THESIS SUBMISSION

Title:

Comparative study of the specific weights of risk factors in low birth weight in four health service institutions [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Ministry of Health of the Mexican State of Yucatán (SSY); Mérida Regional Hospital of the Institute of Security and Social Services of the Workers in the Service of the State (ISSSTE); and National Medical Center "Ignacio García Téllez" of the Mexican Social Security Institute (IMSS)] in the city of Mérida, Yucatán, Mexico *versus* the specific weights of risk factors in low birth weight in four health service institutions (Comprehensive Hospital "Lázaro Cárdenas"; General Hospital "Felipe Carrillo Puerto"; Comprehensive Hospital "José María Morelos"; and Comprehensive Hospital "Tulum") in the Maya Zone of the Mexican State of Quintana Roo, Mexico, according to the Multiple Logistic Regression Model. Case-control study

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Summary – [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Ministry of Health of the Mexican State of Yucatán (SSY); Mérida Regional Hospital of the Institute of Security and Social Services of Workers in the Service of the State (ISSSTE); and National Medical Center "Ignacio García Téllez" of the Mexican Social Security Institute (IMSS)]

Introduction. Low birth weight has been a mystery to science throughout history. There have been many theories. Research has been conducted on the causes and consequences of birth weight. Birth weight is one of the variables. recognized as among the most important due to their association with a higher risk of mortality in any period, especially in the period perinatal. Birth weight is, without a doubt, the most important determinant of a newborn's chances of experiencing perinatal growth. and satisfactory development. Therefore, the rate of low birth weight newborns is currently considered a general health indicator. Since it is multifactorial, due to maternal, fetal, and environmental problems. **Objective:** To evaluate multivariately the specific weights of 19 risk factors, explanatory variables, independent variables, predictor variables, Regressor variables or causes in the response variable, dependent variable, or effect (low birth weight). **Materials and methods.** Approach Quantitative. Observational analytical epidemiological study of cases and controls with directionality effectÿrisk factors and with prospective temporality. 24,676 newborns were studied (1,161 cases and 23,515 controls), which corresponds to 20 controls per case. All full-term newborns (37 ÿ 41 weeks of gestation) with weights < 2,500 g ÿ 2,500 g were defined, respectively, as a case and as a control. To evaluate the specific weights of the 19 risk factors, the values of the ÿ Exponents or Odds Ratios (OR) were used. of the Multiple Logistic Regression Model. **Results.** OR values > 1 indicate the positive contribution of the risk factors age Maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; personal pathological history; age at menarche ÿ 12 years; Number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; interpregnancy interval ÿ 24 months; low socioeconomic level; marital status "unmarried"; smoking; alcoholism; initiation of prenatal care at or after the week N ˜ 20 days of gestation; number of prenatal visits ÿ 5; type of delivery or abdominal birth route; and female gender of the product. **Conclusions.** The values obtained from the ÿ Exponents or Odds Ratios indicate the positive contribution (OR > 1) in numerical order ascending risk factors, type of delivery or delivery route, abdominal (1.0073); initiation of prenatal care from or after week N ˜ 20 days of gestation (1.0512); history of abortion(s) (1.0535); pathological obstetric history (1.0693); number of consultations

prenatal ÿ 5 (1.0781); maternal age ÿ 36 years (1.0915); female gender of the product (1.1472); number of deliveries = 1 (1.1674); level low socioeconomic status (1.2506); personal pathological history (1.2848); age at menarche ÿ 12 years (1.3523); marital status "unmarried" (1.4897); smoking (1.6384); number of births ÿ 5 (2.0351); interpregnancy interval ÿ 24 months (2.7028); maternal weight < 50 kg (2.8376); alcoholism (4.3879); and maternal height < 150 cm (8.1153).

Abstract – [General Hospital "Dr. Agustin O'Horan" of the Ministry of Health of the Mexican state of Yucatan (SSY); Maternal and Child Hospital of the Ministry of Health of the Mexican state of Yucatan (SSY); Merida Regional Hospital of the Institute of Social Security and Services for Workers at the Service of the State (ISSSTE); and "Ignacio Garcia Tellez" National Medical Center of the Mexican Institute of Social Security (IMSS)]

Introduction. Low birth weight has been a mystery to science throughout the ages. Multiple have been the investigations carried out about the causes that produce it and the consequences that it causes. Birth weight is one of the variables recognized among the most important due to its association with the highest risk of mortality in any period, especially in the perinatal period. Birth weight is by far the most important determinant of a newborn's chances of experiencing satisfactory growth and development. For this reason, currently, the rate of low birth weight newborns is considered a general health indicator, since it is multifactorial in origin, due to both maternal problems and fetal and environmental problems. **objective.** Multivariate evaluation of the specific weights of nineteen risk factors, explanatory variables, independent variables, predictor variables, regressor variables or causes in the response variable, dependent variable or effect (low birth weight). **Material and methods.** Quantitative approach. Analytical observational epidemiological study of cases and controls with directionality effectÿrisk factors and with prospective temporality. Twenty–four thousand six hundred and seventy–six newborns (1,161 cases and 23,515 controls) were studied corresponding to twenty controls per case. All term newborns (37 ÿ weeks of gestation ÿ 41) with weights < 2,500 g and ÿ 2,500 g were defined, respectively, as a case and as a control. To evaluate the specific weights of the nineteen risk factors, the values of the ÿ Exponents or Odds Ratios (OR) of the Multiple Logistic Regression Model were used. **Results.** OR values > 1 indicate the positive contribution of risk factors maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; pathological personal history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; birth interval ÿ 24 months; low socioeconomic status; "not–married" marital status; tuxedo; alcoholism; initiation of prenatal care from or after the 20th week of gestation; number of prenatal visits ÿ 5; type of delivery or abdominal birth route; and female gender of the product. **Conclusions.** The values obtained from the ÿ Exponents or Odds Ratios indicate the positive contribution (OR > 1) in ascending numerical order of the risk factors type of labor or abdominal birth route (1.0073); initiation of prenatal care from or after the 20th week of gestation (1.0512); history of abortion(s) (1.0535); pathological obstetric history (1.0693); number of prenatal visits ÿ 5 (1.0781); maternal age ÿ 36 years (1.0915); female gender of the product (1.1472); number of deliveries = 1 (1.1674); low socioeconomic level (1.2506); pathological personal history (1.2848); age at menarche ÿ 12

years(1.3523); "unmarried" marital status (1.4897); tuxedo (1.6384); number of deliveries ÿ 5 (2.0351); birth interval ÿ 24 months (2.7028); maternal weight < 50 kg (2.8376); alcoholism (4.3879); and maternal height < 150 cm (8.1153).

Summary – Lázaro Cárdenas Comprehensive Hospital; Felipe Carrillo Puerto General Hospital; José María Comprehensive Hospital Morelos"; and the "Tulum" Comprehensive Hospital

Introduction. Low birth weight is an indicator that allows us to predict a child's probability of survival. In fact, there is There is an exponential relationship between weight deficit, gestational age, and perinatal mortality. Furthermore, it is important to note that a percentage Full-term infants (37 ÿ 41 weeks of gestation) who have low birth weight experience various sequelae of varying severity – especially in the neurological sphere—hence the importance of predicting the presentation of low birth weight. Multiple Logistic Regression It is one of the most expressive and versatile statistical tools available for data analysis in both clinical and other settings. Epidemiology. Its origins date back to the 1960s with the seminal work of Cornfield, Gordon & Smith on the risk of to suffer from coronary heart disease and already, in the form we know it today, with the contribution of Walter & Duncan in which it It addresses the issue of estimating the probability of a certain event occurring based on several variables. Its use becomes widespread and It has expanded since the early eighties, mainly due to the improved computer infrastructure available since then. **Objective.** Multivariately evaluate the specific weights of 19 risk factors, explanatory variables, independent variables, variables predictors, regressor variables or causes (maternal age ÿ 19 years; maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; personal pathological history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; interpregnancy interval ÿ 24 months; low socioeconomic status; marital status "unmarried"; smoking; alcoholism; initiation of prenatal care at or after week N · 20 weeks of gestation; number of prenatal visits ÿ 5; type of abdominal delivery or birth route; and female gender of the product) in the response variable, dependent variable or effect (low birth weight at birth) (birth) **Material and methods.** Quantitative approach. The study design corresponds to that of an analytical observational epidemiological study of cases and controls with a directionality effectÿrisk factors and with prospective temporality. 1,815 newborns were studied [178 (9.81%) cases and 1,637 (90.19%) controls], which corresponds to nine controls per case. All term newborns (37 ÿ weeks of Gestation ÿ 41) with weights < 2,500 grams and ÿ 2,500 grams was defined, respectively, as case and control. In the evaluation of the The specific weights of the 19 risk factors were used as the values of the ÿ Exponents or Odds Ratios (OR) of the Regression Model Multiple Logistics. **Results.** OR values > 1 indicated the positive contribution of the risk factor maternal age ÿ 19 years (2.4827); maternal age ÿ 36 years (2.8070); maternal weight < 50 kg (1.4700); maternal height < 150 cm (5.5092); personal history

pathological (4.6475); age at menarche ÿ 12 years (1.0792); number of deliveries = 1 (1.5524); number of deliveries ÿ 5 (2.2714); history of abortion(s) (1.5407); pathological obstetric history (4.0735); interpregnancy interval ÿ 24 months (0.7942); low socioeconomic level (0.5694); marital status "unmarried" (1.0961); smoking (2.2019); alcoholism (0.0018); initiation of prenatal care at or after the week N ··· 20 days of gestation (0.6116); number of prenatal visits ÿ 5 (1.5966); type of delivery or delivery route: abdominal (1.6169); and female gender of the product (1.1271). **Conclusions.** The values obtained from the ÿ or OR exponents indicate the positive contribution (OR > 1) in ascending numerical order of the risk factors alcoholism (0.0018); low socioeconomic level (0.5694); start of care prenatal from or after week N ··· 20 days of gestation (0.6116); interpregnancy interval ÿ 24 months (0.7942); age at menarche ÿ 12 years (1.0792); marital status "unmarried" (1.0961); female gender of the product (1.1271); maternal weight < 50 kg (1.4700); history of abortion(s) (1.5407); number of deliveries = 1 (1.5524); number of prenatal visits ÿ 5 (1.5966); type of delivery or route of birth abdominal (1.6169); smoking (2.2019); number of births ÿ 5 (2.2714); maternal age ÿ 19 years (2.4827); maternal age ÿ 36 years (2.8070); pathological obstetric history (4.0735); pathological personal history (4.6475); and maternal height < 150 cm (5.5092).

Abstract – “Lázaro Cárdenas” Comprehensive Hospital; “Felipe Carrillo Puerto” General Hospital; “Józem María Morelos” Comprehensive Hospital Hospital; and "Tulum" Integral Hospital

Introduction. Low birth weight is an indicator that allows predicting the probability of survival of a child. In fact, there is an exponential relationship between weight deficit, gestational age, and perinatal mortality. In addition, it is important to indicate that a percentage of term children (37 ÿ weeks of gestation ÿ 41) who have low birth weight present with various sequelae of variable severity –especially in the neurological sphere– and hence the importance of predicting the presentation of low birth weight. Multiple Logistic Regression is one of the most expressive and versatile statistical instruments available for data analysis in both clinical and epidemiology. Its origin dates back to the sixties with the transcendent work of Cornfield, Gordon & Smith on the risk of suffering from coronary heart disease and, in the way we know it today, with the contribution of Walter & Duncan in which addresses the issue of estimating the probability of occurrence of a certain event based on several variables. Its use has been universalized and expanded since the early eighties, due to the computer facilities available since then. **objective.** Multivariate assessment of the specific weights of nineteen risk factors, explanatory variables, independent variables, predictor variables, regressor variables or causes (maternal age ÿ 19 years; maternal age ÿ 36 years; maternal weight < 50 kg; maternal height <150cm; pathological personal history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; birth interval ÿ 24 months; low socioeconomic level; "unmarried" marital status; tuxedo; alcoholism; initiation of prenatal care from or after 20 weeks of gestation; number of prenatal visits ÿ 5; type of delivery or abdominal birth route; and female gender of the product) in the response variable, dependent variable or effect (low birth weight). **Materials and methods.** Quantitative approach. The study design corresponds to that of an analytical observational epidemiological study of cases and controls with directionality effectÿrisk factors and with prospective temporality. 1,815 newborns were studied [178 (9.81%) cases and 1,637 (90.19%) controls], which corresponds to nine controls per case. All term newborns (37 ÿ weeks of gestation ÿ 41) with weights < 2,500 grams and ÿ 2,500 grams were defined, respectively, as a case and as a control. In the evaluation of the specific weights of the nineteen risk factors the values of the ÿ Exponents or Odds Ratios (OR) of the Multiple Logistic Regression Model were used. **Results.** OR values > 1 indicated the positive contribution of risk maternal factors age ÿ 19 years; maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; pathological personal history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; birth interval ÿ 24 months; low socioeconomic status; "not–married" marital status; tuxedo; alcoholism; initiation of prenatal care from or after

the 20th week of gestation; number of prenatal visits ÿ 5; type of delivery or abdominal birth route; and female gender of the product. **Conclusions.** The values obtained from the ÿ Exponents or Odds Ratios indicate the positive contribution (OR > 1) in ascending numerically order of the risk factors alcoholism (0.0018); low socioeconomic level (0.5694); initiation of prenatal care from or after the 20th week of gestation (0.6116); birth interval ÿ 24 months (0.7942); age at menarche ÿ 12 years (1.0792); "unmarried" marital status (1.0961); female gender of the product (1.1271); maternal weight < 50 kg (1.4700); history of abortion(s) (1.5407); number of deliveries = 1 (1.5524); number of prenatal visits ÿ 5 (1.5966); type of delivery or abdominal birth route (1.6169); tuxedo (2.2019); number of deliveries ÿ 5 (2.2714); maternal age ÿ 19 years (2.4827); maternal age ÿ 36 years (2.8070); pathological obstetric history (4.0735); pathological personal history (4.6475); and maternal height < 150 cm (5.5092).

Introduction

Low birth weight has been a mystery to science throughout history. Numerous investigations have been conducted.

(1) carried out regarding the causes that produce it and the consequences it causes .

Birth weight is one of the variables recognized as being of greatest importance due to its association with a higher risk of mortality in any period, especially the perinatal period. Birth weight is undoubtedly the most important determinant of a child's chances of success. newborns experience satisfactory growth and development. Therefore, the current rate of low birth weight newborns is It is considered a general health indicator **(2) ,** since it is of multifactorial origin, due to maternal, fetal and environmental problems **(3)** These children typically experience multiple problems later in the perinatal period, in childhood, and even in adulthood. These problems include poor adaptation to the environment and various physical and mental impairments that become evident upon reaching school age **(4)** .

Programs aimed at reducing the rate of low birth weight show that children born with a weight < Children weighing 2,500 g present a 14 times greater risk of mortality during the first year of life compared to children born at a weight normal **(5)**When the cause of low birth weight has been intrauterine growth retardation, this can become irreversible after birth. and is often accompanied by below-normal mental function and neurological and intellectual sequelae. Low birth weight constitutes Low birth weight is a global concern and is much more common in developing countries. It can be due to the following two factors. Fundamental causes: 1. Having had a birth before the end of gestation (preterm birth = < 37 weeks of gestation); or 2. That the fetus presents with insufficient weight in relation to its gestational age (intrauterine malnutrition and intrauterine growth restriction) delayed). Preterm birth has been linked to very young maternal age, rapid succession of pregnancies, and dilation permanent cervical insufficiency and various illnesses or pregnancy complications. In turn, intrauterine growth restriction is It has been linked to maternal malnutrition and to environmental and social factors. It can sometimes be considered an effect generational **(6)** .

Low birth weight is an indicator that can predict a child's chances of survival. In fact, there is a correlation. There is an exponential relationship between weight deficit, gestational age, and perinatal mortality. Furthermore, it is important to note that a percentage of the

Full-term infants with low birth weight experience various sequelae of varying severity – especially in the neurological sphere – and Hence the importance of predicting the presentation of low birth weight [7–8].

A very common problem in research is determining the effects of each of the risk factors on some Answer. In the past, it was advised that each factor be studied individually, dedicating a statistical significance test to it (analysis). bivariate). Later, Fisher indicated that important advantages are obtained by combining several factors in the same analysis (multivariate analysis) **(9)** .

The Multiple Logistic Regression Model is highly effective because each observation provides information about all the factors included in the analysis **(10)** .

Multiple Logistic Regression is one of the most expressive and versatile statistical tools available for analysis of data in clinical and epidemiological studies. Its origins date back to the 1960s with the seminal work of Cornfield, Gordon & Smith on the risk of suffering from coronary heart disease **(11)** and already, in the form in which we currently know it, with the contribution of Walter & Duncan, which addresses the topic of estimating the probability of occurrence of a certain event based on several variables [12]Its use became universal and expanded from the early eighties onwards, mainly due to the available computer resources. since then.

Logistic Regression is a multivariate statistical method that allows estimating the relationship between a dependent variable non-metric, particularly dichotomous, and a set of independent variables, whether metric or non-metric. Logistic Regression Analysis Multiple has the same strategy as Multiple Linear Regression Analysis, which differs essentially from Regression Analysis. Multiple Logistics because the dependent variable is metric; in practice the use of both methods is very similar, although their Mathematical approaches are different.

The response variable or dependent variable is not continuous, but discrete (generally taking values zero (0) and one (1)). Explanatory variables, independent variables, predictor variables, regressor variables, or causes can be quantitative or qualitative, and the equation The model's function is not initially linear, but exponential; however, through a simple logarithmic transformation, it can ultimately be presented as as a linear function.

Thus, the Multiple Logistic Regression Model will be useful in frequent practical research situations where the response
It can only take the following two values: 1 = Presence (with probability p); and 0 = Absence (with probability *1–p).*

Wald (1943) studied an asymptotic test for maximum likelihood estimates and asserted that the parameters estimated in the
Logistic models have a normal distribution for large samples. This test is used to evaluate the statistical significance (ÿ) of
each explanatory variable or regressor variable.

The Multiple Logistic Regression Model is useful because, often, the variable profile can be made up of
Both qualitative and quantitative characteristics are considered, and the aim is to integrate them all into a single, unified equation. The Model of
Multiple Logistic Regression can more closely approximate reality, since many phenomena, such as those in the epidemiological field, resemble it.
more like a curve than a straight line. Furthermore, the exponential curve chosen as the best fit can be logarithmically transformed into a
linear equation of all variables, thus the mathematical apparatus studied for Multiple Linear Regression will be applicable, although
The researcher will ultimately have to reverse the transformation to interpret their conclusions. The primary objective of the Regression Model
Multiple logistics is about modeling how regressor variables influence the probability of a particular event occurring. In short,
The overall goal of Multiple Logistic Regression is to predict the probability of an event of interest in a research study, as well as
identify the predictor variables useful for such prediction.

The Hosmer–Lemeshow goodness-of-fit test evaluates the goodness of fit of the model, that is, the degree to which the
The predicted probability matches the observed probability by constructing a contingency table and applying a $\div^2$ test. To do this,
Calculate the deciles of the estimated probabilities and divide the observed data into ten categories.

Using the Multiple Logistic Regression Model, this work was aimed at the evaluation and comparison of the
Specific weights of 19 risk factors for low birth weight in children born in four health service institutions [Hospital
General "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Ministry
Health of the Mexican state of Yucatán (SSY); Mérida Regional Hospital of the Institute of Security and Social Services for Workers
to the State Service (ISSSTE); and the "Ignacio García Téllez" National Medical Center of the Mexican Social Security Institute (IMSS)] of the
city of Mérida, Yucatán, Mexico *versus* the specific weights of 19 risk factors for low birth weight in children born in four
health service institutions (Lázaro Cárdenas Comprehensive Hospital; Felipe Carrillo Puerto General Hospital; José Comprehensive Hospital

María Morelos"; and "Tulum" Integral Hospital) of the Mayan Zone of the Mexican state of Quintana Roo, Mexico, in order to detect those risk factors that can be modified through public health interventions by the relevant health authorities.

Birth weight is considered the single most important indicator of growth and development during intrauterine life and of nutritional status of the newborn **(13–16)** . Underweight is perhaps one of the world's biggest public health problems due to its close relationship with mortality **(17)** It is estimated that 21 million babies are born with low birth weight worldwide, and Of those, 20 million are born in non-industrialized countries. Regarding mortality, in Mexico it is estimated that the incidence of low birth weight is 15% **(18–21)** .

The experts from the United States Academy of Sciences recommend the inclusion of the following variables **(22)** in the study of the incidence of low birth weight.

Social variables. Most of the social indicators with predictive value for low birth weight are strongly associated with food. Thus, for example, studies carried out during the Siege of Leningrad (1941–1944) showed that the decrease in the Nutrient availability caused a significant decrease in average birth weight of 529 and 542 g in boys and girls, respectively. **(23).** This group of social variables also recommends the inclusion of variables related to the availability of services of health, since when working with models for the prevention of low birth weight that are based on the identification of at-risk subjects Based on social variables, it is necessary to have the possibility of profoundly modifying the social structure of communities, since In various reports in the scientific literature, low birth weight is one of the characteristics of poorly developed communities. **(24–26)**.

Family variables. These constitute the necessary bridge to link social variables with biological variables and include, Basically, they are indicators of family habits and lifestyles. They establish difficult processes, insofar as they are the result of... prevailing socioeconomic conditions in the community such as:

–Socioeconomic level.– When analyzed according to paternal occupation, the percentage of low birth weight infants It can range from 3.6% in professionals to 5.5% in unskilled workers **(27);**

–Presence of malnourished individuals in the family.– The lack of available food within the family is often evident. It is reflected in insufficient nutrition not only for children, but also for pregnant women **(28);** and

–Exposure to a smoking environment.– Carbon monoxide (CO) and nicotine (CÿÿHÿÿNÿ) adversely affect the growth of the product of gestation because they rapidly cross the placental barrier **(29)** However, the mechanism involved is still unclear, as some authors propose that smoking produces a decrease in food intake **(30)** while others claim that low birth weight is due to adverse effects of the cigarette *per se* **(31);**

Biological variables. Unlike social variables, biological variables can be modified for the most part through of intervention programs. This condition means that prevention models in the short and medium term are based on this type of variables such as:

–Previous reproductive losses or a history of low birth weight infants.– There is a high probability that the Reproductive events tend to be repeated. Thus, for example, the percentage of cases with low birth weight is 5.4% in women without previous fetal losses and 9.0% in those who have had them **(32)** Furthermore, there is an increase in the incidence of low birth weight among Mothers who have had hypotrophic children (anything below the 10th percentile is considered to be a newborn) hypotrophic) compared with those who have had children of adequate weight. The incidence is 16.0 and 3.3%, respectively **(27);**

–Low pre-pregnancy weight.– When women are classified according to their pre-pregnancy weight –underweight and overweight or pre-obesity– The incidence of children with low birth weight is found to be 7.8 and 2.3%, respectively **(33)** It has been observed that women with a pre-pregnancy weight < 50 kg have a higher proportion of low birth weight infants than women with a higher weight **(34);**

–Poor weight gain during pregnancy.– According to scientific literature, there is a direct association between the weight of the newborn and maternal weight gain. It has been observed that in women with a weekly weight gain < 250 g during the two In the last few quarters, the incidence of low birth weight products doubles **(35);**

–Complications during pregnancy.– There are various intercurrent pathologies in gestation such as toxemia, bleeding and Urinary tract infections that have been associated with low birth weight **(35–36)**It has been observed that the incidence of low birth weight increased from 21 to 44% when the mother had high blood pressure **(37)** It has been documented that toxemias produce lesions at the level placental that cause a reduction in placental flow of 300 to 600 ml/min with the consequent decrease in the supply of nutrients to the fetus **(16);**

–Alcohol abuse.– Some researchers have found no association between alcohol intake (ÿ 3 g/day) and low birth weight.
be born. However, when alcohol consumption is higher, the "alcohol-induced fetal syndrome" occurs, in which there are alterations in development, malformations and low birth weight **(38);**

–Age less than 17 years.– The mother's age is a variable frequently associated with fetal hypotrophy **(28, 30, 34)** . In
In the two years following the onset of menarche, the risk of having a low birth weight child doubles because the mother's own energy needs increase due to growth and she is unable to meet the demands of pregnancy **(23, 27, 32);** and

–Limited maternal experience or lack of psychosocial support.– Pregnancy triggers a series of social, psychological and biological factors. When a woman does not have the necessary support to adjust properly to pregnancy, she is likely to be unable to respond to the demands and, therefore, give birth to a child with low birth weight. Thus, for example, when the frequency with which
Among infants born to single mothers, the percentage of low birth weight was 8.65%, while among mothers who had
The frequency was 4.41% **(27)** .

Background

Maternal age.– Duanis–Neyra and Neyra–Álvarez **(6)** reported that maternal age ÿ 19 years represents a risk factor essential for children to be born weighing less than 2,500 g. This is because adolescents are not suitable for the Pregnancy, since their organs are immature and there is a possibility of having a low birth weight baby. Studies conducted by Benício *et* al., **(43)** and Victoria *et* al., **(44)** report that one of the factors that was associated with low birth weight was maternal age ÿ 19 years. A study by Liang *et* al., **(45)** reports that as maternal age increases (ÿ 36 years) newborns tend to to present a decreasing weight. Santos–Pereira–Solla *et* al., **(46)** report that very young pregnant woman (ÿ 19 years) or of advanced maternal age (ÿ 36 years) were factors associated with low birth weight with OR values > 1. A study carried out by Aguilar–Valdés *et* al., **(47)** reports that the Being under 20 years of age at delivery had an OR > 1, and this association was statistically significant with low birth weight. Bortman **(48)** reports that maternal ages that increase the risk of low birth weight are those under 20 years of age and those between 35 and 39 years and older. Ruiz-Linares *et* al. **(49)** and Gama *et* al. **(50)** have identified maternal age under 20 years as a risk factor, and Santos-Pereira-Solla *et* al. **(46)** have identified maternal age over 35 years as a risk factor.

low birth weight. Fuentes-Afflick & Lurie **(51)** have extensively investigated the maternal ages at which pregnancy is most likely has a favorable outcome, concluding that ages under 20 and over 35 have been identified as Risk factors for low birth weight. During the period from 1990 to 1993, Díaz-Alonso *et* al., **(52)** conducted a study retrospective case-control study in the area of the "Luis A. Turcios Lima" Teaching Polyclinic in the municipality of 10 de Octubre with the objectives of To identify the behavior of low birth weight and to establish the existence and intensity of this condition with risk factors selected; the variables studied were maternal age, weight assessment, obstetric complications, diseases associated with the Pregnancy, smoking habit, and interpregnancy interval; all variables were significantly associated with low birth weight, and maternal age ÿ 19 years was identified as a risk factor with a slight influence. Jewell *et* al., **(53)** analyzed the ages of the mothers and They found that, for the estimation of birth weight, children of mothers aged ÿ 16 years weighed 62 g less than those of mothers aged between 20 and 35 years; similarly, the children of mothers between 17 and 19 years old weighed 43 g less, those of mothers between 36 and 38 years old weighed 15 g less and those of mothers aged ÿ 39 years weighed 28 g less; in addition, in the estimation of low birth weight, mothers aged ÿ 36 years had children with lower weight; these differences reinforce the idea of the social and/or reproductive risk of extreme maternal ages and consider age

Ideally between 20 and 35 years. Chen *et* al., **(54)** reported that the risk of low birth weight increases if mothers, due to education and

Women in the workforce have decided to postpone motherhood until after the age of 35.

Maternal weight.— One of the risk factors for low birth weight most frequently found in studies conducted by Duanis–Neyra and Neyra–Álvarez **(6)** by Cisneros *et* al., **(2)** is a pre-pregnancy weight of less than 50 k g . LFeemdu ri sc-kLago *et* al., **(1)** Hernández–

Adelstein **(34)** observed that women with a pre-pregnancy weight < 50 kg have a higher proportion of low birth weight infants than women with a higher weight. Benício *et* al. **(43)** performed a multifactorial analysis and found that one of the factors associated with low birth weight was a pre-pregnancy maternal weight < 50 kg. Regarding weight assessment, Faúndes *et* al. **(55)** state that

The greater the mother's weight at the start of pregnancy, the greater the average weight of the newborn, and the better the weight will be.

when the patient has a pre-pregnancy weight ÿ 50 kg. Soriano-Llora *et* al., **(56)** report that a pre-pregnancy maternal weight < 50 kg is

was associated with low birth weight (OR= 1.7; 95% CI= 1.03–2.69). In the logistic model, the absence of maternal weight

Pre-pregnancy weight ÿ 50 kg acts as a risk factor for low birth weight; this has been reported in studies conducted by

Cnattingius *et* al., **(57)** and Doctor *et* al., **(58)** Casanueva **(59)** and Bakewell *et* al., **(60)** who point out that it is important to consider that maternal weight

< 50 kg is a risk factor for low birth weight and for it to be repeated in subsequent pregnancies.

Maternal height.– Studies carried out by Lemus-Lago *et* al., **(1)** report that one ofrntheDuanis–Neyra & Neyra–Álvarez **(6)**

The most frequently found risk factor for low birth weight is maternal height < 150 cm. Hernández-Cisneros *et* al., **(2)**

They report that one anthropometric variable that should be taken into consideration is height, since a pregnant woman's height < 150 cm increases the risk of having a low birth weight child. Santos-Pereira-Solla *et* al., **(46)** report that maternal height ÿ 149 cm was a factor associated with low birth weight with an OR > 1. A study by Casanueva **(59)** reports that when

Mothers who are shorter than 150 cm increase the number of low birth weight babies.

Past medical history.– Galbraith *et* al., **(37)** reported that the incidence of low birth weight increased from 21 to 43%

when the mother had high blood pressure. Among the risk factors for low birth weight that have been most frequently found

in studies carried out by Lemus–Lago *et* al., **(1)** Hernández–Cisneros *et* al., **(2)** hypertensionanisdpDreusaennist–Neyra and Neyra–Álvarez **(6)**

arterial hypertension during pregnancy and cervicovaginal sepsis. Several authors have reported the association between low birth weight and factors

such as chronic hypertension **(61)** , kidney diseases **(62)** , thyroid diseases, cardiorespiratory diseases and

autoimmune diseases **(63)** · In recent years, Deodhar & Jarad **(64)** , Vangen *et* al., **(65)** , Bergsjo & Villar **(66)** and Stratton *et* al., **(67)** have

Studies have examined how certain maternal characteristics can influence indicators of the degree of growth in newborns; in particular, it has been shown that

It has been shown that certain conditions, such as blood pressure disorders, diabetes mellitus, and infections, are related to alterations in

the weight of the newborn. Mota-Sanhua *et* al., **(68)** conducted a study on the distribution of newborns according to various

maternal history found that 30% had maternal history without pathology (AMSP), 22% had maternal history with

High blood pressure (AMCHA) and about 7% had a maternal history of diabetes mellitus (AMDM); the authors present the risks

low birth weight according to various maternal histories; children with AMCHA had a 2.4 times greater risk of low birth weight

at birth that children with AMSP and this was the only statistically significant risk of low birth weight; likewise, the authors present

The risks of macrosomia in newborns (ÿ 4,500 g); children with AMDM had a five times greater risk of being born with macrosomia

that children with AMSP and this was the only statistically significant risk factor for macrosomia. In a study conducted in women

Canadians with blood pressure disorders, Xiong *et* al., **(69)** found that the risks of low birth weight are greater than those of

hypertrophy, regardless of the severity of the disorder.

Age at menarche.— Langer and Arroyo **(7)** , Harfouche **(13)** and Beal **(14)** report age at menarche ÿ 12 years as a risk factor

of low birth weight. A study by Franco-Monsreal *et* al., **(70)** reports a statistically significant association at the level of

significance (ÿ) of 5% between low birth weight and age at menarche ÿ 12 years.

Parity.– Langer and Arroyo **(7)** , Harfouche **(13)** , Beal **(14)** and Bergner & Susser **(23)** report primiparity and multiparity (ÿ 5 births)

as risk factors for low birth weight. Primiparity has been associated with low birth weight in

(72) studies carried out by Campbell *et* al., **(71)** and Silva *et* al., Furthermore, Campbell *et* al., **(71)** report that although in pregnancies

In subsequent pregnancies, a decrease in the incidence of low birth weight was observed, but an increase in this risk was again detected starting with the

fourth child. Najmi **(73)** reports that a historyof four or more births is identified as a risk factor for low birth weight.

birth; however, neither in the crude analysis nor in the multivariable analysis did this variable present a significant risk. Millar *et* al.,

(74) describe in their study the existence of an increased risk of low birth weight with primiparity. Fernández-González *et* al., **(75)**

They report a statistically significant association between low birth weight and primiparity. Likewise, the association between low birth weight

at birth and primiparity is reported in an investigation carried out by Pagola-Prado **(76)** .

History of abortion(s).– Pitkin **(15)** reports a history of abortion(s) as a risk factor for development and presentation of low birth weight. Likewise, Rosell-Juarte *et* al., **(77)** report that a factor associated with low birth weight is a history of abortion(s); previous abortions and stillbirths decrease birth weight by 18 and 29 g and increase the likelihood of low birth weight by 0.6% and 1.3%, respectively; the above indicates the existence of natural or environmental factors that have a negative effect on gestation forcing us to identify the reasons and address them as far as possible. A study by Franco-Monsreal *et* al., **(70)** reports the statistically significant association at the significance level (ÿ) of 5% between low birth weight and history of abortion(s).

Pathological obstetric history.– Langer and Arroyo **(7)** , Harfouche **(13)** and Beal **(14)** report pathological obstetric history as a risk factor for low birth weight. Silva *et* al., **(78)** and Abdulrazzaq *et* al., **(79)** report that a history of Previous deliveries with low birth weight constitute a risk factor for the development of low birth weight infants. The results obtained in studies carried out by Miller & Mvula **(80)** and by Bratton *et* al., **(81)** indicate that a history of low birth weight in pregnancies Previous history is the main risk factor in subsequent pregnancy; in 20.4% (51/250) of the case group and in 6.4% (16/250) of the In the control group, these authors found a history of low birth weight in previous deliveries; the differences between the two groups were statistically significant *(p* < 0.0010); in the Logistic Regression Model this variable acts as a risk factor with a The adjusted OR was 4.2, with a 95% CI of 2.0–8.9 and a *p* < 0.001. Becerra *et* al., **(82)** found that the presence of previous perinatal death is a strong predictor of subsequent prematurity and low birth weight. Bakewell *et* al., **(60)** reported that a history of a previous pregnancy Having a child with low birth weight shows a strong relationship to repeating low birth weight, especially when the second pregnancy is preceded by an extremely low birth weight infant; the risk of repeating low birth weight has been calculated at 10.1 for preterm infants small for gestational age, in 7.9 for preterm infants with appropriate weight for gestational age and in 6.3 for small for gestational age term products.

