Healthcare Economics

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Contents

Lecture 1: Resource allocation I : allocative efficiency

Mon 05 Feb 12:31

1 Health care markets and access to health care

1.1 Overview

Health Care markets

- Health as an economic good
- There are efficiency and equity concerns on both sides of the arguments for and against public and private provision of health care
- But why inequalities in health exist is important

Access to health care

- Looking at the importance of access to health care
- Measuring inequalities in access to health care
- Policy on how we can reduce inequalities in this aspect

Access to health care is particularly important to resource allocation

1.2 Health care as an economic good

Healthcare : perfect competition

- Healthcare is an economic good, it is scarce relative to wants
- In competitive markets, market forces match supply with demand
  - Shortages drive prices up
  - Shortages drive prices down
- Providers produce health care in an efficient way, maximising profit
- Purchasers are willing and able to pay equilibrium
- Access in a free market is based on *the ability to pay rather than need*

Market Failure

- The first fundamental theorem of welfare economics
  - Perfect competition generates a socially efficient (pareto optimal) allocation of resources
  - That is, social marginal benefit = social marginal cost
- In a perfectly competitive market the allocation of resources may be privately efficient but not necessarily socially efficient
- When the private marginal benefit $\neq$ social marginal benefit OR private marginal cost $\neq$ social marginal cost then we cannot be **pareto optimal** and market failure exists

Externalities

- Individuals consume unto the point where the individual's marginal utility of consumption (PMB) equals the individuals marginal cost of consumption
- Any external effect of consumptino or production (MEB, MEC) is typically not accounted for when individuals or firms maximise their utility/profit
- EG, smoking vaccinations altruism
- From a welfare perspective, the competitive market is not pareto optimal since with
  - Positive externalties : goods are underconsumed
    - SMB=PMB + MEB > PMB MEB>0
    - SMC = PMC + MEC < PMC MEC<0
  - Negative externalities : goods are overconsumed
    - SMB = PMB + MEB < PMB (MEB<0)
    - SMC = PMC + MEC > PMC (MAC>0)

Public goods

- Public goods are good jointly consumed by everyone
  - Non rival : consumption by one does not prevent consumption of same good by another individual
  - Non-excludable : cannot exclude other from consuming same good (free rider problem)
- Healthcare can be rival (hospital beds) and excludable (ability to pay)
- Some types of health care are public goods (vaccinations, altruism)

Consumer sovereignity

- Individuals may not demand health care rationally (over or under - valuing healthcare)
- This could be due to :
  - Imperfect information - not knowing what treatment is needed/necessary
  - The ability to communicate needs - how can we signal our preferences (if unconscious)
  - Exploitation when health shocks arise (irrationally choosing healthcare with highest cost and lowest risk - does having say headache make a painkiller worth more?
  - Excessive discounting (age dependent) : long term effects of activities?

Imperfect information

Three main causes of imperfect information

- Lack of opportunity for sampling : no prior experience to value quality since most health care is "one off event"
- Unclear cause-effect relationship :
  - Quality is rarely learnt
  - It is difficult to distinguish the cause and effect of treatment impacts, is it the effect of drugs or the natural healing process
- Asymmetric information : education is costly, giving suppliers a degree of power, this may incentivise supplier induced demand

2 For and against public and private provision of healthcare

Public or private provision?

- The existence of market failure in health care does not necessarily mean public provision is warranted :
  - Insurance markets can work to account for unpredictable nature of health
  - Nominated guardians and insurers can offset such concerns about under or over - estimating value of health and health care
  - Limited public intervention could work alongside health insurance :

    - Information campaigns, quality guidelines, regulation
    - Taxes and subsidies

Public provision problems :

- Removes competitive market forces which can potentially open up inefficiencies in the provision of healthcare, possibly government failure
- Moral hazards - can be insured regardless of health investment
- Free riding - no 'price' to health care, over utilisation may occur
- Financing - equitable - use it or lose it?

Private provision problems

- Free rider problem - compulsory insurance can resolve this
- Adverse selection and asymmetric information - the wrong people buy insurance
- Moral hazard - individuals may alter their probability of ill-health
- Uninsured populations are certainly those most in need of health care, no provision

There is currently an A&E crisis in England, is this indicative of government failure, would this be resolved in the private sector?

Health policy trilemma

We can think of health policy as being three pronged

1. Health - health of the population
2. Wealth 0 spending on other goods
3. Equity - fairness

Moving towards either poses an opportunity cost, reducing the ability to meet the other. Though it must be noted that different countries may have different preferences.

2.1 Access to healthcare

Access to health care depends on:

- A vailability (geographic, queuing, opening times)
- A cceptability (patient's willingness to accept treatment and provider's willingness to provide treatment
- A wareness (knowledge of service availability and effects of treatment)
- A ffordability (cost of using services : time off work transport etc)

Access is much more than that, (Mcintyre paper), some is availability (number of appointments), opening times, appointment times - what you can access, But it also *depends on awareness*, for instance weekend appointments, would that constitute good access to GP appointments, 7 days a week.

Gender, sex, age, ethnicity, sexual orientation can all influence threshold to access GPs. This is also the case for the flip side. GPs may not offer services based upon these.

Affordability - prescription costs, NHS dental costs, **opportunity cost** - what could you have been doing instead of visiting dentist/hospital. Possibly not prepared to since value extra hour in bed etc, affordability in that sense.

Equitable access to healthcare is not just about access :

Good access : empowerment of the patient to seek and obtain care when needed

Extended access policy - **access 7 days a week**

Prolific work in this area, motivation being :

Take pressure off of A&E services

Issues

- Moral hazard - people already accessing them may overuse them upon further opportunity to use services
- 7 day access doesn't necessarily improve access for the population, no improvement in access in terms of opportunity cost
- Cultural changes take time (such as sunday shop opening hours), maybe culturally it is strange to access GP on Sundays
- *Awareness* - reflecting poor access

Finding that it does take pressure off of A&E services, specifically for younger people it has improved access. However, uptake of this was very low, 40% of appointments weren't taken up. Due to practices not advertising this.

Issues around service itself such as not being the 'local' centre etc.

Given the NHS and public sector interventions are mainly around improving access

How can we define access inequality?

- Horizontal Equity - Equal treatment of equals - individuals with equal need for health care have equal access. Essentially, that access depends on need. The GP has final say in this.
- Vertical Equity - Unequal treatment of unequal needs - different access for individuals with different needs

Vertical different health different access. People who are different have different access

Horizontal - same need same health. Everyone cancer free has same access. Everyone in cancer group has same access. People who are identical in that sense

> **Example.** Horizontal equity - people with MA in economic get the same wage
>
> - vertical equity - people with different degrees get different wages

Access inequities - empirics

How to define unequal in health?

- One way to measure inequalities in access is to assess use: Here we can regress use on **health**, age, gender, income, social class, supply
- Need to record protected characteristics and need (health)
- This allows us to make positive statements about equity
- Supply can also bias the protected characteristics

Example (OVB). Population of 1000 where split population under and above 50

50+ have 3 emergency department visits, those under have 1

Regression

$$Use_{it} = \beta_0 + \beta_1(age_{50} + u) + e_{it} \tag{1}$$

To get estimated use of poeple under 50

$$\hat{\beta}_0 + \hat{\beta}_1(age_{50} + u) = 1.0 + 2.0(age_{50} + u) = 1.0 + 2.0 \cdot 0 = 1 \tag{2}$$

Predicted use of those aged 50+

$$\hat{\beta}_0 + \hat{\beta}_1(age_{50} + u) = 1.0 + 2.0(age_{50} + u) = 1.0 + 2.0 \cdot 1 = 3 \tag{3}$$

This regression basically gives us the averages

$\hat{\beta}_1$ tells us by how much more (or less) the population aged 50+ use

But need for healthcare likely depends on more than age, and specifically characteristics correlated with age, the variable before is likely biased, hence OTB, not picking up the true effect, picking up other things.

