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Original Research

Co-payments for emergency department visits: a quasi-experimental study

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ABSTRACT

Objectives: Financial recession in Cyprus has led to health reforms to promote efficiency and reduce public expenditure. In this context, a co-payment fee was introduced in 2013 for all emergency department (ED) visits, with the aim of reducing potentially avoidable visits. The objective of this study was to assess the short-term intended and unintended impacts of introducing these co-payments.

Study design: The study design is an interrupted time series analysis.

Methods: We used an autoregressive integrated moving average model for interrupted time series analysis of data on ED visits over 42 consecutive months, from 2013 to 2015 in a regional hospital in Cyprus. The ED visits have been classified to non-avoidable and potentially avoidable visits.

Results: The introduction of co-payment had no effect on non-avoidable visits (4% [95% confidence interval {CI}: 4.3–11.08] $P = 0.694$). However, it had the immediate and sustained effect of reducing potentially avoidable visits, an effect that was statistically significant from the first month onwards (29.8% [95% CI: 22.6–34.1] $P < 0.00001$).

Conclusions: Co-payments can be a valuable tool for reducing potentially avoidable emergency department visits, without adversely impacting non-avoidable visits. This is a particularly significant finding for countries experiencing financial pressures and struggling to reduce waste in health expenditure. However, the long-term impact of this policy must be assessed, including potential negative effects on public health, to make sure it does not create barriers in obtaining necessary health care that might actually increase expenses in the long run. In particular, timely access to primary care services must be safeguarded.

Introduction

In the operational framework of a health system, emergency departments (EDs) are designed to deal with non-avoidable cases, such as major injuries and other situations where ambulatory care is not appropriate, such as those related to alcohol and drugs.[1] The inherently unpredictable nature of these cases implies that an ED must be able to cope with a multitude of diverse and possibly life-threatening conditions. This presupposes that EDs are staffed with multidisciplinary

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teams including specialists and are equipped accordingly. These attributes render EDs prone to overuse by patients.[2,3]

Disincentives to using EDs in the form of co-payments at the point of treatment have been applied in several countries.[4,5] The co-payment, as a demand-side cost containment measure, has proved its efficacy in reducing excessive utilization of health care by inducing a trade-off between the welfare gains from health-care provision and the welfare losses due to waste.[6–11]

The ability of co-payment to reach an equilibrium between deterring overuse and not discouraging necessary care- by comprising a barrier- is key to its operational scope.[11–13] More specifically, in the context of EDs, co-payment encourages patients to undertake a kind of self-triage to determine whether visiting an ED is really necessary and appropriate.

Cyprus

Cyprus is a unique case among European Union member states, because it is the only one without a national system providing universal health coverage.[14,15] The current health-care system consists of two fragmented and uncoordinated components, the private and public sector. The private health sector is completely financed by out-of-pocket (OOP) payments, which can be subsidised by voluntary private insurance, while the public health care sector provides free health care (to almost 85% of the total population).[15]

Beneficiaries of the public sector include people who satisfy one of several socioeconomic criteria and people with certain chronic conditions.[15,16]

Until 2013, Cyprus was one of the few countries in which the public health-care sector did not apply co-payments. Up to that date, EDs operated in all six public hospitals in Cyprus and anybody could use them free of charge, regardless of their eligibility for public-sector care. Some private hospitals have only basic ED units, capable of coping with only minor cases and not offering the breadth and scope of EDs in public hospitals, while charges apply. As a result, the ED services mostly used are the public ones.

Following an assessment of the public health-care sector in 2013, in the context of a memorandum of understanding concerning the financial crisis in Cyprus, a technical committee concluded that EDs in Cyprus are overused.[16,17] This is considered to be a repercussion of long-waiting lists in the public healthcare sector, in tandem with financial crisis and the austerity measures, that further impeded access. People also assign blame to public sector's time-table, which excludes afternoon, public holidays and weekend shifts. This is further exacerbated by the lack of a national coverage health system, which cascades to the existence of many uninsured patients, for which the EDs emerge as the only pathway of access to health care.[16–18] Finally, the absence of auxiliary measures such as call centres, as well as lack of collaboration with primary health-care centres, hinders referral of minor cases to day care settings, which could extenuate the burden on the ED.

