



Non-communicable diseases: risk factors and actions for their prevention and control in Cuba*

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ABSTRACT

Non-communicable diseases (NCDs) represent one of the greatest challenges for development of the 21st century due to their devastating social, economic and public health impact. The objective of this article are to describe the evolution and risk factors for NCDs in Cuba, mainly in the period 1990–2015, to outline actions undertaken by the Ministry of Public Health of Cuba, and to highlight the most important challenges with a focus on their prevention and control. The information is based on data collected and published by the Directorate of Medical Records and Health Statistics, research on risk factors, other studies and documentation of comprehensive actions. Mortality in Cuba is determined by four major health problems: cardiovascular diseases, malignant tumors, chronic diseases of the lower respiratory tract and diabetes mellitus, which together cause 68.0% of deaths. Cancer presents a growing trend, and chronic kidney disease emerges as a serious health problem. Cuba has a known baseline on risk factors, and hypertension and tobacco consumption are the main factors related to NCDs mortality. In line with the importance of these diseases, there are milestones and interventions with a positive impact, as well as gaps and challenges within the framework of the World Health Organization's Global Action Plan for the Prevention and Control of NCDs.

Keywords

Chronic disease; risk factors; mortality, premature; social determinants of health; Cuba.

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Non-communicable diseases (NCDs) are a global problem, above all in

developing countries, where they have become a heavy burden on public health in recent years.

Economic, social and health progress in Cuba since the 1960s contributed to the development of an extensive and well-equipped public health system that has guaranteed universal coverage and

effective access to health services (1). This has created a unique epidemiologic and demographic situation in a developing country characterized by a marked decrease in communicable diseases and perinatal conditions, along with a predominance of NCDs, leading to gradual and accelerated aging of the population and a new disease and mortality profile (2) resembling that of developed countries.

For this article, data collected by the National Medical Records and Health Statistics Bureau of the Cuban Ministry of Public Health (MINSAP) were used; results of the Third National Survey on Risk Factors and Chronic Diseases (III ENFR) conducted in 2010 (3) and other studies were evaluated; and comprehensive actions taken were analyzed.

For the series studies and mortality analyses, lists of cardiovascular disease (heart, cerebrovascular, arterial and capillary vessel diseases), malignant tumors and diabetes mellitus, with corresponding codes according to different revisions of the International Classification of Diseases (ICD-10 from 2001 to 2015, ICD-9 from 1978 to 2000 and ICD-8 from 1968 to 1977) were used. For chronic lower respiratory disease, the period studied corresponds to 2001–2015, since Cuba started using ICD-10 in 2001. That classification included new disease codes and more of them than in prior versions. For various reasons, to date, MINSAP has been unable to reconstruct the age-adjusted mortality series for the period 1970–2000, which is a limitation of this study, although total deaths from this cause in 1990–2000 could be counted.

The purpose of this article is to describe the evolution of NCDs and their risk factors in Cuba, primarily for the period 1990–2015, summarize the actions taken by MINSAP, and highlight the greatest challenges to their prevention and control.

AGING AND BURDEN OF DISEASE IN CUBA

In the period 1994–1995, life expectancy in Cuba was 74.8 years, rising to 78.5 years according to the most recent calculation (2011–2013) (4). In 1990, only 11.9% of Cubans were aged ≥60 years; in 2015 this group represented 19.4% of the population. The overall age-adjusted mortality rate in 2015 was 4.7 deaths per

1 000 population, decreased from 5.8 in 1990 (4).

In 2015, years of potential life lost in groups aged 1 to 74 years were 18.5 per 1 000 population from malignant tumors, 15.5 from cardiovascular disease, 1.8 from chronic lower respiratory disease, and 1.4 from diabetes mellitus. (4).

In 1990, 64.1% of all deaths were attributed to cardiovascular disease, malignant tumors, chronic lower respiratory disease and diabetes mellitus. This figure rose to 68.0% in 2015 (Figure 1). That same year, 32.5% of deaths in Cuba were premature (aged 30 to 69 years). Of these, 68.7% were due to the four NCDs mentioned: malignant tumors and cardiovascular disease represented 32.9% and 29.5% of premature deaths, respectively, while chronic lower respiratory disease and diabetes mellitus accounted for 3.7% and 2.6%, respectively (4).

