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Study the important factors affecting the congenital anomalies of the contingency tables data using the negative binomial model

Abdul amir Taima Bandar(1)
University of Karbala, College of Tourism Sciences
Abdulameer.t@uokerbala.edu.iq

Ahmed Turki Abd Ali(2)
Karbala University / College of Administration and Economics
Ahmed.turki@uokerbala.edu.iq

Maha Hasan Sultan(3)
Business Administration Department, Al-Bayan University
Maha.h@albayan.edu.iq

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Corresponding Author: **Abdul amir Taima Bandar**

Abstract*:* Congenital anomalies have become a widespread phenomenon in our time due to the presence of many reasons that have been clarified according to the International Classification of Diseases (ICD10), and the study of these causes in the form of data classified in tables of compatibility is extremely important to know the most important effects, so we used in our research this model Negative binomial regression and its transformation into a logarithmic model. The model parameters were estimated by the Greater Possible Method (MLE) and (5) models were extracted according to the type of interactions between the variables. A diagnosis was made of the most important effects on distortions and it was found that the interaction between urban housing and the presence of a degree of proximity in addition The The primary variables have a significant effect on subsequent deformed births.

Keywords: Negative Binomial Regression, Maximum Likelihood Estimation (MLE), Congenital Anomalies.

Introduction: [1][2][5]

The classified data is generally in the study of variables that are likely to fall in the form of data tables containing consensus responses, for example (najeh / loser, responsive / unresponsive, etc.) It can be defined as the standard data according to its relationship with fatf-style groups, the response to describe the nature of working in other words describe what happens to working during the experiment (success / failure, wounded or injured, etc.) The data taken from these experiments are called Count Data. this type of data appears in many phenomena, such as road accidents, floods, environmental studies, medical and biological experiments. these data follow different statistical distributions, such as: (Poisson , Binomial, multinomial, negative binomial).

There are some natural phenomena such as medical phenomena, engineering, finance, geophysical and natural (rain, hurricanes and earthquakes), and others, cannot be represented by a single distribution but need to consolidate miein like Poisson distribution and camabole distribution for the distribution of more elastic, to represent the complex phenomena and heterogeneous societies.

Distribution is a negative one of the limits of statistical distributions bursty task in multiple scientific domains such as Life Studies, biological, environmental, agricultural sciences, engineering, science of bacteria. It is the basis of a statistical model of numerical data(count data) It is understood that the arithmetic mean the contrast of Poisson distribution equal, and the increase the average value increased inequality and the characteristic of data called the equivalent of dispersion (equidispersion) in the case of data have Poisson distribution, but this is not achieved any assumption that the discrepancy larger than the median of data where data have a surfeit of scattering (overdispersion), will use the binomial model negative, any model boisson - camabole compound (poisson - gamma mixture model) more appropriate in the case of excessive dispersion. For this we dealt with this model was important and practical applications in all areas of medicine, engineering and life and other. The problem of search theory: The lack of recent research dealing with cases and phenomena that cannot be represented only by numerical models (count models) and especially "binomial model negative,The practical problem: increased incidence of congenital malformations in the recent period because of the Iraq war and the conditions that prevailed in the country Which brings us to study the factors and causes that helped to access.

Birth defects[4] [7]

Birth defects was the formation of abnormal in one of the body parts at conception Or is the birth of a lack of or increase in natural is not a member of the body of a child or part of it through a flaw jenie during the early stages of development bfipu formative due to exposure to some effects and erratic factors on the nature of the developing foetus. The birth defects either ẓāhirī or internal and gift can be confirmed by laboratory testing and mammography and sonar.

of the most important causes of stillbirths or after childbirth are congenital malformations of the foetus, and possibly survive disabled my body or functional as well as ماتتركة implications for psychiatric and maternal health and the vertical deformation happens during the formation of organs and tissue inside the uterus and can be diagnosis during pregnancy ultrasound or diagnosis after birth, after days of birth or weeks, and birth defects can be classified into three categories:

Internal distortions:

The distortions of morality in the heart and circulatory system (congenital anomalies of heart & circulatory system) is the distortions of various sorts and distress, either to infect alawrd or arteries entering the heart or emerging gift, as well as likely to affect heart valves or barriers of the heart of this kind is distortions are the most prevalent "and widespread" The symptoms immediately after birth defects, heart and circulatory system, speaking to the fetus in the first weeks of pregnancy, one of the main causes of this type of anomalies is a flaw in the chromosomes or mother abuse drugs or mother infected with measles [German] or diabetes and those distortions can be treated with surgery.

