



Santiago, 28jan15

Risk equalization a conceptual framework

*Seminar 2 organized by
the Asociación de ISAPREs*

Wynand PMM van de Ven
professor of health insurance
Erasmus University Rotterdam
vandeven@bmg.eur.nl



Agenda

1. Why risk equalization (RE)?
2. Which RE-formula?
3. Criteria for choosing among RE-models;
4. Potential risk adjusters;
5. Risk sharing;
6. Premium rate restrictions;
7. Risk selection;
8. The preferred strategy;
9. Evaluation measures of RE-models;
10. Prospective versus retrospective RE.



1. *WHY risk equalization?*

Starting point: a free, unregulated competitive health insurance market.

The focus is on affordable *individual* health insurance, irrespective whether this is in the context of a voluntary or mandatory health insurance.



Risk rating and risk selection

- In a free competitive insurance market insurers have to break even, in expectation, on each contract either by adjusting the premium to the consumer's risk (*risk-adjusted premiums*) or by adjusting the accepted risk to the premium (*risk selection*).
- The premium differences can easily go up to a factor 1,000.



Risk factors for health insurance

- Age/gender;
- Health (e.g. yes/no AIDS, cancer);
- Yes/no disabled;
- Health habits (smoking, drinking, exercising);
- Prior costs & prior utilization (hospitalization, prescription drugs);
- Occupation, socio-economic status, region;
- Duration of coverage;
- Level of chosen deductible.



Examples of selection

- Selection by insurers:
 - Denial of coverage;
 - Exclusion of preexisting medical conditions;
 - Waiting periods;
 - No renewal of contract.
- Selection by consumers:
 - Within each risk group the high-risks are more inclined to buy insurance than the low-risks.
- Market segmentation via product differentiation.



No long term insurance

- There is no market for insurance against the risk of becoming a high risk in the future.
- In a free market the premium for an insured who develops AIDS, cancer or heart disease has to be raised in the next contract period. Or the insurer may not renew the contract.



Conclusion

Without any external intervention individual health insurance may be unaffordable for the (low-income) high risks in a competitive insurance market.



Affordable health insurance

Question: *How can we make individual health insurance affordable for high-risk individuals in a competitive insurance market?*

Answer: **Subsidies.**

Question: What is the best form of subsidies?



Several types of subsidies

- Risk-adjusted subsidies;
- Premium-adjusted subsidies;
- Means-tested (premium/risk-adjusted) subsidies;
- Tax deductibles/credits;
- Excess loss compensations to insurers ('risk sharing').



Premium-adjusted subsidies

Premium-adjusted subsidies are not optimal:

1. they reduce the incentive for high-risk consumers to shop around for the lowest premium;
2. they induce over-insurance resulting in additional moral hazard;
3. they create a misallocation of subsidies.



