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Trends in risk and protective factors for non-communicable diseases in the population with health insurance in Brazil from 2008 to 2015

Tendências de fatores de risco e proteção de doenças crônicas não transmissíveis na população com planos de saúde no Brasil de 2008 a 2015

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ABSTRACT: *Objective:* To analyze trends in risk and protective factors for non-communicable diseases (NCD) and access to preventive tests in the population with health insurance in Brazilian state capitals between 2008 and 2015. *Methods:* This is a cross-sectional study that analyzed data collected from the Surveillance of Risk and Protective Factors for non-communicable diseases (NCD) Telephone Survey (*Sistema Nacional de Vigilância de Doenças Crônicas por Inquérito Telefônico* - Vigitel) on adults aged 18 years and older. We analyzed trends in NCD indicators among health insurance users in approximately 30 thousand interviews done between 2008 and 2015. We used the simple linear regression model to calculate the trends. *Results:* Health insurance users showed an increase in the prevalence of protective factors such as fruit and vegetable consumption, and physical activity in leisure time. Also, there was a decrease in risk factors such as smoking and soft drink consumption, increase in mammography coverage, and a drop in smoking prevalence. However, overweight, obesity, and diabetes increased. *Conclusion:* There are differences according to gender, and, in general, women accumulate more protective factors and men, more risk factors.

Keywords: Noncommunicable diseases. Health insurance. Time series studies. Tobacco use disorder. Obesity.

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RESUMO: *Objetivo:* Analisar as tendências de fatores de risco e proteção de doenças crônicas não transmissíveis (DCNT) e do acesso a exames preventivos na população com planos de saúde nas capitais brasileiras entre 2008 e 2015. *Métodos:* Trata-se de estudo transversal, analisando dados coletados do Sistema Nacional de Vigilância de Doenças Crônicas por Inquérito Telefônico (Vigitel), de adultos com 18 anos e mais. Foram analisadas tendências de indicadores de DCNT entre os usuários de planos de saúde, em cerca de 30 mil entrevistas a cada ano, entre 2008 e 2015. Utilizou-se o modelo de regressão linear simples para o cálculo das tendências. *Resultados:* Usuários de planos de saúde apresentaram aumento das prevalências de fatores de proteção como o consumo de frutas e legumes e atividade física no lazer; houve redução de fatores de risco como tabagismo, consumo de refrigerantes, aumento na cobertura de mamografia e declínio na prevalência do tabagismo. Entretanto, ocorreu aumento do excesso de peso, obesidade e diabetes. *Conclusão:* Existem diferenças segundo sexo, e em geral as mulheres acumulam mais fatores de proteção e homens, mais fatores de risco.

Palavras-chave: Doenças crônicas. Doenças não transmissíveis. Planos de saúde. Estudos de séries temporais. Tabagismo. Obesidade.

INTRODUCTION

The World Health Organization (WHO) estimates that non-communicable diseases (NCD) are responsible for about 38 million deaths annually, with 16 million of them corresponding to premature deaths, before 70 years of age, making NCD the largest health problem in the world[1]. In addition, NCD generate a high level of disability, suffering, and economic impact on global economy[2,3]. According to the Global Burden of Disease study, NCD represent approximately 75% of mortality in Brazil in 2015[4].

Evidence shows that among NCD determinants several of them are modifiable risk factors (smoking, physical inactivity, inadequate diet, alcohol consumption, obesity, and dyslipidemia) that can be reduced with actions and integrated strategies to prevent and control these diseases[3].

Also, NCD have a long duration and evolve slowly, disproportionately affecting low- and middle-income countries, the poorest and most vulnerable populations[3,5]. Recent data from the National Health Survey (NHS) in Brazil indicated that people with higher schooling and health insurance have more access to health services and medical appointments[6,7]. They also have a lower prevalence of risk factors[8] and are less affected by disabilities caused by NCD, which illustrates the inequalities in health[6].

In the United States, investigations such as the Behavior Risk Factor Surveillance System (BRFSS), done by telephone, reveal that populations with health insurance have more protective factors — e.g., healthy diet and physical activity —, more access to preventive tests, and lower frequency of risk factors — e.g., tobacco[9,10]. WHO recommends monitoring NCD and their risk factors as an important public health action[3], in addition to following different population segments and their singularities.

