

DIFFERENCES IN THE PREVALENCE OF RISK AND PROTECTIVE FACTORS FOR CHRONIC NON-COMMUNICABLE DISEASES AMONG ADULTS LIVING IN BRAZILIAN CAPITALS IN 2019: CROSS-SECTIONAL STUDY

DIFERENÇAS NA PREVALÊNCIA DOS FATORES DE RISCO E PROTEÇÃO PARA DOENÇAS CRÔNICAS NÃO TRANSMISSÍVEIS ENTRE ADULTOS RESIDENTES NAS CAPITAIS BRASILEIRAS EM 2019: ESTUDO TRANSVERSAL

DIFERENCIAS EN LA PREVALENCIA DE LOS FACTORES DE RIESGO Y PROTECCIÓN PARA ENFERMEDADES CRÓNICAS NO TRANSMISIBLES ENTRE ADULTOS QUE RESIDEN EN LAS CAPITALES BRASILEÑAS EN 2019: ESTUDIO TRANSVERSAL

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ABSTRACT

Objective: this study aimed to analyze the prevalence of risk and protective factors for Chronic Non-Communicable Diseases in the adult Brazilian population living in the capitals in 2019, focusing on differences in gender, age group, and schooling. **Methods:** a cross-sectional study was conducted using 2019 data from the Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel). Prevalence and prevalence ratios were estimated using the Poisson Regression model, with a significance level of 5%. **Results:** the study revealed that 9.8% of the participants were smokers, with a higher prevalence among men, especially in the 55-64 age group. Alcohol abuse was reported by 18.8% of respondents, with men having a prevalence 1.8 times higher than women. Regarding weight, 55.4% of the participants were classified as overweight, with a higher prevalence among men, morbid obesity, on the other hand, was 40% less prevalent in this group. Concerning food consumption, women reported a higher intake of fruit and vegetables than men who consumed more beans, soft drinks, and ultra-processed foods. Leisure-time physical activity was more frequent among men and young people. Poor self-rated health was reported by 4.8% of participants and was more common among women and the elderly. Hypertension was reported by 24.5% of respondents, with a lower prevalence among men, while diabetes had a prevalence of 7.4%, with no significant differences between the sexes. **Conclusion:** the study identified significant differences related to gender, age, and schooling in the distribution of diseases, risk and protective factors among adults in Brazilian capitals. **Keywords:** Risk Factors; Chronic Disease; Cross-Sectional Studies; Health Surveys; Prevalence; Brazil.

RESUMO

Objetivo: este estudo teve como objetivo analisar as prevalências dos fatores de risco e proteção para as Doenças Crônicas Não Transmissíveis na população adulta brasileira residente nas capitais em 2019, com foco nas diferenças de sexo, faixa etária e escolaridade. **Métodos:** foi conduzido um estudo transversal utilizando dados de 2019 do sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico (Vigitel). As prevalências e razões de prevalências foram estimadas ajustando-se pelo modelo de Regressão de Poisson, com um nível de significância adotado de 5%. **Resultados:** o estudo revelou que 9,8% dos participantes eram fumantes, com uma prevalência mais alta entre homens, especialmente na faixa etária de 55-64 anos. O consumo abusivo de álcool foi relatado por 18,8% dos entrevistados, sendo que os homens apresentaram prevalências 1,8 vezes superiores às das mulheres. Quanto ao peso, 55,4% dos participantes foram classificados como tendo excesso de peso, com prevalência mais alta entre os homens; a obesidade mórbida, por outro lado, foi 40% menos prevalente nesse grupo. Em relação ao consumo alimentar, as mulheres relataram maior ingestão de frutas e hortaliças, enquanto os homens consumiam mais feijão, refrigerantes e alimentos ultraprocessados. A atividade física no tempo livre foi mais frequente entre homens e jovens. Uma autoavaliação de saúde ruim foi relatada por 4,8% dos participantes, sendo mais comum entre mulheres e idosos. A hipertensão foi relatada por 24,5% dos entrevistados, apresentando menor prevalência entre os homens, enquanto a diabetes teve uma prevalência de 7,4%, sem diferenças significativas entre os sexos. **Conclusão:** o estudo identificou diferenças significativas relacionadas ao sexo, idade e escolaridade na distribuição de doenças, fatores de risco e de proteção entre adultos das capitais brasileiras.

Palavras-chave: Fatores de Risco; Doenças Crônicas não Transmissíveis; Estudos Transversais; Inquéritos Epidemiológicos; Prevalência; Brasil.

RESUMEN

Objetivo: este estudio tuvo como objetivo analizar las prevalencias de los factores de riesgo y protección para las Enfermedades Crónicas No Transmisibles en la población adulta brasileña residente en las capitales en 2019, centrándose en las diferencias de sexo, edad y escolaridad. **Métodos:** se llevó a cabo un estudio transversal utilizando datos de 2019 del sistema de Vigilancia de Factores de Riesgo y Protección para Enfermedades Crónicas a través de Encuesta Telefónica

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(Vigitel). Las prevalencias y razones de prevalencias se estimaron ajustando el modelo de Regresión de Poisson, con un nivel de significancia adoptado del 5%. **Resultados:** el estudio reveló que el 9,8% de los participantes eran fumadores, con una prevalencia más alta entre los hombres, especialmente en el grupo de 55 a 64 años. El consumo excesivo de alcohol fue reportado por el 18,8% de los encuestados, siendo que los hombres presentaron prevalencias 1,8 veces superiores a las de las mujeres. En cuanto al peso, el 55,4% de los participantes fueron clasificados como con sobrepeso, con una prevalencia más alta entre los hombres; por otro lado, la obesidad mórbida fue un 40% menos prevalente en este grupo. En relación al consumo alimentario, las mujeres reportaron un mayor consumo de frutas y verduras, mientras que los hombres consumían más frijoles, refrescos y alimentos ultraprocesados. La actividad física en el tiempo libre fue más frecuente entre los hombres y los jóvenes. El 4,8% de los participantes reportaron una autoevaluación de salud deficiente, siendo más común entre las mujeres y los ancianos. La hipertensión fue reportada por el 24,5% de los encuestados, presentando una menor prevalencia entre los hombres, mientras que la diabetes tuvo una prevalencia del 7,4%, sin diferencias significativas entre los sexos. **Conclusión:** el estudio identificó diferencias significativas relacionadas con el sexo, la edad y la escolaridad en la distribución de enfermedades, factores de riesgo y de protección entre los adultos brasileños.