Interpregnancy interval. —Bergner & Susser **(23)** and Sever *et* al. **(24)** report that an interpregnancy interval ÿ 24 months represents a key risk factor for infants being born with a weight < 2,500 g. A longitudinal study by Victoria *et* al. **(44)** reports a short interpregnancy interval as a risk factor for low birth weight. Santos-Pereira-Solla *et* al. **(46)** report that brevity The interpregnancy interval (< 13 months since the last pregnancy) was a risk factor associated with low birth weight with an OR value > 1. An investigation carried out by Bortman **(48)** reports that the risk of having children with low birth weight was higher in those women

whose interpregnancy interval was < 18 months. From 1990 to 1993, Díaz-Alonso *et* al., **(52)** conducted a retrospective case-control study in the area of the "Luis A. Turcios Lima" Teaching Polyclinic in the 10 de Octubre municipality with the objectives of identifying the behavior of low birth weight and to establish the existence and intensity of this condition with the selected risk factors; the variables studied These included maternal age, weight assessment, obstetric complications, pregnancy-related illnesses, smoking habit, and interval interpregnancy interval; all variables were significantly associated with low birth weight and an interpregnancy interval < 1 year was identified as a risk factor with a moderate effect; in mothers with an interpregnancy interval < 1 year, it was observed that in the group of The study showed a prevalence of 34.3% in the 23 patients and 13.8% in the control group of 44 patients; for an interpregnancy interval ÿ 1 The behavior was 43 patients for 64.7% in the study group and 280 patients for 85.2% in the control group: x 2= 14.84; df= 1; p < 0.01; and OR= 3.25; therefore, it was clearly a risk factor, since its presence tripled the probability that a low birth weight baby. A study by Díaz-Tabares *et* al., **(83)** reports that during pregnancy and lactation the mother It depletes its biological and nutritional resources, so it needs time to recover and prepare for another pregnancy; the above explains The high frequency of low birth weight when the time between pregnancies is short. López **(84)** reports that the children Properly spaced infants have a greater weight than those born at short intervals and suggest a minimum safety period of 36 months. Franco-Monsreal *et* al., **(70)** report the statistically significant association at the significance level (ÿ) of 5% between low birth weight and the interpregnancy interval ÿ 24 months.

Socioeconomic level.– Langer and Arroyo **(7)** , Harfouche **(13)** , Beal **(14)**, Pitkin **(15)** , Beal **(16)** and Jurado-García **(17)** report the level Low socioeconomic status as a risk factor in the presentation of low birth weight. A study conducted by Goldenberg *et* al., **(85)** Sung *et* al. **(86)** report that low birth weight is more frequently associated with mothers from disadvantaged economic backgrounds. that in Scotland, particularly among working-class women, the mother's social class represents a risk factor independent of maternal age, parity, adverse obstetric history and the father's socioeconomic status.

Marital status.– Langer and Arroyo **(7,)**Harfouche **(13)** , Beal **(14)**, Pitkin **(15)**, Beal **(16)**, Jurado-García **(17)** and Arias & Tomich **(25)** report the Marital status as single as an associated risk factor in the presentation of low birth weight. Bortman **(48)** reports that the risk of having children Low birth weight is more frequently associated with unmarried women. Soriano-Llora *et* al., **(56)** report that Marital status "unmarried" was identified as a risk factor for low birth weight (OR= 1.7; 95% CI= 1.1–2.7); the authors note that in

In this sense, it is worth noting that the category "unmarried" does not implicitly imply the presence or absence of social, emotional and stability, which could be due to a poor economic situation and stresses associated with pregnancy in a woman in this situation. Likewise, Hall **(87)** reports the marital status "unmarried" as a risk factor for low birth weight. Ventura *et* al., **(88)** report Regarding marital status, single women showed an OR= 1.67 and 95% CI= 1.36–2.07; the authors note that values Higher odds ratios were observed for these same factors in term infants. Nault **(89)** is the main, In Cameroon, it is reported that being a single mother risk factor for low birth weight. Chaturachinda *et* al., **(90)** report that when they analyzed the change in marital status in Interestingly, different pregnancy studies found that married mothers had a higher incidence of low birth weight in their first child. but less low birth weight in the second child, with a greater risk of low birth weight in those who did not remain married for the second pregnancy (OR= 1.4 *versus* OR= 1.3); thus, they conclude, being single seems to increase the risk of low birth weight in the young women in contrast to single adult women.

Smoking.– Langer and Arroyo **(7)** , Harfouche **(13)**, Beal **(14)**, Pitkin **(15)**, Beal **(16)** and Sinclair & Saigal **(26)** report maternal smoking as a risk factor for the presentation of low birth weight. Rosell-Juarte *et* al., **(77)** point out that a risk factor of connotation in Their contribution to low birth weight is smoking, which exerts its negative influence both by causing prematurity and by causing malnutrition. intrauterine. Studies by Risiko **(91)** and Ganzer **(92)** report that children of smoking mothers weigh on average 200 to 300 g less at birth than those of non-smoking mothers. Bakketeig *et* al., **(93)** report in their study that smoking mothers have twice as many probability of giving birth to a low birth weight newborn compared to non-smoking mothers. Barros *et* al., **(94)** determined using the technique of Regression studies indicate that one of the most important variables associated with low birth weight is smoking during pregnancy; according to these The authors state that the toxic products of tobacco damage the vascular bed, causing disorders in fetal nutrition and oxygenation. Benício *et* al., **(43)** performed a multifactorial analysis and found that one of the factors associated with low birth weight is smoking during pregnancy. Santos-Pereira-Solla *et* al., **(46)** report that smoking during pregnancy is a factor associated with low birth weight. to be born with an OR value > 1. Martin *et* al., **(95)** reported that smoking practically doubles the risk of the baby being born with low birth weight; In the United States of America, in 2002, 12.2% of babies born to smoking mothers were born with low birth weight compared to 7.5% of babies born to non-smoking mothers. Lightwood *et* al., **(96)** and Lumley *et* al., **(97)** point out that interventions to reduce smoking During pregnancy, they have demonstrated their usefulness and cost-effectiveness in reducing low birth weight. Of the social factors studied

According to Aguilar-Valdés *et* al., **(47)** being a smoking mother had an OR > 1 and this association was statistically significant with low birth weight. A research study by Bortman **(48)** reports that the risk of having children with low birth weight is high in women who smoke. A multivariable study by Cabrales-Escobar *et* al., **(98)** reports a significant association between low birth weight and smoking. Studies by Santos-Pereira-Solla *et* al., **(46)** , Brown *et* al., **(99),** Lieberman *et* al., **(100)** Brett *et* al., **(101)** identified the association between low birth weight and maternal smoking during pregnancy. Díaz-Alonso *et* al., **(52)** conducted a retrospective case-control study in the area of the "Luis A. Turcios Lima" Teaching Polyclinic in municipality 10 of October during the period from 1990 to 1993; the variables studied were maternal age, weight assessment, complications obstetrics, pregnancy-related diseases, smoking habit, and interpregnancy interval; all variables were associated significantly associated with low birth weight and smoking was labeled as a risk factor with a moderate effect. Jewell *et* al., **(53)** Reports indicate that in mothers who smoke, the probability of having a low birth weight newborn increases by 2.5%, decreasing the birth weight. in 116 g. Medical scientific literature has shown that this characteristic causes a deleterious effect on fetal blood flow placental and on the fetus. According to Bouckaert **(102)**, Tobacco use is an environmental and behavioral risk that is associated with This is an important factor associated with an increased incidence of low birth weight. There appears to be a dose-response relationship between the number of cigarettes smoked by the mother during pregnancy and the decrease in the weight of the product at birth, a decrease quantified by Chomitz *et* al., **(103)** between 150 and 320 g. Windham *et* al., **(104)** report in their study that although the consumption of more than 10 cigarettes has been considered Daily smoking is associated with a higher risk of low birth weight; to date, no safe recommended smoking level has been established. In the study conducted by Soriano-Llora *et* al., **(56)** this circumstance was recorded dichotomously (yes or no) and acted as a factor of risk when obtaining the following results: OR= 1.6; 95% CI= 1.1–2.4; and p= 0.01; however, these results may be biased, since that tobacco use is often associated with combined consumption with alcohol **(105)** , with coffee **(106)**, with illicit drugs **(107–109)** or with a combination of all of them **(110–111)** Franco-Monsreal *et* al., **(70)** report in their study the statistically significant association at the level significance (ÿ) of 5% between low birth weight and smoking habit.

Alcoholism.– Investigations carried out by Langer and Arroyo **(7)** , Harfouche **(13)** and Beal **(14)** report maternal alcoholism as Risk factors associated with low birth weight. Among the factors that increase the probability of low birth weight Birth weight has been cited as a factor in alcohol consumption, a substance which, according to Rama-Sastryd **(112) ,** along with its metabolites, crosses the placenta and

It acts on the fetus, producing in 84% of cases, according to Elorza **(113)** and Aguilar , prenatal and postnatal growth deficiencies that **(114),** explaining a birth weight lower than the gestational age and the poor response to nutritional intervention during childhood **(115)** It has It has been shown that the children of women who consume at least one cup of alcohol daily weigh around 160g less on average than Those of mothers who do not consume it, which, according to , It is caused by the restriction of cell growth during critical periods with Buyse **(116),** has a notable impact on the normal development of the cellular cytoskeleton. Romera and Fernández **(117)** assert that the "safe level" has not been defined, so abstinence during pregnancy is recommended. According to Lazzaroni *et* al., **(118)** alcohol consumption is a risk environmental and behavioral factors that are significantly associated with an increased incidence of low birth weight.

Week of gestation at the start of prenatal care.– Arias & Tomich **(25)** report the start of prenatal care from or after week N ·· 20 weeks of gestation as a risk factor associated with low birth weight. The maternal and child health program Cubans have established the requirement to have a first prenatal check-up by the primary care physician before week N ·· 14 weeks of gestation and the evaluation by a specialist 15 days after the first check-up. Based on these standards, the hypothesis was formulated that the first check-up Late prenatal testing for pregnancy evaluation could constitute a risk factor for low birth weight. Cabrales-Escobar *et* al., **(98)** revealed a statistically significant association between low birth weight and late pregnancy control (after the first 14 weeks). Franco-Monsreal *et* al., **(70)** report the statistically significant association at the significance level (ÿ) of 10% between low weight at birth and the start of prenatal care from week N ·· 20 days of gestation.

Number of prenatal visits.– Arias & Tomich **(25)** report five or fewer prenatal visits as a risk factor associated with The presentation of low birth weight. A multifactorial analysis by Benício *et* al., **(43)** reports that one of the factors associated with low birth weight is the absence of prenatal care. Santos-Pereira-Solla *et* al., **(46)** report that deficient prenatal care (< 6 visits) is a factor associated with low birth weight with an OR > 1. Bortman **(48)** reports that the highest OR corresponded to lack of prenatal care (OR= 8.77; 95% CI= 6.7–11.4); likewise, this author reports that the Odds Ratio (OR) values associated with Inadequate prenatal care and a delayed first prenatal visit were greater than two. Cabrales-Escobar *et* al., **(98)** report a statistically significant association between low birth weight and delayed prenatal visit. Brown *et* al., **(99)** report the association between Low birth weight and inadequate prenatal medical care. Based on a study of births occurring between 1995 and 2003 in the main maternity hospital in Uruguay, Jewell *et* al., **(53)** report having found a positive effect on low birth weight when

Prenatal care increases; the results, through two-stage least squares estimations and controlling for the
The endogeneity of prenatal care shows that going from no check-ups to nine (the appropriate amount for low-risk pregnancies) would increase birth weight by 521 g. Halpern *et* al., **(119)** report that low birth weight is associated with both prenatal care initiated late (after week N · 13 weeks of gestation) as well as by an insufficient number of visits (less than six). Using Abel **(120) ,** using a scale to classify prenatal care as adequate, intermediate, and inappropriate, found that adequate and intermediate care decreases the risk of prematurity and low birth weight. Moore *et* al. **(121)** conducted a comparative study between pregnant women with and without prenatal care, reporting, for the former, significant reductions in the frequency of premature births and low birth weight infants at birth, in addition to fewer very low birth weight infants. A study by Franco-Monsreal *et* al., **(70)** reports an association statistically significant at the significance level (ÿ) of 5% between low birth weight and a number of prenatal visits ÿ 5.

Type of delivery or route of birth.– Sinclair & Saigal **(26)** report the type of delivery or abdominal route of birth as a factor of risk in the presentation of low birth weight. A research study carried out by Franco-Monsreal *et* al., **(70)** reports that the The percentage (51.62%) of cases was significantly higher than the percentage (11.68%) of controls with type of delivery or birth route abdominal and conclude by pointing out the existence of statistically significant evidence at the significance level (ÿ) of 5% to conclude that there is an association between low birth weight and the type of delivery or abdominal birth route.

Product gender.– Research work carried out by van den Berg **(27)** and by Habicht *et* al., **(28)** reports the female gender of the product as a risk factor associated with the presentation of low birth weight. Barros *et* al., **(94)** determined using the technique of Regression studies show that an important variable associated with low birth weight is the female gender of the infant. A study conducted by Jewell *et* al., **(53)** reports that, as expected, boys at birth weigh on average 111 g more than girls, thus decreasing the probability of being born with low birth weight.

Justification

The low birth weight rate is defined as the ratio obtained by dividing the total number of live births registered with a weight less than 2,500 g in a given area and in a given period among the total number of live births registered in that same area and in that same period **(122)** .

According to a report presented in November 2020 by the Pan American Health Organization **(39) ,** Mexico is among The countries with high rates of low birth weight babies. The figure rises to 181,840 babies and places the country second only to Brazil. It ranks first with 269,920 children. Haiti is the Latin American country with the highest percentage of underweight children. birth (15.0%), followed by Guatemala (14.0%) and Puerto Rico (14.0%). Mexico is at an intermediate level (8.0%), as is Brazil, by below Venezuela (10.0%) and above Argentina (7.0%). The countries with the lowest percentage of low birth weight babies are Belize (6.0%), El Salvador (6.0%), Peru (6.0%) and the Dominican Republic (6.0%). Low birth weight rates for Central American countries are They are found in the following ascending order: El Salvador (6.0%), Costa Rica (7.0%), Nicaragua (9.0%), Honduras (9.0%), Panama (10.0%) and Guatemala (14.0%). Similarly, for South American countries, the corresponding low birth weight rates, in ascending order, are Peru (6.0%), Chile (7.0%), Argentina (7.0%), Uruguay (8.0%), Brazil (8.0%), Paraguay (9.0%), Ecuador (9.0%), Colombia (9.0%), Bolivia (10.0%) and Venezuela (10.0%).

According to data from the National Institute of Statistics and Geography (INEGI) **(40) ,** corresponding to the years 2015–2019, the state Mexicano de Yucatán was ranked number 4 with a rate of 7.7% (national rate of 6.1%); number 15 with a rate of 4.7% (national rate of 4.5%); number 7 with a rate of 8.3% (national rate of 7.4%); number 3 with a rate of 8.2% (national rate of 6.4%); and, again, in third place with a rate of 7.9% (national rate of 6.6%). The comparison of low birth weight rates for The Mexican state of Yucatán, compared to the corresponding figures for the Mexican Republic, showed statistically significant differences. for the years 2017 ($x^2M–H= 44.55$; p= 0.0000); 2018 ($x^2M–H= 180.11$; p= 0.0000); and 2019 ($x^2M–H= 96.27$; p= 0.0000). Due to a lack of data, it was not possible to When the comparison was made for the year 2015 and for the year 2016, no statistically significant difference was found ($x^2M–H= 3.45$; p= 0.0629).

However, there are no previous studies that multivariately evaluate the specific weights of risk factors in low birth weight. to be born. Therefore, this thesis work constitutes a contribution that evaluates the specific weights of 19 risk factors in the low birth weight in four health service institutions [General Hospital "Dr. Agustín O'Horán" of the State Health Secretariat

Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Mexican State of Yucatán Health Secretariat (SSY); Regional Hospital Mérida of the Institute of Security and Social Services for State Workers (ISSSTE); and the "Ignacio" National Medical Center García Téllez" of the Mexican Social Security Institute (IMSS)] in the city of Mérida, Yucatán, Mexico, as well as the specific weights of 19 risk factors for low birth weight in four health service institutions (Lázaro Cárdenas Comprehensive Hospital; Hospital General "Felipe Carrillo Puerto"; "José María Morelos" Comprehensive Hospital; and "Tulum" Comprehensive Hospital) of the Mayan Zone of the Mexican state from Quintana Roo, Mexico, according to the Multiple Logistic Regression Model. Case-control study.

Problem statement

What are the specific weights of 19 risk factors (maternal age ÿ 19 years; maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; personal pathological history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of miscarriage(s); pathological obstetric history; interpregnancy interval ÿ 24 months; low socioeconomic status; marital status "unmarried"; smoking; alcoholism; initiation of prenatal care at or after week N ¯· 20 days of gestation; number of consultations prenatal factors ÿ 5; type of delivery or abdominal delivery route; and female gender of the product) in low birth weight in four institutions of health services [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Hospital Maternal and Child Hospital of the Yucatán State Health Secretariat (SSY); Mérida Regional Hospital of the Institute of Social Security and Social Services for State Employees (ISSSTE); and the "Ignacio García Téllez" National Medical Center of the Institute Mexican Social Security Institute (IMSS)] in the city of Mérida, Yucatán, Mexico, as well as in four health service institutions (Hospital "Lázaro Cárdenas" Comprehensive Hospital; "Felipe Carrillo Puerto" General Hospital; "José María Morelos" Comprehensive Hospital; and "Tulum" Comprehensive Hospital from the Mayan Zone of the Mexican state of Quintana Roo, Mexico?

General objective

Multivariate assessment of the specific weights of 19 risk factors for low birth weight in children born in four health service institutions [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Yucatán State Health Secretariat (SSY); Mérida Regional Hospital of the Institute of Social Security and Services for State Employees (ISSSTE); and the "Ignacio García Téllez" National Medical Center of Mexican Social Security Institute (IMSS)] of the city of Mérida, Yucatán, Mexico and in four health service institutions (Hospital "Lázaro Cárdenas" Comprehensive Hospital; "Felipe Carrillo Puerto" General Hospital; "José María Morelos" Comprehensive Hospital; and "Tulum" Comprehensive Hospital from the Mayan Zone of the Mexican state of Quintana Roo, Mexico.

Specific objectives

Evaluate the contribution (positive, negative, or zero) using the ÿ Exponents or Odds Ratio of 19 risk factors in low weight at birth through different types of statistical significance tests; and

Predict the probability value of low birth weight (response variable, dependent variable or "Y" effect) by applying of the Multiple Regression Logistic Model given certain values of explanatory variables, independent variables, variables predictors, regressor variables or causes (X1, X2, X3 , X4 , X5 , X6 , X7 , X8 , X9 , X10 , X11 ,

Formulation of hypotheses

Null hypothesis (Ho)

The values of the ÿ Exponents or Odds Ratios are ÿ 1, which indicates a zero contribution (OR = 1) or a negative contribution (OR = 0). < 1), respectively. Additionally, there is no statistically significant evidence at the significance level or significance level (ÿ) of 5% to conclude that the effect (low birth weight) and risk factors (maternal age ÿ 19 years; maternal age ÿ 36 years; weight Maternal weight < 50 kg; maternal height < 150 cm; past medical history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; interpregnancy interval ÿ 24 months; low socioeconomic level; marital status "unmarried"; smoking; alcoholism; initiation of prenatal care at or after week N · 20 days of gestation; number prenatal consultations ÿ 5; type of delivery or abdominal birth route; and female gender of the product) are associated.

Alternative hypothesis, working hypothesis or research hypothesis (H1)

The values of the ÿ exponents or odds ratios are > 1, indicating a positive contribution (OR > 1). Additionally, there are statistically significant evidence at the significance level (ÿ) of 5% to assume that the effect (low weight at birth) and risk factors (maternal age ÿ 19 years; maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; history personal pathological history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); history pathological obstetrics; interpregnancy interval ÿ 24 months; low socioeconomic level; marital status "unmarried"; smoking; alcoholism; Start of prenatal care from or after week N · 20 weeks of gestation; number of prenatal visits ÿ 5; type of delivery or route of abdominal birth; and female gender of the product) are associated.

Materials and methods

–Epistemological approach

Quantitative approach, probabilistic approach or positivist approach **(20)** .

–Study design

Observational analytical epidemiological study of cases and controls with directionality (effectÿcause) and with temporality prospective **(21)** .

–Universe of study

Births (cases and controls that met the inclusion criteria) occurring in four institutions were recorded. health services [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternity Hospital Children's Hospital of the Yucatán State Health Secretariat (SSY); Mérida Regional Hospital of the Institute of Security and Social Services Social Security Institute for State Employees (ISSSTE); "Ignacio García Téllez" National Medical Center of the Mexican Institute of Social Security (IMSS)] of the city of Mérida, Yucatán, Mexico, as well as four health service institutions (Integral Hospital "Lázaro Cárdenas"; General Hospital "Felipe Carrillo Puerto"; Comprehensive Hospital "José María Morelos"; and Comprehensive Hospital "Tulum") of the Mayan Zone of the Mexican state of Quintana Roo, Mexico, during the period from February 1, 2019 to January 31, 2020.

Mérida, Yucatán, Mexico

In the Southeast of the Mexican Republic, the municipality of Mérida is a city of great importance because, in addition to providing services It is an economic center that influences the states of Quintana Roo, Campeche, Tabasco, and Chiapas. At the state level, of the 106 Among the municipalities of the State of Yucatán, the most important and influential is the municipality of Mérida because it contains the vast majority of the State's socio-economic activities and public administration, cultural, commercial, equipment and financial services which causes the municipality of Mérida to have a continuous flow of people with goods, concentrating a large job market and also It requires more services.

Location and area. The city of Mérida is located in the Northwest of the Yucatán Peninsula, less than 50 km from the Gulf. of Mexico between the parallels 202°45" and 212°15" North latitude and the meridians 892°30" and 892°45" West longitude. It has an area of 858.41 km² (equivalent to 2.18% of the surface area of the entire state and 0.04% of the national territory) and borders to the North with Progreso and

Chicxulub Town; to the South with Tecoh, Abalá and Timucuy; to the east with Conkal, Kanasín and Tixpéhual; and to the west with Ucú and Umán. The Zone The conurbation is made up of the municipalities of Kanasín, Conkal, Ucú, Umán, Tixpéhual, Progreso and the municipality of Mérida itself.

Police stations and sub-stations. The municipality is territorially divided into the following police stations and sub-stations with a population total of 52,083 inhabitants: Caucel (the largest with a population of 6,988 inhabitants), Cosgaya, Chablekal, Cholul, Dzityá, Dzununcán, Komchén, Molas, Sitpach, Sierra Papacal and San José Tzal, and with the sub-commissions of Chalmuch, Cheumán, Chichí Suárez, Dzibichaltún, Dzidzilché, Dzoyaxché, Hunxectamán, Kikteil, Noc–Ac, Oncán, Opichén, Petac, Sac–Nicté, San Antonio Hool, San Pedro Chimay, San Ignacio Tesip, Santa Cruz Palomeque, Santa María Chi, Santa Gertrudis Copó, Suytunchén, Susulá, Tamanché, Santa María Yaxché (the most small with 52 inhabitants), Tahdzibichén, Temozón Norte, Texán Cámara, Tixcuytún, Tixcacal, Tzacalá, Xcanatún, Xcumpich, Xcunyá, Xmatkuil, Yaxché Casares, Yaxnic, and Sodzil Norte. The main towns are Caucel, Cholul, Komchén, and San José Tzal. Thirty-five Localities within the municipality of Mérida have a high marginalization index because more than 70% of their inhabitants earn less than two minimum wages and between 40 and 80% of its population lacks a primary education. Furthermore, eight localities located mainly to the Northeast and South of the city and in the vicinity of the main communication routes in the municipality have a medium marginalization index, given that between 30 and 40% of the inhabitants do not have primary education and between 70 and 85% perceive less than two minimum wages. Only the towns of Mérida and La Ceiba have a very low marginalization index; regarding Mérida 10.47% of the population does not have primary education and 51.26% earn less than two minimum wages, and in relation to the second, The percentage of the population without primary education is 4.21%, and the percentage of people earning less than two minimum wages is 23.69%.

Population. A total of 830,732 people live in the municipality of Mérida, of which 401,340 are men and 429,392 are women. This represents 42.5% of the total population in the state of Yucatán, with an average annual growth rate of 1.8%. Of the total Of the population, 32.94% are between 0 and 19 years old; 55.29% are between 20 and 59 years old; and 10.62% are 60 years and older. The most widely spoken indigenous language is... Besides Spanish, there is Maya, with the population aged 3 and over who do not speak an indigenous language being 703,371 (338,117 men and 365,254 women). women) and the population that does speak an indigenous language is 74,827 (36,573 men and 38,254 women). Likewise, the total population of five The number of people aged 674,371 and over who practiced the Catholic religion was 69,462, while the number of Protestant and Evangelical citizens was 69,462. The number of people belonging to a non-evangelical biblical religion was 26,749, the Jewish population was 152, and those practicing any other religion were...

represented by 897 people, and 39,279 citizens stated that they did not practice any religion. The predominant religion in the
The municipality of Mérida is predominantly Catholic with 81.18%, and the churches located in the city are Catholic, Mormon, Seventh Day Adventist, Church of the Living God, Pillar and Ground of the Truth, Light of the World, and the Church of Latter Day Saints.

Employment. Yucatán is among the states with the lowest unemployment rates. As of the third quarter of 2011, the population
The economically active population (EAP) of the state amounted to 935,936 people, of whom 907,325 were employed (553,683 men and
353,642 women) compared to the first quarter of 2009; this represented an increase in the employed population of 31,804 people. This
This favorable performance allowed Yucatán to position itself in the third quarter of 2011 as the fifth state with the lowest rate of
unemployment at 3.6% of the economically active population, a rate slightly higher than that recorded during 2009, which was 3.4%, well below the rate of
national unemployment, which during the reference period was 6.2%. The informal economy is one of the main obstacles that
Yucatán faces this challenge. In the third quarter of 2011, the occupancy rate in this sector was 33.4%, above the national rate for the same period.
The rate of employment in the informal sector was 28.7% during the period, and it is higher for women than for men, since in the third quarter
In 2011, this indicator was 36.6% for women and 31.4% for men; regarding the municipality of Mérida, the economy
The informal sector represents 25.7% of the employed population, of which 25.4% are men and 26.2% are women. This situation is reflected in...
in the precariousness of a considerable proportion of jobs, which offer no benefits whatsoever to their workers. Thirdly
In the first quarter of 2011, only 49.6% of salaried employees had medical coverage, and only 62.9% had health insurance.
some other benefit. Another problem related to employment is the low income received by workers. In general, the
Yucatán's employed population is concentrated in the lowest income levels, including those earning up to and above the minimum wage.
by one or even two percentage points, higher than the national average. The lower wages received by the Yucatecan population are due, among other things.
Other causes include lower productivity at the production facilities. Yucatán is one of the states in the country with the lowest productivity rates.
labor market where it is noted that the State's economy ranked 28th with an index of 211.9, well below the national index of 389.
Mérida has productive potential due to its geographic location and the average age of its economically active population.
The municipality's economic activity comprises activities from three sectors: agriculture, industry, and services.
The tertiary sector includes commerce, hospitality, finance, transportation, and communications. This sector represents 75% of the employed workforce.
overall being the most equitable in terms of gender distribution of jobs. The majority of the economically active population

Active workers in the municipality receive remuneration for their work of between two and three minimum wages, with the most common workday being 35 to 48 hours.
hours during the calendar week, usually with Sunday as the day of rest. Taking as a reference the information above
Based on the data presented on the employed and unemployed labor force, it is estimated that during the first three quarters of 2011 the unemployment rate of
The municipality was 3.73%, which represents a decrease of 0.6% compared to the rate of 4.34% recorded during 2010.

Housing. Housing is a building whose main function is to provide shelter and accommodation for people, protecting them from the elements.
inclement weather and other natural hazards. By 2010, Mérida had 45.3% of all housing in the state.
This represents a moderate increase of 2.8% compared to the 44.5% recorded in 1990; that is, for 17 years the increase of
Housing has not met the needs of a population that is growing rapidly compared to the growth of the
Housing. Housing represents between 15 and 40% of monthly household spending worldwide (International Financial Cooperation).
– CF1). The proportion between the economically active population (EAP) and the total population of the country in general is around 43%, but in
The state of Yucatán represents 47%; the highest concentration of the economically active population is found in the Zone
Metropolitan area of Mérida with 49% of the population. From the analysis between the socioeconomic level of the population and the type of housing that
It can be concluded that the population earning more than ten minimum wages per day represents only 3%; therefore
There is a significant group that receives incomes of more than two and less than ten minimum wages, representing 26%. Regarding
the distribution of income and its correspondence with the relevance of economic activity, the economically active population (EAP) that has an income of up to two wages
The minimum rainfall in the state of Yucatán is 28%. This percentage is above the national average of 23%. It is in the Zone
Metropolitan area of Mérida where percentages are higher than those recorded at the national and state levels (26%) because in this area
The state capital is located there, and that's where the main economic activities of the state are concentrated.

Women. The Mexican state of Yucatán has 1,987,769 inhabitants, of which 1,027,810 are women, representing a
50.71% of the population. Similarly, the municipality of Mérida has a population of 830,732 inhabitants. Of the 429,392 women in the municipality
403,073 people live in the city and only 26,319 live in the outlying communities. There are 226,524 registered households in the municipality, of which 62,691 have
as head of the household to the women.

Maya people. It is important to highlight the rights of indigenous peoples recognized in the 2001 reform to the Constitution
Federal and the International Covenant on Economic, Social and Cultural Rights (DOF 12/05/81), the American Convention on Human Rights

Human Rights (DOF 07/05/81), ILO Convention 169 concerning Indigenous and Tribal Peoples (DOF 24/01/91), the International Convention on The Elimination of All Forms of Racial Discrimination (DOF 13/06/75), among others, must be implemented by the municipalities.

Neighborhood and community revitalization. There are approximately 15,627 homes in the Historic Center, of which 5,027 are located occupied. The problems they present are loss of residential use as a consequence of the increase in commercial activities, administrative and service-related issues, environmental pollution, and land speculation, among others. The municipality has 88 neighborhoods and 137 [unclear - possibly "neighborhoods" or "community centers"]. subdivisions.

Health. The infant mortality rate is 1.4% lower than the national average and 1.3% lower than expected. The mortality rate Maternal mortality in Yucatán is much lower than the national average; moreover, if the Millennium Development Goals (MDGs) target is taken into account, in which countries commit to reducing it by three-quarters between 1990 and 2015, the progress since 1990 is still insufficient. The male population of Yucatán ranks first nationally in cerebrovascular diseases and fourth in acute attacks. myocardial infarction and liver cirrhosis. In the case of women, cancer ranks fourth nationally among women in Yucatán. HIV affects 3,873 people, placing the state fourth nationally in terms of the number of patients. Other diseases Type 2 diabetes mellitus is prevalent among young people and is on the rise, with 12% of Yucatecans over 20 years of age suffering from it. disease, a figure that exceeds the national average by 1.5 percentage points. Yucatán ranks fourth nationally with the highest number of People with malnutrition. Of the percentages mentioned above, Mérida accounts for a large part of the population affected by these conditions. In In general terms, the quality of services provided by the health sector in the state is not optimal due to a lack of policies. extension.

Education. Education is one of the best financial investments that states can make, as it allows individuals to... Individuals generate the resources necessary to enjoy essential economic goods. Therefore, more education and better jobs are needed. They constitute a pairing that is generally found to be established in all developed countries, which makes it possible to affirm that the Governments that are committed to development will necessarily have to invest in education.

Soil care. The territorial reserve of the municipality of Mérida is 8,639.4 ha.