$\beta_2 < 0$ then ...

If $\hat{\beta}_1$ is significant, looking at equation 2 there will be horizontal inequity in need, their use and treatment is different subject to which sides of 50 they are on. Thus horizontal inequity in need. In 3 ...

Protected characteristics allow us to identify horizontal inequality, health measure vertical inequity

Example. Under the NHS constitute, there should be equal use of services for those with equal need (capacity to benefit)

Erwin and Whittaker (2016) aimed to analyse whether access to primary care (GP services) was equitable across sexual orientation (regressing GP visits on : sexual orientation, job status, religious belief, ethnicity (protected, age, health () and GP characteristics ()

Findings suggest in NW, there may be inequality in access for lesbian women, bisexual using more (OR > 1)

Adjusted model does not include age - since this can be a big issue here (we don't want to pick up other things when advising policy - we can have unintended effects)

Adjusted regression takes into account supply measures, need, so on.

For the adjusted, we still find less use for lesbian women, but maybe we are concerned there is access issues for bisexual women

Gay men use GP services 20% more. From which side is this?

Looking at inequalities, it is so important to make sure regression is specified correctly

Under the NHS constitution, where we want equal want for equal need, not depending on sexual orientation, it should be equitable.

Barriers to access - differences due to acceptability? Concerns on sex of GP? Availability is still there but there is something in the patients mind creating a barrier, but this is the

Health System's problem to make right

If we believe heterosexual women should use GPs more (say pregnancy), this may be a reason why heterosexual women are using more than bisexual

Vertical Equity :

- Recall normative judgements are needed on whether unequal use is justified for unequal need for health care
- A standard test is that those in rose health have higher use

Summary

Market for health care

- Health care is an economic good - scarce relative to our wants
- Left to a competitive market, the market for health care would not be **pareto optimal** - market failure likely
- The existence of market failure does not necessarily prove the need for public provision
- Public provision or intervention usually driven by equity concerns

Lecture 2: Allocation of healthcare resources (budgets)

Wed 07 Feb 14:53

2.2 Health Care Budgets

- Publicly funded health care systems require some form of resource allocation funding principles to enable the payer to distribute budgets across a population
- Health care provision is usually by geographically specified boundaries (primary care trusts, local authorities (public health), clinical commissioning groups (NHS Budget)
- These geographically specified population groups are likely to differ in terms of the need for healthcare (recall NHS aims of equal access for equal need)

Capitation

- Capitation - population size
- Populations can be identical, though they can vary Population of 4 will always get the same share, though a much older population is likely to need a greater need for healthcare, furthermore looking at gender, ethnicity etc. This may influence the make-up of our budget required

- Rarely done, when we don't have good data to find above characteristics

Differences in health care likely due to

- Population size, age and gender distribution, health and socio economic deprivation

Weighted Capitation

Say elderly have twice the need as young, we can take this into account by multiplying need factor by population size

$$\begin{aligned} Weight = 2:1 \quad &\text{(A young, B elderly)} \\ \text{Weighted population} &= 1000 * 1 \\ \text{weighted population} &= 500 * 2 \end{aligned}$$

2.3 Utilisation Measures

Use as a proxy for need - how much use a population has of healthcare, last year say, compared to another population

Though there are issues with use, we may underestimate need due to under access

- Access is a product of demand and supply (nearby to a hospital - induced demand?)
- Access depends on list of access - why is the use a problem (**fundamental problem in this course**)
- Say if dentists earn more money, the more they treat, is use reflecting need? Or rather over treatment?

We have measures of use, this may reflect differences in supply (more hospitals / appointments due to differences in supply), we don't want to allocate resources based upon this (we want to adjust/predict supply), we want to predict use.

Use might be related to protected characteristics

We predict **use**, however use is mad up of supply, inequality and need. We want to isolate several valid estimations of need into our predicted value of use.

$$Utilisation_{it} = \beta_x Need_{it} + \delta_x Supply_{it} + e_{it} \tag{4}$$

$\hat{\beta}_x$ enables us to determine the predicted need in a population (population weights) $\hat{\delta}_X$ is not used to estimate need

We need to come up with some kind of measure that aggregates all factors of use (appointments etc.), we put this into cost. We need to measure supply and run OLS based on these measures. 1 injection + 1 A&E visit, translating this to cost is logical.

Recap

Deciding how to distribute budget accordingly : capitation - most obvious way of doing it, looking at geography.

However, this is quite inequitable. 2 populations of same n, if differ in age there will likely be different healthcare needs than a younger population (sex, ethnicity differ also). Say Manchester to Salford, an are more deceived may require more resources, even if population sizes are same.

Weighted Capitation - say weighted population has twice the needs of unweighted (could be younger). Just take into account population B is elderly and has greater need, we redistribute the need.

Problem lies in how we calculate utilisation. There is no measure for how healthier Salford or Liverpool or London is to Manchester

In these cases we make use of previous healthcare use, we hope those that have a greater use of healthcare are likely to have a larger need for healthcare. However there are different domains of access, measures of use may capture issues of supply variation, inequalities in access.

If more dentists in an area, there will naturally be more use here as opposed to dentist desserts, thus basing utilisation off of this is not warranted. We need to 'strip' supply from this measure. *Use as the sum of a range of different things* - create a 'needs-based' use to predicted need. That isn't reflecting supply.

$$Utilisation_{it} = \beta_x Need_{it} + \delta_x Supply_{it} + e_{it}$$

Need to be proxied using deprivation, diagnosis data, proportion of population own benefits - using variables correlated with the need for healthcare.

Question : Cancer - if more checkups say in Japan than America, how can we obtain need for cancer checkups? Since cancer rates higher in japan - presumably due to more check-ups and mortality from cancer higher in the US, how would we whittle down to the 'utilisation' of cancer check-ups?

Needs Index - 2 populations, 500 and 750 = 1250. Under capitation pop 1 = 40 percent, 2 = 60 percent of budget, if we think unemployment is a needs variable

Under weighted capitation, estimate $y =: b_0 + \beta_1 UB + e$ Predict need $\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 UB = \hat{y} = 216 + 20(UB)$

Using some measures of need to predict needs-based use and make it into our budget-share they are almost equal (in our example) **Limitations**

- If used alone, utilisation may sustain inequalities in access to healthcare and health
- Unmet need becomes a key concern
    1. Utilisation is only observed for services being used
    2. Under-utilisation from populations with need is not controlled for
        (a) Specific unmet need - for particular groups (minority ethnic groups, liability status)
        (b) General unmet need - for the whole population
- Inappropriately met need (over-utilisation) may also occur

From a technical side, the lower the unit of analysis, the better. Historically in England, they are stuck in regions but now we have progressed to the individual level (as opposed to governmental region - hence ecological fallacy).

