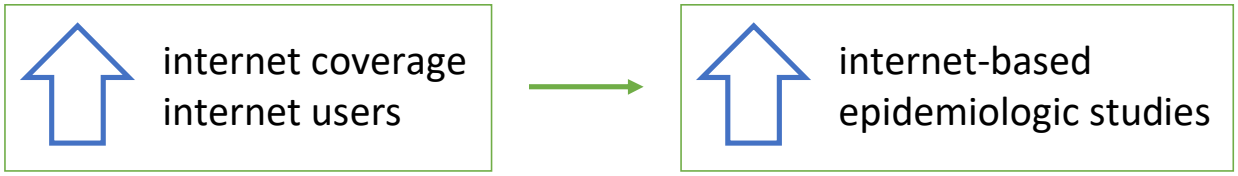
Web-based questionnaires in cohort studies: design issues and determinants of item nonresponse

Cauane Blumenberg

Introduction

- “Novel methodologies should be adopted in the epidemiology area...”



- Little methodological research focused on e-epidemiology

Objectives

1. Analyze the influence of individual characteristics on breaking off a web-based questionnaire of the NINFEA birth cohort
2. Study the association of questionnaire design features and respondent characteristics with item nonresponse rates.

Study population

- NINFEA web-based birth cohort
- Baseline questionnaire
  - Ruby on Rails version
  - No supplementary sections

5,970
individuals

14
sections

238
items

Outcomes

- Questionnaire breakoff
  - Unit of analysis: individual
  - Binary outcome for each respondent

5,970 individuals

QUESTIONNAIRE

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14
Woman 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Woman 2	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓
Woman 3	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗

Outcomes

- Item nonresponse
  - Unit of analysis: item
  - Bynary outcome per item and for each participant

5,970 individuals	X	238 items

1. Do you practice any sports?
   - ✓ Yes
   - ○ No
2. Do you play volleyball? ✗
   - ○ Yes
   - ○ No
3. How many times per week? __
4. Do you play football?
   - ✓ Yes
   - ○ No
5. How many times per week? ✗
6. Do you swim?
   - ○ Yes
   - ✓ No
7. How many times per week? __

Exposures

- Individual exposures
  - Type of recruitment
  - Age
  - Education level
  - Gestational age
  - Primipara
  - Employment status

Online

Offline

Exposures

- Individual exposures
  - Type of recruitment
  - Age
  - Education level
  - Gestational age
  - Primipara
  - Employment status

Age:
- ≤ 30 years of age
- 31 – 35 years of age
- 36+ years of age

Exposures

- Individual exposures
  - Type of recruitment
  - Age
  - Education level
    - University degree
    - Less than university
  - Gestational age
  - Primipara
  - Employment status

Exposures

- Individual exposures
  - Type of recruitment
  - Age
  - Education level
  - Gestational age
    - 1 – 21 weeks
    - 22 – 35 weeks
    - 36+ weeks
  - Primipara
  - Employment status

