Arammis Microsimulation Model Contribution: an Analysis of the Redistributive Effects of an OOP Maximum on Ambulatory Care Expenditures

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In France, although the Compulsory Health Care Insurance scheme reimburses a large part of health expenditures, patients may still be faced with high out-of-pocket payments (difference between actual health expenditure and the amount reimbursed).

Within the framework of IRDES commitment to exploring ways of reducing 'excessive' out-of-pocket (OOP) payments, we tested two possible ways of introducing OOP maximums using the Arammis microsimulation model. We simulated substituting the current long-term illness scheme (ALD), covering registered patients' expenditures at 100%, for two OOP threshold models restricted to ambulatory health care expenditures (excluding hospital stays and charges exceeding statutory fees) and applicable to all Compulsory Health Care Insurance beneficiaries (excluding CMU beneficiaries). The first model introduces a fixed uniform threshold for all beneficiaries; the second an income-related threshold.

Using a microsimulation model based on individual data, the study outlines two OOP threshold mechanisms with a neutral effect on the health insurance scheme's financial equilibrium.

The French Health Insurance system founded on the principal of solidarity: 'individuals pay according to their abilities 9 and receive according to their needs'. Reimbursements are thus based on health risk rather than income but do not exclude the existence of out-of-pocket payments (difference between actual health expenditures and the amount reimbursed by the Compulsory Health Care Insurance scheme). Exoneration schemes (insert 1) have nevertheless been introduced to protect individuals against disease-related risks (ALD) or specific circumstances (pregnancy, occupational accident, invalidity…). In France, even if health expenditures are largely captured by the different schemes, high OOP payments may persist (Tabuteau, 2006).

High or 'excessive' OOP payments can be defined in two ways: in terms of level or in comparison to in terms ofrelative to income level. In the first case, OOP payments are considered excessive beyond a certain fixed amount independent of income level. In the second case, OOP payments are considered excessive if they represent a significant part of burden on thea household's income is such that it has a negative impact on standard of living. Indicators of Health Insurance system performance, excessive OOP payments are revelatory of insufficient risk coverage and question the equitability of the system concerned. Alternatives to the current system are currently being investigated among which the *bouclier sanitaire* (Briet and Fragonard, 2007; Tabuteau, 2009), a healthcare safety net which would consist in replacing the ALD scheme

Insert 1
The principal risk coverge systems

In France, in addition to the Compulsory Health Care Insurance system, there exist three principal systems, both public and private, covering medical and social risks.

Universal Health Insurance Coverage (CMU): This public system provides 100% health expenditure coverage for individuals whose monthly income per unit is inferior to 598€ per month, which a priori excludes OOP payments. This system falls outside our field of analysis.

Complementary Health Insurance schemes: a private insurance system completing Compulsory Health Care Insurance reimbursements. Even if 93% of the French population benefit from complementary health insurance (of which 7% through the CMU), the most fragile and disadvantaged individuals are often excluded despite the introduction of the ACS scheme (Aide à la complémentaire santé)*, a

public scheme providing financial assistance for low-income individuals wishing to purchase complementary health insurance. The cost of individually purchased complementary insurance is not income related and increases with each additional guarantee. Furthermore, individuals do not benefit from complete coverage since franchise deductibles are not reimbursed.

Long-term illness scheme (ALD): CThis public scheme, at the heart of our simulation, provides 100% coverage for patients suffering from a recognized chronic disease requiring costly long-term treatment. Its aim is twofold: economic in neutralising excessive OOP payments and medical by ensuring better follow-up care for patients recognised as ALD. The aim of neutralising OOP payments, however, has not been totally attained.

* Questions d'économie de la santé n° 132 and 153.

and transport (2€). Non-reimbursement can be considered as a financial contribution to healthcare costs.

These measures, by limiting socialized reimbursements, more or less succeed in reducing deficits. At the same time, they equally generate risks: poorer individuals may be inclined to forego treatment and OOP payments for the chronically ill may rise significantly. These potentially adverse affects have given rise to the idea of introducing an OOP maximum threshold referred to as the *bouclier sanitaire* (health care safety net).

