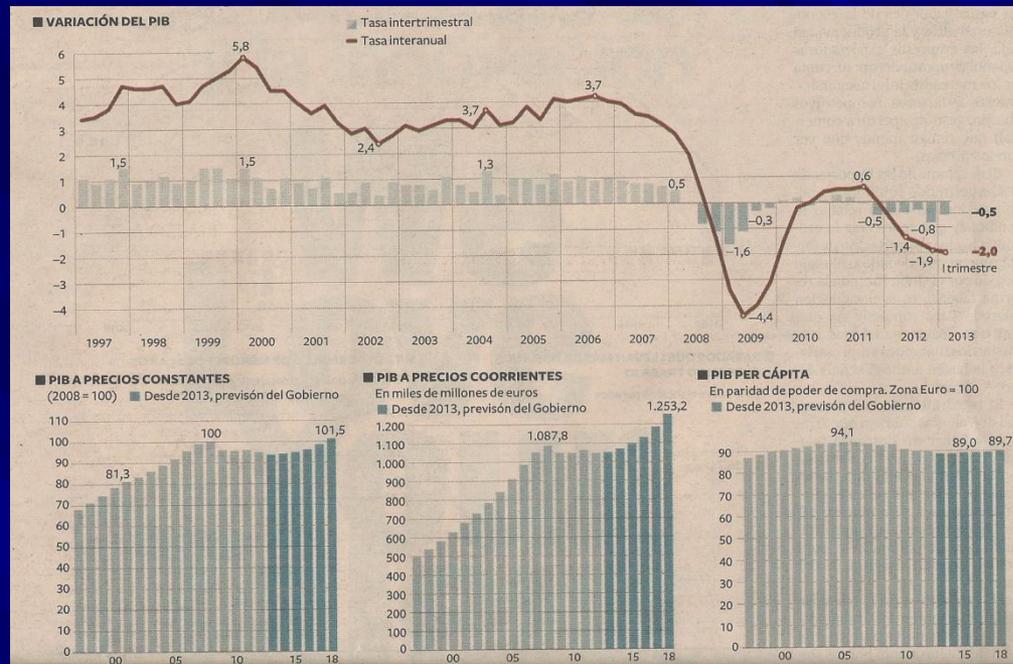


# Economic crisis and follow-up of the conditions that define metabolic syndrome in a cohort of Catalonia, 2005-2012

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# Introduction



✓ Following Dávila-Quintana and Gonzalez Lopez-Valcárcel (2009) is reasonable to assume that, if any, the effects of the recession on health would be, in any case, indirect, short term and reversible.

✓ The problem is that there is little evidence on the impact of the recession on health.

## Introduction

- ✓ Among the effects of the recession, several authors have argued that there might have been a change in dietary patterns.
- ✓ To the extent that, as a consequence of the recession, families are impoverished and, on the other hand, the relative prices of healthy food have increased, might expect that those families opted to increase their consumption of (cheaper) unhealthy food (i.e. junk food).
- ✓ However there is no quantitative evidence and the conclusions of the most recent papers are nothing more than working hypotheses that deserve further research.

- Drewnowski A, Specter SE. Poverty and obesity: the role of energy density and energy costs. *Am J Clin Nutr.* 2004;79:6 -16.
- Darmon N, Drewnowski A. Does social class predict diet quality? *Am J Clin Nutr.* 2008;87:1107 -1117.
- Suhrcke M, Stuckler D. Will the recession be bad for our health? It depends. *Social Science & Medicine* 2012; 74:647-653.
- Winters L, McAtteer S, Scott-Samuel A. *Assessing the impact of the economic downturn on health and wellbeing.* Liverpool Public Health Observatory, Observatory Report Series No. 88, February 2012.

## Introduction

- ✓ In an attempt to broaden the evidence, we proceeded to conduct a literature review. We found twenty-one citations. Most of them, however, contains narrative review, merely discussed hypothesis or proposed future research lines.
- ✓ Only eight articles provide quantitative evidence regarding the current recession.
- ✓ Only Powell and Chaloupka (2010), through a systematic review of studies between 2008 and 2010, found that small taxes or subsidies, altering the cost of unhealthy (energy-dense foods) compared with healthy (less-dense foods) are not likely to produce significant changes in body mass index or obesity prevalence (although it may in some groups).