Palabras clave: Factores de Riesgo; Enfermedad Crónica; Estudios Transversales; Encuestas Epidemiológicas; Prevalencia; Brasil.

INTRODUCTION

Chronic Non-Communicable Diseases (NCDs) are a globally recognized public health problem that generates socio-economic impacts on health systems, governments, families, and society⁽¹⁾. These diseases are a conjunction of health conditions resulting from the complex interaction between genetic, individual, and contextual factors^(1,2).

In 2019, it was estimated that 75.6% of all deaths in Brazil were caused by NCDs, with the four main groups standing out: cardiovascular diseases, diabetes, cancer, and chronic respiratory conditions⁽³⁾. Between 2006 and 2015, heart disease, stroke, and diabetes were responsible for a loss of US\$ 84 billion in an analysis covering 23 countries, including Brazil⁽⁴⁾.

The World Health Organization (WHO) points out that people with NCDs see their poverty condition worsened by the high family costs of the disease, including the search for health services and other associated costs⁽⁵⁾. It is, therefore, essential to prioritize investments in public policies promoting health and tackling inequalities to curb the spread of NCDs^(1,4).

Global and national commitments have been emphasized in the fight against NCDs, including the 2030 Agenda for Sustainable Development and the goal of reducing premature deaths caused by these diseases by a third, as well as monitoring risk and protective factors to support the control of these chronic conditions^(3,6-8). Thus, the systematic monitoring of NCDs and risk and protective factors is essential to understand the problems' distribution and magnitude and to identify the most vulnerable groups⁽²⁾. It is well documented that NCDs share similar risk and protective factors, which are part of the population's habits and lifestyles - mainly smoking, alcohol abuse, physical inactivity, and unhealthy eating⁽³⁾.

On the other hand, the COVID-19 pandemic has exacerbated social and economic inequalities, negatively impacting the fight against NCDs globally⁽⁹⁾. In Brazil, in addition to more than 700,000 deaths caused by the disease, the health crisis triggered by COVID-19 has contributed to a deterioration in lifestyles, including an increase in inadequate food consumption, physical inactivity, and the use of tobacco and alcohol⁽¹⁰⁻¹²⁾. Therefore, it is crucial to understand the pre-pandemic scenario concerning NCDs and their risk and protective factors to establish a basis for monitoring and evaluating prevention and health promotion policies in the post-pandemic context.

Thus, this study aimed to analyze the prevalence of risk and protective factors regarding NCDs among the adult population living in Brazilian capitals in 2019, seeking to investigate differences according to gender, age group, and schooling.

METHODS

Study Design

This cross-sectional study used data from the Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone Survey (Vigitel).

Context

Implemented by the Ministry of Health in 2006, Vigitel is a population-based survey carried out annually to monitor NCDs and their risk and protective factors. This survey covers adults (≥ 18 years old) living in households equipped with at least one fixed telephone line in the capital cities all over Brazil⁽¹³⁾. The data was collected by a specialized company, using a computer-assisted system to carry out the interviews, where the questionnaires were read out and the answers entered directly into electronic media. Field activities took place throughout 2019, covering January to December.

Approximately 2,000 interviews were carried out per capital city, reaching 52,443 interviews. There was a refusal rate of 2% of eligible lines, and 1,165,725 calls were made. The average duration of the interviews in 2019 was around 12 minutes, with variations between 4 and 58 minutes. Further information on the interview process is detailed in another publication⁽¹³⁾.

Variables

The questionnaire covered demographic and socioeconomic aspects; eating habits and physical activity practices; reported weight and height; consumption of cigarettes and alcoholic beverages; incidences of hypertension

and diabetes, and self-assessment of health status, among other topics.

The indicators analyzed for risk and protective factors against NCDs included:

a) Tobacco use:

- Active smokers (individuals who identify themselves as smokers, regardless of the number of cigarettes consumed);
- Active smokers (individuals who identify themselves as smokers, regardless of the number of cigarettes consumed);
- Passive smokers in the workplace (non-smokers who report that there is at least one person who smokes in their workplace).

b) Alcohol consumption:

- Alcohol abuse (defined as the consumption of five or more doses for men and four or more doses for women on a single occasion);
- Driving motor vehicles after drinking any amount of alcohol.

c) Body Mass Index (BMI):

- Mild Overweight (BMI ≥ 25 kg/m²);
- Overweight (BMI ≥ 25 e < 30 kg/m²);
- Obesity (IMC ≥ 30 kg/m²);
- Morbidly Obesity (≥ 40 kg/m²).

d) Food consumption:

- Regular consumption of fruit and vegetables (FV) (five or more days a week);
- Recommended intake of FV (five or more times a day, on five or more days of the week);
- Regular consumption of beans (five or more days a week);
- Regular consumption of soft drinks (consumption of soft drinks or artificial juice on five or more days a week);
- Consumption of ≥ 5 protective non-processed or minimally processed food groups, including lettuce, cabbage, broccoli, watercress or spinach; pumpkin, carrot, sweet potato or okra/caruru; papaya, mango, yellow melon or pequi; tomato, cucumber, zucchini, eggplant, chayote or beet; orange, banana, apple or pineapple;

beans, peas, lentils or chickpeas; peanuts, cashew nuts or Brazil nuts;

- Consumption of ≥ 5 ultra-processed food groups, which include: soda; boxed, carton or canned fruit juice; powdered soft drink; chocolate drink; flavored yogurt; packaged snack (or chips) or salty biscuit/cracker; sweet biscuit/cracker, stuffed cookie or packaged cookie; chocolate, ice cream, gelatin, flan or other industrialized dessert; Sausage, sausage, mortadella or ham; buns, hot dog buns or hamburger buns; mayonnaise, ketchup or mustard; margarine; instant noodles, packet soup, frozen lasagna or other frozen ready meals.

e) Physical Activity (PA):

- Practice the recommended level of leisure-time physical activity (LTPA), consisting of 150 minutes per week of moderate-intensity PA or 75 minutes per week of vigorous-intensity PA, regardless of weekly frequency;
- PA during commuting (going to work or school by bike or on foot, totaling at least 150 minutes per week on the total route);
- Insufficient PA (less than 150 minutes per week of moderate-intensity activity or less than 75 minutes per week of vigorous-intensity physical activity, including LTPA, commuting, and occupational activity);
- Physically inactive (percentage of adults who have not done any leisure-time physical activity in the last three months, who do not make intense physical efforts at work, who do not commute to work or school on foot or by bicycle, and who are not responsible for the heavy cleaning of their own homes);
- The habit of watching television for three or more hours daily.

f) Self-assessment of health:

- Percentage of adults who self-rated their health negatively;

g) Reported morbidity:

- Percentage of adults who reported a medical diagnosis of hypertension;
- Percentage of adults who reported a medical diagnosis of diabetes

Further details on the questionnaire, including the definitions and questions used to build the indicators, can be found in the Vigitel report⁽¹³⁾.

