

An Algorithm to distinguish between COPD and asthma

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Marketing of drugs

- What drug is used
- Where is it used
- To whom is it given
- At what price

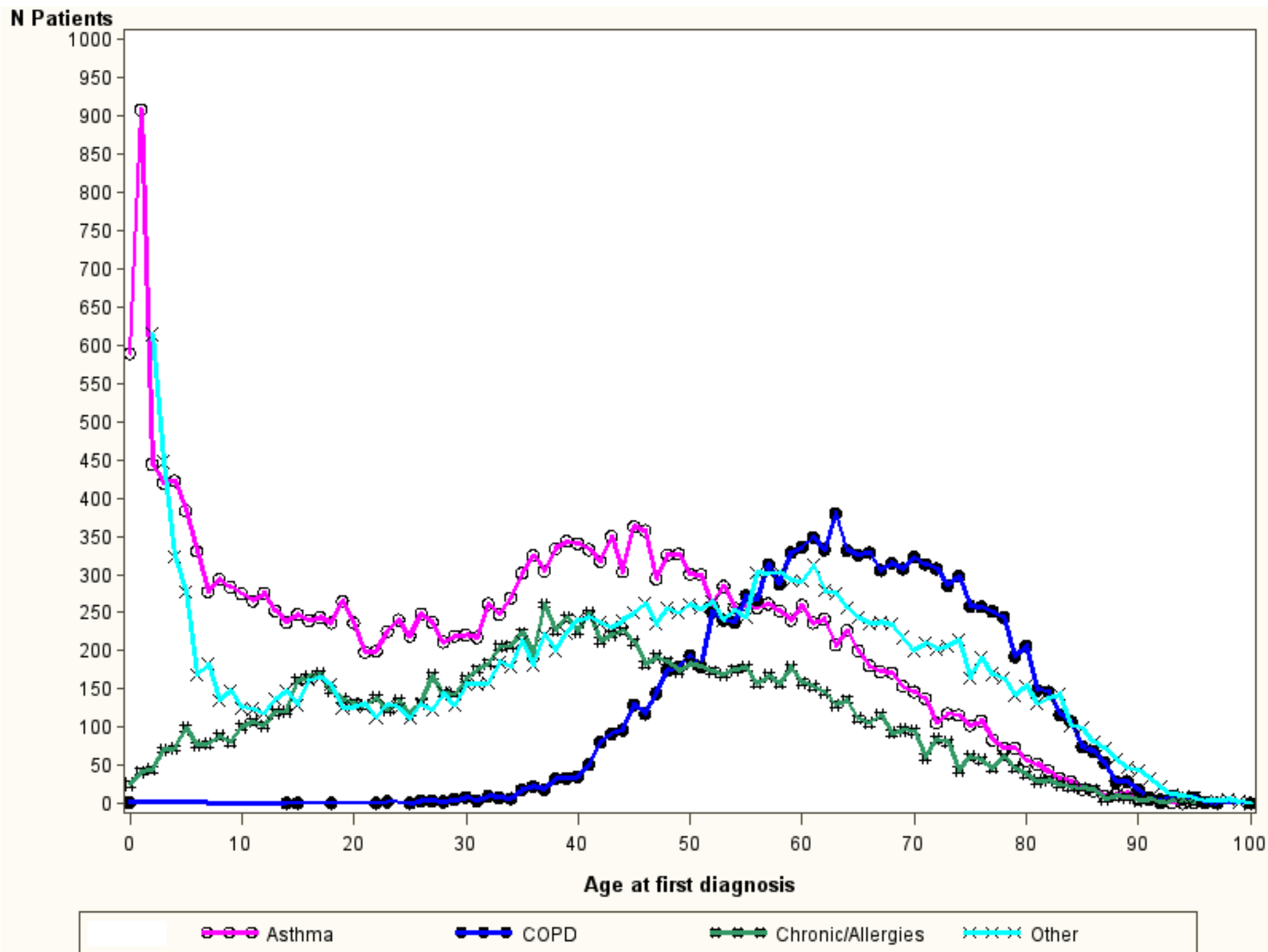
Marketing of drugs

- What drug is used
- Where is it used
- **To whom is it given**
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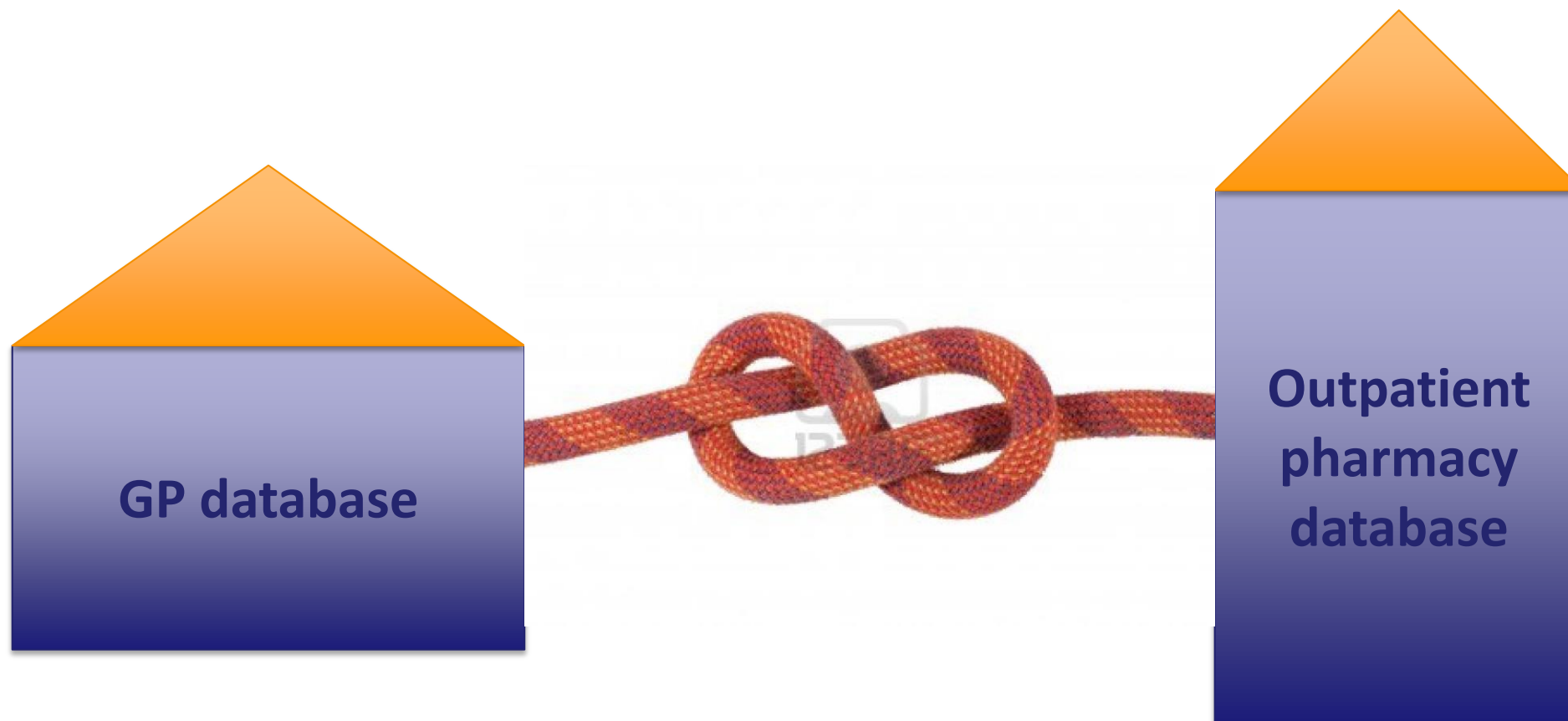
No indication

