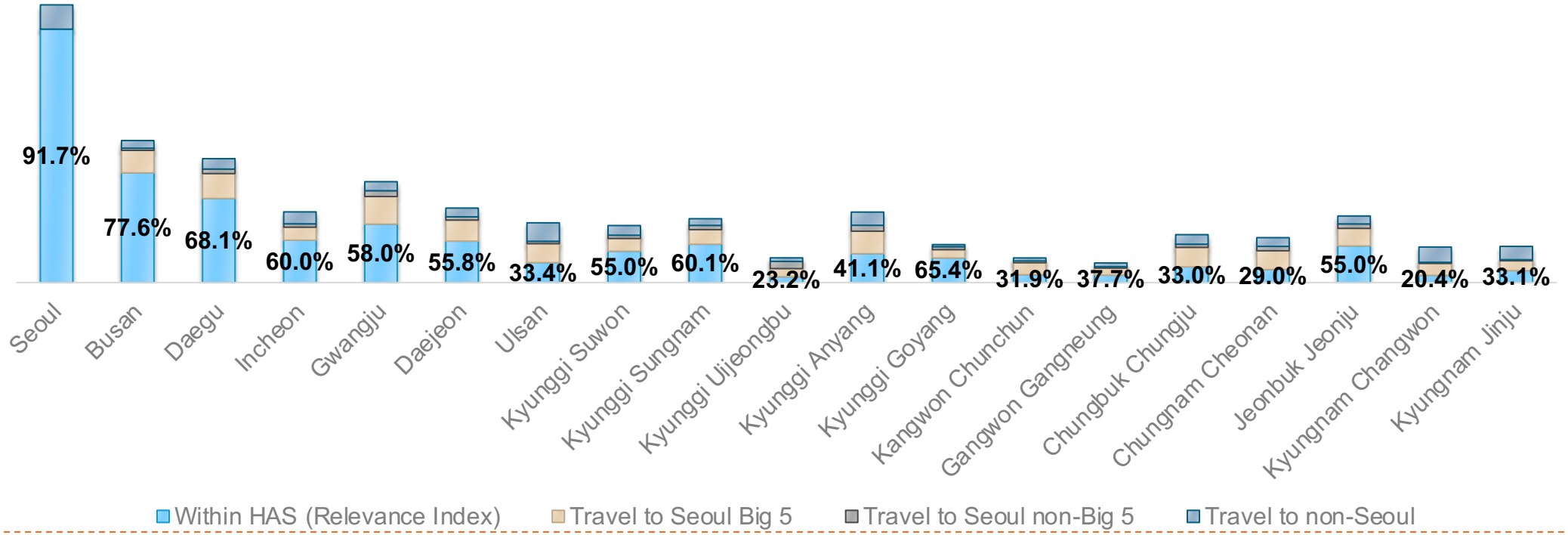
- By patients' medical condition, high risk patients in SEER stage tended to travel for surgery while patients with higher CCI score tended not to travel for surgery





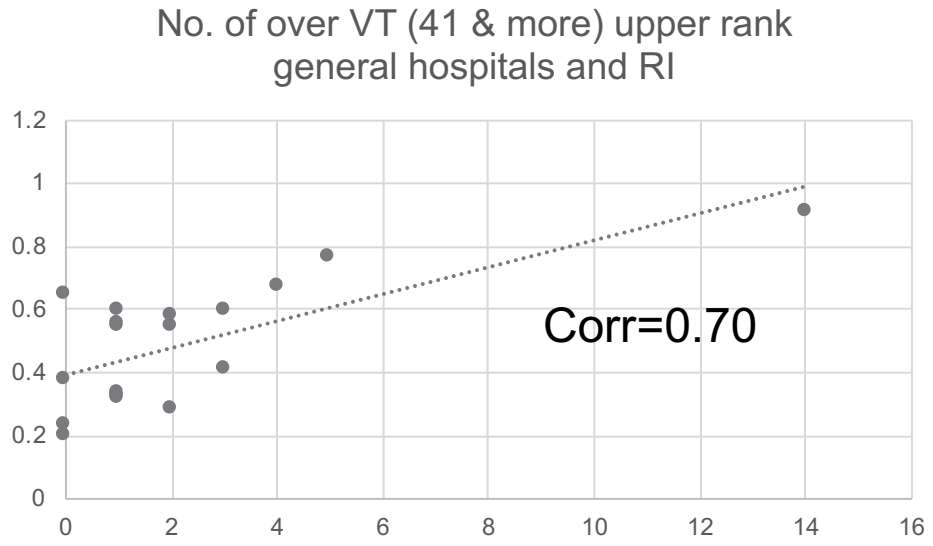
Medical Use-traveling (unit: claim)

