

Physical activity and cardiovascular risk factors of a Health Department Central-South Chile: Trend from 2015 to 2019

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ABSTRACT

The objective was to evaluate the trend of physical activity (PA) and cardiovascular risk factors (CVRF) in a Department of Health in Chile between 2015 and 2019. Records of people ≥ 15 years of age were analysed to determine the trend of PA, nutritional status, cardiometabolic diseases and lifestyles. The probability that these variables occurred over the years was calculated. A tendency to decrease in PA was found in all cases, in men and women, and an increase in CVRF for all cases and in women; between 2015 and 2019, there was a certain stability in men. Women who consulted for PA in July-September 2019 were more likely to do so compared to men (OR: 2.09, $p < .001$), women with obesity (OR: 1.81, $p < .0001$), overweight (OR: 1.91, $p < .0001$), hypertension (OR: 1.15, $p = .01$), high blood glucose (OR: 1.36, $p < .0001$) and smoking (OR: 2.4, $p < .0001$) were more likely to suffer them compared to men in April-June 2019. It is concluded that the highest and lowest periods in the cases of PA and CVRF could be known, and the probability that these occurred over time could be estimated. PA can be important for the control and treatment of CVRF.

Keywords: Physical activity; Risk factors; Tendency; Association.

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INTRODUCTION

Between 1990 and 2019, the first four CVRF in Chile were high blood pressure, high glucose levels, high BMI, and smoking (Petermann-Rocha et al., 2021). From 2009 to 2019 among the first six causes of death in Chile were diabetes and cardiovascular diseases (Martínez-Sanguinetti et al., 2021). Physical inactivity is among the CVRF that affect these diseases (Troncoso-Pantoja et al., 2020a). For its part, the presence of some CVRF has been shown to interact with other risk factors and alter metabolic health, thus there is a greater risk of developing hypertension or type 2 diabetes when someone presents overweight, obesity, family history (Petermann et al., 2017), and the presence of physical inactivity (Leiva et al., 2018). In this sense, for example, physically inactive people are significantly more likely to develop hypertension and diabetes compared to physically active people (Díaz-Martínez et al., 2018). On the contrary, people who perform PA with some regularity, during the weekend, or were insufficiently active, they had between 17 and 41% fewer chances of mortality from cancer, cardiovascular disease, or premature mortality, compared to those who were physically inactive (O'Donovan et al., 2017). It also has been reported that physically active people with low levels of sedentary behaviours were less likely to develop CVRF and metabolic syndrome compared to inactive people with high levels of sedentary behaviour (Cristi-Montero et al., 2018). The practice of PA is so relevant that it can prevent cases and the prevalence of premature deaths, for which it is necessary for the population to comply with PA recommendations (Celis-Morales et al., 2020).

The levels of a sedentary lifestyle, overweight, obesity and cardiometabolic diseases have increased in recent years in the Chilean population (Ministerio de Salud de Chile, 2018a). Although these records correspond to samples made up of approximately 5.000 to 6.000 participants, they have been carried out after periods of 6 to 7 years. In some studies the results are presented as factors expanded to the Chilean national population (Garrido-Méndez et al., 2020; Troncoso-Pantoja et al., 2020b; Troncoso-Pantoja et al., 2020c; Vásquez-Gómez et al., 2020). It should be considered that in many cities of the country, evaluations are carried out every year, and that in certain places low averages of CVRF have been found in young adults, for example in glycemia, hypertension and cholesterol (Leiva et al., 2017). Therefore, it is not possible to ensure what happens in other specific local contexts of the country, at the provincial and municipal level, or in small cities. Given this situation, the relevance of investigating the behaviour of PA and CVRF is justified considering the practical utility that the results may have in order to complement larger-scale studies at the population level with more evidence, and to strengthen local prevention policies, treatment and control of these diseases and lifestyles. Thus contributing to the direct beneficiaries being the professionals who provide health care services in order to design health plans, and the same people who attend the centres for their health care. Therefore, the objective of this research was to evaluate the trend in physical activity and cardiovascular risk factors of men and women aged equal to or older than 15 years in a Health Department in south-central Chile between 2015 and 2019.