Compulsory Health Care Insurance budget deficits and patients' financial contribution

If in 1945 the Compulsory Health Care Insurance system, organised around the National Health Care Insurance Fund for Salaried Workers (Cnamts), was essentially financed by employee contributions, this is no longer the case since the mid 1970's. In effect, a slowdown of economic growth, an ageing population, reforms towards a fairer tax system and attempts to limit revenue deficits, the Health Insurance system is increasingly financed by taxes and charges, including the General Social Contribution (CSG). Since the year 2000, the balance between individual contributions and socialized contributions reimbursed by the Compulsory Health Insurance scheme has remained relatively stable. On average, 35% of ambulatory care expenditures (before complementary health insurance reimbursements) are covered by patient copayments (Eco-Santé, 2010). Despite this relative stability, the reimbursement system is being subject to a radical transformation; an increase in patients' financial contribution reducing the amount of collective financing, and

100% insurance coverage for an increasing number of patients (+ 3,5% per year for ALD according to Païta and Weill (2009)) that could lead to risk selection. The system provides better risk and expense coverage for the chronically ill and less cover for small risks by increasing patients' financial contributions. The ALD scheme represents 62.3% of Compulsory Health Care Insurance reimbursements whereas only 14.6% of beneficiaries are concerned (Païta and Weill, 2008). It should not, however, be forgotten that individuals benefitting from ALD can also be subject to very high OOP payments.

Technological progress, better access to health care, an ageing population and changes in health care consumption behaviours have all contributed to constantly rising health expenditures that largely outweigh revenues. Previous reforms aimed at reducing Compulsory Health Care Insurance deficits implemented between 1967 and 1995 were based on increased contributions, cut backs on reimbursements, increased copayments and the introduction of a fixed copayment for hospital care. These reforms, of limited financial impact, taxed all individuals in the same way whatever their income. More recently, in 2004, a fixed 1€ copayment per consultation was introduced and the hospital care copayment increased from 12 to 16€. In 2006, a fixed 18€ copayment for all medical acts costing over 91€ was instituted followed in 2008 by franchise deductibles on prescription drugs (0.5€ per box)

Replacing the ALD scheme with an OOP maximum threshold for all beneficiaries: hypotheses and field of study

Using the Arammis microsimulation model (Sources and Methods insert), we tested replacing the current ALD sys-

SOURCES

with a single OOP threshold applicable to all beneficiaries; a system that already exists in a number of European countries (Chambaretaud, Hartmann, 2009).

tem, that reimburses registered patients at 100%, with an OOP maximum threshold aimed at limiting excessive OOP for ambulatory care expenditures applicable to all beneficiaries (excluding Universal Health Coverage (CMU) beneficiaries). Two hypothetical safety net thresholds were tested following the definitions outlined previously; a fixed, uniform threshold applicable to all and an income-related threshold, variable according to income level. The choice of threshold thus depends on the definition of excessive OOP retained; either an 'egalitarian' threshold whereby all individuals are treated in the same manner, or an 'equitable' threshold whereby individuals' income level is taken into consideration. Microsimulation models allow heterogeneous individual situations to be taken into account and thereby permit the study of OOP payment dispersion other than through the sole analysis of financial means.

The hypothetical models tested are based on substituting the long-term illness scheme (ALD) limited to the chronically ill for one that introduces an OOP maximum threshold for all Compulsory Health Insurance beneficiaries with a neutral financial effect on the insurance system (it neither gains nor loses from the reform). Our results do not take individual income-related contributions into account and the equity principal discussed remains partial. In effect, part of the redistributive effect emanates from income-related contributions. The aim here being to study the effects of reimbursement rules, we concentrated on the

expenditures side without taking into account resources, invariant. Our calculations are based on certain hypotheses and a specific field of study. Firstly, we study OOP payments relating to 'ambulatory' care expenditures exclusively, that is to say outside hospital care. Non-consumers and individuals eligible for CMU are also excluded from the study. The redistributive nature of CMU in the reimbursement system is not taken into account in our analysis. Secondly, complementary health insurance reimbursements that cover a percentage of individuals' OOP expenses are not taken into account. In effect, these complementary reimbursements have no incidence on the protective and redistributive characteristics of the compulsory insurance system. Thirdly, we do not take into account the OOP payments generated by charges in excess of statutory fees that are currently not reimbursed by the Compulsory Health Care Insurance system. Taking excess fees into account in the reimbursement rule could generate moral hazard for the patient in terms of failure to control health expenditures, and for the physician, in terms of the increase in fees charged. We thus concentrate on expenditures corresponding to the reimbursement rule applied by the Compulsory Health Care Insurance system.