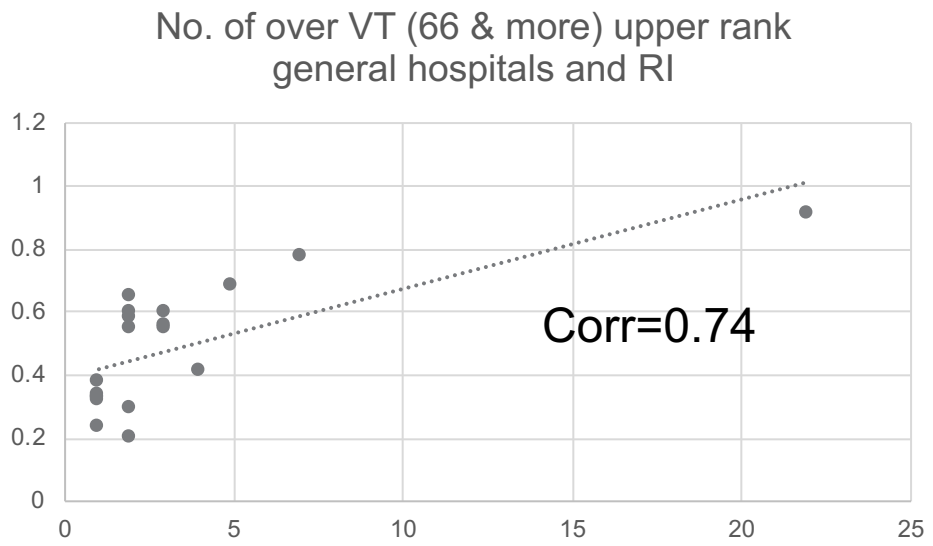
- By patients' HSA, variation in travelling was found.
  - Relevance Index (RI) of Seoul was 91.7%; a few large urban area (Busan, Daegu) had relatively high RI while; others with low RIs were subject to travelling for surgery



Supply and Medical Use – correlation (unit: HSA)

- Number of high-quality gastrectomy surgery hospitals was positively correlated with relevance index of HSA.
  - When high volume threshold was applied, the correlation was strengthened.





Supply and Medical Use – regression (unit: HSA)

- Increase of one high-quality gastrectomy surgery hospital was associated with an increase of RI (41&more: 3.1% ↑, 66&more: 3.4% ↑)

	coeff.	p	coeff.	p
Appropriate Supply				
No. of over VT (41&more) upper rank general hospitals	0.0310	<0.001		
No. of over VT (66&more) upper rank general hospitals			0.0340	<0.001
Gender (ref: Male)				
Female	0.0024	>0.05	0.0020	>0.05
Age (ref: 55-)				
55~65	0.0030	>0.05	0.0026	>0.05
65~75	0.0021	>0.05	0.0018	>0.05
75+	-0.0040	>0.05	-0.0038	>0.05
Income (proxy) (ref: Medical care)				
Health insurance premium level 1	0.0018	>0.05	0.0021	>0.05
Health insurance premium level 2	0.0017	>0.05	0.0020	>0.05
Health insurance premium level 3	0.0002	>0.05	0.0004	>0.05
Health insurance premium level 4	0.0059	>0.05	0.0060	>0.05
Health insurance premium level 5	0.0037	>0.05	0.0033	>0.05
SEER (ref: Low risk)				
Moderate risk	0.0022	0.018	-0.0050	0.020
High risk	0.0059	<0.001	-0.0195	<0.001
CCI score (ref: 0)				
1	-0.0028	>0.05	-0.0030	>0.05
2	0.0010	>0.05	0.0005	>0.05
3	-0.0054	>0.05	-0.0058	>0.05
Adjusted R2(%)	75.0%		76.9%	

CONSLUSION - summary

- Supply
  - Many small- and medium-sized hospitals with under volume threshold conducted gastrectomy.
  - Upper class general hospital (23% of total) with over volume threshold conducted the majority of gastrectomy.
  - These Indicates the oversupply of the low-quality cancer surgery in South Korea.
- Use
  - A substantial portion of (39.2%) gastric cancer patients traveled for gastrectomy.
  - By patients' HSA, RI was highly variable from 20.4% to 91.7%. Among 19 HSA, only 6 had RI more than 60%.
- Supply & Use
  - Variation of RI among HSA was correlated with an unequal distribution of high-quality hospitals.
  - From regression, the increase of high-quality gastrectomy hospitals (over-volume-threshold upper rank general hospitals) were associated with the increase of RI.

CONCLUSION – implications for planning

- High-quality cancer surgery hospitals should be identified based on a surgery volume threshold and hospital type.
- To reduce cancer patients' travelling for surgery, a regional accessibility for a high-quality cancer surgery hospital should be improved.
- For vulnerable HSAs with insufficient high-quality hospitals and low RI, political intervention for facilitating candidate hospitals is necessary.
  - Near-volume-threshold, general hospitals with over 500 beds, where travelling patients usually stopover

CONCLUSION - limitation

- Relationship between a supply and a health outcome (death), and a medical use and an outcome was not observed.
  - Extending years of data and use indexes with longer f/u periods can complement the study findings.
- An analysis considering two-levels (individual, HSA) can be more appropriate.
- Relationship between SEER stage and RI should be explored further.

Thank you