It is estimated that ED visits cost four times more than primary health service visits for the same treatment, leading to productive inefficiency.[19–22] Crowding of EDs can more than double the waiting times, creating risks for people genuinely in need of urgent care.[23,24] A Canadian study reported that reduction of ED waiting times by 1 h would reduce mortality in a high-risk patient cohort by 6.5%, while the corresponding mortality reduction in a low-risk patient cohort would be 13%.[24]

In August 2013, the Cyprus Ministry of Health introduced a co-payment of 10 euros, as a prerequisite of the bail-out agreement for all ED visits, applying to all users.[25] The aim of this article is to explore the effect of co-payments on ED use in Cyprus. Specifically, we want to establish the separate effects of co-payment on non-avoidable versus potentially avoidable ED visits. Our approach involves testing the hypothesis that co-payment reduced potentially avoidable visits to the ED, without deterring non-avoidable ones. We used daily data covering the period January 2011 to June 2014 from one regional hospital. Because the economic situation of Cyrus was not stable during this period, we also controlled for underlying trends that might have been caused by economic fluctuations. This study further advances relevant literature, and it builds on a recent publication by Petrou,[18] who reported on the co-payment on total number of ED visits, without commenting on their underlying emergent (or not) classification (see Table 1).

Methods

Data

Statistics were collected on visits to Paphos public ED between January 2011 and May 2014. Paphos Hospital is located in the western part of Cyprus and offers health care to approximately 150,000 inhabitants. The hospital has 150 beds, and every year around 8000 patients are admitted. Its outpatient clinics serve approximately 160,000 cases every year, while an estimated 65,000 patients visited the ED yearly.[26] No other public EDs operate in this region, so we may assume that these data captured the full impact of the policy change under assessment. The private sector was excluded because co-payments were only introduced in public EDs. We also assume that people did not opt for private health services, because this would perpetuate to a full OOP expenditure, exceeding by far the corresponding co-payment fee, and further burden the already crisis-stricken family disposable income.

In the public ED, the co-payment fee applies to everybody (both beneficiaries and non-beneficiaries of public-sector care and with or without a referral). The fee is payable at point of care. Visits were classified by two health-care professionals into potentially avoidable and non-avoidable, on the basis of available algorithms.[27–29] The rationale was to distinguish visits that should be treated within the ED and visits that potentially could be referred to a Primary Healthcare center (PHC) without posing any threat to patient's health status. Consequently, the definition of the potentially avoidable visits entails the following:

- cases that could be dealt with within 12 h such as dermatological infections, abrasions and sore throat;
- conditions that could be addressed properly at primary health-care centres without compromising the safety and comfort of the patient and conditions that do not require special equipment;

Table 1 – STROBE statement—checklist of items that should be included in reports of observational studies.