Our aim here is neither to chose between instituting an OOP maximum or not, nor choosing between one type of threshold rather than another, but to determine their possible redistributive effects on both patients and Compulsory Health Care Insurance system characteristics.

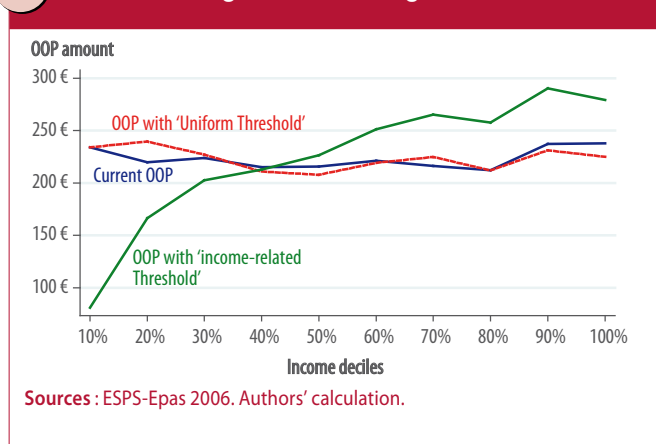## Redistributive effects for patients vary according to OOP payment threshold rule

The two safety net threshold models retained are each based on a different principal. The uniform threshold applies the same OOP maximum to all individuals whatever their income level. It does not therefore take into account beneficiaries' burden rate (OOP burden to annual income ratio) that is higher among individuals with a more modest income. The income-related safety net threshold, attempts to equalise individuals' OOP burden by modulating the threshold according to income level. The OOP maximum is defined as the threshold protecting beneficiaries against excessive OOP payments since over this threshold amount expenses would be reimbursed at 100%. The effects of these different thresholds are illustrated by typical individual case studies (insert 2).
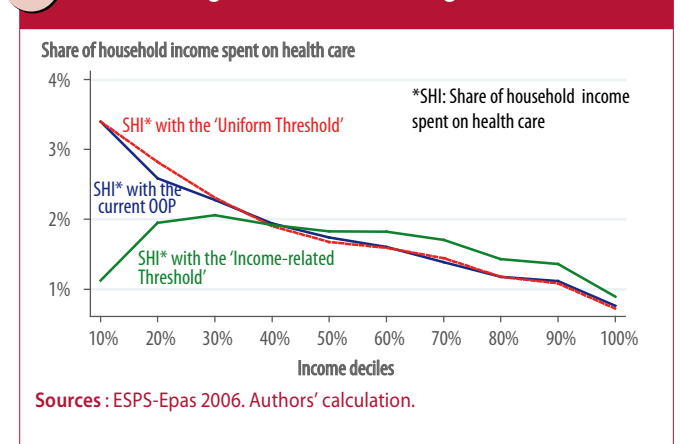
The current situation

The first descriptive results permit a comparison between the current OOP payment situation and the two alternative threshold models (graphs 1 and 2). The average OOP per patient before and after reform remains at 223 €, which validates the neutrality factor in terms of insurance coverage.

Currently, the average OOP payment is more or less identical whatever the income deciles. The standard devia-

G1 Patients' average OOP according to income decile

OOP amount

OOP with 'Uniform Threshold'
Current OOP
OOP with 'income-related Threshold'

Income deciles

Sources : ESPS-Epas 2006. Authors' calculation.

G2 Patients' average burden rate according to income decile

Share of household income spent on health care

*SHI: Share of household income spent on health care

SHI* with the 'Uniform Threshold'
SHI* with the current OOP
SHI* with the 'Income-related Threshold'

Income deciles

Sources : ESPS-Epas 2006. Authors' calculation.

tion, however, is 254€, which reflects a broad dispersion of OOP payments with a maximum OOP amounting to 3,607€. Low for the majority of the population, the OOP burden pay-ments areis concentrated among a small number of individuals: 10% of the popu-lation is burdened with 40% of OOP payments 40% of OOP payments weigh on 10% of the population (graph 3). The cumulated distribution shows us that approximately 92% of individuals pay less than 600€ in OOP payments (graph 4). The share of income spent on health care decreases as income levels go up: compared with high income deciles, The burden rate decreases with income level. Compared with high income deciles, ithe burden rate is three times higher for individuals in the first deciles (graph 2).