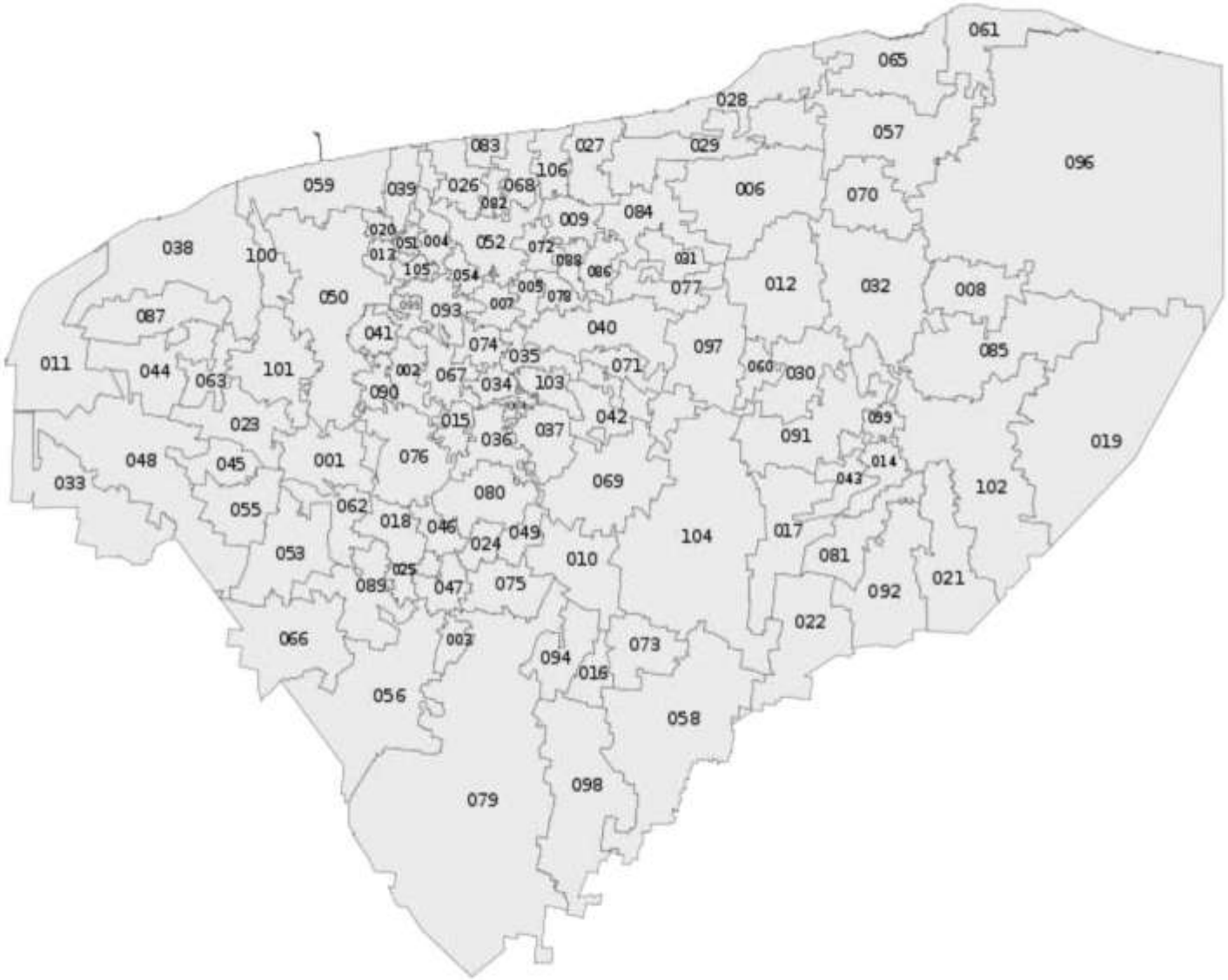


Figure 1. Map of the Mexican state of Yucatán, Mexico

Clue	Municipality	Municipal Headquarters	Clue	Municipality	Municipal Headquarters
001	Abalá	Abalá	054	Muxupip	Muxupip
002	Acanceh	Acanceh	055	Opichén	Opichén
003	Akil	Akil	056	Oxkutzcab	Oxkutzcab
004	Roof	Roof	057	Panabá	Panabá
005	Bokoba	Bokoba	058	Breastplate	Breastplate
006	Buctzotz	Buctzotz	059	Progress	Progress
007	Cacalchén	Cacalchén	060	Quintana Roo	Quintana Roo
008	Calotmul	Calotmul	061	Lagartos River	Lagartos River
009	Cansahcab	Cansahcab	062	Sacalum	Sacalum
010	Cantamayec	Cantamayec	063	Samahil	Samahil
011	Celestún	Celestún	064	Sanahcat	Sanahcat
012	Cenotillo	Cenotillo	065	San Felipe	San Felipe
013	Conkal	Conkal	066	Saint Helena	Saint Helena
014	Cuncunul	Cuncunul	067	Seyé	Seyé
015	Cuzamá	Cuzamá	068	Sinanché	Sinanché
016	Chacsinkín	Chacsinkín	069	Sotuta	Sotuta
017	Chankom	Chankom	070	Sucilá	Sucilá
018	Chapab	Chapab	071	Sudzal	Sudzal
019	Chemax	Chemax	072	Addition	Hidalgo's Sum
020	Chicxulub Pueblo	Chicxulub Pueblo	073	Tahdziu	Tahdziu
021	Chichimilá	Chichimilá	074	Tahmek	Tahmek
022	Chikindzonot	Chikindzonot	075	Teabo	Teabo
023	Chocholá	Chocholá	076	Tecoh	Tecoh
024	Chumayel	Chumayel	077	Tekal de Venegas	Tekal de Venegas
025	Dzan	Dzan	078	Tekantó	Tekantó
026	Dzemul	Dzemul	079	Tekax	Tekax
027	Dzidzantún	Dzidzantún	080	Tekit	Tekit
028	Dzilam de Bravo	Dzilam de Bravo	081	Tekom	Tekom
029	Dzilam González	Dzilam González	082	Telchac Pueblo	Telchac Pueblo
030	Dzitás	Dzitás	083	Telchac Puerto	Telchac Puerto
031	Dzoncauich	Dzoncauich	084	Temax	Temax
032	Spigot	Spigot	085	Temozón	Temozón
033	Halachó	Halachó	086	Tepakan	Tepakan
034	Hocabá	Hocabá	087	Tetiz	Tetiz
035	Hoctun	Hoctun	088	Teya	Teya
036	Homun	Homun	089	Ticul	Ticul
037	Huhi	Huhi	090	Timucuy	Timucuy
038	Hunucmá	Hunucmá	091	Tinum	Tinum
039	Ixil	Ixil	092	Tixcacalcupul	Tixcacalcupul

040	Izamal	Izamal	093	Tixkokob	Tixkokob
041	Kanasín	Kanasín	094	Tixméhuac	Tixméhuac
042	Kantunil	Kantunil	095	Tixpéhual	Tixpéhual
043	Kaua	Kaua	096	Tizimin	Tizimin
044	Kinchil	Kinchil	097	Tunkás	Tunkás
045	Kopomá	Kopomá	098	Tzucacab	Tzucacab
046	Mother	Mother	099	Uayma	Uayma
047	Peanut	Peanut	100	Ucú	Ucú
048	Maxcanú	Maxcanú	101	Umán	Umán
049	Mayapán	Mayapán	102	Valladolid	Valladolid
050	Mérida	Mérida	103	Xocchel	Xocchel
051	Mocochá	Mocochá	104	Yaxcabá	Yaxcabá
052	Motul	Motul de Carrillo Puerto	105	Yaxkukul	Yaxkukul
053	Muna	Muna	106	Yobain	Yobain

Quintana Roo, Mexico

The Mexican state of Quintana Roo is divided into ten municipalities, seven of which were created in 1974.
together with the elevation of the former "Federal Territory of Quintana Roo" to the status of "State of the Federation". The eighth municipality,
Solidaridad was created in 1993; the ninth municipality, Tulum, in 2008; and the tenth municipality, Bacalar, in 2011. The origin of the municipalities
The name of the Mexican state of Quintana Roo comes from the original division of the territory into three delegations: Cozumel, Santa Cruz de Bravo
(today Felipe Carrillo Puerto) and Payo Obispo (today Chetumal). Even though the 1917 Constitution established that the basis of the organization
The policy of the states is the *Free Municipality,* the Federal Territories continued divided into delegations until their respective elevation to the
rank of States. On February 2, 2011, the creation of the tenth municipality of Quintana Roo, Bacalar, with segregated territory, was announced.
by Othón Pompeyo Blanco. On February 21, 2008, the Congress of Quintana Roo approved the preliminary draft for the creation of the municipality of Tulum.
which obtained its territory from the current municipality of Solidaridad and includes Tulum National Park and parts of the Sian Biosphere Reserve
Kan; this was formally ratified when on March 13 the Congress of Quintana Roo unanimously approved the creation of the municipality
from Tulum.

Lázaro Cárdenas is one of the ten municipalities that make up the Mexican state of Quintana Roo.
Located in the far north of the state, its capital is the town of Kantunilkín. The municipality is situated in the north of the state.
Quintana Roo; it borders the municipalities of Isla Mujeres, Benito Juárez, and Solidaridad. The terrain is practically flat, like all of the
Yucatan Peninsula, not exceeding a height of 25 meters above sea level (masl); it is made up of a limestone plateau that
It does not allow surface water currents, so all currents are underground and their outflows to the surface are known
like cenotes. The municipality, unlike the other municipalities in Quintana Roo, is not entirely covered by tropical forest;
The north is characterized by aquatic and semi-aquatic vegetation such as mangroves and seagrass beds, as well as a forested area.
The municipality has a population of 25,333 inhabitants: 12,972 men and 12,361 women.

Felipe Carrillo Puerto is a town in the Mexican state of Quintana Roo, the seat of the Mayan municipality of Felipe Carrillo.
The port, located in the center of the state in the Maya Zone. Felipe Carrillo Puerto was founded by the Maya with the name Chan Santa Cruz
and was the center of the rebel Maya during the Caste War; the Sanctuary of the Talking Cross is located there; conquered by the
The Mexican army in the early 20th century renamed it Santa Cruz de Bravo and it was the capital of the Territory until the 1920s

of Quintana Roo when, later, it was ceded back to the Maya and the capital was moved from Payo Obispo, now Chetumal. In 1930
It received its current name in honor of the Socialist Governor of Yucatán, Felipe Carrillo Puerto. Its original name was Noh Cah Santa Cruz.
Balam Nah Kampokolche. Felipe Carrillo Puerto is located in the central part of the Mexican state of Quintana Roo; its altitude is 30
masl; the distance that separates it from the state capital, the city of Chetumal, is 159 km to the South and from the tourist center of Cancun of
229 km to the North; it is also located 150 km East of the city of Peto in the state of Yucatán. Its main roads
Roads are the primary means of communication, and this is an important road communication hub where three federal highways converge.
The main one is Federal Highway 307, which connects it to Cancun to the North and to Chetumal to the South; it is also one of the ends of the highway
Federal Highway 184 connects it westward with the town of José María Morelos and then with the Mexican state of Yucatán, mainly
with its capital, Mérida; finally, the third highway that originates in Felipe Carrillo Puerto is Federal Highway 295 which leads to
Northwest connects with the interior of Quintana Roo, mainly with the towns of Tihosuco and Tepich, continuing towards the
The Mexican state of Yucatán, uniting the cities of Valladolid and Tizimín. The total population of the city of Felipe Carrillo Puerto is
25,744 inhabitants: 12,572 men and 13,172 women.

José María Morelos. It is a town in the Mexican state of Quintana Roo, the capital of the Mayan municipality of José María Morelos;
It is located inland. The current town of José María Morelos originated in the mid-20th century; it began as a
camp dedicated to the exploitation of chicle and precious woods from the surrounding jungle; most of its inhabitants
Initially, they were migrants from other states of the country arriving in Quintana Roo due to the government's promotion of colonization and development.
economic development of the territory; because it is located 50 km from Peto, Yucatán, it was initially called "Kilometer 50", name
by which it is still called. In 1974 the municipality of José María Morelos was established, with Kilometer 50 becoming its seat.
which was elevated to the category of city and received the same name as the municipality, José María Morelos, in honor of the hero of Independence
José María Morelos y Pavón, Mexico. Today, José María Morelos is one of the main towns in the so-called Maya Zone of
Quintana Roo; its main economic activities continue to be agriculture and forestry. The municipal territory is
Located in what was called the chiefdom of Cochuah when the conquerors arrived in Yucatán at the beginning of the 16th century.

Tulum. The municipality of Tulum is one of the ten municipalities of the Mexican state of Quintana Roo. It is located in the central region.
North of the state in the so-called Riviera Maya; its capital is the city of Tulum and its territory was separated from the municipality of Solidaridad.

Its boundaries are to the North with the municipality of Solidaridad and to the South with the municipality of Felipe Carrillo Puerto; to the East it borders the state of Yucatán, particularly the municipality of Valladolid. Its land area is approximately 2,090.43 km². The territory The municipality of Tulum shares the same composition as much of the Yucatan Peninsula, thus constituting a large plain without There are only slight elevations that descend from west to east towards the sea, never exceeding 25 meters above sea level. Similarly, There are no surface water currents because the soil composition is highly permeable limestone, which causes Rainwater cannot be retained on the surface; instead, this favors the formation of underground rivers that have made it famous to the region; likewise, the cenotes formed when the roofs of underground rivers collapse; in the southern part of the municipality there are numerous coastal lagoons located between the city of Tulum and Punta Allen, separated from the Caribbean Sea by a thin strip of land; these are the Campechen Lagoon, Boca Paila Lagoon, San Miguel Lagoon, Xamach Lagoon, and Catoche Lagoon; also, in the western area of Within the municipality are the Cobá Lagoon, the Green Lagoon and the Nochacam Lagoon in the vicinity of the Cobá Archaeological Zone. Hydrologically, almost the entire territory belongs to the *North Yucatan Hydrological Region* (Yucatan) and the *Quintana Roo Basin* of the same; Only two small portions of the southern tip of the municipality, bordering Felipe Carrillo Puerto, are located in the *Hydrological Region Eastern Yucatán* (Quintana Roo) and in the *Closed Basins* and *Chetumal Bay,* among others. As in the entire continental territory of the state In Quintana Roo, Mexico, the climate recorded in the Mayan municipality of Tulum is classified as warm sub-humid with summer rains characterized by high temperatures and humidity for much of the year; the average annual temperature that The temperature recorded in the inland area of the municipality is below 26°C, while in the coastal area it exceeds this figure; the average rainfall Annual rainfall in almost the entire territory exceeds 1,500 mm, the highest in Quintana Roo; only in an area in the far west of the municipality It is recorded in the range of 1,300 to 1,500 mm. The Mayan municipality of Tulum has a population of 28,263 inhabitants. It is, along with Benito Juárez and Solidaridad are among the municipalities with the highest population growth in the country; the main reason is immigration. attracted by the job opportunities and economic development fostered by tourism, which is the primary economic activity. In this regard, Tulum offers national and international tourism, and as its main activity, eco-friendly hospitality that preserves intact the traditions of the past. Mayan architecture blends seamlessly with modern amenities. Furthermore, it boasts some of the state's best beaches. It is already internationally renowned for its white sands and paradisiacal locations in the Mexican Caribbean. Both in the hotel zone with its beaches, as well as in the In the city center, tourists can enjoy excellent restaurants offering high-quality regional and international cuisine.

In the municipality, hospitality towards tourism is the vocation of all its people. The city of Tulum is currently the city with the highest number of tourists nationwide.

Population growth and in reference to this, its municipal seat, the city of Tulum, went from 6,733 inhabitants in the year 2000 to 14,790

in 2005. Population growth was the main reason for the creation of the municipality, separating it from Solidaridad.

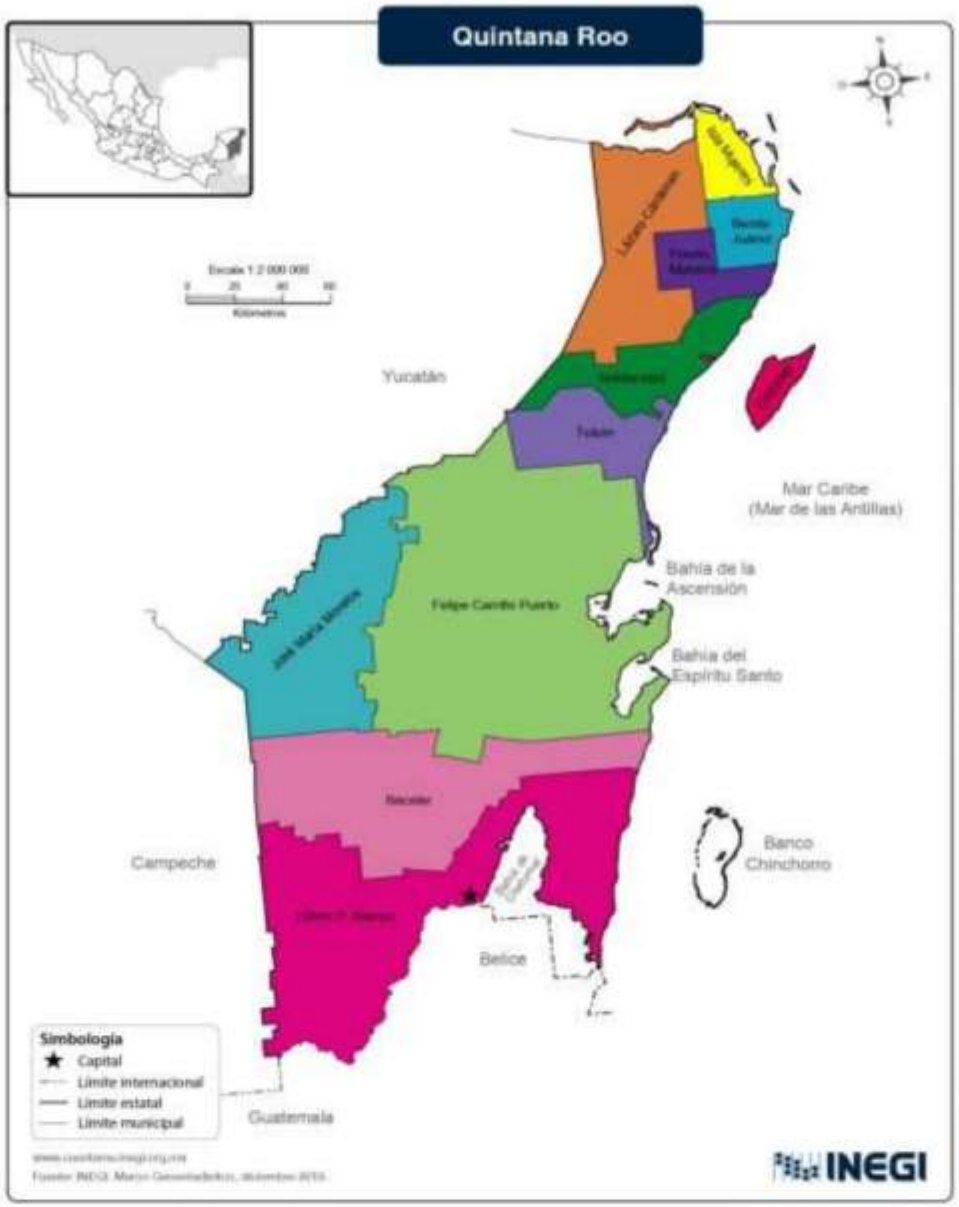


Figure 2. Map of the Mexican state of Quintana Roo, Mexico

–Operational definitions of the variables

Case.– All full-term newborns (37 ÿ weeks of gestation ÿ 41) weighing < 2,500 g;

Control.– All full-term newborns (37 ÿ weeks of gestation ÿ 41) weighing ÿ 2,500 g;

Maternal age – The period of time elapsed from the mother's birth date to the date of delivery. It was recorded in Years completed. Maternal ages ÿ 19 and ÿ 36 years were considered risk factors. Continuous quantitative variable;

Maternal weight.— Recorded in kg. A maternal weight < 50 kg was considered a risk factor. Continuous quantitative variable;

Maternal height.— Height measured from feet to head. It was recorded in cm. A height above 1 cm was considered a risk factor. Maternal < 150 cm. Continuous quantitative variable;

Past medical history – These were recorded as "yes" or "no". Having a history of medical conditions was considered a risk factor. personal pathologies. Nominal qualitative variable;

Age at menarche – Age at which the first menstrual cycle occurred. It was recorded in completed years. It was considered a factor of Risk factors include an age at menarche ÿ 12 years. Continuous quantitative variable;

Parity – Number of deliveries by the mother, including the current one. Risk factors included one delivery (primiparity) and ÿ 5 deliveries. (multiparity). Discrete or discontinuous quantitative variable;

History of abortion(s).– Termination of pregnancy due to natural or deliberately induced causes. It was recorded as "yes" or as "no". Having a history of abortion(s) was considered a risk factor. Nominal qualitative variable;

Pathological obstetric history – This was recorded as "yes" or "no". Having a history of obstetric complications was considered a risk factor. pathological obstetrics. Nominal qualitative variable;

Interpregnancy interval.– Period of time elapsed from the date of birth of the second-to-last child to the date of the current one Birth. It was recorded in whole months. An interpregnancy interval ÿ 24 months was considered a risk factor. Quantitative variable continues;

Socioeconomic level.— It was recorded as "low" or "medium". A low socioeconomic level was considered a risk factor. Ordinal qualitative variable. It should be mentioned that state health services that provide medical and healthcare services through their

Application units apply the table that contains the classification of the different services with six levels of recovery fees

for each service; these levels are applied based on the score resulting from the socioeconomic form established at the national level;

ÿ **Regarding income.** Monthly family income is the sum of the monthly income contributed by each member of the household.

productive members of the family group.

ÿ **Regarding expenses.** Monthly family expenses are the sum of the monthly costs incurred by the family group to cover

their basic needs in terms of food, rent or property, water, electricity, fuel, transportation, education and additional consumption.

ÿ **Regarding the economic situation.** 1. **Indigent** is when there is no income to meet basic needs; 2. **Deficit**

1. Break-even point : when up to 99% of expenses can be covered; 2. **Equity point :** when 100% of expenses can be covered, with no surplus; 3. **Solvent**

This occurs when there is a satisfactory income available to cover basic needs; there is money available for saving or spending.

unforeseen events; they have a surplus of up to 25% of their income over their expenses; and 5. **Surplus** is when there is an excessive availability of

They have resources to cover expenses; they have the funds to make non-essential expenditures; they have a surplus of more than 25% of their income

regarding their spending.

Marital status.— She was registered as single, married, divorced, separated, in a common-law relationship, and widowed. Subsequently, the marital statuses were single,

Divorced, separated, cohabiting, and widowed were recoded as "unmarried." The "unmarried" status was considered a risk factor. Variable

nominal qualitative;

Smoking – Recorded as “yes” or “no”. Smoking ÿ 10 cigarettes per day was considered a risk factor. Qualitative variable

nominal;

Alcoholism – This was recorded as "yes" or "no". Drinking one beer daily, or drinking

alcoholic beverages at least three times a week. Nominal qualitative variable;

Week of gestation at the start of prenatal care.– It was recorded as "from or after week N · 20 days of gestation"

or as "before week N · 20 weeks of gestation." It was considered a risk factor "from or after week N · 20 days of gestation." Variable

quantitative discrete or discontinuous;

Number of prenatal visits. —It was recorded as "ÿ 5 prenatal visits" or as "ÿ 6 prenatal visits". It was considered

Risk factor: having "ÿ 5 prenatal visits". Ordinal qualitative variable;

Type of delivery or mode of birth. —Delivery is the culmination of pregnancy; the exit of a product from the mother's uterus. It was recorded such as "vaginal" or "abdominal". The type of delivery or abdominal delivery route was considered a risk factor. Qualitative variable nominal; and

Product gender.— It was registered as "male" or "female". The "female" gender was considered a risk factor. Product. Nominal qualitative variable.

–Inclusion criteria

Products of 37 ÿ weeks of gestation ÿ 41 born at the "Dr. Agustín O'Horán" General Hospital of the Secretariat were included of Health of the Mexican State of Yucatán (SSY); at the Maternal and Child Hospital of the Ministry of Health of the Mexican State of Yucatán (SSY); at the Mérida Regional Hospital of the Institute of Security and Social Services for State Workers (ISSSTE); at the "Ignacio García Téllez" National Medical Center of the Mexican Social Security Institute (IMSS); at the "Lázaro" Comprehensive Hospital Cárdenas"; at the "Felipe Carrillo Puerto" General Hospital; at the "José María Morelos" Comprehensive Hospital; and at the "Tulum" Comprehensive Hospital during the period from February 1, 2019 to January 31, 2020.

–Exclusion criteria

Both products born at < 37 weeks of gestation and products born at > 41 weeks of gestation in the eight health service institutions during the period studied.

–Elimination criteria

Multiple births, newborns with congenital malformations such as Down syndrome, and newborns who do not count with the complete information required during the study period.

–Techniques and procedures

The necessary information was obtained from the Clinical Archive and Statistics Department of the "Dr. Agustín O'Horán" General Hospital of the SSY; in the Department of Statistics and Clinical Records of the SSY Maternal and Child Hospital; in the Archives Department Clinical at the Mérida Regional Hospital of the ISSSTE; in the Medical Informatics and Clinical Archive Area (ARIMAC) of the Medical Center

National "Ignacio García Téllez" of the IMSS; and in the Clinical Archive Departments of the "Lázaro Cárdenas" Integral Hospital; of the Hospital General "Felipe Carrillo Puerto"; of the "José María Morelos" Integral Hospital; and of the "Tulum" Integral Hospital during the period covered From February 1, 2019 to January 31, 2020.

The data were collected from the relevant databases, from the clinical records of newborns, and from the records mothers' clinicians.

The instrument used was a pre-coded form divided into the following six sections:

ÿ **Biological characteristics of the mother.** Age; weight; height; and personal pathological history;

ÿ **Mother's obstetric history.** Age at menarche; number of deliveries; history of miscarriage(s); obstetric history pathological; and intergenic interval;

ÿ **Social characteristics of the mother.** Socioeconomic level; marital status; smoking; and alcoholism;

ÿ **Characteristics of prenatal care.** Week of gestation at the start of prenatal care; and number of prenatal visits;

ÿ **Characteristics of the delivery.** Type of delivery or route of birth; and

ÿ **Product feature.** Gender.

–Data processing

The data were reviewed (information quality control); classified (on qualitative and quantitative scales); and computerized. (IBM SPSS Statistics for Windows, Version 22 software was used); presented (Tables, Graphs and Figures); summarized (using the corresponding summary measures for data classified on qualitative and quantitative scales); analyzed; and interpreted. For the The graphs were created using Microsoft Excel 365 for Windows and Harvard Graphics ChartXL for Windows software. Version 3.02.

The Bonferroni adjustment method was planned to be used to adjust the significance level in relation to the number of tests. Statistics were performed simultaneously on a dataset. The significance level for each test was calculated by dividing the error global type I or global type ÿ error between the number of tests to be performed**(124)** in order to correct the problem that variables with many categories have a greater probability of being selected as predictors; although it has no effect with dichotomous variables **(125)**

allows "n" tests to be performed to maintain the overall probability ÿ 5% **(126)** Considering the above, 19 contrasts were carried out, being, in Consequently, a value of ÿ = 0.0026 for a *p* ÿ 0.0500; therefore, the values *p* > 0.0026 and *p* ÿ 0.0026 were taken to accept or reject, respectively, the null hypothesis; the above, provided that the explanatory variable has more than two categories.

To estimate the association between the response variable and the explanatory variables, independent variables, predictor variables, Multiple Logistic Regression analysis was performed on the regressor variables or causes.

The probability of low birth weight occurrence was calculated for all observation units using the goodness-of-fit test. Hosmer–Lemeshow adjustment **(127)** based on the distribution of cases and controls predicted by the equation and the values actually observed. Both distributions, expected and observed, were compared using Wald's x^2 statistic (x^2W) **(128)** .

Results

Results in four health service institutions [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Ministry of Health of the Mexican State of Yucatán (SSY); Mérida Regional Hospital of the Institute of Security and Social Services of State Workers (ISSSTE); and National Medical Center "Ignacio García Téllez" of the Mexican Social Security Institute (IMSS)] in the city of Mérida, Yucatán, Mexico

Births (cases and controls that met the inclusion criteria) occurring in four institutions were recorded.

health services [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternity Hospital Children's Hospital of the Yucatán State Health Secretariat (SSY); Mérida Regional Hospital of the Institute of Security and Social Services Social Security Institute for State Workers (ISSSTE); and the "Ignacio García Téllez" National Medical Center of the Mexican Social Security Institute (IMSS)] of the city of Mérida, Yucatán, Mexico during the period from February 1, 2019 to January 31, 2020. The number

The total number of registered newborns was 28,282 (3,434 cases and 24,848 controls). 2,888 (10.21%) were excluded [1,859 (54.14%) cases and 1,029 (4.14%) controls] and 718 (2.54%) newborns [414 (12.06%) cases and 304 (1.22%) controls] were eliminated for not complying with

The inclusion criteria were met, therefore, 24,676 (87.25%) newborns were studied [1,161 (33.81%) cases and 23,515 (94.64%) controls].

Having both cases and controls come from the same population ensured homogeneity, representativeness, and simultaneity.

Table 1 presents the response variable and the explanatory variables, independent variables, predictor variables, variables regressors or causes according to their recoding for Multiple Logistic Regression Analysis.

Table 1. Response variable "Y" and explanatory variables, independent variables, predictor variables, regressor variables or causes "Xi" according to recoding for Multiple Logistic Regression Analysis. 1/II/2019–31/I/2020.

Response variable (Y) and explanatory variables, independent variables, predictor variables, regressor variables or causes (Xi)	**Recoding**
Weight of the term newborn (37 ÿ weeks of gestation ÿ 41)	0 = ÿ 2,500 g 1 = < 2,500 g
Maternal age	0= 20–35 years 1 = ÿ 19 years 2= ÿ 36 years
Maternal weight	0 = ÿ 50 kg 1 = < 50 kg
Maternal height	0 = ÿ 150 cm 1 = < 150 cm
Past medical history	0 = No 1 = Yes
Age at menarche	0 = ÿ 13 years 1 = ÿ 12 years
Number of births	0 = 2–4 1= 1 2= ÿ 5
History of abortion(s)	0 = No 1 = Yes
Pathological obstetric history	0 = No 1 = Yes
Interpregnancy interval	0 = > 24 months 1 = ÿ 24 months
Socioeconomic level	0 = Medium 1= Low
Marital status	0= Married 1= Unmarried
Smoking	0 = No 1 = Yes
Alcoholism	0 = No 1 = Yes
Week of gestation at the start of prenatal care	0 = Before week No · 20 weeks of gestation

	1= From or after week No. · 20 weeks of gestation
Number of prenatal visits	0 = ÿ 6 1 = ÿ 5
Type of delivery or birth route	0= Vaginal 1= Abdominal
Product gender	0 = Male 1= Female

Source: Own elaboration

The explanatory variables, independent variables, predictor variables, regressor variables, or causes according to the results of the Analysis Multiple Logistic Regression results are presented in Table 2.

Table 2. Explanatory variables, independent variables, predictor variables, regressor variables or causes according to the results of the Analysis Multiple Logistic Regression. Mérida, Yucatán, Mexico. 1/II/2019–31/I/2020.

Variables explanatory, variables independent, variables predictors, variables returners or causes	**Coefficients logistics estimated (ÿ)**	**Errors standard Dear All**	**Chi-square statistics Square of Wald (x^2W)**	**Degrees of freedom (gl)**	**Probabilities *(p)***	**Exponents ÿ= Odds Ratios**	**Intervals of estimate to level of confidence of 95%**
Biological characteristics of the mother							
Maternal age ÿ 19 years	-0.1960	0.1393	1.9793	1	0.1595	0.8220	0.6256ÿ1.0801
Maternal age ÿ 36 years	0.0876	0.1520	0.3319	1	0.5646	1.0915	0.8103ÿ1.4704
Maternal weight < 50 kg	1.0430	0.1383	56.8547	1	0.0000	2.8376	2.1638ÿ3.7213
Maternal height < 150 cm	2.0937	0.0764	751.1966	1	0.0000	8.1153	6.9868ÿ9.4260
Background personal pathological	0.2506	0.0864	8.4197	1	0.0037	1.2848	1.0847ÿ1.5217
Mother's obstetric history							
Age at menarche ÿ 12 years	0.3018	0.0642	22.0857	1	0.0000	1.3523	1.1924ÿ1.5337
Number of births = 1	0.1548	0.1992	0.6039	1	0.4371	1.1674	0.7901ÿ1.7251
Number of births ÿ 5	0.7106	0.1999	12.6292	1	0.0004	2.0351	1.3753ÿ3.0115
Background of abortion(s)	0.0521	0.1047	0.2480	1	0.6185	1.0535	0.8581ÿ1.2935
Background obstetrics pathological	0.0670	0.0809	0.6847	1	0.4080	1.0693	0.9124ÿ1.2531

Interval inter-pregnancy interval ÿ 24 months	0.9943	0.1038	91.8390	1	0.0000	2.7028	2.2055ÿ3.3123
Social characteristics of the mother							
Level socioeconomic low	0.2236	0.0810	7.6208	1	0.0058	1.2506	1.0670ÿ1.4658
Marital status no-married	0.3986	0.0698	32.5920	1	21.8970	1	30.3023 :
Smoking	0.4937	0.1055	**Characteristics of prenatal**		0.0000	1.6384	1.3323ÿ2.0147
Alcoholism	1.4789	0.2687	**care**		0.0000	4.3879	2.5917ÿ7.4290
Start of the prenatal care starting from week No. 20 of gestation	0.0499	0.0979	0.2595	1	0.6105	1.0512	0.8676ÿ1.2726
Number of queries prenatal ÿ 5	0.0752	0.0806	0.8713	1	0.3506	1.0781	0.9206ÿ1.2626
Characteristic of delivery							
Type of delivery or birth route abdominal	0.0073	0.0656	0.0123	1	0.9116	1.0073	0.8858ÿ1.1456
Product Feature							
Female gender of the product	0.1373	0.0627	4.7964	1	0.0285	1.1472	1.0145ÿ1.2972
Constant or Intercept	-5.4657	0.2460	493.6744	1	0.0000		

Source. Prepared by the author based on results obtained with IBM SPSS Statistics for Windows, Version 22 software

Interpretation of the values of Wald's x^2 statistic (x^2W):

1. When x^2w is ÿ 3.8416 there is significance; and
2. When x^2w is < 3.8416 there is no significance.

Interpretation of probability values (p):

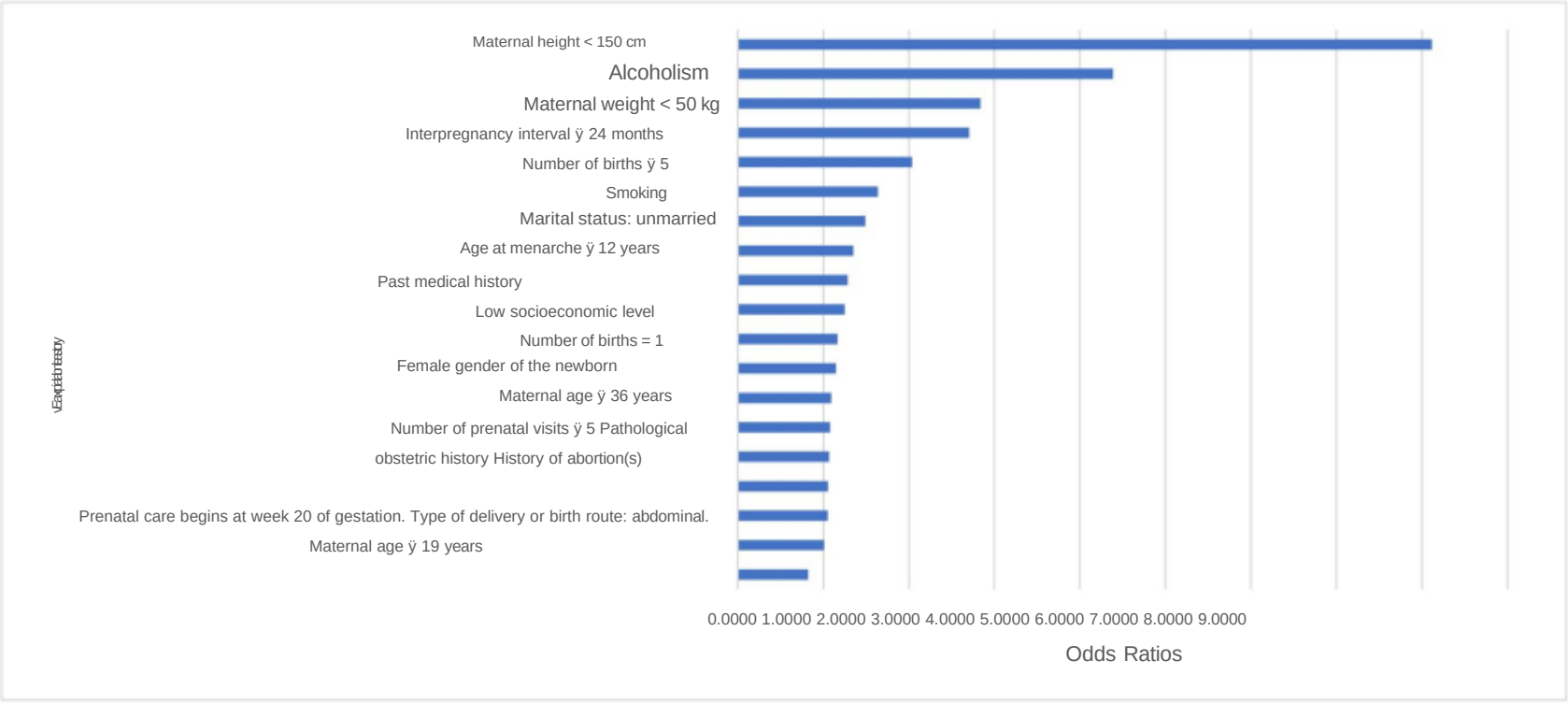
1. When *p* is ÿ 0.0500 there is significance; and
2. When *p* is > 0.0500 there is no significance.

