



Causes of Regional Variation in Health Care: Do Norway and the U.S. differ?

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Government/Compulsory Voluntary/Out-of-pocket USD PPP United States Switzerland Nd University of the second se Hall Korea Portugal

Health expenditure per capita, 2019 (or nearest year)

1. OECD estimates.





Hospital beds, 2009 and 2019 (or nearest year)



Source: OECD Health Statistics, 2021

Adult intensive care beds, 2019 (or nearest year) and 2020



- 1. Data cover critical care beds only.
- 2. Data refers to England only.

Source: OECD/Eurostat/WHO-Europe Joint Questionnaire on Non-Monetary Health Care Statistics 2021 (unpublished data); Country Health Profiles 2021; Health at a Glance: Latin America and the Caribbean 2020: national sources

Practicing doctors per 1000 population, 2000 and 2019 (or nearest year)



1. Data refer to all doctors licensed to practice, resulting in a large over-estimation of the number of practicing doctors (e.g., of around 30% in Portugal). 2. In Finland, the latest data refer to 2014 only.





Source: Gallup World Poll (2020) database





Life expectancy at birth, 1970 and 2019 (or nearest year)



Source: OECD Health Statistics, 2021

Adults rating their own health as bad or very bad, 2019 (or nearest year) and 2020



1. Results for these countries are not directly comparable with those for other countries, due to methodological differences in the survey questionnaire resulting in a downward bias.

Source: OECD Health Statistics 2021 (EU-SILC for EU countries).



1973 - "A Population-based health information system..." John E. Wennberg, MD MPH and Alan Gittelsohn, PhD

Small Area Variations in Health Care Delivery

A population-based health information system can guide planning and regulatory decision-making.

John Wennberg and Alan Gittelsohn

Recent legislation has extended planning and regulatory authority in the health field in a number of important areas. The 1972 amendments to the Social Security Act provide authority for regulating the construction of facilities and establish Professional Standard Review Organizations (PSRO's), which are accountable for setting standards and evaluating professional performance. Phase 3 of the Wage and Stabilization Act of 1970 and state insurance commissions provide authority for regulating dollar flow by controlling the price of services and the price of insurance.

Taken together, this legislation influences major factors determining how a specific health care organization performs—the expenditures it can incur, the facilities and manpower it can use, and the kind and amount of services it produces. While the immediate effects impact of regulatory decisions on the equality of distribution of resources and dollars and the effectiveness of medical care services.

For technical and organizational reasons, documentation of the health care experience of populations has been restricted to large political jurisdictions such as counties, states, or nations. Studies at this level of aggregation have used indicators that support direct comparisons among areas. Relationships between the supply of manpower, facilities, and expenditures and the population on whose behalf these resources are expended are expressed as direct input rates-for example, the number of physicians or beds per thousand persons or per capita expenditures. The quantity of services produced or the kinds of cases treated are commonly expressed as "utilization rates." Examples of hospital utilization

twice as high in California as in Arkansas. The number of physicians per thousand persons has been up to three times higher in some states than in others. International comparisons and studies of regions within states show that there are large differences in the rate of delivery of specific surgical procedures (I).

In 1969, there was implemented in the state of Vermont a data system that monitors aspects of health care delivery in each of the 251 towns of the state. When the population of the state is grouped into 13 geographically distinct hospital catchment, or service, areas, variations in health care are often more apparent than they are when the population is divided into fewer, larger areas. Population rates can be used to make direct statistical comparisons between each of the 13 hospital service areas. Since the medical care in each area is delivered predominantly by local physicians, variations tend to reflect differences in the way particular individuals and groups practice medicine. The specificity of the information in Vermont's data system makes it possible to appraise the impact that decisions controlling facility construction, price of insurance, and the unit price of service have on the equality of distribution of facilities and dollars in a given population.

Our article examines the extent to which bed and manpower use, expenditures, and utilization vary among hospital service areas in Vermont. Variations in utilization appear to indicate that the effectiveness of a given level

Observed variation could not be explained by population differences in demographics or health status.



Wennberg J, Gittelsohn A. Small area variations in health care delivery. Science 1973;182:1102-8.

1973 – 1995

Numerous papers investigating health care variation in the U.S as well some studies in other countries

1996

The Dartmouth Atlas of Health Care Project: Over 60 Atlases; > 350 research papers



1996

2013

2016

2019 10



Before examining patterns of health care, let's consider health care capacity.

