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The use of big data to study socio-economic determinants of compliance to therapies

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March 15th ,2023

Outline

- The use of large administrative datasets in health economics: pros and cons
- The Ligurian case
- Two examples of application:
  - Barriers to access drug and drug compliance: the case of silent killers
  - Covid-19, lockdowns and compliance to therapy

DATASET FOR HEALTH ECONOMICS ANALYSIS

1. Large scale survey datasets

PRO: rich set of info on health, living standards; data rapresentative of a specific population; survey run on regular basis; free access

CONS: sampling and nonsampling errors**;** self-reporting; not representative of small subpopulations

2. Administrative datasets

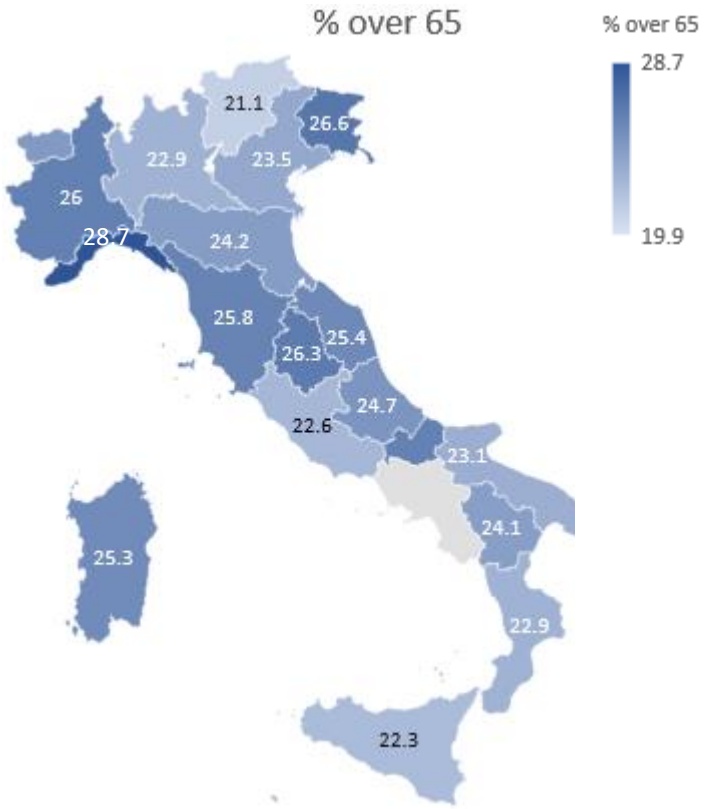
PRO: not a sample but all the population (rare diseases); no self-reporting

CONS: difficult to access (privacy); data protection; data contains limited complementary info (e.g. living standards)

Setting

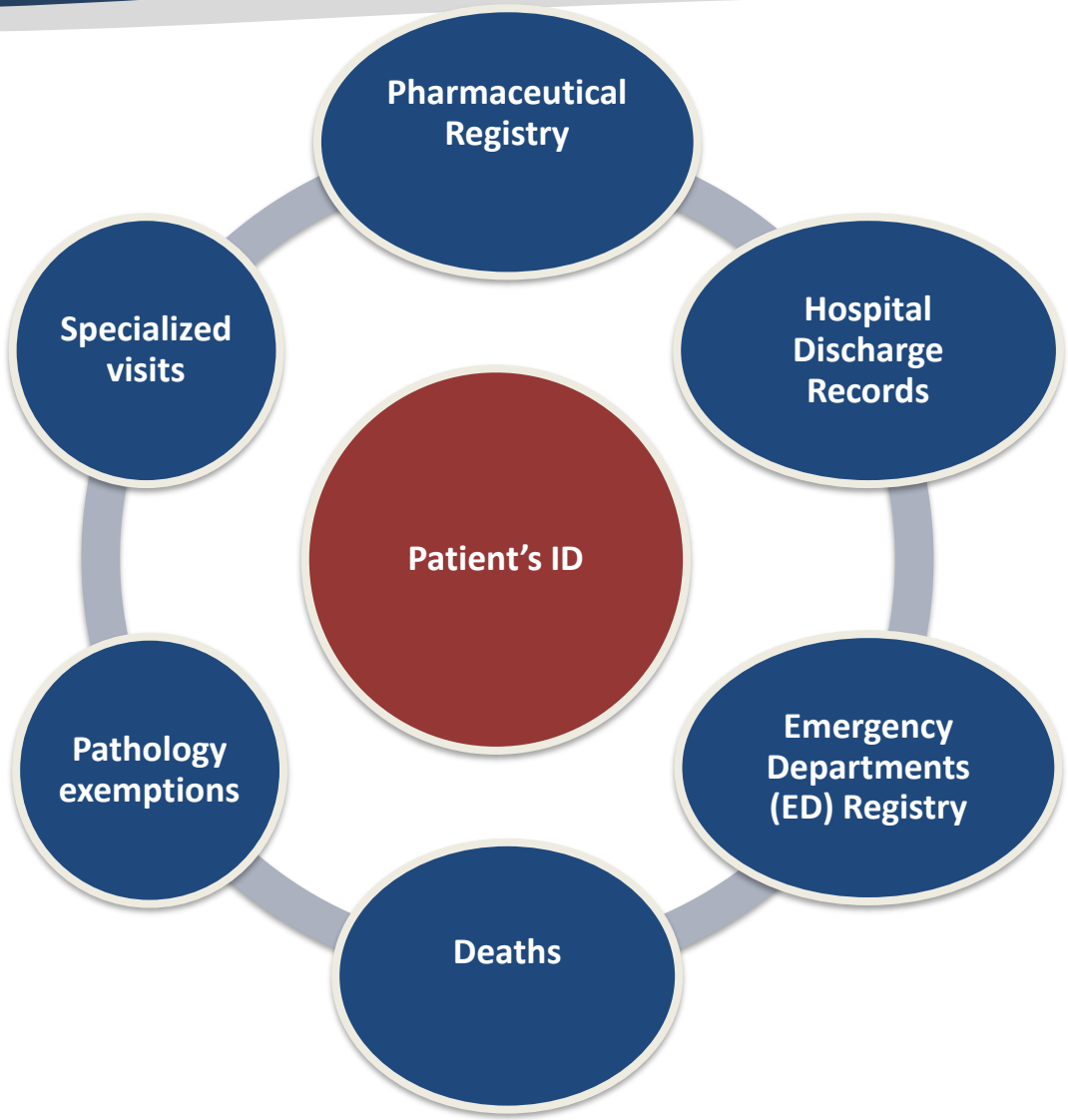
- Liguria is the oldest region in Italy and the second oldest region in Europe. It anticipates a demographic scenarios that will be prevalent in most European countries (Eurostat, 2020)