- Not in de database
- Not allowed to link
- Not available



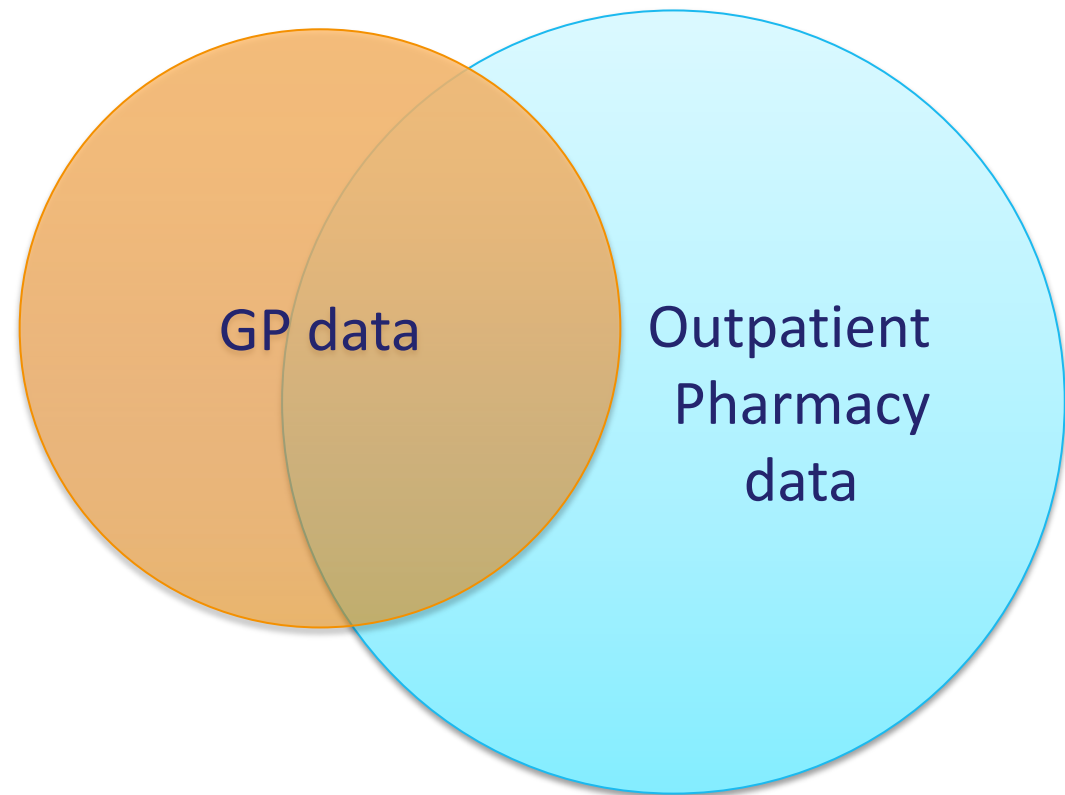


Linkage of databases



Overlap

- GP diagnosis: ICPC R.. (respiratory)
- Pharmacy: ATC R03.... (respiratory)



- > 20,000 patients

To build a model

- Linkage of databases
- Exploratory analysis
- Logistic regression
 - 2 models
- Finetuning
- Estimating the cut-off
- Validation

