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Social and economic impacts of non-communicable diseases by gender and its correlates: a literature review

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Abstract

Background Tackling social impacts derived from gender disparities is a pathway to universal health coverage (UHC). Gender intersects with other factors behind social and health inequalities, exacerbates them and influences health systems' performance. However, there is scarcity of gender-based studies that assess the social and economic impacts of non-communicable diseases (NCDs). This study aims to identify economic and social impacts of NCDs by gender and its correlates.

Methods Following the guidelines proposed in the Cochrane Manual for Systematic Reviews of Interventions and the PRISMA Statement, we conducted a narrative and structured literature review to identify the economic (direct medical and non-medical, and indirect costs) and social (right to health, employment, poverty, social exclusion, and others) impacts of NCDs by gender, and its structural, sociodemographic, health conditions, political and health systems correlates, for the period 2002–2022, in English and Spanish. Reviewed studies were described according to country and research context, temporal evolution, gender, impacts of NCDs and correlates.

Findings Five thousand five hundred fifty-one publications by title and abstract were reviewed, and 185 articles were selected. There is limited evidence with gender perspective addressing the social and economic impacts of NCDs (around 10% of publications) that helps to better understand the difference in the burden of these conditions between men and women. We identified that the social burden primarily affects women in their quality of life, where gender inequities are observed in aspects such as: health care, employment status and living conditions. In addition, a greater responsibility falls on them as caregivers. On the other hand, the economic burden affects more to men, both in terms of direct medical costs and indirect costs. Among the factors that most influenced the identified impacts, we found gender, age, and socioeconomic level. We also identified that access to health insurance that offers financial protection against these conditions is essential to reduce these impacts.

Conclusions NCDs pose a significant social and economic burden due to their impact on the health of the population, healthcare systems, and the economies of households and nations, which will likely increase over time. This impact is closely related to gender, although it has been scarcely documented. Public policies aimed at enhancing

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access and achieving UHC are essential to guarantee effective financial protection in health, especially for the most vulnerable sectors of the population.

Keywords Non-communicable diseases, Gender, Social impacts, Economic impacts, Social determinants of health

Background

Tackling social impacts derived from non-communicable diseases (NCDs) is a critical challenge for the achievement of the Sustainable Development Goals (SDGs). Worldwide, NCDs are responsible for 74.0% of deaths [1], while also causing disability, pain and suffering. NCDs and their complications such as ischemic heart disease, stroke, loss of extremities, and organ damage (nephropathy, neuropathy, blindness, etc.) affect people living with one or more of these conditions, their families, and health systems [2–4]. Understanding and modifying the factors that influence the NCDs health-disease process is a complex task since their determinants are multifactorial [2, 5].

To adequately analyze and address the differences in vulnerability and consequences of NCDs between men and women, it is necessary to distinguish between sex and gender and their respective health effects. Sex-related differences are based on biological factors or attributes and genetic, epigenetic and hormonal influences of biological sex. They are encoded in our DNA and determine physical and physiological characteristics that relate to reproductive function, sex hormone concentrations, gene expression on the X and Y chromosomes, and their effects. Variations caused by sex differentially affect disease susceptibility and presentation, pathophysiology, clinical manifestations, disease progression, and responses to treatments, acting as modifiers of the major causes of death and morbidity [6–9].

In contrast, gender is a multidimensional social construct related to social norms and expectations within a historical and cultural context. It refers to the socially constructed roles, identities, behaviours, lifestyles, gender relations and life experiences, expressions, and identities of girls, women, boys, men, and gender-diverse people. Gender influences health-disease processes, determining how people perceive themselves and others and how they act and interact with each other [6–9].

Gender conceptual domains such as gender identity, gender roles, gender relations and institutionalized gender, related to health care are frequently ignored by health promotion efforts to prevent and mitigate NCDs [10, 11]. NCDs affect negatively individuals, households, health systems and national economies, causing productivity loss and low economic growth and development [6, 7]. These effects vary between men and women, reflecting how gender influences NCDs and perpetuates structural and power inequalities in society [11]. Therefore, gender becomes a major social determinant of health that modulates behaviors, differential exposure to risk factors, and social vulnerabilities. It also interacts with health systems' responses [10], influencing the way men and women fall ill, seek, access and use health services and attitudes of individuals, the community and medical personnel, which are associated with differences in the use of preventive measures, the prescription of medications, health insurance reimbursement, and the referral or acceptance of specific surgical therapies, between men and women [6–9, 12, 13].

In particular, gender disparities exacerbate the negative effect of poverty as a determinant of NCDs [14, 15], imposing a huge burden of disease for both women and men, but there are important differences. The greater social and economic disadvantages that women face compared to men hinder their ability to reach their full health potential [16]. Most of the worldwide poor are women [17], with lower purchasing power to afford NCD treatment requirements. Gender roles impose caregiving responsibilities on women, reducing their opportunities for formal employment. Additionally, women have less autonomy and voice in household decisions, especially regarding health expenditures, and medical costs affect them more, leaving them with less disposable income [18].

