The investigation a frequency of asthma in ECAP study in Poland

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Outline

- Basic information of ECAP study
- Used statistical tools and R packages in our investigations
- Some examples of associations between asthma, regions and age
- Conclusions
- References

ECAP

- ECAP (Epidemiology of Allergy in Poland in years 2006-2008) was a questionnaire-based survey on ISAAC (International Study of Asthma and Allergies in Childhood) and ECRHS (European Community Respiratory Health Survey)
- 18617 subjects were selected to the analysis:

50.4% adults aged 20-44 years, 24.2% children 6-7 years and 25.4% children aged 13-14 years

- 53.8% female and 46.2% male

ECAP

All study subjects were randomly selected from PESEL data base (PESEL - identity number given to each citizen of Poland) in 8 cities (Warszawa, Lublin, Białystok, Gdańsk, Poznań, Wrocław, Katowice, Kraków) and 1 rural region (Zamość)

Methods

- In our resaerch we used simple correspondence analysis to obtain the associations between asthma, region and age of study subjects
- The resaerch were carried on base data from ECAP database
- Analyses were performed in the R package FactoMineR

Basic notations

- Aged groups: **Ch1** (children 6-7 years), **Ch2** (children 13-14 years), **Ad** (adults 20-44 years)
- Cities: **Kat** (Katowice), **Z** (Zamość), **Kr** (Kraków), **Wr** (Wrocław), **L** (Lublin), **Gd** (Gdańsk), **Wa** (Warszawa), **Poz** (Poznań), **B** (Białystok)