- Ideal laboratory to study chronic conditions



Administrative data

Possibility of using multiple inclusion criteria (e.g. exception codes, diagnosis, drugs consumption)



35 million rows per year

Administrative data

How to assess health status?

- Charlson Comorbidity Index
- Exemption codes

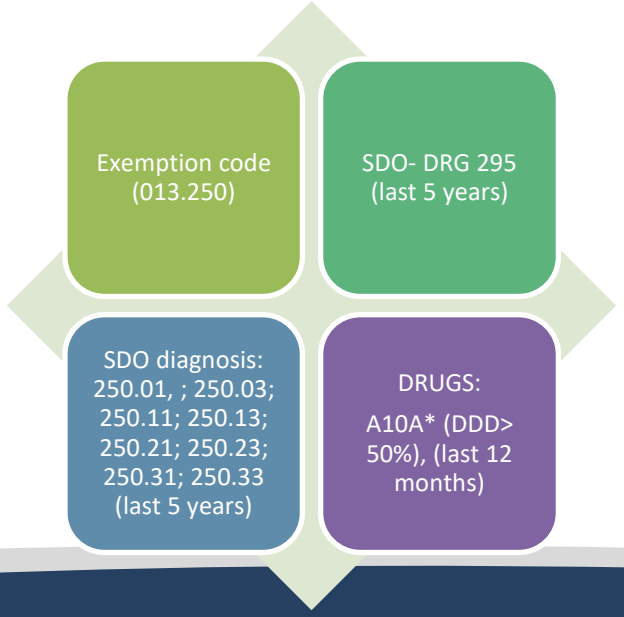
*The **Charlson Comorbidity Index** is an indicator of patient comorbidities based on the International Classification of Diseases (ICD) diagnosis codes. Each comorbidity is weighted (in the range of 1–6) according to the **risk of mortality** or **resource use**. The score for each patient is obtained by summing up all the weights.*

The higher is the score, the higher will be the probability of mortality or higher resource use
(Charlson, Pompei, Ales, & Mackenzie, 1987).

How to select patients?

- Identification criteria

E.g. Diabetes mellitus (1)



Compliance to drug therapy: two applications using administrative datasets

- Medication non-adherence is one of the **main challenges** in the treatment of ailment, especially of chronical diseases.

- In Europe non-adherence is responsible for:
  - about **125 billion extra costs** (Cutler et al., 2018)
  - about **200.000 deaths**
  - half of the potentially avoidable cost of **inappropriate medication usage** (IMS Institute for Healthcare Informatics, 2013)
- Two elements:
  - **barriers to access drugs** (financial constraints or physical barriers)
  - **personal attitudes/patients behaviour**

More than 50% of frail and low-literate patients did not adhere correctly to drug prescription regimens (WHO)

Measuring adherence with administrative datasets

Medical Possession Rate: ratio between the days covered by therapy over the total period from the first fill date and last fill date registered during the observational period.

Defined Daily Dose

$$MPR = \frac{days\ covered\ by\ therapy}{period\ between\ the\ first\ and\ last\ refill} \text{ x } 100$$

MPR<40%

Low Adherence

40%<MPR<80%

Medium Adherence

MPR>80%

High Adherence

The two studies refers to the **Ligurian population** focusing on elderly patients affected by:

Cardiovascular diseases and barriers to access drugs

- silent killer
- high level of non-adherence
- High prevalence among older individuals

Diabetes and COVID-19 pandemic

- high prevalence among older individuals
- serious complications from the COVID-19 virus.

Application 1

SPECIAL ISSUE PAPER

Health Economics WILEY

Older patients and geographic barriers to pharmacy access: When nonadherence translates to an increased use of other components of health care

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Application 2

Journal of Economic Behavior and Organization 204 (2022) 1–14

Contents lists available at ScienceDirect

Journal of Economic Behavior and Organization

journal homepage: www.elsevier.com/locate/jebo

Adherence during COVID-19: The role of aging and socio-economics status in shaping drug utilization

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Application 1:

Older patients and geographic barriers to pharmacy access: When nonadherence translates to an increased use of other components of health care

Introduction

- The previous literature about therapeutic non-compliance have focused almost exclusively on the drugs affordability however **geographic factors** too may influence the ability to fill medications:
  - longer travel time or longer distance, in reaching drugs providers
  - "pharmacy desert"

  might be important barriers to patients ability to fill prescriptions, especially for older individuals even in the absence of economic barriers (Amstislavski et al., 2012; Qato et al., 2014).

- Geographic barriers may have **a direct effect** on the demand for drugs and patients' compliance as well as **an indirect effect** on the demand for other medical services.

Aims

The purpose of this study is threefold:

- understand whether **geographic barriers** to pharmacies may contribute to reduce **compliance** among older patients.