Exposures

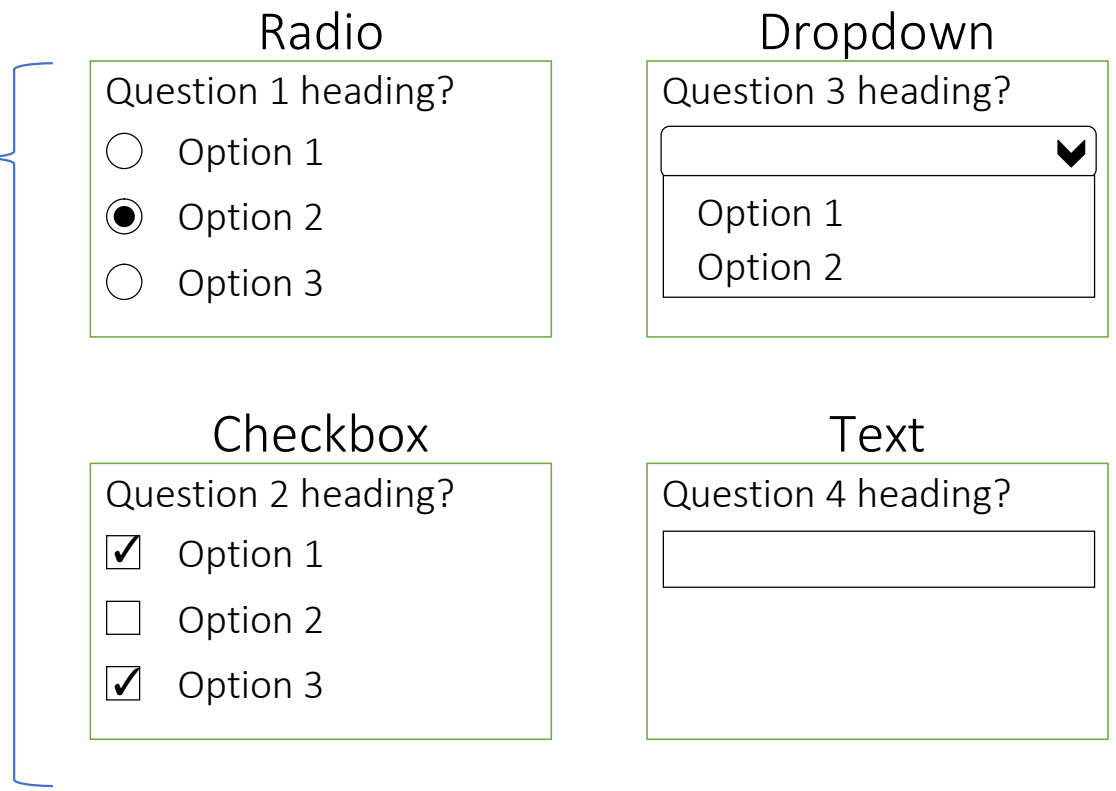
- Individual exposures
  - Type of recruitment
  - Age
  - Education level
  - Gestational age
  - Primipara
    - No
    - Yes
  - Employment status

Exposures

- Individual exposures
  - Type of recruitment
  - Age
  - Education level
  - Gestational age
  - Primipara
  - Employment status
    - Employed
    - Unemployed

Exposures

- Item-related exposures
  - Question type
  - # of response options
  - Item in a grid
  - Question with sensitive content



Exposures

- Item-related exposures
  - Question type
  - # of response options
    - 2 options
    - 3 – 5 options
    - 6+ options
  - Item in a grid
  - Question with sensitive content

Exposures

- Item-related exposures
  - Question type
  - # of response options
  - Item in a grid
  - Question with sensitive content

- Yes
- No

Item in a grid

	Option 1	Option 2	Option 3
Question 1 heading?	○	◉	○
Question 2 heading?	◉	○	○
Question 3 heading?	○	○	◉
Question 4 heading?	○	◉	○

Exposures

- Item-related exposures
  - Question type
  - # of response options
  - Item in a grid
  - Question with sensitive content
    - Yes
    - No

Statistical analyses

- Questionnaire breakoff
  - Logistic regression

Individual characteristics → Breakoff

- Item nonresponse
  - IPW to deal with missing by design
  - Multilevel logistic regression

Level 3	Individual
Level 2	Section
Level 1	Item

Results: descriptive

Individual Characteristic	%
Type of recruitment	
Offline	83.7
Online	16.3
Age	
≤ 30	29.1
31 - 35	41.9
36+	29.0
Education level	
University degree	61.6
Less than university	38.4

Individual Characteristic	%
Gestational age	
1 - 21	39.7
22 - 35	44.0
36+	16.3
Primipara	
Yes	53.6
No	46.4
Employment status	
Unemployed	15.1
Employed	84.9

Results: descriptive

Item-related factor	%
Question type	
Checkbox	5.9
Dropdown	20.6
Radio	48.7
Text	24.8
Response option	
2	38.6
3 - 5	47.4
6+	14.0
Item in a grid	
No	83.6
Yes	16.4

Results: questionnaire breakoff

- 93.1% of women reached the last section of the questionnaire
  - Models adjusted by age and education
  - Age and employment status did not influence the odds of breakoff

Online recruitment

1.52
(1.19, 1.95)

Less than university

1.60
(1.31, 1.96)

Gestational age

22-35: 0.49 (0.39, 0.62)
36+: 0.63 (0.46, 0.85)

Multipara

1.38
(1.12, 1.69)

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O'Neil et al., 2003

Less than university

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Ekman et al., 2006
Ekman et al., 2007

Gestational age

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36+: 0.63 (0.46, 0.85)

Multipara

1.38
(1.12, 1.69)

Ekman et al., 2007

Results: item nonresponse

- Models adjusted by age and education
- Gestational age, primipara women and employment status did not influence the odds of item nonresponse