Foreig distortions:congenital malformations in the face, including:

Congenital clefts of the lip (cleft Bunny) is a congenital malformation resulting from failure to contact the tissue in the lip (mid-face) in the first period of pregnancy (first three months) Any period of the formation of the fetus and the reason for this distortion yet unknown but there are factors prepared Environmental such as intake of medication such as a course or epilepsy medicines, or inbreeding, or the presence of injury in the family or injury to it's right, or lack of acid beans folic acid .

Of congenital clefts of the skill : this yields a displacement of the non-attachment of the tissue in the roof (inside the mouth) and the reasons for this displacement are formed with the slit of the bunny .

The congenital spina bifida is the non-contact of the lip tissue and it extends to the lividity .

Congenital defects in the eye : any imperfections in the eye lens opacity, and The Shape of the eye as well the disappearance or atrophy of the eyes opening or the integration of the eyes into one in the front and blending the eyes of their causes, hereditary or infecting it with the germs such as Toxoplasma gondii (toxoplasmosis) .

Double-negative descent regression: [8][6]

A binary-negative slope is somewhat similar to a regular multi-lateral slope, and here's the approved y-variable. 0 ,1 ,2 ,3 ,....... Downhill binary binomial negative is circulated to the decline in the Poisson , but in the model the Poisson is equal to the expected variance , or regression binary binomial negative be bigger than expected , (NB1 linear relationship between the average contrast) a(NB2 relationship squared between the average contrast) depends on the distribution of the Poisson – Cam compound , this formula common factor because it allows for the use of the distribution of Cam and the lack of homogeneity of Poisson poisson heterogeneity .

Binary model binomial negative (negative binomial model) is a type of general linear models (generalized linear models) contains the variable belief (y) take numbers are countable Lai phenomenon or event , the parameters appropriate to the distribution binary binomial negative is:αμ

$$p(y) = p(Y = y) = \frac{\Gamma(y + 1/\alpha)}{\Gamma(y + 1)\Gamma(1/\alpha)} \left(\frac{1}{1 + \alpha\mu}\right)^{1/\alpha} \left(\frac{\alpha\mu}{1 + \alpha\mu}\right)^{y} \qquad \ldots (1)$$

Since $\mu > 0$ It is the middle of the computational (y) $\alpha > 0$ Scatter teacher (heterogeneity parameter) can be derived from Poisson distribution camabole compound (poisson-gamma mixture) or through a number of failures before $(1/\alpha)^{th}$ from the successes , Although $1/\alpha$ not necessarily to be a true ". binomial model traditional negative (NB2):

$$\ln\mu = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p \qquad \ldots (2)$$

Since $x_1, \ldots \ldots, x_p$ independent variables, $\beta_1, \ldots \ldots, \beta_p$ parameter regression.

In a random sample (n) to any matter under study would believe that the subject (i) takes the dependent variable (y_i) and the independent variables (x_i) and take the values $\left(x_{1i}, x_{2i}, \ldots, x_{pi}\right)$ It takes a vector for teachers $\beta = \left(\beta_0 \beta_1 \ldots \ldots \beta_p\right)^T$، And the matrix of independent variables:

$$X = \begin{bmatrix} 1 & x_{11} & \cdots & x_{1p} \\ 1 & x_{21} & \cdots & x_{2p} \\ \vdots & \vdots & \vdots & \vdots \\ 1 & x_{n1} & \cdots & x_{np} \end{bmatrix}$$

It can be rearranged row i^{th} and x To be x_i:

$$p(y_i) = \frac{\Gamma(y_i + 1/\alpha)}{\Gamma(y_i + 1)\Gamma(1/\alpha)} \left(\frac{1}{1 + \alpha e^{x_i\beta}}\right)^{\frac{1}{\alpha}} \left(\frac{\alpha e^{x_i\beta}}{1 + \alpha e^{x_i\beta}}\right)^{y_i}, i = 1,2, \ldots, n \qquad \ldots (3)$$

