



Autor: Conf. Dr. Bondor Cosmina-Ioana

Sumarizarea și prezentarea datelor



ALWAYS



SEEK



KNOWLEDGE

Descrierea datelor numerice (Continue, Discrete)



Măsuri ale tendinței centrale

- Media aritmetică
- Mediana
- Modul

Măsuri de dispersie (împrăștiere)

- Varianța
- Deviația Standard
- Coeficientul de variație
- Eroarea Standard

Alte măsuri

- Asimetria
- Boltirea
- Cvartile
- Percentile

Grafice

- Histograma
- Box-plots
- Medie/Error plot

Objective

- Alte măsuri
- Măsuri de dispersie
- Statistici înșelătoare
- Exerciții

Măsuri de dispersie

Deviația standard – Media deviației de la medie

Formula pentru **populație** (toate observațiile):

$$\sigma = \sqrt{\frac{\sum (X - \bar{X})^2}{N}}$$

Σ înseamnă adunare, X reprezintă observațiile individuale, μ este media aritmetică a întregii populații, N este numărul de observații.

Formula pentru un subset al populației (eșantion)

Deviația standard pentru **eșantion** (cu corecție)

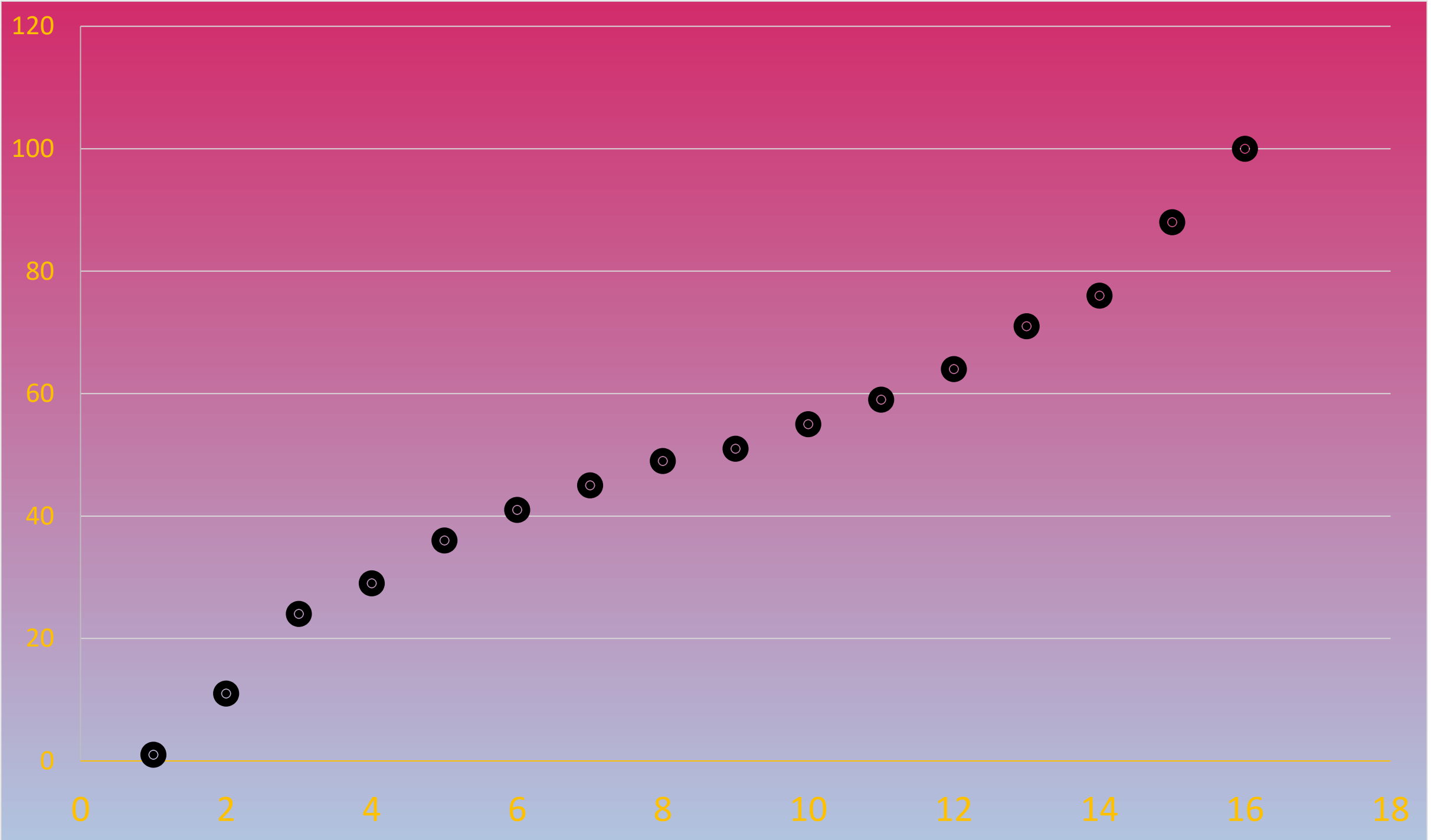
$$S = \sqrt{\frac{\sum (X - \bar{X})^2}{N-1}} = \sqrt{\frac{(x_1 - \bar{X})^2 + (x_2 - \bar{X})^2 + \dots + (x_N - \bar{X})^2}{N-1}}$$

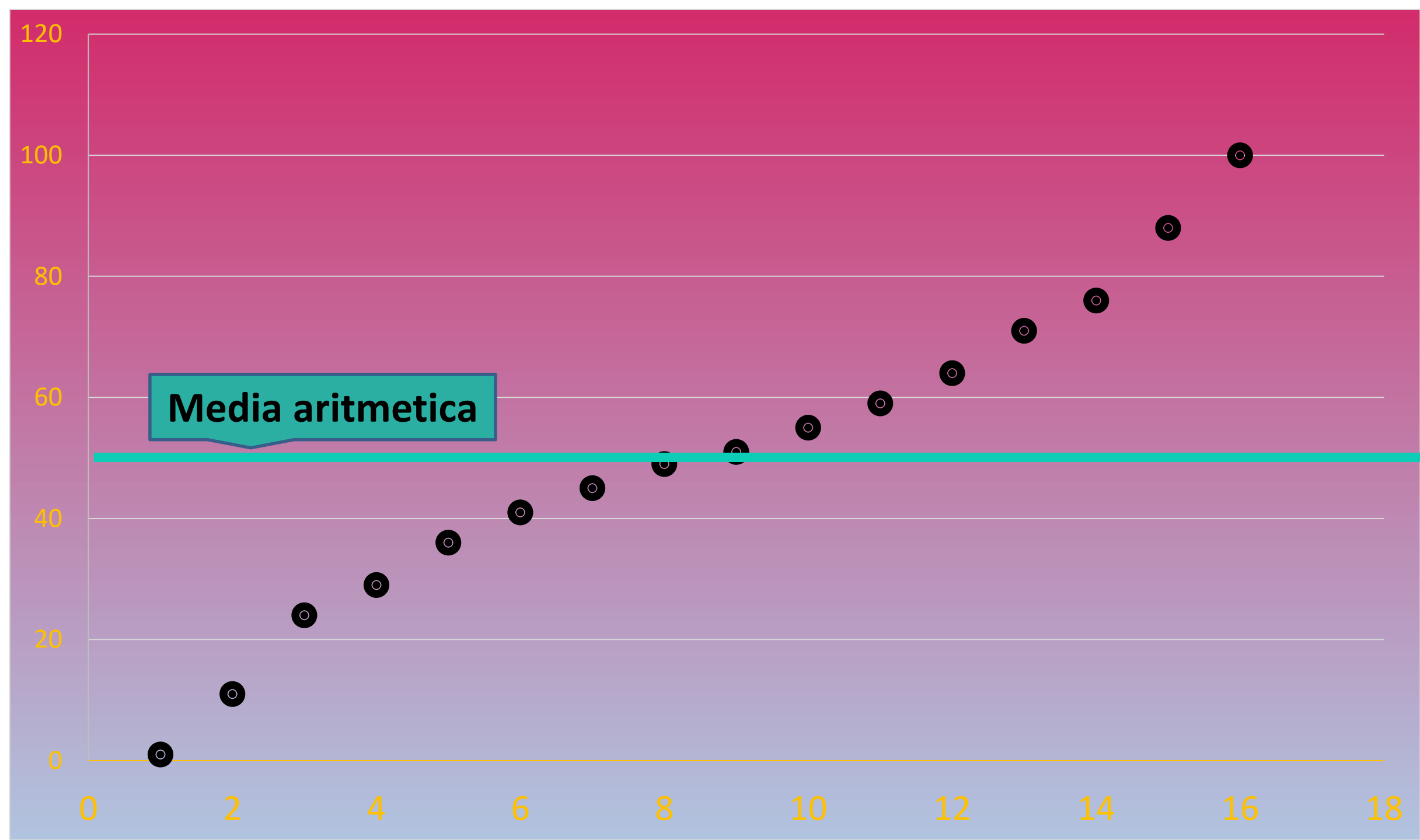
unde

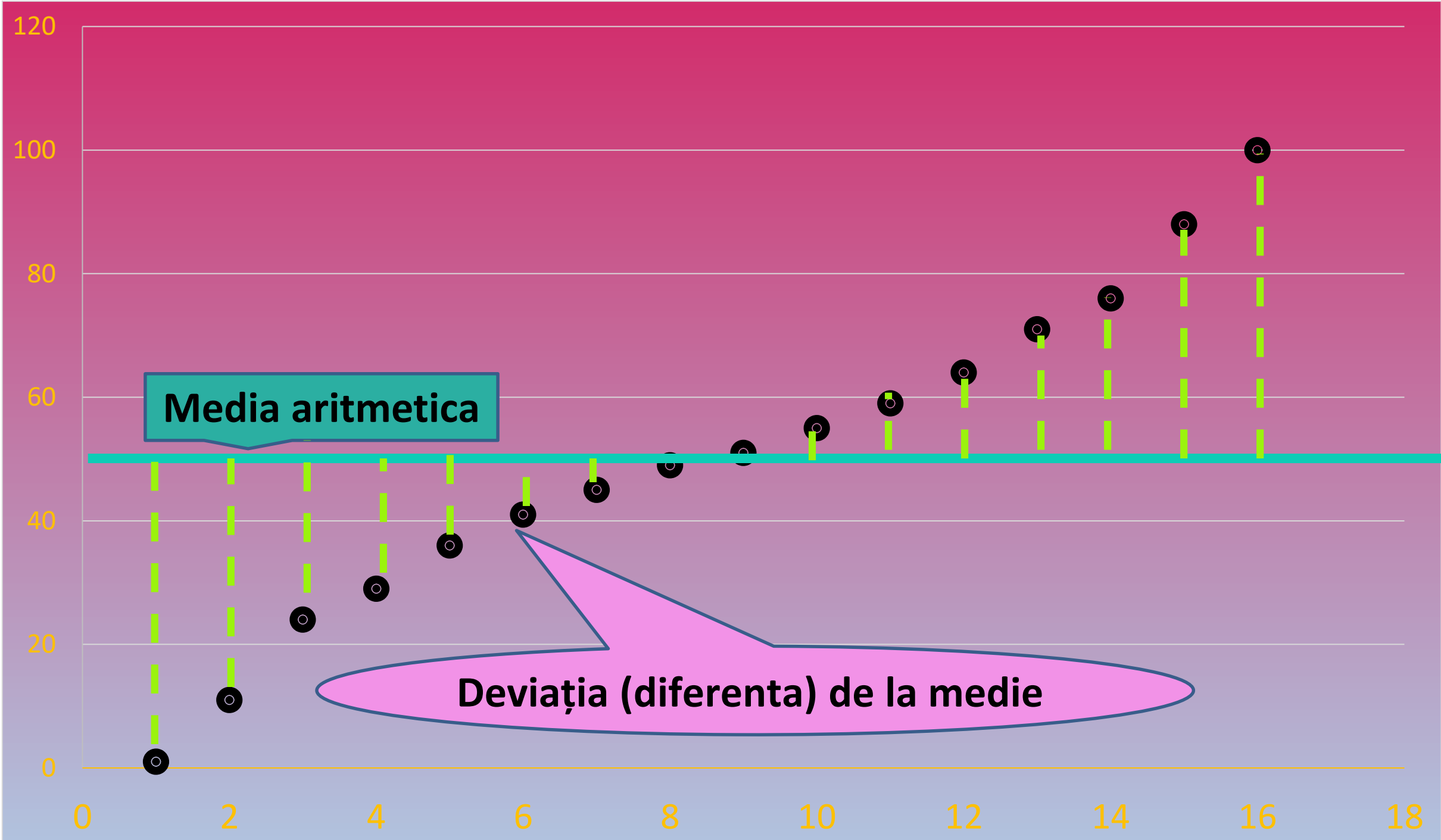
N – numărul total de observații

\bar{X} - media aritmetică

x_1, \dots, x_N - observațiile





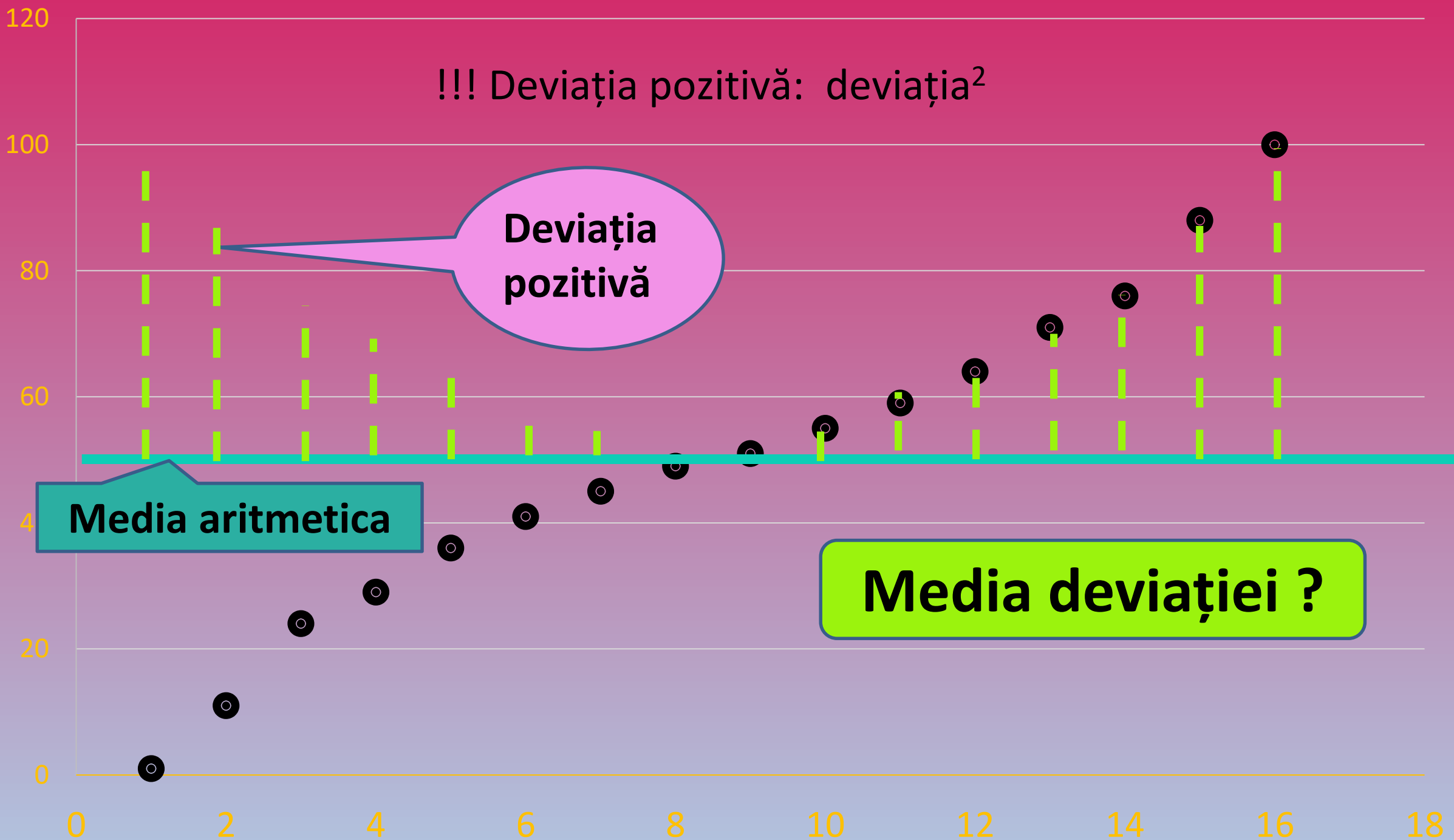


!!! Deviația pozitivă: deviația²

Deviația
pozitivă

Media aritmetica

Media deviației ?