	Item no	Recommendation
Title and abstract	1	(a) Interrupted time series analysis (b) The abstracts provides an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	The fiscal crisis and the bailout agreement mandated reforms in Cyprus public health care to reduce waste and enhance efficiency
Objectives	3	To assess the impact of this measure in non-avoidable and potentially avoidable visits
Methods		
Study design	4	An interrupted time-series analysis
Setting	5	Paphos Hospital, emergency department 2013–2015
Participants	6	(a) Cohort study—All patients that visited the Paphos Hospital ED . No controls apply
Variables	7	Emergent/non-avoidable and avoidable emergency department visits.
Data sources/measurement	8[a]	Paphos Hospital Emergency Department.
Bias	9	Visits were assessed by a team of health professionals regarding their classification.
Study size	10	We recorded all visits
Quantitative variables	11	All visits, non-emergent/avoidable and emergent/non-avoidable
Statistical methods	12	An interrupted time series analysis, which is extensively described in the methodology section
Results		
Participants	13[a]	(a) 213,102 visits to the emergency department, 20,247 defined as emergent/non-avoidable and 192,855, as avoidable
Descriptive data	14[a]	213,102 visits to the emergency department, 20,247 defined as emergent/non-avoidable and 192,855 as avoidable No control group
Outcome data	15[a]	Impact on co-payment emergent/non-avoidable and avoidable Emergency Department visits
Main results	16	The introduction of co-payment did not exert any effect on emergent/non-avoidable visits (4% [95% CI: 4.3–11.08] $P = 0.694$). Nevertheless, co-payments showed an immediate and sustained effect by reducing potentially avoidable emergency department visits, an effect that was statistically significant from the first month onwards (29.8% [95% CI: 22.6–34.1] $P < 0.00001$).
Discussion		
Key results	18	Co-payment reduced non-emergent/potentially avoidable visits, whereas it did not affect the rate of emergent/non-avoidable visits
Limitations	19	A long-term monitoring for potential adverse events of this measure is imperative. Moreover, the classification between emergent/non-avoidable and non-emergent/potentially avoidable is prone to bias
Interpretation	20	Co-payment, in its current form as applied in Cyprus, can contribute to the efficiency of the system, while it does not seem to impede access of people presenting with urgent conditions.
Generalisability	21	Cyprus is a homogenous health market, and results can be extrapolated to the rest of the country.
Other information		
Funding	22	No funding was received

An explanation and elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the websites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/ and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

[a] Give information separately for cases and controls in case–control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

- conditions amenable to ambulatory care that sufficient patient monitoring and follow-up should be able to reduce or eliminate;[27]
- preventable health conditions for which manifestations and exacerbations are usually caused by lack of timely and proper primary care (such as asthma attacks), which are treatable in primary health-care services.[28–32]

On the contrary, non-avoidable visits included conditions for which an ED deems necessary as in the case of the following:

- life-threatening conditions;
- potential impairment of vital functions;
- patients admitted in critical condition;
- major injuries;

- alcohol and substance intoxication and
- all other conditions requiring immediate hospitalization.

We performed three analyses: one for total visits, one for non-avoidable visits and one for potentially avoidable visits, to show the effects of introducing co-payments on these three categories.

Statistical analysis

To distinguish the effects of introducing co-payments from those of the financial crisis which was ongoing at the time, we developed an interrupted time series (ITS) analysis, a method which is regarded as one of the strongest quasi-experimental approaches.[33–35] ITS analysis is a valuable study design for examining the effectiveness of population-level health interventions that have been implemented at a clearly defined point in time.[36–39] An ITS is one that is segmented by specific change points where the values of the time series change, in our case, because of the introduction of a new policy. In this context, we performed segmented and dynamic regression analysis.[35] These models enabled us to explore the effect of introducing co-payments on ED visits while taking into consideration data autocorrelation. They also enable forecasts to be made on the basis of past values. Using this model avoids the need for a control group by making multiple assessments of the outcome variable. Another significant policy-relevant attribute of ITS analysis is the dynamic presentation of response, which can be classified as instant, delayed, prolonged or transient; the method can also assess impact on a specific time point, e.g. 5 or 10 months after the introduction of co-payment. Another attribute is the ability to assess the course of a variable (in our case, the number of ED visits) over a prolonged period of time preceding the introduction of co-payment.

We specified three autoregressive integrated moving average (ARIMA) models, for total , potentially avoidable and non-avoidable visits. This enabled us to examine the effects of two events, the financial crisis and the introduction of co-payment. The model predicts a value in a time series as a linear combination of the past and current values and errors of the model. Bayesian information criteria were used to define parameters of the ARIMA model.

We assume that regression follows the pattern:[33–36]

Outcome = constant + α1 time+ α2 phase + α3 interact + er. Before the copayment introduction, this regression is
Outcome = constant + α1time + er. This model will enable any changes in ED visits due to recession. After the introduction of the co-payment, this is transformed to
Outcome = constant + α1* time + α2*phase + a3* interact + er.