Alternative Measures of need

- Alternative measure of need may be
    - Demographic characteristics of the population
        * Age and gender explain need
    - Epidemiological characteristics of the population
        * Higher mortality rates explain higher need
        * Requires data on everybody in the population
- Both are imperfect measures, need is a function of more than age, gender and a specific health measure

NHS - Weighted Capitation

- England
  - Total health care budget £180.2 In
    - Budget is split between sectors (mental health services, GP, hospital etc. - each have their own formulas - mental health to dental services - may have different use and thus stratified need
    - That is, within each sector different indices and models are estimated to better identify need and split budgets be area
  - NHS England responsible for determining resource allocation formulae, *equity is the ultimate goal*

Example. Ramp Project Research aimed at updating the resource allocation formula for mental health budgets in England (since new data avail, was previously only using amount of time sept in hospital - there could be areas with good mental health services and thus fewer inpatient services receiving less than those with the opposite) 2008/09 - 2% of adult population using metal health services Ran regression of costing, the β from regression are used to inform costing while δ 's are not used in order to not sustain access in inequalities to services

Table 2.12: Models for the working-age population

Model	WA1	WA2
Proportion providing informal care	-11.86309 (-7.71)	-11.78299 (-7.66)
Contains MH provider	2.74108 (4.38)	2.73913 (4.37)
Distance to CMHT base	-0.07264 (-3.32)	-0.07384 (-3.36)
IB/SDA with mental health diagnosis	36.18262 (18.71)	36.02567 (18.67)
SMR (where a mental illness excluding dementia is indicated)	0.07360 (6.48)	0.07355 (6.47)
Proportion Black Caribbean	3.59290 (3.69)	
Proportion Black		2.15511 (3.87)
Constant term	0.89021 (6.40)	0.83010 (5.64)
N	32482	32482
Adjusted R2	16.83%	16.86%
RESET	0.096	0.184

gures in parentheses are t-ratios. Models also contain PCT mean values of each of the included variables to contro for correlation between PCT effects and the included variables.

Figure 1: Ramp Results

Clinical reason for inclusion of ethnicity, analysis largely focuses on adjusted r-squared. Dine for both younger and older populations. Estimates from regression then feed into exposition book, rather than interpreting results. They would each have their own needs index

Talking about need, how we can identify, and how we can redistribute based upon this,

Impact : (aruguably more inline with need for healthcare) :

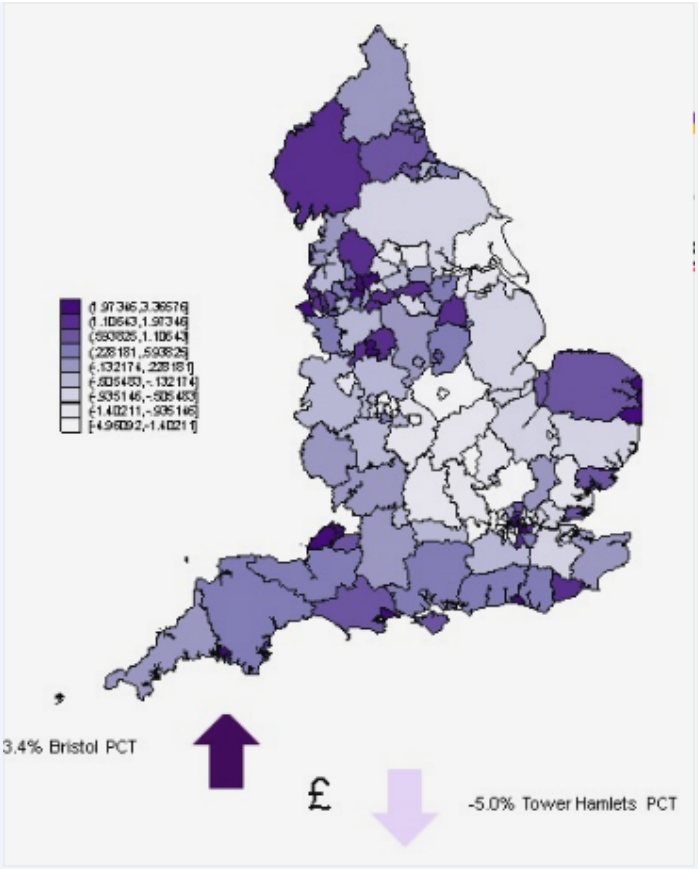

Figure 2: Spatial Effects of RAMP

Clearly, some PCTs have received larger increases in their budget due to others

Weighted Capitation : Equity

- Weighted capitation may be seen as horizontally equitable - attempting to ensure equal need has equal weight
- Weighted capitation may also be seen as vertically equitable - different needs have different weights, relative differences driven by the Odell rather than policymaker, still normative - what activity should be modelled
- Is weighted capitation efficient?
- What if the aim of the payer is equal health outcomes?

PPF approach to resource allocation

WE are largely conceived with allocative efficiency, looking at this over a year

- When discussing efficiency and equity it is helpful to apply a PPF approach. We can recall a PPF plots the output (gain in health) from differing inputs (budget allocations)
- **Allocative efficiency** - producing maximum

PPF of a population group

Assumption 1 :
PPF

1. No historic spend feedback (in play when we commence)
2. Zero expenditure can have positive outcomes
3. Decreasing returns to expenditure (marginal gain decreasing after point)
4. One input, one output
5. Individual behaviours, environment, other external factors are exogenous to the PPF
6. Time period is 1 year

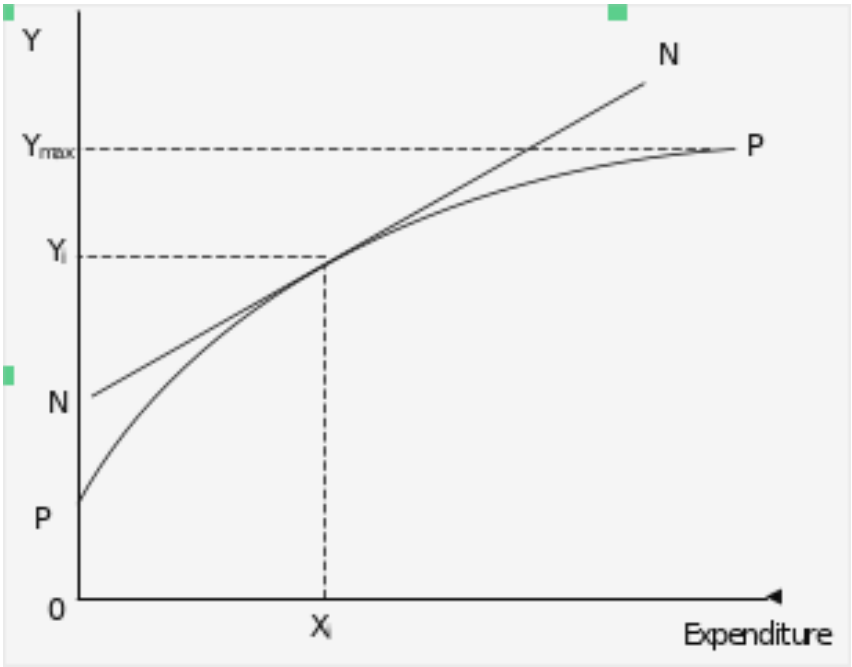

Figure 3: PPF

- Need varies at different levels of budget allocation
- Ideally give budget such that everyone is at maximum
- However healthcare is scarce resource, we are not likely to be at this point for every population
- As a decision maker - what is the most efficient point at which we can provide?
- One way is to look at marginal benefit of additional expenditure, might be prepared to say : extra days health for £1 : looking at the PPF we can figure out at which point this cutoff point meets

In reality we will likely have many different PPFs for each population. We as health economists can try to estimate the PPFs for 2 different populations. 2 populations with different needs will likely have 2 different PPFs.