U.S. Hospital Referral Regions

U.S. Neonatal Intensive Care Regions



Population ≥ 65 years

Low birth weight %

Regional Health Care Capacity is not Associated with Population Need

Wennberg D, et al. *Dartmouth Cardiovascular Atlas* Harrison, Wasserman, Goodman. *J of Pediatr, 2017*.





41 years after the Wennberg's Science paper



Causes, consequences, remedies of variation

Category	Cause	Consequence	Remedy
Unwarranted variation			
1.Effective care			
2. Preference sensitive care			
3. Supply sensitive care			
4. Integrated sensitive care			-
Desired State: Warranted variation			
Care in response to differences in patient needs and preferences		Better outcomes, including higher decision quality, and often lower costs 13	

Use of beta-blockers 7-12 months following discharge for AMI (2008-10) in Medicare beneficiaries \geq 65 years Hospital Referral Regions (=306)



Variation in technical quality: effective care

Munson JC, Morden NE, Goodman DC, Valle, LA, Wennberg JE. The Dartmouth Atlas Report of Medicare Prescription Drug Use. Hanover, NH: The Trustees of Dartmouth College October 2013.



Effective Care for Patients with Acute Myocardial Infarction

Proportion of STEMI patients receiving reperfusion within recommended time.



Age 18-84, 2017-19

Norwegian Myocardial Infarction Registry Healthcare Quality Atlas, 2021

Causes, consequences, remedies of variation

Category	Cause	Consequence	Remedy
Unwarranted variation			
1.Effective care	Clinician decisions ≠ science	Lower probability of good outcomes	Clinical microsystem improvements
2. Preference sensitive care			
3. Supply sensitive care			
4. Integrated sensitive care			
Desired State: Warranted variation			
Care in response to differences in patient needs and preferences		Better outcomes, including higher decision quality, and often lower costs 16	





SPECIAL ARTICLES

SMALL-AREA VARIATIONS IN THE USE OF COMMON SURGICAL PROCEDURES: AN INTERNATIONAL COMPARISON OF NEW ENGLAND, ENGLAND, AND NORWAY

KLIM MCPHERSON, PH.D., JOHN E. WENNBERG, M.D., OLE B. HOVIND, AND PETER CLIFFORD, PH.D.

Abstract We examined the incidence of seven common surgical procedures in seven hospital service areas in southern Norway, in 21 districts in the West Midlands of the United Kingdom, and in the 18 most heavily populated hospital service areas in Vermont, Maine, and Rhode Island. Although surgical rates were higher in the New England states than in the United Kingdom or Norway, there was no greater degree of variability in the rates of surgery among the service areas within the three New England states. Hernia repair was more variable in England (P<0.05) and hysterectomy in Norway (P<0.05) than in the other countries. There was consistency among countries in the rank order of variability for most procedures: tonsillectomy, hemorrhoidectomy, hysterectomy,

SYSTEMATIC and persistent differences have been documented in the standardized rates of use for common surgical procedures in the United States and the United Kingdom,¹ as well as among the political and prostatectomy varied more from area to area than did appendectomy, hernia repair, or cholecystectomy. The degree of variation generally appeared to be more characteristic of the procedure than of the country in which it was performed. Thus, differences among countries in the methods of organizing and financing care appear to have little relation to the intrinsic variability in the incidence of common surgical procedures among hospital service areas in these countries. Despite the differences in average rates of use, the degrees of controversy and uncertainty concerning the indications for these procedures seem to be similar among clinicians in all three countries. (N Engl J Med. 1982; 307: 1310-4.)

of surgery and resources invested in surgery are lower in the United Kingdom than in the United States. In the New England states the use of surgery varies considerably among hospital service areas.^{5,6} Because

McPherson K, Wennberg JE, Hovind OB, Clifford P. Small-Area Variations in the Use of Common Surgical Procedures: An International Comparison of New England, England, and Norway. The New England Journal of Medicine 1982;307(21):1310-1314.



Small Area Variation in Surgical Procedures, New England, England, Norway.



McPherson K, Wennberg JE, Hovind OB, Clifford P. (1982) Small-Area Variations in the Use of Common Surgical Procedures: An International Comparison of New England, England, and Norway. New Engl J Med. 307(21):1310-1314.