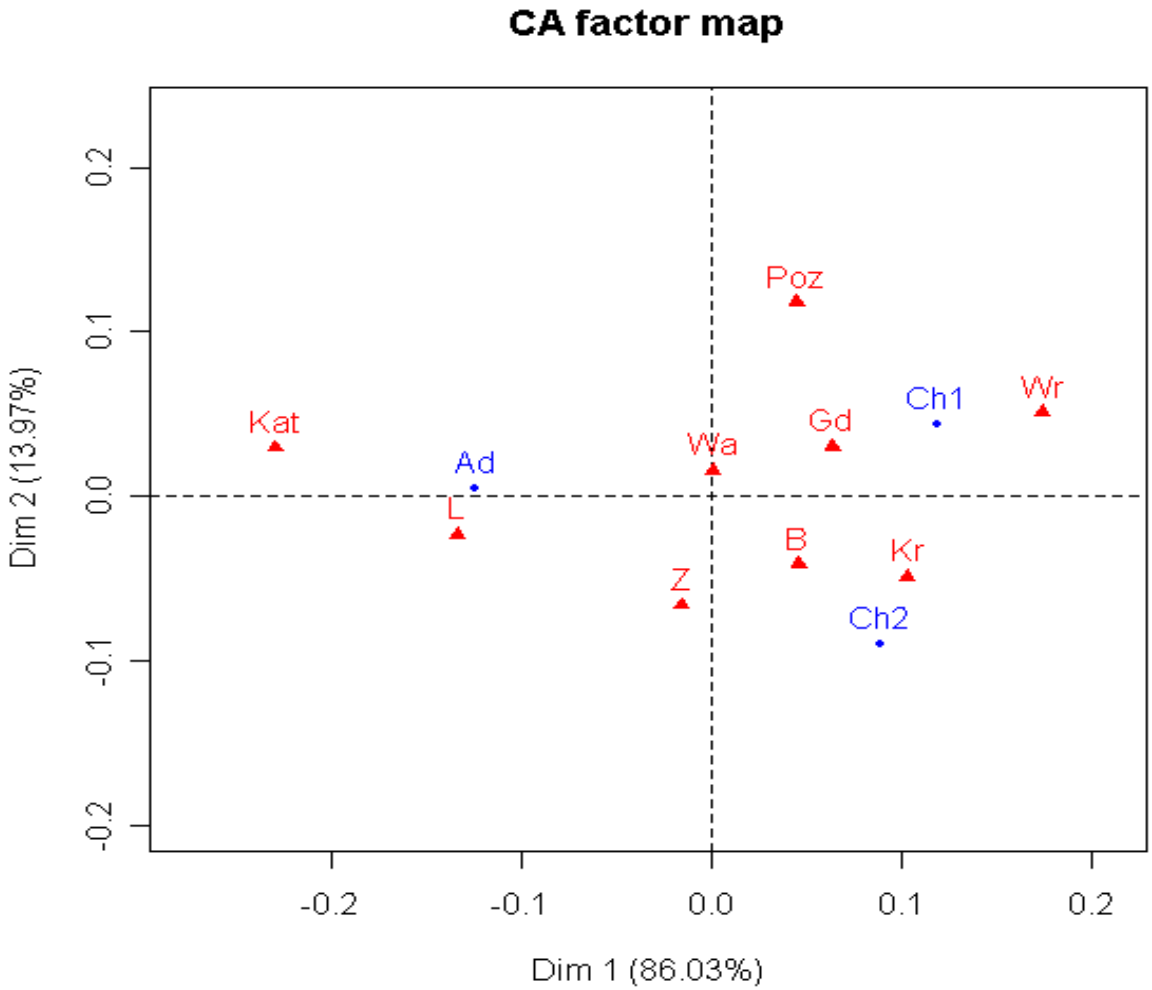
Example 1

We consider patients with the whistle sound during breathing (potential asthma)

Bellow we present contingency table

	Kat	Z	Kr	Wr	L	Gd	Wa	Poz	B
Ch1	89	61	109	100	90	109	126	59	161
Ch2	48	41	67	47	56	55	67	23	99
Ad	191	91	124	91	166	127	169	67	206

Correspondence map



- The chi square test(p-value = 0.0004412) indicate strong dependence between age groups and regions in considered population
- Row masses : 0.34 0.19 0.47
- Column masses: 0.12 0.07 0.11 0.09 0.12 0.11 0.14 0.06 0.18

Row Profiles

	Kat	Z	Kr	Wr	L	Gd	Wa	Poz	B
Ch1	0.10	0.07	0.12	0.11	0.10	0.12	0.14	0.07	0.18
Ch2	0.10	0.08	0.13	0.09	0.11	0.11	0.13	0.05	0.20
Ad	0.15	0.07	0.10	0.07	0.13	0.10	0.14	0.05	0.17

Column Profiles

	Ch1	Ch2	Ad
Kat	0.27	0.15	0.58
Z	0.32	0.21	0.47
Kr	0.36	0.22	0.41
Wr	0.42	0.20	0.38
L	0.29	0.18	0.53
Gd	0.37	0.19	0.44
Wa	0.35	0.19	0.47
Poz	0.40	0.15	0.45
B	0.35	0.21	0.44

Conclusions

From Row Profiles we have that

- in children 6-7 years: the highest frequency of whistles in breath appears in B (Białystok) 18% and the lowest frequency of whistles in breath appears in P (Poznań) and Z (Zamość) 7%,
- in children 13-14 years: the highest frequency of whistles in breath appears in B (Białystok) 20% and the lowest frequency of whistles in breath appears in P (Poznań) 5%,
- In adults: the highest frequency of whistles in breath appears in B (Białystok) 17% and the lowest frequency of whistles in breath appears in P (Poznań) 5%

Conclusions

From Column Profiles we have that

- in all cities without Wr (Wrocław): the highest frequency of whistles in breath appears in adults and the lowest frequency of whistles in breath appears in children 13-14 years.
- In Wr (Wrocław): the highest frequency of whistles in breath appears in children 6-7 years and the lowest frequency of whistles in breath appears in children 13-14 years.

Conclusions

By corespondence map we obtain that

- in L (Lublin) and Kat (Katowice) most patients with whistles in breath are adults (Ad),
- in Wr (Wrocław), Gd (Gdańsk) and Poz (Poznań) most patients are chlidren 6-7 years (Ch1) and in Kr (Kraów) and B (Białystok) most patients are chlidren 13-14 years (Ch2).