METHODS

The records of available cases of people ≥ 15 years of age and both sexes from cities' Health Department in south-central Chile were analysed. The information was requested following Transparency Law N°. 20,285 of the State of Chile (transparency request N°. AO025T000091).

The number of cases in the series Activities for the Promotion and Prevention of Health in the Counselling Area on Physical Activity was accessed. The Preventive Medicine Examination series for those over 15 years of age were also accessed in the Nutritional Status section (number of cases with normal BMI, underweight, overweight and obesity); in the Health Status section (smoking cases and arterial hypertension $\geq 140/90$

mmHg]), and in the Laboratory Examinations section (cases of altered glycemia [between 100 and 199 mg/dL between 2015 and 2017, and ≥ 100 mg/dL between 2018 and 2019] and elevated cholesterol [≥ 200 mg/dL]).

The trend, the absolute and relative delta, in the number of consultations about PA, the number of cases according to nutritional status, health status and laboratory tests, for the total of evaluated, for men and women, and by age range was determined. These curves were recorded in four quarters (January-March, April-June, July-September, and October-December) from 2015 to 2019, which are framed in the four seasonal periods of the Southern Hemisphere, except for the age range that was for the course of the years 2015-2019. According to the trend curves, the highest records were considered and the probability that the cases of PA, nutritional status, health status and laboratory tests occurred over the years according to sex was calculated, calculating the odds ratio (OR) with 95% confidence intervals (CI). To perform the statistical analysis, the STATA version 14 program was used and statistical significance was assumed with a p -value $<.05$.

RESULTS

The highest number of consultations for the PA were in July-September 2015 and 2019; in addition, there was a high record in April-June 2016. In women, a very similar trend was observed with records in the same periods, but in men, the highest number of cases was concentrated in July-September 2015 and April-June 2016 (Figure 1). Regarding the age range, the consultations for PA were concentrated between 15-19 years in both sexes, and between 50-69 years in women from 2015 to 2019. In men, it was similar adding a group of young people (20-24 years) and adults (70-74 years) as the years go by.

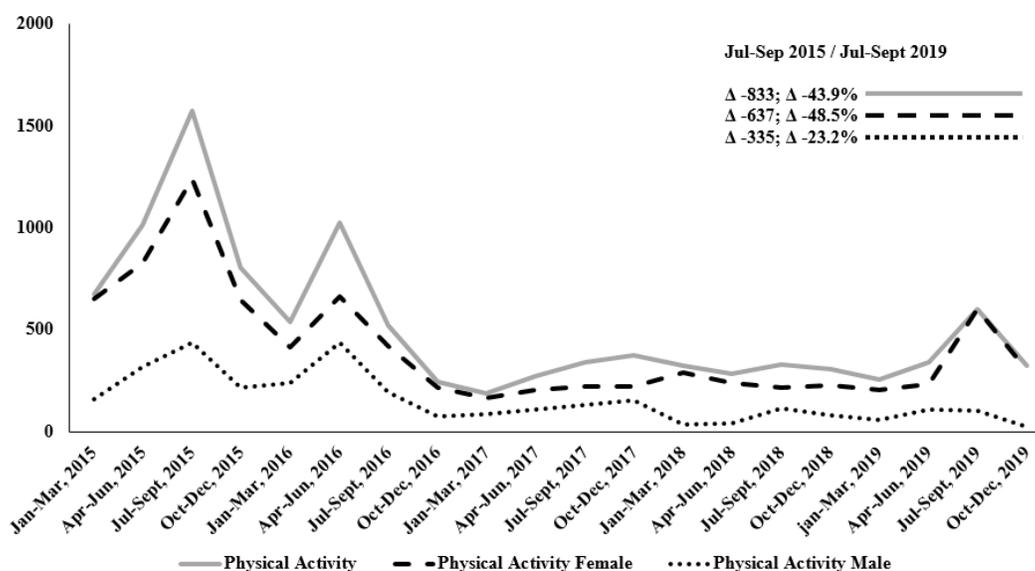


Figure 1. Trend in physical activity consultations in all cases and by sex.