Interpretation of the values of the ÿ Exponents or Odds Ratios (OR): 1. When OR > 1 the variable is a risk factor; 2. When OR < 1 the variable is a protective factor; and 3. When OR = 1 the variable is neither a risk factor nor a protective factor.

Interpretation of the values of the estimation intervals at the 95% confidence level (95% CI): 1. When the estimation interval at the 95% confidence level contains the unit (1) there is no significance; and 2. When the estimation interval at the 95% confidence level does not contain the unit (1) there is significance.

Graph 1 presents the explanatory variables, independent variables, predictor variables, regressor variables, or causes according to values in ascending numerical order of the ÿ Exponents or Odds Ratios of the Multiple Logistic Regression Analysis.

Figure 1. Explanatory variables, independent variables, predictor variables, regressor variables or causes according to values in ascending numerical order of the ÿ Exponents or Odds Ratios of the Multiple Logistic Regression analysis. Mérida, Yucatán, Mexico. 1/II/2019– 31/I/2020.



Source. Table 2

Results in four health service institutions (Lázaro Cárdenas Comprehensive Hospital; Felipe Carrillo General Hospital "Puerto"; "José María Morelos" Comprehensive Hospital; and "Tulum" Comprehensive Hospital) of the Mayan Zone of the Mexican state of Quintana Roo, Mexico

Births (cases and controls that met the inclusion criteria) occurring in four institutions were recorded. health services (Lázaro Cárdenas Comprehensive Hospital; Felipe Carrillo Puerto General Hospital; José María Morelos Comprehensive Hospital; and "Tulum" Comprehensive Hospital in the Mayan Zone of the Mexican state of Quintana Roo, Mexico, during the period from February 1st From 2019 to January 31, 2020. The total number of registered newborns was 1,815 [178 (9.81%) cases and 1,637 (90.19%) controls] all meeting the inclusion criteria. Since both cases and controls came from the same population, the homogeneity, representativeness and simultaneity.

Regarding the performance of Multiple Logistic Regression Analysis in the four health service institutions of the Zone Maya from the Mexican state of Quintana Roo, Mexico, the values obtained indicate the positive contribution (OR > 1) in numerical order ascending of the explanatory variables, independent variables, predictor variables, regressor variables or causes: alcoholism; level low socioeconomic status; initiation of prenatal care from or after week N ¯· 20 days of gestation; interpregnancy interval ÿ 24 months; age at menarche ÿ 12 years; marital status "unmarried"; female gender of the newborn; maternal weight < 50 kg; history of abortion(s); number of deliveries = 1; number of prenatal visits ÿ 5; type of delivery or delivery route: abdominal; smoking; number of deliveries ÿ 5; maternal age ÿ 19 years; maternal age ÿ 36 years; pathological obstetric history; pathological personal history; and maternal height < 150 cm. The determinants of low birth weight found in the four Mayan municipalities that can be modified through interventions Public health, health education programs and changes to healthy lifestyles are: 1) Alcoholism; 2) Start of care prenatal from or after week N ¯· 20 days of gestation; 3) Interpregnancy interval ÿ 24 months; 4) Marital status "unmarried"; 5) Weight Maternal weight < 50 kg; 6) Number of prenatal visits ÿ 5; 7) Smoking; 8) Number of deliveries ÿ 5; 9) Maternal age ÿ 19 years; 10) Age maternal age ÿ 36 years; and 11) Maternal height < 150 cm.

Table 3 presents the explanatory variables, independent variables, predictor variables, regressor variables, or causes according to the results of the Multiple Logistic Regression Analysis.

Table 3. Explanatory variables, independent variables, predictor variables, regressor variables or causes according to the results of the Analysis Multiple Logistic Regression. Lázaro Cárdenas, Felipe Carrillo Puerto, José María Morelos and Tulum, Quintana Roo, Mexico. 1/II/2019–31/I/2020.

Variables explanatory, variables independent, variables predictors, variables returners or causes	**Coefficients logistics estimated (ÿ)**	**Errors standard Dear All**	**Chi-square statistics square of Wald (x^2W)**	**Degrees of freedom (gl)**	**Probabilities *(p)***	**Exponents ÿ= Odds Ratios**	**Intervals of estimate at the level trusted by 95%**
Biological characteristics of the mother							
Maternal age ÿ 19 years old	0.9093	0.6000	2.2969	1	0.1296	2.4827	0.7659ÿ8.0473
Maternal age ÿ 36 years old	1.0321	0.6176	2.7928	1	0.0947	2.8070	0.8366ÿ9.4175
Maternal weight < 50 kg	0.3852	0.2138	3.2465	1	0.0716	1.4700	0.9668ÿ2.2351
Maternal height < 150 cm	1.7064	0.1972	74.8540	1	0.0000	5.5092	3.7429ÿ8.1091
Background personal pathological	1.5363	0.3023	25.8328	1	0.0000	4.6475	2.5700ÿ8.4046
Mother's obstetric history							
Age at menarche ÿ 12 years	0.0763	0.1970	0.1499	1	0.6986	1.0792	0.7336ÿ1.5878
Number of births = 1	0.4398	0.6248	0.4954	1	0.4815	1.5524	0.4562ÿ5.2827
Number of births ÿ 5	0.8204	0.6342	1.6736	1	0.1958	2.2714	0.6554ÿ7.8719
Background of abortion(s)	0.4323	0.3089	1.9588	1	0.1616	1.5407	0.8411ÿ2.8225

Background obstetrics pathological	1.4045	0.4009	12.2760	1	0.0005	4.0735	1.8567ÿ8.9367
Interval inter-pregnancy interval ÿ 24 months	-0.2304	0.1920	1.4409 1 **Social**		0.2300	0.7942	0.5451ÿ1.1570
characteristics of the mother							
Level socioeconomic low	-0.5632	0.4151	1.8410	1	0.1748	0.5694	0.2524ÿ1.2845
Marital status no-married	0.0917	0.2366	0.1503 1 0.4082 1 0.4709 1		0.6983	1.0961	0.6894ÿ1.7427
Smoking	0.7893	1.2353	**Characteristics of prenatal**		0.5229	2.2019	0.1956ÿ24.7928
Alcoholism	–6.3457	9.2474	**care**		0.4926	0.0018	0.0000ÿ130475.06
Start of the prenatal care starting from the week No. . 20 of gestation	-0.4917	0.2363	4.3308	1	0.0374	0.6116	0.3849ÿ0.9718
Number of queries prenatal ÿ 5	0.4670	0.2190	4.5630	1	0.0327	1.5966	0.0394ÿ2.4526
Characteristic of childbirth							
Type of delivery or birth route abdominal	0.4800	0.1879	6.5423	1	0.0105	1.6169	1.1189ÿ2.3367
Product Feature							
Female gender of the product	0.1191	0.1761	0.4619	1	0.4967	1.1271	0.7982ÿ1.5916
Constant or Intercept	-4.8311	0.9442	26.1900	1	0.0000		

Source. Prepared by the author based on results obtained with IBM SPSS Statistics for Windows, Version 22 software

Interpretation of the values of Wald's x^2 statistic (x^2W):

1. When x^2w is ÿ 3.8416 there is significance; and
2. When x^2w is < 3.8416 there is no significance.

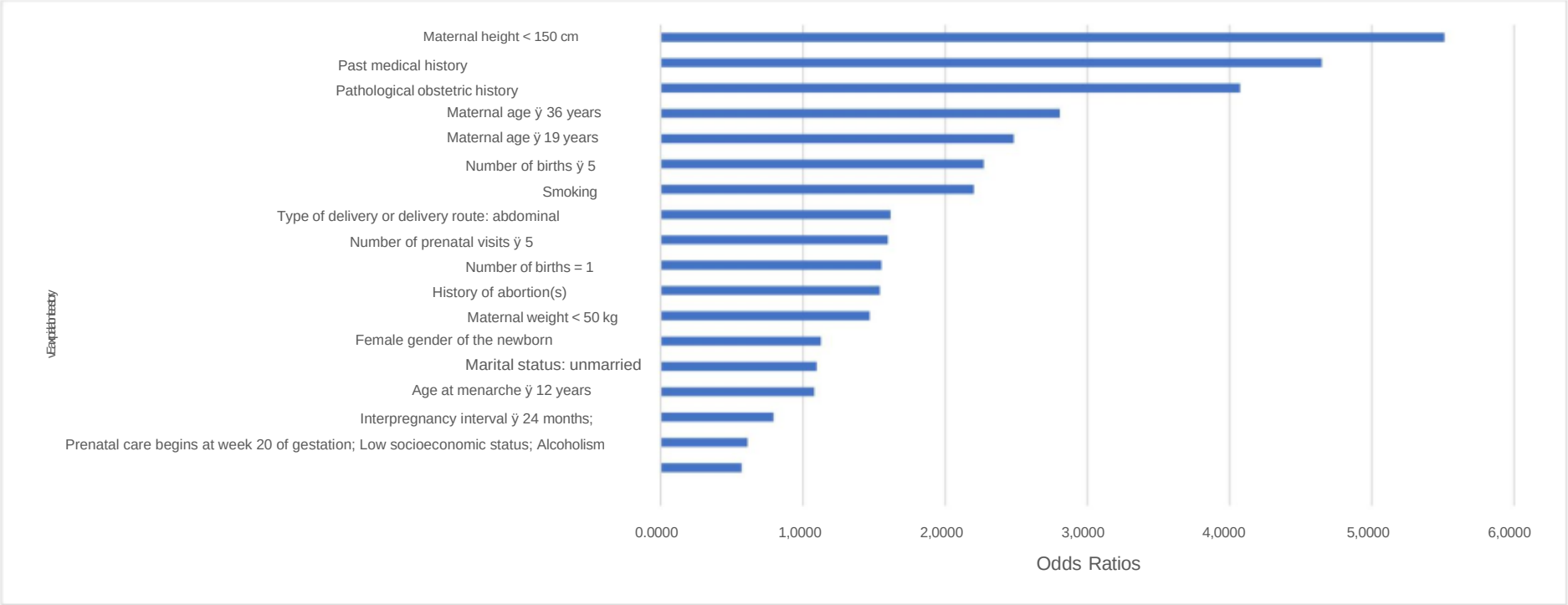
Interpretation of probability values (p): 1. When *p* is ÿ 0.0500 there is significance; and 2. When *p* is > 0.0500 there is no significance.

Interpretation of the values of the ÿ Exponents or Odds Ratios (OR): 1. When OR > 1 the variable is a risk factor; 2. When OR < 1 the variable is a protective factor; and 3. When OR = 1 the variable is neither a risk factor nor a protective factor.

Interpretation of the values of the estimation intervals at the 95% confidence level (95% CI): 1. When the estimation interval at the 95% confidence level contains the unit (1) there is no significance; and 2. When the estimation interval at the 95% confidence level does not contain the unit (1) there is significance.

Graph 2 presents the explanatory variables, independent variables, predictor variables, regressor variables, or causes according to the results of the Multiple Logistic Regression Analysis.

Figure 2. Explanatory variables, independent variables, predictor variables, regressor variables or causes according to the results of the Multiple Logistic Regression Analysis. Lázaro Cárdenas, Felipe Carrillo Puerto, José María Morelos and Tulum, Quintana Roo, Mexico. 1/II/2019– 31/I/2020.



Source. Table 3

Table 4 presents the explanatory variables, independent variables, predictor variables, regressor variables, or causes according to the values of the ÿ Exponents or Odds Ratios in ascending numerical order by health service institutions in the city of Mérida, Yucatán, Mexico and in the Mayan Zone of the Mexican state of Quintana Roo, Mexico.

Table 4. Explanatory variables, independent variables, predictor variables, regressor variables or causes according to the values of the ÿ exponents or Odds Ratios in ascending numerical order by health service institutions in the city of Mérida, Yucatán, Mexico and in the Mayan Zone of the Mexican State of Quintana Roo, Mexico. 1/II/2019–31/I/2020.

Health Service Institutions City of Mérida, Yucatán, Mexico		**Health Service Institutions Mayan Zone of the Mexican State of Quintana Roo, Mexico**	
Explanatory variables, independent variables, variables predictors, regressor variables, or causes	**Odds Ratios**	**Explanatory variables, independent variables, variables predictors, regressor variables, or causes**	**Odds Ratios**
1. Maternal age ÿ 19 years 2. Type	0.8220	1. Alcoholism 2. Low	0.0018
of delivery or delivery route: abdominal **3. Start of prenatal**	1.0073	socioeconomic level **3. Start of**	0.5694
care from week No. 20 of Pregnancy	**1.0512**	**prenatal care from week No. 20 of 4.**	**0.6116**
4. History of abortion(s)	1.0535	Interpregnancy interval ÿ 24 months 5. Age at	0.7942
5. Pathological obstetric history 6. Number of	1.0693	menarche ÿ 12 years 6. Marital status	1.0792
prenatal visits ÿ 5 7. Maternal age ÿ 36 years 8.	1.0781	unmarried 7. Female gender of	1.0961
Female gender of the infant 9.	1.0915	the product 8. Maternal weight < 50 kg 9.	1.1271
Number of deliveries = 1 10. Low	1.1472	History of abortion(s)	1.4700
socioeconomic status 11.	1.1674		1.5407
Pathological personal history 12. Age	1.2506	10. Number of deliveries = 1 11.	1.5524
at menarche ÿ 12 years 13. Marital status: unmarried	1.2848	Number of prenatal visits ÿ 5 12. Type of delivery	1.5966
14. Smoking 15. Number of deliveries ÿ	1.3523	or delivery route: abdominal 13. Smoking 14. Number of	1.6169
5 16. Interpregnancy interval ÿ 24	1.4897	deliveries ÿ 5 15.	2.2019
months 17. Maternal	1.6384	Maternal age ÿ 19 years 16.	2.2714
weight < 50 kg 18. Alcoholism	2.0351	Maternal age ÿ 36 years 17.	2.4827
19. Maternal height < 150 cm	2.7028	Pathological obstetric history 18.	2.8070
	2.8376	Pathological personal history **19. Maternal height**	4.0735
	4.3879	**< 150 cm**	4.6475
	8.1153		**5.5092**

Source: Own elaboration

Logistic model and example

If the response variable is denoted by "Y", it can be assumed that "Y" takes the values zero (0) or one (1). Zero (0) denotes

X denotes non-occurrence and one (1) denotes the occurrence of the event (low birth weight). If X1, X2, X3 , X4, X5, X6, X7, X8, X9, X10, X11, X12, X13, X14, X15, X16

and X17 are explanatory variables, independent variables, predictor variables, regressor variables, or causes related to the occurrence

of the response variable "Y", then the following Logistic Model specifies that the conditional probability of occurrence of the event "Y"

given the values X1 , X2, X3 , X4, X5 , X6, X7 , X8 , X9 , X10 , X11 ,

P(Y= 1 **|** X1 , X2 , X3 , X4 , X5 , X6 , X7 , X8 , X9 , **X10 ,** X11 ,

Where:

P(Y= 1)= Probability of being born with low birth weight; and

Exponent (ÿ)= ÿ0 + (ÿ1*X1) + (ÿ2*X2) + (ÿ3*X3) + (ÿ4*X4) + (ÿ5*X5) + (ÿ6*X6) + (ÿ7*X7) + (ÿ8*X8) + (ÿ9*X9) + (ÿ10*X10) + (ÿ11*X11) (ÿ12*X12) + (ÿ13*X13) + (ÿ14*X14) + (ÿ15*X15) + (ÿ16*X16) + (ÿ17*X17)

Table 5 presents the estimated logistic coefficient (ÿ) values according to explanatory variables.

independent variables, predictor variables, regressor variables or causes (Xi).

Table 5. Estimated logistic coefficients (ÿ) according to explanatory variables, independent variables, predictor variables, variables regressors or causes (Xi). 1/II/2019–31/I/2020.

Explanatory variables, independent variables, predictor variables, regressor variables or causes (Xi)	Estimated logistic coefficients (ÿ)
Constant or intercept	ÿ0= –5.4657
X1= Maternal age ÿ 19 years	ÿ1= –0.1960
X2= Maternal age ÿ 36 years	ÿ2= 0.0876
X3= Maternal weight < 50 kg	ÿ3= 1.0430
X4= Maternal height < 150 cm X5=	ÿ4= 2.0937
Past medical history X6= Age at menarche ÿ	ÿ5= 0.2506
12 years X7= Number of deliveries =	ÿ6= 0.3018
1 X8= Number of deliveries ÿ	ÿ7= 0.1548
5 X9= History of abortion(s)	ÿ8= 0.7106
	ÿ9= 0.0521
X10= Pathological obstetric history X11=	ÿ10= 0.0670
Interpregnancy interval ÿ 24 months X12=	ÿ11= 0.9943
Low socioeconomic level X13=	ÿ12= 0.2236
Marital status "unmarried"	ÿ13= 0.3986
X14= Smoking	ÿ14= 0.4937
X15= Alcoholism	ÿ15= 1.4789
X16= Start of prenatal care from or after week No. 20 of Gestation	ÿ16= 0.0499
X17 = Number of prenatal visits ÿ 5 X18 =	ÿ17= 0.0752
Type of delivery or delivery route: abdominal X19 =	ÿ18= 0.0073
Female gender of the product Source:	ÿ19= 0.1373

Own elaboration

Therefore, substituting into the **equation ,** we obtain:

P (Y = 1 | X2 , X3 , X4 , X5 , X6 , X8 , X9 , X10 , X11 , X12 ,
(ÿ8*X8) + (ÿ9*X9) + (ÿ10*X10) + (ÿ11*X11) + (ÿ12*X12) + (ÿ13*X13) (ÿ14*X14) + (ÿ15*X15) + (ÿ16*X16) + (ÿ17*X17) + (ÿ18*X18) + (ÿ19*X19) / 1 +
ÿ0 + (ÿ2*X2) + (ÿ3*X3) + (ÿ4*X4) + (ÿ5*X5) + (ÿ6*X6) + (ÿ8*X8) + (ÿ9*X9) + (ÿ10* X10) + (ÿ11*X11) (ÿ12*X12) + (ÿ13*X13) + (ÿ14*X14) +
(ÿ15*X15) + (ÿ16*X16) + (ÿ17*X17) + (ÿ18*X18) + (ÿ19*X19)

Note.– Although 19 explanatory variables, independent variables, and predictor variables have been studied in the present study, regressor variables or causes, the proposed Logistic Model contains only 17 values of the estimated logistic coefficients "ÿ" and 17 values of the explanatory variables, independent variables, predictor variables, regressor variables or causes (Xi) because the The explanatory variables maternal age and number of births have two exposure categories which are mutually exclusive, that is, A mother is either ÿ 19 years old or ÿ 36 years old; the same applies to the number of births, since a mother either has 1 birth or has ÿ 5 births.

The above explains why the explanatory variables maternal age ÿ 19 years (X1); and number of births are not included in the **Equation** = 1 (X7).

Example:
Given the following characteristics, what is the probability that a mother will have a low birth weight baby?

1. Age ÿ 36 years;
2. Weight < 50 kg;
3. Height < 150 cm;
4. Past medical history;
5. Age at menarche ÿ 12 years;
6. Number of births ÿ 5;
7. History of abortion(s);
8. Pathological obstetric history;
9. Interpregnancy interval ÿ 24 months;
10. Low socioeconomic level;
11. Marital status "unmarried";
12. Smoking;

13. Alcoholism; 14.
Start of prenatal care from or after week N; 15. Number of prenatal visits ÿ 5; 16.[illegible] · 20 days of gestation;

Type of delivery or vaginal birth route; and 17.
Female gender of the product.

P(Y= 1 **|** X1 , X2 , X3 , X4 , X5 , X6 , X7 , X8 , X9 , **X10 ,** X11 ,

Where:

ÿ= (–5.4657) + (0.0876*1) + (1.0430*1) + (2.0937*1) + (0.2506*1) + (0.3018*1) + (0.1548*1) + (0.7106*1) + (0.0670*1) + (0.9943*1) + (0.2236*1) + (0.3986*1) + (0.4937*1) + (1.4789*1) + (0.0499*1) + (0.0752*1) + (0.0073*1) + (0.1373*1); **ÿ=** (–5.4657) + (0.0876) + (1.0430) + (2.0937) + (0.2506) + (0.3018) + (0.1548) + (0.7106) + (0.0670) + (0.9943) + (0.2236) + (0.3986) + (0.4937) + (1.4789) + (0.0499) + (0.0752) + (0.0073) + (0.1373); **ÿ=** 2.9995
Exponent (ÿ)= Exponent (2.995)= 20.0755

Substituting into the **equation ,** we have:

P (Y = 1 **|** X10 , X11 , X12 , X13 , X14 , X15 , X16 , **X17 ,** X18 , X18, X19= 0.9526

Therefore, with these characteristics, the probability that a mother will have a low birth weight baby is = 0.9526.

expressed as a percentage, it is equal to 95.26%.

Table 6 presents a comparative table of the specific weights of the risk factors in low birth weight of four health service institutions in the city of Mérida, Yucatán, Mexico *versus* the specific weights of risk factors in the low birth weight from four health service institutions in the Maya Zone of the Mexican state of Quintana Roo, Mexico, according to the Model Multiple Logistic Regression. Case-control study

Table 6. Comparative table of the specific weights of risk factors in low birth weight from four service institutions health [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Ministry of Health of the Mexican state of Yucatán (SSY); Mérida Regional Hospital of the Institute of Security and Social Services of State Employees' Social Security Institute (ISSSTE); and the "Ignacio García Téllez" National Medical Center of the Mexican Social Security Institute (IMSS)] of the city of Mérida, Yucatán, Mexico *versus* the specific weights of risk factors in low birth weight of four health service institutions (Lázaro Cárdenas Comprehensive Hospital; Felipe Carrillo Puerto General Hospital; José Comprehensive Hospital María Morelos"; and "Tulum" Integral Hospital) of the Mayan Zone of the Mexican state of Quintana Roo, Mexico, according to the Regression Model Multiple Logistics. Case-control study

Variables explanatory, variables independent, variables predictors, variables returners or causes	Four health service institutions in the city of Mérida, Yucatán, Mexico			Four Mexican state health service institutions Quintana Roo, Mexico		
	Chi-square statistics Wald Square (x^2W)	Exponents ÿ= Odds Ratios	Intervals of estimate at the level trusted by 95%	Chi-square statistics Wald Square (x^2W)	Exponents ÿ= Odds Ratios	Intervals of estimate at the level trusted by 95%
Biological characteristics of the mother						
Maternal age ÿ 19 years	1.9793	0.8220	0.6256ÿ1.0801	2.2969	2.4827	0.7659ÿ8.0473
Maternal age ÿ 36 years	0.3319	1.0915	0.8103ÿ1.4704	2.7928	2.8070 ÿ	0.8366ÿ9.4175
Maternal weight < 50 kg	56.8547	2.8376 ÿ	2.1638ÿ3.7213	3.2465	1.4700	0.9668ÿ2.2351
Maternal height < 150 cm	751.1966	8.1153 ÿ	6.9868ÿ9.4260	74.8540	5.5092	3.7429ÿ8.1091
Background personal pathological	8.4197	1.2848	1.0847ÿ1.5217	25.8328	4.6475 ÿ	2.5700ÿ8.4046
Mother's obstetric history						
Age at menarche ÿ 12 years old	22.0857	1.3523 ÿ	1.1924ÿ1.5337	0.1499	1.0792	0.7336ÿ1.5878
Number of births = 1	0.6039	1.1674	0.7901ÿ1.7251	0.4954	1.5524 ÿ	0.4562ÿ5.2827
Number of births ÿ 5	12.6292	2.0351	1.3753ÿ3.0115	1.6736	2.2714 ÿ	0.6554ÿ7.8719
Background of abortion(s)	0.2480	1.0535	0.8581ÿ1.2935	1.9588	1.5407 ÿ	0.8411ÿ2.8225

Background obstetrics pathological	0.6847	1.0693	0.9124ÿ1.2531	12.2760	4.0735 ÿ	1.8567ÿ8.9367
Interval inter-pregnancy interval ÿ 24 months	91.8390	2.7028	2.2055ÿ3.3123	1.4409	0.7942	0.5451ÿ1.1570
Social characteristics of the mother						
Level low socioeconomic status	7.6208	1.2506	1.0670ÿ1.4658	1.8410	0.5694	0.2524ÿ1.2845
Marital status no-married	32.5920	1.4897 ÿ	1.2992ÿ1.7081	0.1503	1.6384	1.3323ÿ2.0147
Smoking	21.8970	2.5917ÿ7.4290	0.4709	**Characteristics of prenatal care**		
Alcoholism	30.3023				0.0018	0.0000ÿ130475.06
Start of care prenatal from the week No. . 20 of gestation	0.2595	1.0512	0.8676ÿ1.2736	4.3308	0.6116	0.3849ÿ0.9718
Number of queries prenatal ÿ 5	0.8713	1.0781	0.9206ÿ1.2626	4.5630	1.5966 ÿ	0.0394ÿ2.4526
Characteristic of delivery						
Type of delivery or route of birth abdominal	0.0123	1.0073	0.8858ÿ1.1456	6.5423	1.6169 ÿ	1.1189ÿ2.3367
Product Feature						
Female gender	4.7964	1.1472 ÿ	1.0145ÿ1.2972	0.4619	1.1271	0.7982ÿ1.5916

Source: Own elaboration

Discussion

In compliance with the general objective, the specific weights of 19 risk factors in low weight were evaluated multivariately. at birth of children born in four health service institutions in the city of Mérida, Yucatán, Mexico. They were also evaluated in multivariate analysis of the specific weights of the same 19 risk factors in low birth weight of children born in four institutions of health services of the Maya Zone of the Mexican state of Quintana Roo, Mexico.

Regarding newborns from the four health service institutions in the city of Mérida, Yucatán, Mexico, the values The values obtained from the ÿ or OR exponents indicated the positive contribution (OR > 1) in ascending numerical order of the risk factors. of delivery or abdominal birth route (1.0073); start of prenatal care from or after week N · 20 days of gestation (1.0512); history of abortion(s) (1.0535); pathological obstetric history (1.0693); number of prenatal visits ÿ 5 (1.0781); maternal age ÿ 36 years (1.0915); female gender of the product (1.1472); number of births = 1 (1.1674); low socioeconomic level (1.2506); background personal pathological factors (1.2848); age at menarche ÿ 12 years (1.3523); marital status "unmarried" (1.4897); smoking (1.6384); number of births ÿ 5 (2.0351); interpregnancy interval ÿ 24 months (2.7028); maternal weight < 50 kg (2.8376); alcoholism (4.3879); and maternal height < 150 cm (8.1153). Likewise, with respect to newborns in the four health service institutions of the Mexican state of Quintana The values obtained from the ÿ or OR exponents indicated the positive contribution (OR > 1) in ascending numerical order of the factors risk factors for alcoholism (0.0018); low socioeconomic level (0.5694); start of prenatal care from or after week N . 20 of gestation (0.6116); interpregnancy interval ÿ 24 months (0.7942); age at menarche ÿ 12 years (1.0792); marital status "unmarried" (1.0961); female gender of the product (1.1271); maternal weight < 50 kg (1.4700); history of abortion(s) (1.5407); number of deliveries = 1 (1.5524); number of prenatal visits ÿ 5 (1.5966); type of delivery or delivery route abdominal (1.6169); smoking (2.2019); number of deliveries ÿ 5 (2.2714); maternal age ÿ 19 years (2.4827); maternal age ÿ 36 years (2.8070); pathological obstetric history (4.0735); history personal pathological conditions (4.6475); and maternal height < 150 cm (5.5092). Table 5 shows that the only two variables explanatory variables, independent variables, predictor variables, regressor variables, or causes that coincide in terms of the position that They occupy, in ascending numerical order, were the beginning of care from or after week N. · 20th week of gestation (position 3) and the maternal height < 150 cm (in position 19).

The Wald Chi-Square statistic values (x²W) and the corresponding probability values *(p)* were reported for the four health service institutions in the city of Mérida, Yucatán, Mexico, 18 explanatory variables, independent variables, predictor variables, regressor variables or causes with Exponents ÿ or OR > 1 of which 11 were statistically significant: x²W(ÿ= 0.0500; df= 1) ÿ 3.8416; *p* ÿ 0.0500. While for the four health service institutions of the Maya Zone of the Mexican state of In Quintana Roo, 15 exponents ÿ or OR > 1 were found, of which only six were statistically significant: x²W(ÿ= 0.0500; df= 1) ÿ 3.8416; *p* ÿ 0.0500. When the percentage of explanatory variables, independent variables, and predictor variables was compared, regressor variables or causes with statistical significance (11/18; 61.11%) *versus* the percentage of explanatory variables, variables independent variables, predictor variables, regressor variables or causes with statistical significance (6/15; 40.00) no difference was found statistically significant: x²M–H(ÿ= 0.0500; df= 1) < 3.8416; *p* > 0.0500. x²M–H= Mantel–Haenszel Chi-Square Statistic.

Although no statistically significant difference was found at the significance level (ÿ) of 5%, the truth is is that the percentage (11/18= 61.11%) of explanatory variables, independent variables, predictor variables, regressor variables or causes with ÿ Exponents or Odds Ratios > 1 of the total variables studied in the four health service institutions of the city of Mérida, Yucatán, Mexico, is higher than the percentage (6/15= 40.00%) of explanatory variables, independent variables, predictor variables, regressor variables or causes with ÿ exponents or odds ratios > 1 out of the total variables studied in the four service institutions of health of the Mayan Zone of the Mexican state of Quintana Roo.

In accordance with the first specific objective, the positive, negative or zero contribution of the 19 explanatory variables was evaluated, independent variables, predictor variables, regressor variables or causes using the values of their corresponding Exponents ÿ u Odds Ratios. For the four health service institutions in the city of Mérida, Yucatán, Mexico, 18 variables were found explanatory variables, independent variables, predictor variables, regressor variables or causes with positive contribution (OR > 1) and a variable explanatory with negative contribution (OR < 1). Whereas for the four health service institutions of the four institutions of In the health services of the Maya Zone of the Mexican state of Quintana Roo, 15 explanatory variables, independent variables, were found. predictor variables, regressor variables or causes with positive contribution (OR > 1) and four explanatory variables, variables independent variables, predictor variables, regressor variables or causes with negative contribution (OR < 1).

In accordance with the second specific objective, the probability value of low birth weight was predicted (response variable, variable dependent or effect "Y") by applying the Multiple Regression Logistic Model given certain values of variables

explanatory variables, independent variables, predictor variables, regressor variables or causes X1, X2, X3, X4 , X5, X6, X7 , X8, X9, X10, X11, X12, X13,

X14, X15, X16, X17, X18 and X19. The applied equation corresponds to the following Logistic Model:

P(Y= 1 | X1 , X2 , X3 , X4 , X5 , X6 , X7 , X8 , X9 , **X10 ,** X11 ,

With respect to the formulation of hypotheses, it can be concluded, in general terms, that the null hypothesis (H0) should be rejected and the acceptance of the alternative hypothesis (H0) should be accepted.

of the alternative hypothesis, research hypothesis or working hypothesis (H1).

Our results are consistent with those obtained by other authors whose studies have reported maternal age ÿ 36 years **(79–85);** pre-pregnancy weight < 50 kg **(86–89);** maternal height < 150 cm **(90–92);** personal pathological history **(93–102);** age at menarche ÿ 12 years **(103–104);** primiparity and multiparity (ÿ 5 deliveries) **(103–108);** history of abortion(s) **(109);** pathological obstetric history **(110–113);** interpregnancy interval ÿ 24 months **(114);** low socioeconomic level **(115–116);** marital status "unmarried" **(117–122);** smoking **(123–135);** alcoholism **(136–137);** the start of prenatal care from or after week N of prenatal visits ÿ 5 **(138–143);** the type of delivery or abdominal birth route **(144);** and the female gender of the product **(145)** as factors · 20 days of gestation **(138);** the number

risk factors associated with low birth weight.

This thesis work represents the first of its kind that compares two populations using the values of their exponents ÿ u Odds Ratios.

The determinants of low birth weight found in the four health service institutions of the city of Mérida, Yucatán, Mexico, and that can be modified through public health interventions, health education programs, and lifestyle changes Healthy factors include: 1) Maternal age ÿ 36 years; 2) Maternal weight < 50 kg; 3) Past medical history; 4) Number of deliveries ÿ 5; 5) Interpregnancy interval ÿ 24 months; 6) Smoking; 7) Alcoholism; 8) Initiation of prenatal care at or after the week N · 20 of gestation; and 9) The number of prenatal consultations ÿ 5.

Likewise, the determinants of low birth weight found in the four health service institutions of the Maya Zone of Mexican state of Quintana Roo, Mexico, and that can be modified through public health interventions, education programs for the Health and lifestyle changes include: 1) Alcoholism; 2) Starting prenatal care from or after week N ·.

20 days of gestation; 3) Interpregnancy interval ÿ 24 months; 4) Marital status "unmarried"; 5) Maternal weight < 50 kg; 6) Number of consultations prenatal factors ÿ 5; 7) Smoking; 8) Number of births ÿ 5; 9) Maternal age ÿ 19 years; 10) Maternal age ÿ 36 years; and 11) height maternal < 150 cm.

Recommendations

1. Recommend to the relevant health authorities the development of Health Education programs that have as their objective

The main objective is to promote in the population of women of reproductive age (15–49 years) the development of attitudes and behaviors that will allow them to participate in the prevention of low birth weight to protect themselves from risks that endanger both their health and the health of your product(s);

2. Develop and implement a new research project that includes conducting an observational epidemiological study

A nested case-control study within a cohort will be used. This will allow for a more detailed understanding of the contribution of the specific weights. of the risk factors in the development of low birth weight in the four health service institutions of the city of Mérida, Yucatán, Mexico, as well as in the four health service institutions of the Maya Zone of the Mexican state of Quintana Roo; and

3. After the implementation of Health Education programs aimed at preventing low birth weight by the relevant health authorities, compare the low birth weight rate obtained in the present study with the low birth weight rate born during the period from February 1, 2023 to January 31, 2024. The expected outcome is to obtain evidence statistically significant at the significance level (ÿ) of 5% to conclude that the 2023–2024 low birth weight rate is significantly lower compared to the 2019–2020 low birth weight rate.