Risk-adjusted subsidies

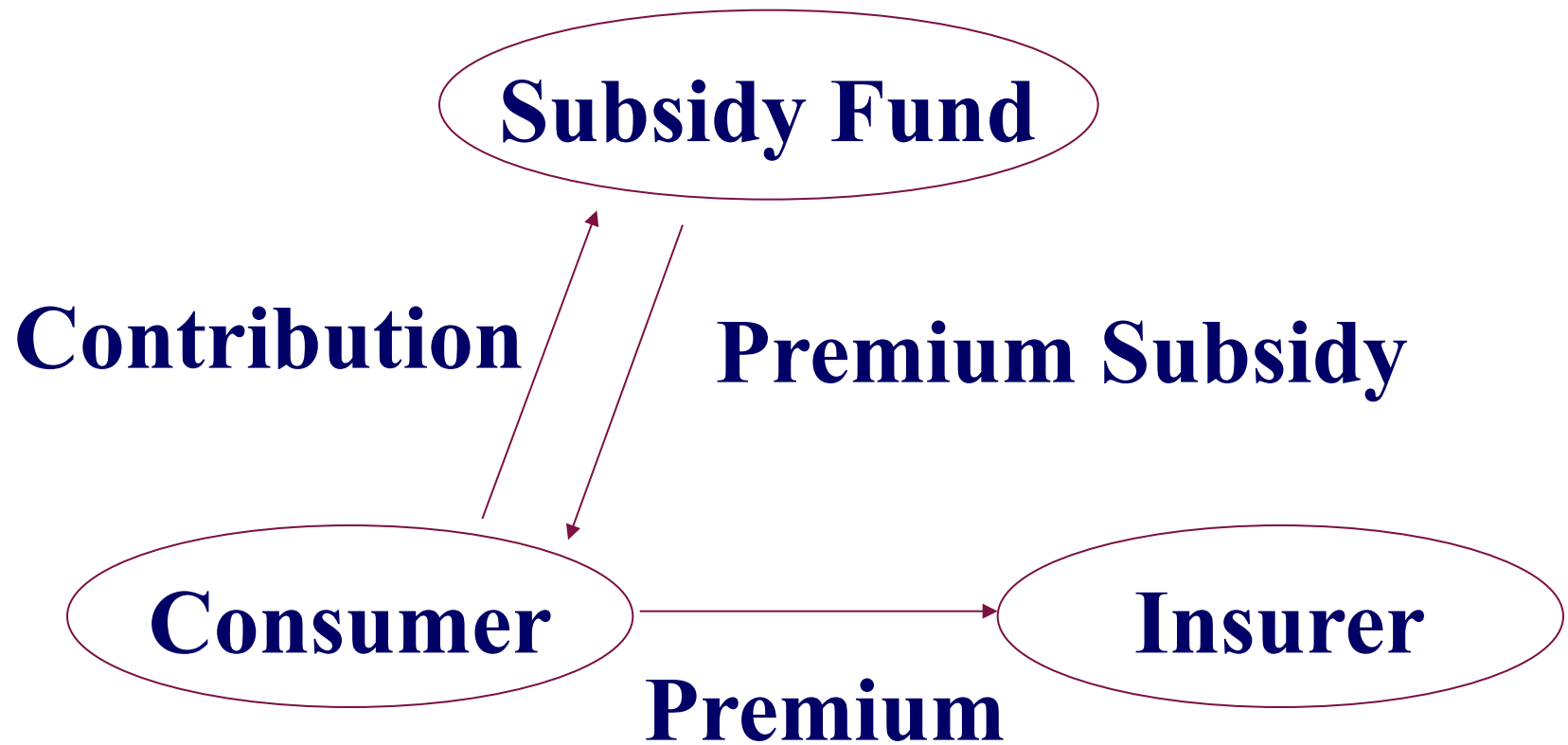
An effective way to deal with these problems is to have *risk-adjusted* subsidies rather than premium-adjusted subsidies.

Risk-adjusted premium subsidies are based on the risk factors that insurers use, such as age and health status.

Risk-adjusted subsidies do not distort the market.



Premium subsidies (Modality A)





Risk Equalization

All countries that apply risk-adjusted subsidies give the subsidy to the insurer who deducts it from the premium.

In this way the different *risks* that consumers represent for the insurer are *equalized*.

We refer to this as *Risk Equalization*.



Risk Equalization

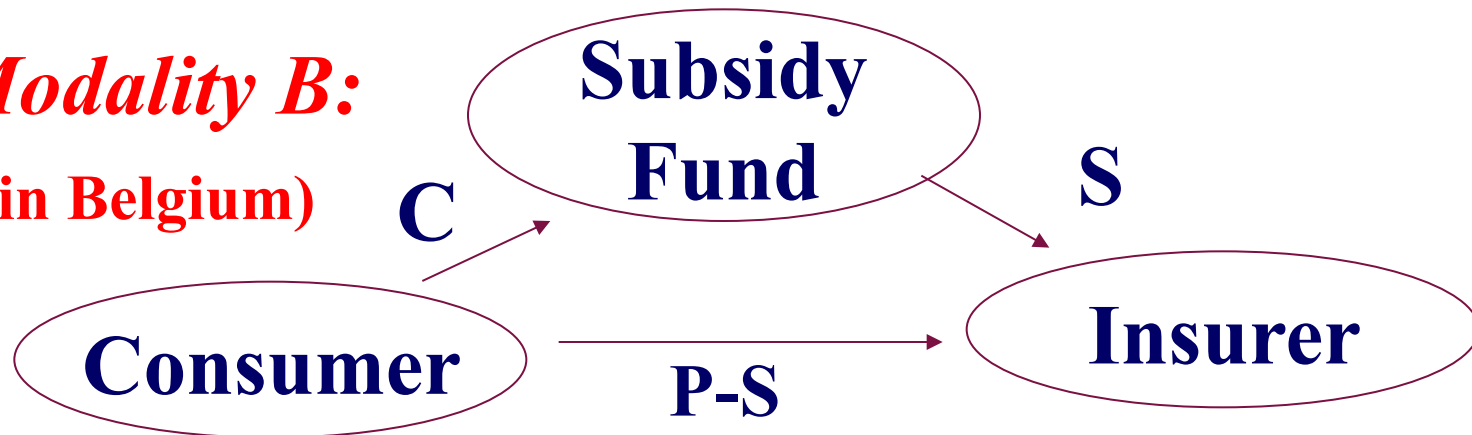
Two modalities of risk equalization are observed:

- The consumer pays the contribution C directly to the Subsidy Fund (*Modality B*);
- The consumer pays the contribution C to the Subsidy Fund *via* the insurer (*Modality C*).

