CAN HEALTH PUBLIC EXPENDITURE REDUCE THE TRAGIC CONSEQUENCES OF ROAD TRAFFIC ACCIDENTS? THE EU-27 EXPERIENCE

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Abstract:

This study uses data for the EU-27 countries in the period 1999-2009 to estimate determinants of road traffic fatality rates. Controlling for country attributes and road safety policy variables, we examine the influence of variables related with the national health systems; the number of hospital beds per square kilometer and the percentage of health expenditures over gross domestic product. We find evidence that the density of hospital beds contributes substantially to the fall in traffic-related fatalities. Furthermore, the quality of general medical facilities and technology associated with increases in health expenditure may be also a relevant factor in reducing road traffic fatalities.

Original publication statement
This study contains original unpublished work and is not being submitted for publication elsewhere at the same time.

Conflicts of Interest
Authors declare that there do not exist financial and personal relationships between themselves and others that might be perceived by others as biasing their work.

Ethical background
This study meets all ethical criteria required by the Committee on Publication Ethics.

1. INTRODUCTION.

Nowadays road traffic accidents (RTAs) and related injuries tend to be recognized as relevant health public problems and economic concerns in European countries (Racioppi et al., 2004). The European Commission CARE database (EC, 2012), estimates that over 31,000 road users are killed annually due to RTAs in the European Union 27 (EU-27), which is equivalent to the population of The Republic of San Marino or The Principality of Monaco. Road safety has become a major issue in EU common transport policies (Threlfall, 2003) within the framework of the four European Road Safety Action Programmes (ERSAP). According to statistical sources (EC, 2012; ETSC, 2011) remarkable improvements have been achieved during recent years, (with a 45% reduction in the number of road deaths since 2001 to 2011), through the whole *acquis* of strategies implemented by member States and the European Authorities (see Bax, 2011 for regulation and directives referred to technical aspects of vehicles, infrastructures, working conditions of professional drivers, creation of a single driving license or cross-border enforcement; European Commission's recommendations on specific areas of behavior such as speeding, alcohol and drugs while driving; so-called "*soft law*" based on non-binding stipulations for States, such as action programs, policy targets and white papers; economic stimuli for research funding and a solid network established with States and other organizations for benchmarking, dissemination of information and sharing best practices).

Several studies have analyzed factors that may be statistically significant for explaining the fall in European accidents rates (Herrero Blanco et al. 2011; Orsi et al. 2012) with variables linked to level of economic activity or to preventive actions (*active safety):* traffic safety policies or related to investment in and maintenance of safer roads and vehicles. Much of this work agrees in also associating reductions in traffic-related fatalities with so-called *passive safety,* in reference to the effectiveness of post-accident care (Gitelman et al., 2012;

Noland, 2003b): i.e., advances in recent decades in National Health Systems (NHS) that provide better emergency services and vehicles (Elvik et al. 2009); advanced trauma care (Bishai et al. 2006; Gitelman et al. 2012); new medical technology and treatments (Noland & Quddus, 2004); greater availability of hospitals, hospital beds and personnel (Anwaar et al. 2012); and faster and better pre-hospital care with a considerable reduction in the so-called *"Golden Hour"*[1] (Arroyo et al. 2012; Sánchez-Mangas et al. 2010).

However, despite of the European Commission's harmonization efforts (such as the e-Call system, EC, 2011) and the real convergence of EU members' health policies over the last 30-40 years (Cucic, 2000; Wörz & Busse, 2005), significant differences can still be detected between the various NHS (Hitiris, 1997; Przywara, 2010): different health public spending patterns, differences in legislation on emergency services (medical response time guaranteed by law in several countries) and their financing (included in the driver's private insurance or by government coverage). In short, different health-care systems may reflect different health outcomes (Nixon & Ulmann, 2006) and different levels of road safety performance, which in turn are also influenced by each State's own socio-political, economic and historical evolution, according to Orsi et al. (2012).

This study uses data for the EU-27 countries in the period 1999-2009 to estimate the determinants of road fatality rates. Controlling for country attributes and road safety policy variables, the main goal is to examine the extent to which differences between member States in road traffic fatally rates can be attributed to changes or disparities in the planning of national health-care systems (considered as a whole).

Prior research indicates that improvements in health management have contributed to better injury outcomes, although no definitive conclusions can be drawn because the relationship with tragic road crash outcomes has been analyzed by relatively few studies and

[1] This concept refers to the care response timeframe after a RTA and is described as "crucial" by the literature for survival or reducing injuries (see Gitelman et al. 2012) (the first 60 minutes post-collision).

only partial aspects of the NHS are considered (i.e., post-impact care and medical technology; see the meta-analysis by Elvik et al. 2009).