Percent of Male Medicare Beneficiaries Age 68-74 Receiving PSA Screening among Hospital Service Areas (2010)





PSA Screening Preferences Sensitive Care

Population	Recommendation	Grade
Men aged 55 to 69 years	For men aged 55 to 69 years, the decision to undergo periodic prostate-specific antigen (PSA)-based screening for prostate cancer should be an individual one. Before deciding whether to be screened, men should have an opportunity to discuss the potential benefits and harms of screening with their clinician and to incorporate their values and preferences in the decision. Screening offers a small potential benefit of reducing the chance of death from prostate cancer in some men. However, many men will experience potential harms of screening, including false-positive results that require additional testing and possible prostate biopsy; overdiagnosis and overtreatment; and treatment complications, such as incontinence and erectile dysfunction. In determining whether this service is appropriate in individual cases, patients and clinicians should consider the balance of benefits and harms on the basis of family history, race/ethnicity, comorbid medical conditions, patient values about the benefits and harms of screening and treatment-specific outcomes, and other health needs. Clinicians should not screen men who do not express a preference for screening.	C

Men 70	The USPSTF recommends against PSA-based screening for prostate cancer in men 70 years and older.	
years and		
older		

U.S. Preventive Services Task Force, JAMA. 2018;319(18):1901-1913. doi:10.1001/jama.2018.3710 20



Hysterectomies and transcervical procedures per 10,000 women, 2015-17 Preferences Sensitive Care

Proc.

902

210

I I ALIBUCI VICA

SKDE

40

Comments

There is no known geographical variation in morbidity to indicate that there should be a geographical variation in the need for hysterectomies and transcervical procedures in Norway. Nor is it likely that differences in patient preferences or chance can fully explain the observed variation. The variation observed must therefore be deemed to be unwarranted.



Hospital referral area

Vestre Viken

Nord-Trøndelag

Møre og Romsdal

Telemark

Innlandet

Finnmark

St. Olavs

Sørlandet

Nordland Østfold

UNN

OUS

Norway

Vestfold

Stavanger

Akershus

Førde Bergen

Lovisenberg

Diakonhjemmet

Fonna Helgeland 47.4%

<u>50.7%</u>

60.4%

52.6%

41.9%

64.9% 58.0%

35.1%

56.6%

47.1%

54.7%

46.6%

49.1%

47.5%

43.5% 38.8%

37.5%

40.8%

38.4%

50.0%

51.7%

50.0%

10

20

Number per 10,000 women

30





Arthroscopies for degenerative knee disease per 10,000 population (≥50 years), 2012-16 Preferences Sensitive Care?



Shared Decision Making

- Providing patients with unbiased information about care options, the chances of associated benefits and harms.
- Eliciting patients' values and goals.
- Legitimizing patients' participation in decision making.



Causes, consequences, remedies of variation

Category	Cause	Consequence	Remedy
Unwarranted variation			
1.Effective care	Clinician decisions ≠ science	Lower probability of good outcomes	Clinical microsystem improvements
2. Preference sensitive care	Provider-driven decisions; patients uninformed and not involved in decisions	Pt. doesn't receive preferred care: the care with highest individual pt. utility	Shared decision making, decisions aids. Better outcomes research. Research in decision quality.
3. Supply sensitive care			
4. Integrated sensitive care			
Desired State: Warranted variation			
Care in response to differences in patient needs and preferences		Better outcomes, including higher decision quality, and often lower costs 24	

Total Medicare Reimbursements per Beneficiary by Hospital Referral Region (n=306) age, sex, race adjusted, 2010



Variation is Medicare reimbursements is primary due to regional differences in volume of services to patients with chronic illness.

To understand the relative efficiency of care for the chronically ill across providers,

risk adjustment is necessary but difficult with medical claims.

One approach: The chronic illness decedent cohort

- \geq 65 years with at least one chronic illness
 - (congestive heart failure, chronic renal failure, cancer, COPD, dementia, diabetes with end organ damage, chronic liver disease, coronary artery disease, peripheral vascular disease)
- Cohort inception death
- Followed back 6, 12, 24 months prior to death
- Utilization rates at regional and hospital level adjusted for age, sex, race, and mix of chronic illness (at death)
- At a regional and hospital level, end-of-life utilization is highly correlated with overall Medicare utilization.