Media deviației



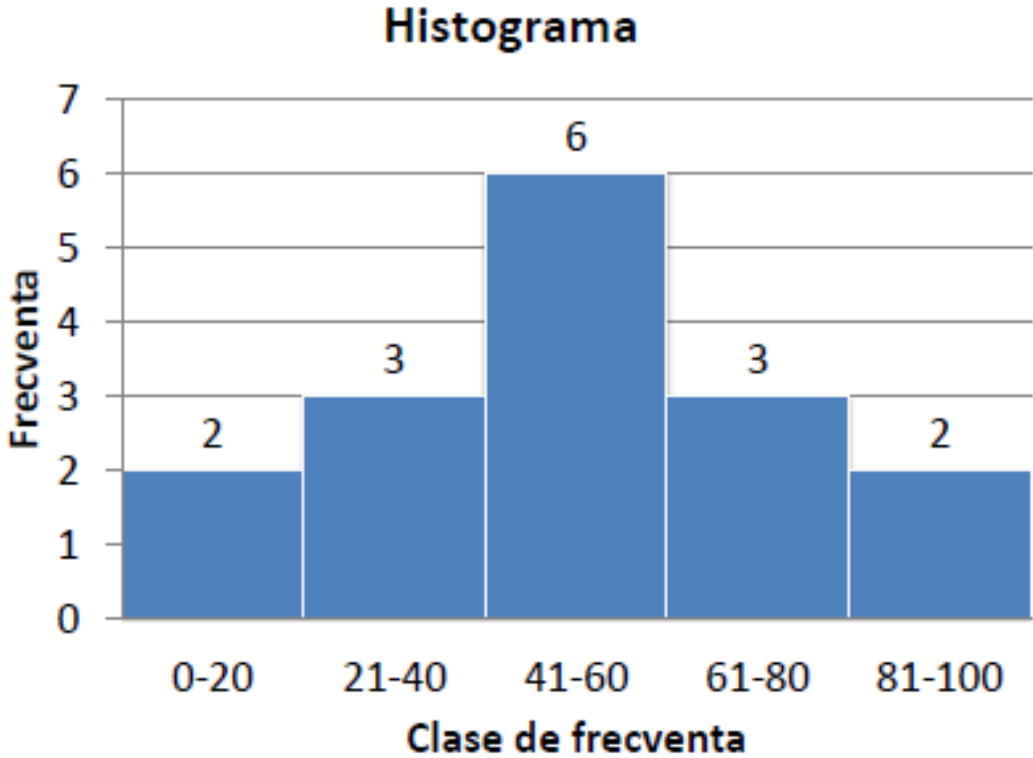
Defapt în loc de linii sunt pătrate (deviația^2)



Seria 3
1
11
24
29
36
41
45
49
51
55
59
64
71
76
88
100

Distribuția

Seria 2 – Clase de frecvență	Frecvența absolută	Frecvența relativă %
0-20	2	12,50
21-40	3	18,75
41-60	6	37,50
61-80	3	18,75
81-100	2	12,50



Seria 3

1

11

24

29

36

41

45

49

51

55

59

64

71

76

88

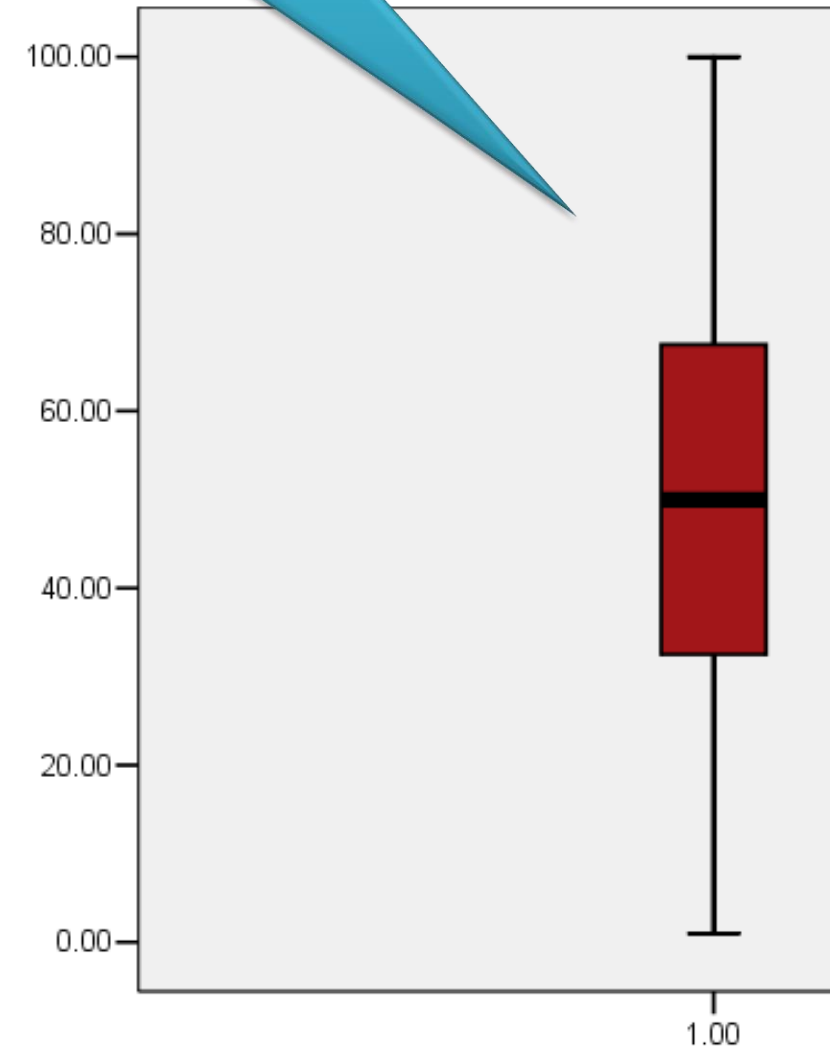
100

Mediana $= (49 + 51) / 2 = 50$

Percentila 25 $= (29 + 36) / 2 = 32,5$

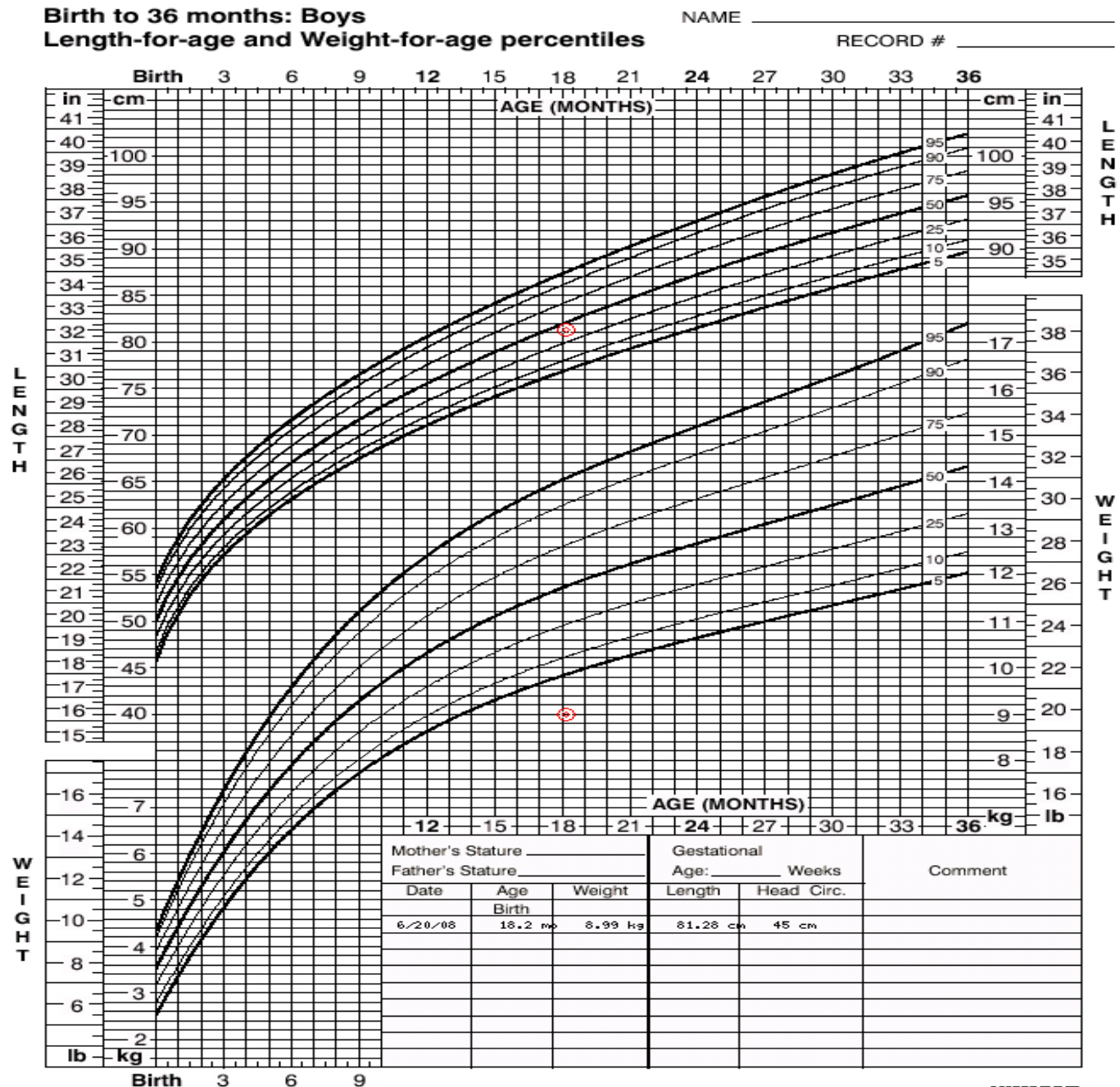
Percentila 75 $= (64 + 71) / 2 = 67,5$

Distribuție normală



Inaltimea si greutatea separate
la baieti pana la 3 ani
Axa Ox – varsta in luni
Axa Oy jos – greutatea
Axa Oy sus – inaltimea

Liniile de pe grafic: cea mai
groasa in mijloc mediana, de la
ea simetric: percentile 25
respective 75; percentile 10
respective 90; percentile 5-95



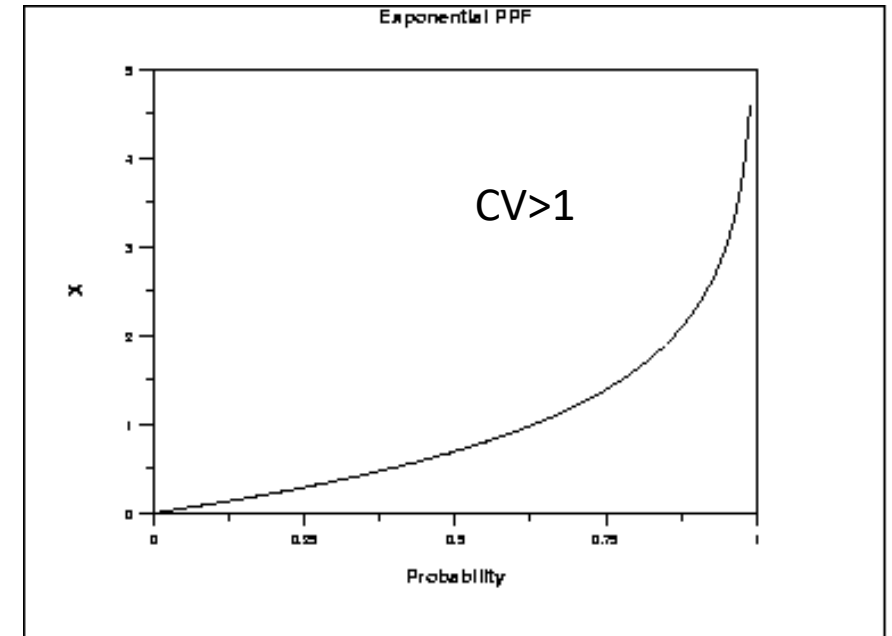
Coeficientul de variatie

Sau Deviatia standard relativa - Arata dispersia relativa la medie

$$CV = \frac{\textit{deviatia standard}}{\textit{media aritmetica}} = \frac{s}{\bar{X}}$$

Proprietati:

- Nu are unitate de măsură
- >1 in cazul distributiei exponentiale



Coeficient de variație - Interpretare

Interpretare: Se interpreteaza in %: $CV \times 100$

Seria poate fi considerate:

$CV < 10\%$

Omogenă (cu valori apropiate de medie)

