



## Temporal trend and factors associated to teenage pregnancy\*

Tendência temporal e fatores associados à gravidez na adolescência

Tendencia temporal y factores asociados con el embarazo adolescente

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### ABSTRACT

**Objective:** To analyze the trend and factors associated to teenage pregnancy in a municipality in Paraná state. **Method:** Ecological study conducted with registers of babies born to teenage mothers between 2000 and 2015 from the Birth Information System (*Sistema de Informação sobre Nascimento*). Proportions were calculated year by year for a trend analysis of teenage pregnancy. Two series of three-year periods were collected for an odds ratio analysis of associated factors. **Results:** The following variables were associated to teenage pregnancy: not having a partner; less than eight years of schooling; primiparity; gestational age shorter than thirty-seven weeks; caesarean section; less than seven appointments; and Apgar below seven in the first minute. A decline trend was observed among pregnant teenagers who had partners; growing trend for teenage expectant mothers who had more than eight years of schooling and premature birth; decline/growing for normal birth; growing for number of prenatal appointments; decline for first and fifth minute Apgar score; growing for congenital anomalies. **Conclusion:** The analysis provided information that can be used to promote pregnancy prevention strategies and assistance to adolescent mothers.

### DESCRIPTORS

Pregnancy in Adolescence; Adolescent Health; Obstetric Nursing; Maternal-Child Nursing.

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## INTRODUCTION

Teenage pregnancy markedly decreased in the last years worldwide; however, this reduction is unequal among countries, a fact which may be related to the low socioeconomic status of some countries and to difficulties implementing and maintaining strategies for its efficient control<sup>(1-3)</sup>.

Pregnancy and birth-related complications are considered the second cause of death among teenagers<sup>(1,4)</sup>. For those born from teenage mothers, prevalence of death during neonatal and childhood periods is significantly higher when compared to those born to mothers in different age groups<sup>(1)</sup>. Also, neonatal results, such as prematurity, low birth weight, and Apgar below seven in the fifth minute, are significantly associated to teenage pregnancy<sup>(5-6)</sup>.

Even though Brazil has seen a reduction in teenage pregnancy<sup>(4)</sup>, its rates continue to be high, together with associated factors. The identification of these factors throughout a period enables a dynamic analysis of such event, providing data which may be used to support plans of effective action aimed at reducing teenage pregnancy rates<sup>(7-8)</sup>.

This study aimed at analyzing the temporal trend and factors associated to teenage pregnancy by characteristics of mother, gestation, birth and newborn from 2000 to 2015 in the municipality of Maringá, in Paraná state (Maringá-PR).

## METHOD

### STUDY TYPE

Ecological retrospective quantitative study.

### SCENARIO

This study employed birth records of babies born to teenage mothers living in Maringá-PR between 2000 and 2015 registered in the System of Information on Children Born Alive (SINASC – *Sistema de Informação sobre Nascidos Vivos*). The data used for the analysis were provided by the municipality's City Health Department.

### DATA COLLECTION

The selected variables were: age, schooling, marital status and parity (mother's characteristics); pregnancy duration, type of pregnancy, type of birth and number of prenatal appointments (pregnancy and birth characteristics); weight at birth; Apgar score of 1st and 5th minute of life; and congenital anomaly (newborn's characteristics).

## DATA ANALYSIS AND TREATMENT

Teenage mothers were divided in two age groups: 10 to 14 years and 15 to 19 years. The proportions of teenage pregnancy were calculated in relation to the total of pregnant teenagers and then in relation to the total of female teenagers. Factors related to teenage pregnancy were also analyzed, including: marital status (with/without partner), schooling (< 8 and ≥ 8 years of schooling), parity (primiparous or multiparous), type of pregnancy (single or multiple), type of birth (vaginal or caesarean), pregnancy duration (< 37 weeks and ≥ 37 weeks), number of prenatal appointments (< 7 and ≥ 7 appointments), Apgar in 1st and 5th minutes (< 7 and ≥ 7), birth weight (< 2,500 and ≥ 2,500 gr) and congenital malformations (with or without).