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UNICLAU LAUDE INTERNATIONAL CHRISTIAN UNIVERSITY

FACULTAD DOCTRINAL DE CIENCIAS NATURALES, EXACTAS, SALUD, INGENIERÍA

DOCTORADO DOCTRINAL EN DESARROLLO DE EXCELENCIA EN NUTRICIÓN

JOSÉ FRANCO MONSREAL

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THESIS SUBMISSION

Title:

Comparative study of the specific weights of risk factors in low birth weight in four health service institutions [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Ministry of Health of the Mexican State of Yucatán (SSY); Mérida Regional Hospital of the Institute of Security and Social Services of the Workers in the Service of the State (ISSSTE); and National Medical Center "Ignacio García Téllez" of the Mexican Social Security Institute (IMSS)] in the city of Mérida, Yucatán, Mexico *versus* the specific weights of risk factors in low birth weight in four health service institutions (Comprehensive Hospital "Lázaro Cárdenas"; General Hospital "Felipe Carrillo Puerto"; Comprehensive Hospital "José María Morelos"; and Comprehensive Hospital "Tulum") in the Maya Zone of the Mexican State of Quintana Roo, Mexico, according to the Multiple Logistic Regression Model. Case-control study

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Summary – [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Ministry of Health of the Mexican State of Yucatán (SSY); Mérida Regional Hospital of the Institute of Security and Social Services of Workers in the Service of the State (ISSSTE); and National Medical Center "Ignacio García Téllez" of the Mexican Social Security Institute (IMSS)]

Introduction. Low birth weight has been a mystery to science throughout history. There have been many theories. Research has been conducted on the causes and consequences of birth weight. Birth weight is one of the variables. recognized as among the most important due to their association with a higher risk of mortality in any period, especially in the period perinatal. Birth weight is, without a doubt, the most important determinant of a newborn's chances of experiencing perinatal growth. and satisfactory development. Therefore, the rate of low birth weight newborns is currently considered a general health indicator. Since it is multifactorial, due to maternal, fetal, and environmental problems. **Objective:** To evaluate multivariately the specific weights of 19 risk factors, explanatory variables, independent variables, predictor variables, Regressor variables or causes in the response variable, dependent variable, or effect (low birth weight). **Materials and methods.** Approach Quantitative. Observational analytical epidemiological study of cases and controls with directionality effectÿrisk factors and with prospective temporality. 24,676 newborns were studied (1,161 cases and 23,515 controls), which corresponds to 20 controls per case. All full-term newborns (37 ÿ 41 weeks of gestation) with weights < 2,500 g ÿ 2,500 g were defined, respectively, as a case and as a control. To evaluate the specific weights of the 19 risk factors, the values of the ÿ Exponents or Odds Ratios (OR) were used. of the Multiple Logistic Regression Model. **Results.** OR values > 1 indicate the positive contribution of the risk factors age Maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; personal pathological history; age at menarche ÿ 12 years; Number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; interpregnancy interval ÿ 24 months; low socioeconomic level; marital status "unmarried"; smoking; alcoholism; initiation of prenatal care at or after the week N ¯ · 20 days of gestation; number of prenatal visits ÿ 5; type of delivery or abdominal birth route; and female gender of the product. **Conclusions.** The values obtained from the ÿ Exponents or Odds Ratios indicate the positive contribution (OR > 1) in numerical order ascending risk factors, type of delivery or delivery route, abdominal (1.0073); initiation of prenatal care from or after week N ¯ · 20 days of gestation (1.0512); history of abortion(s) (1.0535); pathological obstetric history (1.0693); number of consultations

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prenatal ÿ 5 (1.0781); maternal age ÿ 36 years (1.0915); female gender of the product (1.1472); number of deliveries = 1 (1.1674); level low socioeconomic status (1.2506); personal pathological history (1.2848); age at menarche ÿ 12 years (1.3523); marital status "unmarried" (1.4897); smoking (1.6384); number of births ÿ 5 (2.0351); interpregnancy interval ÿ 24 months (2.7028); maternal weight < 50 kg (2.8376); alcoholism (4.3879); and maternal height < 150 cm (8.1153).

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Abstract – [General Hospital "Dr. Agustin O'Horan" of the Ministry of Health of the Mexican state of Yucatan (SSY); Maternal and Child Hospital of the Ministry of Health of the Mexican state of Yucatan (SSY); Merida Regional Hospital of the Institute of Social Security and Services for Workers at the Service of the State (ISSSTE); and "Ignacio Garcia Tellez" National Medical Center of the Mexican Institute of Social Security (IMSS)]

Introduction. Low birth weight has been a mystery to science throughout the ages. Multiple have been the investigations carried out about the causes that produce it and the consequences that it causes. Birth weight is one of the variables recognized among the most important due to its association with the highest risk of mortality in any period, especially in the perinatal period. Birth weight is by far the most important determinant of a newborn's chances of experiencing satisfactory growth and development. For this reason, currently, the rate of low birth weight newborns is considered a general health indicator, since it is multifactorial in origin, due to both maternal problems and fetal and environmental problems. **objective.** Multivariate evaluation of the specific weights of nineteen risk factors, explanatory variables, independent variables, predictor variables, regressor variables or causes in the response variable, dependent variable or effect (low birth weight). **Material and methods.** Quantitative approach. Analytical observational epidemiological study of cases and controls with directionality effectÿrisk factors and with prospective temporality. Twenty–four thousand six hundred and seventy–six newborns (1,161 cases and 23,515 controls) were studied corresponding to twenty controls per case. All term newborns (37 ÿ weeks of gestation ÿ 41) with weights < 2,500 g and ÿ 2,500 g were defined, respectively, as a case and as a control. To evaluate the specific weights of the nineteen risk factors, the values of the ÿ Exponents or Odds Ratios (OR) of the Multiple Logistic Regression Model were used. **Results.** OR values > 1 indicate the positive contribution of risk factors maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; pathological personal history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; birth interval ÿ 24 months; low socioeconomic status; "not–married" marital status; tuxedo; alcoholism; initiation of prenatal care from or after the 20th week of gestation; number of prenatal visits ÿ 5; type of delivery or abdominal birth route; and female gender of the product. **Conclusions.** The values obtained from the ÿ Exponents or Odds Ratios indicate the positive contribution (OR > 1) in ascending numerical order of the risk factors type of labor or abdominal birth route (1.0073); initiation of prenatal care from or after the 20th week of gestation (1.0512); history of abortion(s) (1.0535); pathological obstetric history (1.0693); number of prenatal visits ÿ 5 (1.0781); maternal age ÿ 36 years (1.0915); female gender of the product (1.1472); number of deliveries = 1 (1.1674); low socioeconomic level (1.2506); pathological personal history (1.2848); age at menarche ÿ 12

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years(1.3523); "unmarried" marital status (1.4897); tuxedo (1.6384); number of deliveries ÿ 5 (2.0351); birth interval ÿ 24 months (2.7028); maternal weight < 50 kg (2.8376); alcoholism (4.3879); and maternal height < 150 cm (8.1153).

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Summary – Lázaro Cárdenas Comprehensive Hospital; Felipe Carrillo Puerto General Hospital; José María Comprehensive Hospital Morelos"; and the "Tulum" Comprehensive Hospital

Introduction. Low birth weight is an indicator that allows us to predict a child's probability of survival. In fact, there is There is an exponential relationship between weight deficit, gestational age, and perinatal mortality. Furthermore, it is important to note that a percentage Full-term infants (37 ÿ 41 weeks of gestation) who have low birth weight experience various sequelae of varying severity – especially in the neurological sphere—hence the importance of predicting the presentation of low birth weight. Multiple Logistic Regression It is one of the most expressive and versatile statistical tools available for data analysis in both clinical and other settings. Epidemiology. Its origins date back to the 1960s with the seminal work of Cornfield, Gordon & Smith on the risk of to suffer from coronary heart disease and already, in the form we know it today, with the contribution of Walter & Duncan in which it It addresses the issue of estimating the probability of a certain event occurring based on several variables. Its use becomes widespread and It has expanded since the early eighties, mainly due to the improved computer infrastructure available since then. **Objective.** Multivariately evaluate the specific weights of 19 risk factors, explanatory variables, independent variables, variables predictors, regressor variables or causes (maternal age ÿ 19 years; maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; personal pathological history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; interpregnancy interval ÿ 24 months; low socioeconomic status; marital status "unmarried"; smoking; alcoholism; initiation of prenatal care at or after week N ¯· 20 weeks of gestation; number of prenatal visits ÿ 5; type of abdominal delivery or birth route; and female gender of the product) in the response variable, dependent variable or effect (low birth weight at birth) (birth) **Material and methods.** Quantitative approach. The study design corresponds to that of an analytical observational epidemiological study of cases and controls with a directionality effectÿrisk factors and with prospective temporality. 1,815 newborns were studied [178 (9.81%) cases and 1,637 (90.19%) controls], which corresponds to nine controls per case. All term newborns (37 ÿ weeks of Gestation ÿ 41) with weights < 2,500 grams and ÿ 2,500 grams was defined, respectively, as case and control. In the evaluation of the The specific weights of the 19 risk factors were used as the values of the ÿ Exponents or Odds Ratios (OR) of the Regression Model Multiple Logistics. **Results.** OR values > 1 indicated the positive contribution of the risk factor maternal age ÿ 19 years (2.4827); maternal age ÿ 36 years (2.8070); maternal weight < 50 kg (1.4700); maternal height < 150 cm (5.5092); personal history

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pathological (4.6475); age at menarche ÿ 12 years (1.0792); number of deliveries = 1 (1.5524); number of deliveries ÿ 5 (2.2714); history of abortion(s) (1.5407); pathological obstetric history (4.0735); interpregnancy interval ÿ 24 months (0.7942); low socioeconomic level (0.5694); marital status "unmarried" (1.0961); smoking (2.2019); alcoholism (0.0018); initiation of prenatal care at or after the week N ¯· 20 days of gestation (0.6116); number of prenatal visits ÿ 5 (1.5966); type of delivery or delivery route: abdominal (1.6169); and female gender of the product (1.1271). **Conclusions.** The values obtained from the ÿ or OR exponents indicate the positive contribution (OR > 1) in ascending numerical order of the risk factors alcoholism (0.0018); low socioeconomic level (0.5694); start of care prenatal from or after week N ¯· 20 days of gestation (0.6116); interpregnancy interval ÿ 24 months (0.7942); age at menarche ÿ 12 years (1.0792); marital status "unmarried" (1.0961); female gender of the product (1.1271); maternal weight < 50 kg (1.4700); history of abortion(s) (1.5407); number of deliveries = 1 (1.5524); number of prenatal visits ÿ 5 (1.5966); type of delivery or route of birth abdominal (1.6169); smoking (2.2019); number of births ÿ 5 (2.2714); maternal age ÿ 19 years (2.4827); maternal age ÿ 36 years (2.8070); pathological obstetric history (4.0735); pathological personal history (4.6475); and maternal height < 150 cm (5.5092).

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Abstract – “Lázaro Cárdenas” Comprehensive Hospital; “Felipe Carrillo Puerto” General Hospital; “Józem María Morelos” Comprehensive Hospital Hospital; and "Tulum" Integral Hospital

Introduction. Low birth weight is an indicator that allows predicting the probability of survival of a child. In fact, there is an exponential relationship between weight deficit, gestational age, and perinatal mortality. In addition, it is important to indicate that a percentage of term children (37 ÿ weeks of gestation ÿ 41) who have low birth weight present with various sequelae of variable severity –especially in the neurological sphere– and hence the importance of predicting the presentation of low birth weight. Multiple Logistic Regression is one of the most expressive and versatile statistical instruments available for data analysis in both clinical and epidemiology. Its origin dates back to the sixties with the transcendent work of Cornfield, Gordon & Smith on the risk of suffering from coronary heart disease and, in the way we know it today, with the contribution of Walter & Duncan in which addresses the issue of estimating the probability of occurrence of a certain event based on several variables. Its use has been universalized and expanded since the early eighties, due to the computer facilities available since then. **objective.** Multivariate assessment of the specific weights of nineteen risk factors, explanatory variables, independent variables, predictor variables, regressor variables or causes (maternal age ÿ 19 years; maternal age ÿ 36 years; maternal weight < 50 kg; maternal height <150cm; pathological personal history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; birth interval ÿ 24 months; low socioeconomic level; "unmarried" marital status; tuxedo; alcoholism; initiation of prenatal care from or after 20 weeks of gestation; number of prenatal visits ÿ 5; type of delivery or abdominal birth route; and female gender of the product) in the response variable, dependent variable or effect (low birth weight). **Materials and methods.** Quantitative approach. The study design corresponds to that of an analytical observational epidemiological study of cases and controls with directionality effectÿrisk factors and with prospective temporality. 1,815 newborns were studied [178 (9.81%) cases and 1,637 (90.19%) controls], which corresponds to nine controls per case. All term newborns (37 ÿ weeks of gestation ÿ 41) with weights < 2,500 grams and ÿ 2,500 grams were defined, respectively, as a case and as a control. In the evaluation of the specific weights of the nineteen risk factors the values of the ÿ Exponents or Odds Ratios (OR) of the Multiple Logistic Regression Model were used. **Results.** OR values > 1 indicated the positive contribution of risk maternal factors age ÿ 19 years; maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; pathological personal history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; birth interval ÿ 24 months; low socioeconomic status; "not–married" marital status; tuxedo; alcoholism; initiation of prenatal care from or after

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the 20th week of gestation; number of prenatal visits ÿ 5; type of delivery or abdominal birth route; and female gender of the product.

Conclusions. The values obtained from the ÿ Exponents or Odds Ratios indicate the positive contribution (OR > 1) in ascending numerically order of the risk factors alcoholism (0.0018); low socioeconomic level (0.5694); initiation of prenatal care from or after the 20th week of gestation (0.6116); birth interval ÿ 24 months (0.7942); age at menarche ÿ 12 years (1.0792); "unmarried" marital status (1.0961); female gender of the product (1.1271); maternal weight < 50 kg (1.4700); history of abortion(s) (1.5407); number of deliveries = 1 (1.5524); number of prenatal visits ÿ 5 (1.5966); type of delivery or abdominal birth route (1.6169); tuxedo (2.2019); number of deliveries ÿ 5 (2.2714); maternal age ÿ 19 years (2.4827); maternal age ÿ 36 years (2.8070); pathological obstetric history (4.0735); pathological personal history (4.6475); and maternal height < 150 cm (5.5092).

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Introduction

Low birth weight has been a mystery to science throughout history. Numerous investigations have been conducted.

(1) carried out regarding the causes that produce it and the consequences it causes .

Birth weight is one of the variables recognized as being of greatest importance due to its association with a higher risk of mortality in any period, especially the perinatal period. Birth weight is undoubtedly the most important determinant of a child's chances of success. newborns experience satisfactory growth and development. Therefore, the current rate of low birth weight newborns is It is considered a general health indicator **(2) ,** since it is of multifactorial origin, due to maternal, fetal and environmental problems **(3)**

These children typically experience multiple problems later in the perinatal period, in childhood, and even in adulthood. These problems include poor adaptation to the environment and various physical and mental impairments that become evident upon reaching school age **(4)** .

Programs aimed at reducing the rate of low birth weight show that children born with a weight < Children weighing 2,500 g present a 14 times greater risk of mortality during the first year of life compared to children born at a weight normal **(5)**When the cause of low birth weight has been intrauterine growth retardation, this can become irreversible after birth. and is often accompanied by below-normal mental function and neurological and intellectual sequelae. Low birth weight constitutes Low birth weight is a global concern and is much more common in developing countries. It can be due to the following two factors. Fundamental causes: 1. Having had a birth before the end of gestation (preterm birth = < 37 weeks of gestation); or 2. That the fetus presents with insufficient weight in relation to its gestational age (intrauterine malnutrition and intrauterine growth restriction) delayed). Preterm birth has been linked to very young maternal age, rapid succession of pregnancies, and dilation permanent cervical insufficiency and various illnesses or pregnancy complications. In turn, intrauterine growth restriction is It has been linked to maternal malnutrition and to environmental and social factors. It can sometimes be considered an effect generational **(6)** .

Low birth weight is an indicator that can predict a child's chances of survival. In fact, there is a correlation. There is an exponential relationship between weight deficit, gestational age, and perinatal mortality. Furthermore, it is important to note that a percentage of the

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Full-term infants with low birth weight experience various sequelae of varying severity – especially in the neurological sphere – and Hence the importance of predicting the presentation of low birth weight [7–8].

A very common problem in research is determining the effects of each of the risk factors on some Answer. In the past, it was advised that each factor be studied individually, dedicating a statistical significance test to it (analysis). bivariate). Later, Fisher indicated that important advantages are obtained by combining several factors in the same analysis (multivariate analysis) **(9)** .

The Multiple Logistic Regression Model is highly effective because each observation provides information about all the factors included in the analysis **(10)** .

Multiple Logistic Regression is one of the most expressive and versatile statistical tools available for analysis of data in clinical and epidemiological studies. Its origins date back to the 1960s with the seminal work of Cornfield, Gordon & Smith on the risk of suffering from coronary heart disease **(11)** and already, in the form in which we currently know it, with the contribution of Walter & Duncan, which addresses the topic of estimating the probability of occurrence of a certain event based on several variables [12] Its use became universal and expanded from the early eighties onwards, mainly due to the available computer resources. since then.

Logistic Regression is a multivariate statistical method that allows estimating the relationship between a dependent variable non-metric, particularly dichotomous, and a set of independent variables, whether metric or non-metric. Logistic Regression Analysis Multiple has the same strategy as Multiple Linear Regression Analysis, which differs essentially from Regression Analysis. Multiple Logistics because the dependent variable is metric; in practice the use of both methods is very similar, although their Mathematical approaches are different.

The response variable or dependent variable is not continuous, but discrete (generally taking values zero (0) and one (1)). Explanatory variables, independent variables, predictor variables, regressor variables, or causes can be quantitative or qualitative, and the equation The model's function is not initially linear, but exponential; however, through a simple logarithmic transformation, it can ultimately be presented as as a linear function.

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Thus, the Multiple Logistic Regression Model will be useful in frequent practical research situations where the response
It can only take the following two values: 1 = Presence (with probability p); and 0 = Absence (with probability *1–p).*

Wald (1943) studied an asymptotic test for maximum likelihood estimates and asserted that the parameters estimated in the
Logistic models have a normal distribution for large samples. This test is used to evaluate the statistical significance (ÿ) of
each explanatory variable or regressor variable.

The Multiple Logistic Regression Model is useful because, often, the variable profile can be made up of
Both qualitative and quantitative characteristics are considered, and the aim is to integrate them all into a single, unified equation. The Model of
Multiple Logistic Regression can more closely approximate reality, since many phenomena, such as those in the epidemiological field, resemble it.
more like a curve than a straight line. Furthermore, the exponential curve chosen as the best fit can be logarithmically transformed into a
linear equation of all variables, thus the mathematical apparatus studied for Multiple Linear Regression will be applicable, although
The researcher will ultimately have to reverse the transformation to interpret their conclusions. The primary objective of the Regression Model
Multiple logistics is about modeling how regressor variables influence the probability of a particular event occurring. In short,
The overall goal of Multiple Logistic Regression is to predict the probability of an event of interest in a research study, as well as
identify the predictor variables useful for such prediction.

The Hosmer–Lemeshow goodness-of-fit test evaluates the goodness of fit of the model, that is, the degree to which the
The predicted probability matches the observed probability by constructing a contingency table and applying a $\div^2$ test. To do this,
Calculate the deciles of the estimated probabilities and divide the observed data into ten categories.

Using the Multiple Logistic Regression Model, this work was aimed at the evaluation and comparison of the
Specific weights of 19 risk factors for low birth weight in children born in four health service institutions [Hospital
General "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Ministry
Health of the Mexican state of Yucatán (SSY); Mérida Regional Hospital of the Institute of Security and Social Services for Workers
to the State Service (ISSSTE); and the "Ignacio García Téllez" National Medical Center of the Mexican Social Security Institute (IMSS)] of the
city of Mérida, Yucatán, Mexico *versus* the specific weights of 19 risk factors for low birth weight in children born in four
health service institutions (Lázaro Cárdenas Comprehensive Hospital; Felipe Carrillo Puerto General Hospital; José Comprehensive Hospital

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María Morelos"; and "Tulum" Integral Hospital) of the Mayan Zone of the Mexican state of Quintana Roo, Mexico, in order to detect those risk factors that can be modified through public health interventions by the relevant health authorities.

Birth weight is considered the single most important indicator of growth and development during intrauterine life and of nutritional status of the newborn **(13–16)** . Underweight is perhaps one of the world's biggest public health problems due to its close relationship with mortality **(17)** It is estimated that 21 million babies are born with low birth weight worldwide, and Of those, 20 million are born in non-industrialized countries. Regarding mortality, in Mexico it is estimated that the incidence of low birth weight is 15% **(18–21)** .

The experts from the United States Academy of Sciences recommend the inclusion of the following variables **(22)** in the study of the incidence of low birth weight.

Social variables. Most of the social indicators with predictive value for low birth weight are strongly associated with food. Thus, for example, studies carried out during the Siege of Leningrad (1941–1944) showed that the decrease in the Nutrient availability caused a significant decrease in average birth weight of 529 and 542 g in boys and girls, respectively. **(23)** . This group of social variables also recommends the inclusion of variables related to the availability of services of health, since when working with models for the prevention of low birth weight that are based on the identification of at-risk subjects Based on social variables, it is necessary to have the possibility of profoundly modifying the social structure of communities, since In various reports in the scientific literature, low birth weight is one of the characteristics of poorly developed communities. **(24–26)** .

Family variables. These constitute the necessary bridge to link social variables with biological variables and include, Basically, they are indicators of family habits and lifestyles. They establish difficult processes, insofar as they are the result of... prevailing socioeconomic conditions in the community such as:

–Socioeconomic level.– When analyzed according to paternal occupation, the percentage of low birth weight infants It can range from 3.6% in professionals to 5.5% in unskilled workers **(27);**

–Presence of malnourished individuals in the family.– The lack of available food within the family is often evident. It is reflected in insufficient nutrition not only for children, but also for pregnant women **(28);** and

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–Exposure to a smoking environment.– Carbon monoxide (CO) and nicotine (CÿÿHÿÿNÿ) adversely affect the growth of the product of gestation because they rapidly cross the placental barrier **(29)** However, the mechanism involved is still unclear, as some authors propose that smoking produces a decrease in food intake **(30)** while others claim that low birth weight is due to adverse effects of the cigarette *per se* **(31);**

Biological variables. Unlike social variables, biological variables can be modified for the most part through of intervention programs. This condition means that prevention models in the short and medium term are based on this type of variables such as:

–Previous reproductive losses or a history of low birth weight infants.– There is a high probability that the Reproductive events tend to be repeated. Thus, for example, the percentage of cases with low birth weight is 5.4% in women without previous fetal losses and 9.0% in those who have had them **(32)** Furthermore, there is an increase in the incidence of low birth weight among Mothers who have had hypotrophic children (anything below the 10th percentile is considered to be a newborn) hypotrophic) compared with those who have had children of adequate weight. The incidence is 16.0 and 3.3%, respectively **(27);**

–Low pre-pregnancy weight.– When women are classified according to their pre-pregnancy weight –underweight and overweight or pre-obesity– The incidence of children with low birth weight is found to be 7.8 and 2.3%, respectively **(33)** It has been observed that women with a pre-pregnancy weight < 50 kg have a higher proportion of low birth weight infants than women with a higher weight **(34);**

–Poor weight gain during pregnancy.– According to scientific literature, there is a direct association between the weight of the newborn and maternal weight gain. It has been observed that in women with a weekly weight gain < 250 g during the two In the last few quarters, the incidence of low birth weight products doubles **(35);**

–Complications during pregnancy.– There are various intercurrent pathologies in gestation such as toxemia, bleeding and Urinary tract infections that have been associated with low birth weight **(35–36)** It has been observed that the incidence of low birth weight increased from 21 to 44% when the mother had high blood pressure **(37)** It has been documented that toxemias produce lesions at the level placental that cause a reduction in placental flow of 300 to 600 ml/min with the consequent decrease in the supply of nutrients to the fetus **(16);**

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–Alcohol abuse.– Some researchers have found no association between alcohol intake (ÿ 3 g/day) and low birth weight.
be born. However, when alcohol consumption is higher, the "alcohol-induced fetal syndrome" occurs, in which there are alterations in development, malformations and low birth weight **(38);**

–Age less than 17 years.– The mother's age is a variable frequently associated with fetal hypotrophy **(28, 30, 34)** . In
In the two years following the onset of menarche, the risk of having a low birth weight child doubles because the mother's own energy needs increase due to growth and she is unable to meet the demands of pregnancy **(23, 27, 32);** and

–Limited maternal experience or lack of psychosocial support.– Pregnancy triggers a series of social, psychological and biological factors. When a woman does not have the necessary support to adjust properly to pregnancy, she is likely to be unable to respond to the demands and, therefore, give birth to a child with low birth weight. Thus, for example, when the frequency with which
Among infants born to single mothers, the percentage of low birth weight was 8.65%, while among mothers who had
The frequency was 4.41% **(27)** .

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Background

Maternal age.– Duanis–Neyra and Neyra–Álvarez **(6)** reported that maternal age ÿ 19 years represents a risk factor essential for children to be born weighing less than 2,500 g. This is because adolescents are not suitable for the Pregnancy, since their organs are immature and there is a possibility of having a low birth weight baby. Studies conducted by Benício *et* al., **(43)** and Victoria *et* al., **(44)** report that one of the factors that was associated with low birth weight was maternal age ÿ 19 years. A study by Liang *et* al., **(45)** reports that as maternal age increases (ÿ 36 years) newborns tend to to present a decreasing weight. Santos–Pereira–Solla *et* al., **(46)** report that very young pregnant woman (ÿ 19 years) or of advanced maternal age (ÿ 36 years) were factors associated with low birth weight with OR values > 1. A study carried out by Aguilar–Valdés *et* al., **(47)** reports that the Being under 20 years of age at delivery had an OR > 1, and this association was statistically significant with low birth weight. Bortman **(48)** reports that maternal ages that increase the risk of low birth weight are those under 20 years of age and those between 35 and 39 years and older. Ruiz-Linares *et* al. **(49)** and Gama *et* al. **(50)** have identified maternal age under 20 years as a risk factor, and Santos-Pereira-Solla *et* al. **(46)** have identified maternal age over 35 years as a risk factor.

low birth weight. Fuentes-Afflick & Lurie **(51)** have extensively investigated the maternal ages at which pregnancy is most likely has a favorable outcome, concluding that ages under 20 and over 35 have been identified as Risk factors for low birth weight. During the period from 1990 to 1993, Díaz-Alonso *et* al., **(52)** conducted a study retrospective case-control study in the area of the "Luis A. Turcios Lima" Teaching Polyclinic in the municipality of 10 de Octubre with the objectives of To identify the behavior of low birth weight and to establish the existence and intensity of this condition with risk factors selected; the variables studied were maternal age, weight assessment, obstetric complications, diseases associated with the Pregnancy, smoking habit, and interpregnancy interval; all variables were significantly associated with low birth weight, and maternal age ÿ 19 years was identified as a risk factor with a slight influence. Jewell *et* al., **(53)** analyzed the ages of the mothers and They found that, for the estimation of birth weight, children of mothers aged ÿ 16 years weighed 62 g less than those of mothers aged between 20 and 35 years; similarly, the children of mothers between 17 and 19 years old weighed 43 g less, those of mothers between 36 and 38 years old weighed 15 g less and those of mothers aged ÿ 39 years weighed 28 g less; in addition, in the estimation of low birth weight, mothers aged ÿ 36 years had children with lower weight; these differences reinforce the idea of the social and/or reproductive risk of extreme maternal ages and consider age

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Ideally between 20 and 35 years. Chen *et* al., **(54)** reported that the risk of low birth weight increases if mothers, due to education and
Women in the workforce have decided to postpone motherhood until after the age of 35.

Maternal weight.— One of the risk factors for low birth weight most frequently found in studies conducted by Duanis–Neyra and Neyra–Álvarez **(6)** by Cisneros *et* al., **(2)** is a pre-pregnancy weight of less than 50 kg. Lemus-Lago *et* al., **(1)** Hernández–
Adelstein **(34)** observed that women with a pre-pregnancy weight < 50 kg have a higher proportion of low birth weight infants than women with a higher weight. Benício *et* al. **(43)** performed a multifactorial analysis and found that one of the factors associated with low birth weight was a pre-pregnancy maternal weight < 50 kg. Regarding weight assessment, Faúndes *et* al. **(55)** state that
The greater the mother's weight at the start of pregnancy, the greater the average weight of the newborn, and the better the weight will be.
when the patient has a pre-pregnancy weight ÿ 50 kg. Soriano-Llora *et* al., **(56)** report that a pre-pregnancy maternal weight < 50 kg is
was associated with low birth weight (OR= 1.7; 95% CI= 1.03–2.69). In the logistic model, the absence of maternal weight
Pre-pregnancy weight ÿ 50 kg acts as a risk factor for low birth weight; this has been reported in studies conducted by
Cnattingius *et* al., **(57)** and Doctor *et* al., **(58)** Casanueva **(59)** and Bakewell *et* al., **(60)** who point out that it is important to consider that maternal weight
< 50 kg is a risk factor for low birth weight and for it to be repeated in subsequent pregnancies.

Maternal height.– Studies carried out by Lemus-Lago *et* al., **(1)** report that one of the Duanis–Neyra & Neyra–Álvarez **(6)**
The most frequently found risk factor for low birth weight is maternal height < 150 cm. Hernández-Cisneros *et* al., **(2)**
They report that one anthropometric variable that should be taken into consideration is height, since a pregnant woman's height < 150 cm increases the risk of having a low birth weight child. Santos-Pereira-Solla *et* al., **(46)** report that maternal height ÿ 149 cm was a factor associated with low birth weight with an OR > 1. A study by Casanueva **(59)** reports that when
Mothers who are shorter than 150 cm increase the number of low birth weight babies.

Past medical history.– Galbraith *et* al., **(37)** reported that the incidence of low birth weight increased from 21 to 43%
when the mother had high blood pressure. Among the risk factors for low birth weight that have been most frequently found
in studies carried out by Lemus–Lago *et* al., **(1)** Hernández–Cisneros *et* al., **(2)** hypertension is present and Duanis–Neyra and Neyra–Álvarez **(6)**
arterial hypertension during pregnancy and cervicovaginal sepsis. Several authors have reported the association between low birth weight and factors such as chronic hypertension **(61)** , kidney diseases **(62)** , thyroid diseases, cardiorespiratory diseases and

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autoimmune diseases **(63)** . In recent years, Deodhar & Jarad **(64)** , Vangen *et* al., **(65)** , Bergsjo & Villar **(66)** and Stratton *et* al., **(67)** have Studies have examined how certain maternal characteristics can influence indicators of the degree of growth in newborns; in particular, it has been shown that It has been shown that certain conditions, such as blood pressure disorders, diabetes mellitus, and infections, are related to alterations in the weight of the newborn. Mota-Sanhua *et* al., **(68)** conducted a study on the distribution of newborns according to various maternal history found that 30% had maternal history without pathology (AMSP), 22% had maternal history with High blood pressure (AMCHA) and about 7% had a maternal history of diabetes mellitus (AMDM); the authors present the risks low birth weight according to various maternal histories; children with AMCHA had a 2.4 times greater risk of low birth weight at birth that children with AMSP and this was the only statistically significant risk of low birth weight; likewise, the authors present The risks of macrosomia in newborns (ÿ 4,500 g); children with AMDM had a five times greater risk of being born with macrosomia that children with AMSP and this was the only statistically significant risk factor for macrosomia. In a study conducted in women Canadians with blood pressure disorders, Xiong *et* al., **(69)** found that the risks of low birth weight are greater than those of hypertrophy, regardless of the severity of the disorder.

Age at menarche.— Langer and Arroyo **(7)** , Harfouche **(13)** and Beal **(14)** report age at menarche ÿ 12 years as a risk factor of low birth weight. A study by Franco-Monsreal *et* al., **(70)** reports a statistically significant association at the level of significance (ÿ) of 5% between low birth weight and age at menarche ÿ 12 years.

Parity.– Langer and Arroyo **(7)** , Harfouche **(13)** , Beal **(14)** and Bergner & Susser **(23)** report primiparity and multiparity (ÿ 5 births) as risk factors for low birth weight. Primiparity has been associated with low birth weight in (72) studies carried out by Campbell *et* al., **(71)** and Silva *et* al., Furthermore, Campbell *et* al., **(71)** report that although in pregnancies In subsequent pregnancies, a decrease in the incidence of low birth weight was observed, but an increase in this risk was again detected starting with the fourth child. Najmi **(73)** reports that a historyof four or more births is identified as a risk factor for low birth weight. birth; however, neither in the crude analysis nor in the multivariable analysis did this variable present a significant risk. Millar *et* al., **(74)** describe in their study the existence of an increased risk of low birth weight with primiparity. Fernández-González *et* al., **(75)** They report a statistically significant association between low birth weight and primiparity. Likewise, the association between low birth weight at birth and primiparity is reported in an investigation carried out by Pagola-Prado **(76)** .

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History of abortion(s).– Pitkin **(15)** reports a history of abortion(s) as a risk factor for development and presentation of low birth weight. Likewise, Rosell-Juarte *et* al., **(77)** report that a factor associated with low birth weight is a history of abortion(s); previous abortions and stillbirths decrease birth weight by 18 and 29 g and increase the likelihood of low birth weight by 0.6% and 1.3%, respectively; the above indicates the existence of natural or environmental factors that have a negative effect on gestation forcing us to identify the reasons and address them as far as possible. A study by Franco-Monsreal *et* al., **(70)** reports the statistically significant association at the significance level (ÿ) of 5% between low birth weight and history of abortion(s).

Pathological obstetric history.– Langer and Arroyo **(7)** , Harfouche **(13)** and Beal **(14)** report pathological obstetric history as a risk factor for low birth weight. Silva *et* al., **(78)** and Abdulrazzaq *et* al., **(79)** report that a history of Previous deliveries with low birth weight constitute a risk factor for the development of low birth weight infants. The results obtained in studies carried out by Miller & Mvula **(80)** and by Bratton *et* al., **(81)** indicate that a history of low birth weight in pregnancies Previous history is the main risk factor in subsequent pregnancy; in 20.4% (51/250) of the case group and in 6.4% (16/250) of the In the control group, these authors found a history of low birth weight in previous deliveries; the differences between the two groups were statistically significant *(p* < 0.0010); in the Logistic Regression Model this variable acts as a risk factor with a The adjusted OR was 4.2, with a 95% CI of 2.0–8.9 and a *p* < 0.001. Becerra *et* al., **(82)** found that the presence of previous perinatal death is a strong predictor of subsequent prematurity and low birth weight. Bakewell *et* al., **(60)** reported that a history of a previous pregnancy Having a child with low birth weight shows a strong relationship to repeating low birth weight, especially when the second pregnancy is preceded by an extremely low birth weight infant; the risk of repeating low birth weight has been calculated at 10.1 for preterm infants small for gestational age, in 7.9 for preterm infants with appropriate weight for gestational age and in 6.3 for small for gestational age term products.