$10\% \leq CV < 20\%$

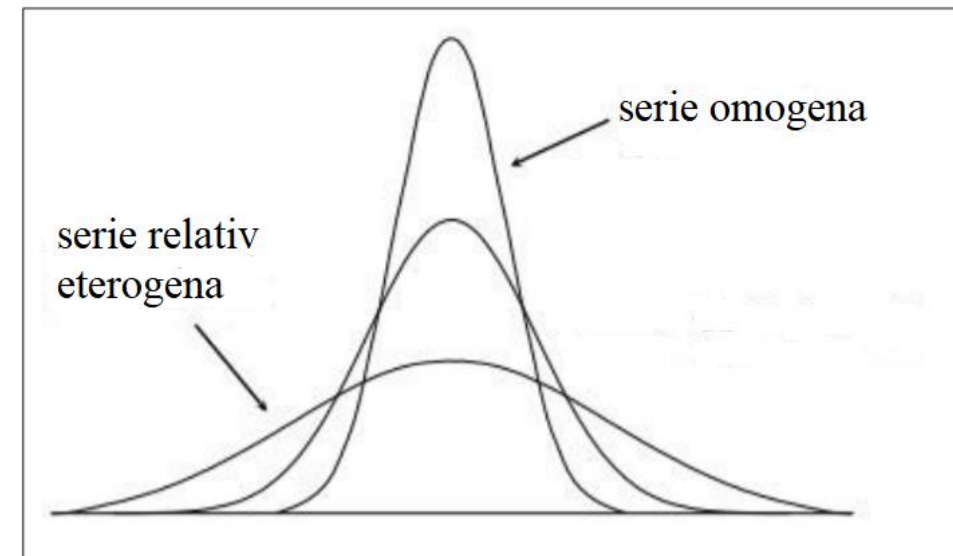
Relativ omogenă

$20\% \leq CV < 30\%$

Relativ eterogenă

$> 30\%$

Eterogenă



Eroarea standard E_s

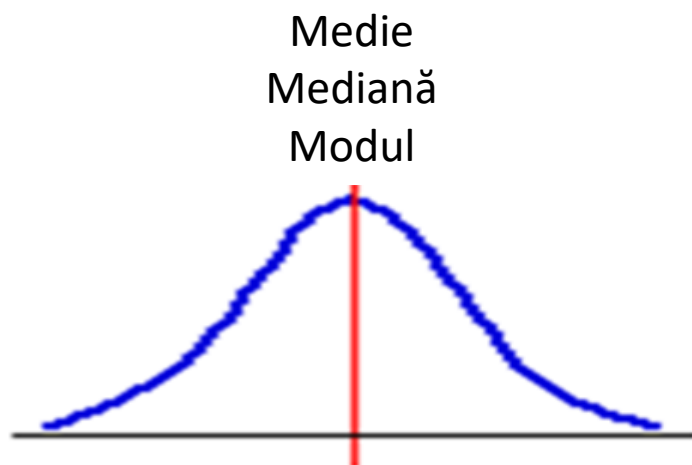
$$E_s = \frac{s}{\sqrt{n}}$$

unde

- s deviatia standard
- n numarul de indivizi
- se foloseste in inferenta statistica

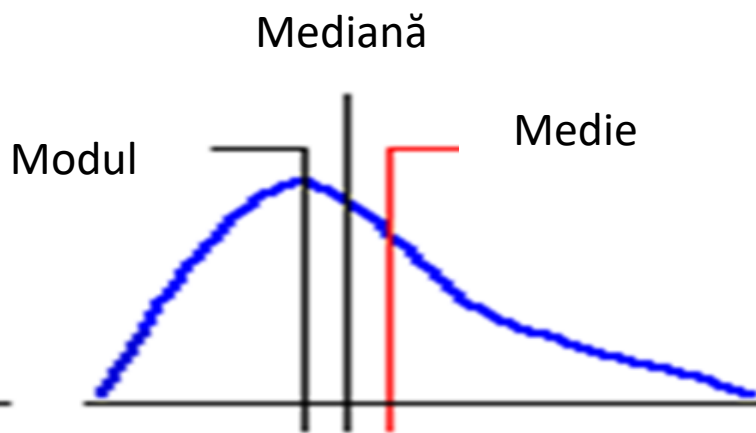
Măsuri de centralitate - aplicabilitate

- Cum să interpretăm media, mediana și modulul:



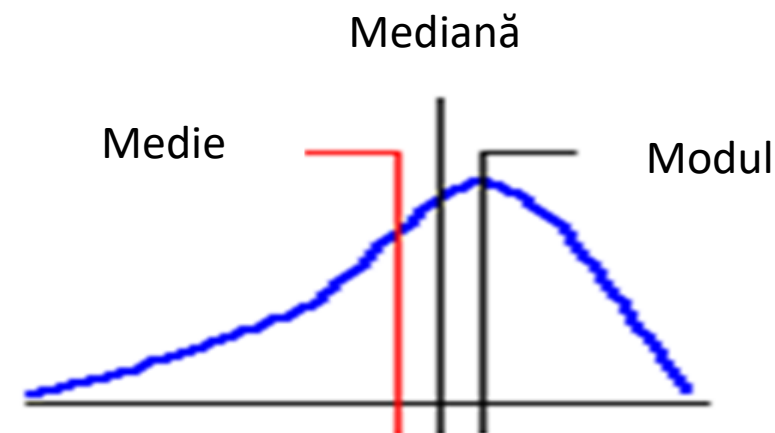
Simetrică

Distribuție
normală



Asimetrică la dreapta

Nu e distribuție
normală



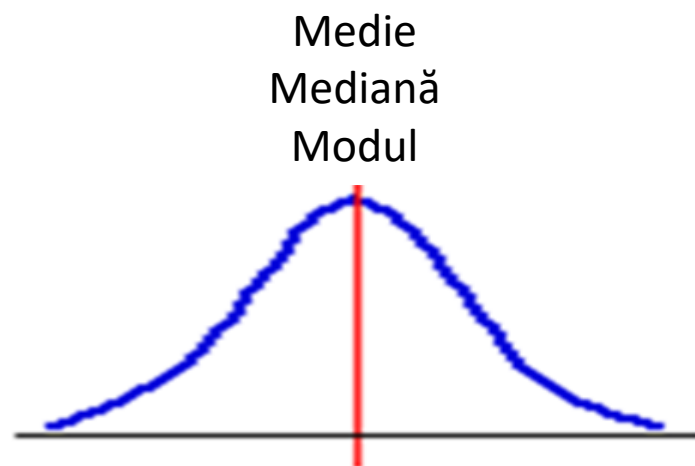
Asimetrică la stânga

Nu e distribuție
normală

Măsuri de centralitate - aplicabilitate

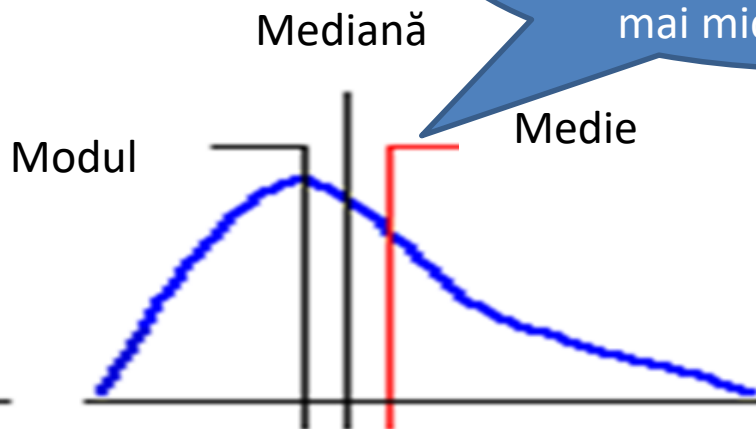
- Cum să interpretăm media, mediana și modulul:

Media mai mare decât mediana și modulul, avem valori mari cazuri extreme, cele mai multe valori sunt mai mici decât media



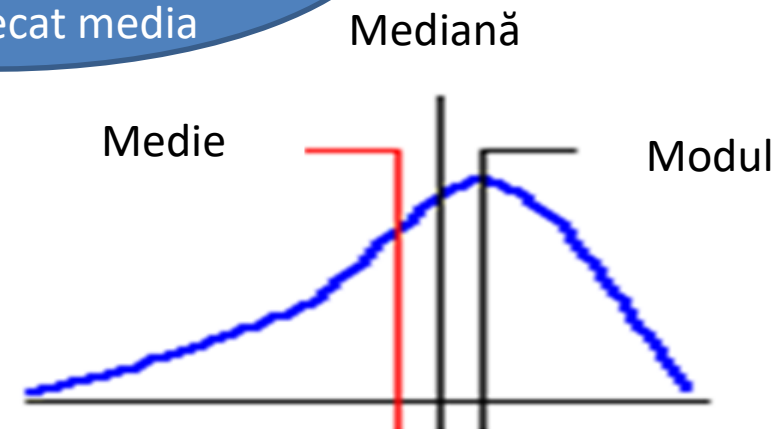
Simetrică

Distribuție normală



Asimetrică la dreapta

Nu e distribuție normală



Asimetrică la stânga

Nu e distribuție normală



Asimetria - Boltirea

Asimetria – Asimetria datelor

Boltirea – Platitudinea

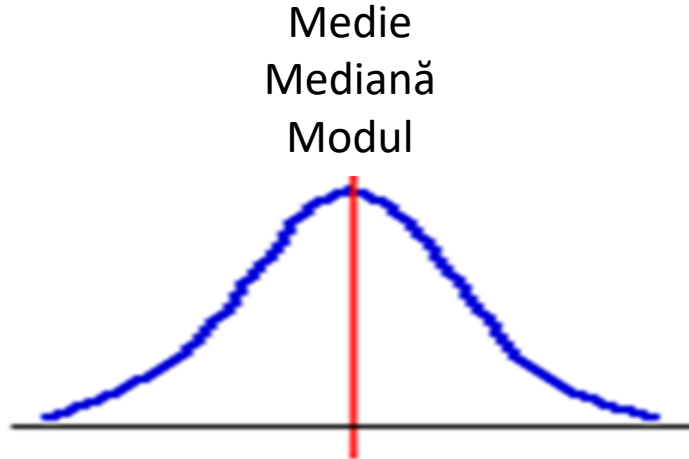
$$S_K \approx \frac{1}{n} \frac{\sum_{i=1}^n (X_i - \bar{X})^3}{s^3}$$

$$K_E \approx \frac{1}{n} \frac{\sum_{i=1}^n (X_i - \bar{X})^4}{s^4} - 3$$

*Unde s – deviația standard, n nr. de indivizi,
 X_1, \dots, X_n – valorile seriei, \bar{X} media aritmetică*

Asimetria - Boltirea

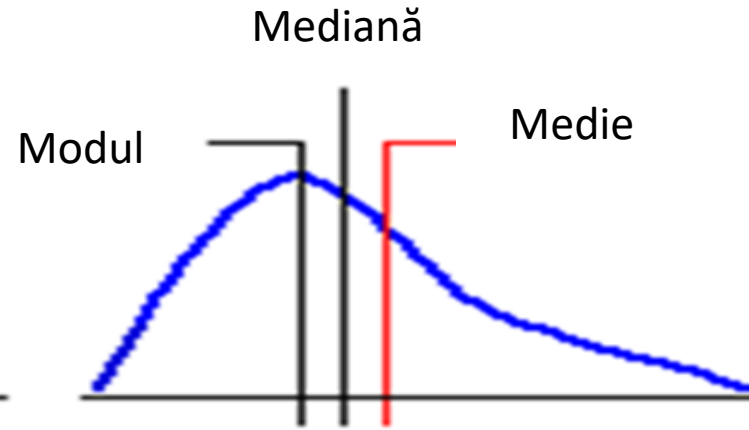
Asimetria este o măsură care descrie distribuția unei variabile cantitative continue



Simetrică

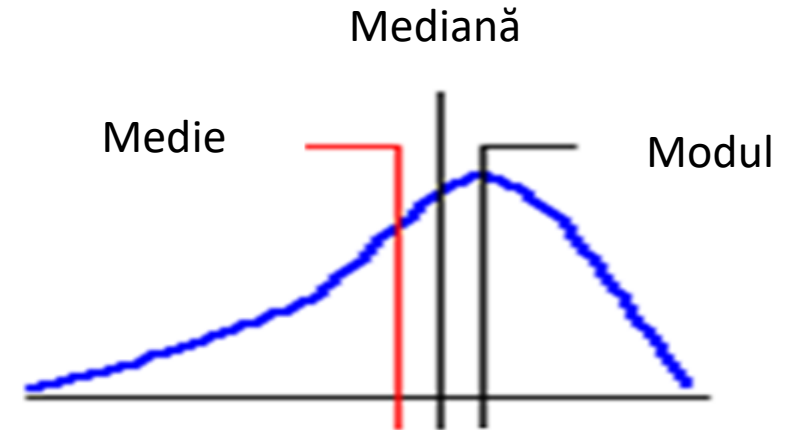
Medie
Mediană
Modul

Simetria=0
Distribuție simetrică



Asimetrică la dreapta

Simetria>0
asimetrică la stânga

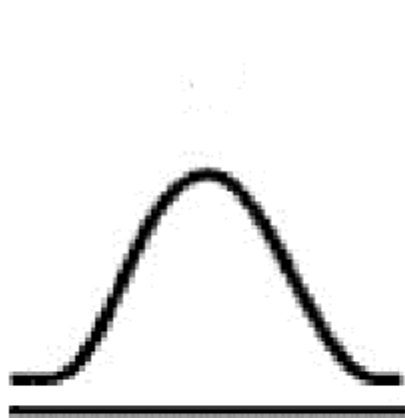


Asimetrică la stânga

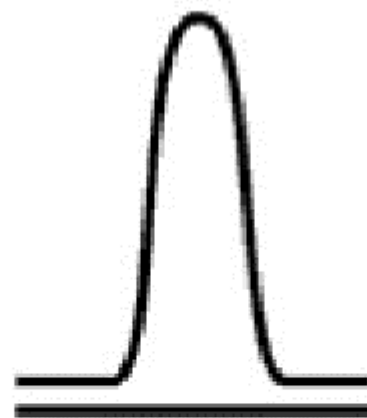
Simetria<0
asimetrică la dreapta

Boltirea (kurtosis)

Boltirea este o măsură care descrie distribuția unei variabile cantitative continue



Mesocurtică
Boltirea=0



Leptocurtică
Boltirea>0



Platicurtică
Boltirea<0

Distribuție
normală

Nu e distribuție
normală

Nu e distribuție
normală



Descrierea datelor numerice (Continue, Discrete) !

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Examen teoretic – exemple de intrebari

*Într-un studiu cercetătorul măsoară gradul de înclinare al premolarului din dreapta sus pentru 10 pacienți. El obține 10 valori diferite ale înclinării dinților, una pentru fiecare pacient: 10, 70, 20, 50, 50, 30, 90, 80, 40, 60. Care dintre următoarele sunt media, mediana și modulul?

