

# Badanie wzajemnosci zjawisk

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**Task 1** The intergenerational transmission of inequalities is an important issue in economics. One aspect of this corresponds to the transmission of human capital, or whether children from parents with more education tend to be more educated themselves. We explore this issue in the table below where rows indicate the education of the mother and columns the education of the child. ISCED are international codes of education, where higher number correspond to more years of education.

	ISCED 0	ISCED 1	ISCED 2	ISCED 3	ISCED 4	ISCED 5	ISCED 6	Total
ISCED 0	97	752	1	963	45	119	2	1,979
ISCED 1	20	1,767	72	5,400	263	844	23	8,389
ISCED 2	0	6	2	49	3	20	1	81
ISCED 3	5	226	290	3,846	318	1,898	50	6,633
ISCED 4	0	3	10	110	32	175	4	334
ISCED 5	0	7	28	334	43	608	24	1,044
ISCED 6	0	0	0	10	2	17	5	34
Total	122	2,761	403	10,712	706	3,681	109	18,494

*Source:* Own elaboration based on data from the Gender and Generation Program for Poland 2010/2011

1. Compare the conditional probability of achieving education higher than 4 for children of mother with education level 1, 3, and 5. Do they support the idea of a transmission of education?

$$P(x_{kid} > 4 | x_{mom} = 1) = \frac{844+23}{8389} = 0.104$$

$$P(x_{kid} > 4 | x_{mom} = 3) = \frac{1898+50}{6633} = 0.294$$

$$P(x_{kid} > 4 | x_{mom} = 5) = \frac{608+24}{1044} = 0.605$$

2. What is the conditional probability of having a well educated mother (ISCED 5-6) if the child has an education level equal to 4?

$$P(x_{mom} > 4 | x_{kid} = 4) = \frac{43+2}{706} = 0.0637$$

3. The average number of years of education in each category is 2, 7, 10, 12, 14, 15, 16. Knowing this, please compute the expected number of years of education for a child whose mother a) completed bachelor studies (ISCED 5) and b) completed only primary (ISCED 1). Interpret.

$$E(x_{kid} > 4 | x_{mom} = 1) = \frac{(20*2+1,767*7+72*10+5,400*12+263*14+844*15+23*16)}{8389} = 11,28$$

$$E(x_{kid} > 4 | x_{mom} = 5) = \frac{(0*2+7*7+28*10+334*12+43*14+608*15+24*16)}{1044} = 13,83$$

**Task 2** The frequency table belows shows respondents attitudes towards the role of education in getting ahead and their education level. Do we have evidence to conclude that there is a relation between education level and the importance assigned to education?

	Essential	Very important	Important	Not important
ISCED 0-2	148	308	35	9
ISCED 3-4	209	281	43	4
ISCED 5-6	86	118	9	1

Source: Own elaboration based on data from ISSP for Poland 2008/2009

### Solving task 2

- $H_0$ : Variables are independent  $\forall_{i,j} p_{i,j} = p_i * p_j$
- $H_A$ : Variables are NOT independent  $\exists_{i,j} p_{i,j} \neq p_i * p_j$

$$\alpha = 0.01$$

$$v = (l - 1)(k - 1) = 2 * 3 = 6$$

$$\lambda = (16, 8119, \infty)$$

$$\hat{n}_i$$

	Essential	Very important	Important	Not important	total
ISCED 0-2	177.0584	282.5739	34.77218	5.595524	500
ISCED 3-4	190.1607	303.4844	37.34532	6.009592	537
ISCED 5-6	75.78098	120.9416	14.88249	2.394884	214
Total	443	707	87	14	1251

$$(\hat{n}_i - n_i)^2 / \hat{n}_i$$

	Essential	Very important	Important	Not important	sum
ISCED 0-2	4.768981	2.287842	0.001493	2.071381	9.129696
ISCED 3-4	1.866423	1.665815	0.856208	0.672003	5.060448
ISCED 5-6	1.37803	0.071549	2.32513	0.812441	4.58715
Sum	8.013434	4.025206	3.182831	3.555824	<b>18.77729</b>

$$\chi^2 = 18,8$$

We have evidence to reject the null in favor of independence between education level and importance given to education at the 1% significance level.