Interpregnancy interval. —Bergner & Susser **(23)** and Sever *et* al. **(24)** report that an interpregnancy interval ÿ 24 months represents a key risk factor for infants being born with a weight < 2,500 g. A longitudinal study by Victoria *et* al. **(44)** reports a short interpregnancy interval as a risk factor for low birth weight. Santos-Pereira-Solla *et* al. **(46)** report that brevity The interpregnancy interval (< 13 months since the last pregnancy) was a risk factor associated with low birth weight with an OR value > 1. An investigation carried out by Bortman **(48)** reports that the risk of having children with low birth weight was higher in those women

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whose interpregnancy interval was < 18 months. From 1990 to 1993, Díaz-Alonso *et* al., **(52)** conducted a retrospective case-control study in the area of the "Luis A. Turcios Lima" Teaching Polyclinic in the 10 de Octubre municipality with the objectives of identifying the behavior of low birth weight and to establish the existence and intensity of this condition with the selected risk factors; the variables studied These included maternal age, weight assessment, obstetric complications, pregnancy-related illnesses, smoking habit, and interval interpregnancy interval; all variables were significantly associated with low birth weight and an interpregnancy interval < 1 year was identified as a risk factor with a moderate effect; in mothers with an interpregnancy interval < 1 year, it was observed that in the group of The study showed a prevalence of 34.3% in the 23 patients and 13.8% in the control group of 44 patients; for an interpregnancy interval ÿ 1 The behavior was 43 patients for 64.7% in the study group and 280 patients for 85.2% in the control group: x 2= 14.84; df= 1; $p < 0.01$; and OR= 3.25; therefore, it was clearly a risk factor, since its presence tripled the probability that a low birth weight baby. A study by Díaz-Tabares *et* al., **(83)** reports that during pregnancy and lactation the mother It depletes its biological and nutritional resources, so it needs time to recover and prepare for another pregnancy; the above explains The high frequency of low birth weight when the time between pregnancies is short. López **(84)** reports that the children Properly spaced infants have a greater weight than those born at short intervals and suggest a minimum safety period of 36 months. Franco-Monsreal *et* al., **(70)** report the statistically significant association at the significance level (ÿ) of 5% between low birth weight and the interpregnancy interval ÿ 24 months.

Socioeconomic level.– Langer and Arroyo **(7)** , Harfouche **(13)** , Beal **(14)**, Pitkin **(15)** , Beal **(16)** and Jurado-García **(17)** report the level Low socioeconomic status as a risk factor in the presentation of low birth weight. A study conducted by Goldenberg *et* al., **(85)** Sung *et* al. **(86)** report that low birth weight is more frequently associated with mothers from disadvantaged economic backgrounds. that in Scotland, particularly among working-class women, the mother's social class represents a risk factor independent of maternal age, parity, adverse obstetric history and the father's socioeconomic status.

Marital status.– Langer and Arroyo **(7)**, Harfouche **(13)** , Beal **(14)**, Pitkin **(15)** , Beal **(16)**, Jurado-García **(17)** and Arias & Tomich **(25)** report the Marital status as single as an associated risk factor in the presentation of low birth weight. Bortman **(48)** reports that the risk of having children Low birth weight is more frequently associated with unmarried women. Soriano-Llora *et* al., **(56)** report that Marital status "unmarried" was identified as a risk factor for low birth weight (OR= 1.7; 95% CI= 1.1–2.7); the authors note that in

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In this sense, it is worth noting that the category "unmarried" does not implicitly imply the presence or absence of social, emotional and
stability, which could be due to a poor economic situation and stresses associated with pregnancy in a woman in this situation. Likewise, Hall **(87)** reports
the marital status "unmarried" as a risk factor for low birth weight. Ventura *et* al., **(88)** report
Regarding marital status, single women showed an OR= 1.67 and 95% CI= 1.36–2.07; the authors note that values
Higher odds ratios were observed for these same factors in term infants. Nault **(89)** is the main, In Cameroon, it is reported that being a single mother
risk factor for low birth weight. Chaturachinda *et* al., **(90)** report that when they analyzed the change in marital status in
Interestingly, different pregnancy studies found that married mothers had a higher incidence of low birth weight in their first child.
but less low birth weight in the second child, with a greater risk of low birth weight in those who did not remain married
for the second pregnancy (OR= 1.4 *versus* OR= 1.3); thus, they conclude, being single seems to increase the risk of low birth weight in the
young women in contrast to single adult women.

Smoking.– Langer and Arroyo **(7)** , Harfouche **(13)**, Beal **(14)**, Pitkin **(15)**, Beal **(16)** and Sinclair & Saigal **(26)** report maternal smoking
as a risk factor for the presentation of low birth weight. Rosell-Juarte *et* al., **(77)** point out that a risk factor of connotation in
Their contribution to low birth weight is smoking, which exerts its negative influence both by causing prematurity and by causing malnutrition.
intrauterine. Studies by Risiko **(91)** and Ganzer **(92)** report that children of smoking mothers weigh on average 200 to 300 g less at birth than those of non-
smoking mothers. Bakketeig *et* al., **(93)** report in their study that smoking mothers have twice as many
probability of giving birth to a low birth weight newborn compared to non-smoking mothers. Barros *et* al., **(94)** determined using the technique of
Regression studies indicate that one of the most important variables associated with low birth weight is smoking during pregnancy; according to these
The authors state that the toxic products of tobacco damage the vascular bed, causing disorders in fetal nutrition and oxygenation. Benício *et* al.,
(43) performed a multifactorial analysis and found that one of the factors associated with low birth weight is smoking during pregnancy. Santos-Pereira-
Solla *et* al., **(46)** report that smoking during pregnancy is a factor associated with low birth weight.
to be born with an OR value > 1. Martin *et* al., **(95)** reported that smoking practically doubles the risk of the baby being born with low birth weight;
In the United States of America, in 2002, 12.2% of babies born to smoking mothers were born with low birth weight compared to 7.5% of babies born to
non-smoking mothers. Lightwood *et* al., **(96)** and Lumley *et* al., **(97)** point out that interventions to reduce smoking
During pregnancy, they have demonstrated their usefulness and cost-effectiveness in reducing low birth weight. Of the social factors studied

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According to Aguilar-Valdés *et* al., **(47)** being a smoking mother had an OR > 1 and this association was statistically significant with low birth weight. A research study by Bortman **(48)** reports that the risk of having children with low birth weight is high in women who smoke. A multivariable study by Cabrales-Escobar *et* al., **(98)** reports a significant association between low birth weight and smoking. Studies by Santos-Pereira-Solla *et* al., **(46)** , Brown *et* al., **(99),** Lieberman *et* al., **(100)** Brett *et* al., **(101)** identified the association between low birth weight and maternal smoking during pregnancy. Díaz-Alonso *et* al., **(52)** conducted a retrospective case-control study in the area of the "Luis A. Turcios Lima" Teaching Polyclinic in municipality 10 of October during the period from 1990 to 1993; the variables studied were maternal age, weight assessment, complications obstetrics, pregnancy-related diseases, smoking habit, and interpregnancy interval; all variables were associated significantly associated with low birth weight and smoking was labeled as a risk factor with a moderate effect. Jewell *et* al., **(53)** Reports indicate that in mothers who smoke, the probability of having a low birth weight newborn increases by 2.5%, decreasing the birth weight. in 116 g. Medical scientific literature has shown that this characteristic causes a deleterious effect on fetal blood flow placental and on the fetus. According to Bouckaert **(102)**, Tobacco use is an environmental and behavioral risk that is associated with This is an important factor associated with an increased incidence of low birth weight. There appears to be a dose-response relationship between the number of cigarettes smoked by the mother during pregnancy and the decrease in the weight of the product at birth, a decrease quantified by Chomitz *et* al., **(103)** between 150 and 320 g. Windham *et* al., **(104)** report in their study that although the consumption of more than 10 cigarettes has been considered Daily smoking is associated with a higher risk of low birth weight; to date, no safe recommended smoking level has been established. In the study conducted by Soriano-Llora *et* al., **(56)** this circumstance was recorded dichotomously (yes or no) and acted as a factor of risk when obtaining the following results: OR= 1.6; 95% CI= 1.1–2.4; and p= 0.01; however, these results may be biased, since that tobacco use is often associated with combined consumption with alcohol **(105)** , with coffee **(106)**, with illicit drugs **(107–109)** or with a combination of all of them **(110–111)** Franco-Monsreal *et* al., **(70)** report in their study the statistically significant association at the level significance (ÿ) of 5% between low birth weight and smoking habit.

Alcoholism.– Investigations carried out by Langer and Arroyo **(7)** , Harfouche **(13)** and Beal **(14)** report maternal alcoholism as Risk factors associated with low birth weight. Among the factors that increase the probability of low birth weight Birth weight has been cited as a factor in alcohol consumption, a substance which, according to Rama-Sastryd **(112) ,** along with its metabolites, crosses the placenta and

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It acts on the fetus, producing in 84% of cases, according to Elorza **(113)** and Aguilar , prenatal and postnatal growth deficiencies that **(114),** explaining a birth weight lower than the gestational age and the poor response to nutritional intervention during childhood **(115)** It has It has been shown that the children of women who consume at least one cup of alcohol daily weigh around 160g less on average than Those of mothers who do not consume it, which, according to , It is caused by the restriction of cell growth during critical periods with Buyse **(116),** has a notable impact on the normal development of the cellular cytoskeleton. Romera and Fernández **(117)** assert that the "safe level" has not been defined, so abstinence during pregnancy is recommended. According to Lazzaroni *et* al., **(118)** alcohol consumption is a risk environmental and behavioral factors that are significantly associated with an increased incidence of low birth weight.

Week of gestation at the start of prenatal care.– Arias & Tomich **(25)** report the start of prenatal care from or after week N ¯· 20 weeks of gestation as a risk factor associated with low birth weight. The maternal and child health program Cubans have established the requirement to have a first prenatal check-up by the primary care physician before week N ¯· 14 weeks of gestation and the evaluation by a specialist 15 days after the first check-up. Based on these standards, the hypothesis was formulated that the first check-up Late prenatal testing for pregnancy evaluation could constitute a risk factor for low birth weight. Cabrales-Escobar *et* al., **(98)** revealed a statistically significant association between low birth weight and late pregnancy control (after the first 14 weeks). Franco-Monsreal *et* al., **(70)** report the statistically significant association at the significance level (ÿ) of 10% between low weight at birth and the start of prenatal care from week N ¯· 20 days of gestation.

Number of prenatal visits.– Arias & Tomich **(25)** report five or fewer prenatal visits as a risk factor associated with The presentation of low birth weight. A multifactorial analysis by Benício *et* al., **(43)** reports that one of the factors associated with low birth weight is the absence of prenatal care. Santos-Pereira-Solla *et* al., **(46)** report that deficient prenatal care (< 6 visits) is a factor associated with low birth weight with an OR > 1. Bortman **(48)** reports that the highest OR corresponded to lack of prenatal care (OR= 8.77; 95% CI= 6.7–11.4); likewise, this author reports that the Odds Ratio (OR) values associated with Inadequate prenatal care and a delayed first prenatal visit were greater than two. Cabrales-Escobar *et* al., **(98)** report a statistically significant association between low birth weight and delayed prenatal visit. Brown *et* al., **(99)** report the association between Low birth weight and inadequate prenatal medical care. Based on a study of births occurring between 1995 and 2003 in the main maternity hospital in Uruguay, Jewell *et* al., **(53)** report having found a positive effect on low birth weight when

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Prenatal care increases; the results, through two-stage least squares estimations and controlling for the
The endogeneity of prenatal care shows that going from no check-ups to nine (the appropriate amount for low-risk pregnancies) would increase birth weight by 521 g. Halpern *et* al., **(119)** report that low birth weight is associated with both prenatal care initiated late (after week N · 13 weeks of gestation) as well as by an insufficient number of visits (less than six). Using Abel **(120) ,** using a scale to classify prenatal care as adequate, intermediate, and inappropriate, found that adequate and intermediate care decreases the risk of prematurity and low birth weight. Moore *et* al. **(121)** conducted a comparative study between pregnant women with and without prenatal care, reporting, for the former, significant reductions in the frequency of premature births and low birth weight infants at birth, in addition to fewer very low birth weight infants. A study by Franco-Monsreal *et* al., **(70)** reports an association statistically significant at the significance level (ÿ) of 5% between low birth weight and a number of prenatal visits ÿ 5.

Type of delivery or route of birth.– Sinclair & Saigal **(26)** report the type of delivery or abdominal route of birth as a factor of risk in the presentation of low birth weight. A research study carried out by Franco-Monsreal *et* al., **(70)** reports that the The percentage (51.62%) of cases was significantly higher than the percentage (11.68%) of controls with type of delivery or birth route abdominal and conclude by pointing out the existence of statistically significant evidence at the significance level (ÿ) of 5% to conclude that there is an association between low birth weight and the type of delivery or abdominal birth route.

Product gender.– Research work carried out by van den Berg **(27)** and by Habicht *et* al., **(28)** reports the female gender of the product as a risk factor associated with the presentation of low birth weight. Barros *et* al., **(94)** determined using the technique of Regression studies show that an important variable associated with low birth weight is the female gender of the infant. A study conducted by Jewell *et* al., **(53)** reports that, as expected, boys at birth weigh on average 111 g more than girls, thus decreasing the probability of being born with low birth weight.

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Justification

The low birth weight rate is defined as the ratio obtained by dividing the total number of live births registered with a weight less than 2,500 g in a given area and in a given period among the total number of live births registered in that same area and in that same period **(122)** .

According to a report presented in November 2020 by the Pan American Health Organization **(39) ,** Mexico is among The countries with high rates of low birth weight babies. The figure rises to 181,840 babies and places the country second only to Brazil. It ranks first with 269,920 children. Haiti is the Latin American country with the highest percentage of underweight children. birth (15.0%), followed by Guatemala (14.0%) and Puerto Rico (14.0%). Mexico is at an intermediate level (8.0%), as is Brazil, by below Venezuela (10.0%) and above Argentina (7.0%). The countries with the lowest percentage of low birth weight babies are Belize (6.0%), El Salvador (6.0%), Peru (6.0%) and the Dominican Republic (6.0%). Low birth weight rates for Central American countries are They are found in the following ascending order: El Salvador (6.0%), Costa Rica (7.0%), Nicaragua (9.0%), Honduras (9.0%), Panama (10.0%) and Guatemala (14.0%). Similarly, for South American countries, the corresponding low birth weight rates, in ascending order, are Peru (6.0%), Chile (7.0%), Argentina (7.0%), Uruguay (8.0%), Brazil (8.0%), Paraguay (9.0%), Ecuador (9.0%), Colombia (9.0%), Bolivia (10.0%) and Venezuela (10.0%).

According to data from the National Institute of Statistics and Geography (INEGI) **(40) ,** corresponding to the years 2015–2019, the state Mexicano de Yucatán was ranked number 4 with a rate of 7.7% (national rate of 6.1%); number 15 with a rate of 4.7% (national rate of 4.5%); number 7 with a rate of 8.3% (national rate of 7.4%); number 3 with a rate of 8.2% (national rate of 6.4%); and, again, in third place with a rate of 7.9% (national rate of 6.6%). The comparison of low birth weight rates for The Mexican state of Yucatán, compared to the corresponding figures for the Mexican Republic, showed statistically significant differences. for the years 2017 ($x^2M–H= 44.55$; $p= 0.0000$); 2018 ($x^2M–H= 180.11$; $p= 0.0000$); and 2019 ($x^2M–H= 96.27$; $p= 0.0000$). Due to a lack of data, it was not possible to When the comparison was made for the year 2015 and for the year 2016, no statistically significant difference was found ($x^2M–H= 3.45$; $p= 0.0629$).

However, there are no previous studies that multivariately evaluate the specific weights of risk factors in low birth weight. to be born. Therefore, this thesis work constitutes a contribution that evaluates the specific weights of 19 risk factors in the low birth weight in four health service institutions [General Hospital "Dr. Agustín O'Horán" of the State Health Secretariat

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Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Mexican State of Yucatán Health Secretariat (SSY); Regional Hospital Mérida of the Institute of Security and Social Services for State Workers (ISSSTE); and the "Ignacio" National Medical Center García Téllez" of the Mexican Social Security Institute (IMSS)] in the city of Mérida, Yucatán, Mexico, as well as the specific weights of 19 risk factors for low birth weight in four health service institutions (Lázaro Cárdenas Comprehensive Hospital; Hospital General "Felipe Carrillo Puerto"; "José María Morelos" Comprehensive Hospital; and "Tulum" Comprehensive Hospital) of the Mayan Zone of the Mexican state from Quintana Roo, Mexico, according to the Multiple Logistic Regression Model. Case-control study.

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Problem statement

What are the specific weights of 19 risk factors (maternal age ÿ 19 years; maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; personal pathological history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of miscarriage(s); pathological obstetric history; interpregnancy interval ÿ 24 months; low socioeconomic status; marital status "unmarried"; smoking; alcoholism; initiation of prenatal care at or after week N ¯ · 20 days of gestation; number of consultations prenatal factors ÿ 5; type of delivery or abdominal delivery route; and female gender of the product) in low birth weight in four institutions of health services [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Hospital Maternal and Child Hospital of the Yucatán State Health Secretariat (SSY); Mérida Regional Hospital of the Institute of Social Security and Social Services for State Employees (ISSSTE); and the "Ignacio García Téllez" National Medical Center of the Institute Mexican Social Security Institute (IMSS)] in the city of Mérida, Yucatán, Mexico, as well as in four health service institutions (Hospital "Lázaro Cárdenas" Comprehensive Hospital; "Felipe Carrillo Puerto" General Hospital; "José María Morelos" Comprehensive Hospital; and "Tulum" Comprehensive Hospital from the Mayan Zone of the Mexican state of Quintana Roo, Mexico?

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General objective

Multivariate assessment of the specific weights of 19 risk factors for low birth weight in children born in four health service institutions [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Yucatán State Health Secretariat (SSY); Mérida Regional Hospital of the Institute of Social Security and Services for State Employees (ISSSTE); and the "Ignacio García Téllez" National Medical Center of Mexican Social Security Institute (IMSS)] of the city of Mérida, Yucatán, Mexico and in four health service institutions (Hospital "Lázaro Cárdenas" Comprehensive Hospital; "Felipe Carrillo Puerto" General Hospital; "José María Morelos" Comprehensive Hospital; and "Tulum" Comprehensive Hospital from the Mayan Zone of the Mexican state of Quintana Roo, Mexico.

Specific objectives

Evaluate the contribution (positive, negative, or zero) using the ÿ Exponents or Odds Ratio of 19 risk factors in low weight at birth through different types of statistical significance tests; and

Predict the probability value of low birth weight (response variable, dependent variable or "Y" effect) by applying of the Multiple Regression Logistic Model given certain values of explanatory variables, independent variables, variables predictors, regressor variables or causes (X1, X2, X3 , X4 , X5 , X6 , X7 , X8 , X9 , X10 , X11 ,

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Formulation of hypotheses

Null hypothesis (Ho)

The values of the ÿ Exponents or Odds Ratios are ÿ 1, which indicates a zero contribution (OR = 1) or a negative contribution (OR = 0). < 1), respectively. Additionally, there is no statistically significant evidence at the significance level or significance level (ÿ) of 5% to conclude that the effect (low birth weight) and risk factors (maternal age ÿ 19 years; maternal age ÿ 36 years; weight Maternal weight < 50 kg; maternal height < 150 cm; past medical history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); pathological obstetric history; interpregnancy interval ÿ 24 months; low socioeconomic level; marital status "unmarried"; smoking; alcoholism; initiation of prenatal care at or after week N ¯· 20 days of gestation; number prenatal consultations ÿ 5; type of delivery or abdominal birth route; and female gender of the product) are associated.

Alternative hypothesis, working hypothesis or research hypothesis (H1)

The values of the ÿ exponents or odds ratios are > 1, indicating a positive contribution (OR > 1). Additionally, there are statistically significant evidence at the significance level (ÿ) of 5% to assume that the effect (low weight at birth) and risk factors (maternal age ÿ 19 years; maternal age ÿ 36 years; maternal weight < 50 kg; maternal height < 150 cm; history personal pathological history; age at menarche ÿ 12 years; number of deliveries = 1; number of deliveries ÿ 5; history of abortion(s); history pathological obstetrics; interpregnancy interval ÿ 24 months; low socioeconomic level; marital status "unmarried"; smoking; alcoholism; Start of prenatal care from or after week N ¯· 20 weeks of gestation; number of prenatal visits ÿ 5; type of delivery or route of abdominal birth; and female gender of the product) are associated.

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Materials and methods

–Epistemological approach

Quantitative approach, probabilistic approach or positivist approach **(20)** .

–Study design

Observational analytical epidemiological study of cases and controls with directionality (effectÿcause) and with temporality prospective **(21)** .

–Universe of study

Births (cases and controls that met the inclusion criteria) occurring in four institutions were recorded. health services [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternity Hospital Children's Hospital of the Yucatán State Health Secretariat (SSY); Mérida Regional Hospital of the Institute of Security and Social Services Social Security Institute for State Employees (ISSSTE); "Ignacio García Téllez" National Medical Center of the Mexican Institute of Social Security (IMSS)] of the city of Mérida, Yucatán, Mexico, as well as four health service institutions (Integral Hospital "Lázaro Cárdenas"; General Hospital "Felipe Carrillo Puerto"; Comprehensive Hospital "José María Morelos"; and Comprehensive Hospital "Tulum") of the Mayan Zone of the Mexican state of Quintana Roo, Mexico, during the period from February 1, 2019 to January 31, 2020.

Mérida, Yucatán, Mexico

In the Southeast of the Mexican Republic, the municipality of Mérida is a city of great importance because, in addition to providing services It is an economic center that influences the states of Quintana Roo, Campeche, Tabasco, and Chiapas. At the state level, of the 106 Among the municipalities of the State of Yucatán, the most important and influential is the municipality of Mérida because it contains the vast majority of the State's socio-economic activities and public administration, cultural, commercial, equipment and financial services which causes the municipality of Mérida to have a continuous flow of people with goods, concentrating a large job market and also It requires more services.

Location and area. The city of Mérida is located in the Northwest of the Yucatán Peninsula, less than 50 km from the Gulf. of Mexico between the parallels 202°45" and 212°15" North latitude and the meridians 892°30" and 892°45" West longitude. It has an area of 858.41 km² (equivalent to 2.18% of the surface area of the entire state and 0.04% of the national territory) and borders to the North with Progreso and

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Chicxulub Town; to the South with Tecoh, Abalá and Timucuy; to the east with Conkal, Kanasín and Tixpéhual; and to the west with Ucú and Umán. The Zone
The conurbation is made up of the municipalities of Kanasín, Conkal, Ucú, Umán, Tixpéhual, Progreso and the municipality of Mérida itself.

Police stations and sub-stations. The municipality is territorially divided into the following police stations and sub-stations with a population total of 52,083 inhabitants: Caucel (the largest with a population of 6,988 inhabitants), Cosgaya, Chablekal, Cholul, Dzityá, Dzununcán, Komchén, Molas, Sitpach, Sierra Papacal and San José Tzal, and with the sub-commissions of Chalmuch, Cheumán, Chichí Suárez, Dzibichaltún, Dzidzilché, Dzoyaxché, Hunxectamán, Kikteil, Noc–Ac, Oncán, Opichén, Petac, Sac–Nicté, San Antonio Hool, San Pedro Chimay, San Ignacio Tesip, Santa Cruz Palomeque, Santa María Chi, Santa Gertrudis Copó, Suytunchén, Susulá, Tamanché, Santa María Yaxché (the most small with 52 inhabitants), Tahdzibichén, Temozón Norte, Texán Cámara, Tixcuytún, Tixcacal, Tzacalá, Xcanatún, Xcumpich, Xcunyá, Xmatkuil, Yaxché Casares, Yaxnic, and Sodzil Norte. The main towns are Caucel, Cholul, Komchén, and San José Tzal. Thirty-five Localities within the municipality of Mérida have a high marginalization index because more than 70% of their inhabitants earn less than two minimum wages and between 40 and 80% of its population lacks a primary education. Furthermore, eight localities located mainly to the Northeast and South of the city and in the vicinity of the main communication routes in the municipality have a medium marginalization index, given that between 30 and 40% of the inhabitants do not have primary education and between 70 and 85% perceive less than two minimum wages. Only the towns of Mérida and La Ceiba have a very low marginalization index; regarding Mérida 10.47% of the population does not have primary education and 51.26% earn less than two minimum wages, and in relation to the second, The percentage of the population without primary education is 4.21%, and the percentage of people earning less than two minimum wages is 23.69%.

Population. A total of 830,732 people live in the municipality of Mérida, of which 401,340 are men and 429,392 are women. This represents 42.5% of the total population in the state of Yucatán, with an average annual growth rate of 1.8%. Of the total Of the population, 32.94% are between 0 and 19 years old; 55.29% are between 20 and 59 years old; and 10.62% are 60 years and older. The most widely spoken indigenous language is... Besides Spanish, there is Maya, with the population aged 3 and over who do not speak an indigenous language being 703,371 (338,117 men and 365,254 women). women) and the population that does speak an indigenous language is 74,827 (36,573 men and 38,254 women). Likewise, the total population of five The number of people aged 674,371 and over who practiced the Catholic religion was 69,462, while the number of Protestant and Evangelical citizens was 69,462. The number of people belonging to a non-evangelical biblical religion was 26,749, the Jewish population was 152, and those practicing any other religion were...

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represented by 897 people, and 39,279 citizens stated that they did not practice any religion. The predominant religion in the
The municipality of Mérida is predominantly Catholic with 81.18%, and the churches located in the city are Catholic, Mormon, Seventh Day Adventist, Church of the Living God, Pillar and Ground of the Truth, Light of the World, and the Church of Latter Day Saints.

Employment. Yucatán is among the states with the lowest unemployment rates. As of the third quarter of 2011, the population
The economically active population (EAP) of the state amounted to 935,936 people, of whom 907,325 were employed (553,683 men and 353,642 women) compared to the first quarter of 2009; this represented an increase in the employed population of 31,804 people. This
This favorable performance allowed Yucatán to position itself in the third quarter of 2011 as the fifth state with the lowest rate of unemployment at 3.6% of the economically active population, a rate slightly higher than that recorded during 2009, which was 3.4%, well below the rate of national unemployment, which during the reference period was 6.2%. The informal economy is one of the main obstacles that
Yucatán faces this challenge. In the third quarter of 2011, the occupancy rate in this sector was 33.4%, above the national rate for the same period.
The rate of employment in the informal sector was 28.7% during the period, and it is higher for women than for men, since in the third quarter
In 2011, this indicator was 36.6% for women and 31.4% for men; regarding the municipality of Mérida, the economy
The informal sector represents 25.7% of the employed population, of which 25.4% are men and 26.2% are women. This situation is reflected in... in the precariousness of a considerable proportion of jobs, which offer no benefits whatsoever to their workers. Thirdly
In the first quarter of 2011, only 49.6% of salaried employees had medical coverage, and only 62.9% had health insurance.
some other benefit. Another problem related to employment is the low income received by workers. In general, the
Yucatán's employed population is concentrated in the lowest income levels, including those earning up to and above the minimum wage.
by one or even two percentage points, higher than the national average. The lower wages received by the Yucatecan population are due, among other things.
Other causes include lower productivity at the production facilities. Yucatán is one of the states in the country with the lowest productivity rates.
labor market where it is noted that the State's economy ranked 28th with an index of 211.9, well below the national index of 389.
Mérida has productive potential due to its geographic location and the average age of its economically active population.
The municipality's economic activity comprises activities from three sectors: agriculture, industry, and services.
The tertiary sector includes commerce, hospitality, finance, transportation, and communications. This sector represents 75% of the employed workforce.
overall being the most equitable in terms of gender distribution of jobs. The majority of the economically active population

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Active workers in the municipality receive remuneration for their work of between two and three minimum wages, with the most common workday being 35 to 48 hours.
hours during the calendar week, usually with Sunday as the day of rest. Taking as a reference the information above
Based on the data presented on the employed and unemployed labor force, it is estimated that during the first three quarters of 2011 the unemployment rate of
The municipality was 3.73%, which represents a decrease of 0.6% compared to the rate of 4.34% recorded during 2010.

Housing. Housing is a building whose main function is to provide shelter and accommodation for people, protecting them from the elements.
inclement weather and other natural hazards. By 2010, Mérida had 45.3% of all housing in the state.
This represents a moderate increase of 2.8% compared to the 44.5% recorded in 1990; that is, for 17 years the increase of
Housing has not met the needs of a population that is growing rapidly compared to the growth of the
Housing. Housing represents between 15 and 40% of monthly household spending worldwide (International Financial Cooperation).
– CF1). The proportion between the economically active population (EAP) and the total population of the country in general is around 43%, but in
The state of Yucatán represents 47%; the highest concentration of the economically active population is found in the Zone
Metropolitan area of Mérida with 49% of the population. From the analysis between the socioeconomic level of the population and the type of housing that
It can be concluded that the population earning more than ten minimum wages per day represents only 3%; therefore
There is a significant group that receives incomes of more than two and less than ten minimum wages, representing 26%. Regarding
the distribution of income and its correspondence with the relevance of economic activity, the economically active population (EAP) that has an income of up to two wages
The minimum rainfall in the state of Yucatán is 28%. This percentage is above the national average of 23%. It is in the Zone
Metropolitan area of Mérida where percentages are higher than those recorded at the national and state levels (26%) because in this area
The state capital is located there, and that's where the main economic activities of the state are concentrated.

Women. The Mexican state of Yucatán has 1,987,769 inhabitants, of which 1,027,810 are women, representing a
50.71% of the population. Similarly, the municipality of Mérida has a population of 830,732 inhabitants. Of the 429,392 women in the municipality
403,073 people live in the city and only 26,319 live in the outlying communities. There are 226,524 registered households in the municipality, of which 62,691 have
as head of the household to the women.

Maya people. It is important to highlight the rights of indigenous peoples recognized in the 2001 reform to the Constitution
Federal and the International Covenant on Economic, Social and Cultural Rights (DOF 12/05/81), the American Convention on Human Rights

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Human Rights (DOF 07/05/81), ILO Convention 169 concerning Indigenous and Tribal Peoples (DOF 24/01/91), the International Convention on The Elimination of All Forms of Racial Discrimination (DOF 13/06/75), among others, must be implemented by the municipalities.

Neighborhood and community revitalization. There are approximately 15,627 homes in the Historic Center, of which 5,027 are located occupied. The problems they present are loss of residential use as a consequence of the increase in commercial activities, administrative and service-related issues, environmental pollution, and land speculation, among others. The municipality has 88 neighborhoods and 137 [unclear - possibly "neighborhoods" or "community centers"]. subdivisions.

Health. The infant mortality rate is 1.4% lower than the national average and 1.3% lower than expected. The mortality rate Maternal mortality in Yucatán is much lower than the national average; moreover, if the Millennium Development Goals (MDGs) target is taken into account, in which countries commit to reducing it by three-quarters between 1990 and 2015, the progress since 1990 is still insufficient. The male population of Yucatán ranks first nationally in cerebrovascular diseases and fourth in acute attacks. myocardial infarction and liver cirrhosis. In the case of women, cancer ranks fourth nationally among women in Yucatán. HIV affects 3,873 people, placing the state fourth nationally in terms of the number of patients. Other diseases Type 2 diabetes mellitus is prevalent among young people and is on the rise, with 12% of Yucatecans over 20 years of age suffering from it. disease, a figure that exceeds the national average by 1.5 percentage points. Yucatán ranks fourth nationally with the highest number of People with malnutrition. Of the percentages mentioned above, Mérida accounts for a large part of the population affected by these conditions. In In general terms, the quality of services provided by the health sector in the state is not optimal due to a lack of policies. extension.

Education. Education is one of the best financial investments that states can make, as it allows individuals to... Individuals generate the resources necessary to enjoy essential economic goods. Therefore, more education and better jobs are needed. They constitute a pairing that is generally found to be established in all developed countries, which makes it possible to affirm that the Governments that are committed to development will necessarily have to invest in education.

Soil care. The territorial reserve of the municipality of Mérida is 8,639.4 ha.