A. 50, 40, 50

B. 59, 40, nu exista modul

C. Nici un raspuns nu este corect

D. 50, 50, 50

E. 50, 50, nu exista modul

Examen teoretic – exemple de intrebari

Următoarele afirmații despre mediană sunt ADEVĂRATE:

- A. Nu este influentata de valori extreme
- B. Este un parametru util pentru datele nominale
- C. Are o stabilitate slabă depinzand de marimea eșantionului
- D. Este influentata de distribuția asimetrica a datelor
- E. Este utila pentru date discrete cantitative

Examen teoretic – exemple de intrebari

*Într-un studiu un cercetător este interesat de igiena orală a copiilor. Acesta întreabă 10 copii (un esantion) despre numărul de periaje dentare pe zi. Acestea sunt răspunsurile lor: 1, 2, 3, 2, 1, 0, 2, 0, 2, 2. Care dintre următoarele sunt media, abaterea standard și coeficientul de variație?

A. 1.5, 0.97, 0.65

B. 1.5, 0.92, 0.61

C. 1.5, 0.97, 0.31

D. Nici un raspuns nu este corect

E. 1.5, 0.85, 0.57

Examen teoretic – exemple de intrebari

*Într-un studiu, cercetătorul măsoară gradul de înclinare a premolarului din dreapta sus pentru 10 pacienți. El obține 10 valori diferite ale înclinării dinților, una pentru fiecare pacient: 11, 13, 12, 17, 14, 9, 8, 11, 10, 7. Media aritmetică este 11,2, abaterea standard este 2,97. Câte date sunt în intervalul mediu \pm deviație standard (în procente)? Care este procentul minim de date din intervalul \pm abaterea standard pentru a avea o distribuție normală? Care dintre următoarele este răspunsul corect?

A. 60, 68.3

B. 100, 95.4

C. Nici un raspuns nu este corect

D. 70, 68.3

E. 80, 95.4

Examen teoretic – exemple de intrebari

Următoarele date reprezintă vârsta primului episod de infarct miocardic la o serie de pacienți de sex masculin. Valorile cvartilelor sunt următoarele: $Q1 = 55,5$, $Q2 = 65$ și $Q3 = 74,5$. Următoarele afirmații sunt adevărate:

A. Datele sunt distribuite aproximativ simetric

B. Datele sunt distribuite simetric

C. Datele sunt distribuite asimetric

D. $Q3 - Q2 = 9.5$

E. $Q2 - Q1 = 9.5$

Exemple de articole stiintifice publicate – cu statistici aferente acestui capitol

OPEN ACCESS PEER-REVIEWED
RESEARCH ARTICLE

Intrinsic ankle stiffness during standing increases with ankle torque and passive stretch of the Achilles tendon

Tania E. Sakanaka, Jaspreet Gill, Martin D. Lakie, Raymond F. Reynolds

Published: March 20, 2018 <https://doi.org/10.1371/journal.pone.0193850>

Article	Authors	Metrics	Comments	Media Coverage
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Abstract

Introduction
Methods

Autori

Acknowledgments

References

Reader Comments (0)

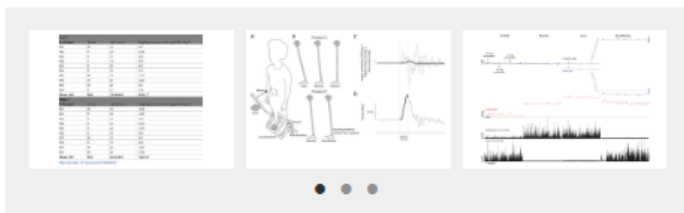
Media Coverage (0)

Figures

Abstract

Individuals may stand with a range of ankle angles. Furthermore, shoes or floor surfaces may elevate or depress their heels. Here we ask how these situations impact ankle stiffness and balance. We performed two studies (each with 10 participants) in which the triceps surae, Achilles tendon and aponeurosis were stretched either passively, by rotating the support surface, or actively by leaning forward. Participants stood freely on footplates which could rotate around the ankle joint axis. Brief, small stiffness-measuring perturbations (<0.7 deg; 140 ms) were applied at intervals of 4–5 s. In study 1, participants stood at selected angles of forward lean. In study 2, normal standing was compared with passive dorsiflexion induced by 15 deg toes-up tilt of the support surface. Smaller perturbations produced higher stiffness estimates, but for all perturbation sizes stiffness increased with active torque or passive stretch. Sway was minimally affected by stretch or lean, suggesting that this did not underlie the alterations in stiffness. In quiet stance, maximum ankle stiffness is limited by the tendon. As tendon strain increases, it becomes stiffer, causing an increase in overall ankle stiffness, which would explain the effects of leaning. However, stiffness also increased considerably with passive stretch, despite a modest torque increase. We discuss possible explanations for this increase.

Figures

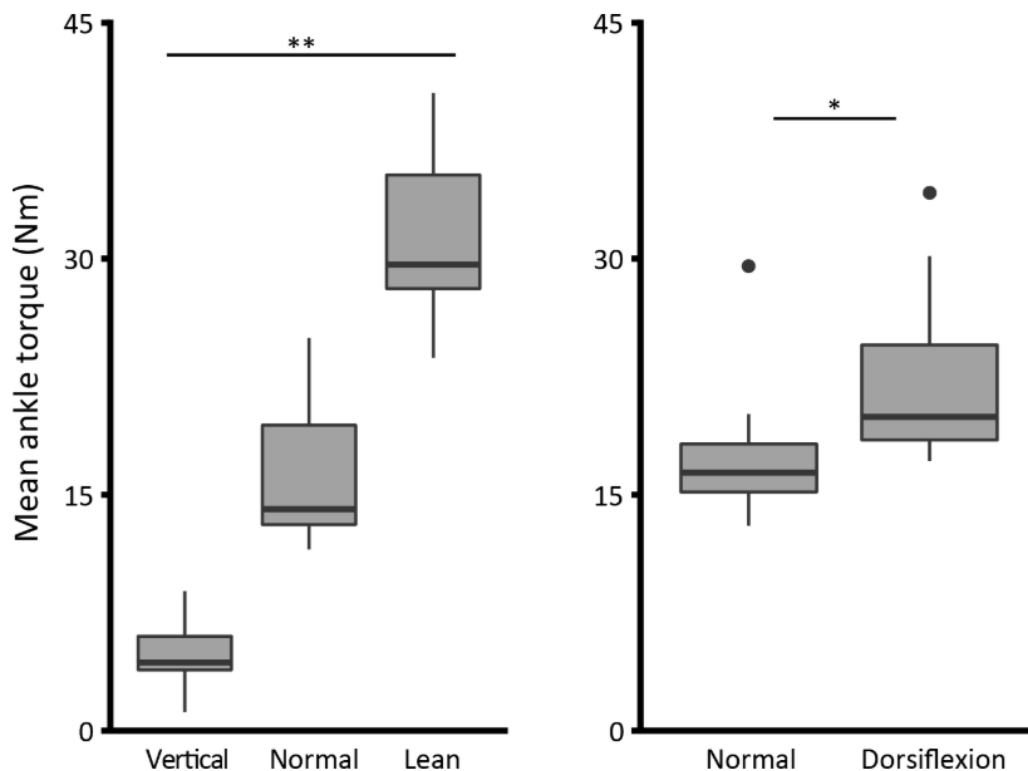


Intrinsic ankle stiffness during standing increases with ankle torque and passive stretch of the Achilles tendon

Fig 3

Mean ankle torque (Nm).

(*) indicates significance of $P < 0.05$, and (**) indicates $P < 0.001$. This and the following box plots show first (bottom), second (band inside the box) and third (top) quartiles; whiskers show 1.5 IQR (Tukey box plot).



doi: <https://doi.org/10.1371/journal.pone.0193850.g003>

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Effect of light pollution on self-reported sleep quality and its components: Comparative assessment among healthy adult populations in a rural and an Urban area of West Bengal, India

Arista Lahiri¹, Arup Chakraborty², Amal Kumar Sinha Roy³, Urmila Dasgupta⁴, Krishnadas Bhattacharyya⁵

Abstract

Background: Light pollution is inappropriate or excessive use of artificial light. Nighttime sky radiance is an effective measure to study its effects on individual sleep quality. **Objectives:** The study is aimed to measure the effect of light pollution on the sleep quality and compare among people residing in selected rural and urban areas of West Bengal, India. **Methods:** A comparative cross-sectional study was conducted during September–October 2018 in 10 villages of Barasat II block and 10 wards of Kolkata Municipal Corporation. Two hundred and sixty-three participants from urban and 249 participants from rural areas were selected through multi-stage sampling. Data regarding sleep quality and other selected factors were geotagged along with the radiance data. Multi-level linear regression models were built. **Results:** The mean age of the participants from rural and urban areas were respectively 37.65 (± 10.77) years and 38.10 (± 11.02) years. Gender-wise the participants were distributed almost evenly in urban and rural areas. Among the urban and rural population, the observed mean global Pittsburgh Sleep Quality Index scores were 12.63 (± 3.04) and 9.23 (± 2.27), respectively. Poorer sleep quality was observed to be statistically significant with increasing level of exposure. Multi-level models show that, at an exposure of $>40.0 \text{ nW/cm}^2/\text{sr}$ the adjusted coefficient was 11.52 (95% confidence interval [CI]: 9.65, 13.40) in the overall model and 12.84 (95% CI: 12.31, 13.37) for urban participants. **Conclusion:** The disturbance in sleep is associated with higher levels of night-time radiance of the sky strongly observed among the urban population.

Keywords: Light pollution, multi-level, Pittsburgh sleep quality index, radiance, sky glow, sleep quality

Lumina artificiale
din timpul noptii
(iluminatul stradal)
si calitatea somnului

263 participanti din
mediul urban

249 participanti din
mediul rural

Effect of light pollution on self-reported sleep quality and its components: Comparative assessment among healthy adult populations in a rural and an Urban area of West Bengal, India

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Titlul
articolului

Iluminarea artificiala
din timpul noptii
(iluminatul stradal)
si calitatea somnului

Numele
revistei

Autori

263 participanti din
mediul urban

249 participanti din
mediul rural

The mean global PSQI score was 10.98 (± 3.18), with an overall median of 11. Among the urban and rural population, the observed mean scores were respectively 12.63 (± 3.04) and 9.23 (± 2.27). A better sleep quality (PSQI global score \leq median) was observed among 82.30% of the rural respondents, while 69.20% of the urban participants had a poor sleep quality (PSQI global score $>$ median) based on the cumulative component scores. The differences were statistically significant. [Figure 1] depicts the distribution of PSQI global scores in urban and rural areas as per exposure category for night time radiance. In unadjusted analysis the trend of higher PSQI global score, i.e., poorer sleep quality was observed to be statistically significant with increasing level of exposure.

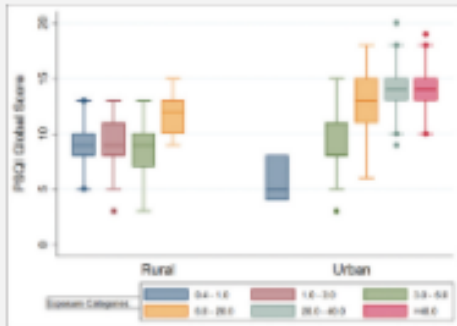


Figure 1: Box and whisker plot showing comparison of Pittsburgh Sleep Quality Index global scores' distribution as per different levels of exposure among the rural and urban respondents.

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Figura se
mentioneaza in
text

The mean global PSQI score was 10.98 (± 3.18), with an overall median of 11. Among the urban and rural population, the observed mean scores were respectively 12.63 (± 3.04) and 9.23 (± 2.27). A better sleep quality (PSQI global score \leq median) was observed among 82.30% of the rural respondents, while 69.20% of the urban participants had a poor sleep quality (PSQI global score $>$ median) based on the cumulative component scores. The differences were statistically significant. [Figure 1] depicts the distribution of PSQI global scores in urban and rural areas as per exposure category for night time radiance. In unadjusted analysis the trend of higher PSQI global score, i.e., poorer sleep quality was observed to be statistically significant with increasing level of exposure.

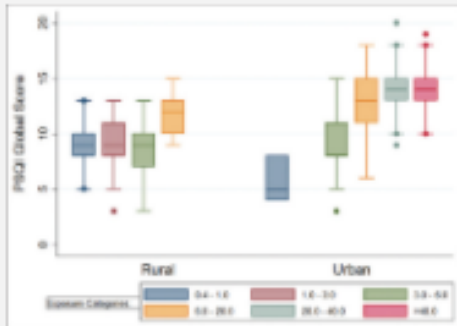


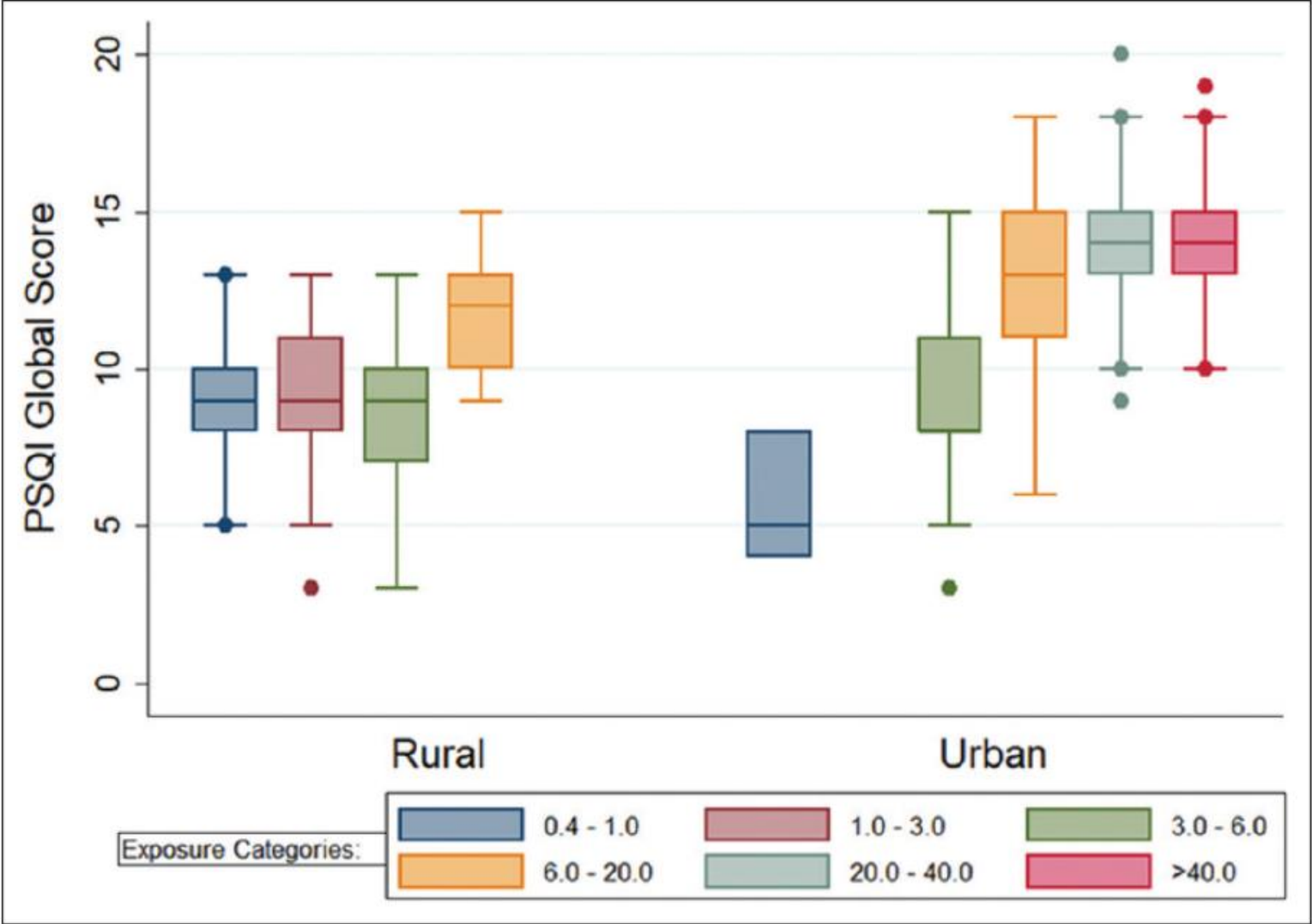
Figura are
titlu

Figure 1: Box and whisker plot showing comparison of Pittsburgh Sleep Quality Index global scores' distribution as per different levels of exposure among the rural and urban respondents.