Efficient Solution

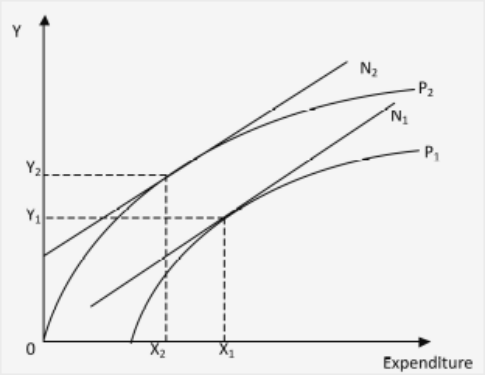

Figure 4

This is where we want to be - the efficient solution, but may we have issues :

- Depends how accurate we can identify differences in need. Say we used regression, if there is problems with this we have under or overestimated need in p_1, p_2. Further, what says this is equitable, that pop 1 has more healthcare allocation than pop 2?

The efficient solution is horizontally equitable in budget allocations (health gains) if populations with the *same* PPF have the same budget allocation (health gain). Say if Liverpool has same budget as Manchester, then same healthcare is horizontally equitable (same PPF).

Whereas vertical equity different PPF

Two reasons why the efficient solution may not be met :

- Technical efficiency across population providers may vary
- Allocations may not be at the point where the *marginal benefit from expenditure equals the marginal social value*

  1. Alternate equity objective of the payer
  2. Inaccurate needs measurement
  3. Differences in the costs of delivering healthcare - hospital in London, same hospital cheaper to run elsewhere in the country. If we don't take this into account we are deflating London's budget

Alternative equity aims

- Since populations differ in demography and epidemiology affecting how productive they are in health and hence have different PPFs
  - Differences in height do not alter efficient allocations - this doesn't alter the capacity to benefit
  - Differences in slope however could be consistent with differing health outcomes

- Even where the efficient solution is met, that is, needs are fully reflected in allocations, this may not be desirable

When bring equity in, this comes at the cost of efficiency

Equal Gain

How identical are different PPFs

Equal Allocations PPF - middle of x_1, x_2 , tracing straight up - is this vertical equitable in budget allocations? Likely not since pops with different needs are receiving same budget allocation

Equity-efficiency trade-off

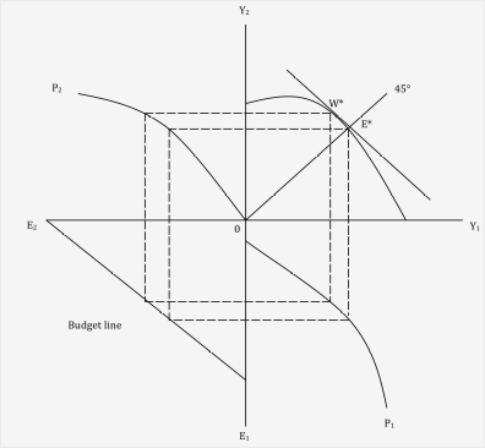

Figure 5

NW/SE represent same PPF as before, in SW budget line with e_1, e_2.

45 degree line - outside of social welfare line and PPF. On N line that is the same as amount of health produced. Equal health outcomes leads to inefficient health allocations.

Inaccurate Needs Measurement

If regression is wrong, say 2 populations with same PPF, but regression is wrong say included supply variables so included supply side variables in predicted use. The gain is less than the loss generated thus inefficient allocations.

Differing costs in delivering health care

- Costs of providers of delivering

Example. Measuring allocative efficiency If for example, pop 2 is cheaper to provide healthcare for than pop 1, then it is like its allocation being less than previously thought, x_1 x_2 so allocate based on that however we have not taken into account ...

Technical Efficiency

- So far assumed budgets are spent efficiently by providers - utilising budgets to maximise outputs
- But technical inefficiency may arise due to

1. Budget risk
   - Health and health care is often uncertain, variations in spend is likely
   - Rationing may be performed
   - No redistributing encourages inefficiency for under-spenders
   - Greater the smaller population groups and the shorter the time horizon - population of 1000 people, catastrophe has less impact on total budget. Smaller population budgets are for, the higher the risk there can be catastrophic events where we might spend more than allocated
2. Within the health care system
   - NHS monopolistic employer and provider of health care services
3. External factors
   - Economy pressures (COVID, Recession and its impact on NHS budgets)

Alternative Equity Aims

- Additional health inequalities
- May detract allocations from being 'needs-based' Diverting allocation away from horizontal equity

NHS - Health Inequalities Factor

- **Unmet need and health inequities adjustment**
- Standardised mortality ratio -

NHS Final Allocations

- Allocations are not efficient

1. Additional needs undex incldues an unmet need and helath inequalities factor

Tutorial 1. 2 : Equity and Efficiency in Resource Allocation Formulae **Q1** a) Show the efficient solution to resource allocation of health care budgets where 2 populations have the same PPF, stating any assumptions made

Solution - same PPF, overlap. Horizontal equity - would we identify pop with same need have same . . . [insert dig here]

$PPF_1 = PPF_2$

Assuming diminishing returns - building hospital upon hospital, marginal returns decreasing. All points on frontier technically efficient, marginal value of expenditure - decreasing retutns to expenditure

SWF - efficient solution is where the 2 curves line up

Assumptions

- Assuming only 1 input, expenditure / budget allocations

explain the efficient solution -

B) population groups now differ in ppf, how does this change?

solution Different expenditure for different populations, gradient population l greater than gradient population h,

Need is the difference between

P_l has greater need, although population h has greater efficiency? *Differences in need key to understanding*

Different allocations, marginal benefit to additional expenditure is greater

Different inputs, different health gains. Vesical equity? Different needs treated different treatment? Is this equitable? Based on need for health care

If get resource allocation wrong,

compared to first, once population starts to differ,

C) what tools might payer use to identify 2 different populations in need?

solution - 2nd lecture. Resource allocation formula, use these to try and predict /estimate the PPFs, we want to be able to estimate high need and low need populations appropriate, using **utilisation** data, however there are problems with using use, it is based on access and supply. We want to remove these parts in our prediction of use,

Cost services to be able to compare using one metric

Use some measures of need, proxy, can use a lot of measures of need in regression, removing supply bias, we need measures of supply for this, but these are often *quite poor* - hospital in area and such

Perverse signs - related to unmet needs argument - that if you include measure of sexual orientation or ethnicity, and find negative coefficients, this may be problematic since you can reduce allocations to places that are more diverse - these could be warning that there are access issues, including these perverse (negative) can lead to sustaining these access issues

D) assume the payer has accurately identified need and the providers of healthcare use their budgets efficiently, why might allocation be inefficient?

End up inflating and deflating budgets,

[insert quad diagram]

W* if model perfect, but high needs costs more to deliver health care to this area.

Modelling need and the importance of it - pace of change factor - if come up with new formula, can't have budgets jumping wildly. Be at A*, want to be at W*, will slowly increase areas budget to move there (simultaneously decreasing other areas budget)

Hence, in reality never at w*, by that point, needs will have likely changed and we should update model by then

$\rightarrow$ on the single diagram, it is hard to see total budget, to split between 2, eitehr spend all money on pop 1 or all on pop 2, and moving this will have adverse effect on the other

Question 2

How do 2 population groups with 2 different PPF differ in their budget allocations according to equity aims, and whether they comply with horizontal and or vertical equity

A) equal health gain

solution Assumptions . . .