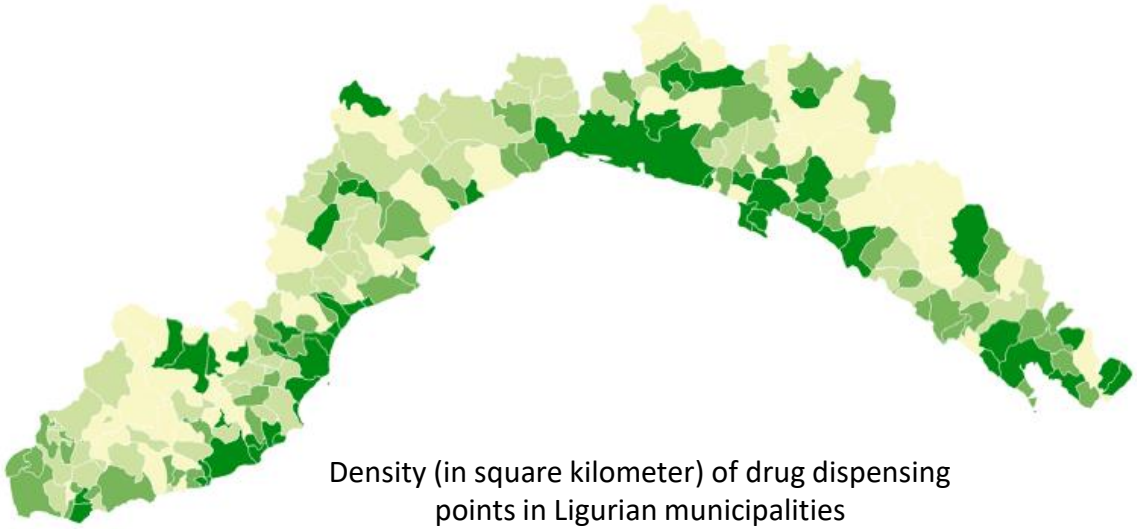
- we test whether inadequate drug therapy, because of geographic barriers, may lead older patients to **increase their demand for other medical care inputs**.

- we investigate the **mediating role of health** in influencing the **degree of substitution** between drugs and medical care consumption and the potential repercussions that medication non-compliance and overuse of medical services, as a substitute for drugs, might have on patients' health status.

Data and sample

For the empirical investigation, we used data from **Liguria**, the oldest Italian region, and which has the highest concentration of elderly in Europe: more than 28% of its population is over 65 and around 5% is over 85 (Eurostat, 2018).

The orographic features of the region mean that a substantial part of the population, even elderly, lives in **rural areas** where health services may not be easily accessible.



Density (in square kilometer) of drug dispensing points in Ligurian municipalities

Data and sample

For the purpose of our study, we constructed a new dataset from three different data sources:

- the **Liguria Hospital Discharge Records** (HDRs) database (roughly 270,000 accesses per year) containing information about hospitalizations,
- the **Ligurian Emergency Departments** (ED) Registry (roughly 630,000 accesses per year) containing information on all visits to ED services, and
- the **Ligurian Pharmaceutical Registry** (roughly 15,000,000 records per year) containing information about drug purchases.

The final dataset was obtained by linking records between the three above-mentioned databases and included **40,658 patients over-65 suffering from Circulatory System Diseases** (CVDs). Elderly suffer from higher cardiovascular risk moreover, lack of adherence to recommended treatments tend to be more common for CVDs which may be often asymptomatic.

Dependent variables

- **Mortality**

The health outcome indicator used in this study concerned patients **mortality.**

Data on patients e mortality were obtained from the regional population registry which contains information on the date of death of Ligurian patients.

Specifically, we constructed a binary indicator of death which takes value 1 if the patient died in 2017 or 2018 and 0 otherwise.

Dependent variables

- **Non-Adherence**

We constructed an indicator of **Medication Possession Rate** (MPR) for drugs specifically targeted to diseases of the circulatory system (Anatomical Therapeutic Chemical - ATC code C09).

MPR is obtained by the **ratio between the number of days of therapy dispensed and the number of days in which patients were alive** in the period of observation

We created a binary variable of nonadherence that takes value one if MPR < 80% and 0 otherwise

Dependent variables

- **Other Medical Services**

Following previous studies, as indicators of “other medical services,” we considered two variables that measure

- **emergency room visits** and
- **hospitalizations,** respectively.

We constructed two binary variables that compare the behavior of each patient in terms of use of ED visits and hospitalizations (for adverse health events specifically related to CVDs) with that of a **group of “equal needs” patients** (age, gender, Charlson Comorbidity Index).

We constructed two binary indicators for excessive use of the above mentioned health care services that take value 1 if patients’ number of hospitalizations/ED visits to any Ligurian hospital was higher than the peer group average, and 0 otherwise (sources: HDRs database and ED Registry, year 2017) .

Geographic Barriers

The main variables of interest proxied for geographic barriers and were mainly based on the concept of

- ✓ pharmacy desert
- ✓ global index of “geographic barriers to access drugs”:

▶ Pharmacy desert

For each patient, the distance to the closest community pharmacy was estimated by using zip codes. The travel distance (in km) was estimated using Bing maps, a Microsoft Cloud Service.

Distance to the closest pharmacy is used to identify pharmacy desert areas = **zip codes where the possibility to access pharmacy services is limited or absent.**

The pharmacy desert indicator assumes value 1 if the distance to the closest pharmacy is higher than 1 mile in urban areas and than 10 miles in rural areas

Geographic Barriers

- **Global Index of geographic barriers to access drugs**

Constructed as the **first component** resulting from a **Principal Component Analysis (PCA)** that included the following variables:

- ✓ **number of pharmacies in the zip code of residence;**
- ✓ **distance to the closest dispensing pharmacy;**
- ✓ **living in a rural municipality**

The final normalized index lies on a continuous scale between 0 (lowest difficulties in accessing drugs) to 1 (highest difficulties in accessing drugs)

Other Independent variables

We considered the following variable categories:

- ✓ **demographics** (patients' age, gender, and whether patients are foreign-born),
- ✓ patients' **health status** at the beginning of the observation period (Charlson
- ✓ Comorbidity Index),
- ✓ **remoteness of the other health care services**, and
- ✓ **socio-economic variables** (years of education completed and patients' marital status).