The proportions were calculated year by year for a trend analysis of teenage pregnancy and trend of teenage mother characteristics, gestation and birth. Factors related to teenage pregnancy were analyzed in two series of three years (2000 to 2002 and 2013 to 2015), employing Odds Ratio (OR) to identify factors possibly associated to teenage pregnancy with a 95% Confidence Interval (CI).

For trend analysis, the polynomial regression model was employed, in which the proportions of teenage pregnancy were considered dependent variables (y) and years of schooling were an independent variable (x). The variable "year" was transformed into the year-centralized (x-2007) variable and the series were smoothed by a three-point moving average. The polynomial linear regression models were tested.

### ETHICAL ASPECTS

This study was approved by the Permanent Research Ethics Committee of Centro Universitário Ingá in Opinion 2.040.578/2017.

## RESULTS

The trend analysis revealed that the pregnancy rate between 10 and 19 years presented a significant decline trend in this municipality (p<0.001). A similar situation was also observed for teenage pregnancy between 10 and 14 years. The range from 15 to 19 years shows a decline trend although presenting a discreet increase by the end of the period (p<0.001). However, such increase was inferior to the rates for the beginning of the studied years (Table 1).

The percentage of pregnant teenagers also presented a decline trend, which was also observed when percentages were separated by age (10-14 and 15-19 years). Both ranges presented a significant decline trend in the studied period (p<0.001) (Table 1).

**Table 1** – Trend models for proportion and rate of teenage pregnancy by age group – Maringá, PR, Brazil, 2019.

TP rate	$\beta_0$	$\beta_1$	$r^2$	p	Trend
10 - 19 years	19.62	-0.44	0.75	<0.001	↓
10 - 14 years	1.24	-0.02	0.32	0.036	↓
15 - 19 years	33.27	-0.99	0.96	<0.001	↓↑

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TP rate	$\beta_0$	$\beta_1$	$r^2$	p	Trend
TP %*					
10 - 19 years	12.37	-0.51	0.96	<0.001	↓
10 - 14 years	0.36	-0.01	0.72	<0.001	↓
15 - 19 years	12.01	-0.49	0.96	<0.001	↓

\*Percentage of each teenage age group calculated in relation to each year's total of births.

 $\beta$ -regression coefficient;  $r^2$ - determination coefficient

After the analysis of factors associated to teenage pregnancy in the period from 2000 to 2002, the variables of mother characteristics observed to associate to teenage pregnancy were: marital status "without partner" (OR=5.0;  $p < 0.001$ ); less than eight years of schooling (OR= 1.6;  $p < 0.001$ ); and primiparous parity (OR: 6.3;  $p < 0.001$ ) (Table 2).

The characteristics of gestation and birth associated to teenage pregnancy were: gestational age smaller than 37 weeks (OR=1.3;  $p = 0.008$ ), caesarean birth (OR= 2.9;  $p < 0.001$ ) and number of prenatal appointments smaller than seven (OR=1.9;  $p < 0.001$ ). The characteristics of the newborn regarding teenage pregnancy was Apgar score below seven in the first minute of life (OR=1.5;  $p < 0.001$ ) (Table 2).

In the second three-year period, 2013–2015, regarding the mother's characteristics, an increase was observed in

chances of teenage expectant mothers having no partner (OR= 8.5  $p < 0.001$ ) and less than eight years of schooling (OR= 1.9;  $p < 0.001$ ) when compared to the first three-year period. Primiparity also presented a significant association, but with decreased chances (OR= 6.0;  $p < 0.001$ ). As for the characteristics of pregnancy and birth, caesarean section (OR=1.2;  $p < 0.001$ ) and number of prenatal appointments smaller than seven (OR=1.3;  $p < 0.001$ ) were associated to teenage pregnancy and presented smaller chances in relation to the first three-year period (Table 2).