For all cases, the highest records of obesity, overweight, high blood glucose and cholesterol, and smoking were reported in April-June (fall) of 2016 and 2019, respectively. For hypertension, the highest total cases were in July-September (winter) of 2015 and in autumn 2016. In women, an increase in obesity and overweight cases was observed in the autumn period, the same happened with cases of elevated glycemia and cholesterol, and smoking habit over the years (in addition, hypertension appeared in winter). In the case

of men, the behaviour was similar, only that hypertension, glycemia and cholesterol had elevated cases in winter (Figure 2, 3, 4 and 5). From 2015 to 2019, cardiometabolic diseases such as hypertension, high blood glucose and cholesterol, in addition to obesity, were grouped into adult ages in women (45 - ≥ 80 years), and lifestyles such as smoking and expressed body fat in overweight, they were concentrated between 20 - 69 years. On the other hand, smoking, overweight and high blood glucose were between 20 - 24 years, hypertension and high cholesterol generally between 70 - 74 years (and between 40 - 49 years), and obesity between 25 - 69 years for men. It should be noted that CVRF cases coincide with the coldest periods of the year in the Southern Hemisphere, specifically in Chile.

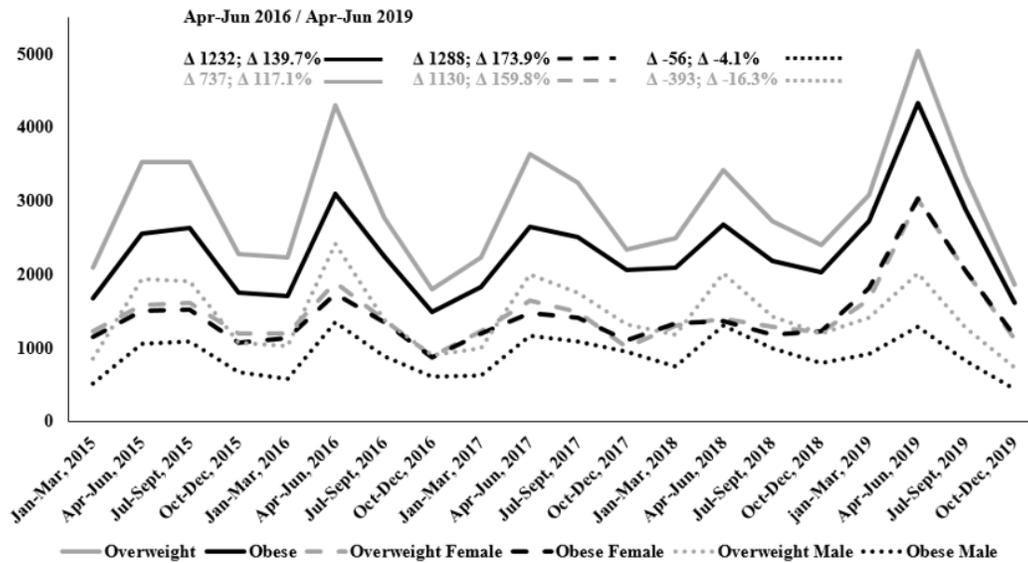


Figure 2. Trend in overweight and obesity in all cases and by sex.