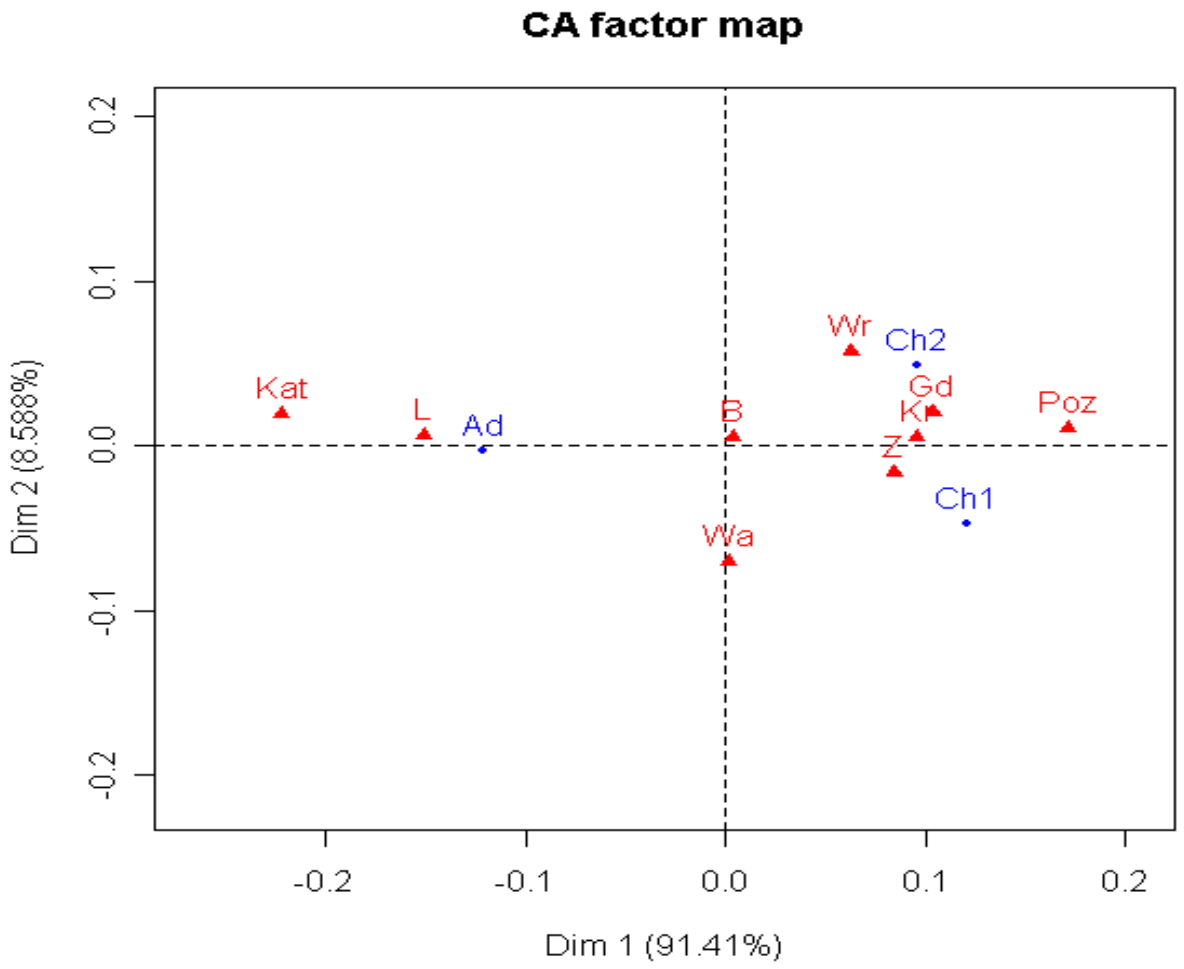
Example 2

We consider patients with problems with breath during last year (potential asthma)