Since 2006, the Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone Survey (*Sistema Nacional de Vigilância de Doenças Crônicas por Inquérito Telefônico - Vigitel*) monitor NCD risk factors in Brazilian state capitals[11]. In 2008, a question was added to the questionnaire about whether the participant had health insurance or not, allowing studies on this specific population[12,13]. However, even though more than 27% of the Brazilian population have health insurance, about 50 million Brazilians[14,15], studies deepening this theme are still rare, particularly ones that analyze the behavioral trends in this population. The progress of trend analysis is essential to follow its evolution[16,17], with the purpose of supporting preventive actions and population control.

The current article analyzed trends in risk and protective factors for NCD and access to preventive tests in the population with health insurance in Brazilian state capitals between 2008 and 2015.

METHODS

This is a cross-sectional study that analyzed data from Vigitel between 2008 and 2015 on adults (≥ 18 years) living in the 26 Brazilian state capitals and the Federal District.

The sampling procedures used by Vigitel aim at obtaining probabilistic samples of the adult population (≥ 18-year-olds) who resides in households with at least one landline telephone. The system establishes a minimum sample size of approximately 2 thousand individuals in each city to estimate the frequency of the main risk factors for NCD in the adult population, with a confidence coefficient of 95% and a maximum error of 2%. Maximum errors of 3% are expected for specific estimates, according to gender, assuming the ratio of men and women in the sample are similar.

The first Vigitel sampling stage consists of drawing at least 5 thousand telephone lines per city. This procedure — systematic and stratified by zip code (CEP) — uses the electronic records of residential landlines of telephone companies. The second stage comprises the drawing of one of the adults (≥ 18-year-olds) living in the household selected. This stage is performed after the identification of eligible lines for the system, among the ones drawn. Lines considered non-eligible for the system were the ones that belonged to companies, no longer existed, were out of service, or did not answer after six call attempts made on different days and times, including Saturdays, Sundays, and at night, and that probably corresponded to closed households.

To reduce the possible bias of not representing individuals with no landline telephone, we adopted post-stratification weights for each individual from the Vigitel sample, calculated with the rake method using a specific routine of the Statistical Analysis Software (SAS)[18]. This method uses iterative procedures that consider successive comparisons between distribution estimates of each sociodemographic variable in the Vigitel sample and the total population of the city. These comparisons culminate in finding weights that, when applied to the Vigitel sample, match their sociodemographic distribution to the one estimated for

the total population who has health insurance in the city. The distribution of the population with health insurance in each sociodemographic variable for each city was collected from the Beneficiaries Information System (*Sistema de Informação de Beneficiários* - SIB) of the National Regulatory Agency for Private Health Insurance and Plans (*Agência Nacional de Saúde Suplementar* - ANS)[19] to build post-stratification weights using the rake method. The population under study consists of adults aged 18 years or older, who live in one of the 26 state capitals or the Federal District and have health insurance. These procedures aim at matching the distribution of the population of the survey to the one estimated by Vigitel in each capital. More details can be found in other publications[11,20]. Thus, we used a subsample of adults with health insurance extracted from the Vigitel sample[19], based on the question "Do you have health insurance?". Specific weights were employed to analyze the population with health insurance.

The Vigitel survey comprises approximately 90 questions and includes topics such as sociodemographic characteristics, eating habits, physical activity, reported weight and height, cigarette and alcohol consumption, reported morbidity, preventive tests, among others. In the current study, we analyzed trends in the population with health insurance in the following indicators:

- tobacco: prevalence of smokers (% of smokers/number of individuals interviewed); 20 or more cigarettes smoked per day (heavy use); passive smokers at home; passive smokers at work;
- overweight (body mass index $\geq 25\,kg/m^2$) and obesity (body mass index $\geq 30\,kg/m^2$);
- eating habits: recommended consumption of fruits and vegetables (five or more daily servings on five or more days a week); consumption of meat with visible fat (red meat with visible fat or chicken with skin); regular consumption of soft drinks or artificial juices (five or more days a week); regular consumption of beans (five or more days a week);
- recommended practice of physical activity during leisure time (at least 150 minutes of mild- or moderate-intensity physical activity per week, or at least 75 minutes of vigorous-intensity physical activity per week, regardless of the number of days per week);
- abusive alcohol consumption (4 or more doses for women and 5 or more doses for men in a single occasion in the last 30 days, considering dose as a shot of distilled drink, a can of beer, or a glass of wine); driving after alcohol consumption (% of adults who reported driving an automotive vehicle after consuming alcoholic drinks);
- reported morbidity (report a prior medical diagnosis of hypertension and diabetes);
- undergoing tests for early cancer detection in women: mammography (for women aged 50 to 69 years) and pap smear (for women aged 25 to 59 years).