[Click here to view](#)

Figura are
descriere

Figure 1: Box and whisker plot showing comparison of Pittsburgh Sleep Quality Index global scores' distribution as per different levels of exposure among the rural and urban respondents.



2 grupuri: urban / rural

Impartite in 4 categorii de expunere la lumina artificiala in timpul somnului (variabila calitativa ordinala)

PSQI scor - variabila calitativa ordinala)

Figure 1: Box and whisker plot showing comparison of Pittsburgh Sleep Quality Index global scores' distribution as per different levels of exposure among the rural and urban respondents.

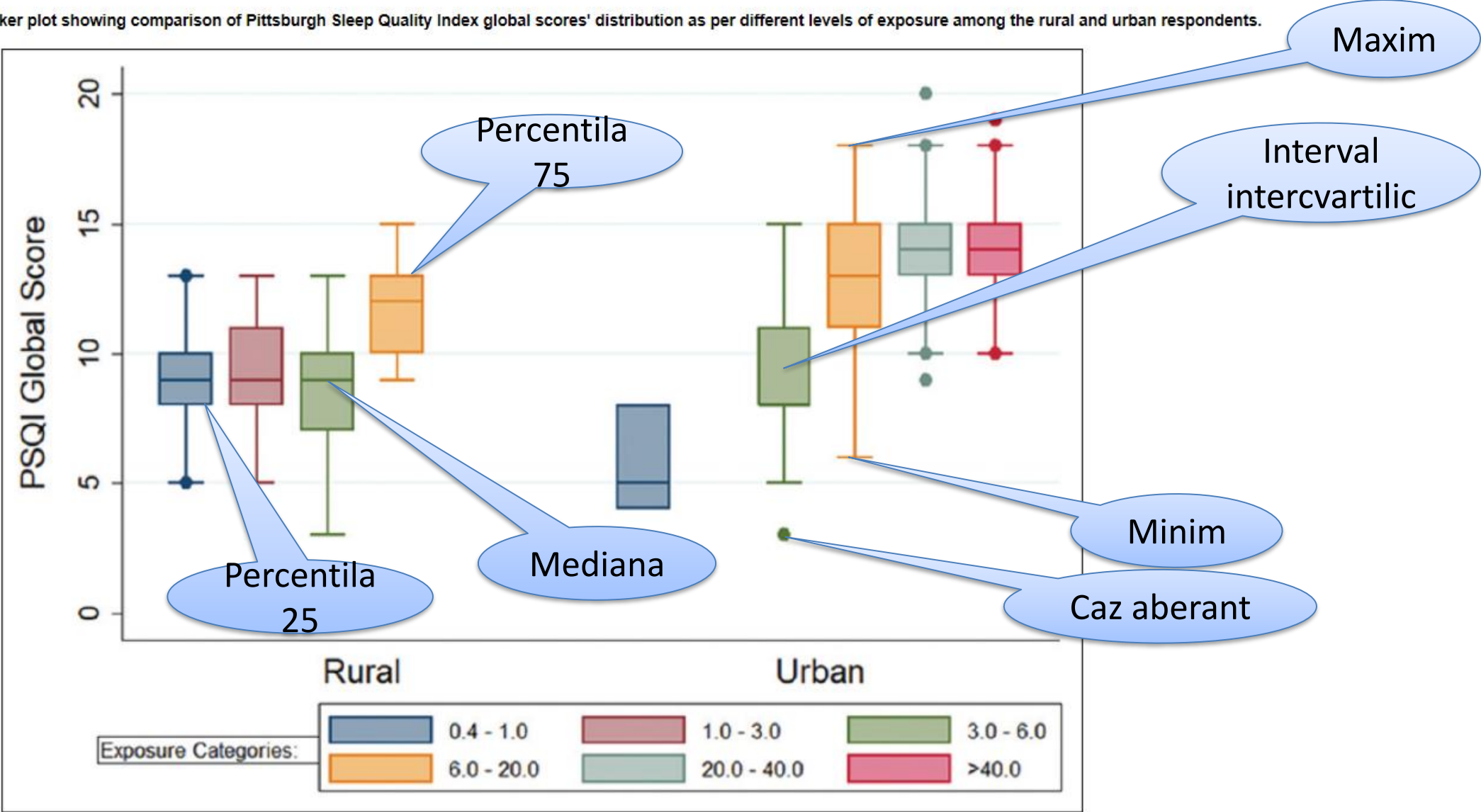
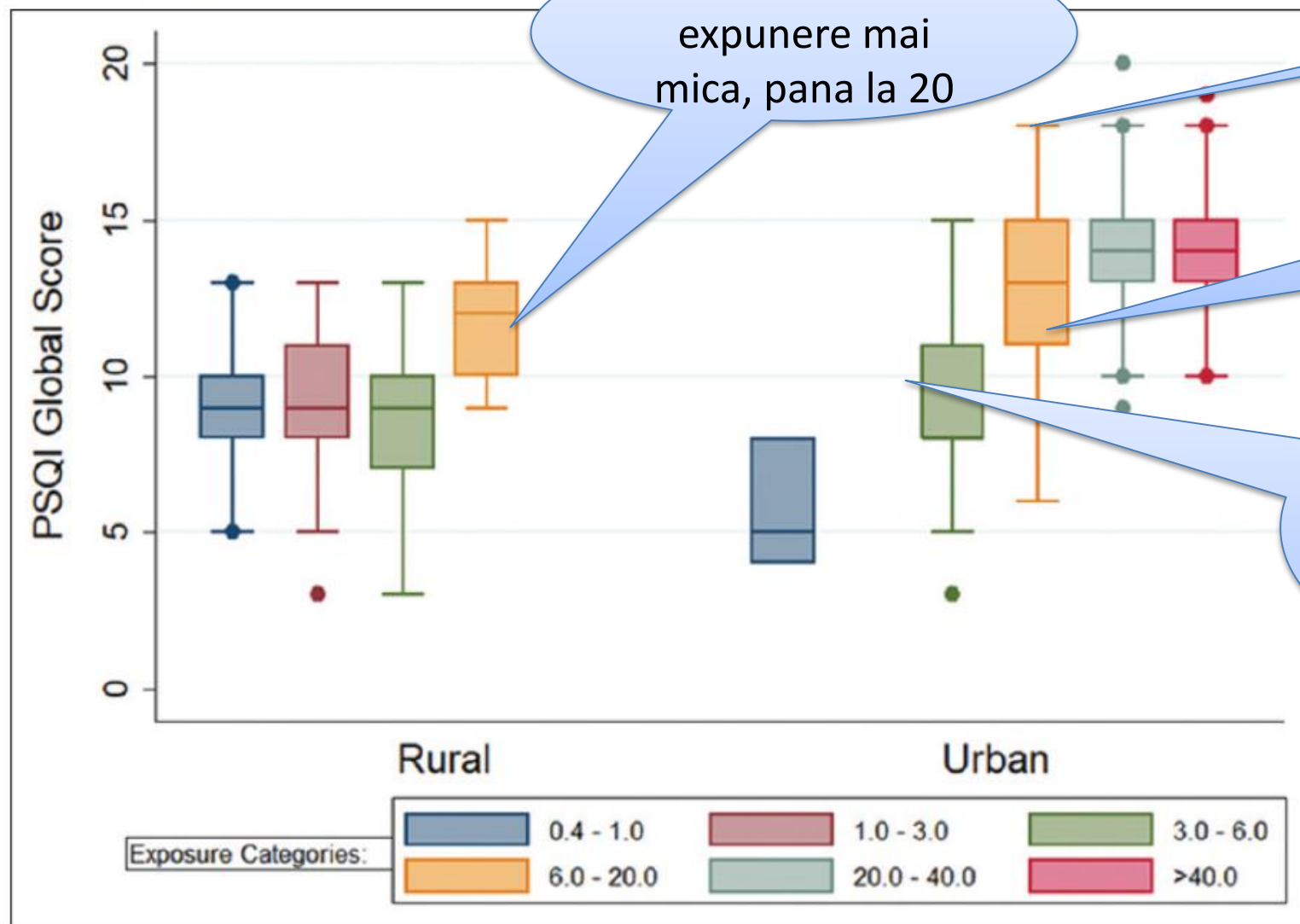


Figure 1: Box and whisker plot showing comparison of Pittsburgh Sleep Quality Index (PSQI) Global Score among the rural and urban respondents.



In rural exista
expunere mai
mica, pana la 20

Maxim

De la 20 in sus
avem scor
PSQI mai mare

Chiar si la aceeasi
categorie de
expunere avem
diferente intre rural
si urban



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Keywords

1. Introduction

2. Experimental

3. Results

4. Discussion

5. Conclusion

Acknowledgement

Appendix A. Supplementary data

References

Show full outline

Figures (7)



ELSEVIER

Polymer

Volume 164, 15 February 2019, Pages 174-182



Titlul
articolului

The effect of boehmite nanoparticles (γ -AlOOH) on nanomechanical and thermomechanical properties correlated to crosslinking density of epoxy

Autori

Media Ghasem Zadeh Khorasani ^{a, b}, Dorothee Silbernagl ^a, Paulina Szymoniak ^{a, b}, Vasile-Dan Hodoroaba ^a, Heinz Sturm ^{a, b}

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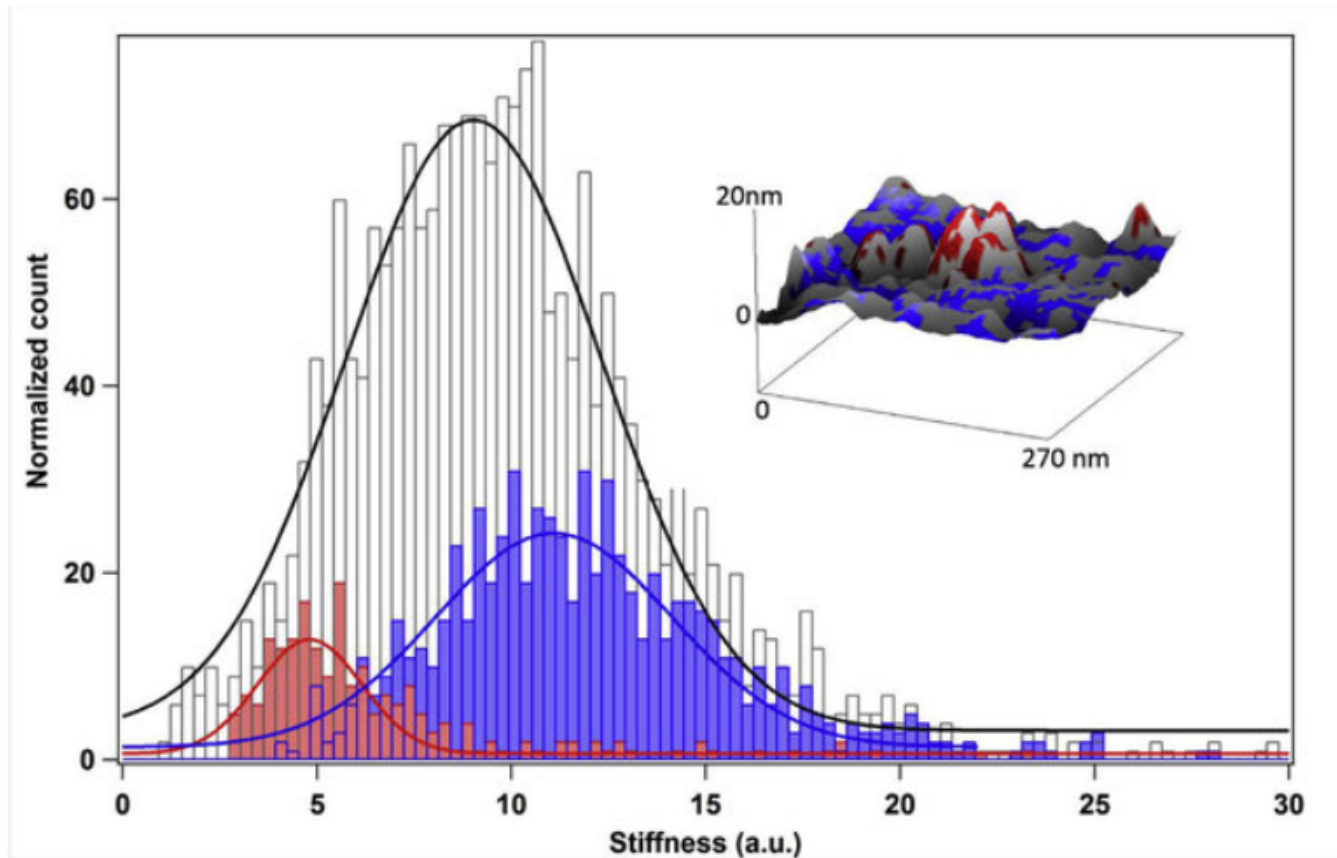
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Stiffness of a composite 2D histogram and 3D histogram



Figure

Caption

Fig. 3. Stiffness histogram from ImAFM measurements on EP/BNP15. The white bars show the histogram from the overall scanned area shown in the 3D topography including both particles and matrix. Blue bars are related to the stiffness histogram of epoxy phase (blue pixels on the 3D topography inset image) and red bars are related to stiffness BNPs (red pixels in the 3D topography inset image). Gaussian fits are shown as solid lines.