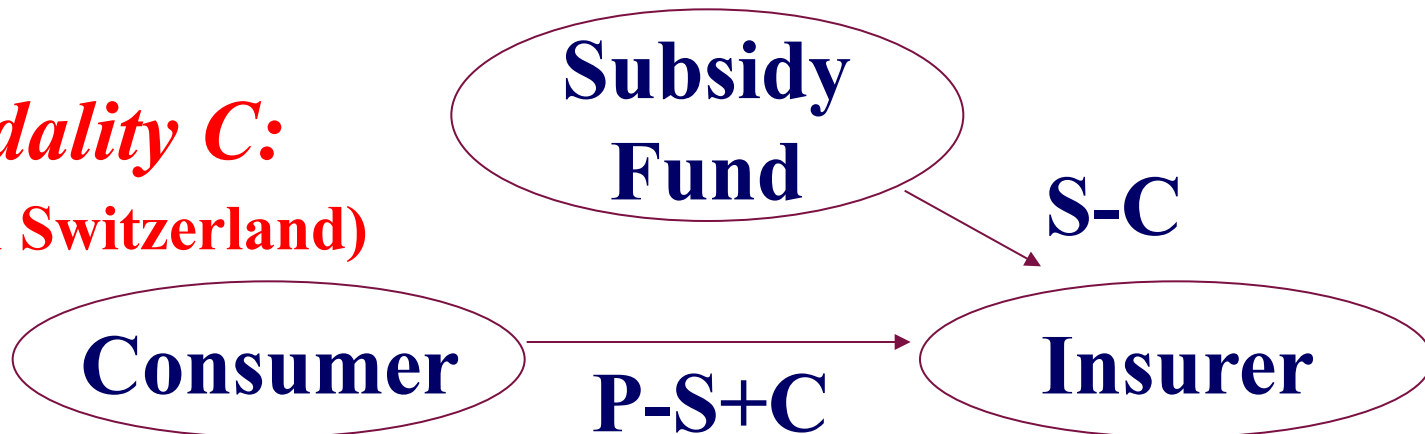


Modalities of risk equalization

Modality B:
(e.g. in Belgium)



Modality C:
(e.g. in Switzerland)



C=Contribution; S=Subsidy; P=Premium



Why risk equalization?

- Answer: to increase the affordability of health insurance for high-risk consumers.
- Risk equalization can be considered as a risk-adjusted subsidy for high-risk consumers, via the insurer.
- Equalization payments are explicit subsidies.

NB: So far **NO assumptions** about **premium rate restrictions!!** (only from agenda point 6)



2. *Which equalization formula?*

Question: on what costs should the risk-adjusted equalization payments (= premium subsidies) be based?

Answer: the ‘acceptable costs’.



Acceptable Costs

Acceptable Costs =

the cost of the set of services and intensity of treatment that the regulator has chosen to be acceptable to be subsidized.

For example: the costs generated in delivering a specified basic benefits package containing only medically necessary and cost-effective care.