MORTALITY TRENDS OF PRINCIPAL NON-COMMUNICABLE DISEASES

Cardiovascular disease represented 36.9% of all deaths in 2015, a slight decrease compared to 1990 (Figure 1).

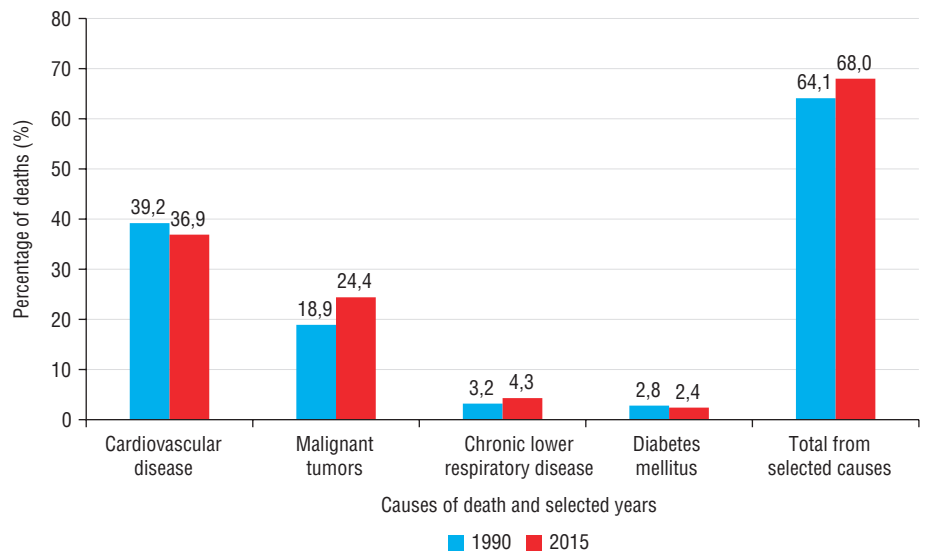
To complement the analysis, mortality series for cardiovascular disease, malignant tumors, diabetes mellitus and their trends during 1970–2015 were studied using regression software (5).

The chronological mortality series for the cardiovascular diseases with greatest impact (heart and cerebrovascular diseases) showed an average 1.3% annual decline in the adjusted rate per 100 000 population in 1970–2017. The decrease was greater in 1977–1998 (0.97%) than in 2003–2015 (0.88%), and there was a sudden drop of approximately 6.12% annually in 1999–2002 (Figure 2). This decline, followed by a period of moderate stability after 2002, was attributed to changes at the population level during the economic crisis of the 1990s, which has been associated with a combination of two factors: a decrease in food consumption and caloric intake, and a pronounced increase in physical activity, which resulted in a population-wide reduction in body mass index (6).

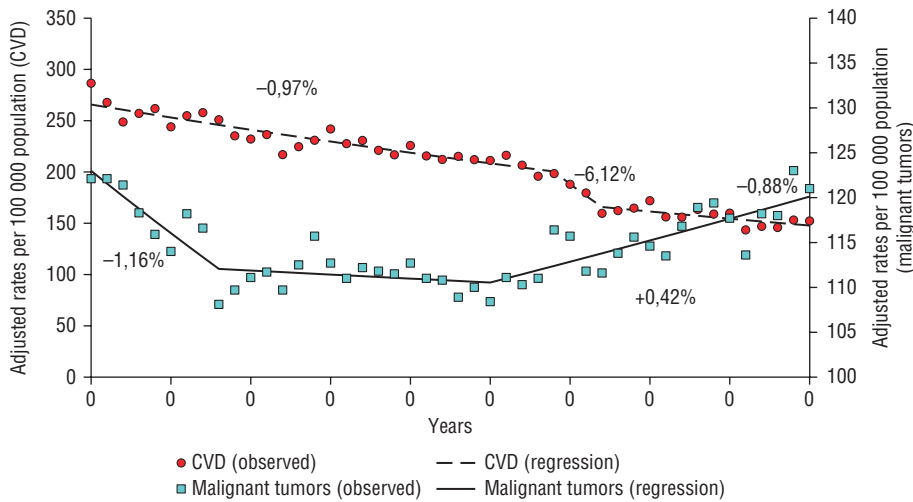
Deaths from heart disease were mainly due to ischemic heart disease (69.1%), predominantly myocardial infarction (42.2%) (4). Hypertension represented the highest risk associated with cardiovascular disease (62.0%) and ischemic heart disease (49.0%) (7).