Therefore our aim is to evaluate the contribution made by some typical factors associated with reductions in RTA consequences and provide evidence for the causal link between health-care expenditure made by EU governments (studied by Pammolli et al., 2012) and traffic safety outcomes. Nixon & Ulmann (2006) acknowledge the difficulty of isolating the contribution of the health service as a determinant (input) of health status (output) in general. Other authors, such as Gitelman et al. (2012), suggest the need to carry out studies to evaluate the relationship between health-care performance and road safety outcomes.

Thus, the crucial variables in our analysis identify differences across European countries in health systems. In particular, we consider the following health related variables; the number of hospital beds per square kilometer and the percentage of health expenditures over gross domestic product.

In this regard, we propose to identity empirically the effect of variables that may increase the speed and effectiveness of health treatment to injured victims in road accidents. Here, it is not just the availability of hospital beds nearby that is relevant, but also all the health services associated with them, such as ambulances and trauma services.

Hence, we seek to test whether investing in a health system beyond what should be expected according to a country's level of economic development (detected by the per capita gross domestic product) has positive effects on the reduction in road traffic fatality rates, as Noland (2003b) states. This should especially be the case when the investment is directed at developing a dense hospital network (with associated health services) that takes into account not only the volume of the population, but also the size of the country.

Furthermore, we analyze the effect of health public expenditure as a percentage of the Gross Domestic Product as a proxy variable of overall domestic improvements in health systems made by member countries. In this respect, the econometric estimation obtained by Herrero Blanco et al. (2011) suggests that fatality rates in the EU (not the accident rate) are more closely linked to domestic health expenditure than the per capita income level. Although a negative and statistically significant correlation is obtained for both variables with respect to road fatality and injury rates, the effect is much higher in the case of health expenditure. Therefore, we assume the hypothesis established by these authors and confirmed by Anwaar et al. (2012) and Bishai et al. (2006): the correlation between the level of economic development and road fatality rates is conditioned by specific components of this economic progress, such as all the different ways in which advances in health policies can be expressed through the general concept of public spending.

Our analysis will also enable us to test the Noland (200b3) hypothesis on the European scale, i.e., that the increased motorization rates that have resulted from economic growth may cause a rise in traffic fatalities, but when a certain level of development has been reached, the quality and accessibility of health facilities and resources have an indirect effect on road users' attitudes to risk (Grimm & Treibich, 2012).

The paper is structured as follows. After this introduction, Section 2 describes the data, variables and empirical model. Section 3 addresses some econometric issues that should be tackled. Section 4 discusses the major findings and their implications and Section 5 lays out the main conclusions of our study.

2. THE EMPIRICAL MODEL.

In our empirical analysis, we use EU-27 data for the 1999-2009 period. We develop a two-way fixed effects model that takes the following form for country *i* during period *t*:

$$Y_{it} = \alpha + \beta_k X_{it} + \lambda_k' Z_{it} + \mu_i + \nu_t + \varepsilon_{it} \quad (1)$$

where Y_{it} is the log of the total per capita fatality rate (within 30 days of the accident according to the Vienna Convention definition)[2], X_{it} contains the vector of the country's economic attributes and Z_{it} are road safety policy-related variables. μ_i are country fixed effects that control for time-invariant country-specific omitted variables, ν_t are year dummies that control for the common trend in all countries in the dataset and ε_{it} is a mean-zero random error.

Table 1 provides the descriptions, information sources and descriptive statistics (mean and standard deviation) of the explanatory variables.

[INSERT TABLE 1]

The main variables in our analysis are health policy-related. Based on other studies on this issue which seem to confirm a positive link between health care expenditure and several health outcomes (see Nixon & Ulmann, 2006 for the EU) we include as an explanatory variable the total expenditure on health as a percentage of the gross domestic product. Following Maio et al. (1992) and Noland (2003a, 2003b) we also include the number of hospital beds per square kilometer. We expect a negative sign for the coefficients associated with these variables. In this case, the health variables would contribute to the reduction in road traffic fatality rates, as stated by Anwaar et al. (2012).