The indicators, except for those relating to a specific age and gender, were calculated taking the total number of adults interviewed as denominator.

We calculated time series analyses, and the first methodology stage consisted of building the time series of each indicator (Z_t) using secondary data. Estimates of risk and protective factors were extracted from Vigitel databases in each of the years under study — from 2008 to 2015 — on the population who reported having health insurance. Approximately 30 thousand adults were interviewed each year, totaling about 240 thousand interviews between 2008 and 2015. The last year of the series, 2015, had 30,549 interviews.

The second stage corresponded to time series (Z_t) modeling to identify if the trend was significant. In this study, we used the simple linear regression model, given by the expression: [$Z_t = \alpha + \beta^* t + a_t$], with t as the time prevalence value — ranging from 2008 to 2015 —, α as the intercept, β as the angular coefficient, also known as regression coefficient, and a_t, as the residual (random error). A positive regression coefficient points to an increasing trend, while a negative one indicates a decrease. The measures evaluated to adjust the model were: analysis of variance (ANOVA), which informs whether the function adjusted by the linear model ($Z_t = \alpha + \beta^* t + a_t$) reduces the residual variance when compared to the simple model ($Z_t = \mu + a_t$), in which we tested the hypothesis that H_0: $\beta = 0$, with a significance level of 5%; determination coefficient, which measures the strength of correlation between indicator and time; analysis of residuals, expressed by the difference between actual (Z_t) and adjusted ($\hat{Z}_t$) prevalence, indicating the adjustment quality: standardized residuals between -2 and 2 show no outliers that can underestimate or overestimate the trend; and p value of α (intercept or intersection) and β (regression) coefficients. The criteria adopted to consider the series trend significant included an ANOVA significance level of less than 5% and R^2 greater than or equal to 70%. The premise of a time series analysis is that what happened in the past will happen again in the future[21].

The National Committee for Ethics in Research with Human Beings of the Ministry of Health approved the Vigitel survey, no. 355.590/2013; and the interviewee verbally agreed to participate at the time of the call.

RESULTS

In the trend analysis of the total population with health insurance between 2008 and 2015, the number of smokers decreased from 12.4 to 7.7% (p < 0.00). Other tobacco indicators also had a statistically significant decrease in this period among the total population, such as smoking 20 or more cigarettes a day, being a passive smoker at home and at work (Table 1).

Overweight increased from 45.8 to 51.6% and obesity, from 12.9 to 16.5% (p < 0.00). The indicator of the recommended daily consumption of fruits and vegetables improved (24.9 to 30.9%; p < 0.00). Consumption of meat with excess fat remained stable, and regular consumption of soft drinks (five or more times a week) dropped. Consumption of beans also remained stable among the population with health insurance (Table 1).

Sufficient physical activity during leisure time increased from 35 to 43.9% (p < 0.00). There was no change in the trend in inactive people. Trends in indicators of alcohol

Table 1. Time series trend analysis of indicators of chronic non-communicable diseases in the population with health insurance. Brazilian state capitals, 2008 to 2015.

Indicator	2008	2009	2010	2011	2012	2013	2014	2015	Regression coefficient	p-value	R^2	Trend
Smoker	12.39	11.20	10.9	10.06	9.37	8.61	8.39	7.68	-0.65	0.00	0.98	Drop
20 or more cigarettes a day	3.48	3.02	3.17	2.98	2.97	2.30	2.21	2.07	-0.20	0.00	0.89	Drop
Passive smokers at home		11.02	9.53	9.82	8.81	9.76	8.30	7.95	-0.42	0.01	0.75	Drop
Passive smokers at work		9.70	8.46	9.28	8.57	8.34	7.51	6.67	-0.43	0.01	0.81	Drop
Overweight	45.81	45.62	48.6	49.35	50.96	49.66	50.43	51.57	0.82	0.00	0.82	Rise
Obesity	12.93	13.72	14.3	15.05	16.24	16.42	16.03	16.50	0.52	0.00	0.88	Rise
Fruits and vegetables (5 times a day)	24.90	24.93	23.9	25.91	28.28	28.33	28.71	30.95	0.91	0.00	0.85	Rise
Meat with excess fat	28.00	28.38	28.6	29.71	27.89	27.95	26.94	28.27	-0.11	0.41	0.12	_
Soft drinks (5 or more times a week)	26.06	25.75	26.6	25.85	24.03	21.76	19.65	17.74	-1.25	0.00	0.84	Drop
Beans (5 or more times a week)	59.77	59.82	61.5	63.82	63.35	62.54	62.69	60.64	0.28	0.29	0.19	_
Sufficient physical activity during leisure time		35.40	36.4	37.64	39.49	39.27	41.32	43.89	1.32	0.00	0.95	Rise
Inactive		16.45	16.1	15.93	15.40	17.05	16.05	15.98	-0.02	0.88	0.01	_
Abusive alcohol consumption	17.09	18.82	19.4	16.56	19.03	16.77	16.69	17.07	-0.19	0.33	0.16	_
Driving after alcohol consumption				9.25	9.53	6.85	7.20	6.57	-0.77	0.06	0.75	_
Mammography every two years (50- to 69-year-olds)	84.94	84.95	85.7	85.70	86.73	85.82	86.37	87.06	0.28	0.00	0.78	Rise
Pap smear every three years (25- to 64-year-olds)	89.94	88.79	89.6	87.75	89.03	88.99	87.62	86.02	-0.40	0.02	0.60	–
Hypertension	23.77	22.77	22.5	22.79	23.05	22.79	21.57	22.46	-0.17	0.07	0.44	
Diabetes	6.03	5.96	6.51	6.29	6.78	6.57	6.80	6.67	0.11	0.01	0.70	Rise