Malignant tumors have remained the second leading cause of death in Cuba since the end of 1950 (8). The series shows an annual 0.42% increase as a general trend, despite a 1.16% annual decrease in 1970–1978 (Figure 2). In 2015, this cause represented 24.4% of deaths in Cuba, higher than in 1990 (18.9%) (Figure 1).

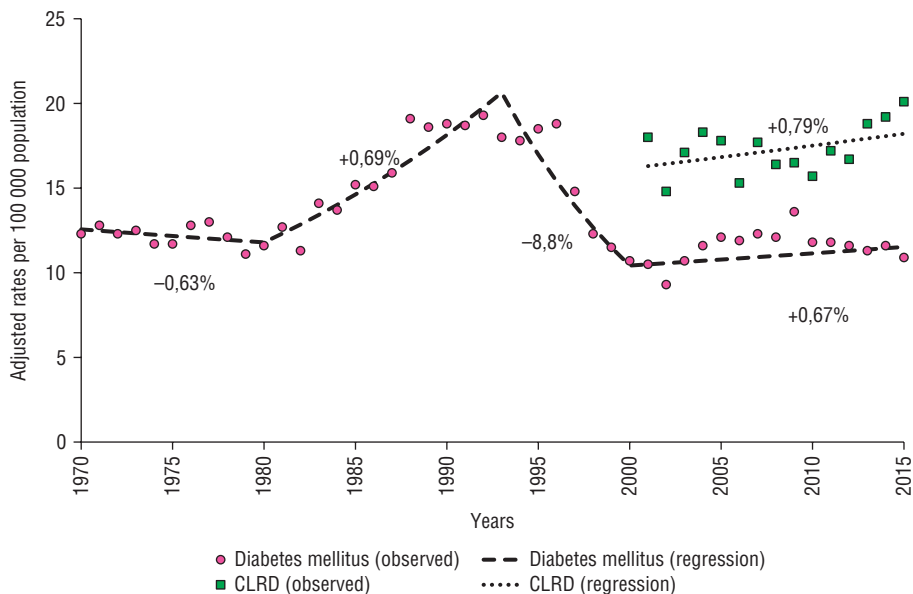
FIGURE 1. Proportional mortality from selected causes. Cuba, 1990 and 2015^a



^a Percentage represented by selected causes in relation to the total number of deaths recorded in Cuba in each year selected. For chronic lower respiratory disease, the period studied was 2001–2015. **Source:** Created by the authors based on Reference 4 and data from the Cuban Ministry of Public Health's National Medical Records and Health Statistics Bureau.

FIGURE 2. Mortality due to cardiovascular disease (CVD) and malignant tumors. Cuba, 1970–2015

Source: Created by the authors based on References 4 and 5, and data from the Cuban Ministry of Public Health's National Medical Records and Health Statistics Bureau.

FIGURE 3. Mortality due to chronic lower respiratory disease (CLRD) and malignant tumors. Cuba, 1970–2015

^aData unavailable to reconstruct the adjusted mortality series for chronic lower respiratory disease before 2001. **Note:** According to the different revisions of the International Classification of Diseases (ICD-10 from 2001 to 2015, ICD-9 from 1978 to 2000 and ICD-8 from 1968 to 1977). For various reasons, to date, the Cuban Ministry of Public Health (MINSAP) has been unable to reconstruct the age-adjusted mortality series in 1970–2000. **Source:** Created by the authors using References 4 and 5, and data from MINSAP's National Medical Records and Health Statistics Bureau.

The majority of tumors (58.0%) manifested in locations for which preventative programs already exist: lung, trachea and bronchi (22.7%), prostate (12.1%), colon (9.7%), breast (in women) (6.4%), oral cavity (3.2%), cervix (2.0%) and skin (1.9%). There is a heightened risk of death from malignant tumors located in the trachea, bronchi and lung (49.1 per

100 000 population), and the intestine, excluding the rectum, (20.6 per 100 000 population) (4), which reveals gaps in the programs and a potential reserve for reducing mortality due to cancer.

In 2013, the most recent year with available records, 44 608 new cases of cancer were recorded. Adjusted rates reflect a predominance in men (263.2 per

100 000 population compared to 223.1 per 100 000 population in women). Each year, more than 300 new cases are diagnosed in those aged <20 years (4).