These elements support the hypothesis that gender roles influence the seeking of health services and access to medical care, affecting diagnosis and treatment [18]. Furthermore, risk factors for NCDs are also influenced by gender-defining different levels of exposure and differentiated health damages while they interact with other social determinants [19]. Mitigating gender disparities and their intersection with health and gender-equity goals outlined in the SDGs is a critical, but not well recognized, pathway to consolidate an effective social protection system and achieve universal health coverage (UHC) [20].

The reduction of gender gaps between women and men has been a global concern since the Fourth United Nations World Conference on Women in Beijing in 1995. Nevertheless, there are no clear strategies to adopt the gender perspective as a central axis to promote gender equity in various priority areas, including health [5, 21]. The gender perspective in health implies a broader and clearer vision of the unjustified differences in health

outcomes between men and women, which should help to make better interventions in different spheres, in addition to allowing the identification of gaps of information and evaluation [5, 21]. As a result, governments have been called upon to undertake deliberate policy actions that —without omitting the genetic or physiological aspects that underlie the diseases of either sex— highlight inequalities and contribute to the reduction of gender disparities in health [22].

The design of effective gender-sensitive health policies should be anchored in research that deepens our understanding of social and economic impacts of NCDs from a gender perspective [23]. However, studies that assess the impacts of gender on NCDs remain scarce. A better understanding of gender-related vulnerabilities is relevant to enhance systemwide efforts to improve the health system response, especially in low and middle-income countries (LMICs). This paper aims to present a narrative and structured literature review, for the last two decades, to identify how gender plays a role as an important mediator or determinant in the social and economic consequences attributable to NCDs.

Methods

Search strategy, inclusion criteria and study selection

Following the guidelines proposed in the Cochrane Manual for Systematic Reviews of Interventions version 6.3 [24], and the PRISMA Statement [24], we conducted a narrative and structured literature review to identify the economic and social impacts of NCDs by gender, and its structural, sociodemographic, health conditions, political and health systems correlates, from 2002 to 2022. We employed the most recognized free access digital libraries: PubMed [25], VHL-OPS [26], Elsevier Science Direct [27], Hinari-Research4Life [28], and Cochrane Library [29]. The reference results were provided by PubMed, acknowledged as the most complete tool. The search algorithms were built independently (details in Appendix 1).

The results obtained were assessed through the free access tool Rayyan [30] version 2022 (https://rayyan.ai/reviews), a web app, which facilitates the selection of publications retrieved by the search engines of digital libraries by multiple people simultaneously. This is done through a semi-automation process where it is possible to identify and eliminate duplicates, all based on the review of abstracts and titles of the published works. The selection of potential publications was made by five researchers independently, based on the title and abstract. Potential articles in full version were reviewed to identify those that could provide information on the proposed objectives and proceeded to extract data. The procedure for inclusion and exclusion of publications is described in Fig. 1. Eligible study designs included observational studies, cohort studies, case-control studies, cross-sectional studies, literature reviews, systematic reviews, economic analyses, qualitative studies, and ecological studies. Studies that estimated the impact of at least one of the NCDs of interest in women or men were included: cancers and neoplasms, cardiovascular diseases, chronic respiratory diseases (COPD or asthma), type 2 diabetes mellitus, and chronic kidney disease in at least one of the considered social or economic impact measures (see Appendix 1). Only studies published between 2002 and 2022 were included, with no age restrictions for the participating individuals, in English or Spanish. Potential publications were defined as those that included the outcomes of interest. Studies that addressed populations with other types of conditions, such as congenital; that had another type of outcome (clinical, association with risk factors) or other types of publications such as research protocols, editorial letters, opinion articles, clinical practice guidelines, and preclinical trials) were not included.

Data extraction

We recorded the following variables: country, year of publication, type of impact (social or economic), gender perspective (dichotomous: yes or no), correlates (health system, social and political) that influence the identified impacts, as well as in those who observed greater vulnerability experienced. We considered a study with a gender perspective if it explicitly analyzed how social and cultural differences between genders influence a phenomenon (social or economic), recognizing that the experiences of women and men are determined not only by biology but also by social constructs [31]. Specifically, we identified those publications that, from the approach, results and conclusions, emphasized gender as one of the most relevant aspects in the impact of NCDs, where a definition of gender as a social construct was first made. We described the selected publications according to country and research context, temporal evolution of the cumulative number, gender, NCDs impact dimensions and its correlates.

The protocol of this study was approved by the Research, Ethics, and Biosecurity Committees of the National Institute of Public Health of Mexico (ID: CI-507–2022/CB22-173).