Online recruitment

1.13
(1.02, 1.25)

Less than university

1.26
(1.17, 1.35)

Age

31-35: 1.10 (1.01, 1.20)
36+: 1.32 (1.21, 1.45)

Results: item nonresponse

- Models adjusted by age and education
- Gestational age, primipara women and employment status did not influence the odds of item nonresponse

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(1.02, 1.25)

Less than university

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(1.17, 1.35)

Messer et al., 2012

Age

31-35: 1.10 (1.01, 1.20)
36+: 1.32 (1.21, 1.45)

Messer et al., 2012

Results: item nonresponse

- Models adjusted by age and education

Sensitive content

0.15
(0.08, 0.29)

Item in a grid

1.63
(1.44, 1.84)

Response options

3-5: 1.09 (1.01, 1.17)
6+: 0.41 (0.35, 0.47)

Question type

Text

0.71
(0.63, 0.79)

Checkbox

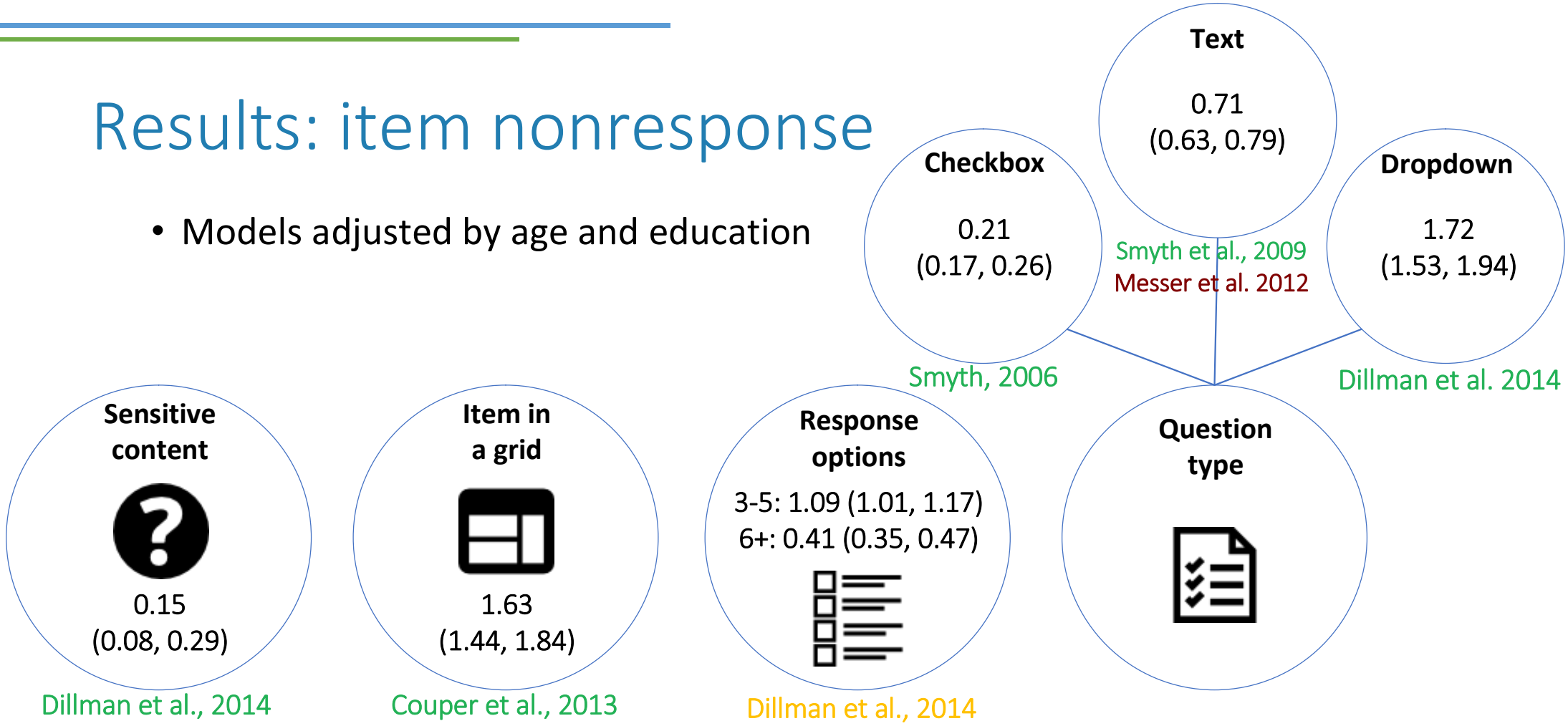
0.21
(0.17, 0.26)