The age-adjusted mortality rate for chronic lower respiratory disease reached 20.1 per 100 000 population, following a rising trend since 2001, reflected in a slight annual increase of 0.79% (Figure 3).

A substantial decline in mortality due to asthma in the last 25 years is associated with improved prevention and therapeutic procedures. In 2015, the adjusted rate was 1.3 per 100 000 population (4, 9). In 2011, asthma was the third leading cause of doctor visits and hospital discharges (9).

Mortality from diabetes declined during 1970–1980, decreasing annually by 0.63%, except for an upward trend in 1981–1992 (0.69% per year). In 1993–2000, there was a marked decrease (8.8%), followed by an annual increase of 0.67% in 2001–2015 (Figure 3). In 2015, the age-adjusted mortality rate was 11.4 per 100 000 population, lower than other countries in the Americas (4, 10).

PRINCIPAL RISK FACTORS AND TRENDS OF NON-COMMUNICABLE DISEASES

Cuba has carried out three population surveys, representative at both provincial and national levels, to determine risk factors in the population aged ≥15 years. III ENFR includes the results of the two previous surveys conducted in 1995 and 2001 (3). These surveys have provided a population-based system for the surveillance of risk factors and a solid baseline for managing NCDs. In the Cienfuegos municipality, the demonstration site in Cuba of the CARMEN Initiative (*Conjunto de Acciones para la Reducción Multifactorial de Enfermedades No Transmisibles*), a non-communicable disease intervention program, the prevalence of risk factors in 1991, 2001 and 2010 has been recorded (11, 12).

According to the results of III ENFR, tobacco consumption was trending downward (36% in 1995, 32% in 2001 and 24% in 2010), although the rate of decline was only 0.8% per year (Table 1). The prevalence of this risk factor in children aged 13 to 15 years was 17.1%, according to the 2010 survey on tobacco use among youth (13).

Harmful consumption of alcohol also showed a slight downward trend. Consumption was highest in men, especially in urban areas and in groups aged 25 to 54

TABLE 1. Prevalence of selected risk factors. Cuba, 1995, 2001 and 2010^a

Risk factor	1995 ^b	2001 ^b	2010 ^b
Tobacco consumption	36.0	32.0	24.0
Alcohol dependence and harmful consumption	8.0	7.7	7.8
Excess weight (BMI from 25 to 29.9)	N/A	42.6	46.3
Obesity (BMI > 30)	N/A	11.8	15.4
Insufficient physical activity	33.2	38.3	39.6
Hypertension	30.6	33.5	31.9

^aIn percentages.

^bData from urban populations.

Note: BMI: body mass index; N/A: information not available.

Source: Created by the authors based on data from the Third National Survey on Risk Factors and Chronic Diseases (3).

years (3). The frequency of harmful consumption and alcohol dependence did not vary substantially among the surveys conducted (3) (Table 1).

With regard to physical activity, a downward trend has been observed over the last 15 years, with a slight increase in insufficient physical activity (Table 1). In 2010, 39.6% of the population was classified as inactive (insufficient physical activity), with a higher frequency in women. Results of the 2001 survey were similar. Insufficient physical activity was greater during free time (88.2%) (3).

In comparison with the 2001 survey, both excess weight and obesity have increased (Table 1). III ENFR showed a 31.9% prevalence of hypertension in urban areas, lower than that recorded in 2001 (Table 1). In 2010, 8.4% of the Cuban population suffered from high cholesterol (3).

Prevalence of diabetes mellitus in Cuba was 10.1% in the population aged ≥15 years (3), while chronic kidney disease has emerged as a growing health problem: according to III ENFR, 5.2% of the population has a glomerular filtration rate <60 mL/min/1.73 m², which indicates a high probability of chronic kidney failure (3). Similar values were found in a population study carried out in the Isla de la Juventud municipality in 2006 (14).

In summary, the Cuban population has seen an upward trend in risk factors related to NCDs. This negatively influences the evolution of these diseases.

RELEVANT NATIONAL HEALTH SYSTEM ACTIONS FOR PREVENTION AND CONTROL OF NON-COMMUNICABLE DISEASES

Cuba has a renowned history in the health field, thanks in part to its

response to NCDs. Although the majority of the actions included in this report took place in the period 1990–2015, there were important precedents, such as creation of the national health institutes in 1966, which became high quality research and teaching centers involved in the health system's research on the principal NCDs (15). Beginning in the 1970s, continuous expansion of coverage was strengthened, providing services with social inclusion policies, and developing the primary care strategy, consolidated in 1984 when the Family Doctor and Nurse Program was established (16). This program favored comprehensive care through active and continuous monitoring of patients and family members directly in the community. That same year, the Chronic Disease Department was created in the National Hygiene, Epidemiology and Microbiology Institute to comprehensively monitor NCDs.