Among the control variables, **drug prices were not included**. In fact, the therapeutic regimes considered in our study concerned drugs belonging to the so-called "class A" category that are reimbursed by the Italian National Health Services (NHS) and dispensed directly through hospital pharmacies or by territorial pharmacies.

Empirical Strategy

- In the medical care utilization equation, the adherence to therapy indicator is included as an explanatory variable.
- The inclusion of this indicator allowed us to test whether patients treat medical service utilization as a substitute for compliance with therapy. In the mortality equation, health behaviors (adherence and medical care utilization) were included as regressors.

Mortality $$y_{1i}^{*} = \beta_1' x_{1i} + \varepsilon_{1i} = \delta_1 y_{2i} + \delta_2 y_{3i} + \alpha_1' z_{1i} + \varepsilon_{1i}$$

Hospitalizations/ED $$y_{2i}^{*} = \beta_2' x_{2i} + \varepsilon_{2i} = \gamma_2 y_{3i} + \alpha_2' z_{2i} + \varepsilon_{2i}$$

Non-Adherence $$y_{3i}^{*} = \beta_3' x_{3i} + \varepsilon_{3i} = \alpha_3' z_{3i} + \varepsilon_{3i}$$

Empirical Strategy

The parameters of the first and second equations are not identified if z_{3i} includes all variables in z_{1i} and z_{2i}.

Maddala (1983) proposed that **at least one of the reduced-form exogenous variables (z3i) is not included in the structural equations as an explanatory variable**. Following Maddala's approach, we imposed exclusion restrictions.

- ✓ For the **reduced form,** we used the index of pharmacy desert and of geographic barriers to access drugs assuming they only have an indirect effect on health and medical care access through the adherence to therapy variable.
- ✓ Moreover, the medical care access equation includes an indicator of remoteness of the other health care services (either hospital or ED).

Results - hospitalizations

		Model (1)	Model (2)
Mortality	Male	0.1143*** (0.017)	0.1152*** (0.017)
	Age_65_74	−0.9030*** (0.024)	−0.8981*** (0.024)
	Age_75_84	−0.5787*** (0.019)	−0.5768*** (0.019)
	Charlson Comorbidity Index	0.1593*** (0.004)	0.1595*** (0.004)
	Educational level	−0.0095*** (0.003)	−0.0092*** (0.003)
	Foreign	−0.2555* (0.104)	−0.2394* (0.109)
	Married	−0.0683*** (0.018)	−0.0693*** (0.018)
	Non-adherence to therapy	0.5850*** (0.034)	0.6008*** (0.034)
	Excessive use of hospitalizations	0.5259*** (0.053)	0.5944*** (0.053)
	_cons	−1.1511*** (0.032)	−1.1698*** (0.032)
Excessive use of hospitalizations	Educational level	−0.0047+ (0.003)	−0.0046+ (0.003)
	Foreign	−0.1392 (0.095)	−0.2199* (0.105)
	Married	0.0088 (0.018)	0.0053 (0.018)
	Hospital remoteness	−0.0551** (0.020)	−0.0555** (0.020)
	Non-adherence to therapy	0.1936*** (0.032)	0.1934*** (0.032)
	_cons	−1.2679*** (0.030)	−1.2629*** (0.030)
Nonadherence to therapy	Male	0.0163 (0.013)	0.0144 (0.013)
	Age_65_74	−0.4155*** (0.018)	−0.4191*** (0.018)
	Age_75_84	−0.3685*** (0.015)	−0.3706*** (0.015)
	Educational level	−0.0047* (0.002)	−0.0042* (0.002)
	Foreign	0.2586*** (0.068)	0.2992*** (0.073)
	Married	−0.1348*** (0.014)	−0.1313*** (0.014)
	Charlson Comorbidity Index	0.0620*** (0.003)	0.0623*** (0.003)
	Pharmacy desert	0.1516* (0.069)	
	Geographic barriers index		0.3469** (0.1086)
	_cons	0.1388*** (0.021)	0.0945*** (0.024)

Results – ED visits

		Model (1)	Model (2)
Mortality	Male	0.1237*** (0.017)	0.1245*** (0.017)
	Age_65_74	−0.8956*** (0.024)	−0.8853*** (0.024)
	Age_75_84	−0.5740*** (0.019)	−0.5676*** (0.019)
	Charlson Comorbidity Index	0.1611*** (0.004)	0.1606*** (0.004)
	Educational level	−0.0095*** (0.003)	−0.0091*** (0.003)
	Foreign	−0.2371* (0.104)	−0.2311* (0.108)
	Married	−0.0750*** (0.018)	−0.0743*** (0.018)
	Non-adherence to therapy	0.5568*** (0.034)	0.6062*** (0.034)
	Excessive use of ED services	0.5807*** (0.062)	0.6134*** (0.065)
	_cons	−1.1342*** (0.032)	−1.1668*** (0.032)
Excessive use of emergency services	Educational level	−0.0107*** (0.003)	−0.0107*** (0.003)
	Foreign	−0.2447* (0.112)	−0.2842* (0.122)
	Married	0.0240 (0.020)	0.0222 (0.020)
	Hospital remoteness	−0.0426* (0.021)	−0.0381+ (0.021)
	Non-adherence to therapy	0.1857*** (0.032)	0.2162*** (0.032)
	_cons	−1.4023*** (0.032)	−1.4131*** (0.032)
Nonadherence to therapy	Male	0.0144 (0.013)	0.0128 (0.013)
	Age_65_74	−0.4158*** (0.018)	−0.4202*** (0.018)
	Age_75_84	−0.3691*** (0.015)	−0.3717*** (0.015)
	Educational level	−0.0046* (0.002)	−0.0042* (0.002)
	Foreign	0.2602*** (0.068)	0.3000*** (0.073)
	Married	−0.1342*** (0.014)	−0.1307*** (0.014)
	Charlson Comorbidity Index	0.0614*** (0.003)	0.0619*** (0.003)
	Pharmacy desert	0.1501* (0.069)	
	Geographic barriers index		0.3500** (0.1086)

Conclusions

According to our results, the **difficulty in accessing medicines**, because of geographic barriers **influence negatively patients compliance** with drug regimes.