Teachers can be appreciated. α and β the use appreciation maximum likelihood becoming the maximum likelihood function :

$$L(\alpha, \beta) = \prod_{i=1}^{n} P(y_i) = \prod_{i=1}^{n} \frac{\Gamma(y_i + 1/\alpha)}{\Gamma(y_i + 1)\Gamma(1/\alpha)} \left(\frac{1}{1 + \alpha e^{x_i\beta}}\right)^{\frac{1}{\alpha}} \left(\frac{\alpha e^{x_i\beta}}{1 + \alpha e^{x_i\beta}}\right)^{y_i} \qquad \ldots (4)$$

and possible function of logarithmic functions become:

$$\ln L(\alpha, B) = \sum_{i=1}^{n} \left(y_i \ln\alpha + y_i (x_i . \beta) - \left(y_i + \frac{1}{\alpha}\right) \ln\left(1 + \alpha e^{x_i\beta}\right) + \ln\Gamma\left(y_i + \frac{1}{\alpha}\right) - \ln\Gamma(y_i + 1) - \ln\Gamma\left(\frac{1}{\alpha}\right) \right) \qquad \ldots (5)$$

values α and β That likelihood $\ln L(\alpha, B)$ will be parameter maximum likelihood And the matrix of variation, contrast jamb For an opportunity to IS $\Sigma = -H^{-1}$ Since

H :(Hessian matrix) For his second derivative For the logarithmic maximum function

liner algorithmic model:[9] [3]

defend linear algorithm model That method through which to changing modelling adopted Response Variable When values that changing a body Count Data or the rates We also know that one type of models that fell under the umbrella Log - Linear Models That testing and analysis linear algorithm is an extension to the test chi-squared Since test chi-squared The repetition expected of cells And by taking the natural logarithm of distribution formula, it turns into writing.

And that linear algorithm model in tawafuq agenda Dimension zoul The so called saturation model We cannot express it mathematically to the next versions:

$$\boldsymbol{\log(E_{ijm}) = \lambda + \lambda_1(i) + \lambda_2(j) + \lambda_3(m) + \lambda_{12}(ij) + \lambda_{13}(im) + \lambda_{23}(jm) + \lambda_{123(ijm)}} \qquad \ldots\ldots(6)$$

λ: The average of model.

$\lambda_1(i)$: a primary influence for the first variant of the plane (i).

$\lambda_2(j)$: a primary influence for the second variant of the plane(j).

$\lambda_3(m)$: a primary influence for the three variant of the plane (m).

$\lambda_{12}(ij)$: a primary influence between (i) For the first and standard variable (j) For the second variable.

$\lambda_{13}(im)$: a primary influence between (i) For the first and standard variable (j) For the third variable.

$\lambda_{23}(jm)$: a primary influence between (j) For the first and standard variable (m) For the third variable.

$\lambda_{123}(ijm)$: : a primary influence between (i) For the first and standard variable (j) For the third variable And level (m) For the third variable.

The model above a efects and fundamental interactions of the first and second, and when a model for mutual interaction between the rows and columns and cells λ_{123}(ijm) The effects and fundamental interactions of first class must be available to be an acceptable form.

$$\log(E_{ijm}) = \lambda + \lambda_1(i) + \lambda_2(j) + \lambda_3(m) \qquad \ldots\ldots(7)$$

As well as the model assumes $\lambda_{12} = 0$ و $\lambda_{123} = 0$ By the following formula :

$$\log(E_{ijm}) = \lambda + \lambda_1(i) + \lambda_2(j) + \lambda_3(m) + \lambda_{13}(im) + \lambda_{23}(jm) \qquad \ldots\ldots(8)$$

Just in case. $\lambda_{123} = 0$ Means that the interaction between the two variables first and second are equal in all the levels of the second variable and put $\lambda_{12} = 0$ Means that is equal to zero , and the form contained in the Formula (3) implies the absence of interaction between the two variables first and second at every level of the second variable .

And a number of the world (Bishop) to it when you continue to delete the limits of λ we get the model contains only one limit which allows based non-comparative (Non – Comprehensive model) this is important in practice because the tables of compatibility is concerned with the study models the comparison of the data sources .