Results

General characteristics of the included studies

After reviewing the title and abstract of 5,551 identified publications, we selected 185 for extensive review (Fig. 1), of which just 12% (22 en total) incorporated the gender perspective, with the majority using sex as a synonym for gender (Table 1). 45.4% of the studies were

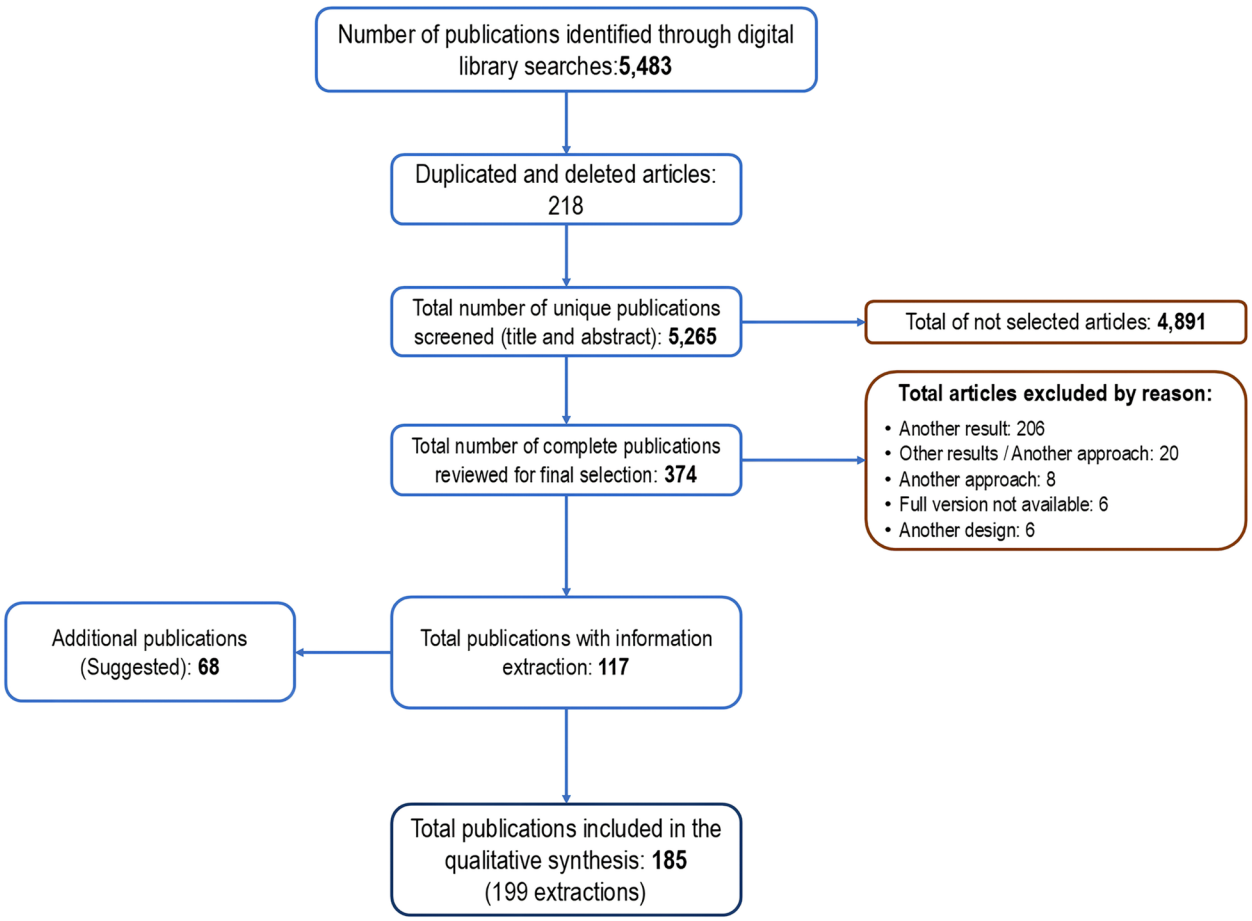

Fig. 1 PRISMA flowchart. Source: Elaboration based on the information extracted

cross-sectional analyses, 15.7% were cohort studies and the remaining 38.9% were observational studies, economic analysis studies, systematic reviews, among others.

95% of the publications reviewed addressed only one NCD. 59.5% dealt with a neoplasm, 14.6% with cardiovascular diseases, and 12% with type 2 diabetes. Regarding neoplasms, 36.6% of the investigations dealt with breast cancer, 28% with cancer in general (without specifying any), 9.3% with cervical cancer, 5.6% with lung cancer, 4.7% with prostate cancer and the remaining 18.8% with others. Breast and cervical cancer were the most investigated in the case of women, while lung and prostate cancers were the most investigated in men.

