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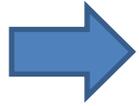
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RxModel, developing and test in Portugal

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0. Introduction

1. Objectives

2. Methods

3. Results

4. Discussion

5. Conclusion

0. Introduction – importance of the theme

There is a **large consensus** that pharmacy information could be useful for healthcare managers, planners and politics (risk adjustment). Although most widely used risk adjustment systems use diagnosis data to classify patients, there is **growing interest** in risk adjustment based on computerized pharmacy data.

The **rationale** of using such models is that individuals with chronic illnesses are frequently prescribed a set of specific and identifiable drugs.

Several **pharmacy-based risk models** have been developed in the last years, most notably those by Clark et al (1995), Roblin (1994, 1998), Lamers (1999, 2001, 2004), Fishman and Shay (1999), Gilmer et al (2001), Fishman et al (2003), Maio et al (2005).

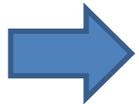
0. Introduction – Portuguese context

- In some health regions, since 2006, we identify a **starting program of electronic prescription** in Primary Care Centers (availability of automated electronic databases at an individual level).

Between 2007 and 2010 were created more 5 **Local Health Units** (vertical integrated organizations). There is a growing interest for:

- Set disease management programs for those new organizations, identifying patients with **chronic conditions** is critical to achieve this goal;
- Healthcare financing: Capitation is the unit of payment used to finance LHU. **Risk adjustment** is essential to give the right incentives to healthcare providers.

0. Introduction



1. Objectives

2. Methods

3. Results

4. Discussion

5. Conclusion

1. Objectives

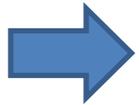
The main objective of the study was to develop the Portuguese version of Rx model (“PRx”), a risk assessment instrument that uses automated ambulatory pharmacy data to identify chronic conditions and predict future health care cost/ utilization.

Two specific objectives were considered:

- Identify patients with chronic conditions;
- Test the performance of the model in estimating future drug costs.

0. Introduction

1. Objectives



2. Methods

3. Results

4. Discussion

5. Conclusion

2. Methods – Principal steps

First it was created a team work constituted by physicians and pharmacists which made the correspondence between each drug and chronic conditions.

There were included 33 Chronic Conditions and 81 Sub-Chronic Conditions.

This classification was adapted according to “Prontuario Terapeutico Nacional” (National Drug Codes), a clinical reference that also assigns drugs to therapeutic classes. From 33.501 initial codes there were included 9.200 codes in PRx.

Some drugs that are included in therapeutic classes were classified into multiple PRx categories, so the same class may appear in several chronic conditions. However, any particular drug can only map to a single Rx chronic condition (mutually exclusive).

2. Methods – PRx model

Chronic Disease	Summary Medication Descriptions
Alzheimer's	Anticholinesterase agents
Anemia	Iron; vitamin B12; folic acids
Benign prostatic hyperplasia	Alfa-adrenoreceptor antagonists; Testosterone 5-alfa reductase inhibitors
Cardiovascular diseases	Digitalis glycosides, antiarrhythmics; diuretics; beta-andrenergic blockers; alpha blockers; ACE inhibitors; calcium channel blockers, antihypertensive vasodilators
Chronic hepatitis	Interferons
Chronic renal disease	Agents for hyperkalaemia and hyperphosphataemia
Chronic respiratory illnesses	Inhaled corticosteroids; beta-2-adrenoreceptor agonists; xanthines; leucotrienies antagonists; cromolyn
Cirrhosis	Blood substitutives and plasmatic protein fractions
Crohn's and ulcerative colitis	Intestinal corticosteroids agents
Cystic fibrosis	Pancreatic enzymes; mucolytics
Diabetes	Insulines; biguanides; sulfonylureas
Diabetes Insipidus	Vasopressin
Epilepsy	Anticonvulsivant barbiturates and congeners
Erectile dysfunction	Alprostadil
Gastric acid disorders	H2 antagonists; prostaglandins; proton pump inhibitors
Glaucoma	Sumpaticomimetic agents, parasympaticomimetic agents, anhydrase inhibitors, ophthalmic beta blockers
Gout	Colchicine, uric acid inhibitors