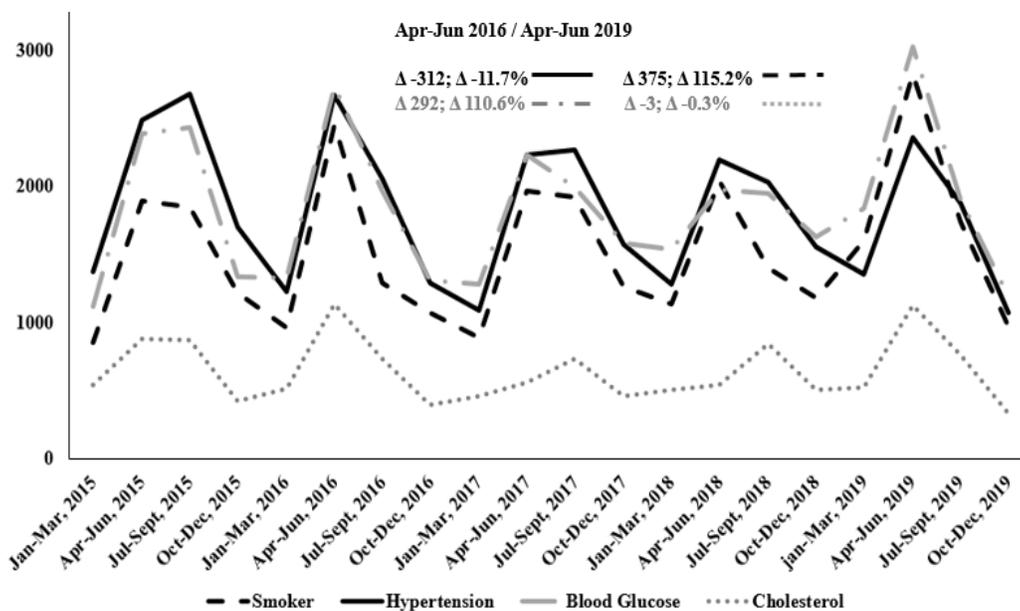


Figure 3. Trend in cardiovascular risk factors in all cases.

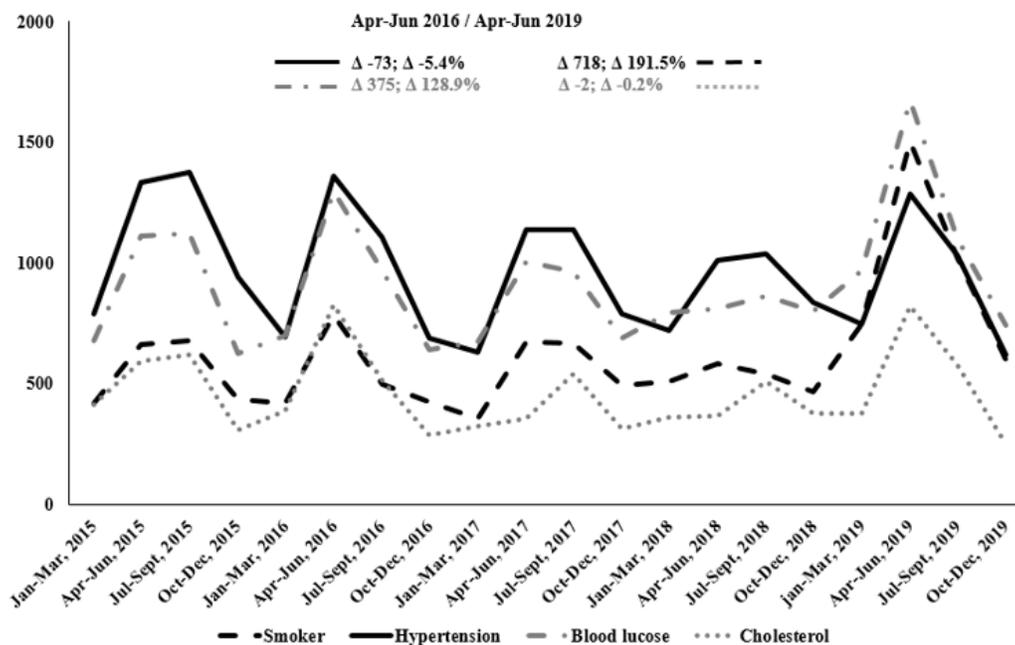


Figure 4. Trend in cardiovascular risk factors in women.