With a uniform threshold

With the uniform threshold, the annual OOP maximum amounts to 544€ and in comparison with the current situa-tion, OOP payment distribution remains relatively stable. In effect, for equivalent health care consumption, out-of-pocket expensesOOP payments for high income households are the same as for households on more modest incomes. In this case, the income share spent on health care burden rate is inversely proportional to income (graph 2). The OOP maximum is equal to the safety net threshold which explains the lesser dispersion of OOP compared with the current situation (graph 4). All non-ALD beneficiaries with OOP pay-ments currently inferior to this fixed

*M*ETHOD

Arammis: a microsimulation model to evaluate reforms

The Arammis microsimulation model analyses Compulsory Health Care Insurance reforms by static microsimulation. It analyses and evaluates the impact of specific reforms within the framework of economic and social policy such as the bouclier sanitaire. Until now, a perennial tool such as this was unavailable in France. Based on a representative sample of microeconomic units, it permits the results for each unit to be aggregated so as to study the characteristics of the system as a whole. As a static model, Arammis uses a cross-sectional data base at a given date t, without modifying population structure before and after

the reform on a given year. The Arammis model is able to simulate reforms by modifying decision variables that intervene in Compulsory Health Care Insurance beneficiaries' financial participation such as: the reimbursement rate, financial contri-butions, and the possibility of eliminating one or several types of exoneration.

From an exogenous model based on static beha-viours (that is to say without taking into account potential changes in behaviour following the reform), we would like to move on to an endoge-nous model integrating certain behaviours, for example foregoing medical treatment.

maximum will be neutral to the reform since they will neither gain nor lose with the uniform threshold. This applies to the majority of individuals since they spend less than the fixed annual threshold, but a reform such as this would nevertheless generate more losers than gainers (9.6% gainers, 10.9 % losers and 79.5 % neutral).
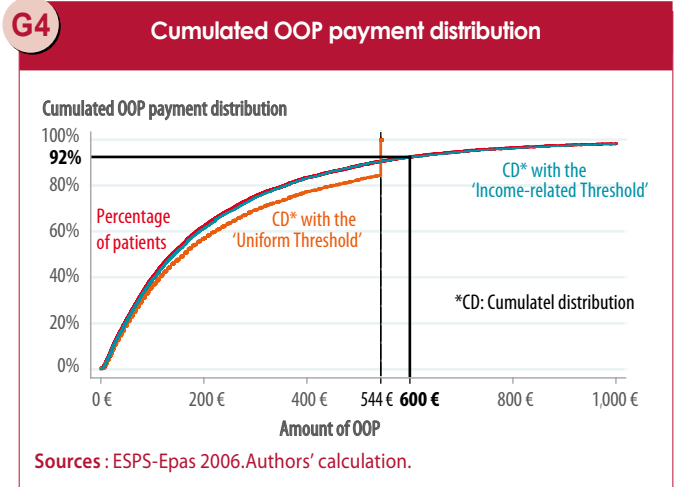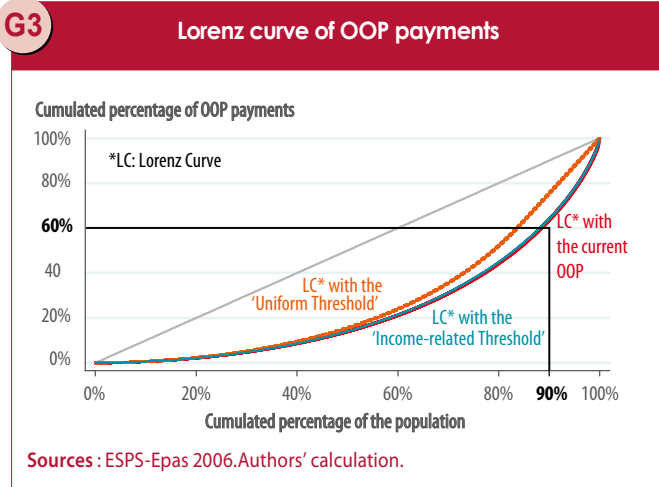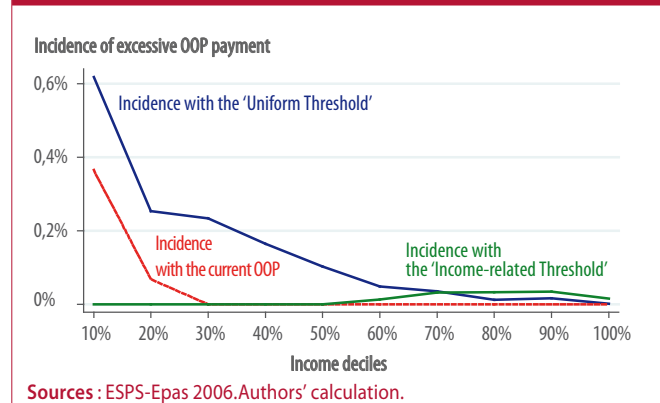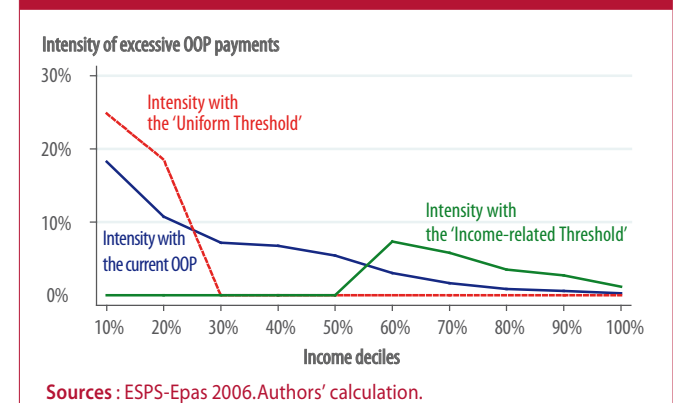
With an income-related threshold