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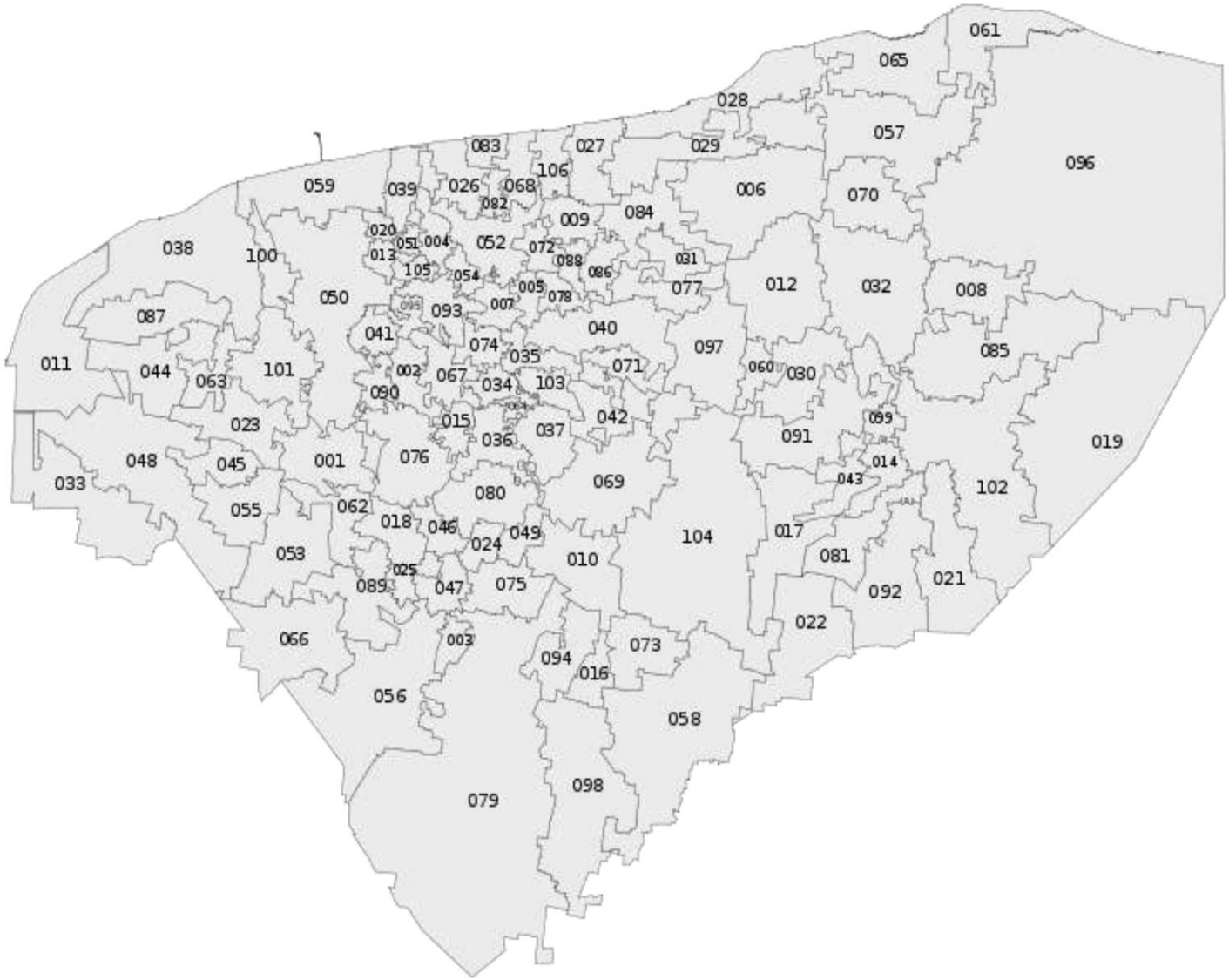


Figure 1. Map of the Mexican state of Yucatán, Mexico

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Clue	Municipality	Municipal Headquarters	Clue	Municipality	Municipal Headquarters
001	Abalá	Abalá	054	Muxupip	Muxupip
002	Acanceh	Acanceh	055	Opichén	Opichén
003	Akil	Akil	056	Oxkutzcab	Oxkutzcab
004	Roof	Roof	057	Panabá	Panabá
005	Bokoba	Bokoba	058	Breastplate	Breastplate
006	Buctzotz	Buctzotz	059	Progress	Progress
007	Cacalchén	Cacalchén	060	Quintana Roo	Quintana Roo
008	Calotmul	Calotmul	061	Lagartos River	Lagartos River
009	Cansahcab	Cansahcab	062	Sacalum	Sacalum
010	Cantamayec	Cantamayec	063	Samahil	Samahil
011	Celestún	Celestún	064	Sanahcat	Sanahcat
012	Cenotillo	Cenotillo	065	San Felipe	San Felipe
013	Conkal	Conkal	066	Saint Helena	Saint Helena
014	Cuncunul	Cuncunul	067	Seyé	Seyé
015	Cuzamá	Cuzamá	068	Sinanché	Sinanché
016	Chacsinkín	Chacsinkín	069	Sotuta	Sotuta
017	Chankom	Chankom	070	Sucilá	Sucilá
018	Chapab	Chapab	071	Sudzal	Sudzal
019	Chemax	Chemax	072	Addition	Hidalgo's Sum
020	Chicxulub Pueblo	Chicxulub Pueblo	073	Tahdziu	Tahdziu
021	Chichimilá	Chichimilá	074	Tahmek	Tahmek
022	Chikindzonot	Chikindzonot	075	Teabo	Teabo
023	Chocholá	Chocholá	076	Tecoh	Tecoh
024	Chumayel	Chumayel	077	Tekal de Venegas	Tekal de Venegas
025	Dzan	Dzan	078	Tekantó	Tekantó
026	Dzemul	Dzemul	079	Tekax	Tekax
027	Dzidzantún	Dzidzantún	080	Tekit	Tekit
028	Dzilam de Bravo	Dzilam de Bravo	081	Tekom	Tekom
029	Dzilam González	Dzilam González	082	Telchac Pueblo	Telchac Pueblo
030	Dzitás	Dzitás	083	Telchac Puerto	Telchac Puerto
031	Dzoncauich	Dzoncauich	084	Temax	Temax
032	Spigot	Spigot	085	Temozón	Temozón
033	Halachó	Halachó	086	Tepakan	Tepakan
034	Hocabá	Hocabá	087	Tetiz	Tetiz
035	Hoctun	Hoctun	088	Teya	Teya
036	Homun	Homun	089	Ticul	Ticul
037	Huhi	Huhi	090	Timucuy	Timucuy
038	Hunucmá	Hunucmá	091	Tinum	Tinum
039	Ixil	Ixil	092	Tixcacalcupul	Tixcacalcupul

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040	Izamal	Izamal	093	Tixkokob	Tixkokob
041	Kanasín	Kanasín	094	Tixméhuac	Tixméhuac
042	Kantunil	Kantunil	095	Tixpéhual	Tixpéhual
043	Kaua	Kaua	096	Tizimin	Tizimin
044	Kinchil	Kinchil	097	Tunkás	Tunkás
045	Kopomá	Kopomá	098	Tzucacab	Tzucacab
046	Mother	Mother	099	Uayma	Uayma
047	Peanut	Peanut	100	Ucú	Ucú
048	Maxcanú	Maxcanú	101	Umán	Umán
049	Mayapán	Mayapán	102	Valladolid	Valladolid
050	Mérida	Mérida	103	Xocchel	Xocchel
051	Mocochá	Mocochá	104	Yaxcabá	Yaxcabá
052	Motul	Motul de Carrillo Puerto	105	Yaxkukul	Yaxkukul
053	Muna	Muna	106	Yobain	Yobain

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Quintana Roo, Mexico

The Mexican state of Quintana Roo is divided into ten municipalities, seven of which were created in 1974.
together with the elevation of the former "Federal Territory of Quintana Roo" to the status of "State of the Federation". The eighth municipality,
Solidaridad was created in 1993; the ninth municipality, Tulum, in 2008; and the tenth municipality, Bacalar, in 2011. The origin of the municipalities
The name of the Mexican state of Quintana Roo comes from the original division of the territory into three delegations: Cozumel, Santa Cruz de Bravo
(today Felipe Carrillo Puerto) and Payo Obispo (today Chetumal). Even though the 1917 Constitution established that the basis of the organization
The policy of the states is the *Free Municipality,* the Federal Territories continued divided into delegations until their respective elevation to the
rank of States. On February 2, 2011, the creation of the tenth municipality of Quintana Roo, Bacalar, with segregated territory, was announced.
by Othón Pompeyo Blanco. On February 21, 2008, the Congress of Quintana Roo approved the preliminary draft for the creation of the municipality of Tulum.
which obtained its territory from the current municipality of Solidaridad and includes Tulum National Park and parts of the Sian Biosphere Reserve
Kan; this was formally ratified when on March 13 the Congress of Quintana Roo unanimously approved the creation of the municipality
from Tulum.

Lázaro Cárdenas is one of the ten municipalities that make up the Mexican state of Quintana Roo.
Located in the far north of the state, its capital is the town of Kantunilkín. The municipality is situated in the north of the state.
Quintana Roo; it borders the municipalities of Isla Mujeres, Benito Juárez, and Solidaridad. The terrain is practically flat, like all of the
Yucatan Peninsula, not exceeding a height of 25 meters above sea level (masl); it is made up of a limestone plateau that
It does not allow surface water currents, so all currents are underground and their outflows to the surface are known
like cenotes. The municipality, unlike the other municipalities in Quintana Roo, is not entirely covered by tropical forest;
The north is characterized by aquatic and semi-aquatic vegetation such as mangroves and seagrass beds, as well as a forested area.
The municipality has a population of 25,333 inhabitants: 12,972 men and 12,361 women.

Felipe Carrillo Puerto is a town in the Mexican state of Quintana Roo, the seat of the Mayan municipality of Felipe Carrillo.
The port, located in the center of the state in the Maya Zone. Felipe Carrillo Puerto was founded by the Maya with the name Chan Santa Cruz
and was the center of the rebel Maya during the Caste War; the Sanctuary of the Talking Cross is located there; conquered by the
The Mexican army in the early 20th century renamed it Santa Cruz de Bravo and it was the capital of the Territory until the 1920s

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of Quintana Roo when, later, it was ceded back to the Maya and the capital was moved from Payo Obispo, now Chetumal. In 1930
It received its current name in honor of the Socialist Governor of Yucatán, Felipe Carrillo Puerto. Its original name was Noh Cah Santa Cruz.
Balam Nah Kampokolche. Felipe Carrillo Puerto is located in the central part of the Mexican state of Quintana Roo; its altitude is 30
masl; the distance that separates it from the state capital, the city of Chetumal, is 159 km to the South and from the tourist center of Cancun of
229 km to the North; it is also located 150 km East of the city of Peto in the state of Yucatán. Its main roads
Roads are the primary means of communication, and this is an important road communication hub where three federal highways converge.
The main one is Federal Highway 307, which connects it to Cancun to the North and to Chetumal to the South; it is also one of the ends of the highway
Federal Highway 184 connects it westward with the town of José María Morelos and then with the Mexican state of Yucatán, mainly
with its capital, Mérida; finally, the third highway that originates in Felipe Carrillo Puerto is Federal Highway 295 which leads to
Northwest connects with the interior of Quintana Roo, mainly with the towns of Tihosuco and Tepich, continuing towards the
The Mexican state of Yucatán, uniting the cities of Valladolid and Tizimín. The total population of the city of Felipe Carrillo Puerto is
25,744 inhabitants: 12,572 men and 13,172 women.

José María Morelos. It is a town in the Mexican state of Quintana Roo, the capital of the Mayan municipality of José María Morelos;
It is located inland. The current town of José María Morelos originated in the mid-20th century; it began as a
camp dedicated to the exploitation of chicle and precious woods from the surrounding jungle; most of its inhabitants
Initially, they were migrants from other states of the country arriving in Quintana Roo due to the government's promotion of colonization and development.
economic development of the territory; because it is located 50 km from Peto, Yucatán, it was initially called "Kilometer 50", name
by which it is still called. In 1974 the municipality of José María Morelos was established, with Kilometer 50 becoming its seat.
which was elevated to the category of city and received the same name as the municipality, José María Morelos, in honor of the hero of Independence
José María Morelos y Pavón, Mexico. Today, José María Morelos is one of the main towns in the so-called Maya Zone of
Quintana Roo; its main economic activities continue to be agriculture and forestry. The municipal territory is
Located in what was called the chiefdom of Cochuah when the conquerors arrived in Yucatán at the beginning of the 16th century.

Tulum. The municipality of Tulum is one of the ten municipalities of the Mexican state of Quintana Roo. It is located in the central region.
North of the state in the so-called Riviera Maya; its capital is the city of Tulum and its territory was separated from the municipality of Solidaridad.

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Its boundaries are to the North with the municipality of Solidaridad and to the South with the municipality of Felipe Carrillo Puerto; to the East it borders the state of Yucatán, particularly the municipality of Valladolid. Its land area is approximately 2,090.43 km². The territory The municipality of Tulum shares the same composition as much of the Yucatan Peninsula, thus constituting a large plain without There are only slight elevations that descend from west to east towards the sea, never exceeding 25 meters above sea level. Similarly, There are no surface water currents because the soil composition is highly permeable limestone, which causes Rainwater cannot be retained on the surface; instead, this favors the formation of underground rivers that have made it famous to the region; likewise, the cenotes formed when the roofs of underground rivers collapse; in the southern part of the municipality there are numerous coastal lagoons located between the city of Tulum and Punta Allen, separated from the Caribbean Sea by a thin strip of land; these are the Campechen Lagoon, Boca Paila Lagoon, San Miguel Lagoon, Xamach Lagoon, and Catoche Lagoon; also, in the western area of Within the municipality are the Cobá Lagoon, the Green Lagoon and the Nochacam Lagoon in the vicinity of the Cobá Archaeological Zone. Hydrologically, almost the entire territory belongs to the *North Yucatan Hydrological Region* (Yucatan) and the *Quintana Roo Basin* of the same; Only two small portions of the southern tip of the municipality, bordering Felipe Carrillo Puerto, are located in the *Hydrological Region Eastern Yucatán* (Quintana Roo) and in the *Closed Basins* and *Chetumal Bay,* among others. As in the entire continental territory of the state In Quintana Roo, Mexico, the climate recorded in the Mayan municipality of Tulum is classified as warm sub-humid with summer rains characterized by high temperatures and humidity for much of the year; the average annual temperature that The temperature recorded in the inland area of the municipality is below 26°C, while in the coastal area it exceeds this figure; the average rainfall Annual rainfall in almost the entire territory exceeds 1,500 mm, the highest in Quintana Roo; only in an area in the far west of the municipality It is recorded in the range of 1,300 to 1,500 mm. The Mayan municipality of Tulum has a population of 28,263 inhabitants. It is, along with Benito Juárez and Solidaridad are among the municipalities with the highest population growth in the country; the main reason is immigration. attracted by the job opportunities and economic development fostered by tourism, which is the primary economic activity. In this regard, Tulum offers national and international tourism, and as its main activity, eco-friendly hospitality that preserves intact the traditions of the past. Mayan architecture blends seamlessly with modern amenities. Furthermore, it boasts some of the state's best beaches. It is already internationally renowned for its white sands and paradisiacal locations in the Mexican Caribbean. Both in the hotel zone with its beaches, as well as in the In the city center, tourists can enjoy excellent restaurants offering high-quality regional and international cuisine.

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In the municipality, hospitality towards tourism is the vocation of all its people. The city of Tulum is currently the city with the highest number of tourists nationwide. Population growth and in reference to this, its municipal seat, the city of Tulum, went from 6,733 inhabitants in the year 2000 to 14,790 in 2005. Population growth was the main reason for the creation of the municipality, separating it from Solidaridad.

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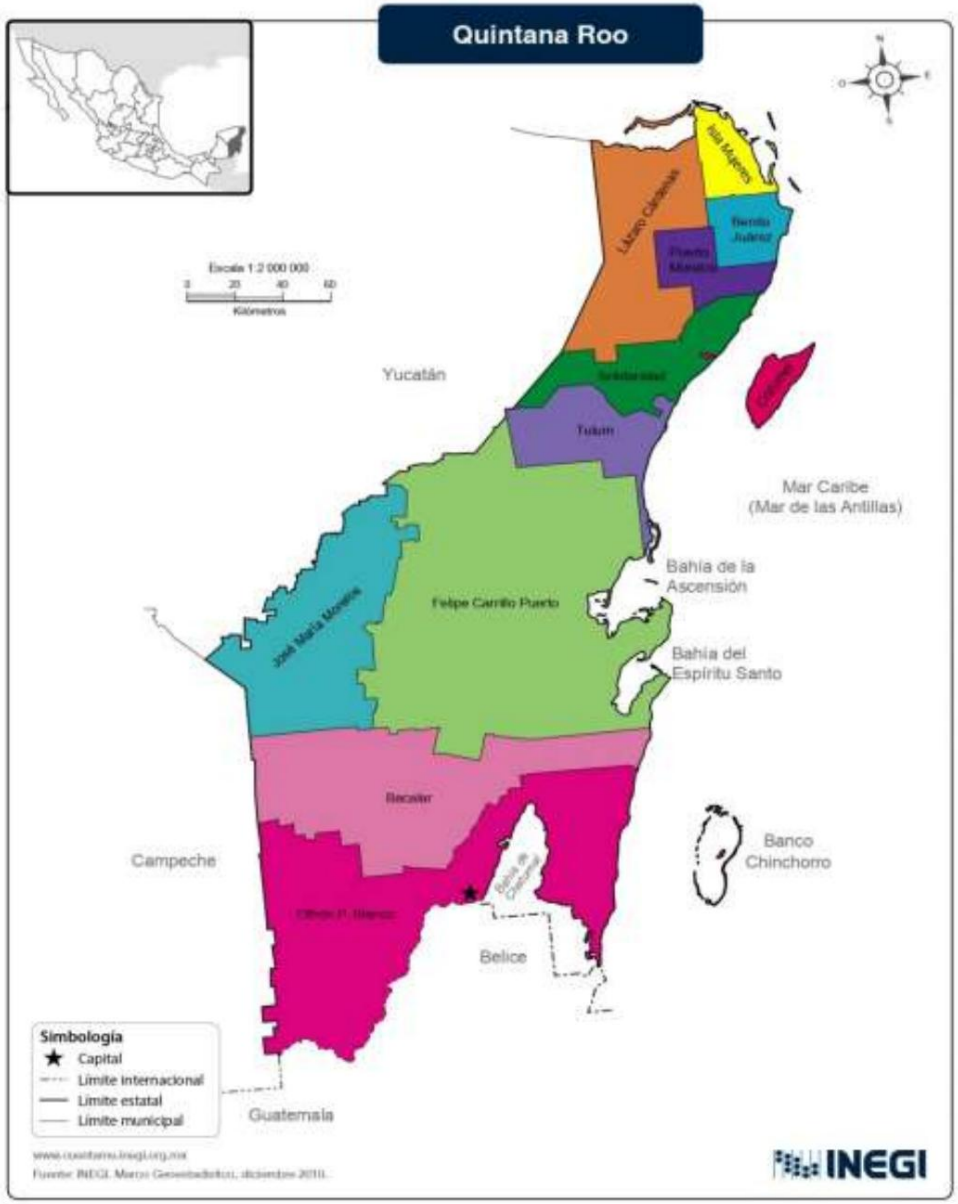


Figure 2. Map of the Mexican state of Quintana Roo, Mexico

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–Operational definitions of the variables

Case.– All full-term newborns (37 ÿ weeks of gestation ÿ 41) weighing < 2,500 g;

Control.– All full-term newborns (37 ÿ weeks of gestation ÿ 41) weighing ÿ 2,500 g;

Maternal age – The period of time elapsed from the mother's birth date to the date of delivery. It was recorded in Years completed. Maternal ages ÿ 19 and ÿ 36 years were considered risk factors. Continuous quantitative variable;

Maternal weight.— Recorded in kg. A maternal weight < 50 kg was considered a risk factor. Continuous quantitative variable;

Maternal height.— Height measured from feet to head. It was recorded in cm. A height above 1 cm was considered a risk factor. Maternal < 150 cm. Continuous quantitative variable;

Past medical history – These were recorded as "yes" or "no". Having a history of medical conditions was considered a risk factor. personal pathologies. Nominal qualitative variable;

Age at menarche – Age at which the first menstrual cycle occurred. It was recorded in completed years. It was considered a factor of Risk factors include an age at menarche ÿ 12 years. Continuous quantitative variable;

Parity – Number of deliveries by the mother, including the current one. Risk factors included one delivery (primiparity) and ÿ 5 deliveries. (multiparity). Discrete or discontinuous quantitative variable;

History of abortion(s).– Termination of pregnancy due to natural or deliberately induced causes. It was recorded as "yes" or as "no". Having a history of abortion(s) was considered a risk factor. Nominal qualitative variable;

Pathological obstetric history – This was recorded as "yes" or "no". Having a history of obstetric complications was considered a risk factor. pathological obstetrics. Nominal qualitative variable;

Interpregnancy interval.– Period of time elapsed from the date of birth of the second-to-last child to the date of the current one Birth. It was recorded in whole months. An interpregnancy interval ÿ 24 months was considered a risk factor. Quantitative variable continues;

Socioeconomic level.— It was recorded as "low" or "medium". A low socioeconomic level was considered a risk factor. Ordinal qualitative variable. It should be mentioned that state health services that provide medical and healthcare services through their

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Application units apply the table that contains the classification of the different services with six levels of recovery fees
for each service; these levels are applied based on the score resulting from the socioeconomic form established at the national level;

ÿ **Regarding income.** Monthly family income is the sum of the monthly income contributed by each member of the household.
productive members of the family group.

ÿ **Regarding expenses.** Monthly family expenses are the sum of the monthly costs incurred by the family group to cover
their basic needs in terms of food, rent or property, water, electricity, fuel, transportation, education and additional consumption.

ÿ **Regarding the economic situation.** 1. **Indigent** is when there is no income to meet basic needs; 2. **Deficit**
1. Break-even point : when up to 99% of expenses can be covered; 2. **Equity point :** when 100% of expenses can be covered, with no surplus; 3. **Solvent**
This occurs when there is a satisfactory income available to cover basic needs; there is money available for saving or spending.
unforeseen events; they have a surplus of up to 25% of their income over their expenses; and 5. **Surplus** is when there is an excessive availability of
They have resources to cover expenses; they have the funds to make non-essential expenditures; they have a surplus of more than 25% of their income
regarding their spending.

Marital status.— She was registered as single, married, divorced, separated, in a common-law relationship, and widowed. Subsequently, the marital statuses were single,
Divorced, separated, cohabiting, and widowed were recoded as "unmarried." The "unmarried" status was considered a risk factor. Variable
nominal qualitative;

Smoking – Recorded as “yes” or “no”. Smoking ÿ 10 cigarettes per day was considered a risk factor. Qualitative variable
nominal;

Alcoholism – This was recorded as "yes" or "no". Drinking one beer daily, or drinking
alcoholic beverages at least three times a week. Nominal qualitative variable;

Week of gestation at the start of prenatal care.– It was recorded as "from or after week N ¯· 20 days of gestation"
or as "before week N ¯· 20 weeks of gestation." It was considered a risk factor "from or after week N ¯· 20 days of gestation." Variable
quantitative discrete or discontinuous;

Number of prenatal visits. —It was recorded as "ÿ 5 prenatal visits" or as "ÿ 6 prenatal visits". It was considered
Risk factor: having "ÿ 5 prenatal visits". Ordinal qualitative variable;

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Type of delivery or mode of birth. —Delivery is the culmination of pregnancy; the exit of a product from the mother's uterus. It was recorded such as "vaginal" or "abdominal". The type of delivery or abdominal delivery route was considered a risk factor. Qualitative variable nominal; and

Product gender.— It was registered as "male" or "female". The "female" gender was considered a risk factor. Product. Nominal qualitative variable.

–Inclusion criteria

Products of 37 ÿ weeks of gestation ÿ 41 born at the "Dr. Agustín O'Horán" General Hospital of the Secretariat were included of Health of the Mexican State of Yucatán (SSY); at the Maternal and Child Hospital of the Ministry of Health of the Mexican State of Yucatán (SSY); at the Mérida Regional Hospital of the Institute of Security and Social Services for State Workers (ISSSTE); at the "Ignacio García Téllez" National Medical Center of the Mexican Social Security Institute (IMSS); at the "Lázaro" Comprehensive Hospital Cárdenas"; at the "Felipe Carrillo Puerto" General Hospital; at the "José María Morelos" Comprehensive Hospital; and at the "Tulum" Comprehensive Hospital during the period from February 1, 2019 to January 31, 2020.

–Exclusion criteria

Both products born at < 37 weeks of gestation and products born at > 41 weeks of gestation in the eight health service institutions during the period studied.

–Elimination criteria

Multiple births, newborns with congenital malformations such as Down syndrome, and newborns who do not count with the complete information required during the study period.

–Techniques and procedures

The necessary information was obtained from the Clinical Archive and Statistics Department of the "Dr. Agustín O'Horán" General Hospital of the SSY; in the Department of Statistics and Clinical Records of the SSY Maternal and Child Hospital; in the Archives Department Clinical at the Mérida Regional Hospital of the ISSSTE; in the Medical Informatics and Clinical Archive Area (ARIMAC) of the Medical Center

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National "Ignacio García Téllez" of the IMSS; and in the Clinical Archive Departments of the "Lázaro Cárdenas" Integral Hospital; of the Hospital General "Felipe Carrillo Puerto"; of the "José María Morelos" Integral Hospital; and of the "Tulum" Integral Hospital during the period covered From February 1, 2019 to January 31, 2020.

The data were collected from the relevant databases, from the clinical records of newborns, and from the records mothers' clinicians.

The instrument used was a pre-coded form divided into the following six sections:

ÿ **Biological characteristics of the mother.** Age; weight; height; and personal pathological history;

ÿ **Mother's obstetric history.** Age at menarche; number of deliveries; history of miscarriage(s); obstetric history pathological; and intergenic interval;

ÿ **Social characteristics of the mother.** Socioeconomic level; marital status; smoking; and alcoholism;

ÿ **Characteristics of prenatal care.** Week of gestation at the start of prenatal care; and number of prenatal visits;

ÿ **Characteristics of the delivery.** Type of delivery or route of birth; and

ÿ **Product feature.** Gender.

–Data processing

The data were reviewed (information quality control); classified (on qualitative and quantitative scales); and computerized. (IBM SPSS Statistics for Windows, Version 22 software was used); presented (Tables, Graphs and Figures); summarized (using the corresponding summary measures for data classified on qualitative and quantitative scales); analyzed; and interpreted. For the The graphs were created using Microsoft Excel 365 for Windows and Harvard Graphics ChartXL for Windows software. Version 3.02.

The Bonferroni adjustment method was planned to be used to adjust the significance level in relation to the number of tests. Statistics were performed simultaneously on a dataset. The significance level for each test was calculated by dividing the error global type I or global type ÿ error between the number of tests to be performed **(124)** in order to correct the problem that variables with many categories have a greater probability of being selected as predictors; although it has no effect with dichotomous variables **(125)**

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allows "n" tests to be performed to maintain the overall probability ÿ 5% **(126)** Considering the above, 19 contrasts were carried out, being, in Consequently, a value of ÿ = 0.0026 for a *p* ÿ 0.0500; therefore, the values *p* > 0.0026 and *p* ÿ 0.0026 were taken to accept or reject, respectively, the null hypothesis; the above, provided that the explanatory variable has more than two categories.

To estimate the association between the response variable and the explanatory variables, independent variables, predictor variables, Multiple Logistic Regression analysis was performed on the regressor variables or causes.

The probability of low birth weight occurrence was calculated for all observation units using the goodness-of-fit test. Hosmer–Lemeshow adjustment **(127)** based on the distribution of cases and controls predicted by the equation and the values actually observed. Both distributions, expected and observed, were compared using Wald's x^2 statistic (x^2W) **(128)** .

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Results

Results in four health service institutions [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Ministry of Health of the Mexican State of Yucatán (SSY); Mérida Regional Hospital of the Institute of Security and Social Services of State Workers (ISSSTE); and National Medical Center "Ignacio García Téllez" of the Mexican Social Security Institute (IMSS)] in the city of Mérida, Yucatán, Mexico

Births (cases and controls that met the inclusion criteria) occurring in four institutions were recorded.
health services [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternity Hospital Children's Hospital of the Yucatán State Health Secretariat (SSY); Mérida Regional Hospital of the Institute of Security and Social Services Social Security Institute for State Workers (ISSSTE); and the "Ignacio García Téllez" National Medical Center of the Mexican Social Security Institute (IMSS)] of the city of Mérida, Yucatán, Mexico during the period from February 1, 2019 to January 31, 2020. The number
The total number of registered newborns was 28,282 (3,434 cases and 24,848 controls). 2,888 (10.21%) were excluded [1,859 (54.14%) cases and 1,029 (4.14%) controls] and 718 (2.54%) newborns [414 (12.06%) cases and 304 (1.22%) controls] were eliminated for not complying with
The inclusion criteria were met, therefore, 24,676 (87.25%) newborns were studied [1,161 (33.81%) cases and 23,515 (94.64%) controls].
Having both cases and controls come from the same population ensured homogeneity, representativeness, and simultaneity.

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Table 1 presents the response variable and the explanatory variables, independent variables, predictor variables, variables regressors or causes according to their recoding for Multiple Logistic Regression Analysis.

Table 1. Response variable "Y" and explanatory variables, independent variables, predictor variables, regressor variables or causes "Xi" according to recoding for Multiple Logistic Regression Analysis. 1/II/2019–31/I/2020.

Response variable (Y) and explanatory variables, independent variables, predictor variables, regressor variables or causes (Xi)	**Recoding**
Weight of the term newborn (37 ÿ weeks of gestation ÿ 41)	0 = ÿ 2,500 g 1 = < 2,500 g
Maternal age	0= 20–35 years 1 = ÿ 19 years 2= ÿ 36 years
Maternal weight	0 = ÿ 50 kg 1 = < 50 kg
Maternal height	0 = ÿ 150 cm 1 = < 150 cm
Past medical history	0 = No 1 = Yes
Age at menarche	0 = ÿ 13 years 1 = ÿ 12 years
Number of births	0 = 2–4 1= 1 2= ÿ 5
History of abortion(s)	0 = No 1 = Yes
Pathological obstetric history	0 = No 1 = Yes
Interpregnancy interval	0 = > 24 months 1 = ÿ 24 months
Socioeconomic level	0 = Medium 1= Low
Marital status	0= Married 1= Unmarried
Smoking	0 = No 1 = Yes
Alcoholism	0 = No 1 = Yes
Week of gestation at the start of prenatal care	0 = Before week No · 20 weeks of gestation

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	1= From or after week No. · 20 weeks of gestation
Number of prenatal visits	0 = ÿ 6 1 = ÿ 5
Type of delivery or birth route	0= Vaginal 1= Abdominal
Product gender	0 = Male 1= Female

Source: Own elaboration

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The explanatory variables, independent variables, predictor variables, regressor variables, or causes according to the results of the Analysis Multiple Logistic Regression results are presented in Table 2.

Table 2. Explanatory variables, independent variables, predictor variables, regressor variables or causes according to the results of the Analysis Multiple Logistic Regression. Mérida, Yucatán, Mexico. 1/II/2019–31/I/2020.

Variables explanatory, variables independent, variables predictors, variables returners or causes	**Coefficients logistics estimated (ÿ)**	**Errors standard Dear All**	**Chi-square statistics Square of Wald (x^2W)**	**Degrees of freedom (gl)**	**Probabilities *(p)***	**Exponents ÿ= Odds Ratios**	**Intervals of estimate to level of confidence of 95%**
Biological characteristics of the mother							
Maternal age ÿ 19 years	-0.1960	0.1393	1.9793	1	0.1595	0.8220	0.6256ÿ1.0801
Maternal age ÿ 36 years	0.0876	0.1520	0.3319	1	0.5646	1.0915	0.8103ÿ1.4704
Maternal weight < 50 kg	1.0430	0.1383	56.8547	1	0.0000	2.8376	2.1638ÿ3.7213
Maternal height < 150 cm	2.0937	0.0764	751.1966	1	0.0000	8.1153	6.9868ÿ9.4260
Background personal pathological	0.2506	0.0864	8.4197	1	0.0037	1.2848	1.0847ÿ1.5217
Mother's obstetric history							
Age at menarche ÿ 12 years	0.3018	0.0642	22.0857	1	0.0000	1.3523	1.1924ÿ1.5337
Number of births = 1	0.1548	0.1992	0.6039	1	0.4371	1.1674	0.7901ÿ1.7251
Number of births ÿ 5	0.7106	0.1999	12.6292	1	0.0004	2.0351	1.3753ÿ3.0115
Background of abortion(s)	0.0521	0.1047	0.2480	1	0.6185	1.0535	0.8581ÿ1.2935
Background obstetrics pathological	0.0670	0.0809	0.6847	1	0.4080	1.0693	0.9124ÿ1.2531

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Interval inter-pregnancy interval ÿ 24 months	0.9943	0.1038	91.8390	1	0.0000	2.7028	2.2055ÿ3.3123
Social characteristics of the mother							
Level socioeconomic low	0.2236	0.0810	7.6208	1	0.0058	1.2506	1.0670ÿ1.4658
Marital status no-married	0.3986	0.0698	32.5920	1	21.8970	1 30.3023 1	0.0000
Smoking	0.4937	0.1055	**Characteristics of prenatal**			0.0000	1.6384
Alcoholism	1.4789	0.2687	**care**			0.0000	4.3879
Start of the prenatal care starting from week No. 20 of gestation	0.0499	0.0979	0.2595	1	0.6105	1.0512	0.8676ÿ1.2726
Number of queries prenatal ÿ 5	0.0752	0.0806	0.8713	1	0.3506	1.0781	0.9206ÿ1.2626
Characteristic of delivery							
Type of delivery or birth route abdominal	0.0073	0.0656	0.0123	1	0.9116	1.0073	0.8858ÿ1.1456
Product Feature							
Female gender of the product	0.1373	0.0627	4.7964	1	0.0285	1.1472	1.0145ÿ1.2972
Constant or Intercept	-5.4657	0.2460	493.6744	1	0.0000		

Source. Prepared by the author based on results obtained with IBM SPSS Statistics for Windows, Version 22 software

Interpretation of the values of Wald's x^2 statistic (x^2W):

1. When x^2w is ÿ 3.8416 there is significance; and
2. When x^2w is < 3.8416 there is no significance.

Interpretation of probability values (p):

1. When *p* is ÿ 0.0500 there is significance; and
2. When *p* is > 0.0500 there is no significance.

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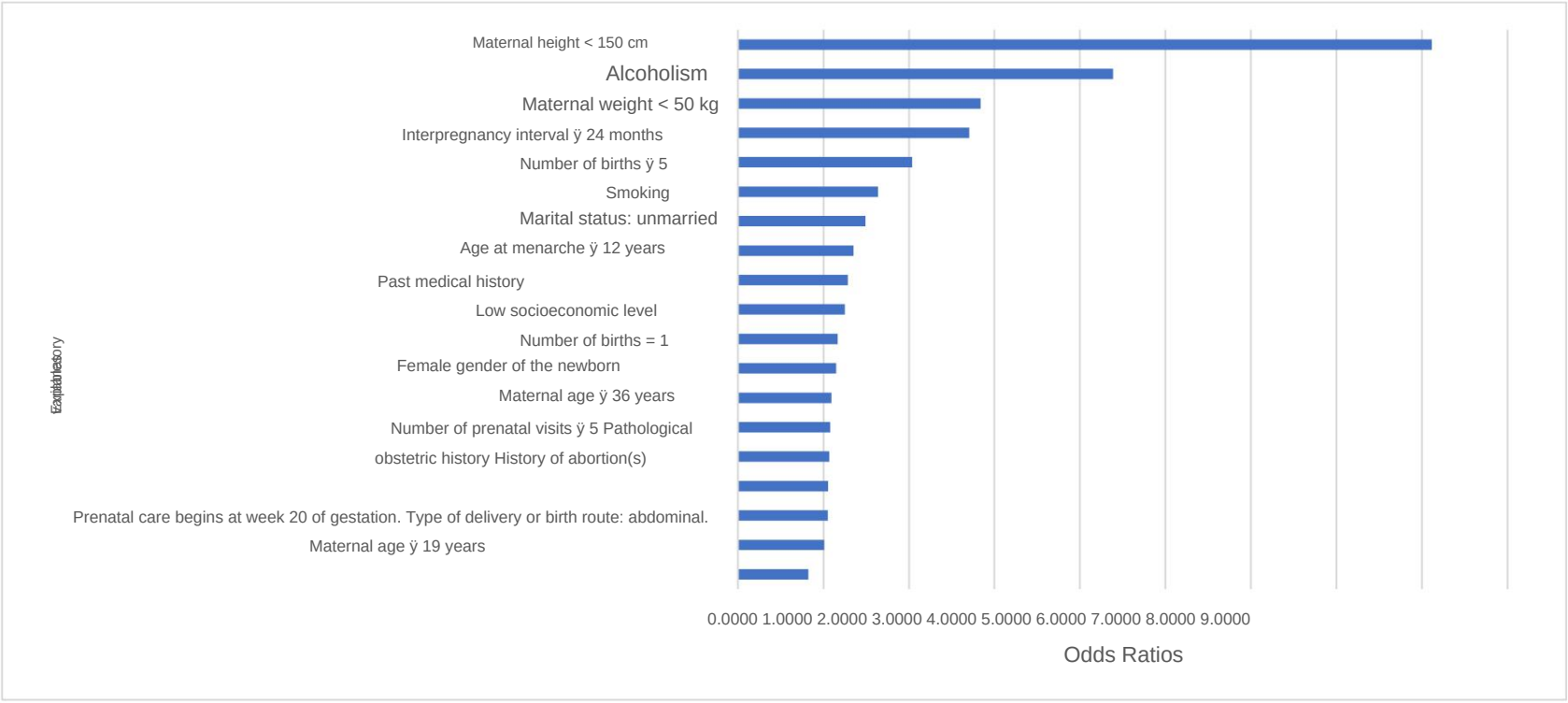
Interpretation of the values of the ÿ Exponents or Odds Ratios (OR): 1. When OR > 1 the variable is a risk factor; 2. When OR < 1 the variable is a protective factor; and 3. When OR = 1 the variable is neither a risk factor nor a protective factor.