For the purpose of estimating the parameters contained in the formula No. (1) the template logarithmic linear we find in the first stage the expected frequencies for the cells of the compatibility table to count the duplicates available E_{ijm}, under conditions of independence between the three variables to the cells of the table of compatibility according to the following formulas.

$$E_{ijm} = \frac{n_{i..}\ n_{.j.}\ n_{..m}}{n_{...}} \qquad \ldots\ldots(9)$$

Since:

$n_{i..}$: It refers to the marginal totals in the compatibility table for the first (variable rows)

$n_{.j.}$: Refers to the marginal totals in the compatibility table for the second variable (column variable)

$n_{..m}$: It refers to the marginal aggregates in the compatibility table for the third variable (cell variant)

$n_{...}$: Total compatibility table repeaters

$$\widehat{K}_{ijm} = \log(E_{ijm}) \qquad \ldots\ldots(10)$$

For the purpose of applying the tests well matching the template logarithmic linear accuracy in the representation of data representation is true we use the following metrics.

The chi-square χ^2 test statistics are written :

$$\chi_c^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \sum_{m=1}^{l} \frac{(n_{ijm} - E_{ijm})^2}{E_{ijm}} \qquad \ldots(11)$$

Sine n_{ijm} Repeat. cell sightings. ijm In the compatibility table, where you compare the value of the chi- Squared. χ_c^2 With the value of the chi- Squared spreadsheet χ_t^2 for degrees of freedom df =(r$\times c \times l - r - c - l + 2$) and the level of moral (0.05) if chi-squared calculated the value of more than the value of indexed chi-squared rejects the premise of scratch any lack of independence among variables.

His statistics test the greater potential. l^2 It is expressed mathematically in the following form:

$$L^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \sum_{m=1}^{l} n_{ijm} ln\left(\frac{n_{ijm}}{E_{ijm}}\right) \quad \ldots\ldots(12)$$

The greatest possible method of estimating the logarithmic model under BI-border distribution in the case of binary negative distribution:. [7][10]

The way it is most commonly old in the report , is meant the possible greatest, fixed and sacred as possible the greatest standard of high efficiency as well as the characteristic consistency to the process of the report by making the function possible variables random the greatest possible.

$$\mathrm{L}(\mu; \mathrm{y}, \alpha) = \prod_{i=1}^{n} \exp\left\{ y_i \ln\left(\frac{\alpha\mu_i}{1+\alpha\mu_i}\right) - \frac{1}{\alpha}\ln(1+\alpha\mu_i) + \ln\Gamma\left(y_i + \frac{1}{\alpha}\right) - \ln\Gamma(y_i+1) - \ln\Gamma\left(\frac{1}{\alpha}\right)\right\} \quad \ldots (13)$$

The logarithmic function can be obtained by taking the normal logarithms of both sides to the equation, and the function becomes more collective than it beats.:

$$\mathrm{L}(\mu; \mathrm{y}, \alpha) = \sum_{i=1}^{n} y_i \ln\left(\frac{\alpha\mu_i}{1+\alpha\mu_i}\right) - \frac{1}{\alpha}\ln(1+\alpha\mu_i) + \ln\Gamma\left(y_i + \frac{1}{\alpha}\right) - \ln\Gamma(y_i+1) - \ln\Gamma\left(\frac{1}{\alpha}\right) \quad \ldots (14)$$

The logarithmic potential of the binary negative has a parameter β and the parameters of the model as expressed in the equation.

$$\mathrm{L}(\beta_j; \mathrm{y}, \alpha) = \sum_{i=1}^{n} y_i \ln\left(\frac{\alpha \exp(x_i' \beta)}{1+\alpha \exp(x_i' \beta)}\right) - \frac{1}{\alpha}\ln[1+\alpha \exp(x_i' \beta)] + \ln\Gamma\left(y_i + \frac{1}{\alpha}\right) - \ln\Gamma(y_i+1) - \ln\boldsymbol{\Gamma}\left(\frac{1}{\alpha}\right) \quad \ldots (15)$$

The first derivative of the greater place, the logarithm, is known as(gradient.) , The second derivative (Hessian matrix), That could be our greatest model parameters defined by creating derivative first (gradient) For possible logarithmic descent to β and equality to zero and solving, is there are other values of First Derivatives fondemi for possible logarithmic to estimate the number of milestones. It may be estimated labelled heterogeneity (heterogeneity parameter) binomial negative for the first to create derivative possible-in logarithmic descent to α.