consumption and driving after drinking did not change in the period. The trend in hypertension remained the same, but diabetes increased from 6% (2008) to 6.7% (2015) (p < 0.01) among the population with health insurance.

Table 2 presents the trends for men, which shows stability in the prevalence of smokers and a drop in the consumption of 20 cigarettes or more and passive smokers at work. Overweight remained stable and obesity increased from 13.9 to 16.3% (p < 0.01). Regarding eating habits, the recommended consumption of fruits and vegetables increased, and soft drink consumption decreased. Driving after alcohol consumption dropped, and other indicators remained stable. Diabetes increased from 5.1 to 6.5%, but the difference was not significant.

Table 3 presents the trends for women. All tobacco indicators dropped. The prevalence of women smokers decreased from 10.9 to 5.6%. Overweight increased from 39.3 to 44.7% (p < 0.00), but remained below the indicators for men, and obesity rose from 12.1 to 16.6% (p < 0.00). Regarding eating habits, the recommended consumption of fruits and vegetables increased, and soft drink consumption decreased. Sufficient physical activity during leisure time increased from 27.7 to 36.1% (p < 0.00). Prevalence of preventive mammography increased, while pap smear remained stable and high, above 85%, among women with health insurance throughout the period. Other indicators remained stable (Table 3).

DISCUSSION

It is important to study the characteristics of the population with health insurance as it represents more than a quarter of Brazilians and can reach half the population in some capitals[15]. In general, this group has a higher schooling and income, greater frequency of insertion in the production process, and better health outcomes[12,22-24].

The trend in smoking decreased in most indicators, which has also been identified in other studies indicating the success of anti-tobacco measures in the country, such as banning advertising, raising taxes and prices of tobacco products; legislation on smoke-free environments, banning smoking in public places; warnings on cigarette packets, among others[25,26]. The study presented differences from previous analyses, by indicating a reduction of smokers only among women. Studies on the Brazilian population point to a decrease among men as well[25,26]. Men have twice the women prevalence and should receive greater attention when monitoring future trends and specific policies. Heavy tobacco consumption dropped for both genders, a fact associated with cardiovascular events and lung cancer[27].

Passive smoking exposes nonsmoking populations to the same types of smoker's diseases[28]. The study shows a decrease in passive smoking at work for both genders, and also in passive smoking at home for women. This represents a great improvement in this behavior, which could have been motivated by the restrictive measures adopted, especially the 2011 law on smoke-free environments, and the executive order[26].

The WHO recommends daily consumption of 400 g of fruits and vegetables to prevent cardiovascular diseases. Fruits and vegetables are also beneficial in overweight prevention and

Table 2. Time series trend analysis of indicators of chronic non-communicable diseases in the male population with health insurance. Brazilian state capitals, 2008 to 2015.