According to sex, 63.2% of the studies reviewed in full analyzed both sexes, 28.6% only women, 1% men, and the rest were not reported because they were review articles with an ecological analysis. Regarding age, 67.6% included persons aged 18 years and over, 11.4% included all ages, and 10.8% did not report a specific age range. However, they described it as an adult population, 7% did not report such data, and the rest were age ranges other than those mentioned above.

By world region, 47.6% of the reviewed studies were conducted in North America, 21.6% in Asia, 20.5% in Europe, and 4.9% from Latin America (Fig. 2). We also observed a remarkable growth in the cumulative number of publications from the second decade analyzed, with a predominance (in amount and increase) of women over men (Fig. 3).

Measures of social or economic impact

Of the articles selected, 65.4% addressed economic impacts (49.7% direct medical costs, 13% indirect costs, and 2.7% direct non-medical expenses). In comparison, the remaining (34.6%) addressed social impacts (10.3% impacts on quality of life, 7.6% on gender inequality, 4.9% right to health, 8.1% quality and level of employment, and 4.3% on poverty, support networks and social exclusion) (Fig. 4).

Excluding the review studies ($n=17$), of those focused on women ($n=53$), 62.3% addressed economic impacts

Table 1 Characteristics of the publications included in the qualitative synthesis

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
1	Kumar et al. (2020)	A cross-sectional	93,925	Hospital discharges	> 1 NCD	Both	All ages	Asia	India	Local	Social-Economic	Gender equality + Poverty + Costs medical directors	Gender inequity in health care, they experience financial difficulties and Catastrophic health expenses	Social: Gender (woman), age (young and old) and income / System. Health: Low health coverage
2	Shugarman et al. (2008)	A cross-sectional	13,120	Deaths	Cancer	Both	≥ 68	North America	USA	Local	Economic	Direct medical costs	Health care costs	Social: Gender (women) and age (75–84) / Sist. Health: serv. social support
3	Feletto et al. (2019)	Review article	Not specified	Publications	Cancer	Does not apply	Does not apply	Oceania	Australia	Local	Economic	Indirect costs	Costs due to lost labor productivity	Social: Gender (woman), inequity in labor remuneration and unpaid work
4	Greimel et al. (1998)	A cross-sectional	227	Patients	Cancer	Both	All ages	North America	USA	Local	Social	Gender equality + Quality of life	Gender inequality in health care and Disability	Social: Gender (woman), health condition (physical limitations), poor social resources / Health condition: Perception of health status and comorbidity.
5	Jacobs-Lawson et al. (2010)	A cross-sectional	100	Patients	Cancer	Both	≥ 18	North America	USA	Local	Social	Quality of life	Health condition	Social: Gender (woman), religion (practices) and social networks.
6	Bugge et al. (2021)	Observational study	64,694	Deaths	Cancer	Both	All ages	Europe	Norway	Local	Social	Right to health + Gender equality repercussions	Use of health services, quality of care and gender inequality in health care	Social: Gender (female), age (≥ 60), gender (male-Direct medical costs) / Health condition: Type of cancer / Sist. Health: Quality of care and Use of Serv. Health
7	Katz et al. (2003)	A cross-sectional	82	Patients	Cancer	Both	24 to 85	North America	Canada	Local	Social	Quality of life	Quality of life	Social: Gender (female) and low social support networks / Health condition: Type of cancer (face): Disfigurement

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
8	Carrero et al. (2017)	Review article	Not specified	Publications	CKD	Does not apply	Does not apply	Europe	Sweden	Global	Social	Gender equality + Right to health	Gender inequality in health care and quality of care	Social: Gender (woman) / System. Health: Health access and quality of care.
9	Azad et al. (2005)	Review article	Not specified	Publications	CVD	Does not apply	Does not apply	North America	Canada	Global	Social	Gender equality + Right to health	Gender inequality in health care and quality of care	Social: Gender (woman) / System. Health: Quality of health care and type of treatment
10	Bhuyan et al. (2017)	A cross-sectional	14,226	Participants	CVD	Both	≥ 18	North America	USA	Local	Social	Right to health + Gender equality repercussions	Access to medicines and Women with limited resources	Social: Gender (woman), poverty and low income / Sist. Health: No access to health insurance
11	Möller-Leimkühler et al. (2007)	Review article	Not specified	Publications	CVD	Does not apply	Does not apply	Europe	Germany	Global	Social	Gender equality + Quality of life	Gender inequality in health care and health condition	Social: Gender (woman) and SES / Health condition: psychosocial factors (depression) / Sist. health: quality of care
12	Murasko et al. (2006)	A cross-sectional	General sample: 13,271 men and 15,091 women / CVD sample: 1,754 men and 1,789 women	Participants	CVD	Both	45 to 64	North America	USA	Local	Social	Right to health	Access to health insurance and use of health services	Social: Gender (woman) / System. Health: Low access to health insurance and low use of services. Health
13	Mateo-Rodríguez et al. (2021)	Literature review	Not specified	Publications	CVD	Does not apply	Does not apply	Europe	Spain	Global	Social	Gender equality + Quality of life	Gender inequality in health care and health condition	Social: Gender (woman) / System. Health: Access to health insurance and quality of care
14	Basu et al. (2010)	A cross-sectional	81,307	Participants	CVD	Both	Not specified	North America	USA	Local	Economic	Direct medical costs	Health care costs	Social: Gender (female) and age (older)
15	Gulbins et al. (2013)	Review article	Not specified	Publications	CVD	Does not apply	Does not apply	North America	USA	Global	Economic-social	Medical director costs + Gender equality repercussions + Quality of life	Health Care Costs (Treatment), Gender Inequity in Health Care, and Health Condition	Social: Gender (woman) / System. Health: Quality care (preventive Tx)