Variables used in the model are as the following:

Outcome = number of visits to ED
α 1 = coefficient for time: time is a continuous variable indicating number of months from the start of the observation period.
α 2 = coefficient for phase, where phase is a binary dummy variable denoted with 0 before introduction of co-payment and 1 after introduction of co-payment.
α 3 = coefficient for interact, where interact is a variable which is coded as zero before co-payment. After the introduction of co-payment, data points remain the same as the time coefficient.
er = error of the model (random variability that is not explained by the model).

This variable will also elucidate whether the financial crisis exerted any impact on the number of ED visits. We assume a starting date for the effects of the financial crisis at January 2011, an approach adopted by several authors. At this point, Cyprus plunged into recession, as attested by its exclusion from international financial markets.[16–18] Therefore, the a3 variable will enable us to evaluate any changes that occurred between the start of the financial crisis and the introduction of co-payment in August 2013. We regard the main determinant of changes in this period as the financial crisis.[16,17]

In our model, constant estimates the baseline outcome level, that is, the number of ED visits at the beginning of the observation period (at time zero). α1 estimates the change in the average ED visits for each month before introduction of the co-payment and it represent the baseline trend (Fig. 1). α2 estimates the change in average ED visits that occurs after introduction of co-payment, and α3 estimates the change in trend in the mean ED visits after introduction of co-payment, which is compared with the trend before the introduction of co-payment. Post-intervention slope is given by the sum of a1 and a3. Therefore, this model offers the capability of controlling for the baseline level and trend, which constitutes a major strength of segmented regression analysis.[33–39] In addition to the aforementioned information, we calculated the dynamic forecast for the post–co-payment period starting August 2013. This enabled the estimation of the number of ED visits which would have occurred if co-payment had not been introduced. We then estimated the impact of co-payment at monthly intervals, by comparing observed and predicted ED visits. A 95% confidence interval was applied.

We used the Box–Jenkins method to identify the model that fits better and estimated average–rank regression with daily ED visits for 42 consecutive months. Seasonality was assessed through the standard integration tests, and the Ljung–Box test was be used for the white noise condition . This enabled us to assess how data fit the model and whether autocorrelation of residuals was random or not.

In addition, we calculated the trend of ED visits without the introduction of co-payment. We assessed impact at intervals of one month, up to eleven months after the introduction of co-payment.

Statistical analysis was performed using SPSS, v 21.0.[40]

Results

Introduction of co-payment was associated with a statistically significant reduction in total ED visits which was evident from the first month after the introduction of this measure (Table 2, Fig. 2) and persisted until the end of the follow-up period. This

effect was primarily due to the significant reduction of the potentially avoidable visits group (Table 2, Fig. 1). Introduction of co-payment did not have any effect on non-avoidable cases, a consistent finding from 11 months after the intervention (Table 2, Fig. 1). The time-lapse between the advent of the financial crisis and the introduction of co-payment showed no impact on ED visits, either non-avoidable or avoidable visits, as reflected by the slope of the ITS and the interact coefficient (est = 0.7, $P = 0.664$).

We used Ljung Box to assess model fit, which was good, and the white noise residual did not have significant P values ($P = 0.432$, $P = 0.51$, $P = 0.543$) (Table 2). Visual inspection of the autocorrelation function and partial autocorrelation function confirmed this. The model was tested for underfitting (dropping of questionable parameters) and overfitting (including extra parameters) through the use of R^2.[44] R^2 (which denotes the square of the correlation between the response values and the predicted response values) was 0.866, 0.892 and 0.823 for total visits, potentially avoidable and non-avoidable visits, respectively. Therefore, we can conclude that model fits well and explains to data variance to a satisfactory degree (Table 2).

Table 2 – Reduction of ED visits following introduction of 10 euro co-payment in August 2013.