Data Processing and Analysis

Prevalence rates were presented as proportions (%) together with their respective 95% confidence intervals (95%CI), stratified by sex (male and female), age group (18-24, 25-34, 35-44, 45-54, 55-64 and 65 years or more) and level of education (0-8, 9-11 and 12 years or more of study). The prevalence ratios (PR) adjusted for age, education level, or both were then estimated using the Poisson Regression model with robust variance, with the last category considered as the reference.

All the analyses included weighting factors, considering the uneven probability that individuals living in households with a higher number of telephone lines, or a lower number of residents had of participating in the sample. Applying these weighting factors adjustments corrects any possible overestimates or underestimates of the Vigitel sample, resulting from inconsistent landline coverage in Brazil, employing a post-stratification procedure.

The data was processed and analyzed using R software, regarding the post-stratification weights. Significant differences were considered when the p-value was less than or equal to 0.05.

Ethical aspects

Informed consent was obtained verbally during telephone contact with the participants. Vigitel was approved by the Ministry of Health's National Human Research Ethics Committee.

RESULTS

In 2019, Vigitel interviewed 52,443 adults living in the country's capitals and the Federal District, with 34,089 (65.02%) women and 18,354 (34.98%) men taking part in the survey.

The prevalence of smoking was 9.8% (95% CI: 9.2; 10.5), with 2.3% (95% CI: 2.0; 2.6) reporting high tobacco consumption. As for passive smoking, 6.8% (95% CI: 6.3; 7.3) reported it in their homes, and 6.6% (95% CI: 6.0; 7.1) in the workplace (Table 1). Compared by gender, men had higher prevalence rates than women, except for passive smoking at home, where there was no significant difference between the sexes. There was a progressive increase in smoking prevalence with age, with the highest PR in the 55 to 64 age group (PR: 1.9; 95% CI: 1.6; 2.3). The highest smoking prevalence of 20 or more cigarettes a day was also found in this age group (PR: 1.8; 95%CI: 1.3; 2.6), with no significant differences in the other groups. Passive smoking at home was more common among individuals aged 18 to 24 (PR: 2.2; 95% CI: 1.7; 2.7) but was

also high among adults aged 25 to 54, as well as in the workplace in all age groups (Table 2). All smoking indicators were more prevalent among individuals with 0 to 8 years of schooling, followed by those with 9 to 11 years of schooling, with passive smoking at home being more prevalent among the latter (Table 3).

Concerning alcohol consumption, 18.8% (95% CI: 18.0; 19.6) reported heavy drinking, and 5.6% (95%CI: 5.1; 6.0) admitted to driving motor vehicles after drinking. The prevalence of alcohol abuse and driving a vehicle after drinking alcohol was 1.8 and 4.7 times higher among men, respectively (Table 1). Regarding the age group of 65 years or more as a reference, all the younger age groups had higher prevalence rates of alcohol consumption, especially abusive consumption among individuals aged 18 to 24 (PR: 5.8; 95% CI: 4.8; 6.9) and 25 to 34 (PR: 5.8; 95% CI: 4.9; 6.9), as well as driving after drinking in the latter age group (PR: 2.8; 95% CI: 2.1; 3.7) (Table 2). The prevalence of alcohol consumption indicators increased according to the level of education, being higher among those with 12 years or more of schooling (Table 3).

About BMI indicators, the prevalence of mild overweight was 55.4% (95% CI: 54.4; 56.3), overweight was 35.1% (95% CI: 34.2; 36.0), obesity was 20.3% (95% CI: 19.5; 21.0), and morbid obesity was 1.8% (95% CI: 1.5; 2.0). Mild overweight and overweight were more prevalent among men, while the prevalence of obesity showed no significant difference by gender. However, morbid obesity was lower among men (Table 1). BMI tended to increase with age, with the highest prevalence of mild overweight being identified among individuals aged 45 to 64 (Table 2). Individuals with a lower level of schooling had the highest prevalence of high BMI, significantly for obesity among those with 0 to 8 years of schooling (PR: 1.2; 95% CI: 1.1; 1.4) and for morbid obesity (PR: 2.1; 95% CI: 1.5; 3.1) and 9 to 11 years of schooling (PR: 1.7; 95% CI: 1.2; 2.5) (Table 3).

Now regarding food consumption indicators, it was found that women reported a higher prevalence of regular fruit and vegetable consumption (FV) (39.8%; 95% CI: 38.7; 40.9), being 30% higher than men. They also had a higher prevalence of recommended fruit and vegetable consumption, around 30% more than men, and 10% more consumption of foods considered healthy and protective. On the other hand, among men, there was a higher prevalence of consumption of beans (PR: 1.2; 95% CI: 1.2; 1.3), soft drinks (PR: 1.4; 95% CI: 1.2; 1.5), and ultra-processed foods (PR: 1.3; 95% CI: 1.2; 1.3) (Table 1). The prevalence of healthy consumption indicators, such

as regular and recommended consumption of FV and non-processed or minimally processed foods, increased with age, except for regular consumption of beans. On the other hand, risk indicators, such as the consumption of soft drinks and ultra-processed foods, were higher among individuals aged 18-24 and decreased with age. Individuals with less schooling had a lower prevalence of regular FV consumption, a lower prevalence of recommended FV consumption, and a lower prevalence of consumption of protective or minimally processed foods. On the other hand, they had a higher prevalence of consumption of ultra-processed foods and soft drinks. However, there was a higher prevalence of regular bean consumption among these individuals (Table 3).