The structural equation for patients hospitalizations and ED accesses clearly identified **non-adherence** as a **determinant of overuse of other medical services**.

The structural equation for post-discharge mortality provided evidence that **non-adherence** to pharmacological therapy and **excessive use of other medical services** positively affect the **probability of worsening** in terms of health outcome with a potential waste of health care system resources.

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Application 2

Adherence during COVID-19: The role of aging and socio-economics status in shaping drug utilization

Adherence during COVID-19

- Adherence to therapies may have been influenced by the pandemic crisis.
- The **COVID-19 pandemic** may have exacerbated disparities in non-compliance to therapies.
- **Lockdowns restrictions on the movement of people** have been a major problem for patients affected by chronic conditions that require continuity in prescriptions
- After an initial "**panic buying**" the prolonged lockdown and the social isolation may have compromised medical adherence, especially for lower SES classes (Clement et al., 2021).

Adherence during COVID-19

AIMS

- investigate the potential impact that COVID-19 and lockdown restrictions may have had on drug utilization and the role of patient age and education in reshaping it in times of COVID-19.

- we focused on two different aspects: stockpiling and therapy adherence where stockpiling measures patients' concern regarding the possibility of accessing the drug or their fear of shortage, in the context of great uncertainty

- **MODEL SPECIFICATION**:

Interaction between bimester and COVID

patients' SES

$$DU_{it} = \beta_1 D_{it} + \beta_2 S_{it} + \beta_3 H_{it} + \beta_n d_t * \mathrm{y}_{2020} + \gamma_i + \varepsilon_{it}$$

patients' demographics characteristics

patients' health status

- Dependent variable: bi-monthly measure of stockpiling (SP) (negative binomial model) and adherence (A) (fractional regression model)

Adherence during COVID-19

- Based on the concept of Medical Possession Rate
- DDD (daily defined dose) of Metformin (ATC=A10BA02)
- Bi-monthly measure of stockpiling (SP) and adherence (A)

$$Adherence_{it} = \frac{Dispensed\ Therapy\ Days_{it} + Stockpiling_{it-1} - Stockpiling_{it}}{Number\ of\ days\ in\ the\ time\ interval\ of\ interest} * 100$$

Adherence during COVID-19

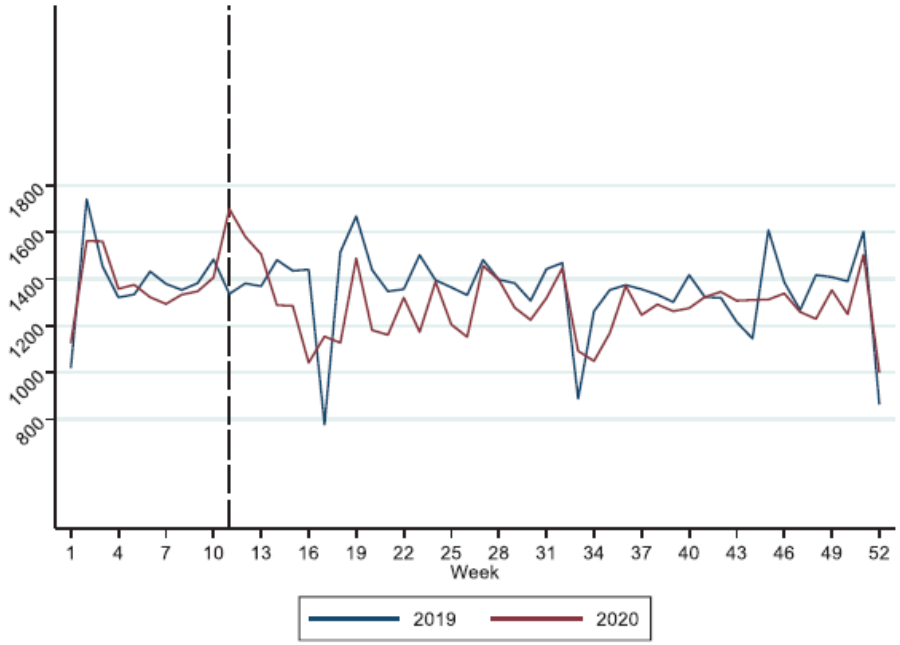


Fig. 1. Trend in weekly amount of Metformin picks up by year
Note: Dashed line points out the start of lockdown restrictions.