Time period after introduction of co-payment	Reduction of total number of ED visits compared with forecasted visits (95% CI)	Reduction of potentially avoidable ED visits compared with forecasted visits	Reduction of non-avoidable ED visits compared with forecasted visits
1 month	30.3% (24.2–35.5) $p < 0.0001$	32.2% (25.1–36.2) $p < 0.0001$	11.38% (5.2–16.77) $p = 0.29$
2 month	25.3% (17.2–31.9) $p < 0.0001$	27.2% (18.2–30.7) $p < 0.0001$	6.3% (−1.4–12) $p = 0.78$
3 month	27.8% (20.3–33.9) $p < 0.0001$	29.2% (21.5–32.7) $p < 0.0001$	15.3% (9.8–15.3) $p = 0.96$
4 month	33.7% (26.8–39.5) $p< 0.0001$	30.8% (25.6–38.1) $p < 0.0001$	5.9% (−1.5–12.3) $p = 0.69$
5 month	25% (17–31.7) $p < 0.0001$	27.6% (17.1–30.7) $p < 0.0001$	−24.49% (−15.9 to −1.57) $p = 0.46$
6 month	30.4% (22.4–37) $p < 0.0001$	33.1% (23.4–36) $p < 0.0001$	−0.1% (−8.2–6.8) $p = 0.56$
7 month	28% (20.6–34.1) $p < 0.0001$	29.4% (21.6–35.3) $p < 0.0001$	4.9% (−2.9–11.7) $p = 0.29$
8 month	25.5% (17.2–32.1) $p < 0.0001$	27.9.1% (17.8–34.1) $p < 0.0001$	13.5% (6.85–19.29) $p = 0.18$
9 month	28.3% (20.3–34.9) $p < 0.0001$	30.6% (20.3–34.9) $p < 0.0001$	−0.68% (−9.4–0.62) $p= 0.35$
10 month	28.8% (21.09–35.1) $p < 0.0001$	29.8% (22.6–34.1) $p < 0.0001$	4% (−4.3–11.08) = 0.28
	R^2 0.866 Ljung Box 17 ($p = 0.432$)	R^2 0.892 Ljung Box 17.7 ($p = 0.51$)	R^2 0.823 Ljung Box 15.7 ($p = 0.543$)

ED, emergency department; CI, confidence interval.
Statistically significant level is set at $P = 0.05$.

Discussion

The introduction of co-payment in Cyprus led to a significant and immediate reduction of ED visits, which persisted during the 11 months of follow-up with no signs of wearing off. The reduction was mainly due to reduction of use by people presenting with potentially avoidable conditions which could be treated in primary health-care centres. This is one of the reasons why the World Health Organization regards easily accessible primary health care as the most important component of an effective health system.[41] In line with this, the Government of Cyprus must ensure that people deterred from visiting EDs by the co-payment received for the health care they need.[42] For achieving this, an array of measures have been put forward by many authors. Reforms of the primary care sector are necessary, including extension of opening hours and implementation of more convenient weekend and night shifts to provide people with potentially avoidable conditions with an accessible alternative to ED use.[43–46] It is also imperative to address the issue of those without health coverage, for whom EDs constitute the only affordable pathway to timely health care.[17–19] An interrelated issue concerns people who repeatedly visit EDs because of substance use or persistent medical, psychological or social problems. Referring them to specialised services for dealing with the underlying condition is also desirable, although time constraints and reimbursement status may hinder their access.[43] Community nursing and the introduction of minor trauma centres can also play a role in reducing the burden on EDs. Campaigns to raise public awareness concerning the appropriate use of ED centres are essential, because EDs are widely assumed in Cyprus to provide better quality health care than primary health-care centres.[4,18] Such campaigns must highlight the fact that EDs are not designed to provide non-urgent care. On the contrary, doctors in EDs cannot easily access the medical records of patients, so the benefit to the non-urgent patient is questionable. In this respect,