Increases beypnd efficient solution, gradient means low need population H, the distance between ye and yl is less, $\rightarrow$ less output. In terms of horizontal equity $\rightarrow$ y_e if 2 pops identical, can argue for this. Treat populations with same PPFs the same

Not vertically equitable in terms of health gain, vertical - different treated differently

B) equal budget allocations 2 pops different needs - vertically equitable in health gain - yes but not efficient

C) equal marginal benefit to additional expenditure

The efficient solution - why the DHSC likes this approach - can argue both horizontally and vertically (completely? Can argue) equitable

Question 3 2 populations have different PPFs, the payer aims to attain an equal health gain outcome, show graphically possible, state assumptions made

solution
[PPF fig here]
If this happens, we are stuck. Payer can move to point where tail starts to tail off since most equal health outcome that can be generated. That inefficiency Linking to health policy trilemma, equity, efficiency

2 populations are the same, just critiqued resource allocation. Where is allocation going to be?

Lecture 3: Topics in the supply, regulation and financing of health care

Wed 21 Feb 14:58

Resource Allocation

Supply, regulation and financing of health care

We need systems to pay healthcare providers, but there are multiple way's of doing this, for healthcare to try to improve the healthcare provided to patients.

How do we pay hospitals? Lecture 1
Can we use incentives for the care a doctor may provide - lecture 2

How is healthcare different?

- Most health care is not paid for directly by the consumer
- Instead, providers are reimbursed by a third party payer (or purchaser), which is government, private insurance companies or social insurance funds depending on country
- The supply of and market *for* healthcare is therefore highly regulated

As such, price competition is typically absent, and instead provider compete for patients in non price dimensions - quality, waiting times, complementary services (visiting times)

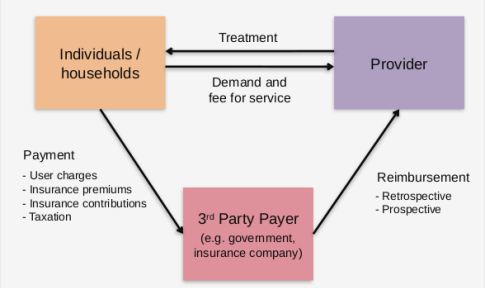

Figure 6: Simplified healthcare financing relationships

Healthcare is a fundamentally different from other types of good

- Demand for healthcare is uncertain - the onset of ill health is difficult to predict, whilst healthcare is often a need and not a want
- Healthcare is an experience good, the quality of the good cannot be known until after consumption. Thus questioning the link between quality of care and demand
- There us a moral understanding that access to health care should be universal

Furthermore, there is *information asymmetry* (Arrow, 1963)

- Between patient and provider - the patient is uncertain about the outcome of 'consuming health care'
- Between payer and provider - the quality of care is often not verifiable to the payer (without expensive monitoring)

2.4 The role of reimbursement in health care

Financial incentives are common in most industries, payers can use reimbursement system to incentive provider behaviour, providing that health care providers are concerned with profits.

There are still financial incentives we need to think about

Challenges in health care reimbursement

There is a tradeoff between cost, access and quality

Where other challenges are specific to health care

1. Upcoming - relating to information asymmetry - want to measure activities hospital are doing as accurately as possible, but the doctors are the ones recording this. So the payer is relying on honesty here, but there are cases where hospital have overstated this to get more funding
2. Supply induced demand - idea being that with information asymmetry, but between patient and provider, provider can over treat patient. Dentists get payer a lot based upon how many treatments they can provide, say a filling when not necessary → unintended incentives we may face.
3. Cream-skimming and dumping patients - more profitable patients you keep, least profitable you get rid of

Role of health economics

One side of health economics is modelling to try to explain what will happen under certain assumptions, on the flip side there is the applied side, was switching from one thing to another the best thing in reality. Theoretical models have their limitations, assumptions may be too strict, and for applied it needs repercussions. Strike a fine line

Context in the UK How to pay hospitals whilst maintaining efficient and quality of care, think of picture.

2.5 Types of reimbursement systems

Characteristics of reimbursement systems Fixed vs Variable

- Fixed - reimbursement doe not change as activity increases or decreases
- Variable - reimbursement increases as activity increases (dentist). Where some systems can be more variable than others, but it depends on the level at which activity is reimbursed (per item or period)

Retrospective vs Prospective

- Retrospective - payer reimburses all costs for treating patient

- Prospective - agree price before hand, any extras hospital provides is not included in the reimbursement
- Close ended - set budget, that is max revenue
- Open ended - no limit on how much hospital can spend

Prospective systems can have variable and fixed aspects, but if retrospective then .

Cost based reimbursement

$$R^c = \sum_{i=1}^{N} [Q_i \cdot c_i] + Z^c$$

This is a relatively easy system to implement, Z is non-activity related revenue say maintenance costs. Unit cost c either set by payer or determined by natural price in market

Features Retrospective, variable, open ended. Varies depending on activity provided
Pros

- Clear incentives to provider to increase activity - good for access
- If c_i includes some profit, for every case treated get some profit on top of that, this creates further incentives
- Incentives to improve quality
- Common in US 60s/70s $\rightarrow$ but led to medical 'arms race' - competing to provide the best health care

Better quality, but costs could spiral
Cons

- Little incentives to reduce costs
- No control over global expenditure
- Adverse incentives = supplier induced demand

Global budgets

Lump sum amount of money, upto hospital if overspend

$$R^g = \sum_{s=1}^{S} B_S + Z^G = \sum_{s=1}^{S} [\overline{Q}_s \cdot p_s] + Z^G$$

Features Prospective, fixed, close-ended
Pros

- Incentives for provider to reduce costs and improve allocative efficiency
- Payer has control over global expenditure (closed ended)

Cons

- Potential adverse impact on quality
- Weak incentives to increase activity
- Providers may exceed target volume of activity
- Adverse incentives - 'cream skimming' - selecting which patients to treat and services to offer

This was the main way of reimbursing for a while, then moved to cost based reimbursement systems after the medical arms race

Prospective Payment Systems

Costs spiralling in US in 80s, but also wanted to increase activity, reduce waiting times. IN England, 'activity based financing'- per unit of care (item to period), tends to be per case now.

For every case treated, get this price. Grouping similar patients together based on diagnosis related groups (DRGs), and then set price pay hospital in say DRG1 equal to the historic how much it costs to treat that group of patients across the country

So take average costs and reimburse all hospitals this. DRG called HRH in England since the population and conditions faced very between England and America.

Normal delivery without CC - complications or co morbidities = £1496, but this may be unfair if paid all delivers one price, patient with CC would have less funding.

$$\text{Linear: } R^A = \sum_{j=1}^{J} [Q_j \cdot \hat{p}_j] \quad \text{Mixed: } R^A = \sum_{j=1}^{J} [Q_j \cdot \hat{p}_j] + \dots \tag{5}$$

Marginal, mixed - weighting
Can set $\alpha = 0$ so that it becomes closed system

2.6 Theory of yardstick competition

Model setup Payer (principal)

- An all knowing payer could directly contract incentives for cost reduction
- However, payers are often unable to monitor and contract cost reductions
- The payer has 2 instrumetns : price and a lump sum transfer

Provider (agent)

- Providers are profit maximising
- Providers have degree of monopoly power = downward-sloping demand curve
- Each provider faces a constant marginal cost

- Possible to reduce marginal cost through a costly fixed cost reduction effort

But how to incentivise cost reduction and increase activity?