Indicator	2008	2009	2010	2011	2012	2013	2014	2015	Regression coefficient	p-value	R²	Trend
Smoker	14.22	13.74	12.61	11.93	12.32	11.14	10.20	10.09	-0.35	0.08	0.43	–
20 or more cigarettes a day	4.42	4.32	3.74	3.76	4.27	3.27	2.93	3.06	-0.21	0.01	0.74	Drop
Passive smokers at home		10.75	8.98	9.26	8.04	9.66	8.02	7.60	-0.39	0.05	0.58	–
Passive smokers at work		13.16	11.98	13.14	12.48	11.58	10.48	9.99	-0.50	0.01	0.77	Drop
Overweight	54.02	52.71	55.86	57.05	57.42	56.20	57.29	57.40	0.57	0.02	0.64	–
Obesity	13.94	14.29	14.15	15.45	16.53	17.58	16.62	16.30	0.47	0.01	0.72	Rise
Fruits and vegetables (5 times a day)	19.19	19.35	19.07	20.87	23.39	23.18	23.92	25.80	1.00	0.00	0.91	Rise
Meat with excess fat	38.44	38.67	40.18	39.73	37.23	37.81	35.96	39.43	-0.19	0.41	0.11	–
Soft drinks (5 or more times a week)	31.27	29.27	31.43	30.65	27.59	25.61	22.43	21.55	-1.46	0.00	0.84	Drop
Beans (5 or more times a week)	67.84	67.10	68.39	71.38	70.68	69.41	69.48	67.88	0.17	0.49	0.08	–
Sufficient physical activity during leisure time		45.06	47.09	46.85	47.98	47.12	47.20	53.15	0.88	0.05	0.57	–
Inactive		14.96	14.60	14.11	14.07	15.63	15.97	13.86	0.03	0.84	0.01	–
Abusive alcohol consumption	26.42	29.53	29.66	24.74	28.68	25.04	24.47	24.57	-0.57	0.11	0.37	–
Driving after alcohol consumption				16.22	16.40	12.23	12.28	11.12	-1.43	0.03	0.84	Drop
Hypertension	21.74	20.71	20.08	20.60	21.05	21.36	20.33	20.83	-0.05	0.61	0.05	–
Diabetes	5.14	5.75	6.37	6.17	6.23	6.22	6.51	6.17	0.13	0.05	0.51	–

Table 3. Time series trend analysis of indicators of chronic non-communicable diseases in the female population with health insurance. Brazilian state capitals, 2008 to 2015. 2015.

Indicator	2008	2009	2010	2011	2012	2013	2014	2015	Regression coefficient	p-value	R^2	Trend
Smoker	10.94	9.20	9.62	8.48	6.95	6.56	6.87	5.67	-0.70	0.00	0.92	Drop
20 or more cigarettes a day	2.73	1.99	2.72	2.32	1.89	1.52	1.61	1.25	-0.19	0.01	0.75	Drop
Passive smokers at home		11.22	9.97	10.30	9.44	9.84	8.53	8.23	-0.44	0.00	0.85	Drop
Passive smokers at work		6.97	5.67	6.04	5.38	5.72	5.03	3.90	-0.39	0.01	0.79	Drop
Overweight	39.30	40.01	42.88	42.87	45.68	44.36	44.71	46.71	0.98	0.00	0.85	Rise
Obesity	12.12	13.28	14.47	14.70	16.01	15.49	15.53	16.66	0.56	0.00	0.86	Rise
Fruits and vegetables (5 times a day)	29.42	29.33	27.79	30.14	32.27	32.50	32.70	35.24	0.88	0.00	0.79	Rise
Meat with excess fat	19.72	20.24	19.45	21.29	20.25	19.95	19.41	18.98	-0.11	0.37	0.13	_
Soft drinks (5 or more times a week)	21.94	22.96	22.73	21.82	21.12	18.64	17.33	14.57	-1.10	0.00	0.81	Drop
Beans (5 or more times a week)	53.37	54.07	55.96	57.48	57.35	56.97	57.03	54.61	0.31	0.24	0.22	_
Sufficient physical activity during leisure time		27.76	28.01	29.89	32.55	32.91	36.41	36.18	1.61	0.00	0.95	Rise
Inactive		17.63	17.36	17.47	16.49	18.20	16.12	17.74	-0.05	0.75	0.02	_
Abusive alcohol consumption	9.70	10.35	11.20	9.68	11.14	10.06	10.19	10.82	0.06	0.56	0.06	_
Driving after alcohol consumption				3.39	3.92	2.48	2.95	2.78	-0.22	0.27	0.38	_
Hypertension	25.37	24.40	24.45	24.62	24.69	23.96	22.61	23.82	-0.25	0.03	0.58	_
Diabetes	6.74	6.12	6.63	6.39	7.23	6.85	7.03	7.10	0.10	0.07	0.44	_
Mammography every two years (50- to 69-year-olds)	84.94	84.95	85.68	85.70	86.73	85.82	86.37	87.06	0.28	0.00	0.78	Rise
Pap smear every three years (25- to 64-year-olds)	89.94	88.79	89.59	87.75	89.03	88.99	87.62	86.02	-0.40	0.02	0.60	_

treatment[29], a serious health issue in the country. The regular and recommended intake of fruits and vegetables grew among women and men, although it was higher among women throughout the period, as already highlighted in other studies[30].