Adherence during COVID-19

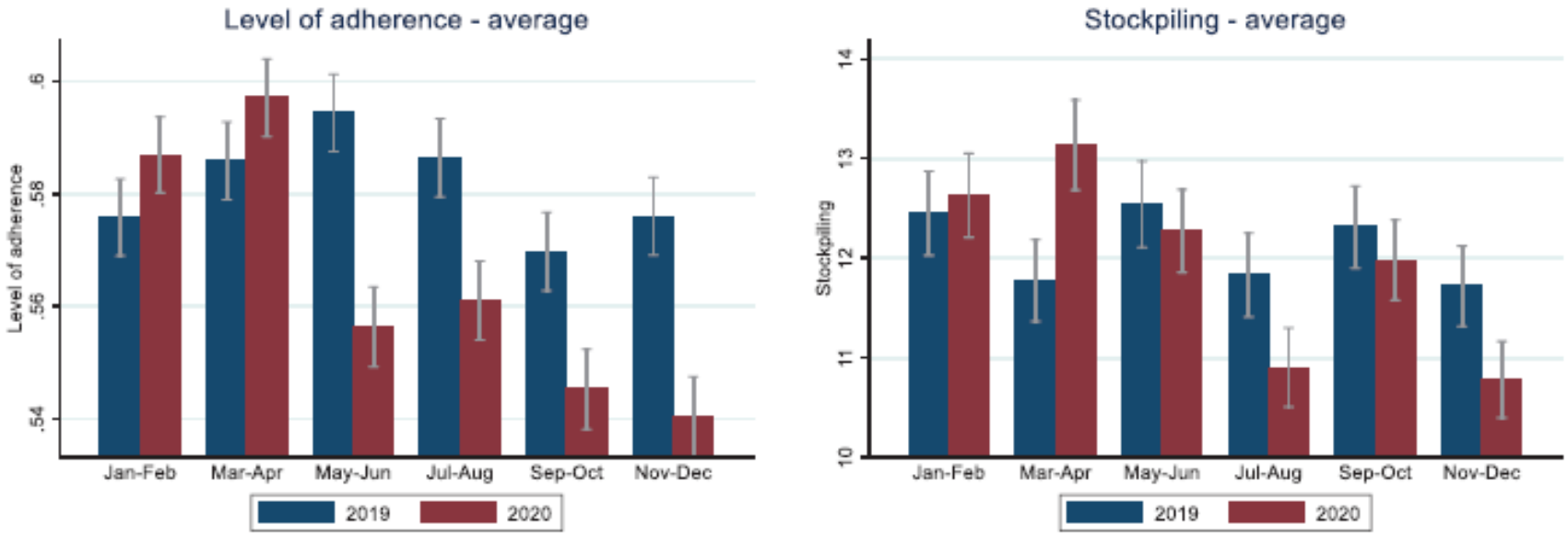
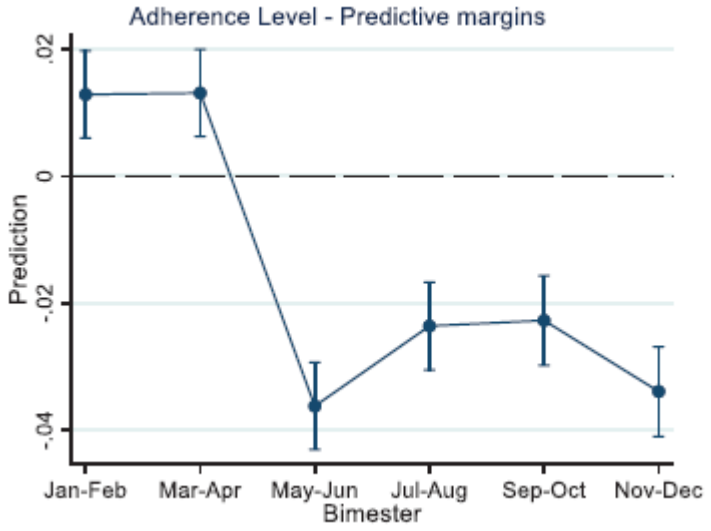
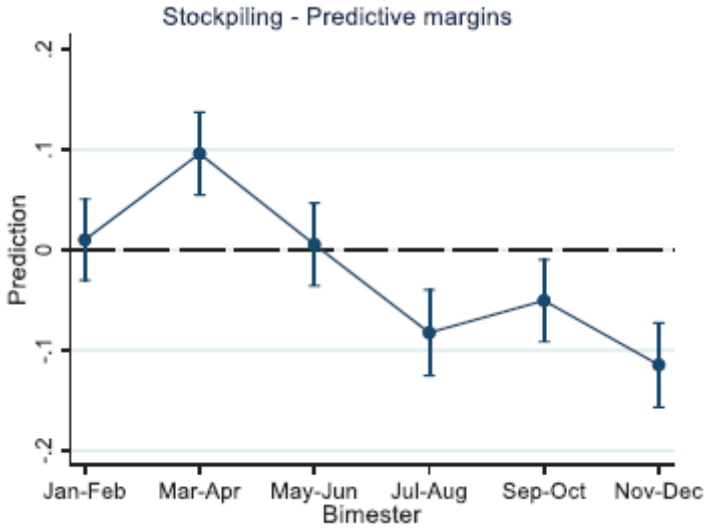


Fig. 2. Descriptive statistics on adherence and stockpiling.

	Adherence	Stockpiling
Male	0.026***	0.110***
	(0.005)	(0.011)
Age (Reference category = 65–74)		
Age_class (75–84)	−0.029***	−0.170***
	(0.005)	(0.012)
Age_class (85+)	−0.070***	−0.411***
	(0.007)	(0.017)
Marital Status (Reference: Married)		
Single	−0.023***	−0.091***
	(0.007)	(0.015)
Divorced	−0.011	−0.052
	(0.016)	(0.032)
Widow	−0.036***	−0.118***
	(0.009)	(0.020)
Education (Reference: primary or no education)		
Lower Secondary	0.030***	0.102***
	(0.006)	(0.012)
Upper Secondary or Degree	0.029***	0.111***
	(0.008)	(0.016)
Comorbidities	0.018***	0.061***
	(0.002)	(0.005)
January-February # Year 2020	0.013***	0.010
	(0.003)	(0.021)
March-April # Year 2020	0.013***	0.096***
	(0.004)	(0.021)
May-June # Year 2020	−0.036***	0.005
	(0.003)	(0.021)
July-August # Year 2020	−0.024***	−0.083***
	(0.004)	(0.022)
September-October # Year 2020	−0.023***	−0.051**
	(0.004)	(0.021)
November-December # Year 2020	−0.034***	−0.115***
	(0.004)	(0.021)
Municipality fixed effects	YES	YES
Bimester fixed effects	YES	YES
Number of observations	107,628	107,628





THE ROLE OF AGE :

- The marginal effects associated with the interaction terms between the first and second bimester (outbreak of COVID-19 in Italy) and the year 2020 were significant and positive for younger classes only.
- Stockpiling behavior seems to have been prevalent among the age group of 65–84 years, but it has translated into a higher level of adherence only for the “65–74 years”class.
- This “positive”effect seems to have left room for a negative and more permanent effect in the following bimesters, which registered a lower level of adherence for all age groups, with older age classes (75–84 and 85 +) reducing adherence more than other classes.