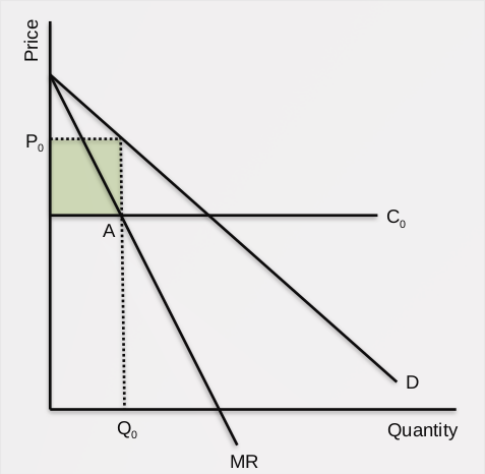

Figure 7: Retrospective Payment

Under PPS

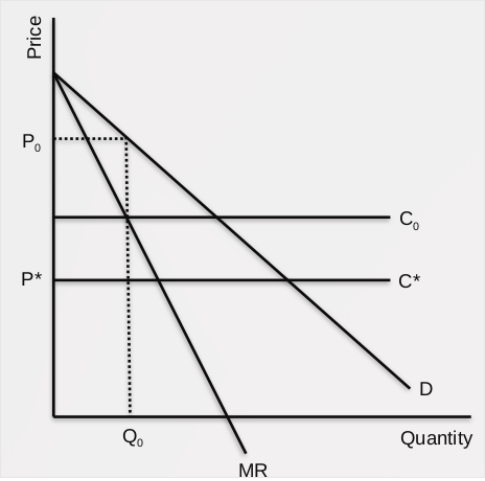

Figure 8

Scenario 1

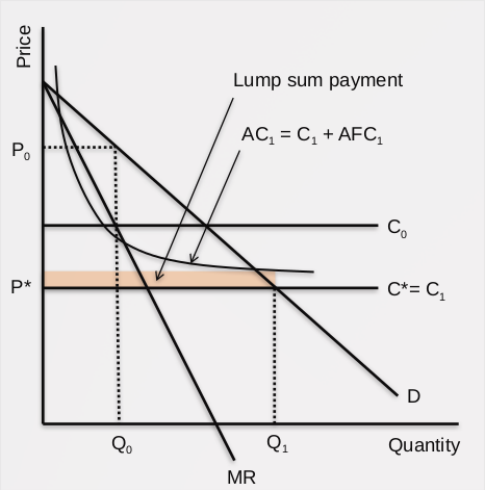

Figure 9

Produce at q p_1 but make loss of orange area since AC is higher than AR, but Schliefer : to incentivise reduction of MC, we can pay lump sum 'break even' payment. Make 0 profit but produce at Q_1

Reduced marginal cost to that of everybody else, if we keep investing in technology

Scenario 2

We can move marginal cost to C_2, they invest more to move marginal cost down.

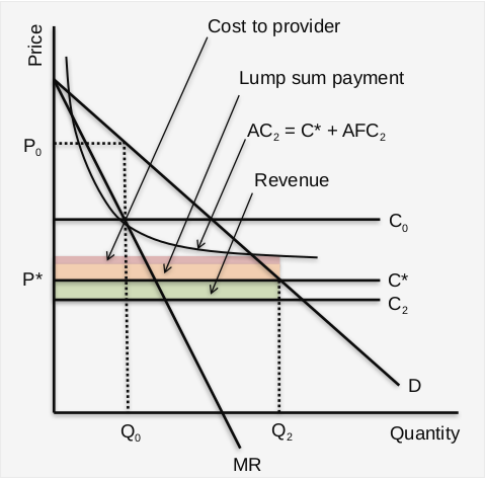

Figure 10

Trading off the size of the rectangles

Would the payer stop making profit, if didn't pay orange then hospital making loss of red plus orange, then overall loss since red and orange greater than green. But key is that since setting price equal to marginal cost of all firms in market, the BE payment 'differs' based upon hospitals starting point, if producing at c* already, get no BE sum, intuitively.

Even with break even payment, still incentivised to reduce costs.

Optimal solution involves lump sum transfer, but if this becomes tricky to do (in paper), we can set price based upon some sort of average cost pricing - making p* higher because we also compensate for lump sum transfer in price that set

That is average cost of treating DRG group in the past,

Extensions If lump sum transfer not possible Or, heterogeneous firms Or, in London or not (in the model)

Pros

- Stronger incentives to reduce costs and improve efficiency
- Incentives to increase activity (depending on how we define this)

Cons

- Potential adverse impact on quality (or activity) say intensity (quality) of services - may negatively impact, if not paid to keep patient. May release prenatally if not keeping in after couple days
- Open-ended - limited control over global spending
- Unintended consequences - information assymetry - hospital is one to decide whether CC

Payer is reliant on physician's judgement, this could have a knock-on effect for those not upcoding (since others have cheated the system). Patient reported CC vs hospital reported CC, comparing over time since noisy - patient reported remained flat whilst hospital reported increased over time, is there some reason for this? But really can argue due to upcoding, or that in the past patients with CC were undercoded

One hospital may be more efficient, prioritising different CC. But remember triangle between cost, access and quality

Trade-offs between reimbursement systems All have advs and disadvs, there is so much variations since different systems require different things at different points in time

Differences between countries

There has been movement away from historical budget (global). Looking at DRG (prospective) based system, the amount of money reimbursed varies massively, comparing Austria $\sim 90\%$ with Estonia 39%.

Additional payments provide incentives

At the top we have DRG system developed in America, in England we have healthcare resource groups, highlighting PPS are different across systems.

It is common and often case that PPS aren't fully prospective, we see variations in what we see in hospitals depending on primary diagnosis, secondary diagnosis, CC, treatment intensity and lengths of stay and decisions hospitals make, that can influence revenue.

Essentially, there is a prospective component and a cost reimbursement component, finding they are much less prospective than is assumed.

Reimbursement systems in England

2003 - Payment by results tariff system first introduced

- Prospective payment system to reimburse hospital care
- System in which autonomous provides competed to deliver care

2020 - COVID-19 led to the suspension of PbR system entirely

- The NHS reconfigured services to deal with the pandemic
- Faced significant new costs that were hard to precisely anticipate

Now, there is a movement towards blended system (fixed, variable and quality payments)

- NHS is increasingly emphasises collaboration over competition
- There is a mismatch between policy intentions and payment incentives

2.7 Evidence on reimbursement systems

Limitations of previous theoretical model Theory of yardstick competition is useful to illustrate rational behind PPS, but it doesn't consider quality of care, just quantity and costs. Assumed profit maximising

Ellis & McGuire (1986)

- Developed a theoretical model to derive optimal reimbursement system
- When physiciajns also care about the benefit to the patient (benevolent)
- Using a cost-sharing perspsctive

Model setup

- Single Patient (principal) - Assume patient is fully insured (no out of pocket costs), they will accept the level of treatment prescribed.
- Essentially that there is optimal level of benefit for the patient q* Hospital (principal) - Hospital profit maximise (think of manager, profitable, don't shut down (profit function of revenue and cost))
- Physician (agent) - decision maker - decided quantity of services, derive utility from hospital profit. Compensation is independent from treatment costs

Physician indifference curves - an inverse flip of patient benefit curve, as provide more quantity, provide more treatments but profits drop. There exists best possible care at q*

The shape of ID curve is MRS = rate at which physician willing to trade 1$ of hospital profit for 1$ of patient benefit. We assume MRS is constamt, that ID curves are parallel.