Bellow we present contingency table

	Kat	Z	Kr	Wr	L	Gd	Wa	Poz	B
Ch1	91	75	116	87	94	140	182	59	168
Ch2	111	76	124	107	107	155	161	63	183
Ad	278	113	175	150	240	211	306	76	308

Correspondence map



- The chi square test(p-value = 1.747e-06) indicate strong dependence between age groups and regions in our population
- Row masses : 0.26 0.27 0.47
- Column masses: 0.12 0.07 0.10 0.09 0.11 0.13 0.16 0.05 0.17

Row Profiles

	Kat	Z	Kr	Wr	L	Gd	Wa	Poz	B
Ch1	0.13	0.09	0.16	0.15	0.13	0.16	0.19	0.09	0.24
Ch2	0.07	0.06	0.09	0.06	0.08	0.08	0.09	0.03	0.14
Ad	0.15	0.07	0.10	0.07	0.13	0.10	0.14	0.05	0.17

Column Profiles

	Ch1	Ch2	Ad
Kat	0.28	0.15	0.60
Z	0.35	0.23	0.52
Kr	0.39	0.24	0.45
Wr	0.44	0.20	0.40
L	0.31	0.19	0.56
Gd	0.32	0.16	0.38
Wa	0.29	0.15	0.39
Poz	0.45	0.17	0.51
B	0.37	0.23	0.47

Conclusions

From Row Profiles we have that

- in children 6-7 years: the highest frequency of problems with breath appears in B (Białystok) 24% and the lowest frequency of problems with breath appears in P (Poznań) and Z (Zamość) 9%,
- in children 13-14 years: the highest frequency of problems with breath appears in B (Białystok) 14% and the lowest frequency of problems with breath appears in P (Poznań) 3%,
- In adults: the highest frequency of problems with breath appears in B (Białystok) 17% and the lowest frequency of problems with breath appears in P (Poznań) 5%

Conclusions

- From Column Profiles we have that in all cities without Wr (Wrocław) the highest frequency of problems with breath appears in adults and the lowest frequency of problems with breath appears in children 13-14 years.
- In Wr (Wrocław) the highest frequency of problems with breath appears in children 6-7 years and the lowest frequency of problems with breath appears in children 13-14 years.

Conclusions

By corespondence map we obtain that

- in L (Lublin) most patients with problems with breath are adults (Ad),
- in Wr (Wrocław), Gd (Gdańsk) and Kr (Kraków) most patients with problems with breath are chlidren 13-14 years (Ch2) and in Z (Zamość) most patients with problems with breath are chlidren 6-7 years (Ch1).