## Introduction

- ✓ We could summarize very little evidence, saying that, as a result of the economic recession, the increase in the relative prices of healthy foods had increased the consumption of unhealthy foods. As a consequence, there may have been an increase in the incidence of obesity and/or dyslipidemia, at least in that most impoverished.
- ✓ Obesity and dyslipidemia are two of the conditions that compose the metabolic syndrome. This is defined as the fulfillment of the *National Cholesterol Education Program Adult Treatment Panel III (ATP-III)* five criteria of diagnoses: abdominal obesity (waist greater than 102 cm in men and 88cm in women); hypertension ( $\geq 130/85$  mmHg); low high density lipoproteins (HDL) (less than 40mg/dL in men and 50mg/dL in women) and hypertriglyceridemia ( $\geq 150$  mg/dL) (these latter two criteria defining dyslipidemia); and glucose intolerance ( $\geq 110$  mg/dL or known diabetes).

## Objective

- ✓ Our objective in this paper was to analyze the incidence of the four conditions defining the metabolic syndrome, namely, obesity, dyslipidemia, hypertension and diabetes mellitus type II, by following a general population cohort from 2005-2012.
- ✓ We were interested, in particular, in the evolution of the incidence during the economic crisis period, i.e. 2009-2012.
- ✓ Our hypothesis is that inputs to the condition of metabolic syndrome have exceeded outputs from 2009 onwards.

## Methods

- ✓ We used a general population retrospective cohort, composed of individuals assigned to one of three Health Basic Areas (ABS, 'Àrea Bàsica de Salut') managed by the Institute of Health Care (IAS, 'Institut d'Assistència Sanitària'), which had some contact with the health services between January 1, 2005 and December 31, 2012. We excluded individuals under 15 years (median of 36477 persons per year; Q1: 33025; Q3: 37864).
- ✓ The IAS managed all the ABS that provide health care to the region of 'La Selva Interior', Girona (ABS Anglès; ABS Breda-Hostalric; and ABS Cassà de la Selva).
- ✓ They are mainly rural (or semi-urban), with many towns scattered and dispersed with farms, estates and small villages far away.

## Methods - Selection bias-free estimation

- ✓ The cohort we used was not a random sample of the population. In fact, there was selection bias. Some individuals could have a higher probability of having contacted with the health services and, therefore, might have been overrepresented in the sample observed.
- ✓ To estimate the incidence we used a selection bias-free method proposed by Saez *et al.* (2009). The method requires the use of a population health survey. In this paper we chose to use the ESCA 2006, carried out between December 2005 and July 2006.

## Methods - Selection bias-free estimation

✓ In the **first stage**, we proceed as if the selection were exogenous and we weighted the sample in such a way as to award less weight to those individuals with greater probability of being observed.

- o The weighting use was equal to the inverse percentage represented by the users over the population (for 2005-2006) of the municipality where the user lived.

✓ The problem, however, was that the selection was endogenous, meaning that the unobserved factors which would influence the use of primary health care would not be independent of those non-observables which affect the response.

✓ **Second stage.** Using the weighting sample obtained in the first stage, we re-weighted the sample according to the probabilities of the use of primary health care.

- o These probabilities were estimated using a two-part econometric model, termed *hurdle* model.

## Methods – Hurdle model

✓ The first part of the decision process (the decision to seek care ) was modelled using a binomial link – logistic- (response: use 12 months ESCA 2006)

$$\mu_{1,i} = \text{Prob}(Y_i \geq 1 | \eta_{1,i})$$

$$\log\left(\frac{\mu_{1,i}}{1 - \mu_{1,i}}\right) = \eta_{1,i} \quad \text{Var}(Y_i) = \phi \mu_{1,i} (1 - \mu_{1,i}) \quad \phi = 1$$