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DISCUSSION

The findings highlight that risk factors for NCDs - especially smoking, alcohol consumption, and consumption of ultra-processed foods - were more prevalent in men and individuals with less schooling and increased with age. On the other hand, protective factors, such as fruit and vegetable consumption, were more prevalent among women, the elderly, and individuals with a higher schooling level. The practice of LTPA was more frequent among men, individuals with a high level of schooling, and young people. Self-reported hypertension and diabetes increased with age and were more common among individuals with low education levels.

Obesity also increased with age and was more frequent in the population with low education levels. A study by Malta and colleagues, which analyzed data from Vigitel

Table 1. Prevalence and prevalence ratio, adjusted for age and schooling, of risk and protective factors for chronic diseases in the adult population living in Brazilian state capitals and the Federal District, according to sex. Vigitel, 2019.

Indicators	Total	Masculine	Feminine	PR (CI95%) M/F
	% (CI95%)	% (CI95%)	% (CI95%)	
Tobacco use				
Smokers	9.8 (9.2; 10.5)	12.3 (11.2; 13.5)	7.7 (7.1; 8.4)	1.6 (1.4; 1.8)
Smokers who consume ≥ 20 cigarettes a day	2.3 (2.0; 2.6)	3.2 (2.6; 3.8)	1.5 (1.2; 1.8)	2.2 (1.7; 2.9)
Passive smokers at home	6.8 (6.3; 7.3)	6.6 (5.8; 7.3)	7.0 (6.3; 7.7)	0.9 (0.8; 1.0)
Passive smokers at work	6.6 (6.0; 7.1)	10.0 (9.0; 11.0)	3.7 (3.2; 4.1)	2.6 (2.2; 3.1)
Alcohol consumption				
Abuse of alcoholic beverages	18.8 (18.0; 19.6)	25.3 (24.0; 26.7)	13.3 (12.4; 14.2)	1.8 (1.7; 2.0)
Drinking and driving motor vehicles	5.6 (5.1; 6.0)	9.7 (8.8; 10.6)	2.1 (1.8; 2.4)	4.7 (4.0; 5.5)
Body mass index				
Mild overweight *	55.4 (54.4; 56.3)	57.1 (55.6; 58.7)	53.9 (52.7; 55.0)	1.1 (1.1; 1.1)
Overweight*	35.1 (34.2; 36.0)	37.7 (36.2; 39.2)	32.9 (31.8; 34.0)	1.2 (1.1; 1.2)
Obesity*	20.3 (19.5; 21.0)	19.5 (18.3; 20.6)	21.0 (20.0; 21.9)	1.0 (0.9; 1.0)
Morbid Obesity*	1.8 (1.5; 2.0)	1.3 (1.0; 1.6)	2.2 (1.8; 2.5)	0.6 (0.5; 0.8)

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Indicators	Total	Masculine	Feminine	PR (CI95%) M/F
	% (CI95%)	% (CI95%)	% (CI95%)	
Food consumption				
Regular fruit and vegetables	34.3 (33.4; 35.2)	27.9 (26.5; 29.3)	39.8 (38.7; 40.9)	0.7 (0.7; 0.8)
Recommended fruit and vegetables	22.9 (22.1; 23.7)	18.4 (17.2; 19.5)	26.8 (25.7; 27.8)	0.7 (0.7; 0.8)
Regular beans	59.7 (5.8; 60.6)	66.5 (65.1; 67.9)	53.9 (52.8; 55.1)	1.2 (1.2; 1.3)
Regular softdrinks	15.0 (14.3; 15.8)	18.3 (16.9; 19.6)	12.3 (11.4; 13.2)	1.4 (1.2; 1.5)
Consumption of ≥ 5 groups of non-processed or minimally processed protective foods	29.8 (28.9; 30.6)	26.9 (25.6; 28.2)	32.3 (31.2; 33.3)	0.9 (0.8; 0.9)
Consumption of ≥ 5 ultra-processed food groups	18.2 (17.4; 19.0)	21.8 (20.5; 23.2)	15.1 (14.2; 16.1)	1.3 (1.2; 1.4)
Physical activity				
Practicing the recommended LTPA level	39.0 (38.0; 39.9)	46.7 (45.2; 48.3)	32.4 (31.3; 33.5)	1.4 (1.4; 1.5)
Physical activity on the move	14.1 (13.4; 14.9)	14.5 (13.4; 15.7)	13.8 (12.9; 14.7)	1.0 (0.9; 1.1)
Insufficient physical activity	44.8 (43.9; 45.7)	36.1 (34.7; 37.6)	52.2 (51.0; 53.4)	0.7 (0.7; 0.7)
Physically inactive	13.9 (13.3; 14.5)	13.8 (12.8; 14.9)	14.0 (13.2; 14.7)	1.0 (1.0; 1.1)
Watching television for three or more hours a day	22.9 (22.2; 23.7)	22.0 (20.7; 23.3)	23.8 (22.8; 24.7)	1.0 (0.9; 1.0)
Self-rated health				
Negative self-rated health	4.8 (4.4; 5.2)	3.4 (2.9; 3.9)	6.0 (5.4; 6.6)	0.6 (0.5; 0.7)
Reported morbidity				
Medical diagnosis of hypertension	24.5 (23.8; 25.3)	21.2 (20.0; 22.4)	27.3 (26.4; 28.3)	0.9 (0.8; 0.9)
Medical diagnosis of diabetes	7.4 (7.0; 7.9)	7.1 (6.4; 7.8)	7.8 (7.3; 8.3)	1.1 (1.0; 1.2)

Note: the use of bold type indicates a p-value < 0.05; 95%CI: 95% Confidence Interval, Ref: Reference. *Data imputation

Table 2. Prevalence and prevalence ratio, adjusted for schooling, of risk and protective factors for chronic diseases in the adult population living in Brazilian state capitals and the Federal District, according to age group. Vigitel, 2019.