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Date despre 1099 de pacienti cu Coronavirus internati in China in ianuarie 2020

Clinical Characteristics of Coronavirus Disease 2019 in China

Wei-jie Guan, Ph.D., Zheng-yi Ni, M.D., Yu Hu, M.D., Wen-hua Liang, Ph.D., Chun-quan Ou, Ph.D., Jian-xing He, M.D., Lei Liu, M.D., Hong Shan, M.D., Chun-liang Lei, M.D., David S.C. Hui, M.D., Bin Du, M.D., Lan-juan Li, M.D., [et al.](#), for the China Medical Treatment Expert Group for Covid-19*

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[Metrics](#)

[24 References](#) [12 Citing Articles](#)

Abstract

BACKGROUND

Since December 2019, when coronavirus disease 2019 (Covid-19) emerged in Wuhan city and rapidly spread throughout China, data have been needed on the clinical characteristics of the affected patients.

METHODS

We extracted data regarding 1099 patients with laboratory-confirmed Covid-19 from 552 hospitals in 30 provinces, autonomous regions, and municipalities in mainland China through January 29, 2020. The primary composite end point was admission to an intensive care unit (ICU), the use of mechanical ventilation, or death.

February 28, 2020

DOI: [10.1056/NEJMoa2002032](#)

[Chinese Translation](#) [中文翻译](#)

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Table 1. Clinical Characteristics of the Study Patients, According to Disease Severity and the Presence or Absence of the Primary Composite End Point.*

Characteristic	All Patients (N = 1099)	Disease Severity		Presence of Primary Composite End Point†	
		Nonsevere (N = 926)	Severe (N = 173)	Yes (N = 67)	No (N = 1032)
Age					
Median (IQR) — yr	47.0 (35.0–58.0)	45.0 (34.0–57.0)	52.0 (40.0–65.0)	63.0 (53.0–71.0)	46.0 (35.0–57.0)
Distribution — no./total no. (%)					
0–14 yr	9/1011 (0.9)	8/848 (0.9)	1/163 (0.6)	0	9/946 (1.0)
15–49 yr	557/1011 (55.1)	490/848 (57.8)	67/163 (41.1)	12/65 (18.5)	545/946 (57.6)
50–64 yr	292/1011 (28.9)	241/848 (28.4)	51/163 (31.3)	21/65 (32.3)	271/946 (28.6)
≥65 yr	153/1011 (15.1)	109/848 (12.8)	44/163 (27.0)	32/65 (49.2)	121/946 (12.8)

Mediana (IQR) pentru Varsta la cazurile severe: 52 (40-65)
ceea ce înseamnă că 25% din cazurile severe au avut mai puțin de 40 de ani,
25% între 40 și 52; alte 25% între 52 și 65 de ani, iar ultimii 25% au fost
peste 65 de ani.

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50–64 yr	292/1011 (28.9)	241/848 (28.4)			16 (28.6)
≥65 yr	153/1011 (15.1)	109/848 (12.9)			16 (12.8)

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52.0 (40.0–65.0)

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Table 1. Clinical Characteristics of the Study Patients, According to Disease Severity and the Presence or Absence of the Primary Composite End Point.*

Characteristic	All Patients (N = 1099)	Disease Severity		Presence of Primary Composite End Point†	
		Nonsevere (N = 926)	Severe (N = 173)	Yes (N = 67)	No (N = 1032)
Median incubation period (IQR) — days‡	4.0 (2.0–7.0)	4.0 (2.8–7.0)	4.0 (2.0–7.0)	4.0 (1.0–7.5)	4.0 (2.0–7.0)
Fever on admission					
Patients — no./total no. (%)	473/1081 (43.8)	391/910 (43.0)	82/171 (48.0)	24/66 (36.4)	449/1015 (44.2)
Median temperature (IQR) — °C	37.3 (36.7–38.0)	37.3 (36.7–38.0)	37.4 (36.7–38.1)	36.8 (36.3–37.8)	37.3 (36.7–38.0)

Median incubation period (IQR) — days‡

4.0 (2.0–7.0)

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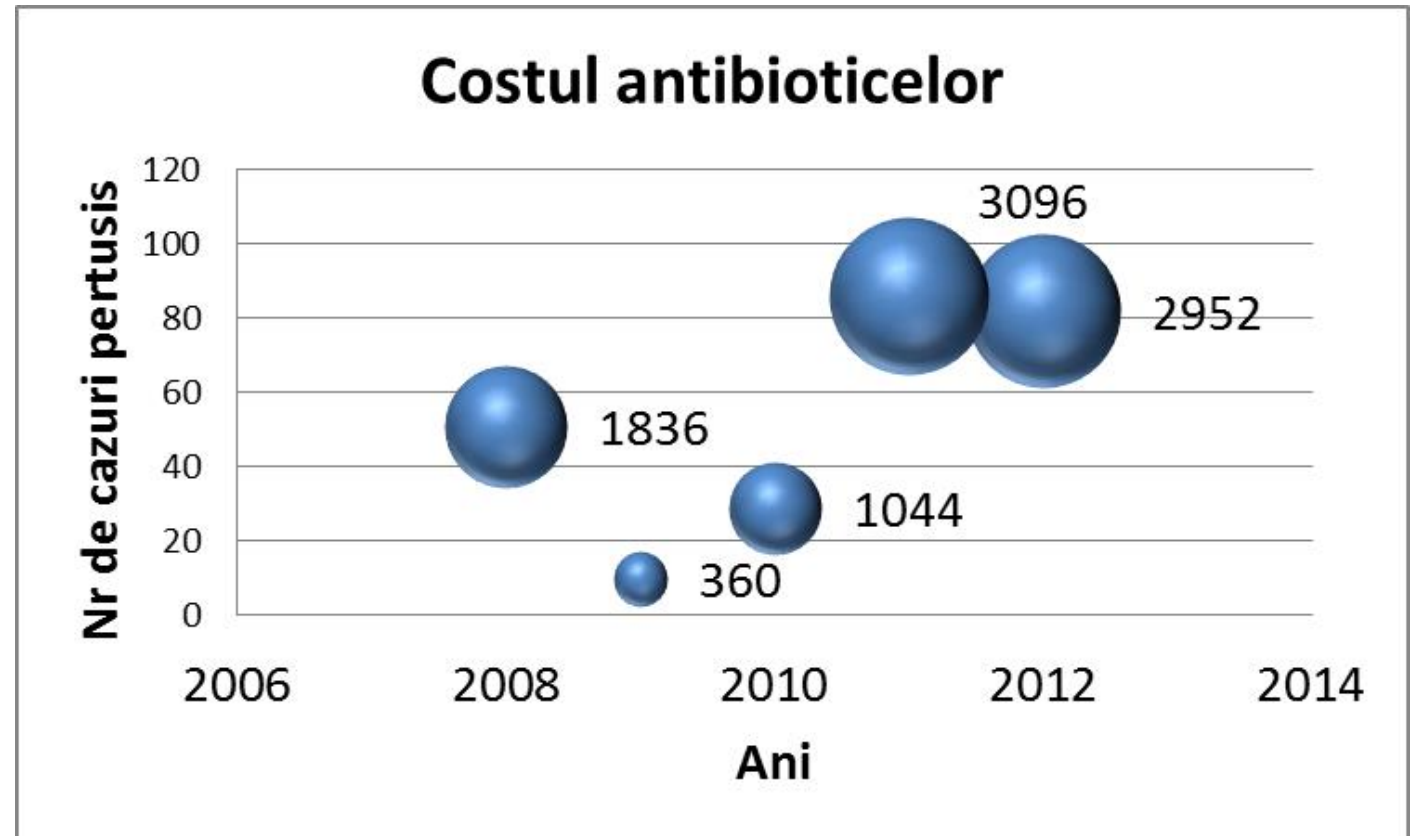
Mediana (IQR) pentru perioada de incubație: 4 (2-7) zile ceea ce înseamnă că 25% din cazuri au avut mai puțin de 2 zile perioada de incubație, 25% între 2 și 4; alte 25% între 4 până la 7, iar ultimele 25% mai mult decât 7 zile.

Întrebare pentru examenul teoretic: Cum interpretăm temperatura dacă stim mediana (IQR) = 37,4 (36,7-38,1) grade Celsius în cazurile severe?

Date despre 1099 de pacienti cu Coronavirus internati in China in ianuarie 2020

Exemple de grafice

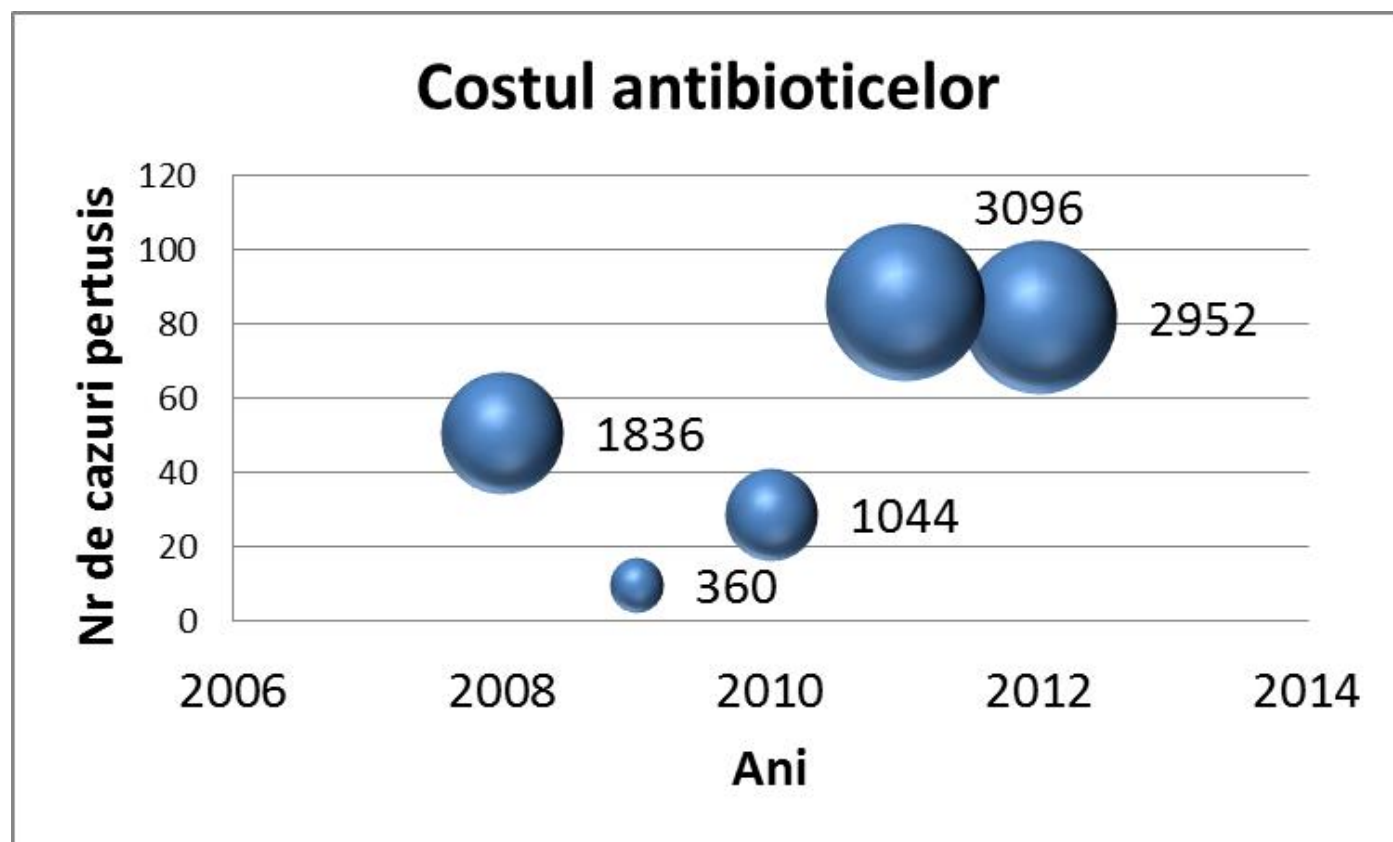
Un grafic trebuie sa fie simplu!



Exemple de grafice ... care induc in eroare

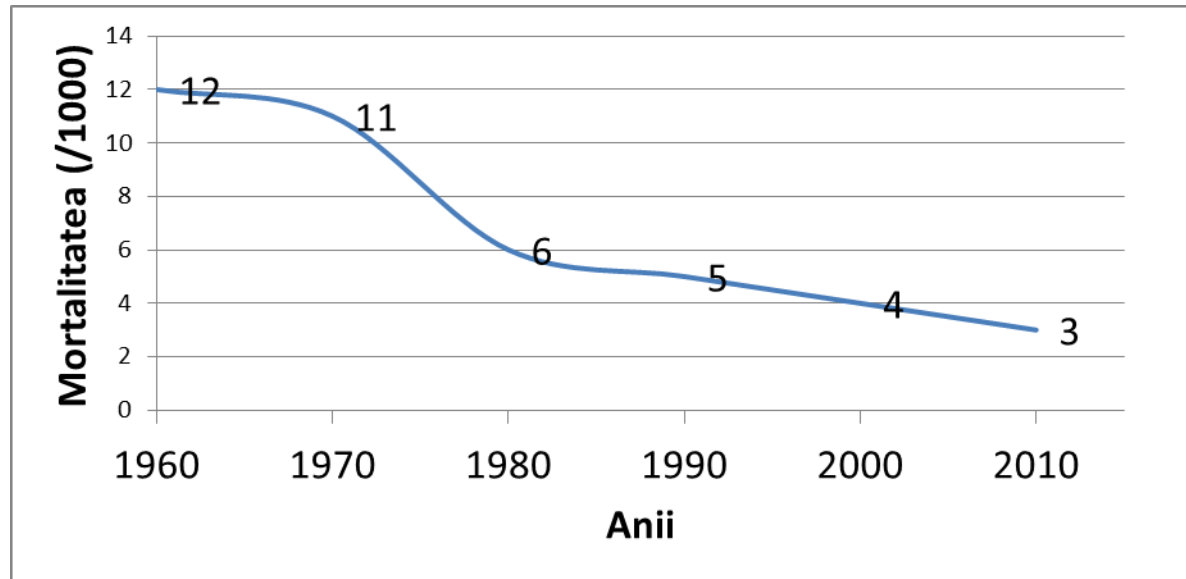
Un grafic trebuie sa fie simplu!