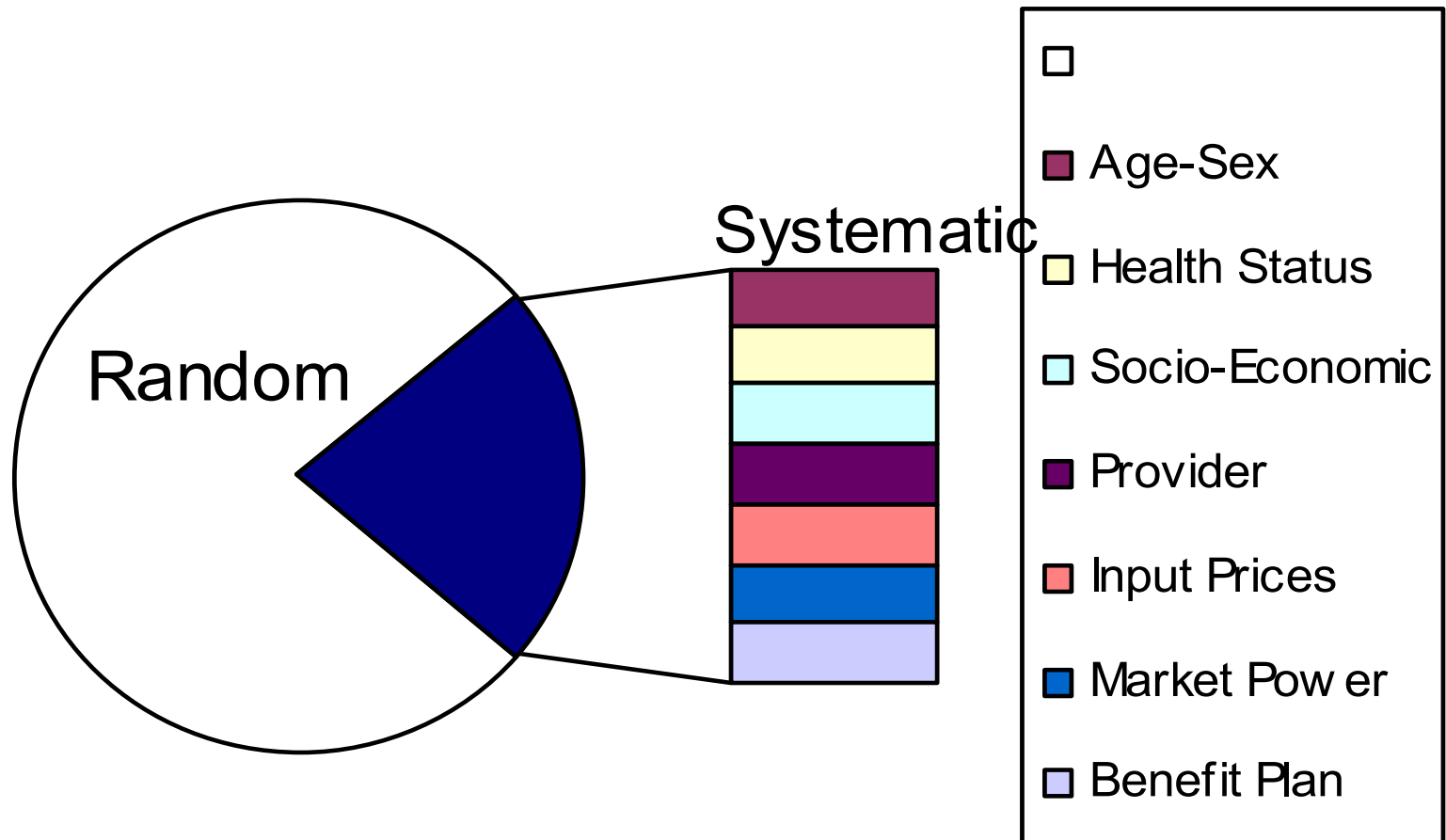
Acceptable costs

Ideally: only medically necessary and cost-effective care.

Because the cost level of such a benefits package is hard to determine, in practice subsidies are based on observed expenses rather than needs-based costs.



Factors Explaining Variation in Health Spending





Observed expenses

1. Which benefits package?
2. For which risk factors should the subsidy be adjusted?



S-type and N-type risk factors

Assume that the full set of risk factors that predict variations in health spending across individuals can be divided into two subsets:

1. Those factors for which solidarity is desired, the **S-type** risk factors;
2. And those factors for which solidarity is not desired, the **N-type** risk factors.



Goal of risk adjustment models

The goal of risk adjustment models is to calculate the best estimate of the acceptable costs for each individual.

The risk-adjusted equalization payment is a function of the acceptable costs.



3. *Criteria for choosing among RE-models*

- *Appropriateness of incentives:*
 - Incentives for efficiency;
 - Incentives for health-improving activities;
 - No incentives to distort information to the regulator;
 - (No incentives for selection;)
- *Fairness:*
 - No compensation for N-type risk factors;
 - No compensation for risk factors which reflect underutilization;
 - Predictive value.
- *Feasibility.*