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
16	Shaw et al. (2017)	Review article	Not specified	Publications	CVD	Does not apply	Does not apply	North America	USA	Global	Social	Gender equality repercussions	Gender inequality in health care	Social: Gender (woman) / System. Health: Low quality of health care
17	Morris et al. (2019)	A cross-sectional	13 countries: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Sweden, Switzerland and the United Kingdom.	Indicators by country	CVD	Both	25 to 64	North America	USA	Regional	Social-Economic	Gender equality repercussions + Indirect costs	Gender equity in health, Mortality and Morbidity: Years of life lost	Social: Gender (both) / Social Policy: Public spending on paid parental leave, public spending on job training (men) and public employment services (women).
18	Worrall-Carter et al. (2012)	Review article	Not specified	Publications	CVD	Does not apply	Does not apply	Oceania	Australia	Global	Social	Gender equality + Right to health	Gender equity in health, Access to health services and Quality of care	Social: Gender (female), low SES, rural or remote areas, being indigenous, cultural and historical perceptions of CVD, and social role (responsibilities)
19	Lou et al. (2012)	A cross-sectional	5,650	Patients	RespD	Both	40 to 75	Asia	China	Local	Social-Economic	Gender equality repercussions + Medical director costs + Indirect costs	Gender inequity in health care, Costs of health care (ambulatory, hospital and medicines) and Costs due to Loss of Labor Productivity	Social: Gender (woman), habits.-smoking (men) vs. biofuel use (woman) and low SES / Syst. Health: lack of financial protection in health and quality of care.
20	Shrestha et al. (2013)	A cross-sectional	200	Participants	T2DM	Both	44 to 70	Asia	Nepal	Local	Social	Gender equality + Right to health	Gender inequality in health care and quality of care	Social: Gender (female) and low educational level
21	Kim et al. (2020)	Qualitative study	11,216	Participants	T2DM	Both	30 to 55	Asia	South Korea	Local	Social	Employment level + Gender equality repercussions + Right to health	Decrease in employment or unemployment, labor gender inequality and access to health insurance	Social: Gender (woman), age, employment status and unemployment / Sist. Health: Access to national health insurance / Health condition: Dx T2DM

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
22	Bhuyan et al. (2018)	A cross-sectional	5260 men y 6188 women	Patients	T2DM	Both	18+	North America	USA	Local	Social-Economic	Right to health + Quality of life + Direct medical costs	Access to medicines, Non-adherence to medicines and Costs of medicines	Social: Gender (female), age (young), low SES and habit (smoking) / Health condition: functional limitations and perceived health (poor) / Sist. Health: (WITHOUT) health insurance and (WITHOUT) health institution.
23	Verma et al. (2021)	A cross-sectional	2014: 26,816 / 2017-18: 38,835	Households and Individuals	> 1 NCD	Both	All ages	Asia	India	Local	Economic-social	Direct Medical Costs + Poverty	Catastrophic Health Expenses and Impoverishment	Social: Income, low SES, poverty, rural area / Sist. Health: Health insurance coverage and private health services
24	Choi et al. (2015)	A cross-sectional	7,006	Households	> 1 NCD	Both	20 to 79	Asia	South Korea	Local	Economic	Direct medical costs	Catastrophic health expenses	Social: Type of head (female), age, low SES, presence of elderly and family member with NCD / Policy: Recipients of the Korean medical assistance program, financial protection against catastrophic health expenses
25	Carrillo González et al. (2014)	A cross-sectional	50	Caregivers	> 1 NCD	Both	≥ 18	Latin America	Colombia	Local	Social	Gender equality repercussions	Burden and responsibility as a caregiver	Social: Sex (women), age, low SES and with family social networks.
26	Jayasinghe et al. (2013)	A cross-sectional	Doctors: 193 and Patients: 2181	Doctors and patients	> 1 NCD	Both	≥ 18	Oceania	Australia	Local	Social	Gender equality + Quality of life	Gender inequality in health care and quality of life	Social: Sex (female), employment status, age (< 39 years) and health status
27	Kwan et al. (2020)	A cross-sectional	379	Patients	> 1 NCD	Both	≥ 18	North America	Haiti	Local	Social	Right to health + Poverty	Access to health services and financial stress	Social: Sex (female), area of residence (rural) and low SES (poverty) and financial difficulty.