✓ In the second part (the frequency of visits) the distribution of use (conditional to some use) was modelled as a truncated negative binomial (response: number of visits 2005-2006 cohort)

$$f(Y_i | \eta_{2,i}, Y_i > 0) = \frac{\Gamma(Y_i + \psi_{2i})}{\Gamma(\psi_{2i}) \Gamma(Y_i + 1)} \left( \frac{\mu_{2,i}}{\mu_{2,i} + \psi_{2i}} \right)^{Y_i} \left[ \left( \frac{\mu_{2,i} + \psi_{2i}}{\psi_{2i}} \right)^{\psi_{2i}} - 1 \right]^{-1}$$

$$\mu_{2,i} = \exp(\eta_{2,i}) \quad \psi_{2i} = \left( \frac{1}{\phi} \right) \mu_{2,i}$$

## Methods – Linear predictor

$$\eta_{it} = \beta_{0i} + \beta_1 Sex_i + \sum_{k=2}^6 \beta_k Age\ Group_{k,i} + \beta_7 HTA_i + \beta_8 DM2_i + \beta_9 OBES_i + \beta_{10} CHOL_i$$

- ✓ **Mixed model:** We allowed the intercept,  $\beta_{0i}$ , to be random effects, i.e. to be different for each individual, capturing characteristics individual specific (i.e. individual heterogeneity).
- ✓ Note that as covariates we included *need* variables (obesity, hypertension, diabetes mellitus type II and hypercholesterolemia) that could condition the use of health services, and variables, such as sex and age group, modulating the effect of the need variables.

## Results

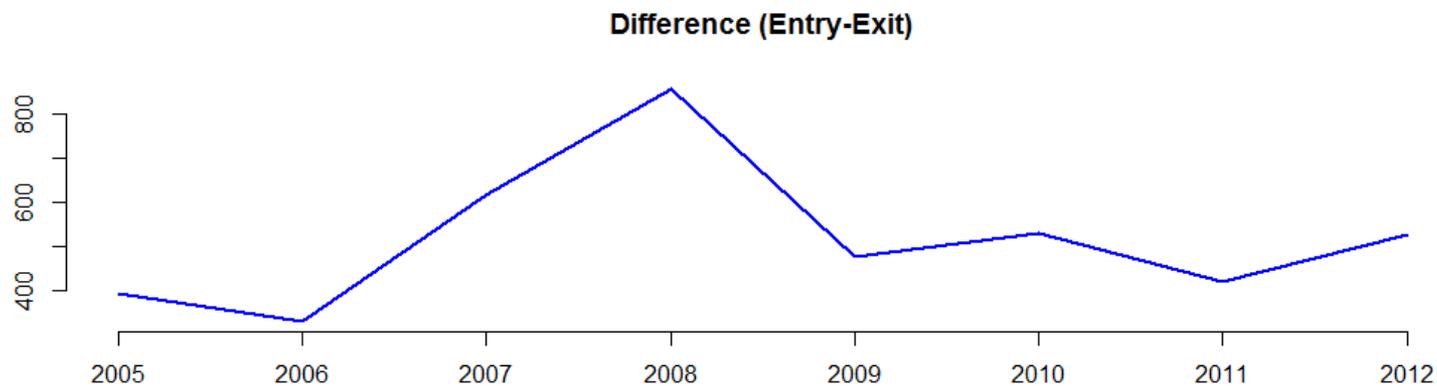
### Prevalence of chronic conditions components of metabolic syndrome