2. Methods – PRx model

Chronic Disease	Summary Medication Descriptions
Growth hormone deficiency	Human growth hormone
HIV/AIDS	nucleosides and nucleotides, reverse transcriptase inhibitors
Hyperlipidemia	Antilipemic agents, HMG CoA reductase inhibitors
Malignancies	Antineoplastics, 5HT3 Antagonists
Migraine	Ergot alkaloids; 5HT1 agonists
Paget's disease/ other osteoporosis chronic conditions	Bisphosphonates; calcitonin
Pain	Opiates and other selective agents
Parkinson's	Dopamine; MAO b inhibitors
Psoriasis	Oral and topical antipsoriasis agents
Psychiatric disorders	Antidepressants; antipsychotic agents
Rheumatologic conditions	Antiinflammatory non-steroids; gold salts; aminoquinolines
Thyroid disorders	Thyroid replacement; antithyroid agents
Transplantation	Immunosuppressive agents
Tuberculosis	Antituberculosis antibiotics; isoniazid
Multiple Sclerosis	Interferons
Acne	Topic and systemic antiacneics

2. Methods – Principal steps

As a second step, three electronic **databases** were collected (all are necessary to capture drug information):

- Electronic prescription, which includes individual information based on primary care visits;
- Claims administrative checking, (co-payment system);
- Hospital ambulatory services, which includes some drugs supplied to patients with special (and expensive) diseases. Other drug consumptions (like inpatient were excluded).

After building the model and getting databases, the classification of each drug was computed and applied to databases.

Individuals were assigned to a chronic condition when they **received three or more drug prescriptions** from that chronic condition. If there is a patient that presents more than three electronic prescriptions in more than one chronic condition, he is identifiable in each chronic condition.

Individual patient information of 2007 and 2008 were matched using the NHS Code (personal health code).

2. Methods – Study population

We used Alentejo's population (one of the five health regions of Portugal), which includes approximately 441.040 habitants.

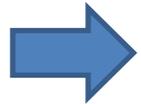
The study included only patients from Alentejo Region whom used ambulatory services in health facilities of this region during 2007 and 2008. Those patients which live in Alentejo that used other health care institutions outside Alentejo's area were excluded (information not available).

Database	2007				2008			
	Prescriptions	%	Patients	%	Prescriptions	%	Patients	%
Alentejo	2.577.813		209.812		3.657.009		304.520	
Alentejo_PRx	1.020.404	40%	141.364	67%	1.184.136	32%	169.948	56%
Alentejo_PRx_+3	813.846	32%	80.762	38%	935.071	26%	92.099	30%