Indicators	18 - 24 years	25 - 34 years		35 - 44 years	
	% (CI95%)	PR (CI95%)	% (CI95%)	PR (CI95%)	% (CI95%)
Tabbaco use					
Smokers	7.9 (6.2; 9.7)	1.4 (1.1; 1.8)	9.2 (7.7; 10.8)	1.7 (1.3; 2.1)	9.7 (8.3; 11.1)
Smokers who consume ≥ 20 cigarettes a day	1.1 (0.5; 1.8)	0.6 (0.3; 1.2)	1.8 (0.9; 2.6)	1.0 (0.5; 1.9)	1.6 (1.1; 2.1)
Passive smokers at home	10.0 (8.4; 11.6)	2.2 (1.7; 2.7)	8.1 (6.8; 9.4)	1.8 (1.4; 2.2)	5.9 (4.8; 6.9)
Passive smokers at work	6.2 (4.8; 7.6)	3.6 (2.6; 5.1)	7.0 (5.6; 8.4)	4.2 (3.0; 5.8)	8.0 (6.8; 9.2)
Alcohol consumption					
Abuse of alcoholic beverages	25.8 (23.4; 28.3)	5.8 (4.8; 6.9)	26.3 (24.0; 28.5)	5.8 (4.9; 6.9)	20.9 (19.2; 22.6)
Drinking and driving motor vehicles	4.4 (3.4; 5.3)	1.6 (1.2; 2.2)	8.0 (6.7; 9.3)	2.8 (2.1; 3.7)	7.1 (6.1; 8.0)

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Table 2. Prevalence and prevalence ratio, adjusted for schooling, of risk and protective factors for chronic diseases in the adult population living in Brazilian state capitals and the Federal District, according to age group. Vigitel, 2019.

Indicators	18 - 24 years	25 - 34 years		35 - 44 years		
	% (CI95%)	PR (CI95%)	% (CI95%)	PR (CI95%)	% (CI95%)	PR (CI95%)
Body mass index						
Mild overweight *	30.1 (27.7; 32.4)	0.5 (0.5; 0.6)	53.1 (50.6; 55.6)	0.9 (0.9; 1.0)	61.0 (58.9; 63.0)	1.0 (1.0; 1.1)
Overweight*	21.4 (19.3; 23.5)	0.5 (0.5; 0.6)	33.8 (31.4; 36.1)	0.8 (0.8; 0.9)	38.2 (36.2; 40.2)	1.0 (0.9; 1.0)
Obesity*	8.7 (7.3; 10.0)	0.5 (0.4; 0.5)	19.3 (17.4; 21.3)	1.0 (0.9; 1.2)	22.8 (21.0; 24.5)	1.2 (1.1; 1.3)
Morbid Obesity*	0.5 (0.3; 0.7)	0.4 (0.2; 0.6)	1.8 (1.2; 2.4)	1.3 (0.8; 2.1)	2.2 (1.5; 2.8)	1.5 (1.0; 2.1)
Food consumption						
Regular fruit and vegetables	26.3 (24.0; 28.5)	0.5 (0.4; 0.5)	31.4 (29.2; 33.7)	0.6 (0.5; 0.6)	32.7 (30.7; 34.6)	0.6 (0.6; 0.7)
Recommended fruit and vegetables	19.0 (17.0; 20.9)	0.6 (0.5; 0.6)	21.5 (19.5; 23.5)	0.6 (0.5; 0.7)	22.1 (20.5; 23.8)	0.7 (0.6; 0.7)
Regular beans	61.2 (58.8; 63.7)	1.2 (1.1; 1.3)	58.2 (55.8; 60.6)	1.2 (1.1; 1.2)	58.5 (56.5; 60.6)	1.1 (1.1; 1.2)
Regular softdrinks	22.4 (20.0; 24.7)	3.1 (2.6; 3.6)	19.3 (17.1; 21.5)	2.7 (2.3; 3.2)	15.8 (14.2; 17.5)	2.1 (1.8; 2.5)
Consumption of ≥ 5 groups of non-processed or minimally processed protective foods	22.9 (20.7; 25.1)	0.6 (0.5; 0.6)	26.9 (24.7; 29.0)	0.6 (0.6; 0.7)	30.2 (28.4; 32.0)	0.8 (0.7; 0.8)
Consumption of ≥ 5 ultra-processed food groups	29.3 (26.9; 31.6)	4.1 (3.5; 4.7)	23.6 (21.5; 25.7)	3.3 (2.8; 3.9)	19.1 (17.4; 20.9)	2.6 (2.2; 3.0)
Physical activity						
Practicing the recommended LTPA level	49.4 (46.8; 52.0)	1.7 (1.5; 1.8)	48.5 (46.0; 51.0)	1.6 (1.5; 1.7)	36.8 (34.9; 3.8)	1.3 (1.2; 1.4)
Physical activity on the move	16.7 (14.5; 18.8)	4.0 (3.3; 4.9)	14.4 (12.6; 16.2)	3.5 (2.9; 4.3)	16.6 (14.9; 18.2)	3.9 (3.2; 4.7)
Insufficient physical activity	36.5 (34.0; 39.0)	0.6 (0.5; 0.6)	36.8 (34.4; 39.1)	0.6 (0.5; 0.6)	42.2 (40.2; 44.3)	0.6 (0.6; 0.7)
Physically inactive	12.9 (11.2; 14.5)	0.4 (0.4; 0.5)	10.8 (9.3; 12.3)	0.4 (0.3; 0.4)	10.9 (9.4; 12.3)	0.4 (0.3; 0.4)
Watching television for three or more hours a day	15.5 (13.6; 17.3)	0.5 (0.5; 0.6)	20.3 (18.2; 22.3)	0.7 (0.6; 0.8)	21.4 (19.6; 23.1)	0.7 (0.6; 0.8)
Self-rated health						
Negative self-rated health	3.8 (2.7; 5.0)	0.7 (0.5; 1.0)	4.3 (3.3; 5.3)	0.8 (0.6; 1.1)	4.0 (3.2; 4.8)	0.7 (0.6; 0.9)
Reported morbidity						
Medical diagnosis of hypertension	4.1 (3.0; 5.1)	0.1 (0.1; 0.1)	9.8 (8.2; 11.4)	0.2 (0.2; 0.2)	17.0 (15.4; 18.6)	0.3 (0.3; 0.4)
Medical diagnosis of diabetes	0.7 (0.4; 1.1)	0.0 (0.0; 0.1)	1.9 (1.1; 2.6)	0.1 (0.1; 0.2)	3.6 (2.8; 4.4)	0.2 (0.1; 0.2)
Indicators	45 - 54 years	55 - 64 years		65 years or over		
	% (CI95%)	PR (CI95%)	% (CI95%)	PR (CI95%)	% (CI95%)	PR (CI95%)
Tabbaco use						
Smokers	10.9 (9.4; 12.3)	1.6 (1.3; 1.9)	13.6 (12.0; 15.2)	1.9 (1.6; 2.3)	7.8 (6.8; 8.8)	Ref. Continua...