Derivatives fondemi matrix of a possible second logarithmic often mataraf as Hassan and Matrix viewing information (observed information matrix) Known as the negative Known as the negative assessed by a possible Greatest. errored standard for the model can be obtained from the square root of the country of a varied and common variation, which are invertible information to that standard error of the model is square root of the border country of his array of minus invertible Matrix (negative inverse Hessian matrix).

Newton - rafsona discretion as possible and require greater information matrix almstguetan al-mushahid, the first and second for a possible bulk logarithmic descent to α , β :

$\mu = \exp(x'\beta)$

NB-GRADIENT–β

$$\frac{\partial L}{\partial \beta} = \sum_{i=1}^{n} \frac{x_i(y_i - \mu_i)}{1 + \alpha\mu_i} \qquad \ldots (16)$$

Derivative first descent to (μ)

$$\frac{\partial L}{\partial \mu} = \sum_{i=1}^{n} \frac{y_i - \mu_i}{\mu_i(1 + \alpha\mu_i)} \qquad \ldots . (17)$$

NB-GRADIENT–α

$$\frac{\partial L}{\partial \alpha} = \sum_{i=1}^{n} \left[\frac{1}{\alpha^2}\left(\ln(1 + \alpha\mu_i) + \frac{\alpha(y_i - \mu_i)}{1 + \alpha\mu_i}\right) + \Psi\left(y_i + \frac{1}{\alpha}\right) - \Psi\left(\frac{1}{\alpha}\right)\right] \qquad \ldots . (18)$$

NB–HESSIAN–β

$$\frac{-\partial^2 L}{\partial \beta\, \partial \beta'} = \sum_{i=1}^{n} \frac{\mu_i(1 + \alpha y_i)}{(1 + \alpha\mu_i)^2} x_i x_i' \qquad \ldots . (19)$$

or

$$\frac{\partial^2 L}{\partial \beta_j' \, \partial \beta_j} = \sum_{i=1}^{n} \left[-x_{ij} x_{ij}' \frac{\mu_i (1 + \alpha \mu_i)}{(1 + \alpha \mu_i)^2} \right] \qquad \ldots. (20)$$

NB–HESSIAN–β;α

$$\frac{\partial^2 L}{\partial \beta \, \partial \alpha} = E\left[- \sum_{i=1}^{n} \frac{\mu_i (y_i - \mu_i) x_{ij}}{(1 + \alpha \mu_i)^2} \right] \qquad \ldots. (21)$$

NB–HESSIAN–α

Derivative camabole logarithmic function is a binary camabole (digamma) As well as a second derivative of variable camabole logarithmic camabole tricycle (trigamma)

$$\mathrm{DIGAMMA} = \Psi_1 = \Psi(x) = \frac{\ln\Gamma(x + 0.0001) - \ln\Gamma(x - 0.0001)}{0.0002} \qquad \ldots (22)$$

As well as

$$= \frac{\left\{ \ln\Gamma\left(\left({}^{1}\!/_{\alpha} \right) + 0.0001 \right) - \ln\Gamma\left(\left({}^{1}\!/_{\alpha} \right) - 0.0001 \right) \right\}}{0.0002} \qquad \ldots. \quad (23)$$

Therefore, the estimation of the parameters of the model of the decline of binomial negative in a case of tawafuq schedules can be appreciated as follows

$$\hat{p}_{11} = \frac{n1.n.1}{n^2}$$

$$\hat{p}_{12} = \frac{n1.n.2}{n^2}$$

$$\hat{p}_{11} = \frac{n2.n.1}{n^2}$$

$$\hat{p}_{11} = \frac{n2.n.2}{n^2}$$

Through the results of these results can be sent to the schedules tawafoq récherche any remaining mathematical formulae to test hypotheses and statistical model estimating binomial negative on what's on it.

Checked simple random sampling of cases of (congenital anomalies) from the Department of Health of premature karabila sacred size (257) And for the purpose of confining congenital malformations adopted classification and labeling (ICD 10)

As in the table (1).

