

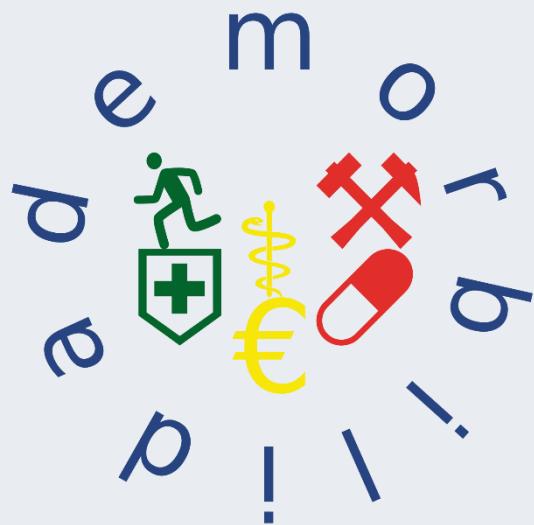
Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



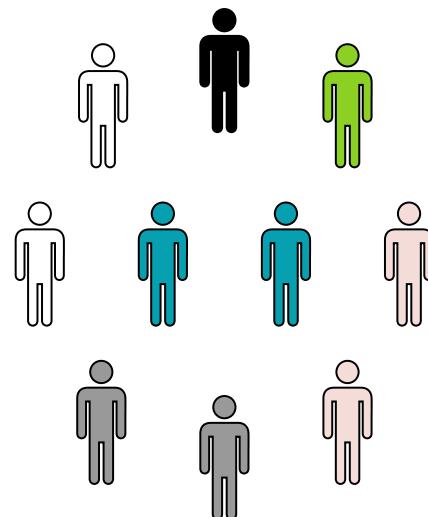
THE PROBLEM



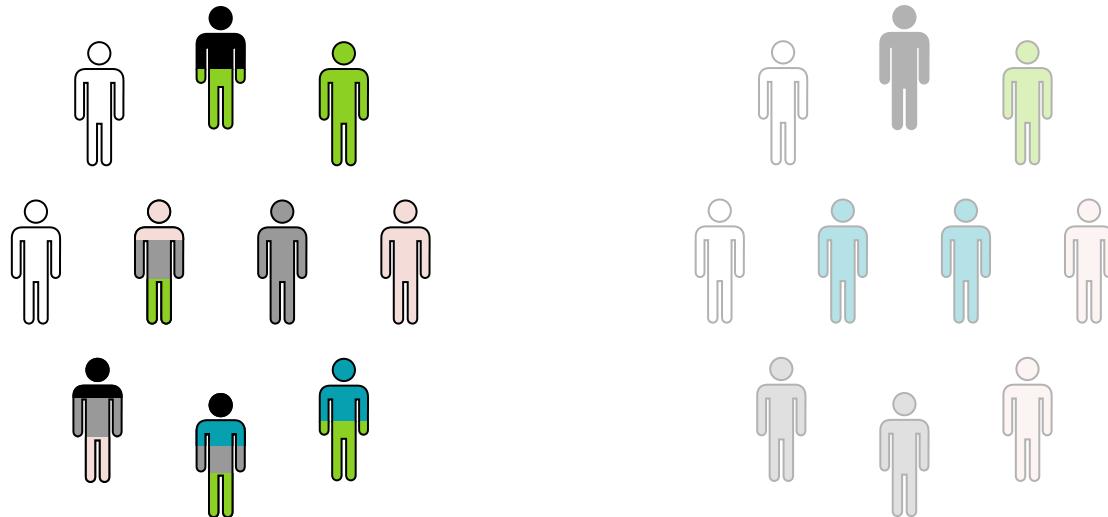
Multimorbidity... how to study?



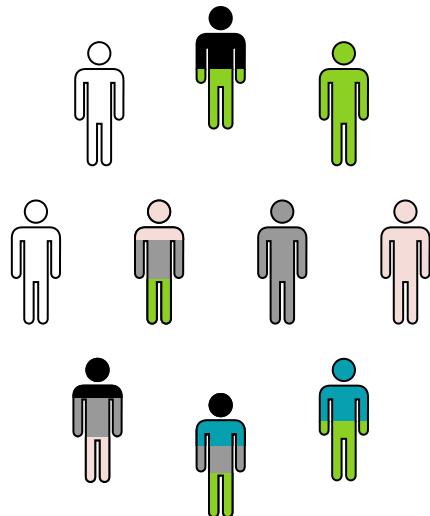
Multimorbidity... how to study?



Multimorbidity... how to study?



Multimorbidity... how to study?



Statistical adjustment (multivariate analysis)

Counts of coexisting diseases

Comorbidity indexes (eg: Charlson)

Observed to expected ratio

Factor Analysis / Principal Component Analysis

Cluster Analysis / Latent Class Analysis



Health and wellbeing... how to measure?





Health and wellbeing... how to measure?

The study of **chronic diseases** and their **impact** on the health and wellbeing of populations is essential for evidence based **health planning, policy making** and the organization and management of **healthcare services**



Health and wellbeing... how to measure?

The study of **chronic diseases** and their **impact** on the health and wellbeing of populations is essential for evidence based **health planning, policy making** and the organization and management of **healthcare services**

- Mortality
- Morbidity
 - Prevalence / Incidence
 - Global indicators (eg: DALYs)
 - Specific indicators

Health and wellbeing... how to measure?

Measure of association → *Prevalence ratio (PR)*



Health and wellbeing... how to measure?

Measure of impact → *Population Attributable Fraction (PAF)*



“Populacion impact”

Health and wellbeing... how to measure?