In 1992, Cuba presented its strategic plan titled *Objetivos, Propósitos y Directrices de la Salud Pública Cubana* (OPD 2000), which outlined goals and guidelines for Public Health in Cuba until the year 2000 (17). It established for the first time comprehensive actions and objectives for combatting NCDs. In 1994, the Non-Communicable Diseases Department and the National Health Promotion and Education Center were created, both in MINSAP. At the same time, similar structures with specialized personnel were formed in the provinces, and even working groups at the municipal level. This organization incorporated new technologies with a programmatic approach, strengthened community and multisector actions, promoted a multidisciplinary approach, consolidated surveillance of risk factors and NCDs, and helped reorient the primary care strategy.

Beginning in 2000, Agreement 3790 of the Executive Committee of the Council of Ministers was implemented, which approved the Health and Quality of Life Program, based on a multi-sector participation model (18). In 2006, Public Health Projections in Cuba for Year 2015 were developed, based on OPD 2000 results (19), which defined the main principles and goals for the period. Then, in 2006, the National Cancer Control Unit was established in MINSAP to lead the Comprehensive Cancer Control Program. Two more units were created in 2009: the Mental Health and Addictions Section, with a network of mental health centers at the municipal level, and the Rehabilitation Section, which has 451 physical rehabilitation rooms providing tobacco cessation services and community-based nutritional counseling in every polyclinic in the country—a formidable example of health service coverage.

From the central level (MINSAP), these organizational units work together to manage capacity building through creation of programs, manuals, guides and other resources, with technology for implementing each product. They also take into account updated information from international sources and the consensus of expert advisor groups on priority diseases, and they include academic accreditation for healthcare provider training. The National Medical Sciences Information Center and Cuba's Health Network, Infomed, provide the technological platforms for networks and services. This network contains sites for the health institutions and special working groups for priority diseases, and specialty networks, among others, that give professionals virtual access to developed products.

Several networks facilitate interinstitutional collaboration for NCD care: the Cardiology Network and its heart centers, the Network of Diabetes Care Centers, the National Nephrology Network and the National Oncology Network. There are also 77 intensive care rooms for adults and 120 municipal intensive care areas that guarantee emergency medical services and advanced life support. The principal demand for care in these units is derived from the effects of NCDs (20). Cuban biotechnology institutions, which form part of the medical-pharmaceutical industry, produce diagnostic tools, reagents, therapeutic vaccines, equipment

and more than 70% of the medicines needed to treat NCDs (15, 21). These institutions contribute to the high levels of therapeutic coverage with State-subsidized medicine for patients with NCDs, and are a model of the social application of scientific research.

Numerous examples demonstrate the results of these actions. In 1998 and 2010, Cuba launched national campaigns to improve hypertension control. Detection of hypertensive patients aged ≥ 15 years registered in health services increased from 8.8% in 1996 to 12.5% in 1998, and rose to 25% in 2015 (4, 22). These results were corroborated by III ENFR, which reported 73% of hypertensive patients were aware their condition, 89% of those who were aware of their condition received treatment, and 55% managed to control their hypertension (3). At the population level, hypertension control was 36%. Cuba is one of only three countries in the Americas (along with the United States and Canada) in which hypertension control at the population level is above 35%, the commitment adopted by the Member States of the Pan American Health Organization for 2019 (3, 23).

The successful treatment provided to diabetics is another example of these remarkable results. In Cuba, 75.5% of diabetics take medication (tablets or insulin) (3). Diabetic foot amputations are performed on over 30% of patients with diabetic foot ulcers, which cause about 1000 lower limb amputations every year (25), for a rate of 2 per 1 000 registered adult diabetics (3). According to a study carried out in the central region of the country (24), amputations have been reduced by 81.2% through the use of Heberprot-P® (15), a Cuban biotechnological product produced using human recombinant epidermal growth factor, also developed in Cuba.