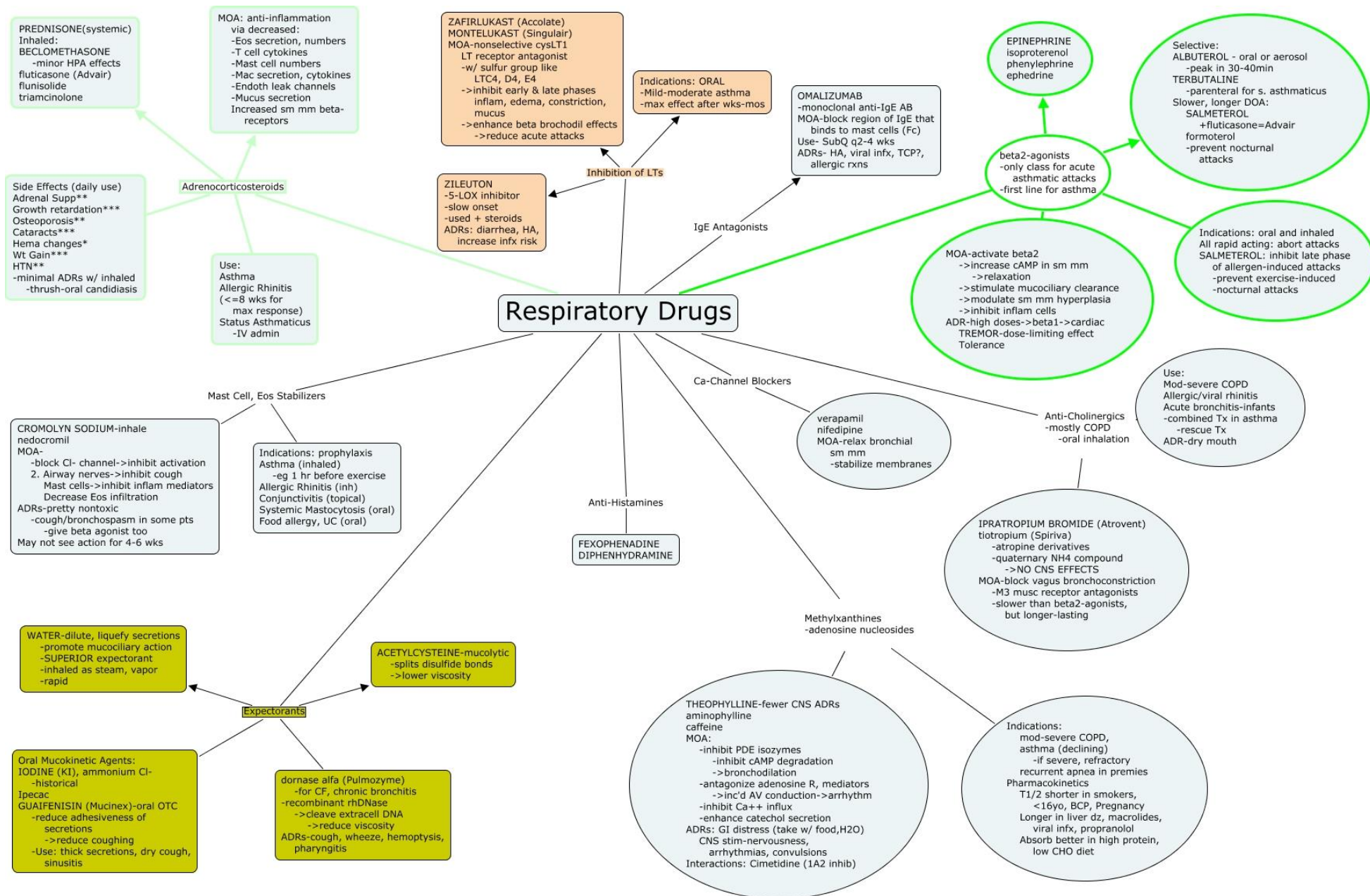
Exploratory analysis

- Examine Differences between indication groups
 - Asthma
 - COPD
 - Allergic conditions
 - Other
- Statistics
 - Descriptive
 - T-tests / Chi-square
 - Correlations / Regression

Exploratory analysis

- Age
- Gender
- Drugs
- Drug classes
- Drug combinations
- Prescriber (GP / specialist)
- Duration of use
- Number of prescriptions

Exploratory analysis



Prepare dataset

- 1 row per patient
- Explanatory variables
 - Drug x? $\rightarrow$ 1/0
 - Age class
 - Duration of use
 - ...
- Outcome variables
 - COPD? $\rightarrow$ 1/0
 - Asthma? $\rightarrow$ 1/0