Concerning newborn characteristics, the data from 2013 to 2015 was observed to be similar to the first three-year and only the Apgar score below seven in the first minute (OR=1.3;  $p = 0.007$ ) presented a statistically significant association with teenage pregnancy (Table 2).

**Table 2** – Factors associated to teenage pregnancy in the three-year periods 2000 – 2002 and 2013 – 2015 concerning characteristics of mother, gestation, birth and newborn – Maringá, PR, Brazil, 2019.

Variables	2000 - 2002		OR	p-value	2013 - 2015		OR	p-value
	Teenagers	Adults			Teenagers	Adults		
	%	%			%	%		
<b>Mother</b>								
<b>Marital status</b>								
Without partner	69.1	30.8	5.0	<0.001	83.8	38.4	8.5	<0.001
With partner	30.9	65.8			15.8	61.4		
<b>Schooling</b>								
< 8 years	38.2	28.2	1.6	<0.001	5.4	1.9	2.9	<0.001
≥ 8 years	61.5	71.2			94.5	98.0		
<b>Parity</b>								
Primiparous	79.1	38.7	6.3	<0.001	80.5	40.8	6.0	<0.001
Multiparous	19.6	60.7			19.4	59.0		
<b>Pregnancy and Birth</b>								
<b>Duration of pregnancy</b>								
< 37 weeks	8.5	6.8	1.3	0.008	12.1	11.7	1.0	0.645
≥ 37 weeks	91.5	93.1			87.5	88.0		
<b>Type of pregnancy</b>								
Single	98.5	97.6			98.9	97.3	0.4	<0.001
Multiple	1.5	2.4	0.6	0.015	1.1	2.7		

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Variables	2000 - 2002		OR	p-value	2013 - 2015		OR	p-value
	Teenagers	Adults			Teenagers	Adults		
	%	%			%	%		
<b>Type of birth</b>								
Normal	46.0	22.7	2.9	<0.001	44.2	38.9	1.2	<0.001
Caesarean section	54.0	77.3			55.8	61.0		
<b>Number of prenatal appointments</b>								
< 7	36.1	21.9	1.9	<0.001	75.6	70.8	1.3	<0.001
≥ 7	68.5	77.6			24.4	29.1		
<b>Newborn</b>								
<b>Gender</b>								
Male	52.7	51.1	1.1	0.185	50.8	50.8	1.0	0.973
Female	47.3	48.9			49.2	49.2		
<b>Birth weight</b>								
< 2500	8.2	7.1	1.2	0.108	9.7	9.3	1.1	0.568
≥ 2500	91.8	92.8			90.3	90.7		
<b>Apgar in the first minute</b>								
< 7	8.4	5.7	1.5	<0.001	8.2	6.4	1.3	0.007
≥ 7	90.8	93.9			91.8	93.6		
<b>Apgar in the 5th minute</b>								
< 7	1.6	1.1	1.4	0.085	1.0	0.7	1.3	0.303
≥ 7	97.8	14.4			99.0	99.2		
<b>Congenital anomaly</b>								
Yes	0.7	1.0	0.7	0.277	1.1	0.8	1.3	0.268
No	99.3	99.0			98.9	99.2		

The result for the trend in teenage pregnancy proportion, by variables regarding mother, pregnancy, birth, and newborn, presented a decrease in the proportion of teenage expectant mothers with partners; nonetheless, there was an increasing trend by the end of the period ( $r^2: 0.82$ ), as well as a growing trend for pregnant teenagers with eight or more years of schooling ( $r^2: 0.79$ ) (Table 3).

The trend of pregnancy proportion in relation to pregnancy and birth presented growth for premature birth (gestational age shorter than 37 weeks) ( $r^2: 0.76$ ); decline/

growth for normal birth ( $r^2= 0.72$ ), growth/decline trend for caesarean section birth ( $r^2= 0.72$ ) and oscillating between growth and decline for those who had more than seven prenatal appointments in the end of the period (Table 3).