An	Pertussis nr. de cazuri	Costul mediu al antibioticelor
2012	82	2952
2011	86	3096
2010	29	1044
2009	10	360
2008	51	1836

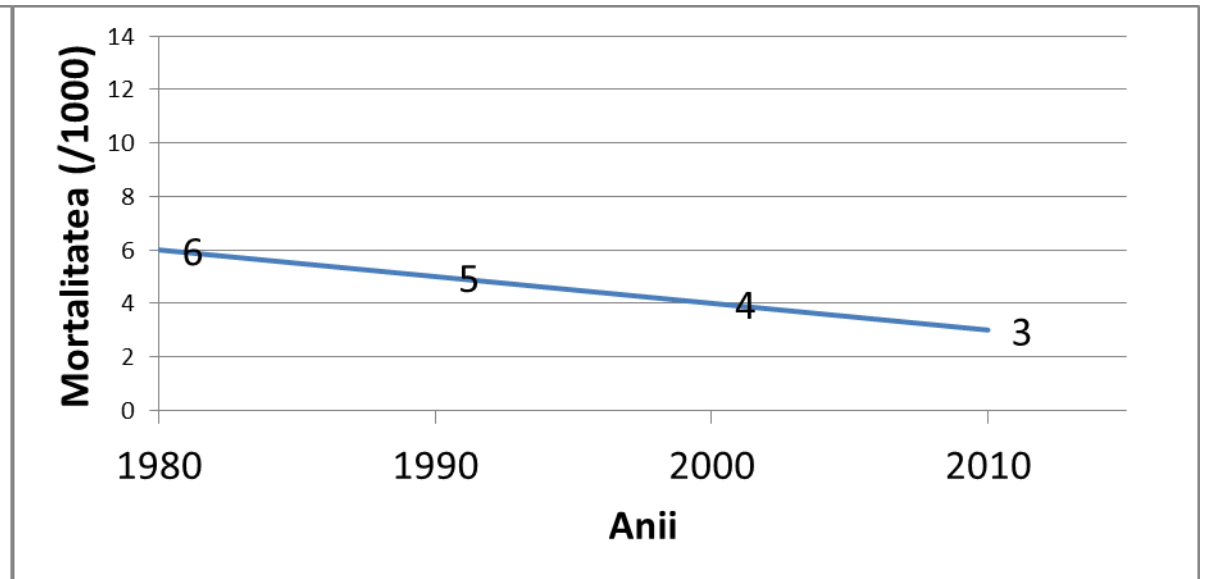


Exemple de grafice care induc in eroare

Din ce an să reprezentăm datele?



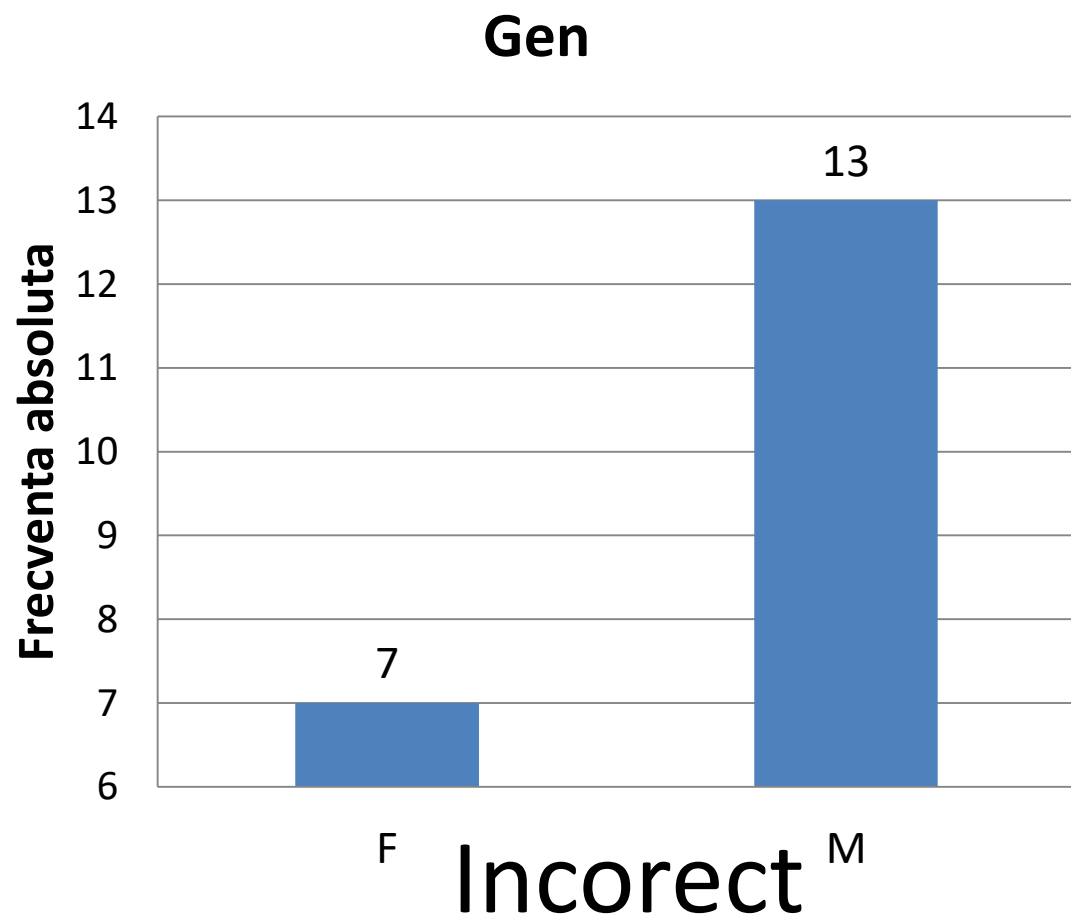
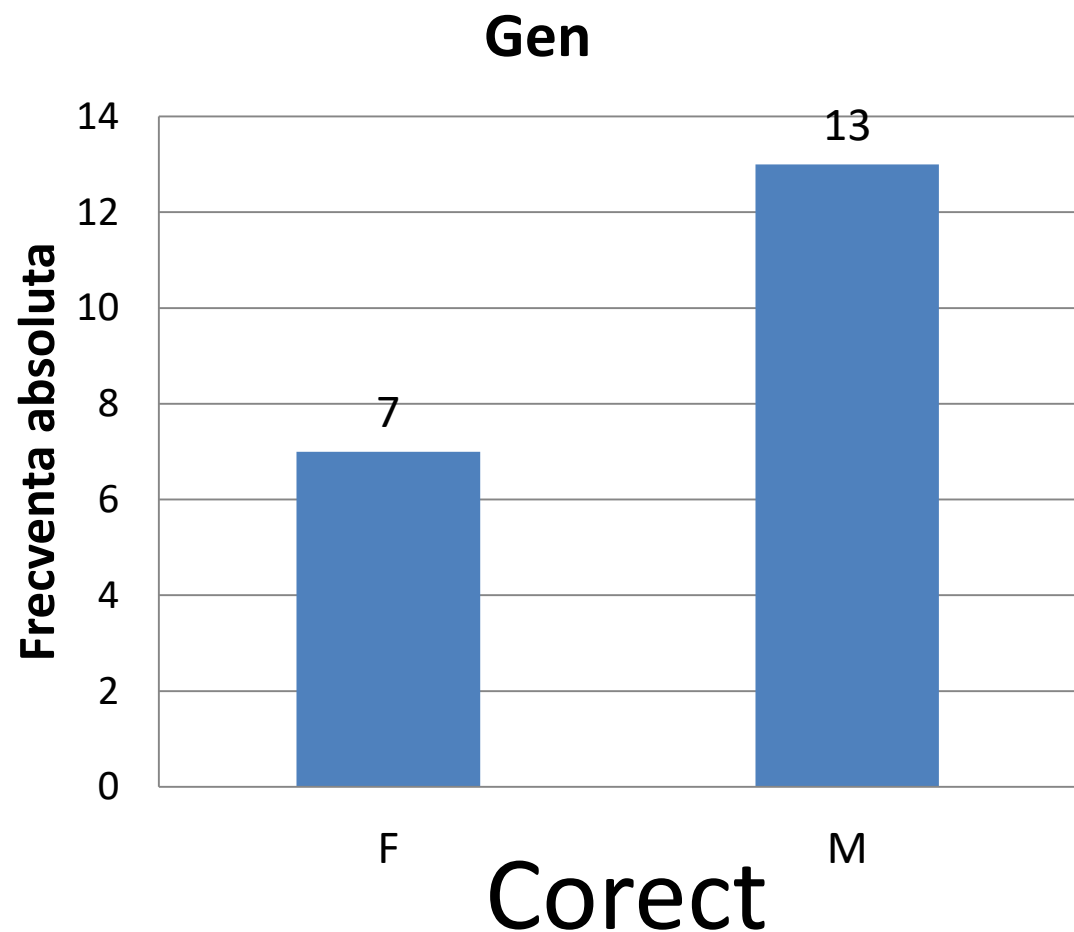
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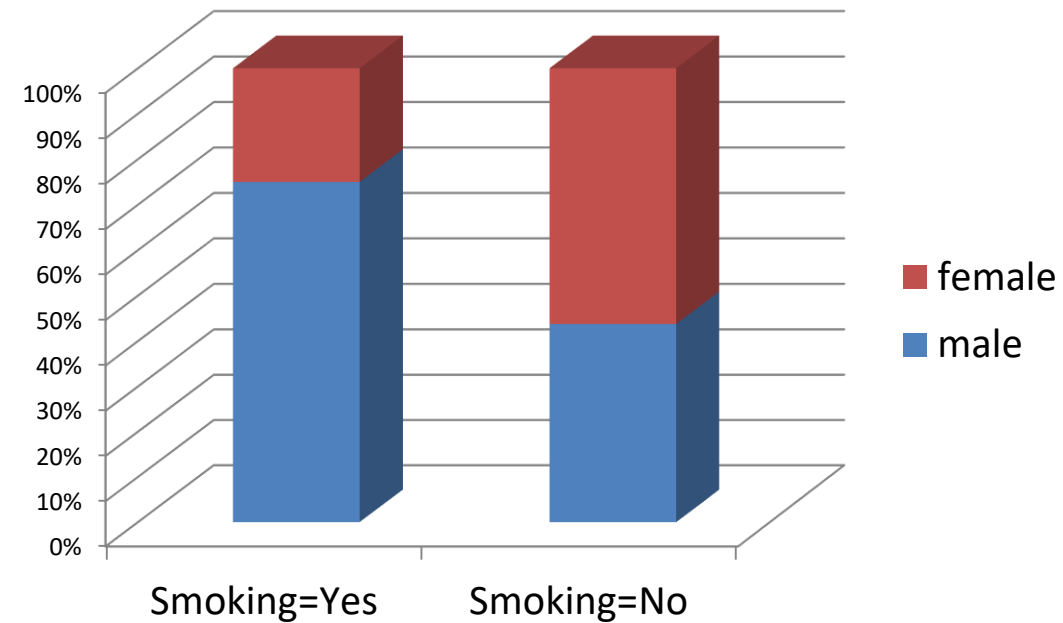
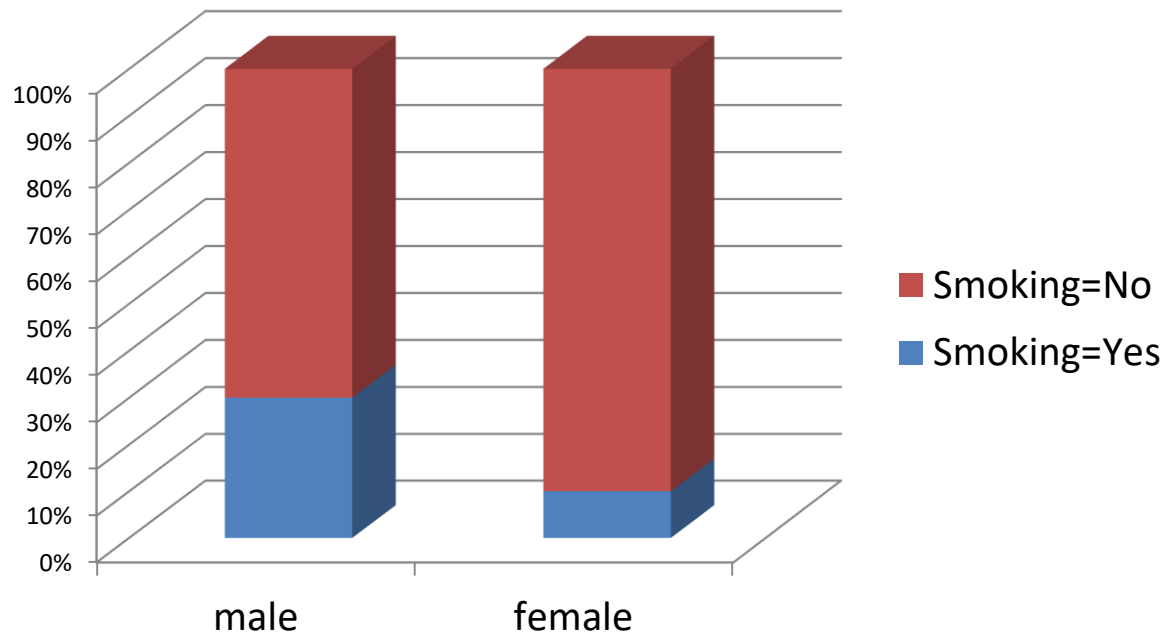
Exemple de grafice ... care induc in eroare