2 types of Physicians Perfect agency
Imperfect agency

Findings Investigates optimal solution under reimbursement systems

Scenario 1 : under pure cost based reimbursement

- Hospital revenue = cost, profits always 0
- Quantity of services therefore does not affect hospital profits
- Implications for physicians behaviour

Scenario 2 : under imperfect cost-based reimbursement

- Not always the case that revenue = cost
  - Providers have some degree of monopoly power to influence price
  - Payer has imperfect information about true cost of services
  - Payer builds in profit margins into payments

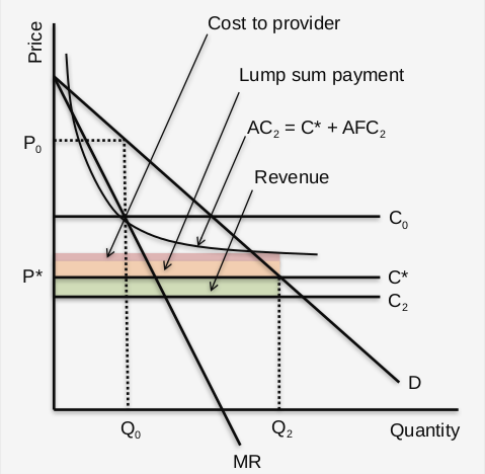

Figure 11

- Profits greater than 0
- Slope of profit line is equal to difference between marginal revenue and marginal cost
- Physician chooses quantity of services q_2 to maximise utility

Scenario 3 : Under PPS (perfect agency)

- Set q = 0, profit = expected payment (single patient)

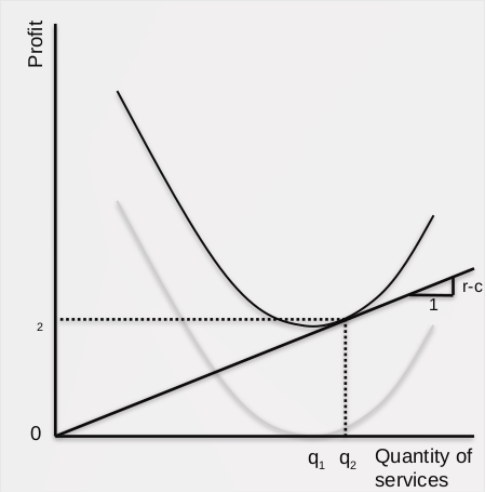

Figure 12

Quantity of services q_1 pure cost based system, we see a drop in quantity of services from here and an increase in profit, optimal solution is worse

Prospective payment price P is based on historical, across everyone in market. Over time price is calibrated and lowered to reflect lower costs hospitals now providing. Profit line intersects IC. But notably because indifference curves are vertically parallel q_3 stays the same

Scenario 4 : (imperfect agent) Indifference curve is a lot shallower, relative to perfect agent curve p_3, provide lower quantity, intensity of services q_4. But in doing so, benefit of q_4 is worse than benefit q_3

Essentially,

Mixed payment system Still fixed prospective payment for treating payment but also cost-based payment that is fraction of cost, reimburse some of cost. Fixed prospective

Set prospective payment

Physician has lower utility, but at q_5

Even if doctors do care bit more about profit, can still devise system where they produce as if they equally valued patient benefit and profits.

This has some real world values, looking at spain only 20% of hospital fee reimbursed but also have FFS. May be more private hospitals for example, reducing the amount of prospective payments

In summary, **Ellis & McGuire (1986)** formalise how different payment systems can yield different results.

Models give idea of what may to expect in real life - but are these assumptions realistic?

Ellis and McGuire better in this respect, incorporating patient benefit, but still need to look at empirical evidence - evaluating adoption of other health care systems.

4 hour A&E target - target setting, can we translate this into salary?

Recap

- Ellis and McGuire - best scenario with imperfect agent is mixed situation

- Theoretical models are good but not the be all and end all since we make a lot of assumptions → empirics are needed

Empirical Evidence on Reimbursement systems

Numerous empirical papers assessing the impact of reimbursement on

- Activity measures
- Health care costs and expenditure
- Quality measures (proxies)
- Adverse impacts (upcoding, shifting of patients)

Different approaches to do so

- Most studies exploit introduction of new reimbursement system. Say a before and after comparison, and comparing changes with a control group
- Others exploit changes within payment systems - say the extent to which payments become more or less prospective

Exercise 1. Moreno-Serra & Wagstaff (2010) Relating back to the grey figure Using country level data from 1990 to 2004, comparing budgets for healthcare systems → Say Estonia from global budget to cost based reimbursement system from 2002, compare this to Turkey for example Look at the switch from global budget to prospective payment system too Setting is that these countries were moving away from communism, looking at multiple outcome measures (hospital activity - admissions, length of stay, bed, bed occupancy. Public private hospital spending)

Fundamentally, we cannot observe say Estonia in 1992 that can say what would have happened has the system not been introduced As a second best we use the countries that didn't change as a control group, for those that switched systems. **Simple DiD**

$$Y_{it} = \alpha + \sigma \ \text{treat}_i \ + \delta \ \text{post}_t \ + c\beta D_{it} + X_{it}\gamma + e_{it}$$

Where y_{it} is any measure of hospital performance (say admissions), i is country, t is time

$$D_{it} = \ \text{treat}_i \cdot \ \text{post}_t$$
$$X_{it} = \ \text{observable time varying factors}$$

Where we condition on time varying factors $y|X_{it}$ Pre : post $= 0$, $D_{it} = 0$ here we have just α Counterfactual If no change in post $\delta post_i = 0$ - in this case didn't need counterfactual In pre $post = 0$ so β still switched off, but treat is $\alpha + \sigma$, then in post the difference difference is β

Their Model :

$$Y_{it} = \beta_1 FFS_{it} + \beta_2 PPS_{it} + X_{it}\gamma + \alpha_i + \theta_t + e_{it}$$

This model allows for s different starting point along y axis for every different country 3 country Example, 1 global budget, 1 switches to FFS, 1 prospective

$\alpha_{gb} < \alpha_{FFS} < \alpha_{PPS}$ - on X axis. Global budgets to begin with Country fixed effects α_i control for 'base level differences' Year level FF control for time level differences (say shocks) across time. Together = TWFE

Model Assumptions

Parallel trends

' in the absence of treatment, the trends in the outcome for treated units (conditional on observable time varying factors) would have followed the same trends as observed for the control units'

Potential violations (may fail if non-parallel trends)

- Non-parallel trends, when
    1. Unobservable tie varying factors differ between treatment and control group
    2. Treatment and control group affected by different exogenous shocks over time
    3. Natural ceiling / floor effects affect treatment and control group differently
- Selecting into treatment (reverse causality) - countries switching systems may be switching into a system based on outcome (global budgets not working in first place)
    - Units may self select into treatment based on outcome
- Spillover effects between treatment and control group - if looking at treated and not within hospitals, there may be some effect here we need to think about
    - Learning or substitution effects, or joint production or migration

Comparing Estonia with turkey, something could change in turkey that doesn't in Estonia after 1992 that could have an effect on mortality and hence invalidate the control group for the analysis.