Adherence during COVID-19

THE ROLE OF EDUCATION:

- patients who are less educated tend to stockpile less. This group, which was already less adherent to their drug therapy and was also most severely hit by the COVID-19 pandemic, increased the adherence gap.
- the COVID-19 pandemic worsened the situation of patients with lower SES in terms of medication intake. The strongest effect was observed during the second bimester from May–June 2020, when the stockpiling behavior effect, which mainly characterized the first bimester of the pandemic (March-April 2020) also disappeared
- between May and June 2020, we estimated that among the less educated individuals, the pandemic reduced the rate of adherence by about 4.6%

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Other applications

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Recent researches – inappropriate use of healthcare

di Bella *et al. Population Health Metrics* (2020) 18:29
https://doi.org/10.1186/s12963-020-00237-w

Population Health Metrics

RESEARCH Open Access

Frequent use of emergency departments and chronic conditions in ageing societies: a retrospective analysis based in Italy

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Abstract

Background: Most western countries are facing relevant demographic changes, and the percentage of older people is destined to rise in the next decades. This fact is likely to affect the sustainability of healthcare systems significantly, mainly due to the connected issue of chronicity.

Methods: In this paper, using an extensive and comprehensive administrative dataset, we analyse the phenomenon of frequent use of emergency departments (ED) in the oldest region in Europe (i.e. Liguria) over 4 years (2013–2016). Two alternative approaches are used to define categories of ED users based on the intensity and frequency of accesses and splitting patients into different age groups.

Results: Results allow identifying clinical and socio-demographic risk-factors connected to different levels of ED utilisation and highlight the influential role played by chronic conditions (particularly mental disorders, respiratory diseases) and by multiple chronic conditions.

Conclusions: The study aims at representing an informative tool to support policy-makers in setting proper policies addressed, on the one side, towards the potentially preventable frequent users and, on the other, towards those accessing due to complex medical conditions. The results can help in building a warning system to help general practitioners in the identification of potential frequent users and to develop preventive policies.

Keywords: Ageing, Emergency departments, Frequent use, Latent class model, Risk factors

Health Policy 120 (2016) 462–470

Contents lists available at ScienceDirect

Health Policy

journal homepage: www.elsevier.com/locate/healthpol

Targeting frequent users of emergency departments: Prominent risk factors and policy implications

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ARTICLE INFO

Article history:
Received 15 October 2015
Received in revised form 9 February 2016
Accepted 7 March 2016

Keywords:
Emergency department
Frequent user
Healthcare system sustainability
Inappropriate use
Risk factor

ABSTRACT

This study investigates the characteristics of frequent users of accident and emergency departments (AEDs) and recommends alternative medical services for such patients. Prominent demographic and clinical risk factors for individuals accessing seven AEDs located in the metropolitan area of Genoa, Italy are identified and analysed. A truncated count data model is implemented to establish the determinants of access, while a multinomial logistic regression is used to highlight potential differences among different user categories. According to previous studies, empirical findings suggest that despite the relevance of demographic drivers, vulnerability conditions (e.g. abuse of alcohol and drugs, chronic conditions, and psychological distress) are the main reasons behind frequent AED use; the analysis seems to confirm an association between AED frequent use and lower level of urgency. Since frequent and highly frequent users are found responsible for disproportionate resource absorption with respect to total amount of AED costs (they represent roughly 10% of the total number of patients, but contribute to more than 19% of the total annual AED cost), policies aiming to reduce frequent use of AEDs could bring significant savings in economic resources. Thus, efficient actions could be oriented toward extending primary care services outside AED and toward instituting local aid services specifically addressed to people under the influence of substances or in conditions of mental distress.

The European Journal of Health Economics (2020) 21:37–44
https://doi.org/10.1007/s10198-019-01107-5

ORIGINAL PAPER

Speeding up the clinical pathways by accessing emergency departments

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Received: 19 April 2019 / Accepted: 15 August 2019 / Published online: 31 August 2019

Abstract

Inappropriate emergency admissions create overcrowding and may reduce the quality of emergency care. In Italy, overcrowding is further exacerbated by patients who use emergency admissions as a shortcut to avoid the general practitioner (GP) gateway. In this paper, we investigate access to emergency departments (EDs) by patients with non-severe medical conditions and their willingness to wait. Population data for ED accesses in Liguria (an Italian administrative region) in 2016 were used to estimate the number of strategic accesses and waiting time elasticities of low-severity patients. Our results show that the practice of using EDs to skip gatekeeping is a serious problem. The percentage of patients who engage in such practice vary from 8.7 to 9.9% of non-urgent patients; they generally prefer to access more specialized hospitals, especially during weekdays, when GPs are available, but hospitals run at full capacity. Strategic patients are usually much younger than average. From a policy point of view, our results show that long waits may discourage "genuine" patients rather than strategic ones. It is necessary to develop a system to improve access to patients mainly requiring specialist care, along with enhancing the management of diagnostic examinations through primary care.