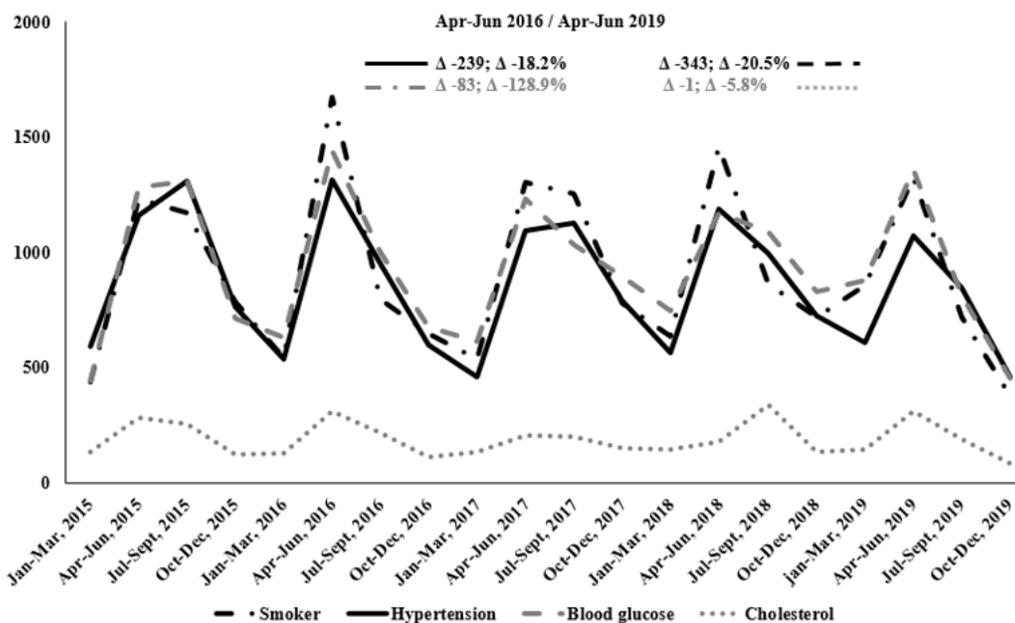


Figure 5. Trend in cardiovascular risk factors in men.

Women who consulted for PA in July-September 2019 were more likely to do so compared to men. Obese and overweight women were more likely to suffer from these pathologies in April-June 2019 compared to men; they were also more likely to have hypertension, high blood glucose, and smoking compared to men in April-June 2019 (Table 1).

Table 1. Consultations for physical activity and risk factors in women compared to men.

Female (Jul-Sept 2019)	OR	CI (95%)	p-value
Physical activity	2.09	1.64; 2.68	< .0001
Female (Apr-Jun 2019)	OR	CI (95%)	p-value
Obesity	1.81	1.64; 1.99	< .0001
Overweight	1.91	1.75; 2.07	< .0001
Hypertension	1.15	1.03; 1.29	= .01
Smoker	2.4	2.14; 2.69	< .0001
Cholesterol	1	.82; 1.21	= .993
Blood glucose	1.36	1.23; 1.51	< .0001

Note. CI: confidence interval; OR: odds ratio.

DISCUSSION

The main findings of this research were that PA visits decreased from 2015 to 2019, for all cases, for men and women. CVRFs tended to increase over the years; overweight and obesity increased in all cases, and in women; in men, it was relatively stable. The metabolic variables and smoking habit had an almost stable behaviour with increases in 2015, 2016, and 2019 for all cases, and in women; in men it was stable with slight increases in cases in 2015 and 2016. In addition, over the years, women were more likely to consult for PA and suffer CVRF than men.