(ICD10) table (1)

The types of housing					Factors influencing skewness
Rife			attended		
Sum	There is no	There is no	There is no	There are	relationship between parents / skewness types
112	20	41	17	34	distortions in the head and spine
92	17	33	15	27	distortions of the digestive system and turnover
53	13	21	6	13	The nervous system abnormalities and parties
257	50	95	38	74	Sum

SOURCE / preparation as the researchers obtained data from the Ministry of Health - the holy karabila health statistics - the department of health and life.

<u>trophophyte study:</u>

The study included independent variables I represented the kind of housing (x) As the designated (rural and urban) and other independent variable (z) A degree of approximately between parents (exist or no) and changing adopted (y) count response variable It takes no symbol (1) of the limbs in the head and spine and the symbol (2) represents skewness occurring in the gastrointestinal tract, turnover and the symbol (3) the distortions of the nervous system and parties, namely that the variant takes preparation digital-based hence the name of numerical models response amounted to a selection of independent variables 64% any independent variables that can be interpreted as much as 64 percent of the changes in the changing y.

Estimating the parameters of the model logarithmic written:

There is a lot of statistical methods for estimating the parameters of the decline model binomial negative and biggest way possible (MLE)

The hypothesis that statistical associated with the form logarithmic can write:

$$H_0: \lambda_{12} = 0 \quad , \quad H_0: \lambda_{13} = 0 \quad , \quad H_0: \lambda_{23} = 0$$

$$H_0: \lambda_{12} \neq 0 \quad , \quad H_0: \lambda_{13} \neq 0 \quad , \quad H_0: \lambda_{23} \neq 0$$

The hypothesis of nothingness suggests that none of the three variables is compatible, that is, that there is complete independence between the variables.

table (2)

Estimating logarithmic model with interplay between (x * z)

Parameter Estimates								
Parameter	Estimate	Std. Error	Z	Sig.	χ_c^2	L^2	d.f	p-value
Constant	2.333	.187	12.476	.000	2.054	2.052	6	.000
[x = 1]	-.274-	.215	-1.275	.202				
[z = 1]	.642	.175	3.674	.000				
[y = 1]	.748	.167	4.488	.000				
[y = 2]	.551	.172	3.198	.001				
[x = 1] * [z = 1]	.025	.265	.093	.926				
c. Design: Constant + x + z + y + x * z								

From the results in the table above, we note that the form which represents the interaction between the two variables type of housing (attended) the degree of kinship among parents (no) as a variable of independent in addition to changing the political, the other was moral because the value of p-value less than (0.05), i.e. that housing in urban areas and a degree Read plus variables the basic effect of the meaning of the states of the grill .

Table (3)

Estimating logarithmic model with interplay between (y* z)

Parameter Estimates[b,c]								
Parameter	Estimate	Std. Error	Z	Sig.	χ_c^2	L^2	d.f	p-value
Constant	2.372	.236	10.05	.000	1.876	1.916	5	.076
[x = 1]	-.258-	.126	-2.05	.040				
[z = 1]	.582	.286	2.032	.042				
[y = 1]	.666	.282	2.362	.018				
[y = 2]	.521	.290	1.800	.072				
[z = 1] * [y = 1]	.125	.350	.356	.722				
[z = 1] * [y = 2]	.047	.360	.130	.897				
c. Design: Constant + x + z + y + z * y								

From the results in the table above, we note that the form which represents the interaction between the two variables of abnormalities in the head, spine, and the presence of consanguinity between parents in addition to the interaction between the existence of kinship between parents and abnormalities of the gastrointestinal tract and dizziness were non significant as p-value is bigger than (0.05).

Table (4)

Estimating logarithmic model with interplay between (x * y)

Parameter Estimates								
Parameter	Estimate	Std. Error	Z	Sig.	χ_c^2	L^2	d.f	p-value
Constant	2.455	.192	12.781	.000	.418	.415	5	.057
[x = 1]	-.582-	.286	-2.032-	.042				
[z = 1]	.653	.131	4.964	.000				
[y = 1]	.585	.214	2.731	.006				
[y = 2]	.386	.222	1.735	.083				
[x = 1] * [y = 1]	.403	.344	1.173	.241				
[x = 1] * [y = 2]	.408	.355	1.149	.251				
c. Design: Constant + x + z + y + x * y								

From the results in the table above, we note that the form which represents the interaction between the two variables of abnormalities in the head, spine, and housing in urban areas in addition to the interaction between housing in the countryside and abnormalities of the gastrointestinal tract and dizziness were non significant as p-value is bigger than (0.05).