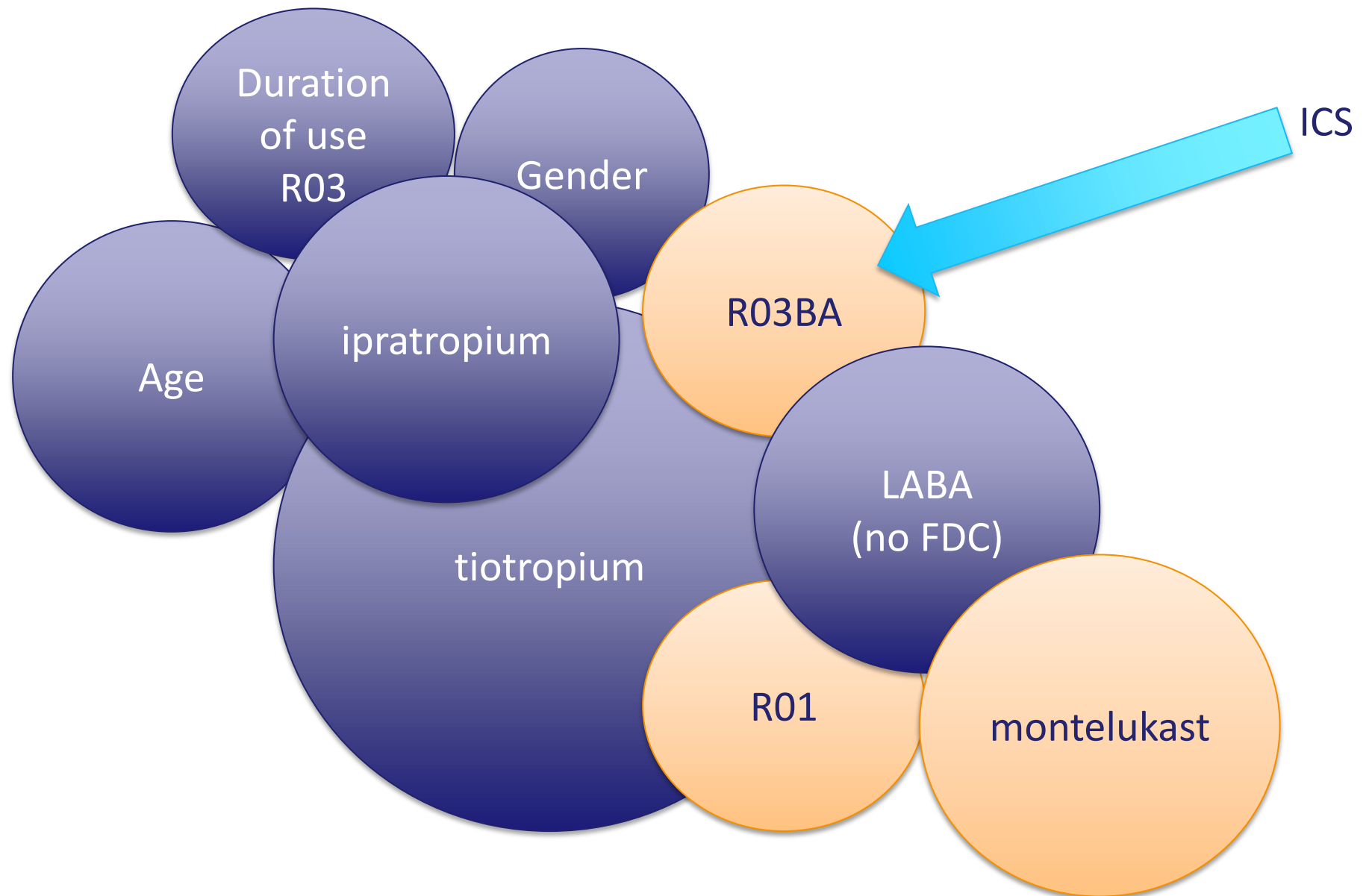
Logistic regression

```
proc logistic data=lngWrk descending  
    OUTest=TmpEst outmodel=data.model1;  
    class agecat gender ;  
    model COPD= AgeCat gender Med1 Med2 Med3 ... /  
        selection=backward slstay=0.001;  
run;
```

Finetuning

- C-statistic (concordance)
- Significance vs influence
- Correlation between explanatory variables
- Comparison of models for consecutive years