Dropdown

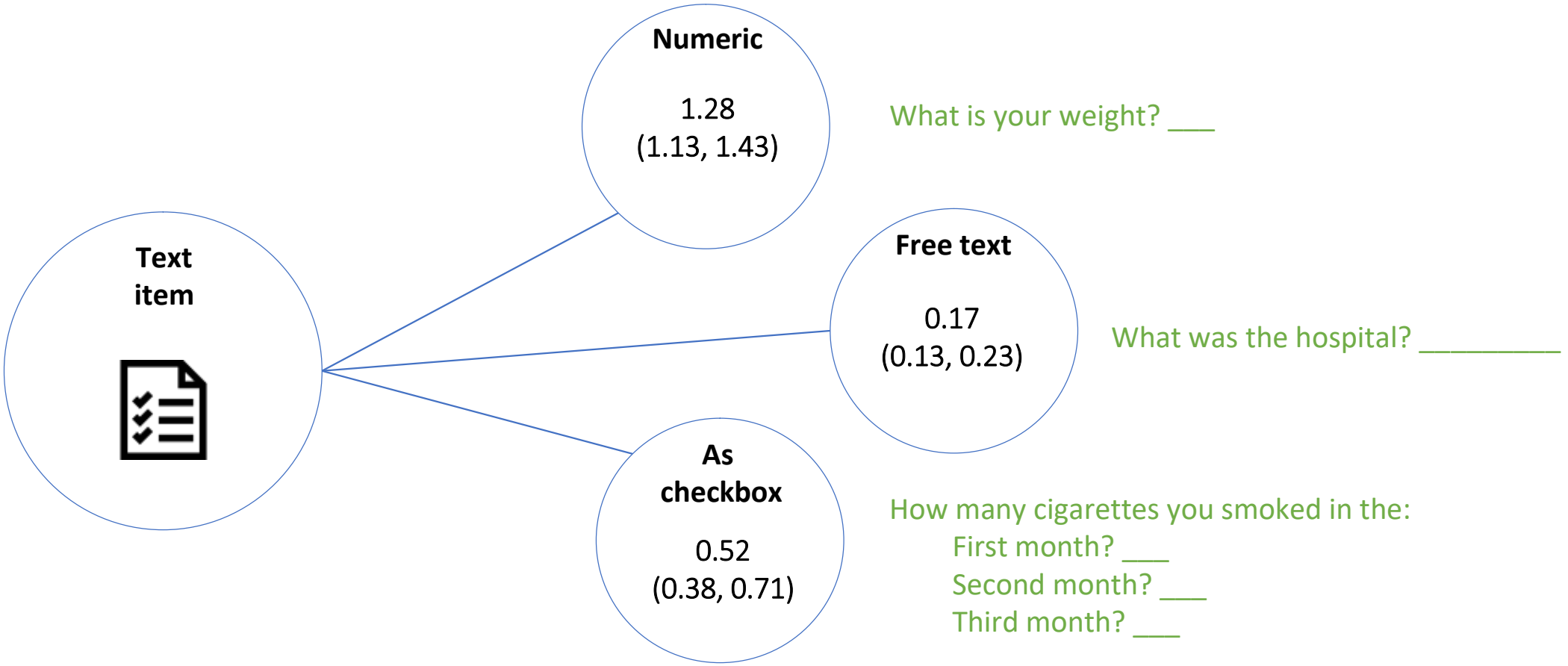
1.72
(1.53, 1.94)

Results: item nonresponse

- Models adjusted by age and education



Results: item nonresponse



Conclusion

- Some individual characteristics are associated with questionnaire breakoff and item nonresponse
  - Focus on the risky groups to reduce breakoff rates and keep participants motivated throughout the questionnaire
- Item-related factors, such as their design, can also impact the item nonresponse rate
  - Important to bring light to how internet-based questionnaires should be designed

