

SHORT REPORT

Switching to the Euro: still hard to swallow

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Injuries from ingestion (choking) of coins are common among children, with non-negligible morbidity,¹ but indications that smaller coins increase the risk of choking are mostly anecdotal. We evaluated this risk using a natural experiment in Greece with the introduction of the Euro in place of previously used larger coins.

METHODS AND RESULTS

Data on inhalation and ingestion events (choking) were collected from a European Union injury monitoring process. A network of three representative hospitals was used for data from Greece, which shifted to the Euro system in 2002. For comparison, we also used similar data from a network of five representative hospitals from Denmark, which has not shifted to the Euro system. Details of these networks are described elsewhere.² Possible unrepresentativeness cannot affect validity of the reported results, since these refer to the same dynamically evolving populations. For each ingestion or inhalation incident, data were obtained by specially trained interviewers interacting with the children, their guardians, and the attending health professionals. General physical characteristics for the coins were retrieved from the European Central Bank, the National Bank of Denmark, and the National Bank of Greece.

For Greece and Denmark, we obtained the risk of childhood coin choking during the three month period January to March 2002, relative to the risk during the same months over the preceding six years, 1996–2001. We report exact significance levels and confidence intervals under the assumption that the numbers are from two Poisson distributions,³ an assumption that was in agreement with the data. The physical characteristics of the coins involved in the injuries were compared before and after 2002 using the Wilcoxon test.

During January–March, over the years 1996–2001, the Greek and the Danish databases each reported 39 childhood

coin choking injuries, a three month incidence of $39/6 = 6.5$ incidents. During the three first months of 2002, the incidence in Denmark (four cases) is similar to that of the earlier years, which is in accordance with no change in the currency in Denmark. In contrast, a sharp and statistically significant increase was noted in Greece, where 17 coin choking incidents were recorded, in comparison to the observed average of 6.5 for the six previous years. Limiting comparison to Euro coins after 2002 and drachma coins (Greece's currency) before 2002 also indicates a doubling of choking incidence (table 1).

The bottom section of table 1 explores potential reasons for the above findings. First, within Greece or Denmark, and within a time period (prior to 2002, or 2002), the smaller of the circulating coins are selectively involved in coin related incidents. Second, in Greece (with an increase in coin related incidents in 2002 compared to earlier years), there was also a decrease in the size of the coins involved, as the country switched currency (see fig 1). Third, in Denmark, (with no increase in coin related incidents in 2002 compared to earlier years), there was no change in type or size of currency.

Using sampling ratios previously calculated² and taking into account that the study period in 2002 was three months long, we can estimate that throughout Greece, 1411 coin related incidents are expected to occur annually. Of these, slightly more than half $((2.15-1.0)/2.15)$ represent coin related incidents that would have not occurred were it not for the change from drachma coins to Euro coins.

DISCUSSION

The findings from a natural experiment in Greece suggest that the change to smaller size coins with the introduction of the Euro is responsible for an increase in coin related incidents. Moreover, no other explanation appears compatible with the data; the paediatric population in Greece is

Table 1 Coin related inhalation and ingestion injuries, and characteristics of coins involved in inhalation and ingestion injuries, during January–March 2002 in comparison to January–March 1996–2001 in Greece (drachmas before 2002, Euros after 2002) and Denmark (same currency before and after 2002)

Country	1996–2001 per year	2002	RR	95% CI	p value
Coin related incidents					
Greece					
All coins	6.5	17	2.62	1.39 to 4.74	0.003
Euro v drachma coins	6.5	14	2.15	1.08 to 4.08	0.029
Denmark (all coins are krone)	6.5	4	0.62	0.16 to 1.71	0.49
Coin characteristics					
Greece					
Mean diameter (mm)	24.7 [25.0]	19.8 [21.6]			0.0001
Mean weight (g)	6.9 [7.1]	4.4 [5.2]			0.007
Total circulation (million pieces)	1780	1600			
Denmark					
Mean diameter (mm)	19.7 [24.9]	20.0 [24.9]			0.67
Mean weight (g)	4.7 [7.4]	4.2 [7.4]			0.77
Total circulation (million pieces)	1790	~1990			

Comparison between "prior to 2002" and 2002 for coins involved in inhalation and ingestion incidents through the Wilcoxon test. Mean values of the totality of the circulating coins are given in square brackets.



Figure 1 A 10 cent coin (left) and a 20 drachma coin (right). The size of the 20 drachma coin (24.5 mm diameter) is the typical (median) size of drachma coins ingested in the period before 2002. The size of the 10 cent coin (19.8 mm diameter) is the typical (median) size of euro coins ingested in the period of 2002.

decreasing, and the total circulation of Euro coins (1600 million pieces) in 2002 is lower than the corresponding circulation of drachma coins in previous years (1780 million pieces).

For these findings to be used for policy on coin design, they need to be combined with a future study on the association between coin size and more specific medical measures of morbidity, although reliable analysis of the latter was not possible with our data. Nevertheless, our findings justify and promote policy actions like that of Scandinavian countries, which have made sure that small and light coins have holes

so that the flow of air is not obstructed in case of choking.⁴ Such studies will be especially relevant to countries that consider changing size and form of coins, including those planning to adopt the Euro.

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REFERENCES

- 1 **Rider G**, Wilson CL. Small parts aspiration, ingestion, and choking in small children: findings of the small parts research project. *Risk Anal* 1996;**16**:321–30.
- 2 **Dessypris N**, Petridou E, Skalkidis Y, *et al*. Countrywide estimation of the burden of injuries in Greece: a limited resources approach. *J Cancer Epidemiol Prev* 2002;**7**:123–9.
- 3 **Cox DR**, Hinkley DV. *Theoretical statistics*, 8th edn. New York: Chapman and Hall/CRC, 2000.
- 4 **Rimell FL**, Thome A Jr, Stool S, *et al*. Characteristics of objects that cause choking in children. *JAMA* 1995;**274**:1763–6.