In line with Orsi et al. (2012) we also consider typical variables used for road traffic fatalities related to the country's economic conditions found in the empirical literature. In this regard, we include the per capita gross domestic product as an indicator of the country's economic development (García-Ferrer et al. 2007). Kopits & Cropper (2005) and Anbarci et al. (2006) find evidence of a non-linear relationship between road fatalities and economic development using samples that include developed and developing countries from all over the

[2] Albalate (2008), Albalate & Bel (2011), Dee (2001) and Eisenberg (2003) consider that this is the most appropriate dependent variable for assessing road traffic fatalities as the interpretation of policy variables is clearer.

world. Indeed, fatality rates may increase with economic development in very poor countries due to increased exposure to road traffic accidents. However, as Bishai et al. (2006) specify, the relationship between economic development and traffic fatality rates may become flat or even decrease after reaching a certain wealth threshold. We test the hypothesis concerning non-linearity between GDP and traffic fatalities by including the GDP and the square of the GDP as explanatory variables.

The country's level of motorization is also taken into account. This variable is related to the development of private transportation. It is not clear what relationship with road traffic fatalities should be expected. On the one hand, higher levels of motorization may imply higher exposure to road traffic accidents. On the other hand, more developed countries may enjoy better infrastructure and vehicles, better policies and better social attitudes towards road safety, confirming what is known as Smeed's Law (Smith, 1999).

The number of passengers-kilometer weighted by country population is an additional explanatory variable in our model. This variable seeks to capture the intensity of traffic on the roads. In this regard, we could expect a positive relationship between the amount of traffic and road fatalities since the total amount of driving is an indication of the population's exposure to road accident risks (Orsi et al. 2012). However, as Li et al. (2012) find, such a relationship could be dependent upon congestion levels. We also include motorway density as an explanatory variable. This is an indicator of the quality of transport infrastructure. We may expect a negative relationship between the quality of transport infrastructure and road traffic fatality rates as it is found in Albalate & Bel (2012) for toll-free motorways. Furthermore, we also consider the percentage of population over 60 years old. Some studies have demonstrated that older populations tend to have fewer crashes, because older road users usually take fewer risks than younger people in many different road safety contexts (i.e. Langford et al., 2006).

Along with countries' economic and demographic attributes, we also consider additional variables for road safety policies. Firstly, following the prior literature on road accidents (Albalate, 2008; Castillo-Manzano & Castro-Nuño, 2012; Eisenberg, 2003), we include a dummy variable that takes a value of one for countries and periods where the maximum blood alcohol concentration rate allowed is lower than 0.5. In our context, most of the countries have set the limit at 0.5 or lower, so we are able to test whether blood alcohol concentration rates lower than 0.5 are effective in reducing road traffic fatalities. Secondly, we include a dummy variable that takes a value of one for countries and periods with points-based driving licenses. With this variable we can test the effectiveness of this policy for reducing road traffic fatalities. Finally, we consider a variable that shows the maximum speed limit allowed on motorways. Following researchers such as Elvik (2012), we may expect a positive relationship between the speed limit (and its subsequent enforcement) and road traffic fatalities.

3. ECONOMETRIC ISSUES.

The estimates can present heteroscedasticity and temporal autocorrelation problems in the error term. The Wooldridge test for autocorrelation in panel data shows that we may have a problem of serial autocorrelation that must be addressed. However, the Breusch-Pagan/Cook-Weisberg test indicates that we do not have a problem of heteroscedasticity. Furthermore, we apply the panel unit root test developed by Levin et al. (2002) that can be viewed as an Augmented Dickey-Fuller (ADF) test when lags are included. This test indicates that we do not have a problem of non-stationarity of our dependent variable.

We perform the estimation using different estimation techniques. First, we use the ordinary least squares (OLS) method including dummies for countries and years. This estimation technique can be considered as essentially identical to the fixed effects or least square dummy variables estimator. Following Bertrand et al. (2004), our standard errors are clustered by country to take into account the correlation between the same country observations.

Given that the dependent variable is a nonnegative count variable, we also make the estimation using the poisson regression including dummies for countries and years (Anbarci et al. 2006). The standard errors in this regression are also clustered by country.

Furthermore, an alternative to deal with the problem of serial autocorrelation is to consider explicitly some autocorrelation structure of the error term. In this regard, we also make the estimation with the OLS method assuming an AR(1) process in the error term.

Finally, we also consider a dynamic model because it is reasonable to think that the fatality rate at period t-1 is a relevant variable to explain the fatality rate at period t. Here an instrumental variables estimation technique should be used so that we make the regression in the dynamic setting applying the Arellano-Bond estimator for the first-differenced model. The Arellano-Bond estimator is a GMM estimator that exploits all the available instruments (all the available lags of the dependent variable up to the second lag). We have also experimented with the system-GMM estimator but we do not report the results because they are less satisfactory. The performance of the system GMM-estimator should be better when the variables are persistent but we have not found a problem of non-stationarity in our dependent variable.