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
28	Giang et al. (2020)	A cross-sectional	2,038	Participants	> 1 NCD	Both	Not specified	Asia	Vietnam	Local	Social-Economic	Right to health + Direct medical costs	Utilization of health services, Out-of-pocket health expenses and Financial toxicity	System Health: (WITHOUT) health insurance, high level hospitalizations / Social: Age (> 65 years), very low SES, Type of head (female), (WITH) elderly people or children < 6 years / Health condition: Comorbidities
29	Blomgren et al. (2016)	Case-control study	Cases: 24,389 and controls: 24,389	Participants	> 1 NCD	Both	25 to 64	Europe	Finland	Local	Economic-social	Direct medical costs + Quality of life	About indebtedness and Quality of life	Social: Sex (female), age (older adults) and over-indebtedness.
30	Valtorta et al. (2013)	Systematic review	35	Publications	> 1 NCD	Does not apply	Does not apply	Europe	United Kingdom	Global	Economic	Direct Medical Costs + Direct Non-Medical Costs + Indirect Costs	Health care costs over HS, Health care costs and costs due to lost labor productivity	Social: Age (> =65 years), perception of health needs, annual income < 30,000 and low SES
31	Murphy et al. (2020)	A cross-sectional	18 countries by income level. 51,920 households: • Households with a person with an NCD: 17,435 • Hypertension: 11,831 Without any: 22.654	Countries and households	> 1 NCD	Both	Not specified	Europe	United Kingdom	Global	Economic-social	Direct medical costs + Direct non-medical costs + Poverty	Out-of-pocket expenses on health and impoverishment	Structural: country income (higher risk in low- and middle-income countries and China) / Social: Households with family members with NCDs and sex (female) / Sist. Health: Financial protection in health
32	Longo et al. (2011)	A cross-sectional	282	Patients	Cancer	Both	≥ 18	North America	Canada	Local	Economic	Direct medical costs + Direct non-medical costs	Out-of-pocket health expenses, Device costs and Costs of care / travel or tickets	Social: Age, sex (female) and income / Syst. health: Limited health insurance coverage / Health condition: Type of cancer (CaMa)
33	Sherwood et al. (2008)	Qualitative study	22	Women	Cancer	Women	36 to 67	North America	USA	Local	Economic	Direct Medical Costs + Indirect Costs	Health Care Costs and Loss of Income	Social: SES, income, social and family networks / Sist. Health: Type of health insurance

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
34	Ferrier et al. (2021)	Cohort study	168	Patients	Cancer	Women	42 to 57	Europe	France	Local	Economic-social	Indirect Costs + Share Capital	Costs for work absenteeism and Human Capital	Social: Labor occupation / Health condition: Stage of the disease
35	Bradley et al. (2006)	A cross-sectional	445	Patients	Cancer	Both	30 to 64	North America	USA	Local	Social	Quality of work + Quality of life	Work absenteeism experience and PL loss experience	Social: Sex (female) and employment status / Sist. Health: Type of treatment
36	Zheng et al. (2016)	A cross-sectional	112,701	Participants	Cancer	Both	≥ 18	North America	USA	Local	Economic	Direct Medical Costs + Indirect Costs	Health Care Costs, Disability Costs, and costs due to lost labor productivity	Health condition: Cancer type (colorectal and breast) / Social: Age (≥ 65)
37	Insinga (2006)	Economic analysis	130,377	Deaths	Cancer	Women	Not specified	North America	USA	Local	Economic	Indirect costs	Costs due to lost labor productivity	System Health: Low coverage in prevention, diagnosis and timely treatment
38	Zheng et al. (2022)	Economic analysis	7,366	Clinical records	Cancer	Women	Not specified	Asia	China	Local	Economic	Direct medical costs	Health care costs	System Health: Medication expenses, surgery, length of stay, health insurance status and institution level.
39	Viñolas et al. (2020)	Cohort study	333	Patients	Cancer	Both	36 to 85	Europe	Spain	Local	Social	Poverty	worst economic situation	Social: Sex (none), age and family social networks
40	Shao et al. (2017)	A cross-sectional	123	Patients	Cancer	Women	44 to 63	Asia	China	Local	Social	Quality of life + Poverty	Quality of life and worse economic situation	Social: Age, education, low SES and occupation / Sist. Health: Type of health insurance
41	Hanly et al. (2012)	A cross-sectional	358	Patients	Cancer	Both	All ages	Europe	Ireland	Local	Economic	Indirect costs	Costs due to lost labor productivity	Social: Sex (both), age (youth), income and employment status
42	Bradley et al. (2002)	Cohort study	• Households: 7,607 • Individuals: 12,557	Households and Individuals	Cancer	Women	51 to 61	North America	USA	Local	Social	Work quality	labor social integration	Health Condition: Diagnosis of BCa
43	Radice et al. (2003)	Review article	Not specified	Publications	Cancer	Does not apply	Does not apply	Europe	Italy	Global	Economic-social	Direct medical costs + Indirect costs + Quality of life	Health care costs on HS, Morbidity and mortality and Quality of life	Health condition: Stage of disease