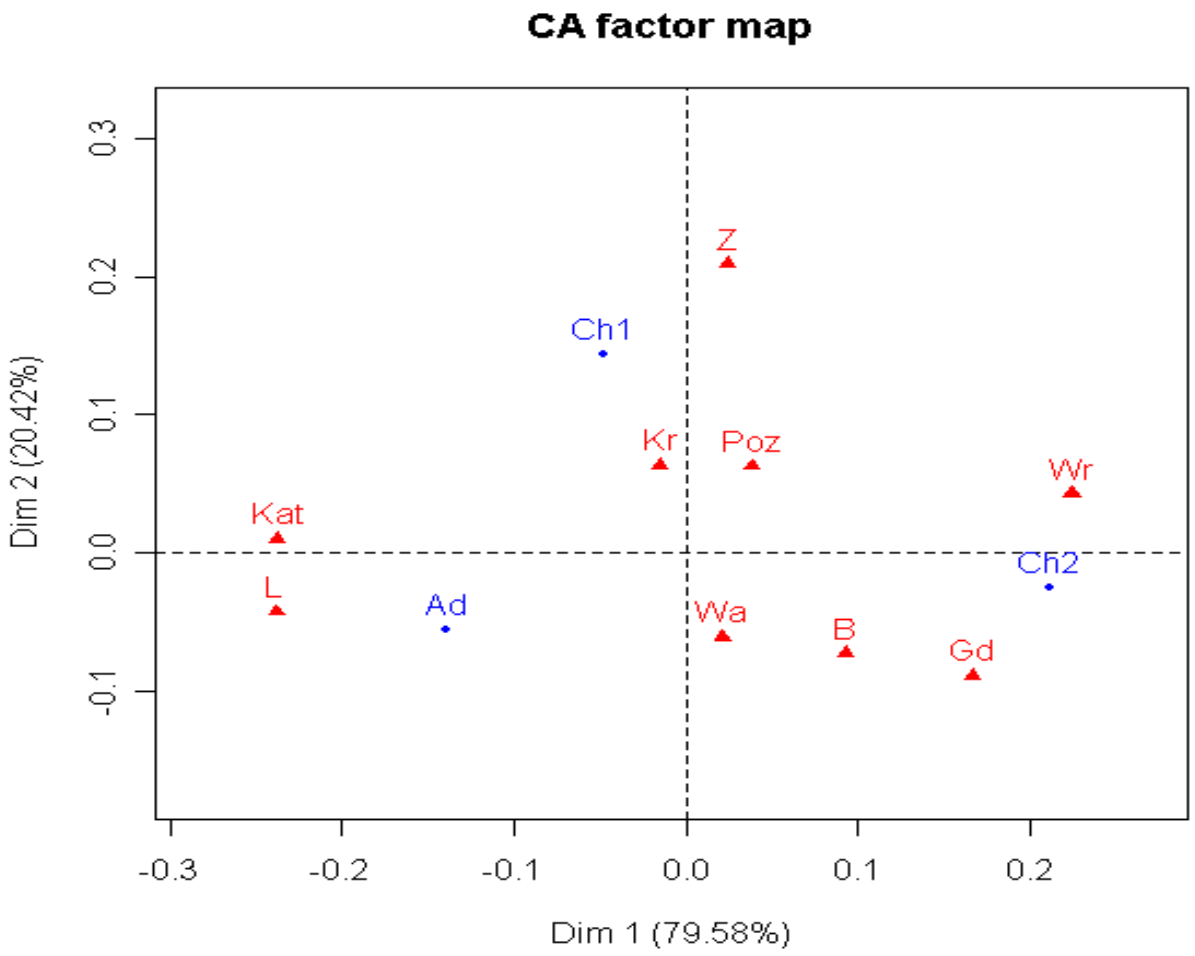
Example 3

We consider patients with declared asthma

Bellow we present contingency table

	Kat	Z	Kr	Wr	L	Gd	Wa	Poz	B
Ch1	26	19	32	24	28	18	27	15	19
Ch2	24	20	41	46	29	43	48	21	39
Ad	55	22	53	35	67	40	60	24	42

Correspondence map



- The chi square test(p-value = 0.03287) indicate dependence between age group and regions in our population
- Row masses : 0.23 0.34 0.43
- Column masses: 0.11 0.07 0.14 0.11 0.14 0.11 0.15 0.07 0.11

Row Profiles

	Kat	Z	Kr	Wr	L	Gd	Wa	Poz	B
Ch1	0.12	0.09	0.15	0.12	0.13	0.09	0.13	0.07	0.09
Ch2	0.08	0.06	0.13	0.15	0.09	0.14	0.15	0.07	0.13
Ad	0.14	0.06	0.13	0.09	0.17	0.10	0.15	0.06	0.11

Column Profiles

	Ch1	Ch2	Ad
Kat	0.25	0.23	0.52
Z	0.31	0.33	0.36
Kr	0.25	0.33	0.42
Wr	0.23	0.44	0.33
L	0.23	0.23	0.54
Gd	0.18	0.43	0.40
Wa	0.20	0.36	0.44
Poz	0.25	0.35	0.40
B	0.19	0.39	0.42

Conclusions

From Row Profiles we have that

- in children 6-7 years: the highest frequency of declared asthma appears in Kr (Kraków) 15% and the lowest frequency of declared asthma appears in P (Poznań) 7%,
- in children 13-14 years: the highest frequency of declared asthma appears in Wr (Wrocław) and Wa (Warszawa) 15% and the lowest frequency of declared asthma appears in Z (Zamość) 6%,
- In adults: the highest frequency of declared asthma appears in L (Lublin) 17% and the lowest frequency of declared asthma appears in P (Poznań) and Z (Zamość) 6%

Conclusions

From Column Profiles we have that

- in all cities without Wr (Wrocław) and Gd (Gdańsk) declared asthma most often appears in adults.
- In Wr (Wrocław) and Gd (Gdańsk) declared asthma most often appears in children 13-14 years.