The COPD model

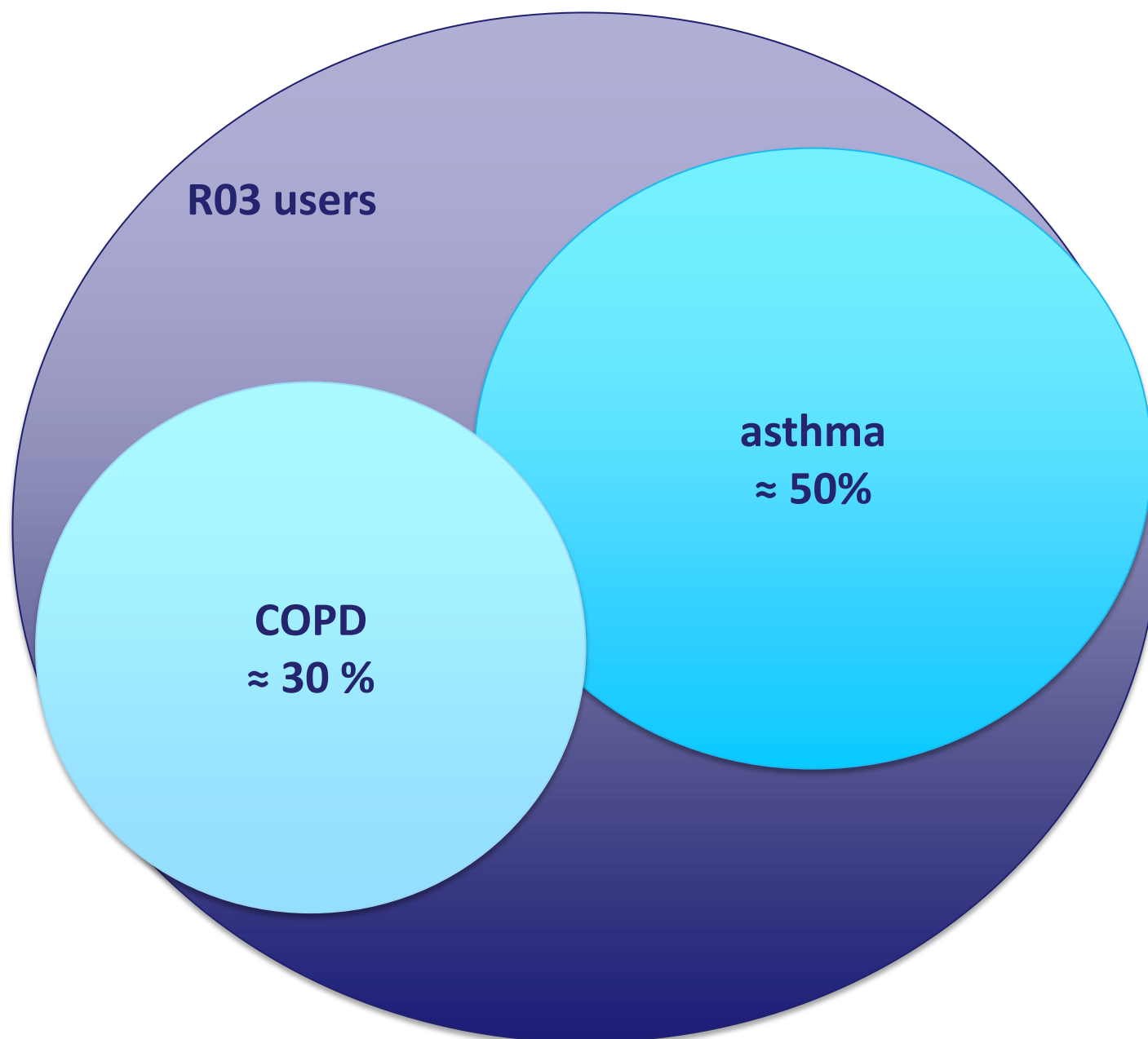


Estimating the cut-off

```
PROC LOGISTIC inmodel=data.model1;  
  score data=InputData OUT=plong  
    (RENAME=(P_1=pcopd) DROP=p_0) ;  
RUN;
```

- Sensitivity, specificity, NPV, PPV
- GP ratios
- Expected ratios based on literature

Expected ratios based on literature



Sensitivity

COPD		GP records	
		Yes	No
Model prediction	Yes		
	No		

- Sensitivity 77.3%

Specificity

COPD		GP records	
		Yes	No
Model prediction	Yes		
	No		

- Specificity 85.6%

Ratios of patients with COPD

- Ratio relative to all R03 users

	2009	2010	2011	2012
GP	22.7%	23.6%	23.7%	23.8%
Model 2010	26.1%	27.5%	28.3%	29.0%
Model 2011	26.3%	27.7%	28.4%	29.1%
Model 2012	26.6%	28.0%	28.7%	29.4%

Other models

- Diabetes Type I/II
- Heart failure
- High blood pressure

Conclusions

- We created an useful model for estimating GPs indication for asthma or COPD.
- This model is used for market analysis for new drugs in the COPD/asthma market.
- COPD model based on age, gender, duration of R03 use and 5 different medication (group)s.
- Asthma model based on age, duration of R03 use and 5 different medication (group)s.
- Yearly update to keep accurate

Questions

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