As additional robustness check, we also make the estimation of equation (1) with different dependent variables. First, we use the number of fatalities per miles driven. Second, we use the number of road accidents per capita and the number of road traffic injured per capita as dependent variables. Theoretically, the coefficients associated with health care variables should not be statistically significant in these latter regressions because they are only influencing severity impacts of accidents after the crash, but have nothing to do with production of accidents or injuries.

Table 2 depicts the variance decomposition of the continuous variables used in the empirical analysis in two orthogonal components: the within-component (variability within each country) and the between-component (variability across countries). This table shows that the variability across countries is higher than the variability within each country for all variables except for the variable of vehicles-km driven. Note also that there is not variability within each country for the road safety policy variables. This explains that these variables cannot be identified in the dynamic estimator for the first-differenced model.

[INSERT TABLE 2]

Another issue that must be addressed is the potential endogeneity of the health expenditure variable. Indeed, there may be a simultaneous determination of road fatalities and health expenditure that could cause a bias in the estimation. To deal with this, we include a one-year lag of health expenditure as an explanatory variable. Noland (2003a) discusses the possibility of an endogeneity problem between hospitals location and traffic crashes but several studies show that location of hospitals is mainly related with a minimization of travel distance or maximization of demand coverage (Cho, 1998; Rahman & Smith, 2000) or geography equity and building costs (Calvo & Marks, 1973; Humphreys, 1985).

Table 3 shows the correlation matrix of the variables used in the empirical analysis. First of all, we do not see a problem of correlation between the health variables. Second, the correlation between the different explanatory variables is generally low although the variable of GDP per capita is correlated with several variables. In this regard, the variance inflation factors are not higher than two for all the variables used in equation (1) so that we do not expect to have a problem of multicollineality.

[INSERT TABLE 3]

4. RESULTS AND DISCUSSION.

Table 4 provides the results of the estimates of the determinants of road traffic fatalities equation. We find no substantial differences in the results for the health variables whichever estimation technique is used. Additionally, results for most of the control variables are also similar regardless the estimation technique used.

[INSERT TABLE 4]

In line with prior results by Bishai (2006) and Grimm & Treibich (2012) we find evidence of a non-linear relationship between road traffic fatality rates and countries' economic development. Indeed, the coefficient associated with the GDP variable is positive and statistically significant, while the square of the same variable is negative and also statistically significant.

The level of motorization variable is not statistically significant in the OLS regression with clusters, and it is negative and statistically significant at the 10% level in the other regressions. In our sample, it seems that the effect of better infrastructures and vehicles overcome that of higher exposure to road traffic accidents.

We also find that the coefficient associated with motorway density is negative and statistically significant, which confirms that the quality of transport infrastructure has a significant effect on road safety, as in Jamroz (2012). Furthermore, the variable of vehicles-kilometer driven is not statistically significant. In the line of Li et al. (2012), more traffic on the roads implies higher exposure to accidents but this effect may be partially compensated for by lower speeds (and therefore less severe accidents) due to congestion.

The sign of the coefficient associated to older populations is positive which is contrary to what was expected. However, it is only statistically significant in the OLS regression with an AR(1) disturbance. This finding is according to other previous studies such as Braver &

Trempel (2004) or Yee et al. (2006). Elderly collision victims may have an increased risk of morbidity and mortality because of increased fragility.

Concerning road safety policies, those related to the maximum blood alcohol concentration rate and speed limits seem to be effective in reducing traffic fatality rates (although the variable for blood alcohol concentration is not statistically significant in the poisson regression). Surprisingly, the sign of the coefficient associated with the points-based driving license policy is only what was expected in the OLS regression with an AR(1) disturbance. The mixed results for this variable may be due to the lack of harmonization of the structure and the period of implementation among the member States. In any case, the mixed result for this variable may be an indication of little relevance of the points-based driving policy. In this regard, the real effectiveness of this measure is starting to be questioned; especially some months after the passing of the measure (see Castillo-Manzano & Castro-Nuño, 2012, for a recent meta-analysis about the effects of this policy).

Importantly, the coefficients associated with both the variables of health expenditure and the density of hospital beds are negative and statistically significant regardless of the estimation technique used.