Interpretation of the values of the estimation intervals at the 95% confidence level (95% CI): 1. When the estimation interval at the 95% confidence level contains the unit (1) there is no significance; and 2. When the estimation interval at the 95% confidence level does not contain the unit (1) there is significance.

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Graph 1 presents the explanatory variables, independent variables, predictor variables, regressor variables, or causes according to values in ascending numerical order of the ÿ Exponents or Odds Ratios of the Multiple Logistic Regression Analysis.

Figure 1. Explanatory variables, independent variables, predictor variables, regressor variables or causes according to values in ascending numerical order of the ÿ Exponents or Odds Ratios of the Multiple Logistic Regression analysis. Mérida, Yucatán, Mexico. 1/II/2019– 31/I/2020.



Source. Table 2

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Results in four health service institutions (Lázaro Cárdenas Comprehensive Hospital; Felipe Carrillo General Hospital "Puerto"; "José María Morelos" Comprehensive Hospital; and "Tulum" Comprehensive Hospital) of the Mayan Zone of the Mexican state of Quintana Roo, Mexico

Births (cases and controls that met the inclusion criteria) occurring in four institutions were recorded. health services (Lázaro Cárdenas Comprehensive Hospital; Felipe Carrillo Puerto General Hospital; José María Morelos Comprehensive Hospital; and "Tulum" Comprehensive Hospital in the Mayan Zone of the Mexican state of Quintana Roo, Mexico, during the period from February 1st From 2019 to January 31, 2020. The total number of registered newborns was 1,815 [178 (9.81%) cases and 1,637 (90.19%) controls] all meeting the inclusion criteria. Since both cases and controls came from the same population, the homogeneity, representativeness and simultaneity.

Regarding the performance of Multiple Logistic Regression Analysis in the four health service institutions of the Zone Maya from the Mexican state of Quintana Roo, Mexico, the values obtained indicate the positive contribution (OR > 1) in numerical order ascending of the explanatory variables, independent variables, predictor variables, regressor variables or causes: alcoholism; level low socioeconomic status; initiation of prenatal care from or after week N ¯· 20 days of gestation; interpregnancy interval ÿ 24 months; age at menarche ÿ 12 years; marital status "unmarried"; female gender of the newborn; maternal weight < 50 kg; history of abortion(s); number of deliveries = 1; number of prenatal visits ÿ 5; type of delivery or delivery route: abdominal; smoking; number of deliveries ÿ 5; maternal age ÿ 19 years; maternal age ÿ 36 years; pathological obstetric history; pathological personal history; and maternal height < 150 cm. The determinants of low birth weight found in the four Mayan municipalities that can be modified through interventions Public health, health education programs and changes to healthy lifestyles are: 1) Alcoholism; 2) Start of care prenatal from or after week N ¯· 20 days of gestation; 3) Interpregnancy interval ÿ 24 months; 4) Marital status "unmarried"; 5) Weight Maternal weight < 50 kg; 6) Number of prenatal visits ÿ 5; 7) Smoking; 8) Number of deliveries ÿ 5; 9) Maternal age ÿ 19 years; 10) Age maternal age ÿ 36 years; and 11) Maternal height < 150 cm.

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Table 3 presents the explanatory variables, independent variables, predictor variables, regressor variables, or causes according to the results of the Multiple Logistic Regression Analysis.

Table 3. Explanatory variables, independent variables, predictor variables, regressor variables or causes according to the results of the Analysis Multiple Logistic Regression. Lázaro Cárdenas, Felipe Carrillo Puerto, José María Morelos and Tulum, Quintana Roo, Mexico. 1/II/2019–31/I/2020.

Variables explanatory, variables independent, variables predictors, variables returners or causes	**Coefficients logistics estimated (ÿ)**	**Errors standard Dear All**	**Chi-square statistics square of Wald (x^2W)**	**Degrees of freedom (gl)**	**Probabilities *(p)***	**Exponents ÿ= Odds Ratios**	**Intervals of estimate at the level trusted by 95%**
Biological characteristics of the mother							
Maternal age ÿ 19 years old	0.9093	0.6000	2.2969	1	0.1296	2.4827	0.7659ÿ8.0473
Maternal age ÿ 36 years old	1.0321	0.6176	2.7928	1	0.0947	2.8070	0.8366ÿ9.4175
Maternal weight < 50 kg	0.3852	0.2138	3.2465	1	0.0716	1.4700	0.9668ÿ2.2351
Maternal height < 150 cm	1.7064	0.1972	74.8540	1	0.0000	5.5092	3.7429ÿ8.1091
Background personal pathological	1.5363	0.3023	25.8328	1	0.0000	4.6475	2.5700ÿ8.4046
Mother's obstetric history							
Age at menarche ÿ 12 years	0.0763	0.1970	0.1499	1	0.6986	1.0792	0.7336ÿ1.5878
Number of births = 1	0.4398	0.6248	0.4954	1	0.4815	1.5524	0.4562ÿ5.2827
Number of births ÿ 5	0.8204	0.6342	1.6736	1	0.1958	2.2714	0.6554ÿ7.8719
Background of abortion(s)	0.4323	0.3089	1.9588	1	0.1616	1.5407	0.8411ÿ2.8225

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Background obstetrics pathological	1.4045	0.4009	12.2760	1	0.0005	4.0735	1.8567ÿ8.9367
Interval inter-pregnancy interval ÿ 24 months	-0.2304	0.1920	1.4409 1 **Social**		0.2300	0.7942	0.5451ÿ1.1570
characteristics of the mother							
Level socioeconomic low	-0.5632	0.4151	1.8410	1	0.1748	0.5694	0.2524ÿ1.2845
Marital status no-married	0.0917	0.2366	0.1503 1 0.4082 1 0.4709 1		0.6983	1.0961	0.6894ÿ1.7427
Smoking	0.7893	1.2353	**Characteristics of prenatal**		0.5229	2.2019	0.1956ÿ24.7928
Alcoholism	–6.3457	9.2474	**care**		0.4926	0.0018	0.0000ÿ130475.06
Start of the prenatal care starting from the week No. . 20 of gestation	-0.4917	0.2363	4.3308	1	0.0374	0.6116	0.3849ÿ0.9718
Number of queries prenatal ÿ 5	0.4670	0.2190	4.5630	1	0.0327	1.5966	0.0394ÿ2.4526
Characteristic of childbirth							
Type of delivery or birth route abdominal	0.4800	0.1879	6.5423	1	0.0105	1.6169	1.1189ÿ2.3367
Product Feature							
Female gender of the product	0.1191	0.1761	0.4619	1	0.4967	1.1271	0.7982ÿ1.5916
Constant or Intercept	-4.8311	0.9442	26.1900	1	0.0000		

Source. Prepared by the author based on results obtained with IBM SPSS Statistics for Windows, Version 22 software

Interpretation of the values of Wald's x^2 statistic (x^2W):

1. When x^2w is ÿ 3.8416 there is significance; and
2. When x^2w is < 3.8416 there is no significance.

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Interpretation of probability values (p): 1. When *p* is
ÿ 0.0500 there is significance; and 2. When
p is > 0.0500 there is no significance.

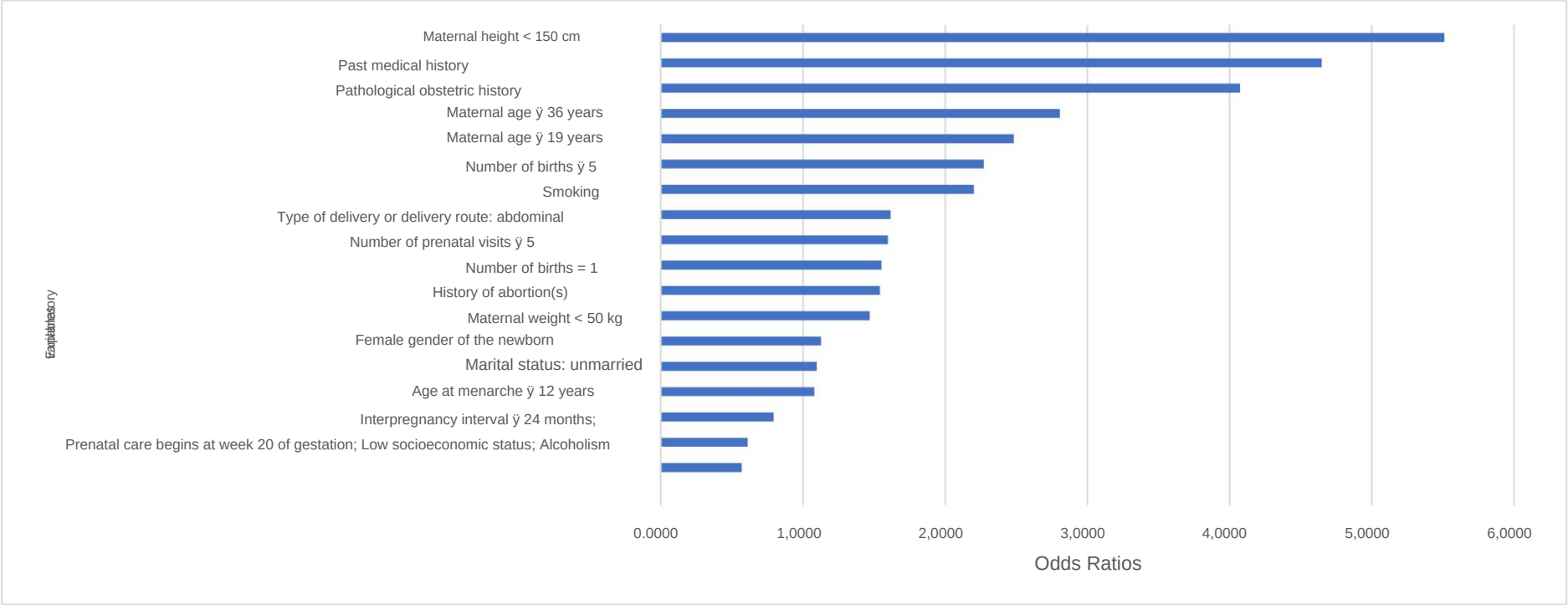
Interpretation of the values of the ÿ Exponents or Odds Ratios
(OR): 1. When OR > 1 the variable is a risk
factor; 2. When OR < 1 the variable is a protective
factor; and 3. When OR = 1 the variable is neither a risk factor nor a protective factor.

Interpretation of the values of the estimation intervals at the 95% confidence level (95% CI): 1.
When the estimation interval at the 95% confidence level contains the unit (1) there is no significance; and 2.
When the estimation interval at the 95% confidence level does not contain the unit (1) there is significance.

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Graph 2 presents the explanatory variables, independent variables, predictor variables, regressor variables, or causes according to the results of the Multiple Logistic Regression Analysis.

Figure 2. Explanatory variables, independent variables, predictor variables, regressor variables or causes according to the results of the Multiple Logistic Regression Analysis. Lázaro Cárdenas, Felipe Carrillo Puerto, José María Morelos and Tulum, Quintana Roo, Mexico. 1/II/2019– 31/I/2020.



Source. Table 3

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Table 4 presents the explanatory variables, independent variables, predictor variables, regressor variables, or causes according to the values of the ÿ Exponents or Odds Ratios in ascending numerical order by health service institutions in the city of Mérida, Yucatán, Mexico and in the Mayan Zone of the Mexican state of Quintana Roo, Mexico.

Table 4. Explanatory variables, independent variables, predictor variables, regressor variables or causes according to the values of the ÿ exponents or Odds Ratios in ascending numerical order by health service institutions in the city of Mérida, Yucatán, Mexico and in the Mayan Zone of the Mexican State of Quintana Roo, Mexico. 1/II/2019–31/I/2020.

Health Service Institutions City of Mérida, Yucatán, Mexico		**Health Service Institutions Mayan Zone of the Mexican State of Quintana Roo, Mexico**	
Explanatory variables, independent variables, variables predictors, regressor variables, or causes	**Odds Ratios**	**Explanatory variables, independent variables, variables predictors, regressor variables, or causes**	**Odds Ratios**
1. Maternal age ÿ 19 years 2. Type	0.8220	1. Alcoholism 2. Low	0.0018
of delivery or delivery route: abdominal **3. Start of prenatal**	1.0073	socioeconomic level **3. Start of**	0.5694
care from week No. 20 of Pregnancy	**1.0512**	**prenatal care from week No. 20 of 4.**	**0.6116**
4. History of abortion(s)	1.0535	Interpregnancy interval ÿ 24 months 5. Age at	0.7942
5. Pathological obstetric history 6. Number of	1.0693	menarche ÿ 12 years 6. Marital status	1.0792
prenatal visits ÿ 5 7. Maternal age ÿ 36 years 8.	1.0781	unmarried 7. Female gender of	1.0961
Female gender of the infant 9.	1.0915	the product 8. Maternal weight < 50 kg 9.	1.1271
Number of deliveries = 1 10. Low	1.1472	History of abortion(s)	1.4700
socioeconomic status 11.	1.1674		1.5407
Pathological personal history 12. Age	1.2506	10. Number of deliveries = 1 11.	1.5524
at menarche ÿ 12 years 13. Marital status: unmarried	1.2848	Number of prenatal visits ÿ 5 12. Type of delivery	1.5966
14. Smoking 15. Number of deliveries ÿ	1.3523	or delivery route: abdominal 13. Smoking 14. Number of	1.6169
5 16. Interpregnancy interval ÿ 24	1.4897	deliveries ÿ 5 15.	2.2019
months 17. Maternal	1.6384	Maternal age ÿ 19 years 16.	2.2714
weight < 50 kg 18. Alcoholism	2.0351	Maternal age ÿ 36 years 17.	2.4827
19. Maternal height < 150 cm	2.7028	Pathological obstetric history 18.	2.8070
	2.8376	Pathological personal history **19. Maternal height**	4.0735
	4.3879	**< 150 cm**	4.6475
	8.1153		**5.5092**

Source: Own elaboration

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Logistic model and example

If the response variable is denoted by "Y", it can be assumed that "Y" takes the values zero (0) or one (1). Zero (0) denotes

X denotes non-occurrence and one (1) denotes the occurrence of the event (low birth weight). If X1, X2, X3 , X4, X5, X6, X7, X8, X9, X10, X11, X12, X13, X14, X15, X16

and X17 are explanatory variables, independent variables, predictor variables, regressor variables, or causes related to the occurrence

of the response variable "Y", then the following Logistic Model specifies that the conditional probability of occurrence of the event "Y"

given the values X1 , X2, X3 , X4, X5 , X6, X7 , X8 , X9 , X10 , X11 ,

P(Y= 1 | X1 , X2 , X3 , X4 , X5 , X6 , X7 , X8 , X9 , **X10 ,** X11 ,

Where:

P(Y= 1)= Probability of being born with low birth weight; and

Exponent (ÿ)= ÿ0 + (ÿ1*X1) + (ÿ2*X2) + (ÿ3*X3) + (ÿ4*X4) + (ÿ5*X5) + (ÿ6*X6) + (ÿ7*X7) + (ÿ8*X8) + (ÿ9*X9) + (ÿ10*X10) + (ÿ11*X11) (ÿ12*X12) + (ÿ13*X13) + (ÿ14*X14) + (ÿ15*X15) + (ÿ16*X16) + (ÿ17*X17)

Table 5 presents the estimated logistic coefficient (ÿ) values according to explanatory variables.

independent variables, predictor variables, regressor variables or causes (Xi).

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Table 5. Estimated logistic coefficients (ÿ) according to explanatory variables, independent variables, predictor variables, variables regressors or causes (Xi). 1/II/2019–31/I/2020.

Explanatory variables, independent variables, predictor variables, regressor variables or causes (Xi)	Estimated logistic coefficients (ÿ)
Constant or intercept	ÿ0= –5.4657
X1= Maternal age ÿ 19 years	ÿ1= –0.1960
X2= Maternal age ÿ 36 years	ÿ2= 0.0876
X3= Maternal weight < 50 kg	ÿ3= 1.0430
X4= Maternal height < 150 cm X5=	ÿ4= 2.0937
Past medical history X6= Age at menarche ÿ	ÿ5= 0.2506
12 years X7= Number of deliveries =	ÿ6= 0.3018
1 X8= Number of deliveries ÿ	ÿ7= 0.1548
5 X9= History of abortion(s)	ÿ8= 0.7106
	ÿ9= 0.0521
X10= Pathological obstetric history X11=	ÿ10= 0.0670
Interpregnancy interval ÿ 24 months X12=	ÿ11= 0.9943
Low socioeconomic level X13=	ÿ12= 0.2236
Marital status "unmarried"	ÿ13= 0.3986
X14= Smoking	ÿ14= 0.4937
X15= Alcoholism	ÿ15= 1.4789
X16= Start of prenatal care from or after week No. 20 of Gestation	ÿ16= 0.0499
X17 = Number of prenatal visits ÿ 5 X18 =	ÿ17= 0.0752
Type of delivery or delivery route: abdominal X19 =	ÿ18= 0.0073
Female gender of the product Source:	ÿ19= 0.1373

Own elaboration

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Therefore, substituting into the **equation ,** we obtain:

P (Y = 1 | X2 , X3 , X4 , X5 , X6 , X8 , X9 , X10 , X11 , X12 ,
(ÿ8*X8) + (ÿ9*X9) + (ÿ10*X10) + (ÿ11*X11) + (ÿ12*X12) + (ÿ13*X13) (ÿ14*X14) + (ÿ15*X15) + (ÿ16*X16) + (ÿ17*X17) + (ÿ18*X18) + (ÿ19*X19) / 1 +
ÿ0 + (ÿ2*X2) + (ÿ3*X3) + (ÿ4*X4) + (ÿ5*X5) + (ÿ6*X6) + (ÿ8*X8) + (ÿ9*X9) + (ÿ10* X10) + (ÿ11*X11) (ÿ12*X12) + (ÿ13*X13) + (ÿ14*X14) +
(ÿ15*X15) + (ÿ16*X16) + (ÿ17*X17) + (ÿ18*X18) + (ÿ19*X19)

Note.– Although 19 explanatory variables, independent variables, and predictor variables have been studied in the present study, regressor variables or causes, the proposed Logistic Model contains only 17 values of the estimated logistic coefficients "ÿ" and 17 values of the explanatory variables, independent variables, predictor variables, regressor variables or causes (Xi) because the The explanatory variables maternal age and number of births have two exposure categories which are mutually exclusive, that is, A mother is either ÿ 19 years old or ÿ 36 years old; the same applies to the number of births, since a mother either has 1 birth or has ÿ 5 births.

The above explains why the explanatory variables maternal age ÿ 19 years (X1); and number of births are not included in the **Equation** = 1 (X7).

Example:
Given the following characteristics, what is the probability that a mother will have a low birth weight baby?

1. Age ÿ 36 years;
2. Weight < 50 kg;
3. Height < 150 cm;
4. Past medical history;
5. Age at menarche ÿ 12 years;
6. Number of births ÿ 5;
7. History of abortion(s);
8. Pathological obstetric history;
9. Interpregnancy interval ÿ 24 months;
10. Low socioeconomic level;
11. Marital status "unmarried";
12. Smoking;

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13. Alcoholism; 14.
Start of prenatal care from or after week N; 15. Number of prenatal visits ÿ 5; 16.¯ · 20 days of gestation;

Type of delivery or vaginal birth route; and 17.
Female gender of the product.

P(Y= 1 | X1 , X2 , X3 , X4 , X5 , X6 , X7 , X8 , X9 , **X10 ,** X11 ,

Where:

ÿ= (–5.4657) + (0.0876*1) + (1.0430*1) + (2.0937*1) + (0.2506*1) + (0.3018*1) + (0.1548*1) + (0.7106*1) + (0.0670*1) + (0.9943*1) + (0.2236*1) + (0.3986*1) + (0.4937*1) + (1.4789*1) + (0.0499*1) + (0.0752*1) + (0.0073*1) + (0.1373*1); **ÿ=** (–5.4657) + (0.0876) + (1.0430) + (2.0937) + (0.2506) + (0.3018) + (0.1548) + (0.7106) + (0.0670) + (0.9943) + (0.2236) + (0.3986) + (0.4937) + (1.4789) + (0.0499) + (0.0752) + (0.0073) + (0.1373); **ÿ=** 2.9995
Exponent (ÿ)= Exponent (2.995)= 20.0755

Substituting into the **equation ,** we have:

P (Y = 1 | X10 , X11 , X12 , X13 , X14 , X15 , X16 , **X17 ,** X18 , X18, X19= 0.9526

Therefore, with these characteristics, the probability that a mother will have a low birth weight baby is = 0.9526.
expressed as a percentage, it is equal to 95.26%.

Table 6 presents a comparative table of the specific weights of the risk factors in low birth weight of four health service institutions in the city of Mérida, Yucatán, Mexico *versus* the specific weights of risk factors in the low birth weight from four health service institutions in the Maya Zone of the Mexican state of Quintana Roo, Mexico, according to the Model Multiple Logistic Regression. Case-control study

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Table 6. Comparative table of the specific weights of risk factors in low birth weight from four service institutions health [General Hospital "Dr. Agustín O'Horán" of the Ministry of Health of the Mexican State of Yucatán (SSY); Maternal and Child Hospital of the Ministry of Health of the Mexican state of Yucatán (SSY); Mérida Regional Hospital of the Institute of Security and Social Services of State Employees' Social Security Institute (ISSSTE); and the "Ignacio García Téllez" National Medical Center of the Mexican Social Security Institute (IMSS)] of the city of Mérida, Yucatán, Mexico *versus* the specific weights of risk factors in low birth weight of four health service institutions (Lázaro Cárdenas Comprehensive Hospital; Felipe Carrillo Puerto General Hospital; José Comprehensive Hospital María Morelos"; and "Tulum" Integral Hospital) of the Mayan Zone of the Mexican state of Quintana Roo, Mexico, according to the Regression Model Multiple Logistics. Case-control study

Variables explanatory, variables independent, variables predictors, variables returners or causes	Four health service institutions in the city of Mérida, Yucatán, Mexico			Four Mexican state health service institutions Quintana Roo, Mexico		
	Chi-square statistics Wald Square (x^2W)	Exponents ÿ= Odds Ratios	Intervals of estimate at the level trusted by 95%	Chi-square statistics Wald Square (x^2W)	Exponents ÿ= Odds Ratios	Intervals of estimate at the level trusted by 95%
Biological characteristics of the mother						
Maternal age ÿ 19 years	1.9793	0.8220	0.6256ÿ1.0801	2.2969	2.4827	0.7659ÿ8.0473
Maternal age ÿ 36 years	0.3319	1.0915	0.8103ÿ1.4704	2.7928	2.8070 ÿ	0.8366ÿ9.4175
Maternal weight < 50 kg	56.8547	2.8376 ÿ	2.1638ÿ3.7213	3.2465	1.4700	0.9668ÿ2.2351
Maternal height < 150 cm	751.1966	8.1153 ÿ	6.9868ÿ9.4260	74.8540	5.5092	3.7429ÿ8.1091
Background personal pathological	8.4197	1.2848	1.0847ÿ1.5217	25.8328	4.6475 ÿ	2.5700ÿ8.4046
Mother's obstetric history						
Age at menarche ÿ 12 years old	22.0857	1.3523 ÿ	1.1924ÿ1.5337	0.1499	1.0792	0.7336ÿ1.5878
Number of births = 1	0.6039	1.1674	0.7901ÿ1.7251	0.4954	1.5524 ÿ	0.4562ÿ5.2827
Number of births ÿ 5	12.6292	2.0351	1.3753ÿ3.0115	1.6736	2.2714 ÿ	0.6554ÿ7.8719
Background of abortion(s)	0.2480	1.0535	0.8581ÿ1.2935	1.9588	1.5407 ÿ	0.8411ÿ2.8225

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Background obstetrics pathological	0.6847	1.0693	0.9124ÿ1.2531	12.2760	4.0735 ÿ	1.8567ÿ8.9367
Interval inter-pregnancy interval ÿ 24 months	91.8390	2.7028	2.2055ÿ3.3123	1.4409	0.7942	0.5451ÿ1.1570
Social characteristics of the mother						
Level low socioeconomic status	7.6208	1.2506	1.0670ÿ1.4658	1.8410	0.5694	0.2524ÿ1.2845
Marital status no-married	32.5920	1.4897 ÿ	1.2992ÿ1.7081	0.1503	1.6384	1.3323ÿ2.0147
Smoking	21.8970	2.5917ÿ7.4290	0.4709	**Characteristics of prenatal care**		2.2019 ÿ
Alcoholism	30.3023				0.0018	0.0000ÿ130475.06
Start of care prenatal from the week No. . 20 of gestation	0.2595	1.0512	0.8676ÿ1.2736	4.3308	0.6116	0.3849ÿ0.9718
Number of queries prenatal ÿ 5	0.8713	1.0781	0.9206ÿ1.2626	4.5630	1.5966 ÿ	0.0394ÿ2.4526
Characteristic of delivery						
Type of delivery or route of birth abdominal	0.0123	1.0073	0.8858ÿ1.1456	6.5423	1.6169 ÿ	1.1189ÿ2.3367
Product Feature						
Female gender	4.7964	1.1472 ÿ	1.0145ÿ1.2972	0.4619	1.1271	0.7982ÿ1.5916

Source: Own elaboration

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Discussion

In compliance with the general objective, the specific weights of 19 risk factors in low weight were evaluated multivariately. at birth of children born in four health service institutions in the city of Mérida, Yucatán, Mexico. They were also evaluated in multivariate analysis of the specific weights of the same 19 risk factors in low birth weight of children born in four institutions of health services of the Maya Zone of the Mexican state of Quintana Roo, Mexico.

Regarding newborns from the four health service institutions in the city of Mérida, Yucatán, Mexico, the values The values obtained from the ÿ or OR exponents indicated the positive contribution (OR > 1) in ascending numerical order of the risk factors. of delivery or abdominal birth route (1.0073); start of prenatal care from or after week N ¯· 20 days of gestation (1.0512); history of abortion(s) (1.0535); pathological obstetric history (1.0693); number of prenatal visits ÿ 5 (1.0781); maternal age ÿ 36 years (1.0915); female gender of the product (1.1472); number of births = 1 (1.1674); low socioeconomic level (1.2506); background personal pathological factors (1.2848); age at menarche ÿ 12 years (1.3523); marital status "unmarried" (1.4897); smoking (1.6384); number of births ÿ 5 (2.0351); interpregnancy interval ÿ 24 months (2.7028); maternal weight < 50 kg (2.8376); alcoholism (4.3879); and maternal height < 150 cm (8.1153). Likewise, with respect to newborns in the four health service institutions of the Mexican state of Quintana The values obtained from the ÿ or OR exponents indicated the positive contribution (OR > 1) in ascending numerical order of the factors risk factors for alcoholism (0.0018); low socioeconomic level (0.5694); start of prenatal care from or after week N ¯. 20 of gestation (0.6116); interpregnancy interval ÿ 24 months (0.7942); age at menarche ÿ 12 years (1.0792); marital status "unmarried" (1.0961); female gender of the product (1.1271); maternal weight < 50 kg (1.4700); history of abortion(s) (1.5407); number of deliveries = 1 (1.5524); number of prenatal visits ÿ 5 (1.5966); type of delivery or delivery route abdominal (1.6169); smoking (2.2019); number of deliveries ÿ 5 (2.2714); maternal age ÿ 19 years (2.4827); maternal age ÿ 36 years (2.8070); pathological obstetric history (4.0735); history personal pathological conditions (4.6475); and maternal height < 150 cm (5.5092). Table 5 shows that the only two variables explanatory variables, independent variables, predictor variables, regressor variables, or causes that coincide in terms of the position that They occupy, in ascending numerical order, were the beginning of care from or after week N. ¯· 20th week of gestation (position 3) and the maternal height < 150 cm (in position 19).

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The Wald Chi-Square statistic values (x^2W) and the corresponding probability values *(p)* were reported for the four health service institutions in the city of Mérida, Yucatán, Mexico, 18 explanatory variables, independent variables, predictor variables, regressor variables or causes with Exponents ÿ or OR > 1 of which 11 were statistically significant: x^2W(ÿ= 0.0500; df= 1) ÿ 3.8416; *p* ÿ 0.0500. While for the four health service institutions of the Maya Zone of the Mexican state of In Quintana Roo, 15 exponents ÿ or OR > 1 were found, of which only six were statistically significant: x^2W(ÿ= 0.0500; df= 1) ÿ 3.8416; *p* ÿ 0.0500. When the percentage of explanatory variables, independent variables, and predictor variables was compared, regressor variables or causes with statistical significance (11/18; 61.11%) *versus* the percentage of explanatory variables, variables independent variables, predictor variables, regressor variables or causes with statistical significance (6/15; 40.00) no difference was found statistically significant: $x^2M–H$(ÿ= 0.0500; df= 1) < 3.8416; *p* > 0.0500. $x^2M–H$= Mantel–Haenszel Chi-Square Statistic.

Although no statistically significant difference was found at the significance level (ÿ) of 5%, the truth is is that the percentage (11/18= 61.11%) of explanatory variables, independent variables, predictor variables, regressor variables or causes with ÿ Exponents or Odds Ratios > 1 of the total variables studied in the four health service institutions of the city of Mérida, Yucatán, Mexico, is higher than the percentage (6/15= 40.00%) of explanatory variables, independent variables, predictor variables, regressor variables or causes with ÿ exponents or odds ratios > 1 out of the total variables studied in the four service institutions of health of the Mayan Zone of the Mexican state of Quintana Roo.

In accordance with the first specific objective, the positive, negative or zero contribution of the 19 explanatory variables was evaluated, independent variables, predictor variables, regressor variables or causes using the values of their corresponding Exponents ÿ u Odds Ratios. For the four health service institutions in the city of Mérida, Yucatán, Mexico, 18 variables were found explanatory variables, independent variables, predictor variables, regressor variables or causes with positive contribution (OR > 1) and a variable explanatory with negative contribution (OR < 1). Whereas for the four health service institutions of the four institutions of In the health services of the Maya Zone of the Mexican state of Quintana Roo, 15 explanatory variables, independent variables, were found. predictor variables, regressor variables or causes with positive contribution (OR > 1) and four explanatory variables, variables independent variables, predictor variables, regressor variables or causes with negative contribution (OR < 1).

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In accordance with the second specific objective, the probability value of low birth weight was predicted (response variable, variable dependent or effect "Y") by applying the Multiple Regression Logistic Model given certain values of variables

explanatory variables, independent variables, predictor variables, regressor variables or causes X1, X2, X3, X4 , X5, X6, X7 , X8, X9, X10, X11, X12, X13,

X14, X15, X16, X17, X18 and X19. The applied equation corresponds to the following Logistic Model:

P(Y= 1 | X1 , X2 , X3 , X4 , X5 , X6 , X7 , X8 , X9 , X10 , X11 ,

With respect to the formulation of hypotheses, it can be concluded, in general terms, that the null hypothesis (H0) should be rejected and the acceptance of the alternative hypothesis (H0) should be accepted.

of the alternative hypothesis, research hypothesis or working hypothesis (H1).

Our results are consistent with those obtained by other authors whose studies have reported maternal age ÿ 36 years **(79–85);** pre-pregnancy weight < 50 kg **(86–89);** maternal height < 150 cm **(90–92);** personal pathological history **(93–102);** age at menarche ÿ 12 years **(103–104);** primiparity and multiparity (ÿ 5 deliveries) **(103–108);** history of abortion(s) **(109);** pathological obstetric history **(110–113);** interpregnancy interval ÿ 24 months **(114);** low socioeconomic level **(115–116);** marital status "unmarried" **(117–122);** smoking **(123–135);** alcoholism **(136–137);** the start of prenatal care from or after week N of prenatal visits ÿ 5 **(138–143);** the type of delivery or abdominal birth route **(144);** and the female gender of the product **(145)** as factors ¯· 20 days of gestation **(138);** the number

risk factors associated with low birth weight.

This thesis work represents the first of its kind that compares two populations using the values of their exponents ÿ u Odds Ratios.

The determinants of low birth weight found in the four health service institutions of the city of Mérida, Yucatán, Mexico, and that can be modified through public health interventions, health education programs, and lifestyle changes Healthy factors include: 1) Maternal age ÿ 36 years; 2) Maternal weight < 50 kg; 3) Past medical history; 4) Number of deliveries ÿ 5; 5) Interpregnancy interval ÿ 24 months; 6) Smoking; 7) Alcoholism; 8) Initiation of prenatal care at or after the week N ¯· 20 of gestation; and 9) The number of prenatal consultations ÿ 5.

Likewise, the determinants of low birth weight found in the four health service institutions of the Maya Zone of Mexican state of Quintana Roo, Mexico, and that can be modified through public health interventions, education programs for the Health and lifestyle changes include: 1) Alcoholism; 2) Starting prenatal care from or after week N ¯·

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20 days of gestation; 3) Interpregnancy interval ÿ 24 months; 4) Marital status "unmarried"; 5) Maternal weight < 50 kg; 6) Number of consultations prenatal factors ÿ 5; 7) Smoking; 8) Number of births ÿ 5; 9) Maternal age ÿ 19 years; 10) Maternal age ÿ 36 years; and 11) height maternal < 150 cm.

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Recommendations

1. Recommend to the relevant health authorities the development of Health Education programs that have as their objective
The main objective is to promote in the population of women of reproductive age (15–49 years) the development of attitudes and behaviors that will allow them to participate in the prevention of low birth weight to protect themselves from risks that endanger both their health and the health of your product(s);

2. Develop and implement a new research project that includes conducting an observational epidemiological study
A nested case-control study within a cohort will be used. This will allow for a more detailed understanding of the contribution of the specific weights. of the risk factors in the development of low birth weight in the four health service institutions of the city of Mérida, Yucatán, Mexico, as well as in the four health service institutions of the Maya Zone of the Mexican state of Quintana Roo; and

3. After the implementation of Health Education programs aimed at preventing low birth weight by the relevant health authorities, compare the low birth weight rate obtained in the present study with the low birth weight rate born during the period from February 1, 2023 to January 31, 2024. The expected outcome is to obtain evidence statistically significant at the significance level (ÿ) of 5% to conclude that the 2023–2024 low birth weight rate is significantly lower compared to the 2019–2020 low birth weight rate.

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