Conclusions

By corespondence map we obtain that

- in L (Lublin) and Kat (Katowice) most patients with declared asthma are adults (Ad),
- in Wr (Wrocław) and Gd (Gdańsk) most patients are chlidren 13-14 years (Ch2) and in Kr (Kraków) most patients are chlidren 6-7 years (Ch1).

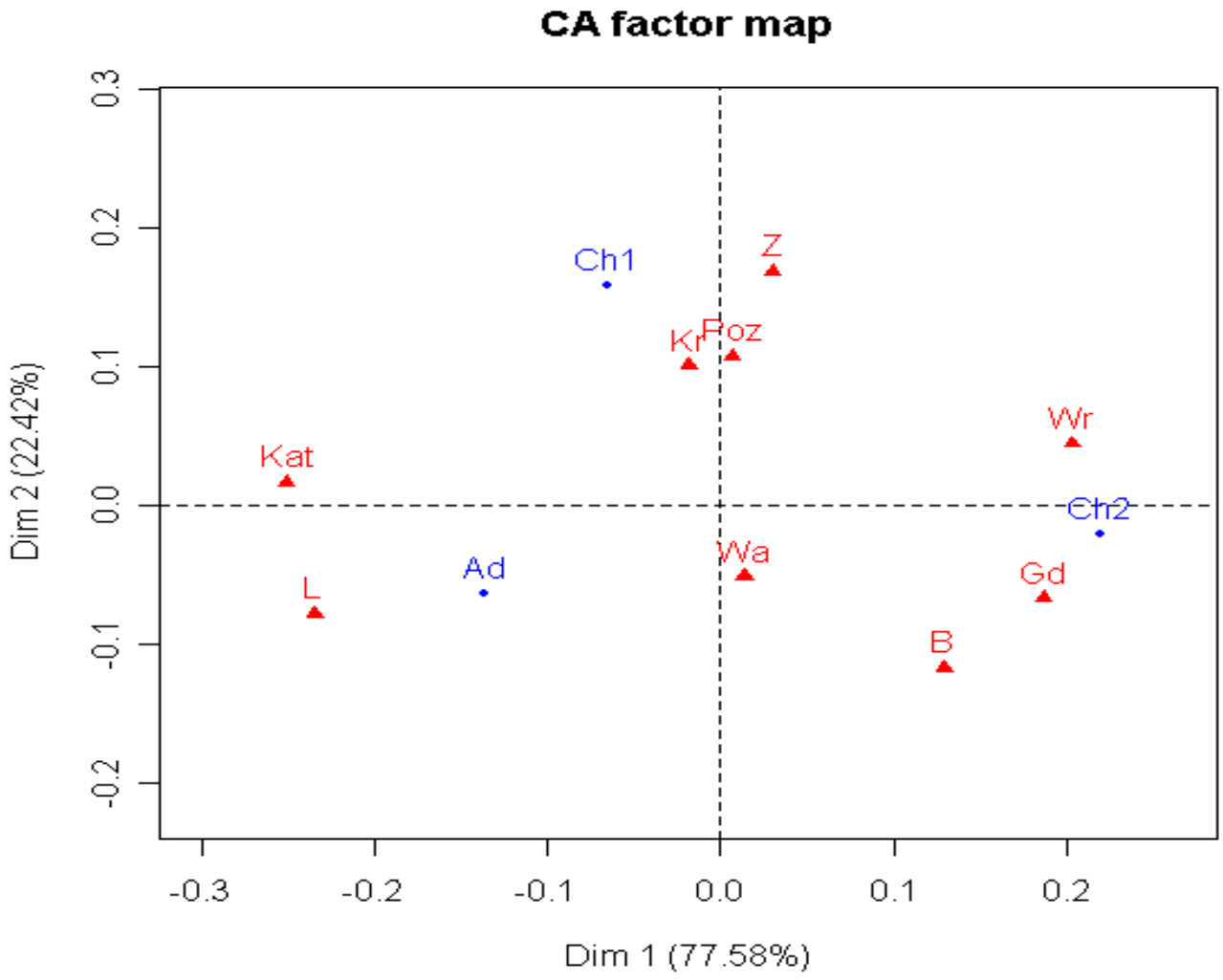
Example 4

We consider patients with doctor's diagnosed asthma

Bellow we present contingency table

	Kat	Z	Kr	Wr	L	Gd	Wa	Poz	B
Ch1	25	16	31	22	25	18	25	15	15
Ch2	22	19	38	43	28	44	44	19	38
Ad	53	21	49	35	66	40	57	23	40

Correspondence map



- The chi square test(p-value = 0.02569) indicate dependence between age group and regions in our population
- Row masses : 0.22 0.34 0.44
- Column masses: 0.11 0.06 0.14 0.11 0.14 0.12 0.14 0.07 0.11

Row Profiles

	Kat	Z	Kr	Wr	L	Gd	Wa	Poz	B
Ch1	0.13	0.08	0.16	0.11	0.13	0.09	0.13	0.08	0.08
Ch2	0.07	0.06	0.13	0.15	0.09	0.15	0.15	0.06	0.13
Ad	0.14	0.05	0.13	0.09	0.17	0.10	0.15	0.06	0.10

Column Profiles

	Ch1	Ch2	Ad
Kat	0.25	0.22	0.53
Z	0.29	0.34	0.38
Kr	0.26	0.32	0.42
Wr	0.22	0.43	0.35
L	0.21	0.24	0.55
Gd	0.18	0.43	0.39
Wa	0.20	0.35	0.45
Poz	0.26	0.33	0.40
B	0.16	0.41	0.43

Conclusions

From Row Profiles we have that

- in children 6-7 years: the highest frequency of doctor's diagnosed asthma appears in Kr (Kraków) 16% and the lowest frequency of doctor's diagnosed asthma appears in P (Poznań), Z (Zamość) and B (Białystok) 8%,