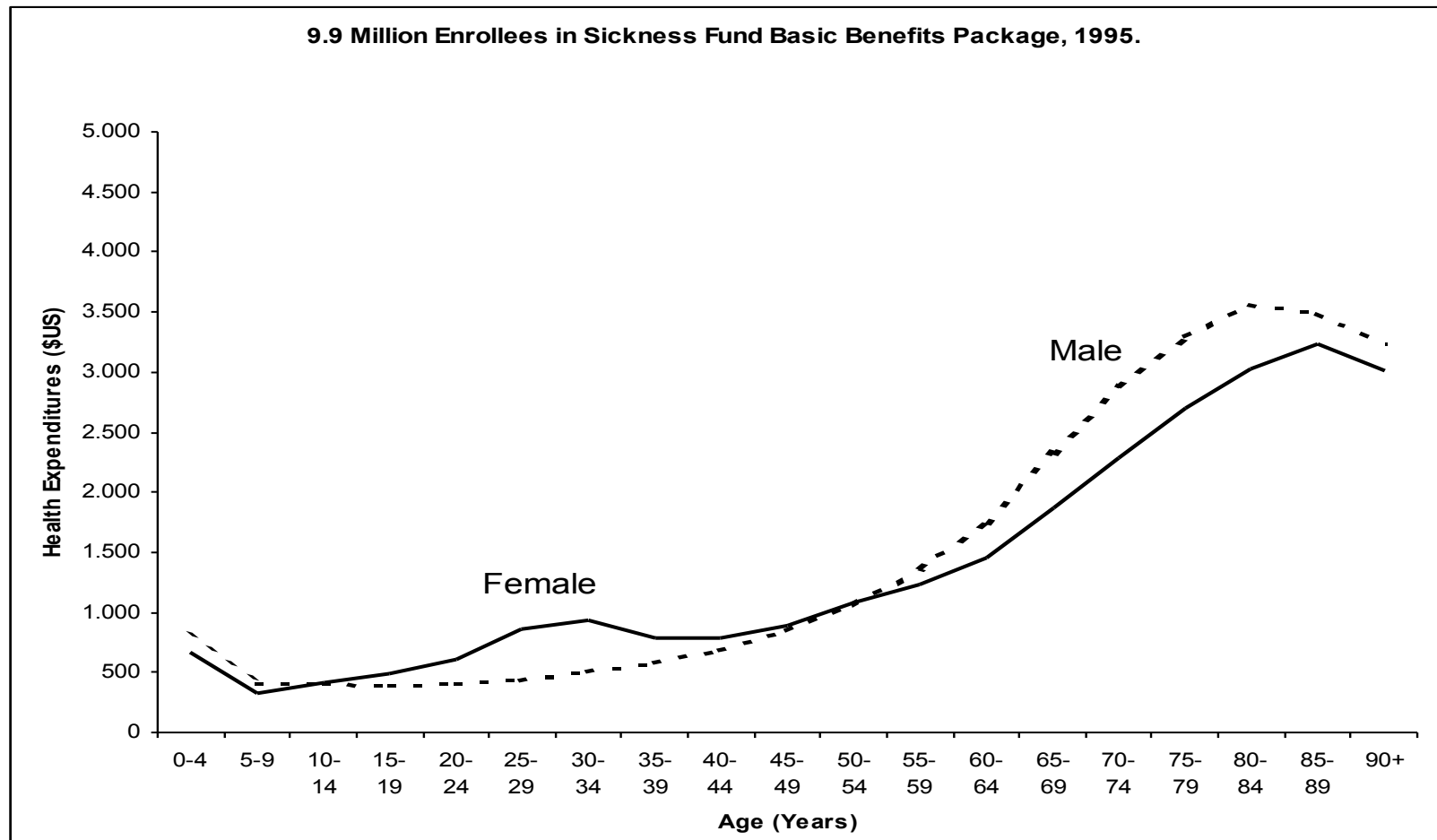


4. *Potential risk adjusters*

- Age and gender;
- Prior-year expenditures;
- Diagnosis-based risk adjustment;
- Information derived from prescription drugs;
- Self-reported health information;
- Mortality;
- Disability status;
- Geography.



Health Spending by Gender and Age in the Netherlands





Are age and gender sufficient?

NO.

If the equalization payments are based on only age and gender, then an insurer will, roughly speaking:

- be undercompensated by about 50% for the 10% of the population with the worst health status;
- be overcompensated by about 50% for the healthiest half of the population.



Prior utilization

- Best single predictor of an individual's future health expenditures;
- Two major criticisms:
 1. No regard is paid to the appropriateness of the care;
 2. Average relationship between prior use and subsequent cost.

Solution: Diagnosis-based risk adjustment.



Diagnosis-based RA: 3 leading models

1. Ambulatory Care Groups (ACG),

Johns Hopkins,
Jonathan Weiner and colleagues (1991, 1996);

2. Diagnostic Cost Groups (DCG),

Boston University and Health Economics Research,
Arlene Ash, Randall Ellis, Gregory Pope and
colleagues (1998a, 1998b, 1999);

3. Disability Payment System (DPS),

University of San Diego and Boston University,
Richard Kronick and Anthony Dreyfus (1996).



Common features diagnosis-based RA

- Diagnoses-predicted healthcare expenses;
- Identify subsets of diagnoses that predict resource use;
- Use only claims from professionally trained clinicians;
- Impose restrictions on how information is used;
- Use regressions to estimate multivariate models;
- Much more predictive than demographic only models.



Diagnostic cost groups (DCGs)

The essence of DCGs lies in the allocation of people to a restricted number of groups according to the diseases diagnosed during previous hospitalizations and incorporating this information in the risk-adjusted premium subsidy.