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Table 2. Prevalence and prevalence ratio, adjusted for schooling, of risk and protective factors for chronic diseases in the adult population living in Brazilian state capitals and the Federal District, according to age group. Vigitel, 2019.

Indicators	45 - 54 years	55 - 64 years			65 years or over	
	% (CI95%)	PR (CI95%)	% (CI95%)	PR (CI95%)	% (CI95%)	PR (CI95%)
Tobacco use						
Smokers who consume ≥ 20 cigarettes a day	3.0 (2.2; 3.8)	1.4 (0.9; 2.0)	4.3 (3.2; 5.3)	1.8 (1.3; 2.6)	2.6 (1.9; 3.2)	Ref.
Passive smokers at home	6.3 (5.2; 7.5)	1.4 (1.1; 1.7)	4.8 (3.9; 5.7)	1.0 (0.8; 1.3)	4.7 (4.1; 5.4)	Ref.
Passive smokers at work	8.3 (7.0; 9.7)	4.2 (3.1; 5.7)	5.4 (4.4; 6.4)	2.6 (1.9; 3.5)	2.2 (1.7; 2.8)	Ref.
Alcohol consumption						
Abuse of alcoholic beverages	15.8 (14.3; 17.2)	3.7 (3.1; 4.4)	11.2 (10.0; 12.4)	2.7 (2.2; 3.2)	4.1 (3.5; 4.7)	Ref.
Drinking and driving motor vehicles	5.0 (4.1; 5.8)	2.1 (1.6; 2.8)	4.1 (3.2; 4.9)	1.9 (1.4; 2.5)	1.9 (1.5; 2.3)	Ref.
Body mass index						
Mild overweight *	63.7 (61.7; 65.7)	1.1 (1.0; 1.1)	63.1 (61.1; 65.0)	1.1 (1.0; 1.1)	59.8 (58.3; 61.3)	Ref.
Overweight*	39.2 (37.1; 41.2)	1.0 (0.9; 1.1)	38.7 (36.8; 40.6)	1.0 (0.9; 1.1)	38.8 (37.3; 40.4)	Ref.
Obesity*	24.5 (22.8; 26.3)	1.2 (1.1; 1.4)	24.3 (22.7; 26.0)	1.2 (1.1; 1.3)	20.9 (19.7; 22.2)	Ref.
Morbid Obesity*	2.0 (1.5; 2.6)	1.2 (0.9; 1.8)	2.0 (1.5; 2.5)	1.2 (0.8; 1.6)	1.9 (1.5; 2.4)	Ref.
Food consumption						
Regular fruit and vegetables	35.7 (33.7; 37.6)	0.7 (0.7; 0.8)	40.1 (38.2; 42.0)	0.8 (0.8; 0.9)	44.2 (42.7; 45.8)	Ref.
Recommended fruit and vegetables	23.9 (22.2; 25.6)	0.8 (0.7; 0.9)	26.3 (24.6; 27.9)	0.9 (0.8; 1.0)	26.6 (25.2; 28.0)	Ref.
Regular beans	61.4 (59.5; 63.4)	1.1 (1.1; 1.2)	61.3 (59.4; 63.1)	1.1 (1.0; 1.1)	58.7 (57.2; 60.2)	Ref.
Regular softdrinks	10.9 (9.4; 12.3)	1.4 (1.2; 1.7)	9.6 (8.2; 11.0)	1.2 (1.0; 1.4)	8.4 (7.4; 9.4)	Ref.
Consumption of ≥ 5 groups of non-processed or minimally processed protective foods	33.1 (31.2; 35.0)	0.9 (0.8; 1.0)	34.9 (33.1; 36.7)	1.0 (0.9; 1.1)	32.6 (31.2; 34.0)	Ref.
Consumption of ≥ 5 ultra-processed food groups	13.9 (12.3; 15.5)	1.8 (1.6; 2.2)	9.8 (8.4; 11.1)	1.3 (1.1; 1.5)	8.0 (7.1; 8.9)	Ref.
Physical activity						
Practicing the recommended LTPA level	34.6 (32.7; 36.6)	1.3 (1.2; 1.4)	31.5 (29.7; 33.3)	1.2 (1.1; 1.3)	24.4 (23.1; 25.6)	Ref.
Physical activity on the move	17.2 (15.6; 18.8)	3.8 (3.2; 4.5)	11.4 (10.2; 12.7)	2.5 (2.1; 3.0)	4.8 (4.2; 5.5)	Ref.
Insufficient physical activity	44.2 (42.1; 46.3)	0.7 (0.6; 0.7)	52.3 (50.3; 54.3)	0.8 (0.7; 0.8)	69.1 (67.1; 70.6)	Ref.
Physically inactive	10.4 (9.1; 11.7)	0.3 (0.3; 0.4)	14.6 (13.2; 15.9)	0.5 (0.4; 0.5)	31.8 (30.3; 33.2)	Ref.
Watching television for three or more hours a day	23.4 (21.7; 25.2)	0.7 (0.7; 0.8)	28.1 (26.3; 29.8)	0.9 (0.8; 0.9)	33.8 (32.3; 35.3)	Ref.
Self-rated health						
Negative self-rated health	4.6 (3.7; 5.4)	0.7 (0.6; 0.9)	5.9 (5.0; 6.9)	0.9 (0.7; 1.1)	7.5 (6.7; 8.3)	Ref.
Reported morbidity						
Medical diagnosis of hypertension	31.6 (29.6; 33.5)	0.6 (0.5; 0.6)	45.2 (43.3; 47.2)	0.8 (0.8; 0.8)	59.3 (57.7; 60.8)	Ref.
Medical diagnosis of diabetes	7.4 (6.4; 8.5)	0.4 (0.3; 0.4)	17.3 (15.7; 18.8)	0.8 (0.7; 0.9)	23.0 (21.7; 24.3)	Ref.