As for the factors concerning the newborn, a trend for oscillation between decline and growth was observed in relation to Apgar higher or equal to seven in the first minute ( $r^2: 0.75$ ), growth in relation to Apgar below seven in the fifth minute ( $r^2: 0.57$ ) and growth for newborn with congenital anomalies ( $r^2= 0.69$ ) (Table 3).

**Table 3** – Trend models for teenage pregnancy proportion, according to variables mother, pregnancy, birth and newborn – Maringá, PR, Brazil, 2019.

Mother	Model	r2	p	Trend
<b>Marital status</b>				
With partner	$22.09-2.91x+1.03x^2$	0.82	<0.001	↓↑
Without partner	$77.90+2.91x-1.04x^2$	0.82	<0.001	↑↓
<b>Schooling</b>				
< 8 years	$y=30.34-1.06x$	0.80	<0.001	↓
≥ 8 years	$y=69.55+1.07x$	0.79	<0.001	↑

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Mother	Model	r <sup>2</sup>	p	Trend
<b>Pregnancy and Birth</b>				
<b>Duration of pregnancy</b>				
< 37 weeks	$y=10.90+0.35x$	0.76	<0.001	↑
≥ 37 weeks	$y=89.07-0.36x$	0.77	<0.001	↓
<b>Type of pregnancy</b>				
Single	$y=98.95+0.03x$	0.28	0.054	-
Multiple	$y=1.05-0.03x$	0.27	0.054	-
<b>Type of birth</b>				
Normal	$y=40.60-0.73x+0.08x^2$	0.72	<0.001	↓/↑
Caesarean section	$y=59.40+0.73x+0.08x^2$	0.72	<0.001	↑/↓
<b>Number of prenatal appointments</b>				
< 7	$y=31.90-0.23x$	0.36	0.022	↓
≥ 7	$y=68.31-0.33x-0.03x^2+0.02x^3$	0.85	<0.001	↑/↓/↑
<b>Birth site</b>				
Hospital	$y=99.74+0.01x$	0.28	0.051	-
Others	$y=0.26-0.01x$	0.28	0.051	-
<b>Newborn</b>				
<b>Gender</b>				
Male	$y=52.32-0.15x$	0.47	0.007	↓
Female	$y=47.67+0.15x$	0.47	0.007	↑
<b>Weight at birth</b>				
< 2500	$y=9.44+0.08x$	0.20	0.113	-
≥ 2500	$y=90.56-0.08x$	0.19	0.117	-
<b>Apgar in the first minute</b>				
< 7	$y=15.65+0.46x-0.03x^2-0.01x^3$	0.84	<0.001	↑/↓
≥ 7	$y=84.07-0.43x+0.03x^2+0.01x^3$	0.75	0.001	↑/↓/↑
<b>Apgar in the 5th minute</b>				
< 7	$y=2.48+0.12x$	0.57	0.002	↑
≥ 7	$y=97.30-0.08x$	0.40	0.015	↓
<b>Congenital anomaly</b>				
Yes	$y=0.79+0.05x$	0.69	<0.001	↑
No	$y=99.16-0.04x$	0.73	<0.001	↓

r<sup>2</sup>- determination coefficient

## DISCUSSION

This study's results are similar to those found in other studies regarding declining rates of teenage pregnancy<sup>(2-3)</sup>.

The study has shown a discreet increase in pregnancy rates among 15 to 19-year-old teenagers by the end of the studied period. This result may be related to an increase in the proportion of sexually active teenagers, mainly at the end of adolescence; also, the absence of future perspectives for some adolescents may lead them to overlook pregnancy in earlier ages<sup>(9-11)</sup>. For them, teenage pregnancy may be considered a positive event and a mark of transition into adulthood<sup>(11)</sup>. Nonetheless, it is filled with

adverse social outcomes, such as the possibility of harsher financial difficulties, unemployment, lower salaries and low educational achievements in comparison with their peers; also, children of teenage mothers may also become teenage parents<sup>(10)</sup>. This emphasizes the importance of implementation and continuation of actions aimed at preventing teenage pregnancy, as well as public policies which broaden the range of possible futures for adolescents and young people<sup>(11)</sup>.