DCGs developed by Arlene Ash et al.

1. Classify diagnoses into 78 clinically homogeneous groups;
2. Further clustering into 9 groups according to similarities in the future costs;
3. Some diagnoses were downgraded to group 0 - no hospitalization - because of high discretionary in decision to hospitalize.



Rationale for multi-year DCGs

- A serious hospitalization might induce predictably above-average expenditures over a series of years;
- Multi-year DCGs may reduce the undercompensation for chronically ill patients who have not been hospitalized in the last year.

(Lamers and Van Vliet, 1996)



Information from prescription drugs

- Pharmacy Cost Groups (PCGs);
- Potential problem: the additional subsidy for a PCG-classified enrollee (far) exceeds the costs of the prescribed drugs that form the basis for PCG-assignment.
- Solutions:
 - Partial compensation;
 - Exclude certain PCGs;
 - Restrict compensation to high-cost persons only;
 - Monitoring.

(Lamers and Van Vliet, 2001)



Pharmacy Costs Groups (PCGs)

- An outpatient morbidity measure based on information about chronic conditions deduced from the use of prescribed drugs.
- Extending the demographic model with PCGs (8 groups) doubled the R²-value.



Pharmacy Cost Groups (PCGs)

- Potential problem:
 - the additional subsidy for a PCG-classified enrollee (far) exceeds the costs of the prescribed drugs that form the basis for PCG-assignment;
 - manipulation;
- Solutions:
 - partial compensation;
 - exclude certain PCGs;
 - restrict compensation to high-cost persons only;
 - Monitoring.

(Lamers and Van Vliet, 2001)



Self-reported health information

Advantages over diagnosis-based systems:

- Most information is not contingent on having a contact with a medical provider;
- No prior history of claims or enrollment is needed;
- Measurement of consumer need uniformly across insurers;
- Adjustment for socioeconomic (lifestyle, taste, employment) factors.



Disadvantages self-reported health

- Relatively costly;
- Low response rate;
- Selective response;
- Relatively small samples;
- Confidentiality and accuracy concerns (e.g. HIV/AIDS or mental illness).



Mortality

- Most of the excess costs associated with dying are unpredictable;
- Practical concerns like reliability, validity, availability, manipulation, auditing and privacy of data;
- Inappropriate incentives for insurers (“mortal hazard”)?

(Van Vliet and Lamers, 1998)



Disability and functional health status

- Reflect someone's ability to perform various activities of daily living and the degree of infirmity;
- Relatively good predictors of future expenditures;
- Roughly speaking: twice as much health care expenditures;
- Newhouse (1986): an almost ideal adjuster.



Additional 'promising' risk factors

- Indicator of mental illness;
- Yes / no voluntary deductible chosen;
- Multiyear high expenses;
- Multiyear low expenses;
- Interaction between health & age;
- Interaction between other risk adjusters;
- . . . , , . . .



Choice of risk factors

- If health is taken into account sufficiently, for instance by age/sex/PCGs/DCGs, **are self-employed and region/zip-code acceptable risk factors?**
- One could argue that then any systematic difference in costs between employed and self-employed people should not be compensated via the risk-adjusted premium subsidies, but should be reflected in a differentiation of the premium contribution.



Additional subsidies

To the extent that some high-risk consumers are insufficiently subsidized, the risk-adjusted equalization payments can be complemented by

1. premium-based subsidies or by
2. ex-post cost-based compensations to the insurers by the sponsor (risk sharing).

→ **tradeoff affordability - efficiency.**



5. *Risk sharing*

Imperfect risk equalization may be complemented with a system of **risk sharing** between the regulator and the insurers.

Risk sharing implies that the insurers are retrospectively reimbursed by the regulator for some of the acceptable costs of some of their members.

→ **tradeoff affordability - efficiency.**



Forms of risk-sharing

	Reimbursement rate	Threshold	Ex-ante percentage of members to whom the risk sharing applies
Proportional risk sharing	r	0	100
Outlier risk sharing	r	T	100
Risk sharing for high risks	r	T	p



Other forms of risk sharing

- **Condition-specific risk sharing:**
the regulator retrospectively reimburses the insurers some prospectively determined payments dependent on the occurrence of some medical conditions (e.g. maternity care).
- **Bandwidth:**
each insurer's average 'profit/loss-per-insured' outside a bandwidth is shared with the risk equalization fund.



Reinsurance versus risk sharing

Reinsurance requires a *risk-adjusted* premium to the reinsurer.

Hence, reinsurance does *not reduce* the high-risks premium.

Risk Sharing is a “mandatory reinsurance program with regulated reinsurance premiums”.