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
44	Bradley et al. (2002)	Case-control study	5,974	Women	Cancer	Women	51 to 61	North America	USA	Local	Social	Work quality	Labor inequality, Working time and Wage inequality	Social: labor market
45	Li et al. (2013)	Observational study	88	Caregivers (couple)	Cancer	Men	34-80y	North America	USA	Country	Economic	Indirect Costs + Direct Non-Medical Costs	Costs due to lost labor productivity and Costs in caregivers	Social: Employment status (unpaid work: Caregivers)
46	The ACTION Study Group (2015)	Cohort study	6,787 patients from eight countries: Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Thailand, and Vietnam.	Countries and households	Cancer	Both	≥ 18	Oceania	Australia	Regional	Economic-social	Direct Medical Costs + Share Capital	Catastrophic Health Expenditures and Premature Death	Social: Age, sex (men at death), and educational level, household income, experience of economic hardship, and paid employment status. / SYst. Health: Safe access to health.
47	Leng et al. (2019)	Observational study	792	Deaths	Cancer	Both	All ages	Asia	China	Local	Economic-social	Direct Medical Costs + Poverty	Catastrophic Health Expenses and Impoverishment	Social: Income
48	Houts et al. (1985)	A cross-sectional	185	Patients	Cancer	Both	16 to 76	North America	USA	Local	Economic	Direct medical costs	Financial risk for health care	Social: Age, race, income, and region. / System Health: Health insurance
49	Bouknight et al. (2006)	A cross-sectional	416	Patients	Cancer	Women	30 to 64	North America	USA	Local	Social	Work quality	Labor condition to the Dx and labor reinstatement	Social: Working conditions
50	Miranda et al. (2021)	Economic analysis	4,495	Patients	Cancer	Women	< 40 to ≥ 70	North America	USA	Local	Economic	Direct medical costs	Health care costs on HS	System Health: Recent Diagnosis of cancer
51	Singh et al. (2020)	A cross-sectional	Not specified	Patients	Cancer	Women	45 to 60	Asia	India	Local	Economic	Direct medical costs	Health care costs	Social: Low income / Sist. Health: Low health coverage and inadequate financial protection
52	Eaglehouse et al. (2016)	Observational study	2,666	Women	Cancer	Women	40 to 64	North America	USA	Local	Economic	Direct medical costs	Health care costs on HS	Social: Age / Sist. Health: Type of health insurance and beneficiaries

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
53	Lindbohm et al. (2014)	Observational study	914 patients from four countries: Denmark, Finland, Iceland and Norway.	Cancer survivors	Cancer	Women	<65	Europe	Finland	Regional	Social	Employment level + Quality of life	Unemployment and Quality of Life	Social: Low educational level / Health condition: Stage of the disease and low functional status
54	Yue et al. (2020)	A cross-sectional	477 (Weight: 609787)	Patients	Cancer	Women	≥21	North America	USA	Local	Economic	Direct medical costs	Health care costs	Social: Income (low and medium) and region / Sist. Health: Type of health insurance (private)
55	Zhang et al. (2017)	A cross-sectional	195	Cancer survivors	Cancer	Both	All ages	Asia	China	Local	Economic	Direct medical costs	Health care costs	System Health: Low health insurance coverage / Social: sex (male) and area (urban)
56	Sargazi et al. (2022)	Economic analysis	Cancer incidence: 3,500 and Cancer prevalence: 10,000	Patients	Cancer	Women	Not specified	Asia	Iran	Local	Economic	Direct Medical Costs + Direct Non-Medical Costs + Indirect Costs	Health Care Costs, Transportation, Lodging, and Food, costs due to lost labor productivity for Disability, Absenteeism, or Early Death	Social: Sex (woman), cultural aspects / Syst. Health: Quality of health care / Health condition: Stage 1, type of cancer (ovarian and endometrial)
57	Borget et al. (2011)	Economic analysis	52,099	Patients	Cancer	Both	Not specified	Europe	France	Local	Economic	Direct medical costs	Health care costs on HS	Health condition: Type of cancer (Men: head and neck Ca, women: invasive BCu and head and neck Ca)
58	Préaud et al. (2013)	Revisión de alcance	21	Publications	Cancer	Does not apply	Does not apply	Europe	France	Regional	Economic	Direct medical costs	Health care costs	Social: Sex (men) / Health condition: Type of cancer attributed to HPV (Not CC)
59	Sasser et al. (2005)	Case-control study	12,154	Women	Cancer	Women	50 to 64	North America	USA	Local	Economic	Direct Medical Costs + Indirect Costs	Health Care Costs, Disability Costs, and Absenteeism Costs	Social: High use of medical services and labor condition (loss of work) / Health condition: Postmenopausal.