Hospital days per patient during the last six months of life Hospital referral regions (n=206) (2010 deaths) adjusted for age, sex, race, mixture of chronic illness

Correlates highly with overall Medicare spending







ICU days per Chronically III Medicare Beneficiaries, last 6 months of life, Academic Medical Centers (2010 deaths)







12.4

12.0

11.5

11.3

11.0

2.3

1.8

1.7

1.4

1.2

In U.S. chronically ill elderly....

- Utilization of inpatients & ICU days, imaging, physician clinical labor, and costs vary markedly across regions and hospitals, even when the outcomes are held constant.
- Regions with higher intensity of end-of-life chronic illness care, are also much more likely to have higher utilization rates of medical care prospectively, but with lower technical quality, poorer patient perceived access, and no better (and possibly worse outcomes)
- These higher intensity regions have higher capacity more hospital beds & physicians (particularly specialists).
 - Fisher ES, et al (2003) The implications of regional variations in Medicare spending. Part 1: the content, quality, and accessibility of care. Ann Intern Med
 - Fisher ES, et al. (2003) The implications of regional variations in Medicare spending. Part 2: health outcomes and satisfaction with care. *Ann Intern Med.*
 - Sirovich BE, et al. (2006) Regional variations in health care intensity and physician perceptions of quality of care. *Ann Intern Med.* 144(9):641-649.
 - Goodman DC, et al. (2006) End-of-life care at academic medical centers: implications for future workforce requirements. *Health Aff (Millwood)*.
 - Skinner J, et al. (2009) The elusive connection between health care spending and quality. Health Aff (Millwood).
 - Skinner J, et al. (2010) Looking back, moving forward. *N Engl J Med.*
 - Nyweide DJ, et al. (2011) Seniors' perceptions of health care not closely associated with physician supply. *Health Aff (Millwood)*.

Is unwarranted variation a problem of only the elderly?



Cole Lee Goodman: December 5, 2019

Developments in newborn care has improved outcomes

U.S. Birth Weight Specific Neonatal Mortality Rates, 1957 & 2010



Conditional on birth weight, neonatal mortality rates continue to decline.

Good news, but still lagging many countries.

Sources: Wishik SM, et al. AJPH 1961. 51:53-64. and U.S. Birth Linked-Death File, NCHS,.

Variation in NICU Admissions. (U.S. Neonatal Intensive Care Regions)



Harrison WN, Wasserman JR, Goodman DC. Regional variation in neonatal intensive care admissions and the relationship to bed supply. *J Pediatr.* 2018;192:73-79.

Variation of NICU Admissions Across Norwegian Regions, 2009-14



Moen A. Regional Variation in the Treatment of Sick Newborns in Norway <u>in</u> The Dartmouth Atlas of Neonatal Intensive Care





While regional NICU capacity (NICU beds and neonatologist) is poorly related to perinatal risk, <u>capacity is strongly related to NICU utilization</u>,

for the lower risk groups of newborns

Harrison, Wasserman, Goodman. J of Pediatr, 2017.



Number of NICU Days in Texas Medicaid Insured Late Preterm (34-36 Wk) Singletons by NICU Regions, 2010-14





Length of Stay, Norwegian Live Births, 34 - 36 Wk Gestation, 2009-14



Shorter NICU stays are not associated with a higher chance of readmission, ER visit, or mortality.



Goodman DC, Wasserman JR, Mowitz ME, et al. Neonatal intensive care utilization and postdischarge newborn outcomes: A population-based study of Texas Medicaid insured infants. *J Pediatr.* 2021;236:62-69.

What can we learn from population-based variation studies?

- Patterns of care prior to, during, and after hospitalization.
- And care of patients who are not hospitalized
- Hospital admissions and surgical procedure rates.
- Outcomes, including mortality.
- Detailed measures of quality and efficiency of health care across regions and providers.

These studies...

- Are necessary to conduct research in the causes and consequences of variation in health system performance.
- Assist in identifying quality and efficiency benchmarks.
- Provide transparency and encourage public engagement.

Done for Today...

Cole Lee Goodman

Son of Theresa Wagner Goodman Andrew Goodman

Date of Birth: 3 Dec. 2019

33 1/7 weeks

2083 grams

Date of discharge: 24 Dec 2019 (21-day length of stay)





Home at last....