0. Introduction

1. Objectives

2. Methods



3. Results

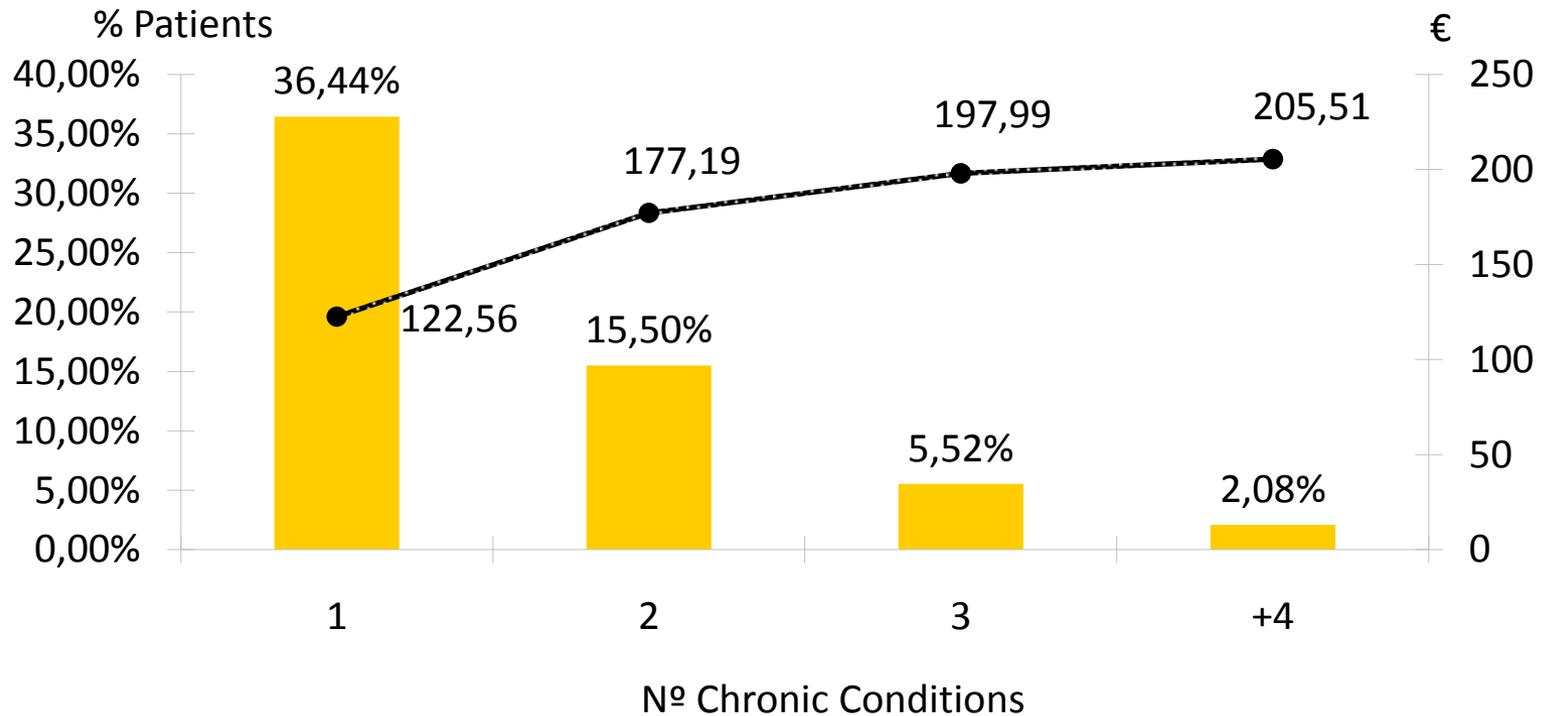
4. Discussion

5. Conclusion

3. Results – Top 20 Chronic conditions

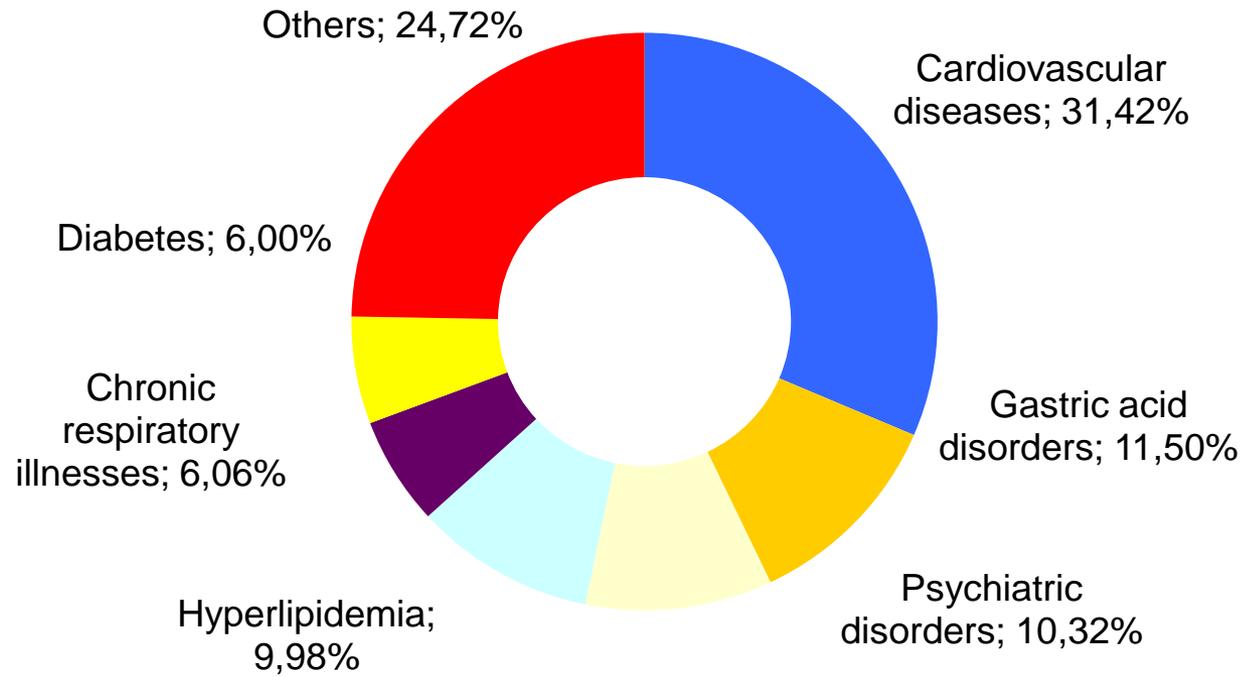
Chronic condition	Prevalence Rate	Nº patients
Cardiovascular diseases	34,45%	151.926
Psychiatric disorders	10,17%	44.844
Diabetes	10,12%	44.644
Hyperlipidemia	8,87%	39.098
Gastric acid disorders	7,82%	34.477
Chronic respiratory illnesses	5,33%	23.526
Anemia	3,42%	15.105
Epilepsy	3,12%	13.757
Glaucoma	2,94%	12.982
Parkinson's	2,12%	9.357
Thyroid disorders	2,09%	9.236
Gout	1,82%	8.040
Chronic renal disease	1,45%	6.404
Pain	1,02%	4.487
Alzheimer's	0,99%	4.367
Paget's disease/other osteop. chrpnic cond.	0,95%	4.194
Malignancies	0,77%	3.409
Crohn's and ulcerative colitis	0,58%	2.566
Migraine	0,16%	705
Psoriasis	0,11%	465