We find that a 10% increase in health expenditure (as a percentage of the GDP) implies a decrease in traffic fatality rates of about 3-5%. Additionally, a 100% increase in the number of hospital beds per kilometer implies a decrease in traffic fatality rates of about 3-5%. Thus, we confirm that countries that provide a better geographical coverage of health care for road accidents are able to reduce the likelihood of death once the accident has taken place (Buchmueller et al. 2006) by enabling a quick medical response and pre-hospital care (Arroyo et al. 2013; Sánchez-Mangas et al. 2010; Wilde, 2012). The upper statistical significance of the density of hospital beds over the health expenditure variable is according to previous researchers as Bentham (1986), Bishai et al. (2006) or Grimm & Treibich (2012) who identified a better and quicker post injury medical care related to greater availability of hospitals as one of the key factors for lower injury severity and traffic fatality rates.

Finally, table 5 shows the results with different dependent variables. For the sake of simplicity, we only report the results for the health variables in the regressions that use the OLS with an AR(1) disturbance. We confirm the results obtained previously in the regression that uses the fatalities per vehicle-km driven as dependent variable. Furthermore, the variable of beds per km is not statistically significant in the regression that uses the accidents per capita as dependent variable. In fact, this variable is positive (although not statistically significant) in the regression that uses the injuries per capita as dependent variable. Concerning the variable of health expenditure, it is still negative and statistically significant in both regressions with accidents per capita and injuries per capita as dependent variables (although it is only statistically significant at the 10% level in the regression of accidents per capita).

Overall, this latter result confirms that a higher bed density contributes to reduce the severity impacts of accidents after the crash. The variable of health expenditure may be also capturing additional country characteristics like attitudes of citizens about health in general (lifestyle) and other factors as medical technical progress. However, the proximity to hospital resources (with all that our proxy variable of the concentration/density of hospital beds entails: physicians, nurses, emergency medical services, operating rooms, advanced trauma services) seems to be a more significant contributor to minimize the traffic accidents consequences.

5. CONCLUDING REMARKS.

In this paper, we have shown and quantified the way in which the quantity and quality of the health system affects road traffic fatality reductions in the EU-27. This study uses data for the EU-27 countries in the period 1999-2009 to estimate determinants of road traffic fatality rates. We have controlled for several variables that are also significant and which are related to the country's economic development, the quality of its infrastructure, the amount of road traffic and policies such as maximum blood alcohol content and speed limits.

We find evidence that the density of hospital beds contributes substantially to the fall in traffic-related fatalities. Furthermore, the quality of general medical facilities and technology associated with increases in health expenditure may be also a relevant factor in reducing road traffic fatalities.

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TABLE 1. Variables used in the empirical analysis

Variables	Description	Source	Mean	Standard Deviation
Per capita fatalities	Fatality rates per million inhabitants	CARE (EU road accidents database)	110.61	45.32
Health_expenditure	Total expenditure on health as a percentage of the gross domestic product	WHO (Global health observatory data repository)	8.00	1.64
Bed density	Total hospital beds per square km	Eurostat and World Bank Statistics	9757	41523
Per capita GDP	Per capita gross domestic product in International Comparable Prices (US$ at 2005 prices and PPP)	UNECE Statistical Division Database, compiled from official national and international (CIS, EUROSTAT, IMF, OECD) sources	25211	11738
Motorization	Number of registered vehicles per 1000 inhabitants	UNECE transport division, Eurostat, World Bank and national databases	424.27	113.57
Vehicles-km driven	Number of passenger-cars-km expressed in 1000 million km and weighted by national population	European Commission (Directorate General for mobility and transport)	44.21	337.56
Motorway density	Number kms of motorways divided by square km of the country	EUROSTAT and UNECE	1.68	1.74
Old	% population over 60 years old	UNECE	19.65	2.32
BAC_05	Dummy variable that takes a value of 1 for countries and periods where the maximum blood alcohol concentration rate allowed is less than 0.5	European Commission Road Safety Website	0.25	0.43
PPS	Dummy variable that takes a value of 1 for countries and periods with a points-based driving license	SWOV and National legislation	0.74	0.43
Speed limits	Maximum speed limits (km/hour)	European Commission Road Safety Website	121.18	13.66

TABLE 2. Variance decomposition of continuous variables

Variables	Variability across countries	Variability within each country
Per capita fatalities	39.57	23.26
Health_expenditure	1.52	0.53
Bed density	41729.73	6452.56
Per capita GDP	11693.23	2301.21
Motorization	108.02	40.30
Vehicles-km driven	164.83	296.13
Motorway density	1.75	0.23
Old	2.26	0.68