		2006			2011			2012
		ESCA <sup>1</sup>	ENSE <sup>3,4</sup>	Cohort	ESCA <sup>1</sup>	ENSE <sup>3,4</sup>	Cohort	Cohort
HTA	≥ 15 years	19.8%	20.6%	14.4%	25.2%	25.7%	21.1%	21.5%
	Males	18.3%	18.6%	13.1%	24.5%	23.5%	20.5%	21.0%
	Females	21.2%	22.6%	15.8%	25.9%	27.5%	21.7%	22.2%
DM2	≥ 15 years	5.1%	6.2%	4.1%	8.0%	8.8%	6.8%	7.3%
	Males	4.6%	6.3%	4.4%	8.0%	8.7%	7.6%	8.1%
	Females	5.5%	6.0%	3.7%	8.1%	8.9%	6.1%	6.5%
Obesity <sup>2</sup>	≥ 15 years	11.2%	15.7%	6.4%	11.8%	17.8%	14.0%	15.6%
	Males	11.2%	16.2%	4.0%	12.6%	18.7%	11.1%	12.7%
	Females	11.3%	15.3%	8.7%	11.0%	17.0%	16.9%	18.4%
High cholesterol	≥ 15 years	15.0%	15.7%	12.5%	21.9%	21.6%	22.2%	25.2%
	Males	14.5%	15.3%	12.1%	21.2%	20.6%	22.6%	24.9%
	Females	15.4%	16.1%	12.8%	22.7%	22.5%	23.1%	25.4%
Metabolic syndrome	≥ 15 years			21.32%			30.34%	32.35%
	Males			17.58%			26.79%	30.19%
	Females			23.05%			33.37%	36.66%

Weighted using the elevation factors of ESCA (Catalan Health Survey) and ENSE (Spanish National Health Survey) and the Hurdle model for the cohort

1 Self-declared 2 Weight and Height self-declared in ESCA and ENSE 3 Including Catalonia 4 Declares that the doctor has said that suffers the condition