In Brazil, some strategies have been developed with the objective of preventing teenage pregnancy, such as: talks in primary health units, programs in schools, conversation circles, operative groups and domiciliary visits, conducted

with adolescents and their families, in addition to health professional training. Nonetheless, programs and health policies already implemented need to be strengthened, such as Health in School Program (*Programa Saúde na Escola*), with medical and nursing appointments, so as to facilitate dialogue between professionals and teenagers and their access to health actions<sup>(11-12)</sup>.

Broader programs, which promote healthy adolescence and safe sexuality, should reach not only teenagers, but also involve parents, teachers, religious leaders and other community members, so as to provide a safe environment with support for boys and girls at home, school and other places they frequent, aimed at reducing the condition of teenager vulnerability<sup>(12-16)</sup>. Policies involving teenage mothers also need to be implemented, such as income generation and educational incentives for mothers who dropped school early<sup>(11)</sup>.

Some factors which generate risk to the binomial are presented as associated to teenage pregnancy. The data reveal variables associated to increased odds ratio when the three-year series are compared. Such variables regarding the mothers were: not having a partner and less than eight years of schooling. Other studies have also shown a significant association between low schooling and abandoning school due to teenage pregnancy<sup>(17)</sup>. However, in this study, according to the analysis of trend models in the proportion of pregnant adolescents, the variables without partner and less than eight years of schooling present a decline trend during the period for the studied municipality.

Concerning the characteristics of pregnancy and birth, number of prenatal appointments smaller than seven, gestational age smaller than 37 weeks and caesarean section birth were important to identify teenage pregnancy in the first series of three years, but with decreased odds ratio observed for the last three-year period, which may suggest an improvement in assistance to pregnant mothers.

For prenatal appointments, there is evidence that the proper implementation of this kind of assistance is one of the main determinants for a satisfactory pregnancy evolution for it enables the identification of risk situations and the conduction of early and efficient intervention. Inappropriate adolescent prenatal care may initiate a cycle of negative impacts, considering that in this group pregnancy is more frequent for young females of less favored social groups, who generally receive no support from their family, their partner or society<sup>(7)</sup>.

Concerning premature birth (pregnancy shorter than 37 weeks), other than its association to teenage pregnancy, the trend analysis of proportion of pregnant adolescents also revealed a growing trend, a fact which corroborates other studies<sup>(5-6,18-19)</sup>.

Authors describe the relation between low purchasing power and type of birth. There is a high rate of caesarean section births among pregnant teenagers. The facts presented in the literature as related to caesarean section are: schooling matching chronological age; higher

economic status; considering it a safer means of birth; birth financed by the private sector; same professional assisting prenatal; and birth presenting clinical antecedents of risk and complications during pregnancy<sup>(7)</sup>. In the present study, a decrease in the odds ratio of caesarean sections from the first to the last three-year period may be considered a positive factor, but may also indicate a rise in pregnancy for teenagers with smaller income, whose need to use the public health system stimulate them to normal birth<sup>(7)</sup>.

In this research, there was no significant association between teenage pregnancy and low birth weight, diverging from results found in the literature, which show a strong association to low weight or insufficient weight newborns<sup>(6,18,20)</sup>.

Also, Apgar below seven in the first minute was associated to teenage pregnancy and presented a reduction in the odds ratio from the first to the last studied three-year period. However, the study presented a decreasing trend for Apgar score above seven and growing for Apgar score below seven in the fifth minute, a fact that may be related to pregnancy conditions and teenage mother birth. Apgar score below seven in the first minute presented an oscillating trend between increasing and decreasing for teenage mother's newborns.