Measure of impact → Population Attributable Fraction (PAF)

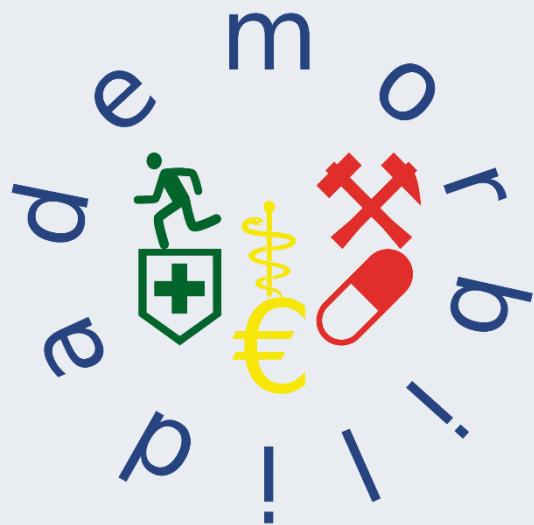


↑ Exposure-Outcome association
↑ Exposed prevalence → ↑ PAF



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THE
SOLUTION



Monitoring morbidity associated with chronic conditions

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Proposal of a model and a tool that...

...considers a more realistic approach to the existence of multimorbidities

...studies its impact on specific morbidity indicators

...allows its reproducibility by programming the data analysis in code



National Health Survey 2014



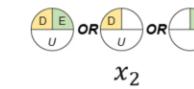
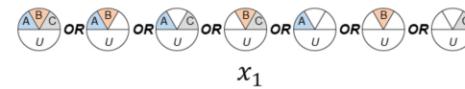
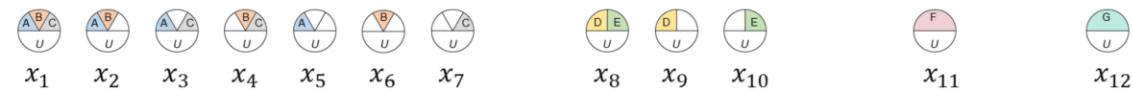
Standardized according to the
European Health Interview Survey
(EHIS wave 2)



- 17 **Chronic diseases (*exposure*)**
- 14 **Specific morbidity indicators (*outcome*)**
- 4 Confounding variables



Conceptual model

Chronic diseases**Grouping of chronic diseases by their coexistence (PCA)****LEVEL 1: Components**Principal components
(groups of diseases)**LEVEL 2: Classes**Possible classes of sufficient causes
(combinations of diseases within groups)**Log-Poisson model**

$$\log(E(Y)) = \beta_0 + \beta_i x_i + \beta_1 C_1 + \dots + \beta_n C_n$$

for C_n possible considered confounders

Adjusted prevalence ratio (PR_{aj_i})

$$PR_{aj_i} = \exp(\beta_i)$$

Population attributable fraction (PAF_i)

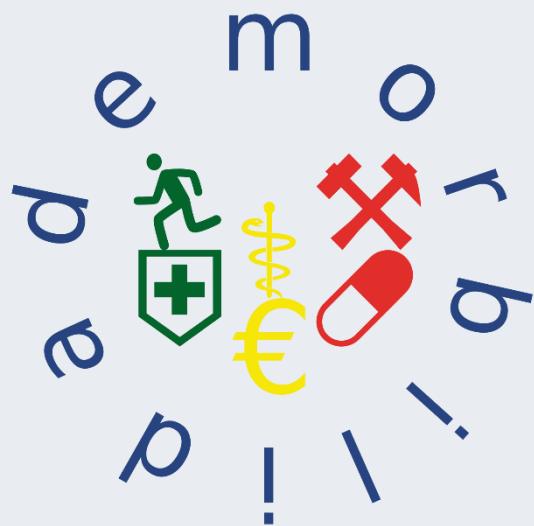
$$PAF_i = p_i \times \frac{PR_{aj_i} - 1}{PR_{aj_i}}$$

for the p_i proportion of subjects with the outcome (Y) that report the disease(s) (x_i)



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MULTIMORBIDITY PATTERN

Multimorbidity pattern

Principal component analysis (*Grouping of chronic diseases*)

8 chronic diseases groups
(components)

Arthrosis

Low back/neck disorder

Allergy

Depression

Asthma

Chronic pulmonary disease

Visual impairment

Hearing impairment

Hypertension

Diabetes

Obesity

Urinary incontinence

Kidney problems

Myocardial infarction

Coronary heart disease

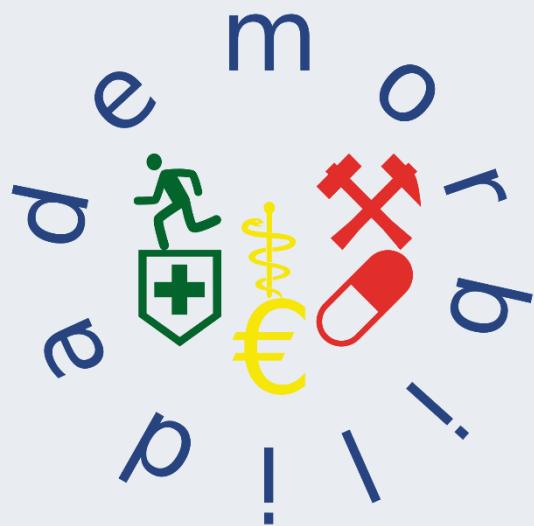
Stroke

Cirrhosis



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MORBIDITY TOOL



R code

Code programming of...