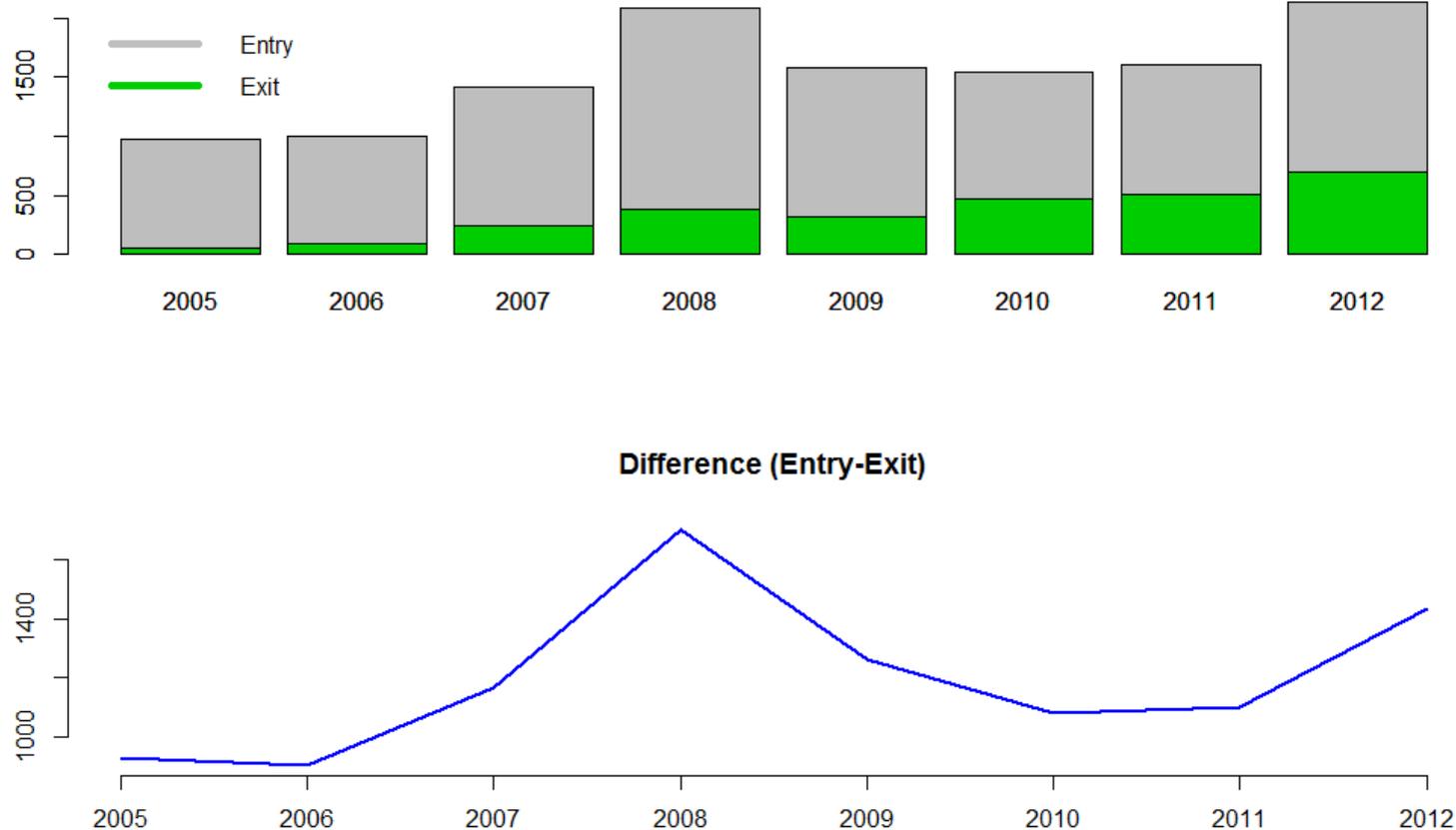
## Results – Incidence of obesity



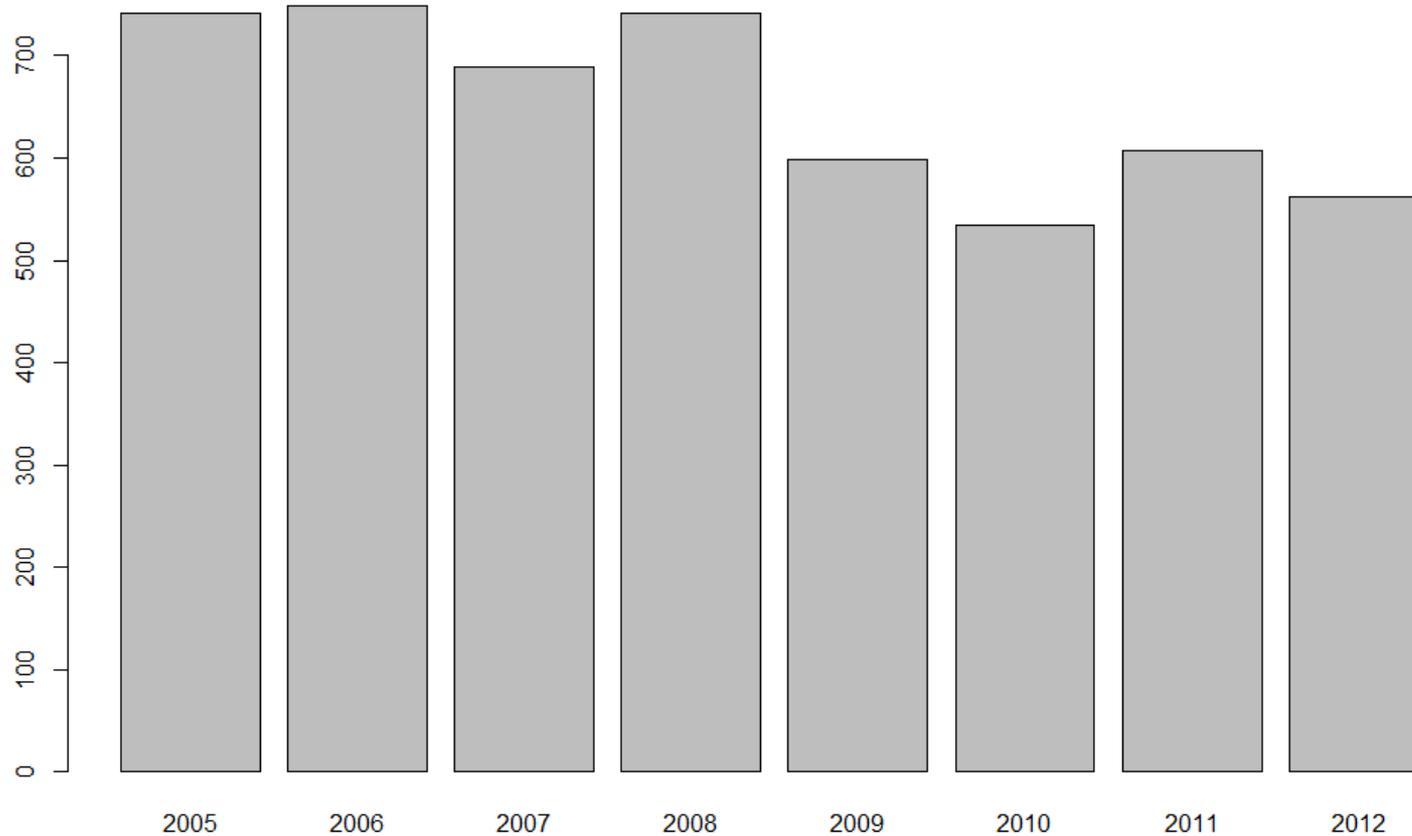
## Results – Incidence of high cholesterol