With the income-related threshold, the annual OOP maximum is proportional to income (0.092% of annual income above CMU eligibility threshold). The OOP maximum thus increases with income level (graph 1). Contrary to the uniform threshold and the current situa-tion, the income share spent on health careburden rate remains constant wha-tever the income level and the standard deviation in OOP payment distribution is higher which reflects a greater heteroge-

neity of situations. At 3,638 €, the maxi-mum OOP payment is also higher than in the current situation (and even higher with the uniform threshold). With this model, there are more gainers than losers (12.5% gainers, 10.4% losers and 77.1% neutral). The redistribution of OOP is thus greater when income is taken into account and greater for ALD beneficiaries than non-ALD beneficiaries.

Evolution of the redistributive characteristics of Compulsory Health Care Insurance scheme reimbursements

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Three methods were used to study the evo-lution of the health care expenditure reim-bursement system characteristics accor-ding to reimbursement rules; the analysis of excessive OOP, equity and risk sharing.

G3 Lorenz curve of OOP payments

Sources : ESPS-Epas 2006. Authors' calculation.

G4 Cumulated OOP payment distribution

Sources : ESPS-Epas 2006. Authors' calculation.

G5 Incidence of excessive OOP payments according to income deciles

Incidence of excessive OOP payment

Incidence with the 'Uniform Threshold'

Incidence with the current OOP

Incidence with the 'Income-related Threshold'

Income deciles

Sources : ESPS-Epas 2006. Authors' calculation.

G6 Intensity of excessive OOP payment according to income deciles

Intensity of excessive OOP payments

Intensity with the 'Uniform Threshold'

Intensity with the current OOP

Intensity with the 'Income-related Threshold'

Income deciles

Sources : ESPS-Epas 2006. Authors' calculation.

From an analysis of excessive OOP payments

In this analysis, we define an OOP payment as excessive when it amounts to over 5% of a household's annual income. This standard varies according to situation and author (cf. Berki, 1986; Xu et al., 2003). For example, for a monthly income of 1,200€, OOP payments will be considered excessive beyond the 5% threshold of 720€ per annum. To measure the impact of the reforms proposed on excessive OOP payments, we study the incidence curve that measures the percentage of individuals with excessive OOP payments and the intensity curve that measures the average rate by which OOP payments exceed overrun rate beyond the 5% of the annual income (graphs 5 and 6).

In the current situation, both the income share spent on health careburden rate and the incidence rate decrease according to income deciles. 10 to 20 % of individuals with income levels below the third decile pay excessive OOP payments. The intensity curve for excessive OOP payments indicates that the poorest individuals are not only more frequently subject to excessive OOP payments but are also on average have, on average, burdened with the highest excessive OOP payment amounts.