coortesnaweb

A gamified web-based platform for epidemiologic research

coortes de nascimentos PELOTAS Web

Pelotas, Brazil

- Approximately 330,000 inhabitants
- 4 universities

UNIVERSIDADE FEDERAL DE PELOTAS
RS-BRASIL

coortes de nascimentos PELOTAS Web

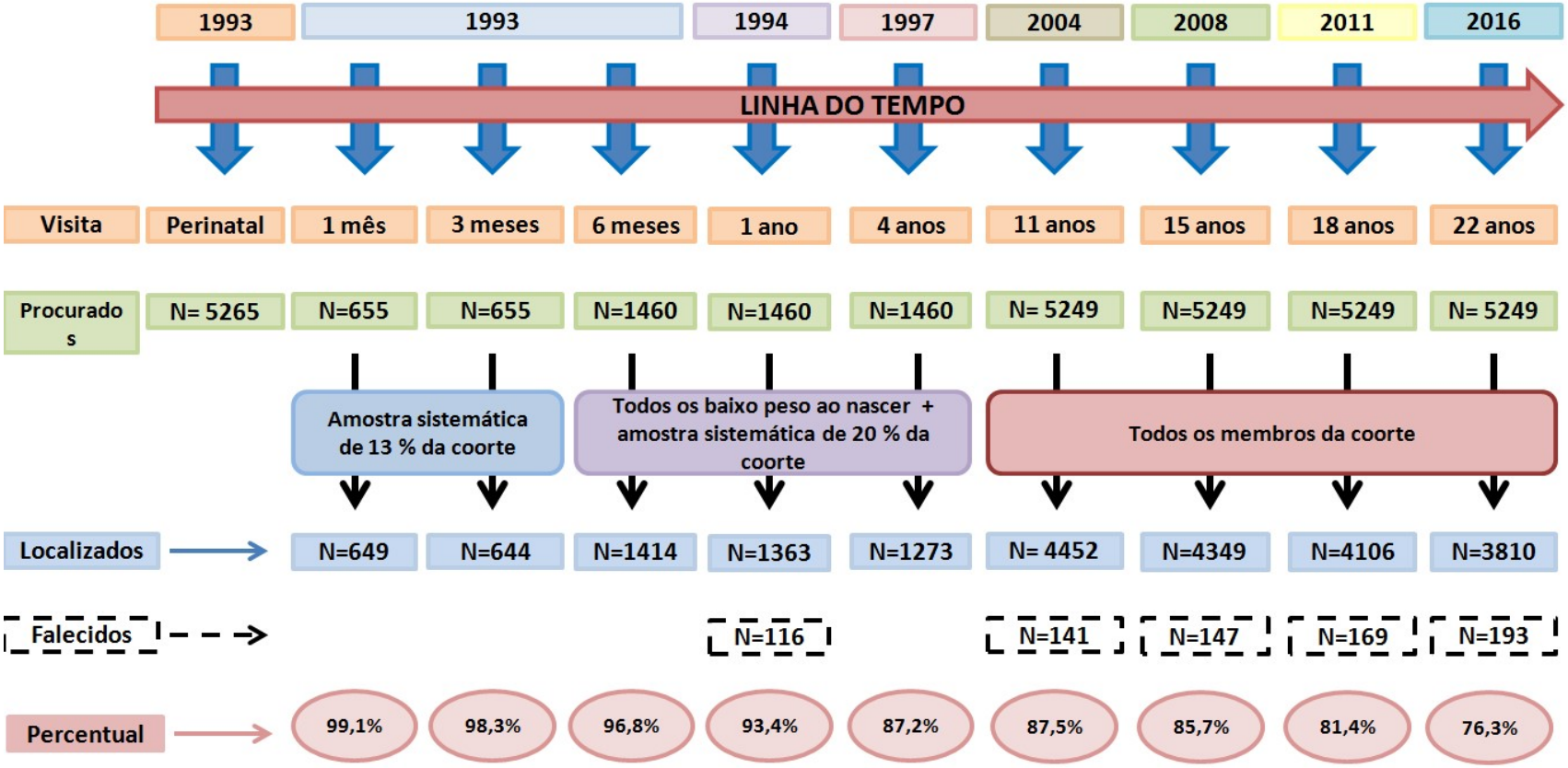
Pelotas Birth Cohorts

- 1982 Pelotas Birth Cohort
  - 5,914 individuals
- 1993 Pelotas Birth Cohort
  - 5,249 individuals
- 2004 Pelotas Birth Cohort
  - 4,231 individuals
- 2015 Pelotas Birth Cohort
  - 4,275 individuals