This paper runs a DiD model, requiring the parallel trends assumption, if we try to relax this potential violation by allowing trends to differ.

2nd model : random trend model or trend adjusted DID now allows for different underlying trends between countries to begin with and factor in these trends when devising the counterfactual, running time variable allows for linear trends in one country.

Extends base model to control for assumption that all countries face same trend over time, but relying on extrapolation of linear trend - assuming linearity

Differential trends model - for all countries that switched to PPS and all they switched to FFS - allow for unique - control for non linear time trends across countries that switched. Random trends relaxes parallel trends assumption.

Importantly, they test parallel trends in pre-policy periods and check whether statistically parallel to each other

Concerns about reverse causality - countries that switch into might be fundamentally different from those that don't. Test this with model

Including lead dummies is almost like a placebo test - for whether they observe a difference in the data before the change happened - thus suggesting reverse causality may be an issue.

Hypothesis - positive effect on admissions activity, but even larger effect for PPS - under cost based - billed for item of service so treat more intensively but PPS may be encouraged to (DRG at admission level) treat less intensively to decrease cost

Results - find significant increase Note since country level analysis, we require country-level data

Testing assumptions

- Chi squared - if significant use model
- Tests are looking to see whether trends in pre policy period are different from each other
- At least in pre period, can argue trends are parallel

- Find increase in STR in diabetes - may have been some selection for treatment - but only one specific outcome (diabetes) so could be that controls included in the model are controlling for decision to switch systems

Countries implement changes at different times - differential time as a treatment - simple model may be biased under differential treatment timings

External Validity - only looks at global budget to FFS or PPS, so doesn't consider blended systems, thus questioning the nuance.

Lecture 4: Topics in the supply, regulation and financing of healthcare

Wed 28 Feb 14:58

2.8 Rationale for incentivising quality of healthcare

Patient demand does not always reflect quality

- Information asymmetry between patient and provider - patient is uncertain about the outcome of 'consuming healthcare' or may not be aware if all relevant aspects of quality
- Health care is an experience good - the quality of the good cannot be known until after consumption, thus questioning the link between quality of care and demand

Though, there may be limited incentives to competed for patients, this may be due to

- Few hospitals/practices in an area (a degree of monopoly power)
- Not all payers allow free choice of provider

Barriers to quality Practitioners may base decisions on outdated information and practice norms
Healthcare providers may lack the incentives to respond to new advancements
Healthcare providers may perceive other goals as more important to pursue

Quality Improvement Initiatives

- Various different initiatives, *integrating* health care systems and initiatives. Hospitals were previously separate from primary care, social care etc.
- Payer is often

Quality incentive schemes
A quality incentive scheme is an intervention that uses incentives to reward or penalise the performance of healthcare providers based on a set of measurable quality indicators

Defining Quality

6 domains of healthcare quality

1. Safe - avoiding harm to patients from the care that is intended to help them
2. Timely - reducing waits and sometimes harmful delays
3. Effective - providing services based on scientific knowledge to all who could benefit and refraining from providing services to those not likely to benefit
4. Efficient - avoiding waste, including waste of equipment, supplies and effort

5. Equitable - is care provided same across different groups of people (protected characteristics) (or even coastal towns receiving lessor healthcare)
6. Patient-centred - providing care that is respectful and responsive to individual patient preferences, needs, and values

Ultiamtely need to consider all deimensions of quality and to categorise, if we are going to incentive effectively

But we can categorise them into

1. At the individual level (1, 2, 3, 6) -
2. At the population level (4, 5)

Donabedian - Conceptualisation of quality

- In measuring or incentivising structure of care, how does a facility ultimately care? It is the activities carried out rather than the facility itself? Say certain treatment, for recommended best practices
- But how can we measure everything a doctor does?
- To get around this we can incentivise patient outcomes instead, say 30 day stroke mortality - incentivising CD scans after stroke (is a best practice)

Public Reporting

To decrease information asymmetry, so we know where to go for best quality care such that places have to start competing on care to get people to start registering there.

Like exam scores, perceived being monitored or assessed by colleagues, to incentivise.

CQC Ratings etc

Target settings How well a provider is performing, 4 hour A&E waiting target. This will create incentives to hit this since they will be granted with greater autonomy and financial incentives as a incentive.

Say promotion or job loss incentives for staff within hospital.

Can provide common mission - to aim towards. *Targets and Terror* is an example where the consequences could be large for a poorly performing management $\rightarrow$ managers losing jobs etc

Pay for performance Provided the hospital/doctor is not fully benevolent, a financial reward or penalty for performance of providers

Quality of Outcomes Framework

Different dimensions of quality - % of asthma patients who have had review recently - a process measure

Most are process measures, some outcome measures $\rightarrow$ more indicators / measures = more money ($\sim$ 20% of income). Linked with public reporting

But the scheme, since doctors have relative autonomy they have some discretion over the criteria they can set it to some degree. But creates income incentive, especially due to owning mechanisms of practices.

Processes, structures, outcomes Boils down to **what** to incentive - no scheme can target everything, and also applicable for *who* to incentive, individuals, teams, wards, organisation

How to measure performance? Absolute say rank of mortality rate in country (30 day). Or say relative performance or performance improvements, it maybe unfair to say 5% mortality rate level for the whole country.

Who is monitoring data? If it is self reported - is there potential for gaming or unintended consequences?

How to incentivise?

- Supporting levers - practices may not know if not collected data before
- Advance in quality scheme - incentivising 23 hospitals in Manchester to participate in financial quality dimensions (voluntary - all participated)
- Say if was reverse to penalise, like opt out - thus linking to how we frame incentives
- Types of payments - payment structure - linear, target payment, tournament
- Bonuses

P4P has variation in how incentive shames are designed, comparing effects across schemes can result in differences and whether we can really compare them

Spillover effects

- Health care providers are often responsible for
  - Multiple patients with different conditions
  - Multiple take on day to day basis

  Holmström & Milgrom's (1991)
  - Treating a patient or 'tasks' may be substitutes or complements - this could be driven by various things - joint factors in production - incentivising improvements in treatments of stroke may lead to investment that also benefits other conditions
  - On the flip side, there may be effort / resource substitution

Gaming Schemes could also create adverse incentives to 'game' the system

- Exploiting loopholes in design or incentive schemes
- Providing that reward from gaming outweighs the risk of detection and penalty
- Eg selection of payments - cream skimming of patients where it is easier to meet incentive targets , dumping of patients where it is more difficult to meet incentive target
- Changes in coding practices - it is sometimes possible to increase reward by implying changing coding practices. It is often nominal change that does not affect patient care It is only when incentive rewards depend on provider information

Evidence on Quality incentive schemes

Exercise 2. Gaughan et al. 2019 Incentivising same-day discharges In England there is payment by results, for certain HRGs (knee replacement etc), the payment a hospital received weren't based on average payment but built in the PPS to incentive performance of hospitals To define a day case as a period of care in which they essentially didn't stay overnight → evidence to say this is safer 60% should be sent home in practice it is 19%

PPS - before this scheme was introduced, hospital was reimbursed average case of that treatment regardless of day case or not, thus there is a financial incentive to treat as day case - but maybe this is to do with logistics of this - day case hospital rooms etc. But this scheme increased price difference between day case and night, in some cases 66% If patient stayed overnight, gets paid less than before the scheme, but if same day bayed more Study looks at hospital level data, 157 planned and 34 recommended conditions in which 32 conditions are targeted