...data analysis

...outputs

(R programming language)

...under validation

before public distribution

```
fun06_pafregionfun <- function(fun = fun05_pcapaffun,
                                x = pcaclasses,
                                level = c("components",
                                          "classes"),
                                weights = TRUE,
                                adjustment = TRUE) {

  ##### From the results of the fun05_pcapaffun function, make the analysis for Portugal
  ##### and the different regions

  # Prepare the analysis

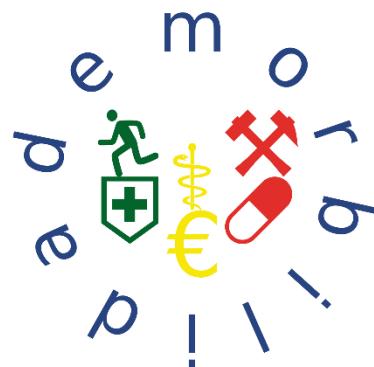
  regions <- as.character(x$data$others$REGION)
  strata  <- c("Portugal",
              unique(regions))
  resultsregion <- list(results = NULL,
                        results_labels = NULL)

  # Analysis for Portugal and regions

  for (i in 1:length(strata)) {
    if (strata[i] == "Portugal") {
      results_temp <- fun(x = x,
                           level = level,
                           weights = weights,
                           adjustment = adjustment)
      results_temp$results <- cbind(REGION = rep("Portugal",
                                                dim(results_temp$results)[1]),
                                     results_temp$results)
      results_temp$results
    }
    gc()
  }
}
```



Monitoring morbidity associated with chronic conditions



morbilidade.github.io/en

morbilidade@gmail.com



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



MORBIDITY

Instructions



Methodological
documentation

Authors



Monitoring morbidity associated with chronic conditions

Study of the coexistence of chronic diseases and their impact on specific
morbidity indicators in the Portuguese National Health Survey 2014

Note: This website is under development and the presented results are preliminary (in validation).

The study of the impact of chronic diseases on morbidity is essential for health planning and healthcare services management. Given the natural coexistence of multiple chronic diseases in the population, this must be taken into account in the analysis of their impact. This study aims to analyse the impact of chronic diseases on specific morbidity indicators in the Portuguese population, considering their coexistence.

Data from the Portuguese National Health Survey 2014 were used. The coexistence of chronic disease was studied by a principal component analysis, grouping chronic diseases in principal components according to their clinical similarity. The variables used for this grouping. The initial chronic diseases were recoded by principal component into sufficient causes for each principal component. These recoded variables were modelled using a multivariate log-Poisson regression. The exponential of the coefficients of the regression were used as a measure of association (prevalence ratio) for calculating the population attributable fractions.

morbilidade.github.io/en



Português



English



10th European Public Health
Conference

Oral presentation at the 10th European Public Health Conference, on November 2, 2017, in Stockholm, Sweden.



V National Congress of Public Health

Oral presentation at the V National Congress of Public Health, on February 16, 2017, in Porto, Portugal.





Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



Monitoring morbidity associated with chronic conditions

Study of the coexistence of chronic diseases and their impact on specific morbidity indicators in the Portuguese National Health Survey 2014

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Monitoring morbidity associated with chronic conditions

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STATISTICS PORTUGAL

Level:

Level 1: Components

Region:

Portugal

Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Top (graph):



Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Prevalence ratios, p<0.05

Any chronic disease (8.14)

Population attributable fraction (%)

Any chronic disease (86.04)

1. Arthrosis, low back/neck disorder, allergy and/or depression (3.28)

1. Arthrosis, low back/neck disorder, allergy and/or depression (61.96)



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Region:

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Level 1: Components

Level 2: Classes

Health

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health

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Morbidity indicators: Negative self-perceived general health

Region: Portugal

Results adjusted for (graph): Confounders and components

Top (graph): 0 5 36

Ne I health in Portugal

of diseases)

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Portuguese National Health Survey 2014



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Top (graph): 0 5 36

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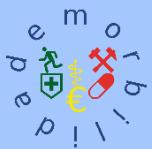
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Portuguese National Health Survey 2014



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Top (graph): 0 5 36

I health in Portugal

Number of diseases: 5 (of diseases)

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Portuguese National Health Survey 2014



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Morbidity indicators:

Negative self-perceived general health

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Confounders and components

Ne

I health in Portugal

of diseases)

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Ne

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Negative self-perceived general health

Results adjusted for (graph):

Confounders and components

Ne

Portugal
North
Center
Lisbon
Alentejo
Algarve
Azores
Madeira

Top (graph):



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Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



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Level:

Level 1: Components

Region:

Portugal

- Portugal
- North
- Center
- Lisbon
- Alentejo
- Algarve
- Azores
- Madeira

Morbidity indicators:

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New

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Negative self-perceived general health

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Hospitalisation as inpatient

Prevalence ratios, p<0.05

Any chronic disease (8.14)

1. Arthrosis, low back/neck disorder, allergy and/or depression (3.28)

Population attributable fraction (%)

Any chronic disease (86.04)

1. Arthrosis, low back/neck disorder, allergy and/or depression (61.96)



Top (graph):



I health in Portugal

(of diseases)

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Monitoring morbidity associated with chronic conditions

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Level:

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Region:

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Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Physical functional limitations

Personal care activities limitations (>65 years old)

Household activities limitations (>65 years old)

Intensity of bodily pain

Impact of the pain on daily life

Hospitalisation as inpatient

Hospitalisation as day patient

Prevalence ratios, p<0.05

Any chronic disease (8.14)

1. Arthrosis, low back/neck disorder, allergy and/or depression (3.28)

Top (graph):



I health in Portugal

(of diseases)

Population attributable fraction (%)

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Morbidity indicators:

Negative self-perceived general health



Household activities limitations (>65 years old)

Intensity of bodily pain

Impact of the pain on daily life

Hospitalisation as inpatient

Hospitalisation as day patient

Consultation of a general practitioner

Consultation of other specialist

Prevalence ratios, p<0.05

Any chronic disease (8.14)

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I health in Portugal

(of diseases)

Population attributable fraction (%)

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Confounders and components

Morbidity indicators:

- Negative self-perceived general health
- Intensity of bodily pain
- Impact of the pain on daily life
- Hospitalisation as inpatient
- Hospitalisation as day patient
- Consultation of a general practitioner
- Consultation of other specialist
- Use of medicines prescribed



Prevalence ratios, p<0.05

Any chronic disease (8.14)

1. Arthrosis, low back/neck disorder, allergy and/or depression (3.28)

Population attributable fraction (%)

Any chronic disease (86.04)

1. Arthrosis, low back/neck disorder, allergy and/or depression (61.96)



I health in Portugal

(of diseases)

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Confounders and components

Morbidity indicators:

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- Consultation of a general practitioner
- Consultation of other specialist
- Use of medicines prescribed
- Use of medicines not prescribed



Prevalence ratios, p<0.05

Any chronic disease (8.14)

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Top (graph):



I health in Portugal

(of diseases)

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Results adjusted for (graph):

Confounders and components

Morbidity indicators:

- Negative self-perceived general health
- Impact of the pain on daily life
- Hospitalisation as inpatient
- Hospitalisation as day patient
- Consultation of a general practitioner
- Consultation of other specialist
- Use of medicines prescribed
- Use of medicines not prescribed
- Out-of-pocket health expenditure



Prevalence ratios, p<0.05

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Level:

Level 1: Components

Region:

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Morbidity indicators:

Negative self-perceived general health

Results adjusted for (graph):

Confounders and components

Confounders and components

Only confounders

 0
 4
 8
 12
 20
 24
 32
 36

Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Prevalence ratios, p<0.05

Any chronic disease (8.14)

Population attributable fraction (%)

Any chronic disease (86.04)

1. Arthrosis, low back/neck disorder, allergy and/or depression (3.28)

1. Arthrosis, low back/neck disorder, allergy and/or depression (61.96)



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Morbidity indicators:

Negative self-perceived general health

Results adjusted for (graph):

Confounders and components

Confounders and components

Only confounders



Negative self-perceived general health in Portugal

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Negative self-perceived general health

Top (graph):



Graph

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Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Prevalence ratios, p<0.05

Any chronic disease (8.14)

Population attributable fraction (%)

Any chronic disease (86.04)

1. Arthrosis, low back/neck disorder, allergy and/or depression (3.28)

1. Arthrosis, low back/neck disorder, allergy and/or depression (61.96)



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MORBIDITY

Instructions



Methodological
documentation

Authors



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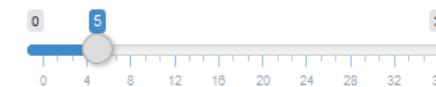
Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Top (graph):



Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Prevalence ratios, p<0.05

Any chronic disease (8.14)



1. Arthrosis, low back/neck disorder, allergy and/or depression (3.28)

2. Stroke (1.54)

3. Visual impairment and/or hearing impairment (1.50)

Population attributable fraction (%)

Any chronic disease (86.04)

1. Arthrosis, low back/neck disorder, allergy and/or depression (61.96)

2. Visual impairment and/or hearing impairment (22.91)

3. Hypertension, diabetes and/or obesity (22.87)



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Level 1: Components

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Portugal

Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Top (graph):



Graph

Table

Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

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Prevalence ratios, p<0.05

- Any chronic disease (8.14)
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- 3. Visual impairment and/or hearing impairment (1.50)
- 4. Hypertension, diabetes and/or obesity (1.46)
- 5. Cirrhosis (1.42)



Population attributable fraction (%)

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- 2. Visual impairment and/or hearing impairment (22.91)
- 3. Hypertension, diabetes and/or obesity (22.87)
- 4. Urinary incontinence and/or kidney problems (9.49)
- 5. Myocardial infarction and/or coronary heart disease (5.59)



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



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Region:

Portugal

Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Top (graph):



Negative self-perceived general health in Portugal

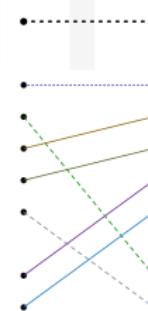
Level 1: Components (groups of diseases)

Graph

Table

Prevalence ratios, p<0.05

- Any chronic disease (8.14)
1. Arthrosis, low back/neck disorder, allergy and/or depression (3.28)
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 7. Myocardial infarction and/or coronary heart disease (1.36)



Population attributable fraction (%)

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 5. Myocardial infarction and/or coronary heart disease (5.59)
 7. Stroke (2.89)
 8. Cirrhosis (0.68)



Monitoring morbidity associated with chronic conditions

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Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Top (graph):



Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Measure of "individual" association

Prevalence ratios, p<0.05

Any chronic disease (8.14)

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Any chronic disease (86.04)

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Level 1: Components

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Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Top (graph):

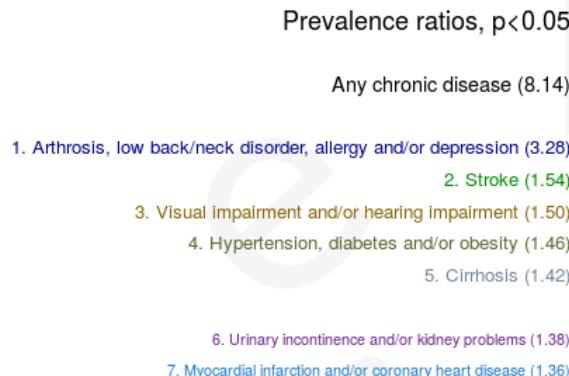


Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table



Measure of "population" impact

Population attributable fraction (%)

Any chronic disease (86.04)

- 1. Arthrosis, low back/neck disorder, allergy and/or depression (61.96)
- 2. Visual impairment and/or hearing impairment (22.91)
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Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Top (graph):



Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Prevalence ratios, p<0.05

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Results adjusted for (graph):

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Morbidity indicators:

Negative self-perceived general health

Top (graph):



Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

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Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Top (graph):



Negative self-perceived general health in Portugal

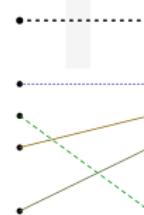
Level 1: Components (groups of diseases)

Graph

Table

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Results adjusted for (graph):

Confounders and components

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Negative self-perceived general health

Top (graph):



Negative self-perceived general health in Portugal

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Negative self-perceived general health

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Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

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Negative self-perceived general health

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Negative self-perceived general health in Portugal

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 6. Asthma and/or chronic pulmonary disease (5.34)
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Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Top (graph):



Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

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Negative self-perceived general health

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Morbidity indicators:

Negative self-perceived general health

Top (graph):



Graph

Table

Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Search:

Disease(s)	Total number of subjects (components)	Total number of subjects (outcome)	Prevalence ratio	Population Attributable Fraction (%)	p value	Adjusted prevalence ratio	Adjusted Population Attributable Fraction (%)	Adjusted p value
Any chronic disease	17739	17735	8.14	86.04	<0.001	8.14	86.04	<0.001



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Confounders and components ▾

Morbidity indicators:

Negative self-perceived general health ▾

Top (graph):



Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Search:

Disease(s)	Total number of subjects (components)	Total number of subjects (outcome)	Prevalence ratio	Population Attributable Fraction (%)	p value	Adjusted prevalence ratio	Adjusted Population Attributable Fraction (%)	Adjusted p value
Any chronic disease	17739	17735	8.14	86.04	<0.001	8.14	86.04	<0.001
Arthrosis, low back/neck disorder,	17739	17735	4.17	67.76	<0.001	3.28	61.96	<0.001



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014

Level: Level 1: Components Region: Portugal Results adjusted for (graph): Confounders and components

Morbidity indicators: Negative self-perceived general health

Top (graph): 0 8 36

Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph Table

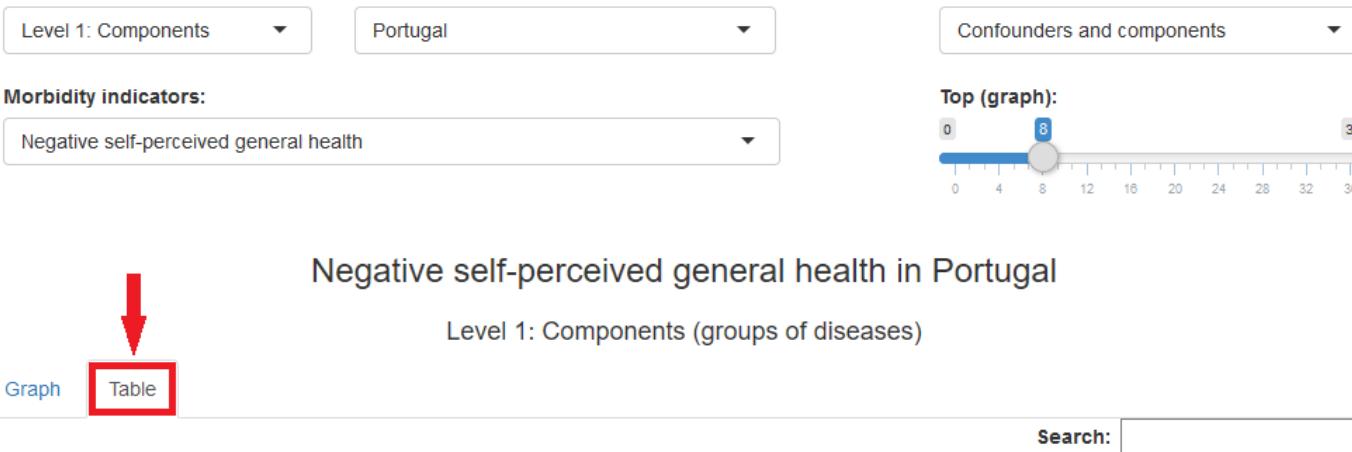
Search:

Disease(s)	Total number of subjects (components)	Total number of subjects (outcome)	Prevalence ratio	Population Attributable Fraction (%)	p value	Adjusted prevalence ratio	Adjusted Population Attributable Fraction (%)	Adjusted p value
Any chronic disease	17739	17735	8.14	86.04	<0.001	8.14	86.04	<0.001
Arthrosis, low back/neck disorder, allergy and/or depression	17739	17735	4.17	67.76	<0.001	3.28	61.96	<0.001



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



Disease(s) ▾	Total number of subjects (components) ▾	Total number of subjects (outcome) ▾	Prevalence ratio ▾	Population Attributable Fraction (%) ▾	p value ▾	Adjusted prevalence ratio ▾	Adjusted Population Attributable Fraction (%) ▾	Adjusted p value ▾
Any chronic disease	17739	17735	8.14	86.04	<0.001	8.14	86.04	<0.001
Arthrosis, low back/neck disorder, allergy and/or depression	17739	17735	4.17	67.76	<0.001	3.28	61.96	<0.001
Asthma and/or chronic	17739	17735	1.81	9.42	<0.001	1.34	5.34	<0.001



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014

Morbidity indicators:

Negative self-perceived general health

Top (graph):



Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Search:

Disease(s)	Total number of subjects (components)	Total number of subjects (outcome)	Prevalence ratio	Population Attributable Fraction (%)	p value	Adjusted prevalence ratio	Adjusted Population Attributable Fraction (%)	Adjusted p value
Any chronic disease	17739	17735	8.14	86.04	<0.001	8.14	86.04	<0.001
Arthrosis, low back/neck disorder, allergy and/or depression	17739	17735	4.17	67.76	<0.001	3.28	61.96	<0.001
Asthma and/or chronic pulmonary disease	17739	17735	1.81	9.42	<0.001	1.34	5.34	<0.001



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Search:

Disease(s)	Total number of subjects (components)	Total number of subjects (outcome)	Prevalence ratio	Population Attributable Fraction (%)	p value	Adjusted prevalence ratio	Adjusted Population Attributable Fraction (%)	Adjusted p value
Any chronic disease	17739	17735	8.14	86.04	<0.001	8.14	86.04	<0.001
Arthrosis, low back/neck disorder, allergy and/or depression	17739	17735	4.17	67.76	<0.001	3.28	61.96	<0.001
Asthma and/or chronic pulmonary disease	17739	17735	1.81	9.42	<0.001	1.34	5.34	<0.001
Visual impairment and/or	17730	17735	1.85	31.57	<0.001	1.5	22.01	<0.001



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014

Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Search:

Disease(s)	Total number of subjects (components)	Total number of subjects (outcome)	Prevalence ratio	Population Attributable Fraction (%)	p value	Adjusted prevalence ratio	Adjusted Population Attributable Fraction (%)	Adjusted p value
Any chronic disease	17739	17735	8.14	86.04	<0.001	8.14	86.04	<0.001
Arthrosis, low back/neck disorder, allergy and/or depression	17739	17735	4.17	67.76	<0.001	3.28	61.96	<0.001
Asthma and/or chronic pulmonary disease	17739	17735	1.81	9.42	<0.001	1.34	5.34	<0.001
Visual impairment and/or hearing impairment	17739	17735	1.85	31.57	<0.001	1.5	22.91	<0.001



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014

Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Search:

Total number of subjects (components)	Total number of subjects (outcome)	Prevalence ratio	Population Attributable Fraction (%)	p value	Adjusted prevalence ratio	Adjusted Population Attributable Fraction (%)	Adjusted p value	Proportion (%) of subjects with the disease(s) in the population	Prop
17739	17735	8.14	86.04	<0.001	8.14	86.04	<0.001	69.54	
17739	17735	4.17	67.76	<0.001	3.28	61.96	<0.001	50.07	
17739	17735	1.81	9.42	<0.001	1.34	5.34	<0.001	8.27	
17739	17735	1.85	31.57	<0.001	1.5	22.91	<0.001	35.07	



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014

Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Search:

Total number of subjects (n)	Prevalence ratio	Population Attributable Fraction (%)	p value	Adjusted prevalence ratio	Adjusted Population Attributable Fraction (%)	Adjusted p value	Proportion (%) of subjects with the disease(s) in the population	Proportion (%) of subjects with the outcome in the population	Proportion (%) of subjects with the outcome within those with the disease(s)
17735	8.14	86.04	<0.001	8.14	86.04	<0.001	69.54	13.16	18.1
17735	4.17	67.76	<0.001	3.28	61.96	<0.001	50.07	13.16	23.4
17735	1.81	9.42	<0.001	1.34	5.34	<0.001	8.27	13.16	33.4
17735	1.85	31.57	<0.001	1.5	22.91	<0.001	35.07	13.16	25.1



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014

Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Search:

	Population Attributable Fraction (%)	p value	Adjusted prevalence ratio	Adjusted Population Attributable Fraction (%)	Adjusted p value	Proportion (%) of subjects with the disease(s) in the population	Proportion (%) of subjects with the outcome in the population	Proportion (%) of subjects with the outcome within those with the disease(s)	Proportion (%) of subjects with the doença(s) within those with the outcome
4	86.04	<0.001	8.14	86.04	<0.001	69.54	13.16	18.56	98.09
7	67.76	<0.001	3.28	61.96	<0.001	50.07	13.16	23.42	89.14
1	9.42	<0.001	1.34	5.34	<0.001	8.27	13.16	33.47	21.04
5	31.57	<0.001	1.5	22.91	<0.001	35.07	13.16	25.79	68.72



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014

Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Search:

p value	Adjusted prevalence ratio	Adjusted Population Attributable Fraction (%)	Adjusted p value	Proportion (%) of subjects with the disease(s) in the population	Proportion (%) of subjects with the outcome in the population	Proportion (%) of subjects with the outcome within those with the disease(s)	Proportion (%) of subjects with the doença(s) within those with the outcome	Number of subjects with the disease(s)	Number of subjects with the outcome
<0.001	8.14	86.04	<0.001	69.54	13.16	18.56	98.09	13012	13012
<0.001	3.28	61.96	<0.001	50.07	13.16	23.42	89.14	9441	9441
<0.001	1.34	5.34	<0.001	8.27	13.16	33.47	21.04	1636	1636
<0.001	1.5	22.91	<0.001	35.07	13.16	25.79	68.72	6863	6863



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014

Negative self-perceived general health in Portugal

Level 1: Components (groups of diseases)

Graph

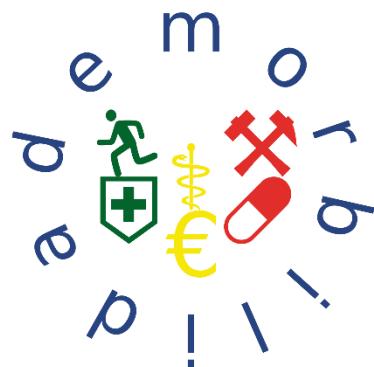
Table

Search:

	Adjusted Population Attributable Fraction (%)	Adjusted p value	Proportion (%) of subjects with the disease(s) in the population	Proportion (%) of subjects with the outcome in the population	Proportion (%) of subjects with the outcome within those with the disease(s)	Proportion (%) of subjects with the doença(s) within those with the outcome	Number of subjects with the disease(s)	Number of subjects with the outcome	Number of subjects with the disease(s) and the outcome
14	86.04	<0.001	69.54	13.16	18.56	98.09	13012	2858	2812
28	61.96	<0.001	50.07	13.16	23.42	89.14	9441	2858	2580
34	5.34	<0.001	8.27	13.16	33.47	21.04	1636	2858	625
15	22.91	<0.001	35.07	13.16	25.79	68.72	6863	2858	1940



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Monitoring morbidity associated with chronic conditions

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STATISTICS PORTUGAL

Level:

Level 1: Components

Level 1: Components

Level 2: Classes

Region:

Portugal

(>65 years old)

Results adjusted for (graph):

Confounders and components

Top (graph):



Personal care activities limitations (>65 years old) in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Prevalence ratios, p<0.05

- Any chronic disease (12.52)
- 1. Stroke (1.97)
- 2. Arthrosis, low back/neck disorder, allergy and/or depression (1.87)
- 3. Urinary incontinence and/or kidney problems (1.73)
- 4. Visual impairment and/or hearing impairment (1.65)



Population attributable fraction (%)

- Any chronic disease (91.67)
- 1. Arthrosis, low back/neck disorder, allergy and/or depression (41.87)
- 2. Visual impairment and/or hearing impairment (30.77)
- 3. Urinary incontinence and/or kidney problems (20.58)
- 4. Stroke (6.51)