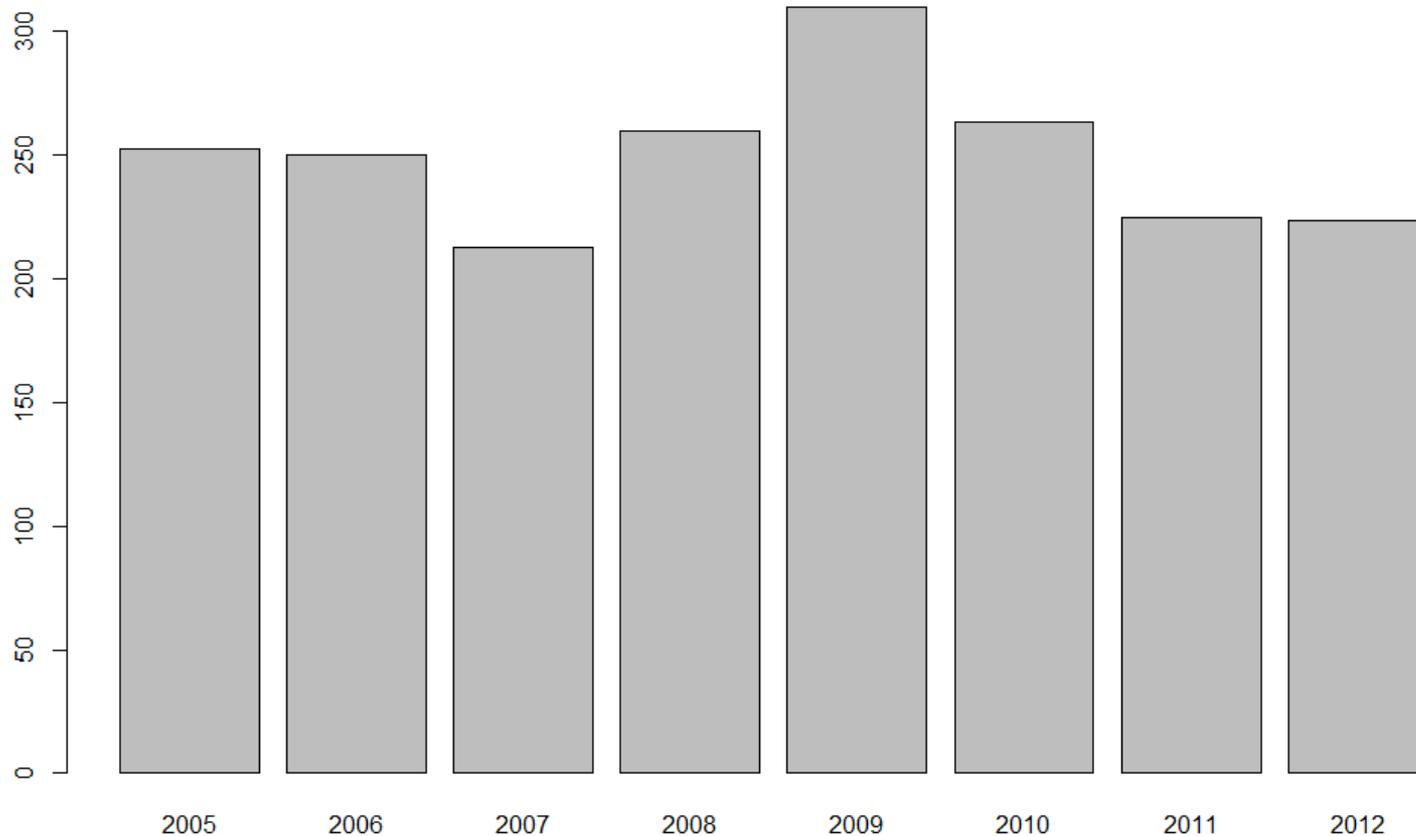
## Results – Incidence of obesity and high cholesterol