Comparative evidence indicates that in 2009 the prevalence of physical inactivity in the Chilean population was 22.9% in women, and 15.4% in men (Celis-Morales et al., 2016), that same year some member countries of The World Health Organization proposed to reduce physical inactivity by 10% with a view to 2025. In Chile, the prevalence of physical inactivity in 2016 was 26.6% and 24.4% in women and men, respectively, being one of the lowest in Latin America (Celis-Morales et al., 2019). Although between 1990 and 2019 decreases in physical inactivity were also reported that reached up to 26.5% in women, and up to 24.2% in men (Petermann-Rocha et al., 2021), these changes were very small. Despite the efforts of public policies and private initiatives to mitigate this situation, physical inactivity has been present in Chile, projecting little encouraging scenarios; we believe that this trend may partly explain the decrease in the cases of consultations on PA in the present research, which marked a downward trend from 2015 to 2019. Regarding the age range, already in 2009 the chances of being physically inactive were two, three and four times more in men and women ≥ 70 years, compared to a young adult group. Likewise, the chances of being inactive were approximately one more time in the group under 30 years of age of women and men (Garrido-Méndez et al., 2019). These data still complement our findings since most of the consultations about PA were concentrated in young ages and in adulthood; and in our study women were more likely to consult about PA compared to men.

Regarding body adiposity, from 1976 to 2014, BMI has increased by 3.5 and 3.6 kg·m² in men and women, respectively, and obesity has increased by about 10% in both sexes during the same period in the Chilean population (Celis-Morales et al., 2017). Between 1990 and 2019, the BMI also increased by 88.4% in men, and by 68.4% in women (Petermann-Rocha et al., 2021). According to the National Health Survey applied in Chile in 2009 - 2010 for the value of BMI ≥ 30 kg·m², the records were 30.7% and 19.2% in women and men, respectively, and overweight weighted 33.6% in women, and 45.3% in men (Celis-Morales et al., 2016). It has also been reported that the highest percentages of overweight and obesity are found from 30 to 65 years of age and over in the Chilean population according to the 2016-17 National Health Survey (Ministerio de Salud de Chile, 2018a), which coincide with the age ranges found in our research. All this evidence gives

certain explanations of what happens in smaller provinces or local sectors in which the cases of overweight and obesity tended to increase as shown by our analysis of the Department of Health. In these times of mobility restrictions due to health measures of the COVID-19 pandemic, it is necessary to stimulate body weight control. The benefits of the interaction between body adiposity and CVRF have been reported that a 5% reduction in body weight, BMI and waist circumference were significantly more likely to reduce hypertension, type 2 diabetes, total cholesterol, among other risk factors (Labraña et al., 2017). The increase in body adiposity levels in the Chilean population could be explained by the body's inability to remove the accumulation of lipids from adipose tissue as result of the aging process, in addition to the loss of muscle mass (Villagrán et al., 2020).

In 2003, the percentage of the Chilean population with suspected hypertension was 33.7% (Ministerio de Salud de Chile, 2018a), in 2009 hypertension has been prevalent in people ≥ 80 years of age in Chile (Concha-Cisternas et al., 2019). Between 2003 and 2017 it has weighted by 35.1% (2732 cases) in women and 39.6% (2079 cases) in men according to population surveys (Petermann-Rocha et al., 2020). On the other hand, the suspicion of hypertension continues to be prevalent in people aged 65 years and over (Ministerio de Salud de Chile, 2018a). Hypertension has shown decreases in all cases, men and women, between the years that we analyse in our research (2016 - 2019), in this way, the registered cases have oscillated between approximately 1000 and 1500, much lower than the more than 2000 records recently cited by Petermann-Rocha et al. (2020). On the other hand, according to our findings, hypertension presented from 45 to ≥ 80 years of age, incorporating a lower age range than that reported by the 2016-17 National Health Survey.