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STATISTICS PORTUGAL

Level:
Level 1: Components

Region:
Portugal

Results adjusted for (graph):
Confounders and components

Morbidity indicators:

Personal care activities limitations (>6

Personal

Portugal
North
Center
Lisbon
Alentejo
Algarve
Azores
Madeira

Top (graph):



65 years old) in Portugal

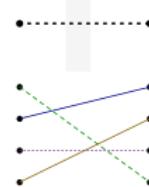
(of diseases)

Graph

Table

Prevalence ratios, p<0.05

- Any chronic disease (12.52)
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Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



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Level:

Level 1: Components

Region:

Portugal

Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Personal care activities limitations (>65 years old)

Negative self-perceived general health

Absence from work (only employed individuals)

Physical functional limitations

Personal care activities limitations (>65 years old)

Household activities limitations (>65 years old)

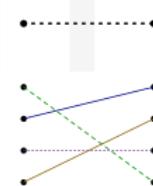
Intensity of bodily pain

Impact of the pain on daily life

Hospitalisation as inpatient

Prevalence ratios, p<0.05

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65 years old) in Portugal

(of diseases)

Population attributable fraction (%)

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Top (graph):





Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



With the
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Level:

Level 1: Components

Region:

Portugal

Results adjusted for (graph):

Confounders and components

Confounders and components

Only confounders

0 4 8 12 16 20 24 28 32 36

Morbidity indicators:

Personal care activities limitations (>65 years old)

Personal care activities limitations (>65 years old) in Portugal

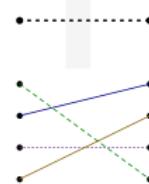
Level 1: Components (groups of diseases)

Graph

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Prevalence ratios, p<0.05

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Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



With the
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Level:

Level 1: Components

Region:

Portugal

Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Personal care activities limitations (>65 years old)

Top (graph):



Personal care activities limitations (>65 years old) in Portugal

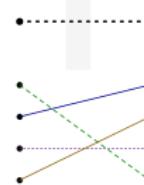
Level 1: Components (groups of diseases)

Graph

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Prevalence ratios, p<0.05

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Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



With the
collaboration of:



Level:

Level 1: Components

Region:

Portugal

Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Personal care activities limitations (>65 years old)

Top (graph):



Personal care activities limitations (>65 years old) in Portugal

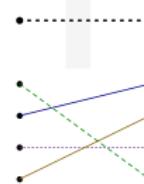
Level 1: Components (groups of diseases)

Graph

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Prevalence ratios, p<0.05

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Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



With the
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Level:

Level 1: Components

Region:

Portugal

Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Personal care activities limitations (>65 years old)

Top (graph):



Personal care activities limitations (>65 years old) in Portugal

Level 1: Components (groups of diseases)

Graph

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Prevalence ratios, p<0.05

Population attributable fraction (%)

Any chronic disease (12.52)

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Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



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STATISTICS PORTUGAL

Level:

Level 1: Components

Region:

Portugal

Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Personal care activities limitations (>65 years old)

Top (graph):



Personal care activities limitations (>65 years old) in Portugal

Level 1: Components (groups of diseases)

Graph

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Prevalence ratios, p<0.05

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Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



With the
collaboration of:



Level:

Level 1: Components

Region:

Portugal

Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Personal care activities limitations (>65 years old)

Top (graph):



Personal care activities limitations (>65 years old) in Portugal

Level 1: Components (groups of diseases)

Graph

Table

Prevalence ratios, p<0.05

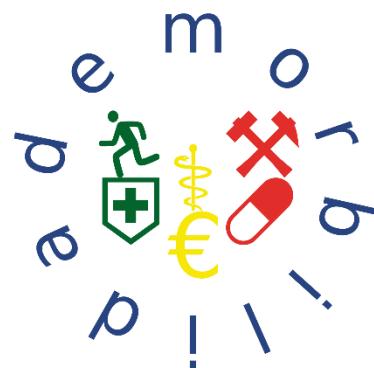
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Monitoring morbidity associated with chronic conditions

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Level:

Level 2: Classes

Region:

North

Results adjusted for (graph):

Confounders and components

Level 1: Components

Level 2: Classes

Top (graph):



Negative self-perceived general health in the North region

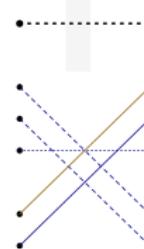
Level 2: Classes (combinations of diseases within groups)

Graph

Table

Prevalence ratios, p<0.05

- Any chronic disease (19.72)
- 1. Allergy and depression (2.39)
- 2. Arthrosis, allergy and depression (2.29)
- 3. Arthrosis, low back/neck disorder and depression (1.87)
- 11. Visual impairment and hearing impairment (1.51)
- 13. Arthrosis and low back/neck disorder (1.36)



Population attributable fraction (%)

- Any chronic disease (94.20)
- 1. Visual impairment and hearing impairment (11.23)
- 2. Arthrosis and low back/neck disorder (8.25)
- 3. Arthrosis, low back/neck disorder and depression (5.66)
- 23. Allergy and depression (0.54)
- 24. Arthrosis, allergy and depression (0.53)



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



With the
collaboration of:



Level:

Level 2: Classes

Region:

North

Morbidity indicators:

Negative self-perceived general health

Negati

Results adjusted for (graph):

Confounders and components

Top (graph):



alth in the North region

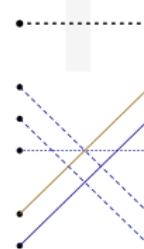
eases within groups)

Graph

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Prevalence ratios, p<0.05

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Population attributable fraction (%)

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Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



With the
collaboration of:



Level:

Level 2: Classes

Region:

North

Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Absence from work (only employed individuals)

Physical functional limitations

Personal care activities limitations (>65 years old)

Household activities limitations (>65 years old)

Intensity of bodily pain

Impact of the pain on daily life

Hospitalisation as inpatient

Top (graph):