Almost **20,000** individuals with different age ranges

coortes de nascimentos PELOTAS Web

1993 Pelotas Birth Cohort



coortes de nascimentos PELOTAS Web

coortesnaweb

- Web-based data collection platform
- No regular follow-ups
- Gamification strategies
- Instant feedback

- Objectives: test different methodological aspects
  - Type of recruitment
  - Questionnaire length
  - Frequency of reminders

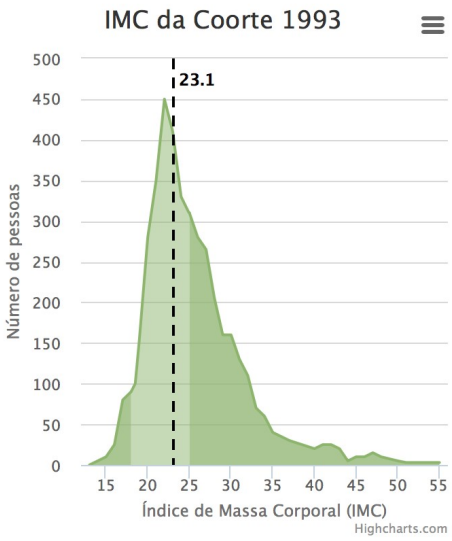
coortes de nascimentos PELOTAS Web

coortesnaweb: gamification

coortesnaweb: instant feedback

Início Sobre Ajuda Nível: 3 191 Cauane Blumenl

Compare o seu status de IMC com os participantes da Coorte 1993

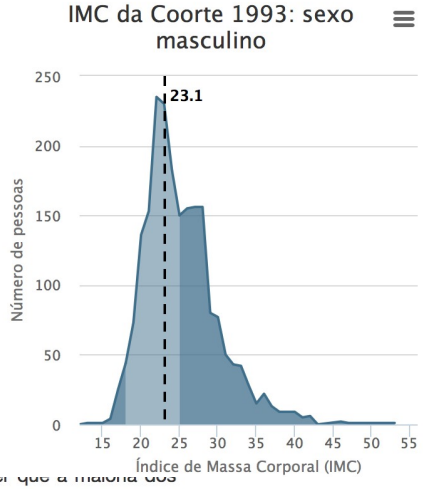


O que é IMC?

O Índice de Massa Corporal (IMC) é uma medic
nutricional em adultos, sendo também muito u
para medir a gordura corporal. Segundo a Org
Saúde (OMS), conforme o IMC aumenta, tambe
de desenvolver doenças do coração, pressão
mesmo alguns tipos de câncer.

IMC na Coorte 1993

No gráfico verde você pode conferir a distribuiçã
dos participantes da Coorte 1993 aos 22 anc
distribuição para os homens.
A parte mais clara dos gráficos representam a
OMS considera "peso normal". A gente pode ve
participantes da Coorte 1993 tem IMC considerado normal!



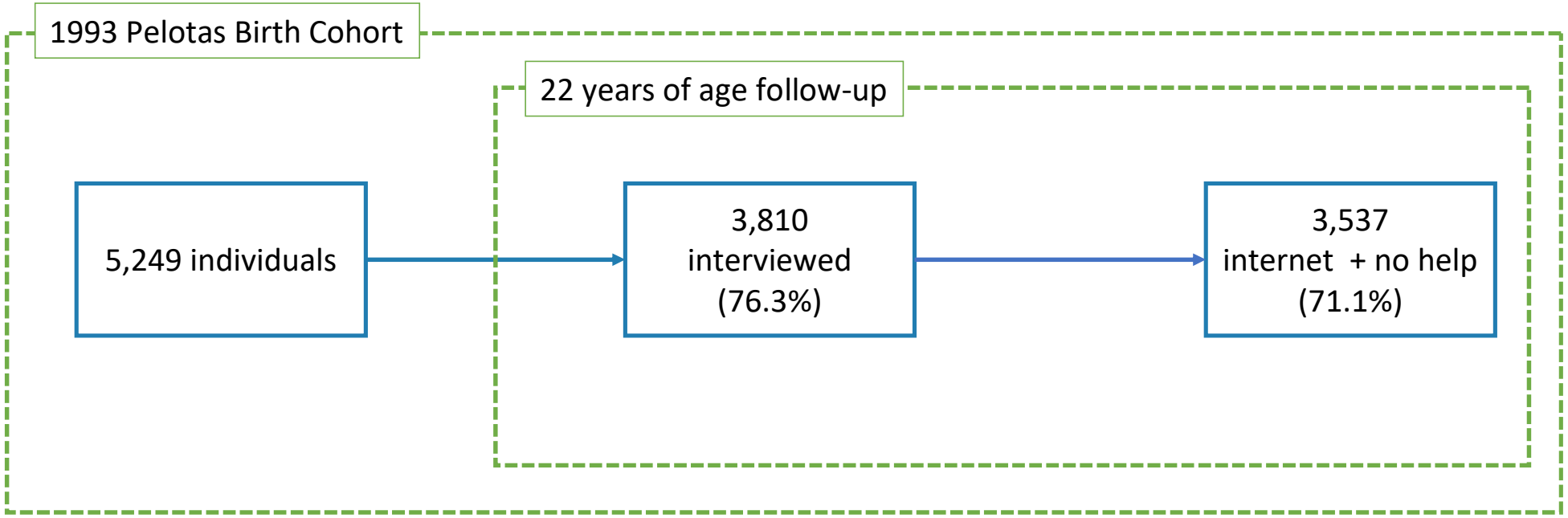
Condição	Valor mínimo de IMC	Valor máximo de IMC
Baixo peso	0.0	18.4
Peso normal	18.5	24.9
Sobrepeso	25.0	29.9
Obesidade	30.0	50.0