Elevated blood glucose has reached 95.4% and 75.9% in the Chilean population of men and women, respectively, between 1990 and 2019 (Petermann-Rocha et al., 2021), and in 2009 the range of prevalent age for diabetes has been between 60 and 79 years (Concha-Cisternas et al., 2019). Thus, over time, diabetes has had a weighting of 14% (1089 cases) in women and 12.2% (637 cases) in men according to data obtained in population surveys between 2003 and 2017 (Petermann-Rocha et al., 2020). The suspicion of suffering from diabetes mellitus has been increasing since 2003, past 2009, until 2017, with values from 4.2 to 12.3% in which the most prevalent age was ≥ 65 years (Ministerio de Salud de Chile, 2018a). The highest records of elevated blood glucose in our study have been between approximately 1000 and 1500 cases in men and women. This show similar to that reported by national surveys over time, especially in women, and according to our results are striking that many cases of glycemia have occurred between the ages of 20 and 24 in men, apart from the more advanced ages as reported in the literature.

In 2003 the prevalence of high total cholesterol was 35.4% (men 35.1%, women 35.6%), in 2009 it was 38.5% (men 39%, women 38.1%), and according to the age range, the prevalence was between 45 and 64 years for all cases (Ministerio de Salud de Chile, 2010). According to the 2016-17 National Health Survey, the prevalence of high total cholesterol was 27.8%; women had more prevalence with 29.4% (men 26.1%), and according to age range the highest percentage of 31,1% was also concentrated between 45 and 64 years (Ministerio de Salud de Chile, 2018b). Our results indicated that the cases of elevated total cholesterol were lower in quantity compared to other metabolic diseases, such as glycemia and hypertension, and at the same time, they had a slight decrease over the years in the total of cases, in men and women, a trend that is similar to that reported by the recently cited population surveys. For its part, the age group with the highest prevalence of high cholesterol in our study included people from 45 to ≥ 80 years of age, which shows that in our local context, older people are suffering from this alteration and is uneven with the data from the polls.

Regarding the cases of smokers in Chile, in 2003, 43.5% of the population was registered with this habit (Ministerio de Salud de Chile, 2018a). In 2009, according to the National Health Survey 2009-10, the highest number was between 20 and 29 years old (Concha-Cisternas et al., 2019) with a prevalence of 37.3% in women and 43.3% in men (Celis-Morales et al., 2016). In 2016-17, the 30-49 age group was added to this same age range from 20 to 29 years, with a lower prevalence of 33.3% in the country (Ministerio de Salud de Chile, 2018a). Although the smoking habit has shown a decrease according to the data reported by national surveys, especially in recent years, our data in a smaller local context have shown contradictions, that is, there was an increase in all cases and in the women, but a decreasing trend in the case of men. What is also uneven is the age range of smokers, since we found that apart from young people this habit has been present up to 69 years of age.

The strength of this research is to have analysed a large number of cases of PA and CVRF and their behaviour in a period of 5 years; in addition to that, the cases were part of a community Health Department that responds to a local and specific context in which these phenomena occurred. A potential limitation could be that the cases analysed did not present absolute values in terms of CVRF, in order to calculate mean values, mean differences, regressions, etc. which would undoubtedly enrich the investigation further, but was beyond the reach of the investigators.

CONCLUSIONS

It is concluded that the behaviour of the cases of PA and CVRF gave the possibility of knowing oscillating periods over the years, detecting in which periods the highest and lowest cases were registered, and at the same time the feasibility of determining the probability of occurrence of cases of PA and CVRF over time in the Department of Health. These CVRF should be considered for the lifestyle, especially from the practice of PA, which has a preventive role in the first instance and as part of its treatment or control of chronic diseases in the cases of higher prevalence in the different periods of the year.

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