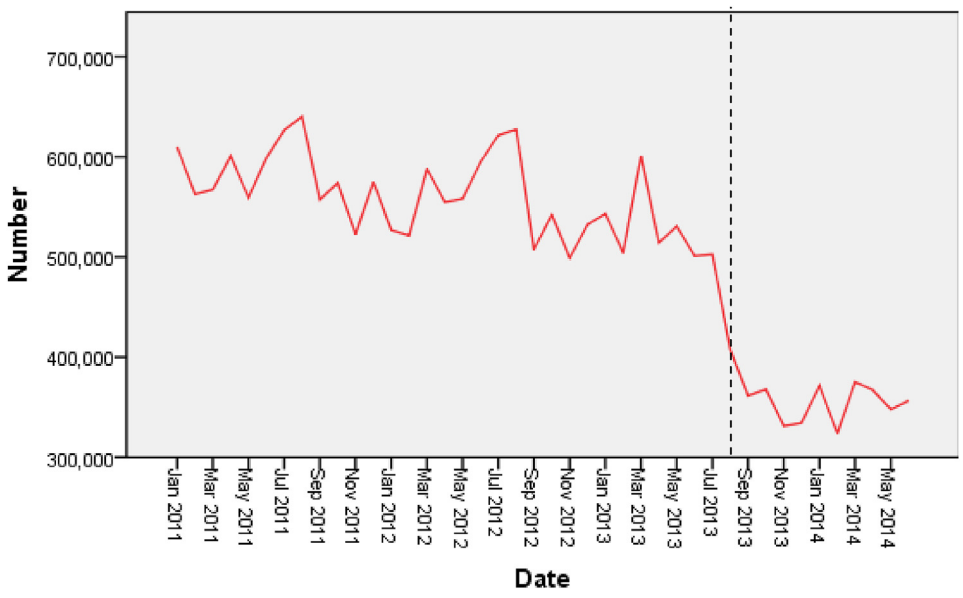

Fig. 1 – Monthly potentially avoidable visits to emergency department. Dotted line indicates introduction of co-payment.

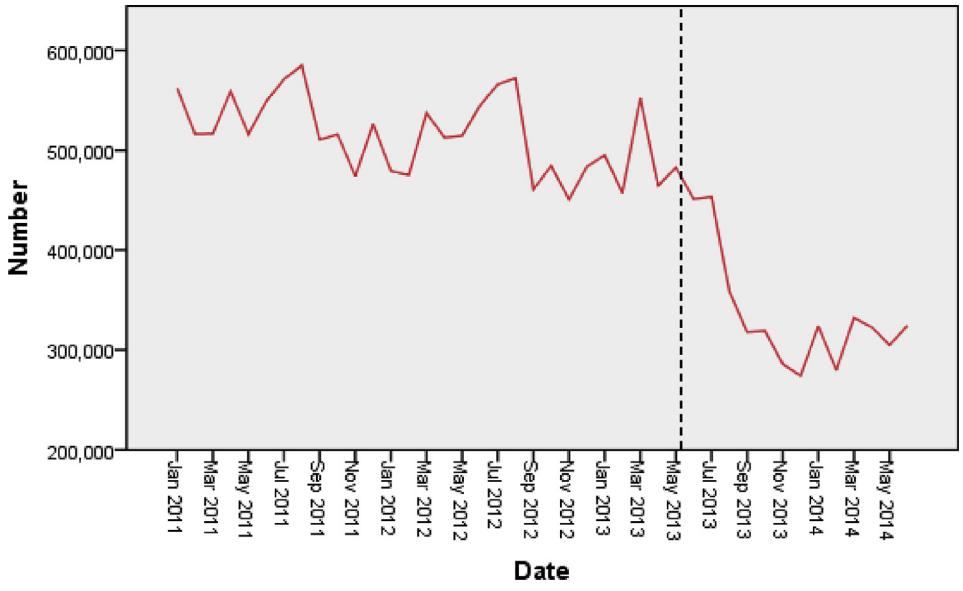

Fig. 2 – Total number of visits to emergency department. Dotted line indicates introduction of co-payment.

appropriate use of EDs can both reduce costs and improve health care.[18,46]

This study also showed that non-avoidable visits were not affected by the introduction of co-payment. This is a significant finding because it sheds light on one of the main objections to user charges: the danger of impeding access to urgently necessary care.[47] Nevertheless, for patients with very limited means and those who use the ED frequently to obtain treatment for persistent or multiple conditions, even a 10 euro charge could be a deterrent.

The fluctuations in the economy of Cyprus did not appear to have any impact on ED visits, as seen in the ITS analysis, specifically, in the interaction coefficient (Figs. 1–3). Although some authors have reported a marked shift towards free public health care during crisis periods,[47–49] our data do not support this. Also, noteworthy is the high percentage of potentially avoidable visits, which surpassed estimates from other countries[50–52] and implies significant waste in the form of productive and allocative inefficiency.