A sedentary lifestyle is the fourth main cause of death in the world[31], and studies point to significant differences regarding gender, with the practice of physical activity during leisure time being more common among men and young people[32,33]. The current study showed that men practice physical activity in their leisure time approximately 50% more than women in Brazil. However, the trend remained stable among males and increased in females, which differs from previous studies[34].

Vigitel researches some proxy indicators of saturated fat, such as removing the fat from the meat. Previous studies point out that the Brazilian population consumes saturated fat within the maximum limit recommended by WHO (10% of total calories)[35]. The consumption of free sugar by the Brazilian population exceeds more than 50% the maximum limit recommended by WHO (10% of total calories)[35,36]. Thus, the drop in consumption of soft drinks and artificial juices shown here is important. We also underline that this number is lower than the 23% identified by the NHS 2013[35].

Although eating habits and physical activity indicators have improved, obesity and overweight showed an increasing trend in the population with health insurance. Overweight and obesity are risk factors for the global burden of disease due to their association with cardiovascular diseases, diabetes, colon, rectum, and breast cancer, cirrhosis, among others[2,3]. In light of its magnitude and steady growth in the world, the WHO included in its global targets the challenge of halting the increase in obesity by 2025[3]. However, countries have not positively advanced to reach this goal[1]. Brazil shows an increasing trend in obesity[37], the same trend found in this study for both genders. Obesity in the general population estimated by Vigitel was present in 18.1% of men and 19.7% of women in 2015, values higher than the ones of this study[38]. Factors such as higher schooling and income in this specific population can justify the lower prevalence in the previous study[37].

Differences related to overweight reveal stability among men with health insurance, and growth in the general male population, from 49.8% (2008) to 57.6% (2015)[38]. We underline that in 2015 prevalence rates were similar for men in the general population and those with health insurance. Women showed increasing trends in both populations.

Studies in the United States indicate that the population with health insurance has a lower prevalence of risk factors, and more access to health and preventive services[9,10], such as mammography, colonoscopy, and pap smear[9]. In Brazil, the NHS pointed to improvements in access to health services and the importance of the public health system in its universalization. However, the country still faces inequalities in access to health services according to region, as well as coverage of tests, such as mammography and pap smear[7,39].

Cervix cancer preventive tests, such as pap smear, are recommended for fertile women every three years. To prevent breast cancer, women aged 50 to 69 years should get a mammography every two years. The population with health insurance has been reaching this goal, with coverage rates above 85%, and mammography coverage has

been growing. This constitutes a virtually concluded objective by the universality of these procedures among women with health insurance. A study analyzing data from the NHS confirms that women with health insurance have greater coverage of breast cancer preventive tests[39].

In this period, trends in hypertension did not change, while self-reported diabetes increased among the total population. Studies have demonstrated the association between diabetes and non-localized obesity, characterized by a high body mass index[40,41]. The growing obesity in the Brazilian population has contributed to the rise of diabetes and population ageing[42].

The trend in abusive alcohol consumption remained stable, and there was a decrease in driving after alcohol consumption among men. In the latter, we underline that the population with health insurance has higher frequencies than the total population — almost three times greater —, which can be due to their better income and, therefore, the ownership of a car[43]. Vigitel data also indicate that drinking and driving is more common in the population with higher schooling and has decreased among men[44].

Limitations of this study include the interviews being conducted only with individuals who have a landline telephone, which can reduce the participation of low-income populations. However, we minimized this bias by using weighting factors to match the same population distribution of Vigitel and the Census 2010. The evolution of time trends outlined here might be due to other factors and cannot be attributed to the population having health insurance. In addition, the trends were measured in different cross-sectional studies and not in the same individual.

CONCLUSION

The time series analysis of NCD indicators among individuals with health insurance showed positive aspects, such as increasing trends in protective factors — consumption of fruits and vegetables and physical activity in leisure time —, decrease in risk factors — smoking and soft drink consumption —, and higher mammography coverage. Among indicators with negative performance, we have the rise in overweight, obesity, and diabetes. There are differences according to gender, and, in general, women accumulate more protective factors and men, more risk factors.

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