Financing the retrospective payments

1. Reduce the equalization payments;
2. Mandatory payments from the insurers;
3. Higher solidarity contributions and lower premiums.



Still an affordability problem?

To the extent that there still is an affordability problem, the regulator may consider to require premium rate restrictions.

NOTE: So far we did not assume any premium rate restrictions!



6. *Premium rate restrictions*

- **Premium rate restrictions**, e.g.
 - Community rating (by class);
 - A ban on certain rating factors;
 - Rate-banding: for certain risk factors, or for the total premium;
 - A maximum premium;
 - All premiums must be zero.
- **Open enrollment** (alternatively, FONASA is the fall back option).



Premium rate restrictions

- **Goal:** to create implicit cross-subsidies from the low-risks to the high-risks.
- **Effect:** such pooling of people with different risks creates substantial predictable profits and losses for subgroups, and thereby creates incentives for risk selection.

→ **Tradeoff affordability – selection.**



7. Risk selection

- The goal of premium rate restrictions: **pooling of heterogeneous risks** (i.e. risk-solidarity: all pay the same premium);
- Risk selection: actions by consumers or insurers to exploit the unpriced risk heterogeneity and **break the pooling arrangements** (Newhouse, 1996, JEL).
- → **Selection** is always a threat to solidarity, and even more!!



Forms of selection (despite OE)

- Design of benefits package,
- selective contracting,
- selected managed care techniques;
- selective advertising;
- the design of supplementary health insurance;
- internet health plans,
- golden handshake,
- via brokers & health insurance agents, ...



Effects of selection

- Disincentive for insurers to be responsive to the high-risk consumers and to contract the best quality care for them;
- Disincentive for providers to acquire the best reputation for treating chronic diseases;
- Selection more profitable than efficiency;
- High premiums for high-risk patients;
- Instability in the insurance market.



Most worrisome form of risk selection

- The **most worrisome** form of selection is that insurers skimp the quality of care that is particularly used by the undercompensated high-cost insured.
- They may give poor service to them and choose not to contract with providers who have the best reputations for treating them.
- This in turn can discourage physicians and hospitals from acquiring such a reputation. That would be an undesirable outcome of a competitive healthcare system.



How can we prevent selection?

- Risk equalization;
- Less severe premium rate restrictions:
→ tradeoff **selection - affordability**;
- Risk sharing between the regulator and the insurers (e.g. excess loss compensations to insurers):
→ tradeoff **selection - efficiency**.



Conclusion

Given insufficient risk equalization we are confronted with a trade-off between:

- affordability,
- efficiency,
- and the potential effects of selection, notably low quality care for the chronically ill.



8. *The preferred strategy*

Risk equalization is the **preferred strategy** to organize cross-subsidies because:

- The better the risk equalization is, the less severe is the resulting tradeoff.
- In the (theoretical) case of perfect risk equalization there is no need for any other strategy and the tradeoff no longer exists.
- Each of the other strategies alone inevitably confronts policymakers with a tradeoff.



The only effective strategy

Good risk equalization is the only effective strategy to resolve the tradeoff between affordability, efficiency and selection in a competitive individual health insurance market.

Source: WPM van de Ven , FT Schut, Guaranteed access to affordable coverage in individual health insurance markets, Chapter 17 in *the Oxford Handbook of Health Economics* (eds. Sherry Glied and Peter Smit), Oxford University Press, 2011



9. *Evaluation measures of RE-models*

Although many criteria are applied to evaluate the predictive power of risk adjustment formulas, policy makers must be aware that some of the most often used criteria are inappropriate measures of incentives for risk selection.

Van Veen SHCM, Van Kleef RC, Van de Ven WPM, and Van Vliet RCJA, "Is There One Measure-of-fit that Fits All? A Taxonomy and Critical Assessment of Measures that are used for assessing the Predictive Performance of Risk-Equalization Models" to be published in *Medical Care Research and Review*.



Evaluation measures of RA-models

A common criterion to evaluate risk adjustment formulas is the **R^2** , which measures the proportion of the variance in expenditures that is explained by a set of risk adjusters.

Although most empirical studies on risk adjustment present R^2 -values, these are hard to interpret as a measure of incentives for selection because in most cases it is **unknown what the maximum R^2 -value is** in a specific setting.



Maximum R^2

The maximum variance in individual annual health care expenditures that is predictable by means of factors reflected in past spending, is around 20 percent of the total variance.

The “around 20 percent” is a “lower bound on the upper bound”, rather than a true upper bound on R^2 .

(Newhouse, JEL, **1996**)



Determinants of R^2

1. Type of service;
2. (Sub)population;
3. Variation in explanatory variables;
4. Level of medical technology;
5. Year of the data analyzed;
6. Length of the time period being predicted.