Note: There is not variability within each country for the variables BAC_05, PPS and Speed limits

TABLE 3. Correlation matrix

Variables	fatalities	Health_ex pend.	Bed dens.	GDP	Motor.	Vehicles-km	Motor way	Old	BAC_05	PPS	Speed limits
fatalities	1										
Health_ex pend.	-0.43	1									
Bed dens.	-0.42	-0.04	1								
GDP	-0.39	0.45	-0.006	1							
Motor.	-0.38	0.49	0.25	0.76	1						
Vehicles-km	0.03	0.03	0.03	0.03		1					
Motorway	-0.19	0.51	-0.14	0.64	0.46	0.03	1				
Old	0.009	0.39	-0.20	-0.07	0.14	0.20	0.06	1			
BAC_05	0.12	-0.43	-0.13	-0.40	-0.58	-0.07	-0.43	- 0.17	1		
PPS	0.20	-0.12	0.12	-0.02	0.13	0.06	-0.18	- 0.03	-0.22	1	
Speed limits	0.20	0.28	-0.58	0.14	-0.08	0.07	0.27	0.10	0.07	0.11	1

TABLE 4. Results of estimates: Fatality rates per capita

Independent variables	**(1) OLS with clusters at the country level**	**(2) OLS with an AR (1) disturbance**	**(3) Poisson with clusters at the country level**	**(4) GMM (Arellano-Bond dynamic estimation)**
Lag (fatalities per capita)	-	-	-	-0.29 (0.05)***
Health_expenditure	-0.054 (0.026)**	-0.048 (0.01)***	-0.048 (0.02)**	-0.037 (0.019)**
Bed density	-2.51e-06 (6.30e-07)***	-2.78e-06 (1.42e-06)**	-2.45e-06 (5.72e-07)***	-5.00e-06 (8.80e-07)***
Per capita GDP	0.000062 (0.000015)***	0.00005 (0.000010)***	0.00006 (0.000015)***	0.00003 (0.000014)***
Per capita GDP ^{2}	-5.56e-10 (1.46e-10)***	-4.29e-10 (8.60e-10)***	-5.63e-10 (1.35e-10)***	-4.10e-10 (1.05e-10)***
Motorway density	-0.12 (0.004)**	-0.14 (0.02)***	-0.11 (0.04)***	-0.12 (0.05)**
Motorization	-0.0006 (0.0004)	-0.0005 (0.0003)*	-0.0009 (0.0005)*	-0.0005 (0.0003)*
Vehicles-Km driven	1.48e-06	4.91e-06	3.85e-06	-5.92e-06

	(8.05e-06)	(7.88e-06)	(7.09e-06)	(4.60e-06)
BAC_05	-0.15 (0.05)***	-1.26 (0.14)***	-0.12 (0.27)	-
PPS	1.08 (0.23)***	-0.50 (0.17)***	0.45 (0.27)*	-
Speed limits	0.016 (0.004)***	0.03 (0.003)***	0.04 (0.004)***	-
Old	0.05 (0.03)	0.05 (0.02)***	0.04 (0.03)	0.037 (0.24)
Constant term	0.81 (1.18)	-	-2.44 (1.30)	2.72 (0.58)***
R-Sq. Test joint sign. Number observations	0.95 96.92*** 268	0.99 2.22e+06*** 268	0.69 4458.95*** 268	- 4395.8*** 239

Note 1: Standard errors are given in brackets
Note 2: Statistical significance at 1% (***), 5% (**), 10% (*)
Note 3: We use one lag of the health expenditure variable to deal with the potential simultaneous determination with road traffic fatalities

TABLE 5. Estimates of health variables with different dependent variables (OLS with an AR(1) disturbance

Independent variables	(1) Fatalities per capita	(2) Fatalities per miles	(3) Accidents per capita	(4) Injured per capita
Health_expenditure	-0.048 (0.01)***	-0.11 (0.031)***	-0.051 (0.029)*	-0.067 (0.03)**
Bed density	-2.78e-06 (1.42e-06)**	-2.90e-06 (1.39e-06)**	-2.54e-06 (1.55e-06)	8.72e-07 (8.37e-07)

Note 1: Standard errors are given in brackets
Note 2: Statistical significance at 1% (***), 5% (**), 10% (*)
Note 3: We use one lag of the health expenditure variable to deal with the potential simultaneous determination with road traffic fatalities