Note: the use of bold type indicates a p-value < 0.05; 95%CI: 95% Confidence Interval, Ref: Reference. *Data imputation

Table 3. Prevalence and prevalence ratio, adjusted for age, of risk and protective factors for chronic diseases in the adult population living in Brazilian state capitals and the Federal District, according to schooling. Vigitel, 2019.

Indicators	0 - 8 years of schooling	9 - 11 years of schooling				12 years or over of schooling	
	% (CI95%)	PR (CI95%)	% (CI95%)	PR (CI95%)	% (CI95%)	PR (CI95%)	
Tobacco use							
Smokers	13.8 (12.4; 15.2)	2.1 (1.8; 2.6)	9.5 (8.5; 10.5)	1.4 (1.2; 1.7)	6.7 (5.9; 7.6)		Ref.
Smokers who consume ≥ 20 cigarettes a day	3.6 (2.8; 4.4)	2.3 (1.5; 3.5)	2.1 (1.6; 2.7)	1.6 (1.2; 2.3)	1.3 (1.0; 1.6)		Ref.
Passive smokers at home	5.4 (4.6; 6.1)	1.0 (0.9; 1.3)	8.3 (7.4; 9.2)	1.3 (1.1; 1.6)	6.3 (5.5; 7.2)		Ref.
Passive smokers at work	7.4 (6.3; 8.4)	1.9 (1.5; 2.4)	7.4 (6.5; 8.3)	1.6 (1.3; 1.9)	4.8 (4.0; 5.7)		Ref.
Alcohol consumption							
Abuse of alcoholic beverages	12.4 (11.1; 13.7)	0.8 (0.7; 0.9)	20.0 (18.7; 21.3)	0.9 (0.8; 1.0)	23.1 (21.6; 24.6)		Ref.
Drinking and driving motor vehicles	2.9 (2.2; 3.6)	0.4 (0.3; 0.5)	4.8 (4.1; 5.4)	0.5 (0.5; 0.6)	8.9 (8.0; 9.8)		Ref.
Body mass index							
Mild overweight *	61.0 (59.2; 62.8)	1.0 (1.0; 1.1)	53.8 (52.3; 55.3)	1.0 (1.0; 1.1)	52.2 (50.6; 53.9)		Ref.
Overweight*	36.8 (35.0; 38.5)	0.9 (0.9; 1.0)	33.9 (32.5; 35.3)	1.0 (0.9; 1.0)	35.0 (33.5; 36.6)		Ref.
Obesity*	24.2 (22.8; 25.7)	1.2 (1.1; 1.4)	19.9 (18.7; 21.1)	1.1 (1.0; 1.3)	17.2 (15.9; 18.5)		Ref.
Morbid Obesity*	2.5 (2.0; 3.0)	2.1 (1.5; 3.1)	1.8 (1.4; 2.3)	1.7 (1.2; 2.5)	1.1 (0.7; 1.4)		Ref.
Food consumption							
Regular fruit and vegetables	30.8 (29.2; 32.4)	0.6 (0.5; 0.6)	29.9 (28.6; 31.3)	0.7 (0.7; 0.7)	42.5 (40.9; 44.1)		Ref.
Recommended fruit and vegetables	19.0 (17.7; 20.4)	0.5 (0.5; 0.6)	20.2 (19.1; 21.3)	0.7 (0.6; 0.7)	29.5 (28.0; 31.0)		Ref.
Regular beans	66.6 (64.9; 68.3)	1.4 (1.3; 1.5)	63.4 (62.0; 64.8)	1.3 (1.2; 1.3)	49.4 (47.7; 51.0)		Ref.
Regular softdrinks	13.5 (12.0; 15.0)	1.4 (1.2; 1.6)	17.3 (16.0; 18.6)	1.3 (1.1; 1.4)	13.8 (12.5; 15.1)		Ref.
Consumption of ≥ 5 groups of non-processed or minimally processed protective foods	24.2 (22.7; 25.7)	0.5 (0.5; 0.6)	28.0 (26.7; 29.3)	0.8 (0.7; 0.8)	36.7 (35.1; 38.2)		Ref.
Consumption of ≥ 5 ultra-processed food groups	14.7 (13.2; 16.2)	1.3 (1.1; 1.4)	21.7 (20.3; 23.0)	1.3 (1.1; 1.4)	17.3 (15.9; 18.6)		Ref.
Physical activity							
Practicing the recommended LTPA level	25.8 (24.1; 27.4)	0.6 (0.5; 0.6)	39.5 (38.0; 41.0)	0.8 (0.8; 0.8)	50.0 (48.3; 51.6)		Ref.
Physical activity on the move	14.3 (12.9; 15.7)	1.5 (1.2; 1.7)	15.7 (14.5; 16.8)	1.3 (1.1; 1.5)	12.2 (11.0; 13.5)		Ref.
Insufficient physical activity	53.7 (51.9; 55.6)	1.2 (1.1; 1.2)	43.4 (41.9; 44.9)	1.1 (1.1; 1.2)	38.6 (37.1; 40.2)		Ref.
Physically inactive	18.0 (16.8; 19.3)	1.2 (1.1; 1.3)	12.7 (11.7; 13.7)	1.1 (1.0; 1.2)	11.7 (10.7; 12.7)		Ref.
Watching television for three or more hours a day	27.7 (26.2; 29.3)	1.4 (1.3; 1.6)	24.9 (23.6; 26.3)	1.5 (1.4; 1.6)	16.4 (15.2; 17.5)		Ref.
Self-rated health							
Negative self-rated health	7.3 (6.5; 8.1)	2.4 (1.9; 3.0)	4.7 (4.0; 5.3)	1.6 (1.3; 2.1)	2.8 (2.3; 3.3)		Ref.
Reported morbidity							
Medical diagnosis of hypertension	41.5 (39.8; 43.2)	1.6 (1.4; 1.7)	20.5 (19.4; 21.6)	1.4 (1.3; 1.5)	14.3 (13.4; 15.3)		Ref.
Medical diagnosis of diabetes	14.8 (13.6; 15.9)	1.9 (1.6; 2.3)	5.4 (4.9; 5.9)	1.5 (1.2; 1.7)	3.5 (3.0; 3.9)		Ref.