Predictive ratios (PR)

- The PR for a group of insured = the ratio of the average predicted expenses to the average actual expenses for individuals in this group.
- A $PR < 1$ indicates undercompensation.
- Under ‘Ordinary Least Squares’ the PR for risk groups that are explicitly included in the RE are by definition close to 1, even for inadequate risk adjustment formulas.
- The same holds for PRs calculated for simulated insurer portfolios based on groups within the RE.



Inappropriate predictive ratios (PR)

- It is also inappropriate to measure incentives for risk selection on the basis of predictive ratios for subgroups based on percentiles sorted by predicted expenditures, because these predictive ratios are close to 1 even for inadequate risk adjustment formulas.
- It is important that policymakers do not misinterpret such results.



Appropriate predictive ratios (PR)

An appropriate measure of incentives for risk selection is the extent to which the RE significantly over- or undercompensates **non-equalized groups** of consumers, i.e. groups that are not identical to the risk groups that are explicitly included as risk adjusters in the RE.



Undercompensation Dutch RE-2014

Average undercompensation per person in year t

Selected groups based on year t-1	% of population	Undercompensation (-) in year t	Reduction compared with no RE
Worst score physical health (SF-12)	18.9%	- €670	-75%
Contact with a medical specialist in the last 12 months	37.8%	- €326	-75%
Use of physiotherapy in the last 12 months	21.8%	- €328	-71%
At least one chronic condition	31.5%	- €331	-80%
Use of outpatient nursing care	1.9%	- €1,034	-84%



Must risk adjustment be perfect?

No. We do not need a ‘perfect’ formula:

1. Is perfect risk-solidarity desired? How much deviation is acceptable?
2. Variation in N-type risk factors;
3. Longer-run opportunity costs of selection;
4. Transaction costs of selection, including the loss of reputation;
5. Periodic improvements of the formula reduce the predictable losses and profits;
6.



Must risk adjustment be perfect? (cnt.)

6. By refining the formula the standard deviation of (and thereby the uncertainty about) the profits from selection increases.
7. Do insurers really have additional information to discern the high/low risks within the RE-subgroups?

Unknown how much imperfection is acceptable.



Can RA be too successful?

For example, the birthday-zipcode formula (40,000 birthday-groups and 10,000 zipcodes) largely reduces the health plans' incentives for efficiency.

However, rejected because of:

- Inappropriate incentives;
- Lack of robustness in the sense of stability of the weights over time;
- Overfitting in the estimation model;
- Efron's R^2 for prediction being negative.



10. Prospective / Retrospective RE

Prospective RE: the equalization payments are calculated prospectively, at the beginning of the prediction period (year t), using only prior information (from year $t-1$, $t-2$, etc.)

Retrospective RE: the equalization payments are calculated retrospectively, at the end of the period. Retrospective payments can reflect information that becomes known during the period being predicted.



Mixtures

Prospective RE with retrospective determination of:

- Enrolees, including new enrolees and disenrolees;
- Value of risk factors:
 - Age, gender, region;
 - Disability (determined outside HC system);
 - Morbidity (cancer, heart attack,...);
- Weights (payments) per risk factor.



Retrospective

- No time lag between diagnoses and euros;
- Retrospective equalization payments for year t reflect diagnoses recorded in year t ;
- Retrospective weights mean that the level of payment reflects the **high acute care costs in** the year of diagnosis.



Prospective

- Diagnoses precede euros;
- Prospective equalization payments for year t are based on diagnoses reported in year $t-1$, $t-2$, etc;
- Prospective weights mean that the level of payment reflects the **lower chronic-care costs** in the year **after** diagnosis.



Weights

- “Morbidity-diagnosis” risk groups: prospective weights (much) lower than retrospective weights;
- Non-”morbidity-diagnosis” risk groups (e.g. age): prospective weights (much) higher than retrospective weights.
- The weights of the retrospective RE model capture acute, unpredictable episodes of care; for the prospective RE model, by contrast, the cost of such episodes is averaged into the “no diagnosis” group.



Criteria

- Fairness to the health insurers;
- Reduction of (true) adverse selection;
- Incentives for risk selection;
- Incentives for quality (skimping);
- Incentives for preventive care;
- Moral hazard and incentives for efficiency;
- What is the normal insurer's risk?
- Feasibility;
- R-square;
-



Condition-specific risk sharing

Insurers retrospectively receive some prospectively determined payments dependent on the occurrence of some medical problems. For example: diagnosis that are relatively invulnerable to manipulation and for which high cost treatment is relatively non-discretionary.

An alternative: ‘Risk Sharing for High Risks’ (see earlier PPT-slide).