In the face of financial crisis, it is tempting for cash-deprived countries to raise levels of co-payment, to compensate for reduced tax income due to unemployment and reduced incomes.[53] This underpins the importance of monitoring health indicators in the long term to track potential

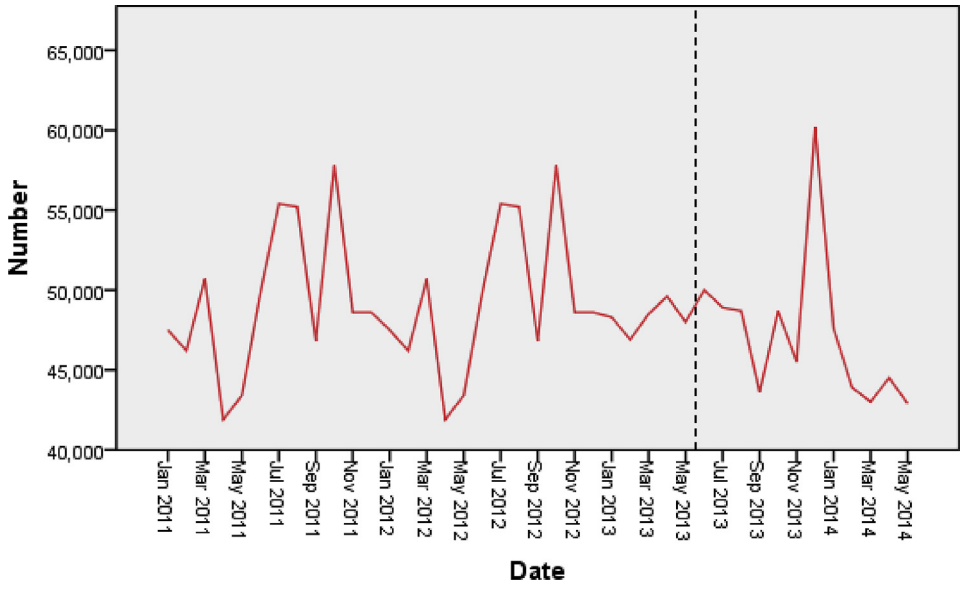

Fig. 3 – Monthly non-avoidable visits to emergency department. Dotted line indicates introduction of co-payment.

delayed effects of the measure. Excessive use of co-payments as a source of revenue may create inequities in the short term and increased health costs in the long run.[2–5,8–10,53] Therefore, they should be (and often are) combined with exemptions, ceilings and reimbursements that counteract the tendency to penalise the sick and the poor.

Limitations of this study

This study is subject to some limitations. It was not possible to check the validity of the classification of visits as 'non-avoidable' or 'potentially avoidable' against other indicators. The description of symptoms in medical records may not correspond to the experience of the patient; it may also influenced by the decision to treat or not to treat. There was no examination of inequities resulting from the introduction of co-payments—the possibility that people with more health problems and those with limited financial means would be more strongly penalised by co-payments than others. Data were also obtained from only one hospital. Although no significant regional differences apply, as always, caution is required when extrapolating from these data.

Conclusions

Introduction of copayment reduced ED use, primarily due to a reduction of potentially avoidable visits, whereas, in the short term (up to 11 months), it did not reduce non-avoidable visits. Therefore, introduction of co-payment in the midst of financial crisis exerts a beneficial and discrete effect on public healthcare resources, at least within the time span studied. This can be partly attributed to the low amount of the co-payment, which encourages personal responsibility without providing a serious barrier to access (which could be interpreted as punishment for improper use). Nevertheless, the long-term impacts still have to be assessed. To this end and to safeguard equity in health provision, as well as avoiding possible future costs arising from impediments to necessary treatment, it is crucial to establish accessible and affordable primary care and to provide health education to the public. This presupposes a massive overhaul of the system to adapt it to users' needs.

Author statements

Ethical approval

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Competing interests

None declared.

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