- in children 13-14 years: the highest frequency of doctor's diagnosed asthma appears in Wr (Wrocław), Wa (Warszawa) and Gd (Gdańsk) 15% and the lowest frequency of doctor's diagnosed asthma appears in Z (Zamość) and P (Poznań) 6%,
- In adults: the highest frequency of doctor's diagnosed asthma appears in L (Lublin) 17% and the lowest frequency of doctor's diagnosed asthma appears in Z (Zamość) 5%

Conclusions

From Column Profiles we have that

- in all cities without Wr (Wrocław) and Gd (Gdańsk) doctor's diagnosed asthma most often appears in adults.
- In Wr (Wrocław) and Gd (Gdańsk) doctor's diagnosed asthma most often appears in children 13-14 years.

Conclusions

By corespondence map we obtain that

- in L (Lublin) and Kat (Katowice) most patients with doctor's diagnosed asthma are adults (Ad),
- in Wr (Wrocław) and Gd (Gdańsk) most patients are chlidren 13-14 years (Ch2) and in Kr (Kraków) most patients are chlidren 6-7 years (Ch1).

References

- Greenacre M (1984). Theory and Applications of Correspondence Analysis. *London: Academic Press*.

- Husson F, Josse J, Le S, Mazet J (2008) The FactoMineR Package, version 1.10,

http://cran.r-project.org/web/packages/FactoMineR/FactoMi

- Samoliński B (2008). Epidemiology of Allergic Diseases in Poland, Report of ECRHS II and ISAAC study*, Department of Environmental Hazards Prevention and Allergology, Medical University of Warsaw* (in Polish)