*Valores válidos para adultos com mais de 20 anos.
*Fonte: Organização Mundial da Saúde

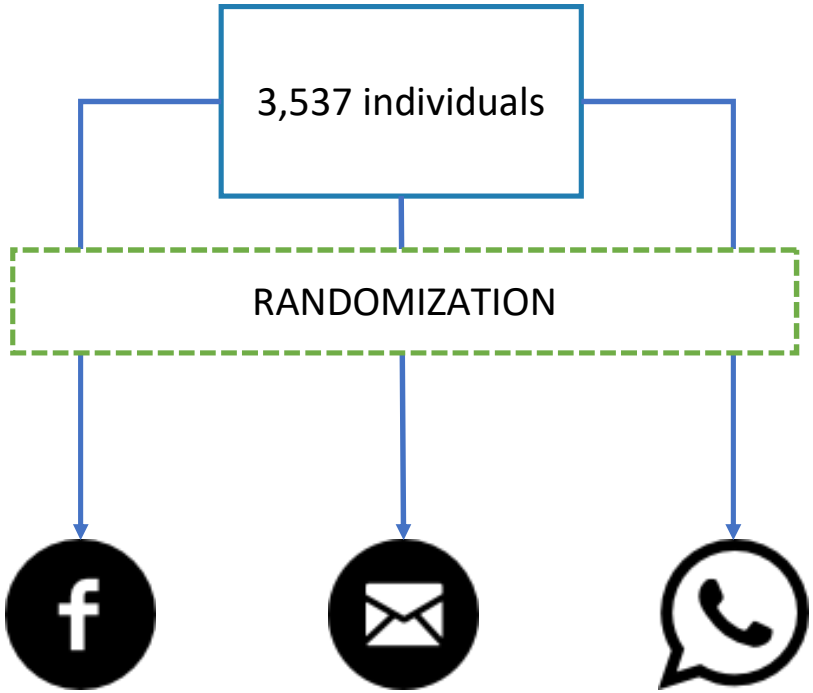
Seu IMC

Seu IMC é **23.1 kg/m²**, e está marcado pelas linhas pretas.
Segundo a OMS, seu status de IMC indica **peso normal**.
Manter hábitos de alimentação saudáveis e fazer atividade física vão ajudar você a manter este status!

coortesnaweb: target population

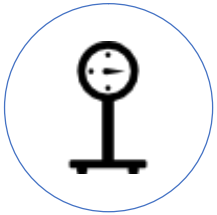


coortesnaweb: recruitment

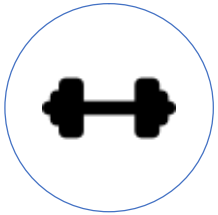


coortesnaweb: monthly questionnaires

6 months


BMI

Alcohol


Physical Activity

Internet Adiction

Violence

Lactose & Gluten

Sleep

Smoking

coortes de nascimentos PELOTAS Web

coortesnaweb:
questionnaire length / frequency of reminders

- Registered individuals will be randomly assigned to one of the four groups

		Questionnaire length: Long	Questionnaire length: Short
Frequency of reminders	Low	A	B
	High	C	D

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