With the uniform threshold, only individuals in the first two income deciles are burdened with excessive OOP payments. The incidence rate is nil for the remainder of individuals with higher income levels. In effect, for the latter the OOP threshold fixed at 544€ does not represent a sufficiently critical percentage of their

annual income. For the poorer individuals with excessive OOP payments with the uniform threshold, this is reduced by approximately half even if the incidence rate remains high for individuals in the first income decile.

With the income-related threshold, it is the poorer individuals that are protected from excessive OOP payments. In effect, for half of the poorest population the incidence rate is nil: none of the individuals belonging to the first five income deciles will be subject to excessive OOP payments. It is the sixth and seventh income deciles that indicate the highest incidence rate but in general, the wealthier households will not see a change in their excessive OOP payments.

… to the analysis of equity…

We broach 'equity' with the aid of the Kakwani index that 'measures the proportionality gap between a tax system and taxpayers' ability to pay' (Lachaud, Largeton, Rochaix, 1998). In other words, this index is used to quantify the progressivity or regressivity of the health expenditure reimbursement system. Regarding the current situation, calculations the Kakwani index gives a negative value; that is to say that the current reimbursement system is regressive. OOP payments are distributed according to income in favour of the wealthiest (11% of incomes and 21% of OOP payments are concentrated among 20 % of the poorest individuals whereas 36% of incomes and 19% of OOP payments among 20% of the wealthiest). According to our defi-

nition of 'equity' (see above) it is possible to assimilate 'regressivity' with 'equality' and 'progressivity' with 'equity'.

After simulation of the different thresholds, this index varies according to safety net threshold model. Regressivity increases with the uniform threshold and decreases with the income-related threshold which generates a more equitable reimbursement system. In effect, the uniform threshold, unrelated to income level, would tend to create a more egalitarian distribution of OOP payments whereas the contrary would occur with the income-related threshold to the benefit of the poorest.

… and risk sharing

The second order stochastic dominance indicator is used to measure the theoretical preferences of risk-averse individuals when confronted with a change in the reimbursement system. If the individuals are 'rational', following the economic theory definition, risk-averse individuals will prefer a system that reduces risks whereas the contrary will apply to risk-takers.

Risk-averse individuals will prefer the uniform threshold as it ensures a relatively low maximum OOP threshold for all insurance beneficiaries. The descriptive analyses effectively show that OOP payment dispersion is weaker with a uniform threshold. In effect, risk-averse individuals would consider themselves more protected against excessive OOP payments according to the first definition at absolute level. In the absence of moral hazard, individuals with an aversion to risk would therefore

Insert 2
The impact of different safety net thresholds on OOP payments using five typical case studies

These typical case studies concern real individuals present in our data base and are thus representative of real-life situations.

As the file is anonymous, the names are fictitious. Patients whose OOP payments increased following the reform are qualified as losers. Their individual burden rate increases whereas their socialized healthcare expenditure rate decreases.

Patients whose OOP payments decreased following the reform are qualified as gainers. Their individual burden rate decreases whereas their socialized healthcare expenditure rate increases.

Anne, aged 70, living in the west of France and benefitting from the long-term illness scheme (ALD) currently spends 4,636 € on ambulatory care excluding charges in excess of statutory fees, and her OOP payments amount to 1,644 €. She lives in a 2 person household with a monthly income of 1,470 € per consumption unit, that is a total income of 2,205 €:
- with the uniform threshold, her OOP payment would amount to 544 €,
- with the income related threshold, her OOP payment would amount to 610 €.

She would thus be a gainer with both the uniform and income-related thresholds.

Paul, aged 60, living in the south of France and benefitting from ALD, currently spends 1,618 € on ambulatory care excluding charges in excess of statutory fees, and his OOP payments amount to 258€. He lives in a 2 person household with a monthly income of 1,829 € per consumption unit, that is a total income of 4,989 €:
- with the uniform threshold, his OOP payments would amount to 544 €,
- with the income-related threshold, his OOP payments would amount to 941 €.

He would thus be a loser with both the uniform and income-related thresholds.