Table (5)

Estimating logarithmic model with interplay between (z * y)،(x * z)

Parameter Estimates								
Parameter	Estimate	Std. Error	Z	Sig.	χ_c^2	L^2	d.f	p-value
Constant	2.379	.247	9.614	.000	1.870	1.907	4	.092
[x = 1]	-.274-	.215	-1.27	.202				
[z = 1]	.571	.309	1.851	.064				
[y = 1]	.666	.282	2.362	.018				
[y = 2]	.521	.290	1.800	.072				
[z = 1] * [y = 1]	.125	.350	.356	.722				
[z = 1] * [y = 2]	.047	.360	.130	.897				
[x = 1] * [z = 1]	.025	.265	.093	.926				
c. Design: Constant + x + z + y + z * y + x * z								

From the results in the table above, we note that the form which represents the interaction between the two variables of abnormalities in the head, spine, and housing in urban areas in addition to the interaction between housing in the urban and abnormalities of the gastrointestinal tract, dizziness and the interaction between housing in the urban and the existence of a relationship between the parents was not meaningful because the value of the p-value is bigger than (0.05).

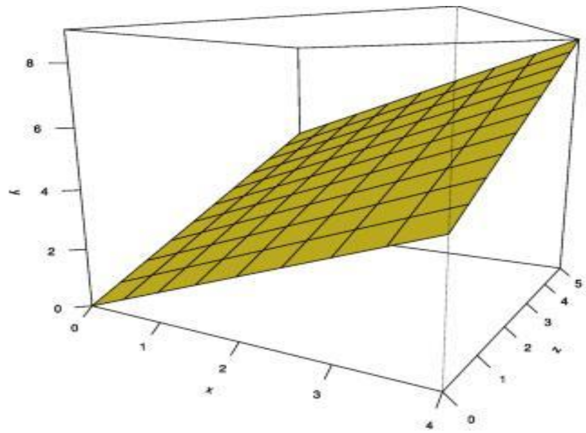
Table (6)

Estimating logarithmic model with interplay between(z * y) ,(x * y)

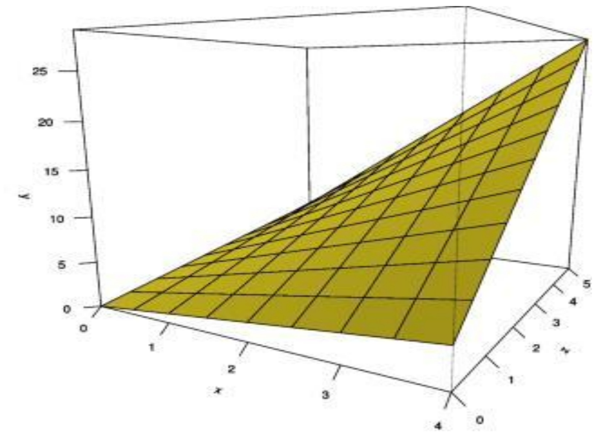
Parameter Estimates								
Parameter	Estimate	Std. Error	Z	Sig.	χ_c^2	L^2	d.f	p-value
Constant	2.501	.251	9.952	.000	.268	.270	3	.000
[x = 1]	-.582	.286	-2.03	.042				
[z = 1]	.582	.286	2.032	.042				
[y = 1]	.503	.312	1.609	.108				
[y = 2]	.355	.322	1.105	.269				

[z = 1] * [y = 1]	.125	.350	.356	.722				
[z = 1] * [y = 2]	.047	.360	.130	.897				
[x = 1] * [y = 1]	.403	.343	1.173	.241				
[x = 1] * [y = 2]	.408	.355	1.149	.251				
c. Design: Constant + x + z + y + z * y + x * y								