Keywords Clinical pathway · Emergency department · General practitioner · Inappropriate emergency admission · Specialist care · Strategic patient behavior

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Recent researches – inappropriate use of healthcare

Health Policy 120 (2016) 462–470

Contents lists available at ScienceDirect

Health Policy

journal homepage: www.elsevier.com/locate/healthpol

Targeting frequent users of emergency departments: Prominent risk factors and policy implications

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ARTICLE INFO

Article history:
Received 15 October 2015
Received in revised form 9 February 2016
Accepted 7 March 2016

Keywords:
Emergency department
Frequent user
Healthcare system sustainability
Inappropriate use
Risk factor

ABSTRACT

This study investigates the characteristics of frequent users of accident and emergency departments (AEDs) and recommends alternative medical services for such patients. Prominent demographic and clinical risk factors for individuals accessing seven AEDs located in the metropolitan area of Genoa, Italy are identified and analysed. A truncated count data model is implemented to establish the determinants of access, while a multinomial logistic regression is used to highlight potential differences among different user categories. According to previous studies, empirical findings suggest that despite the relevance of demographic drivers, vulnerability conditions (e.g. abuse of alcohol and drugs, chronic conditions, and psychological distress) are the main reasons behind frequent AED use; the analysis seems to confirm an association between AED frequent use and lower level of urgency. Since frequent and highly frequent users are found responsible for disproportionate resource absorption with respect to total amount of AED costs (they represent roughly 10% of the total number of patients, but contribute to more than 19% of the total annual AED cost), policies aiming to reduce frequent use of AEDs could bring significant savings in economic resources. Thus, efficient actions could be oriented toward extending primary care services outside AED and toward instituting local aid services specifically addressed to people under the influence of substances or in conditions of mental distress.

Access numbers by triage code and demographic characteristics (year 2013).

Patient	Normal users	Frequent users	Highly frequent users
Accesses per year	1–2	3–4–5	Greater than 6
Frequencies	133,981 (90.1%)	13,029 (8.8%)	1643 (1.1%)
Accesses	161,600 (72.9%)	44,796 (20.2%)	15,139 (6.8%)
Average access number per patient	1.2	3.4	9.2
% Foreign	16,725 (12.5%)	1999 (15.3%)	296 (18.0%)
% Male	65,822 (49.1%)	6216 (47.7%)	853 (51.9%)
Psychological distress = 1	3291 (2.5%)	1125 (8.6%)	503 (30.6%)
Substance abuse = 1	575 (0.4%)	177 (1.4%)	169 (10.2%)
Domestic violence = 1	1989 (1.5%)	546 (4.2%)	179 (10.9%)
Chronic condition = 1	6047 (4.5%)	1503 (11.5%)	272 (16.6)

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Recent researches – health inequalities

Contents lists available at ScienceDirect

Health Policy

journal homepage: www.elsevier.com/locate/healthpol

The role of education in psychological response to adverse health shocks

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ARTICLE INFO

Article history:
Received 30 March 2020
Received in revised form 12 February 2021
Accepted 19 February 2021

Keywords:
Mental health
Educational gradient
Health inequalities
Chronic conditions
Adverse health shocks

ABSTRACT

The prevalence of common mental disorders is on the rise: in the last decade mental disorders have become one of the major contributors to the global burden of disease and the leading cause of disability worldwide. While the association between depressive symptoms and physical health has been the subject of many studies, little is known about the potential pathways through which physical health affects mental health and how this relationship varies across different socioeconomic groups. This study aims at investigating on the role that a higher educational level may have not only in protecting people from depressive and anxiety symptoms but also on its role in mediating the relationship between mental and physical health shocks. For the scope of our analysis, we relied on hospital administrative records collected from Liguria, a north-western Italian region. We evaluate the impact of education in protecting individuals from mental disorders when they experienced an adverse health event, such as severe hospitalization or an onset of a chronic condition. Our results suggest that among those who suffer from severe physical health issues, highly educated individuals are less likely to experience depressive and anxiety symptoms compared to those with a lower level of education, even though, in presence of an adverse health shock, the protecting role of education slightly decreases.

Table 1
Characteristics of patients (over 14 years and over 64) with mental diseases compared to those of the total sample and of the Italian population. Note: the patients included in 65+ category is a subsample of those included in 15+.

		Italy (1)	Hospitalized patients in 2015–17				
			All diagnoses	Depression diagnoses	Anxiety diagnoses	Chronic diagnoses	Death
15+	**No. of observations**	52,406,861	236,310	5,042	5507	157,045	31,952
	% Patients	–	100	2.13 %	2.33 %	66.46 %	13.52 %
	% Male	48.15	43.76	33.52	35.25	46.81	50.73
	Average Age	50.23	61.57	66.44	59.36	66.84	81.38
	% Foreign	7.9	5.57	3.57	5.88	3.71	0.691
	Educational level						
	Primary and Lower Secondary School	50.03	69.04	70.1	71.82	73.68	85.89
	Upper Secondary School	35.84	25.11	26.47	24.3	21.52	11.04
	Tertiary education	14.13	5.85	3.43	3.89	4.8	3.07
	Years of education (mean)	10.7	8.78	8.67	8.57	8.38	7.17
	% physical chronic condition	–	64.38	80.56	71.15	96.88	94.10
	% severe hospitalization	–	26.67	45.58	33.16	35.09	50.48
65+	**No. of observations**	13,528,550	122,342	3,021	2508	99,201	29,347
	% Patients	–					
	% Male	43.23	47.81	29.66	30.78	48.32	50.1
	Average Age	75.74	79.44	79.33	79.32	79.9	83.68
	% Foreign	1.38	0.81	0.43	0.56	0.77	0.45
	Educational level						
	Primary and Lower Secondary School	75.6	83.13	83.8	84.89	83.64	88.4
	Upper Secondary School	17.15	13.37	13.89	12	12.86	8.76
	Tertiary education	7.25	3.50	2.31	3.11	3.5	2.85
	Years of education (mean)	7.9	7.54	7.47	7.43	7.49	6.94
	% physical chronic condition	–	81.08	89.17	88.76	98.70	93.97
	% severe hospitalization	–	32.11	50.45	41.95	37.04	48.89

(1) Source: Italian National Institute of Statistics (ISTAT), 2017.

Thank you!