Note: the use of bold type indicates a p-value < 0.05; 95%CI: 95% Confidence Interval, Ref: Reference. *Data imputation

in 2013, had already identified differences in the distribution of risk and protective factors in the adult population living in Brazilian state capitals⁽¹⁴⁾. However, even after seven years, this study points out that inequalities concerning gender, age group, and schooling among risk and protective indicators for NCDs persist, besides emphasizing the increase in mild overweight (from 50.8% in 2013 to 55.4% in 2019) and obesity (from 17.5% in 2013 to 20.3% in 2019).

Smoking indicators were predominantly higher among men, in the 55-64 age group and with low education levels. In Brazil, data from the National Health Survey (Pesquisa Nacional de Saúde - PNS) also showed differences in the distribution of smoking indicators, affecting men more often, in the 40-59 age group, those with less schooling, low income, and black and brown people⁽¹⁵⁾. In 2019, deaths attributed to tobacco use totaled 7.69 million and Disability Adjusted Life Years (DALYs) reached 200 million, representing 13.6% of all deaths and 7.89% of all DALYs globally, with 80% of these deaths occurring among men⁽¹⁶⁾.

The prevalence of heavy drinking and driving was higher among men, young people, and those with a higher level of education. A global analysis carried out in 195 countries indicated that alcohol use resulted in 2.8 million deaths and was the leading risk factor for premature death and disability among people aged 15 to 49 in 2016, accounting for almost 9% of all DALYs for men and more than 2% for women⁽¹⁷⁾. Additionally, there is evidence that, among individuals who consumed harmful amounts of alcohol in 2020, 59.1% were aged between 15 and 39 and 76.9% were male⁽¹⁸⁾.

Obesity was more common among people aged 35 to 64 and among adults with low education levels. It is important to note that overweight affects more than half of adults living in Brazilian capitals, and obesity affects more than a fifth. The results of the Global Burden of Disease Study revealed an increase in the burden of high BMI over the last 25 years, accounting for 4 million deaths globally in 2015, with two-thirds of these deaths related to high BMI due to cardiovascular diseases⁽¹⁹⁾. The global prevalence of obesity has been higher among women, which is consistent with anthropometric data from the 2013 and 2019 PNS^(20,21). However, it is noteworthy that Vigitel did not show differences by gender, possibly due to the use of self-reported measures.

Concerning food consumption, protective factors were more common among women with a higher level of education and increased with age. Risk factors were more common among men, those with low education

levels, and young people, and slumped with age. In Brazil, inadequate diet was the main cause of DALYs in 2015, making it the main risk factor for diseases in the country⁽²²⁾. Besides, dietary indicators have been affected and there has been a decline in the consumption of healthy foods, such as FV, due to the fiscal austerity measures adopted in Brazil after 2016, which have intensified inequalities⁽²³⁾.

Indicators of LTPA engagement were more prevalent among men, young people, and those with a higher education level. In contrast, indicators of physical inactivity and sedentary behavior were more prevalent among women, those aged 65 or over, and low education levels. Other studies explain such inequality by the greater access to PA practices for higher socioeconomic level populations in contrast with the greater difficulty of access among the most vulnerable^(23,24).

Negative self-rated health was more prevalent among women, those aged 65 and over, and those with a lower education level. A study using data from the 2013 PNS indicated that illiteracy, low schooling, total difficulty in carrying out instrumental activities of daily living, the impossibility of carrying out any usual activity for some health reason, the presence of a diagnosis of physical or mental illness, negative self-perception of oral health, a strong demand for health services in recent weeks, medical consultations and hospitalization in the last 12 months were associated with negative self-rated health among elderly Brazilians⁽²⁵⁾.

The prevalence of hypertension and diabetes increased with age and was higher in the population with less schooling. NCDs were more frequent in the elderly population, an expected effect of aging, as well as in less educated adults, reflecting social inequalities and lower access to health promotion and care practices⁽¹⁴⁾.

At this time, in a scenario of rebuilding the Unified Health System (Sistema Único de Saúde - SUS) and resuming health policies in Brazil, it is crucial to increase investments in policies to reduce social inequalities, repeal the fiscal austerity policies that have been implemented and, above all, strengthen health promotion actions in the SUS⁽²³⁾. These actions, along with advocacy and the implementation of regulatory measures, are key components in tackling the social, cultural, and commercial determinants of health, intending to halt the NCD epidemic in the country.

It is important to emphasize that the National^(3,8) and Global⁽⁶⁾ Plans to Combat CNCDs are structured around three central axes: surveillance, health promotion, and comprehensive care. Therefore, health actions must

improve NCD indicators, especially in Primary Health Care, through integrated and intersectoral prevention measures, encompassing these axes in several prevention, treatment, and health protection actions. Our findings reinforce the importance of policies to reduce inequalities and show that the actions to tackle them must consider the social determinants of health, such as gender, education, and age when planning and developing actions to improve this scenario.

In the context of the COVID-19 pandemic, NCD indicators and risk factors worsened. One study, using data from Vigitel from 2006 to 2021, found that there was a reduction in the prevalence of LTPA and PA on the move; and an increase in the prevalence of adults with insufficient PA, sedentary behavior, and physical inactivity in the years of the pandemic. In addition, overweight, obesity, and diabetes indicators deteriorated during the pandemic⁽²⁶⁾.

Strengths and Limitations

We must consider some of the limitations of this analysis. Firstly, there is a representative limitation since it was restricted to individuals living in the Brazilian state capitals and with a sample linked to fixed-line telephone coverage. This condition requires the application of post-stratification methodologies to mitigate possible biases. Secondly, it is worth noting that the indicators are based on self-reports, making them prone to information bias. However, it is essential to emphasize that Vigitel is a nationally recognized survey and, despite the inherent limitations of cross-sectional studies, offers an intrinsic data set for the surveillance of risk and protective factors against NCDs in Brazil.

CONCLUSION

Significant differences were identified in the distribution of risk and protective factors for NCDs among Brazilian adults in 2019, overall, there was a gradient concerning the indicators analyzed, with risk factors being more prevalent among men, individuals with low education levels, and the elderly.

These results can delineate public health actions and policies that consider these disparities. They also contribute to monitoring national and international commitments to combat NCDs, particularly regarding the 2030 Agenda for Sustainable Development Goals. By understanding those disparities and the social determinants of health, it is possible to target policies and strategies to reduce inequalities and encourage healthy lifestyles.

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