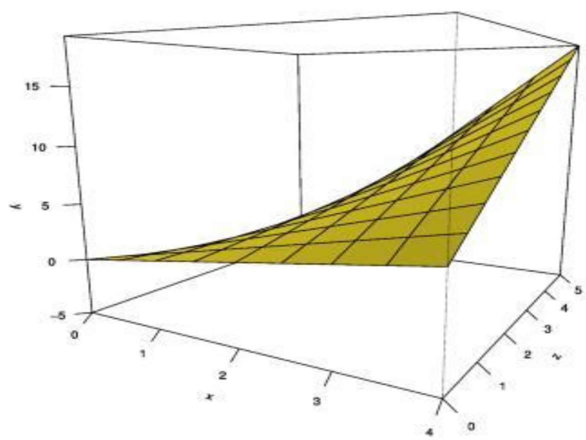
From the results in the table above, we note that the form which represents the interaction between the two variables of abnormalities in the head, spine, and housing in urban areas in addition to the interaction between housing in the urban and abnormalities of the gastrointestinal tract, dizziness and the interaction between housing in the urban and the existence of a relationship between the parents and the interaction between housing in urban areas and the lack of a relationship between the parents was moral because the value of p-value less than (0.05).



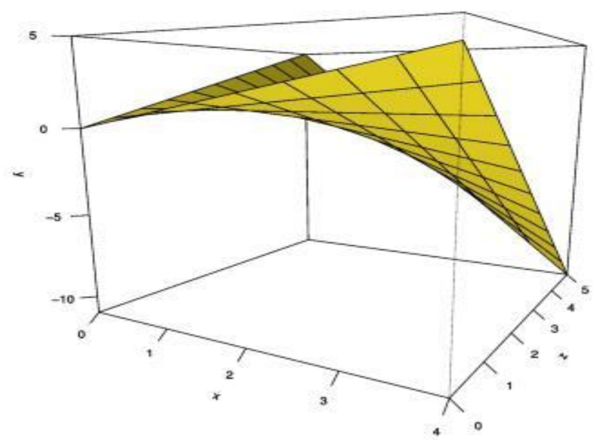
(a) *No interaction.*



(b) *Synergistic interaction.*



(c) *Buffering interaction.*



(d) *Antagonistic interaction.*

The graphical representation in the log-linear model illustrates the relationships among the three study variables represented by housing type (X), parental consanguinity (Z), and types of congenital anomalies (Y). The connecting lines between variables indicate the presence of statistical interaction or association, whereas the absence of a connecting line reflects statistical independence between variables. The graphical structures of the proposed models demonstrate that several two-way interactions were examined in order to investigate their potential influence on congenital anomalies. For instance, the interaction term (X∗Z) represents the relationship between housing type and parental consanguinity, while the interaction (Y ∗Z) examines the association between congenital anomalies and parental consanguinity. Similarly, the interaction (X ∗Y) evaluates the relationship between housing type and the occurrence of congenital anomalies.

However, the statistical findings revealed that most of the two-factor interaction effects were not statistically significant, since the obtained p-values exceeded the significance level of 0.05 This indicates the absence of strong evidence supporting direct associations among these variables within the studied sample. Furthermore, the more complex graphical models containing multiple interaction paths attempted to explain the joint relationships among housing type, parental consanguinity, and congenital anomalies; nevertheless, the observed data did not provide sufficient statistical support for substantial interaction effects. Therefore, it can be concluded that congenital anomalies in the present study were not significantly associated with either housing type or parental consanguinity according to the fitted log-linear model results.

Conclusions:

From what has been presented on the theoretical side and what has been achieved on the practical side, we conclude what comes. :

In Table 2, the model was moral: urban housing and the presence of a degree of kinship in addition to the fundamental variables have a moral impact on distorted births.

In Table (6) was a form meaningful to the interaction between the two variables of abnormalities in the head, spine, and housing in urban areas in addition to the interaction between housing in the urban and abnormalities of the gastrointestinal tract, dizziness and the interaction between housing in the urban and the existence of a relationship between the parents and the interaction between housing in urban areas and the lack of a relationship between the parents was moral because the value of p-value less than (0.05).

In Table 3, Table 4 and Table 5, the estimated models were not morale, i.e. they were ineffective in distorting future births .

The efficiency of the Greater possible method in estimating the logarithmic model of binary minus in the case of disaggregated data .

Through what has been displayed in a through theoretical and what has been reached in the application side, the study recommends the following :

Expand the study of data classified as comprehensive to most phenomena whose data can be converted into consensus tables.

Use other methods of estimation or comparison to determine the most efficient method of estimating a binary model .

Searching for other factors that were not included in the model because the independent variables were able to account for 64% of the changes in the adopted variable y.

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