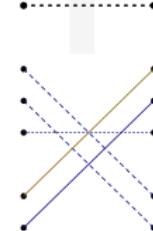


Health in the North region

(diseases within groups)

Prevalence ratios, p<0.05

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Population attributable fraction (%)

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Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



With the
collaboration of:



Level:

Level 2: Classes

Region:

North

Results adjusted for (graph):

Confounders and components

Confounders and components

Only confounders

0 4 8 12 16 20 24 28 32 36

Morbidity indicators:

Negative self-perceived general health

Negative self-perceived general health in the North region

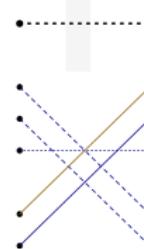
Level 2: Classes (combinations of diseases within groups)

Graph

Table

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- 2. Arthrosis, allergy and depression (2.29)
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- 11. Visual impairment and hearing impairment (1.51)
- 13. Arthrosis and low back/neck disorder (1.36)



Population attributable fraction (%)

- Any chronic disease (94.20)
- 1. Visual impairment and hearing impairment (11.23)
- 2. Arthrosis and low back/neck disorder (8.25)
- 3. Arthrosis, low back/neck disorder and depression (5.66)
- 23. Allergy and depression (0.54)
- 24. Arthrosis, allergy and depression (0.53)



Monitoring morbidity associated with chronic conditions

Portuguese National Health Survey 2014



With the
collaboration of:



Level:

Level 2: Classes

Region:

North

Results adjusted for (graph):

Confounders and components

Morbidity indicators:

Negative self-perceived general health

Top (graph):



Negative self-perceived general health in the North region

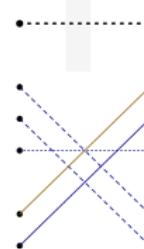
Level 2: Classes (combinations of diseases within groups)

Graph

Table

Prevalence ratios, p<0.05

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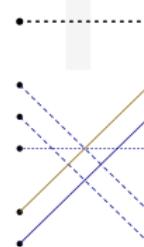
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INSTITUTO NACIONAL DE ESTATÍSTICA
STATISTICS PORTUGAL

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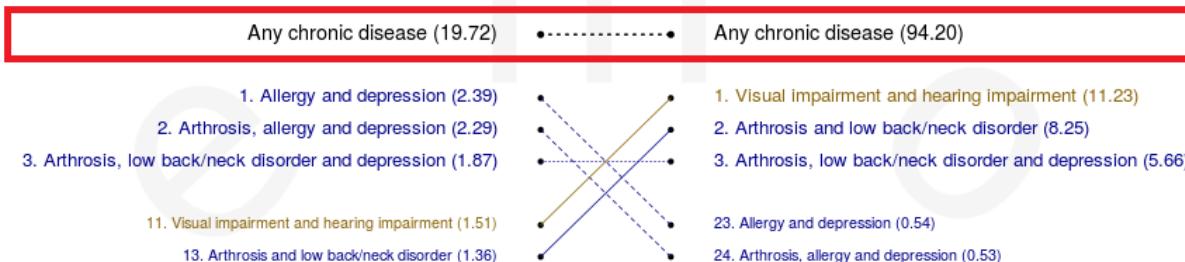
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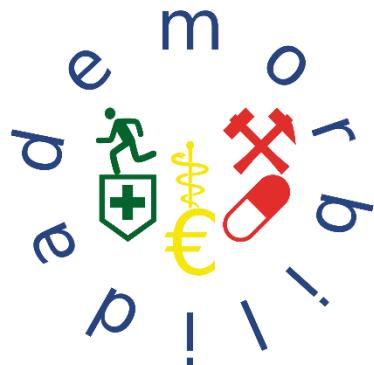
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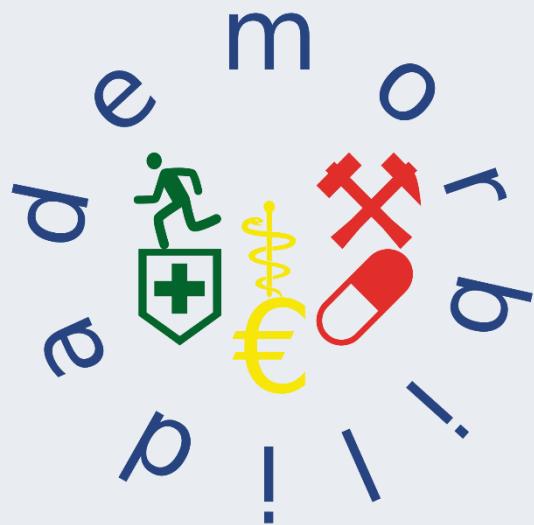


Monitoring morbidity associated with chronic conditions



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FINAL CONSIDERATIONS



Final considerations

Development and online publication of a tool with results of the impact of the pattern of coexistence of chronic diseases on several specific morbidity indicators, in Portugal and by region (NUTS II)



Programming in R code of the data analysis allowing its efficient use in similar studies (future national health surveys, regional health surveys, national health surveys of other countries, etc.) and in population health monitoring

```
fun06_pafregionfun <- function(fit = fm06_pafparfun,
                                x = pafclasses,
                                level = c("componentes",
                                         "classes"),
                                weights = TRUE,
                                adjustment = TRUE) {
  #### From the results of the fun06_pafparfun function, make the analysis for Portugal
  #### and the different regions

  # Prepare the analysis
  regions <- as.character(r$data$others$REGION)
  strata <- c("Portugal", ...,
            unique(regions))
  resultregion <- list(results = NULL,
                        results_label = NULL)

  # Analysis for Portugal and regions
  for (i in 1:length(strata)) {
    if (strata[i] == "Portugal") {
      results_temp <- fm06_pafparfun(x = x,
                                       level = level,
                                       weights = weights,
                                       adjustment = adjustment)
      results_temp$results <- chisq.test(results = rep("Portugal"),
                                         ...,
                                         data(results_temp$results))[[1]],
      results_temp$results
    }
  }
}
```



Research and development team

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