Prevalence of kidney failure in Cuba is presumed to be high, and the annual increase in patients undergoing dialysis replacement therapy is 6% to 20%. Over 3000 patients receive this service, and over 100 kidney transplants are performed annually (around 300 per million population). Taking into account the prevalence of diabetes, hypertension, obesity, primary kidney diseases and the aging population (26), it can be concluded that more early detection of this disease is needed, considering the

consequent loss in opportunity for early treatment.

Cuba has a robust surveillance system for risk factors and NCDs (27), with reliable data in its statistical information system, in addition to the data obtained through the three national risk factor surveys (3). In 2011, the risk factor surveillance system was rolled out in every province, using the World Health Organization (WHO) STEPS approach (28, 29). As an essential component of surveillance, MINSAP's Non-Communicable Diseases Department conducts evaluations of services and technologies that can measure multiple events and the quality of processes (30). Additionally, a national surveillance framework was designed to align the country with the goals and indicators of WHO's Global Action Plan for the Prevention and Control of NCDs 2013–2020 (31).

CHALLENGES AND PRINCIPAL ACTIONS FOR FIGHTING NON-COMMUNICABLE DISEASES

Cuba's health system faces enormous and complex challenges to providing care for NCDs. One of the biggest challenges is accelerating the attention paid to NCDs at the local level throughout the country. This requires that the health system and other sectors be better prepared to promote changes in attitude among individuals, families and communities by creating healthier environments. This scenario is supported internationally and fits into strategies and proposals developed by international bodies, medical societies, and scientific and academic institutions. In line with transformations in Cuba's health system and the State's social policies, health is promoted in policies across all sectors. Proposals for improving policies and regulations to promote healthier lifestyles have been presented, with the aim of reducing the risk factors that most affect Cuba's population (32).

Tobacco consumption plays an important part in the burden of disease in Cuba (33). Interventions have not been sufficient to stop this trend. In particular, the high prevalence of tobacco consumption among youth requires differentiated health strategies aimed specifically at this age group, and comprehensive actions are needed that facilitate implementation of the WHO Framework Convention on Tobacco Control (34).

Another priority area is organization of the healthcare system to improve comprehensive care, focusing on patients with risk factors and NCDs, and promoting self-care and responsibility for one's own health. The health system is working to expand the chronic care model (35) in harmony with the basic concepts of the primary healthcare model. Part of this challenge is improving care for patients with hypertension, diabetes mellitus, asthma, chronic kidney disease and cancer. Higher rates of control can be achieved, and secondary prevention of these diseases can be improved, resulting in lower rates of premature and avoidable mortality from these causes.

Reliable evidence shows that Cuba is developing a cardiovascular disease risk reduction program based at a demonstration site in Matanzas province and extending to other provinces. Its main objective is to improve hypertension control levels. This project emphasizes quality of care, supported by a simplified treatment algorithm based on evidence, high-quality medicines, clinical records that aid clinical monitoring and performance assessment, teamwork beyond physician care, and promoting patient and community involvement. This model is based on widespread international consensus and results obtained in Canada and the United States (36).

LESSONS LEARNED

Due to the complexity of the problem, fighting NCDs has been difficult and often fragmented and disperse. Nevertheless, Cuba has made substantial progress in driving comprehensive actions in NCD care through creation of a structure that spans the ministry and the local level, supported by implementation of a primary care strategy and truly universal healthcare coverage. Table 2 displays the main lessons learned during the process of fighting NCDs.

CONCLUSIONS

Mortality in Cuba is determined by four major health problems: cardiovascular disease, malignant tumors, chronic lower respiratory disease and diabetes mellitus. Together, these conditions are responsible for 68.0% of deaths. Cancer is on the rise and chronic kidney disease is emerging as a serious health problem. Cuba has established baseline data on

TABLE 2. Lessons learned during the process of fighting non-communicable diseases (NCDs)