3. Results



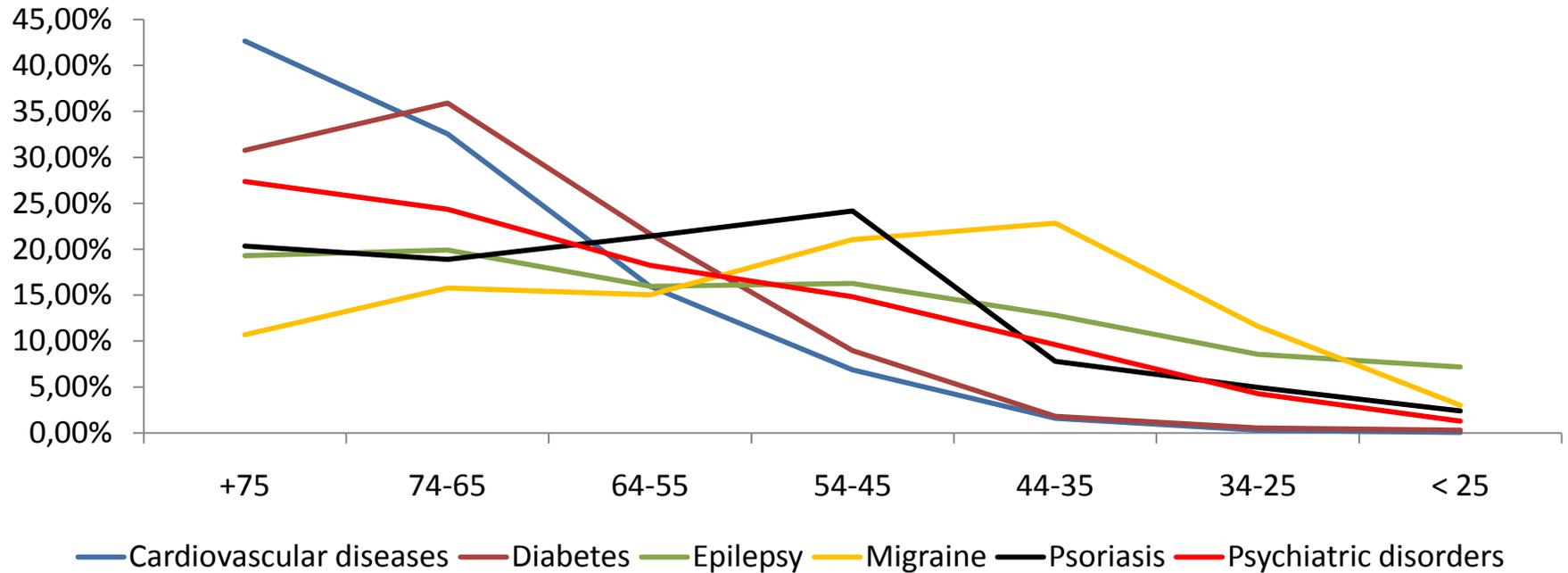
3. Results

Concentration of drug costs by chronic condition



3. Results

Distribution by age

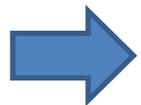


0. Introduction

1. Objectives

2. Methods

3. Results



4. Discussion

5. Conclusion

5. Discussion – comparison with other studies

Chronic Condition	NHSurvey (2005/06)	PRx (2008)
Cardiovascular diseases	23%*	34%
Psychiatric disorders	7%	10%
Diabetes	7%	10%
Chronic respiratory illnesses	4%	5%
Pain	15%	1%
Osteoporosis	5%	1%
Malignancies	2%	1%
Rheumatologic conditions	15%	0,02%

*Includes only high blood pressure

5. Discussion – studies comparison

Prevalence rate

PRx (2009)		Maio <i>et al.</i> (2005)		Parker <i>et al.</i> (2003)	
N = 441.020		N = 1.500.000		N = 6.721	
Alentejo, Portugal		Emilia-Romagna, Italy		Kaiser Permanente, USA	
Cardiovascular diseases	34,45%	Cardiovascular diseases	22,90%	Cardiovascular diseases	35,10%
Psychiatric disorders	10,17%	Rheumatologic conditions	6,10%	Gastric acid disorders	18,40%
Diabetes	10,12%	Gastric acid disorders	5,10%	Chronic respir. illnesses	15,10%
Hyperlipidemia	8,87%	Chronic respir. illnesses	4,50%	Psychiatric disorders	12,40%
Gastric acid disorders	7,82%	Psychiatric disorders	4,40%	Rheumatologic conditions	11,60%
Chronic respir. illnesses	5,33%	Benign prostatic hyp.	4,10%	Diabetes	11,00%
Anemia	3,42%	Diabetes	3,60%	Thyroid disorders	7,50%
Epilepsy	3,12%	Thyroid disorders	3,20%	Hyperlipidemia	6,10%

5. Discussion – Methodological

Patients identification is a problem in Portugal (ex: 13 million of NHS cards for 10 million of habitants);

Electronic prescription, represents 75% of all drug prescriptions in Primary care centers of Alentejo region and still not available at all the country;

Regional database: the burden of disease is not totally captured, because the automated database doesn't include the utilization made by Alentejo patients outside this area. On the other hand the majority of transferences are acute situations;

5. Discussion – Results

The model may present some limitations on identifying rheumatological conditions and pain (drugs without claims are not captured by databases)

There are different prevalence rates from different sources of information;

The detailed data from other sources is not available (age, sex, geographical), so it is difficult to be sure if there are some similar results in particular settings.

The main **advantages** of this models over other instruments of risk adjustment (like diagnosis) are:

Data are often more reliable, timely and complete than diagnosis data;

Persons suffering from chronic conditions use drugs on a regular base. Some health care organizations do not routinely collect outpatient diagnostic data

A pharmacy-based instrument may capture the health risk for persons with a stable, well-managed chronic disease even without a visit to a provider.

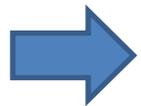
0. Introduction

1. Objectives

2. Methods

3. Results

4. Discussion



5. Conclusion

5. Conclusion

Drug information is a good alternative to diagnosis in determining morbidity level in a population basis through ambulatory care data;

This model offers potential benefits to estimate prevalence and estimate future drug cost in Portuguese healthcare system;

This information could be important to resource allocation, specially concerning risk adjustment and healthcare financing issues. (could also be used to set capitation payments);

Technical improvements can be made to the model.

Thank you !

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