Diferenta poate fi marita in mod fals daca nu incepem la 0

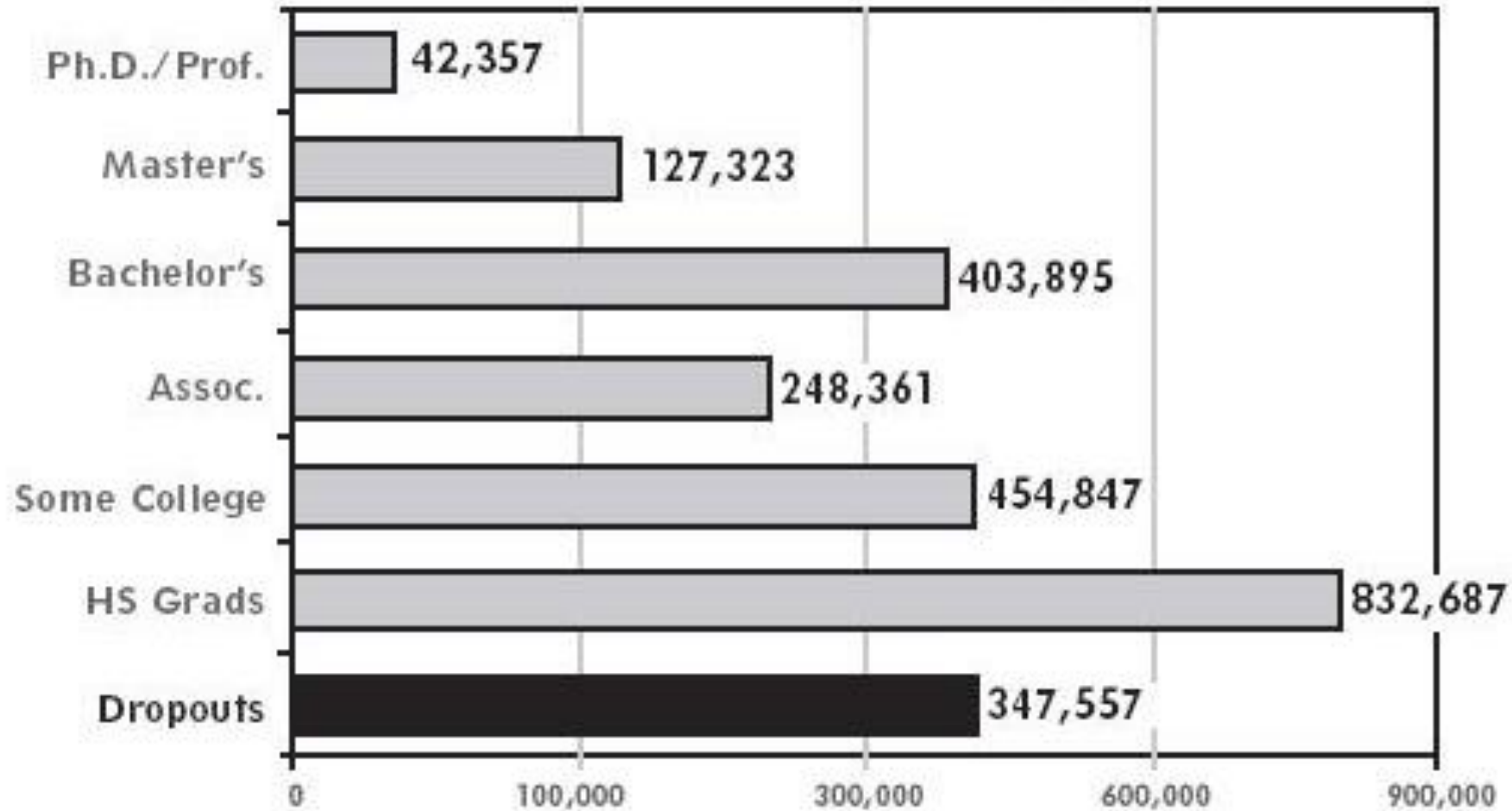


Exemple de grafice ... care induc in eroare

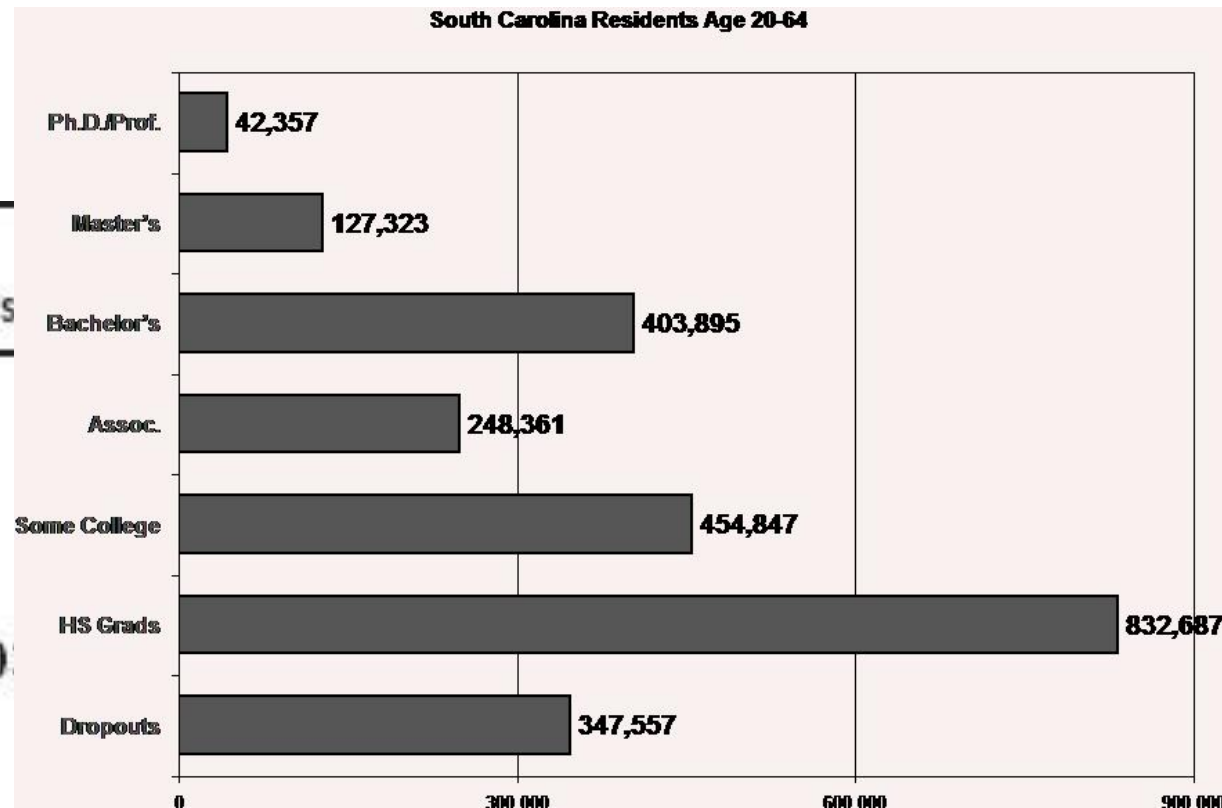
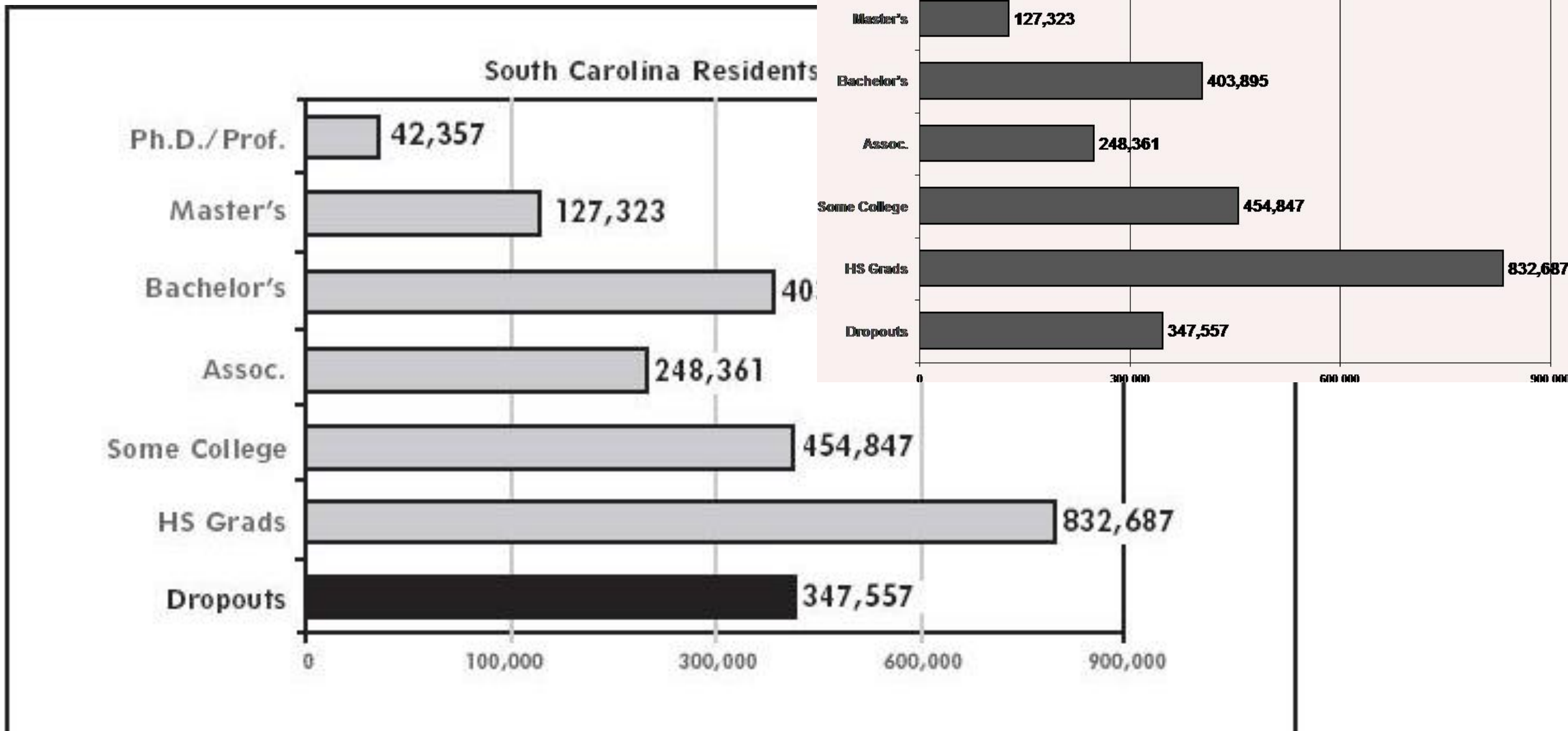
Procente pe linii sau pe coloane?



South Carolina Residents Age 20-64

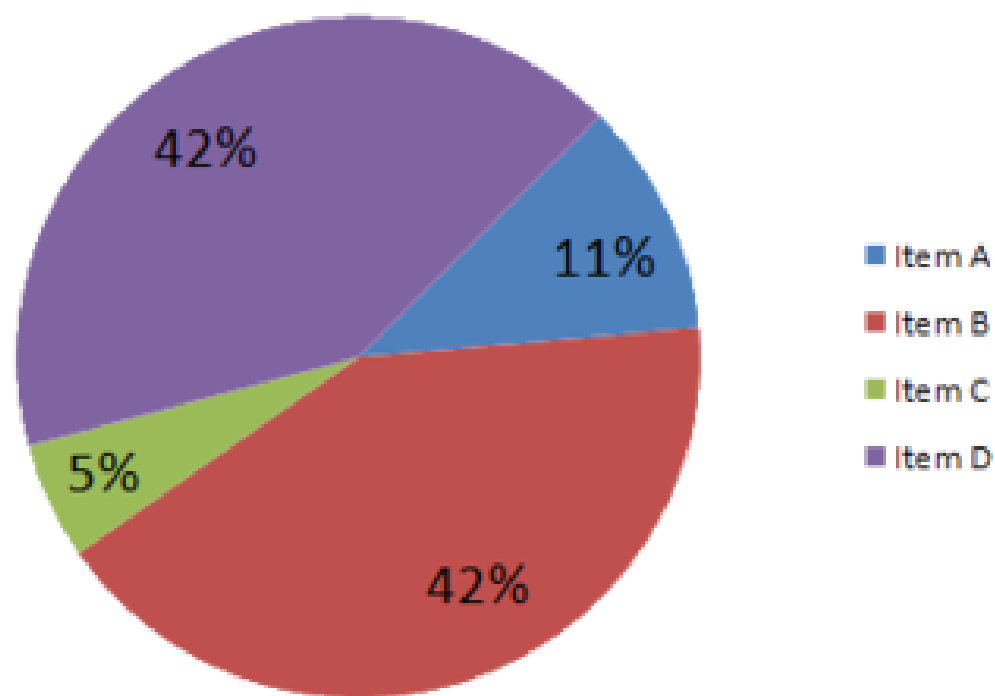


Source: PolEcon analysis of U.S. Census Bureau's Current Population Survey March 2004-06 Supplement data for South Carolina

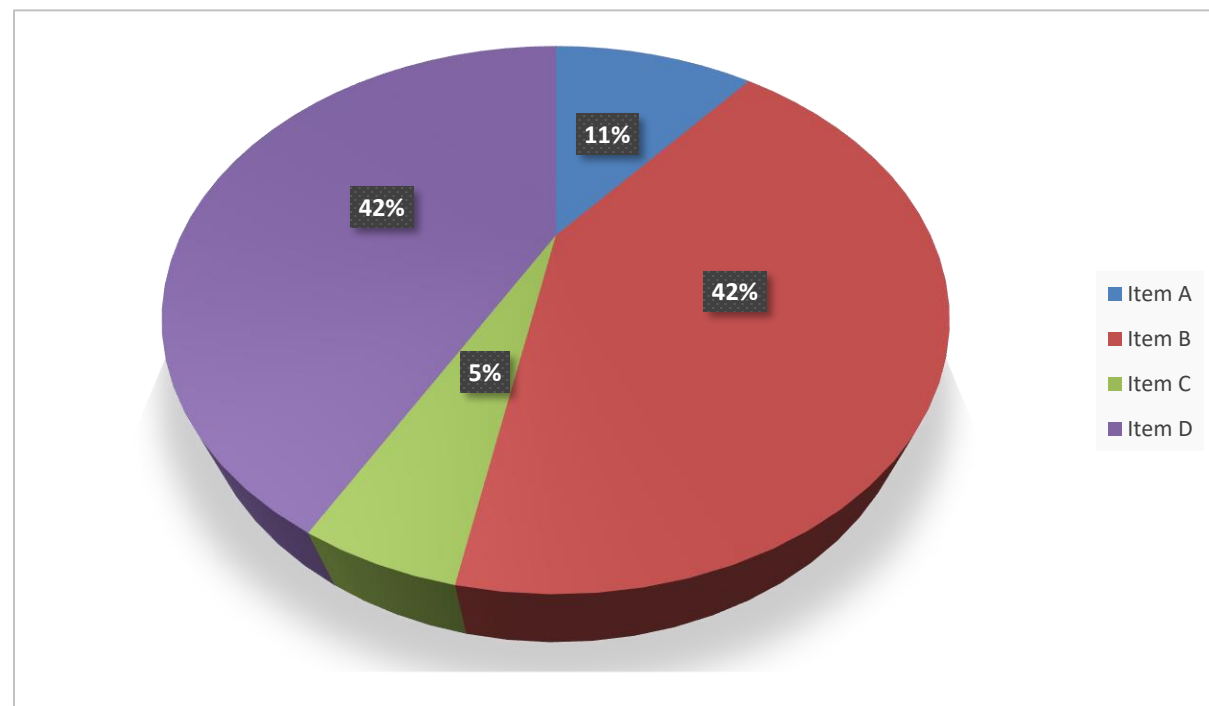


Exemple de grafice ... care induc in eroare

Graficele 3D



Corect



Incorrect



Pestera lui Iosif- Muntii Buzau



Pestera lui Iosif- Muntii Buzau

Muțumesc!