1. Integration of the different areas, institutions and disciplines in order to combat NCDs is complex, but consensus has been reached on systematically training of human capital, with multidisciplinary participation and the help of academic institutions, which has led to better standardized care for NCDs.
2. Capacity building and development of products from the Cuban medical-pharmaceutical and biotechnology industry, aimed at meeting the growing needs of patients with NCDs and in line with population aging, is a strength.
3. Creation of a surveillance system spanning national and local levels contributes important inputs enabling continuous improvement of the management of prevention and control of NCDs and their risk factors. These possibilities must be explored more effectively.
4. Successfully meeting the challenges imposed on the health system by NCDs requires effective and balanced strategies for both primary and secondary prevention. In the Cuban context, this means primarily strengthening national policies that favor the creation and development of healthy environments with a major decrease in tobacco and alcohol consumption, and improved physical activity habits, as well as a healthy diet.
5. Substantial progress in clinical management of NCDs is needed in critical areas such as improving hypertension control rates, expanding secondary prevention coverage for cardiovascular disease, and improving quality of care for people with diabetes and chronic respiratory disease, among other factors. Effective early detection of preventable malignant tumors is equally imperative, along with timely and standardized treatment.
6. Limited documentation of successful processes and interventions in the field of prevention and control of NCDs in Cuba must be overcome.

Source: Created by the authors.

the risk factors: hypertension and tobacco consumption are the main risk factors related to mortality due to NCDs. In line with the seriousness of these diseases, important milestones and interventions making a positive impact can be

observed, as well as gaps and challenges within the framework of the WHO Global Action Plan for the Prevention and Control of NCDs.

Conflicts of interests. None declared.

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RESUMEN

Enfermedades no transmisibles: factores de riesgo y acciones para su prevención y control en Cuba

Las enfermedades no transmisibles (ENT) representan uno de los mayores desafíos para el desarrollo en el siglo XXI, debido al devastador impacto social, económico y de la salud pública que provocan. El propósito de este artículo es describir la evolución y los factores de riesgo de las ENT en Cuba, principalmente en el período 1990–2015, reseñar las acciones emprendidas por el Ministerio de Salud Pública y destacar los desafíos más importantes para su prevención y control. La información contenida proviene de los datos colectados y publicados por la Dirección de Registros Médicos y Estadísticas de Salud, investigaciones sobre los factores de riesgo, otros estudios fundamentados y la documentación de acciones integrales. La mortalidad en Cuba está determinada por cuatro grandes problemas de salud: enfermedades cardiovasculares, tumores malignos, enfermedades crónicas de las vías respiratorias inferiores y diabetes mellitus, que en conjunto causan el 68,0% de los fallecimientos. La tendencia del cáncer es al ascenso y la enfermedad renal crónica emerge como un grave problema de salud. Cuba cuenta con una línea de base conocida sobre los factores de riesgo, de ellos la hipertensión y el consumo de tabaco son los principales relacionados con la mortalidad por ENT. En consonancia con la importancia de estas enfermedades se aprecian hitos e intervenciones de impacto positivo, así como brechas y desafíos en el marco del Plan de Acción Mundial de la Organización Mundial de la Salud para el enfrentamiento a las ENT

Palabras clave

Enfermedad crónica; factores de riesgo; mortalidad prematura; determinantes sociales de la salud; Cuba.

RESUMO

Doenças não transmissíveis: fatores de risco e ações para sua prevenção e controle em Cuba

As doenças não transmissíveis (DNT) representam um dos maiores desafios do século 21 para o desenvolvimento devido ao devastador impacto social, econômico e de saúde pública que elas causam. O objetivo deste artigo é descrever a evolução e os fatores de risco das doenças não transmissíveis em Cuba, principalmente no período de 1990–2015, para delinear as ações realizadas pelo Ministério da Saúde Pública de Cuba e destacar os desafios mais importantes para sua prevenção e controle. A informação vem dos dados coletados e publicados pela Diretoria de Registros Médicos e Estatísticas de Saúde, pesquisa sobre fatores de risco, outros estudos fundamentados e documentação de ações abrangentes. A mortalidade em Cuba é determinada por quatro principais problemas de saúde: doenças cardiovasculares, tumores malignos, doenças crônicas do trato respiratório inferior e diabetes mellitus, que em conjunto causam 68,0% das mortes. O câncer tem uma tendência crescente, e a doença renal crônica surge como um grave problema de saúde. Cuba tem uma linha de base conhecida sobre os fatores de risco, dos quais a hipertensão e o consumo de tabaco são os principais relacionados à mortalidade por DNT. Em consonância com a importância dessas doenças, há marcos e intervenções com impacto positivo, bem como lacunas e desafios no âmbito do Plano de Ação Mundial da Organização Mundial da Saúde para enfrentar as doenças não transmissíveis.

Palavras-chave

Doença crônica; fatores de risco; mortalidade prematura; determinantes sociais da saúde; Cuba.