Yann, aged 54 living in eastern France, benefitting from ALD, currently spends 3046 € on ambulatory care excluding charges in excess of statutory fees and his OOP payments amount to 878 €. He lives in a 3 person household with a monthly income of 2,772 €, that is a total income of 4,989 €:
- with the uniform threshold, his OOP payments would amount to 544 €,
- with the income-related threshold, his OOP payments would amount to 1,079 €.

He would thus be a gainer with the uniform threshold and a loser with the income-related threshold.

Florence, aged 30 living in south-east France, benefitting from ALD, currently spends 1,113 € on ambulatory care excluding charges in excess of statutory fees and her OOP payments amount to 324 €. She lives in a 4 person household with an income of 840 € per consumption unit, that is a total income of 1,764 €:
- with the uniform threshold, her OOP payments would amount to 407 €,
- with the income-related threshold, her OPP payments would amount to 261 €.

She would thus be a loser with the uniform threshold and a gainer with the income-related threshold.

Thierry, aged 40, living in the Paris region and not benefitting from ALD, currently spends 1,837 € on ambulatory care, excluding charges in excess of statutory fees, and his OOP payments amount to 705 €. He lives in a 4 person household with an income of 762 € per consumption unit, that is a total income of 1,600 €:
- with the uniform threshold, his OPP payments would amount to 544 €,
- with the income-related threshold, his OOP payments would amount to 177 €.

He would thus be a loser with the uniform threshold and a gainer with the income-related threshold.

	ALD	Income per CU	Expenditures	OOP			Socialized (in %)			Burden rate (in %)			Gainer/ Loser	
				OOP	UT	IRT	Current	UT	IRT	Actual	UT	IRT	UT	IRT
Anne	yes	1,470	4,636	1,644	544	610	64,5	88,3	86,8	9,3	3,1	3,5	Gainer	Gainer
Paul	yes	1,829	1,618	258	544	941	84,1	66,4	41,8	1,2	2,5	4,3	Loser	Loser
Yann	yes	2,772	3,046	878	544	1,079	71,2	82,1	64,6	2,6	1,6	3,2	Gainer	Loser
Florence	yes	840	1,113	324	407	261	70,9	63,4	76,5	3,2	4,0	2,6	Loser	Gainer
Thierry	no	762	1,837	705	544	177	61,6	70,4	90,4	7,7	5,9	1,9	Gainer	Gainer

Sources: ESPS-Epas 2006. Authors' calculation.

prefer the uniform threshold. Yet, as we have previously demonstrated, the uniform threshold does not guarantee the poorest individuals protection from excessive OOP payments according to the second definition. The advantage for risk-averse individuals, however, is that a fixed OOP maximum reduces uncertainty; even in high risk situations, the OOP payment threshold is known in advance which constitutes a real benefit for patients with a high probability of being faced with high OOP payments.

* * *

The effects of both the thresholds discussed lead to opposite conclusions. The uniform threshold limits excessive OOP payments but leads to an even more regressive reimbursement system. In reducing the risk of being faced with very excessive OOP payments, however, it reduces the heterogeneity of OOP payment situations and could suit individuals with the greatest aversion to risk. Inversely, the income-related threshold increases heterogeneity but leads to a less regressive reimbursement system. We would thus move from a more egalitarian system to a more equitable system but with greater uncertainty. Whatever the potential reform studied, 25% of patients would see their situation change.

Furthermore, the implementation of such reforms would give rise to a number of questions not studied here: should the threshold apply to individuals or households? Should it apply exclusively to ambulatory care expenditures or all health care expenditures, ambulatory and hospital care? What should be done concerning dental and optical care expenditures? What impact would such a system have on offer and demand in the complementary health insurance market? Would such a system be technically feasible? Finally, how would individuals react in terms of their demand for health care and insurance? The different health systems over the world demonstrate the choices countries have made in terms of social justice. In France, the distribution of OOP payments will reflect what is considered as being socially fair and accep-

table in terms of health insurance (Rawl, 1971): is equality not contradictory to the search for greater equity?

The Arammis static microsimulation model thus enables us to precisely evaluate the effect of public policy measures ex ante. In the long-term, it will be possible to take into account certain modifications in way patients use health care, hospital care expenditures, the role of complementary insurance and the redistributive effect of statutory contributions. Simulation studies such as presented here do not aim to find the 'ideal reform' but to describe the effects of various systems and thereby enlighten the public debate. ◆

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