The data analysis provided knowledge on one side of the studied object and the multiplicity of factors which may be associated to teenage pregnancy. However, some limitations must be considered. One of them concerns possible annotation errors which may partially compromise the analysis of some variables. Another issue, which concerns research with secondary sources, is the impossibility of providing information on other characteristics of teenage pregnancy, such as the causes of pregnancy and the involved socioeconomic factors. Hence, this study's findings must be complemented with other sources to provide a broader picture of the phenomenon.

## CONCLUSION

The data analysis improved knowledge on factors associated to teenage pregnancy and its trends, suggesting risk situations which might derive from this event. Despite being a local study, it enabled gathering information which may be used to propose, fundament and/or improve health strategies for teenagers, teenage mothers and newborns.

In the studied municipality, some risk situations presented associations to teenage pregnancy. Thus, it is necessary to evaluate each region individually and verify whether, depending on certain characteristics, these pregnant women present risks or not.

Health professionals must be involved in preventive measures against teenage pregnancy, discussing their efficiency. It is important to listen to families and teenagers, getting closer to them and stimulating their reflections on their choices while encouraging respect for limits that foster the development of a safer sexuality.

**RESUMO**

**Objetivo:** Analisar a tendência e os fatores associados à gravidez na adolescência em um município do Paraná. **Método:** Estudo ecológico, realizado com os registros de nascimentos de bebês de mães adolescentes, nos anos de 2000 a 2015, constantes no Sistema de Informação sobre Nascimento. As proporções foram calculadas ano a ano para a análise de tendência da gravidez na adolescência. Para a análise dos fatores associados utilizando a razão de chances, foram escolhidos dois triênios. **Resultados:** Associaram-se à gravidez na adolescência as variáveis: estar sem companheiro; escolaridade menor que oito anos; primiparidade; idade gestacional menor que 37 semanas; cesárea; número de consultas menor que sete; e Apgar menor que sete no primeiro minuto. Observou-se tendência decrescente entre grávidas com companheiro; crescente de grávidas adolescentes com escolaridade maior que oito anos e para o parto prematuro; decrescente/crescente do parto normal; crescente para número de consultas de pré-natal; decrescente ao valor do Apgar no primeiro e quinto minuto; crescente de anomalias congênitas. **Conclusão:** A análise possibilitou o levantamento de informações que podem ser utilizadas para propor estratégias de prevenção da gravidez e assistência à mãe adolescente.

**DESCRITORES**

Gravidez na Adolescência; Saúde do Adolescente; Enfermagem Obstétrica; Enfermagem Materno-Infantil.

**RESUMEN**

**Objetivo:** Análisis de la tendencia y los factores asociados al embarazo adolescente en un municipio de Paraná. **Método:** Estudio ecológico realizado con los registros de nacimientos de bebés de madres adolescentes, en los años 2000 a 2015, en el Sistema de Información de Nacimientos (*Sistema de Informação de Nascimentos*). Las proporciones se calcularon año por año para el análisis de las tendencias del embarazo adolescente. Para el análisis de los factores asociados mediante el *odds ratio* se eligieron dos periodos trienales. **Resultados:** Las siguientes variables se asociaron con el embarazo adolescente: no tener pareja; escolaridad inferior a ocho años; primiparidad; edad gestacional inferior a 37 semanas; cesárea; número de consultas inferior a siete; y Apgar inferior a siete en el primer minuto. Se observó una tendencia decreciente entre las adolescentes embarazadas con pareja; creciente para adolescentes embarazadas con escolaridad superior a ocho años y para partos prematuros; decreciente/creciente para partos normales; creciente para consultas prenatales; decreciente para Apgar en el primer y quinto minuto; creciente para anomalías congénitas. **Conclusión:** El análisis permitió reunir información que puede utilizarse para proponer estrategias de prevención del embarazo y asistencia a la madre adolescente.

**DESCRIPTORES**

Embarazo en Adolescencia; Salud del Adolescente; Enfermería Obstétrica; Enfermería Materno-infantil.

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