## Results – Incidence of hypertension

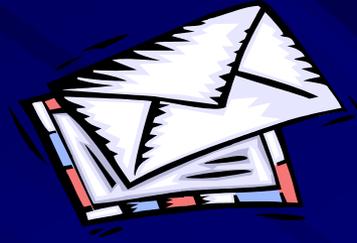


## Results – Incidence of diabetes mellitus type II

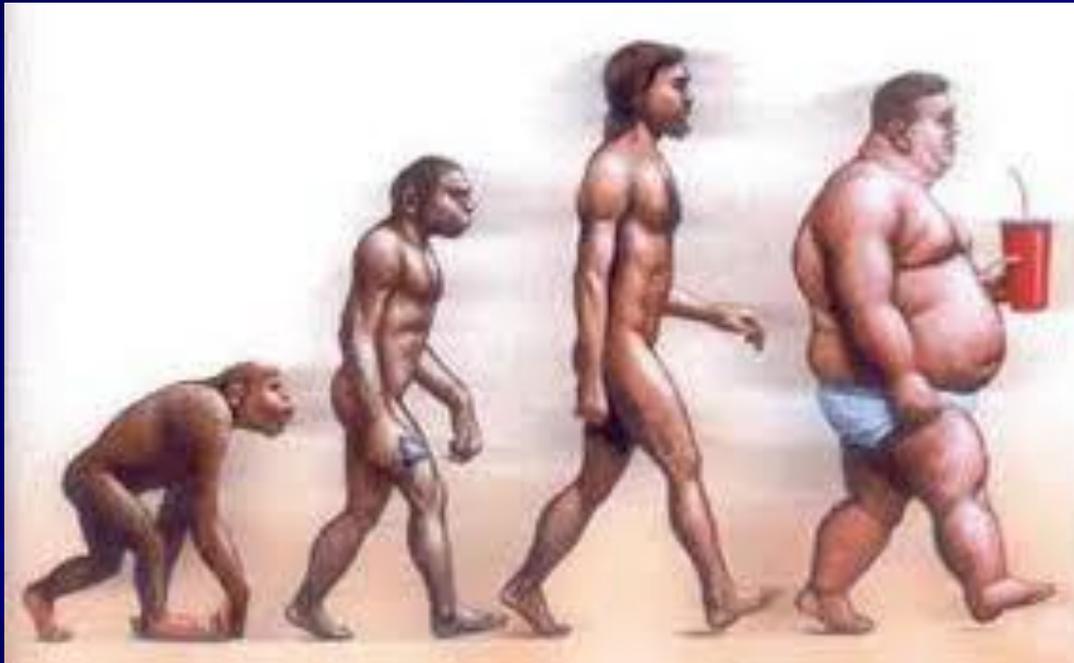


## Conclusions

- ✓ There is little evidence on the impact of the recession on health.
- ✓ As a result of the economic recession, the increase in the relative prices of healthy foods had increased the consumption of unhealthy foods. As a consequence, there may have been an increase in the incidence of obesity and/or dyslipidemia, at least in that most impoverished.
- ✓ Using a method that avoids the selection-bias (consequence of using a non-random cohort) we found that, after the economic recession (2009-2012), there are:
  - o An important increase in the prevalence of obesity, high cholesterol, hypertension and diabetes mellitus type II.
  - o A significant increase in the incidence of high cholesterol and, in a lesser extent, high cholesterol.



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