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
60	Yun et al. (2005)	Economic analysis	704	Caregivers	Cancer	Both	All ages	Asia	South Korea	Local	Social-Economic	Quality of life + Indirect costs	Quality of life and Loss of family income	Social: Poverty, marital status (married), high health expenses, long-term caregivers / Health condition: Poor health condition
61	Mullins et al. (2004)	Cohort study	5,765	Patients	Cancer	Both	≥ 18	North America	USA	Local	Economic-social	Direct medical costs + Gender equality repercussions	Health Care Costs and Inequity in Health Care	Social: sex (both), low SES and area of residence (suburban)
62	Hensley et al. (2005)	A cross-sectional	245	Patients	Cancer	Women	26 to 76	North America	USA	Local	Economic	Direct medical costs	Health care costs	System Health: Access Serv. Health / Social: Age (young) and low income
63	Ell et al. (2008)	A cross-sectional	487	Patients	Cancer	Women	≥ 50	North America	USA	Local	Social	Quality of life + Poverty	Quality of life, Experience of loss of productivity and Worse economic situation	Social: Unemployment, health expenses and income
64	Priyadarshini et al. (2021)	Economic analysis	7,085	Deaths	Cancer	Both	Not specified	North America	USA	Local	Economic	Indirect costs	Costs due to lost labor productivity	Social: sex (both) / Health condition: Type of cancer (women - cervicouterine and men - anus and oropharyngeal) / System. Health: Preventive program (HPV vaccines)
65	Knaul et al. (2009)	Cohort study	Osteoporosis: 2314, BCa: 555, CVD: 1710 and Controls: 7575	Diagnosed cases	Cancer	Women	Not specified	North America	Mexico	Local	Economic	Direct medical costs	Health care costs on HS	Health condition: Advanced stages / Sist. Health: Late diagnosis
66	Zajacova et al. (2015)	A cross-sectional	With cancer: 1117 / Without cancer: 15,856	Participants	Cancer	Both	25 to 64	North America	USA	Local	Social	Employment level + Poverty	Decrease in employment or unemployment, Lower labor market and Decrease in income	Social: sex (man), labor market, low SES

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
67	Kim et al. (2014)	A cross-sectional	830	Cancer survivors	Cancer	Both	>18	Asia	South Korea	Local	Social	Employment level + Quality of life	Decrease in employment or unemployment, Experience of loss of productivity and Quality of life	Social: Sex (female), age (advanced), low educational level, low income, employment status / Health condition: Comorbidity.
68	Yabroff et al. (2008)	A cross-sectional	Men < 65: 69.6 vs. >= 65: 1446.5 / Women < 65: 60.2 vs. >= 65: 883.7	Deaths	Cancer	Both	Not specified	North America	USA	Country	Economic	Indirect costs	Cost per Potential Years of Life Lost	Social: sex (both), population dynamics and life expectancy
69	Ekwueme et al. (2008)	Economic analysis	Not specified	Women	Cancer	Women	50 to 74	North America	USA	Local	Economic	Direct medical costs	Health care costs	Social: Gender (female), race (non-Hispanic)
70	Kim et al. (2008)	A cross-sectional	311,759	Patients	Cancer	Both	All ages	Asia	South Korea	Local	Economic	Direct Medical Costs + Indirect Costs	Health care costs, costs due to lost labor productivity and Premature death	Social: sex (both) / Sist. Health: Medical fees / Health condition: Type of cancer (stomach, lung, liver, colorectal, breast and cervical)
71	Gutiérrez-Delgado et al. (2016)	A cross-sectional	Deaths: 20,526 and cases: 605,758	Deaths and estimated cases	Cancer	Both	15–64	North America	Mexico	Country	Economic	Indirect costs	Lost income costs due to premature death, benefits, disability and non-medical caregiver opportunity.	System Health: Low coverage in prevention and timely diagnosis / Social: sex (male)
72	Huang et al. (2017)	A cross-sectional	2,356	Patients	Cancer	Both	Not specified	Asia	China	Local	Economic	Direct medical costs	Health care costs	Health condition: Advanced stage of CaCol / Syst. Health: Quality of health care
73	Gordon et al. (2007)	Cohort study	287	Women	Cancer	Women	Mean: 57	Oceania	Australia	Local	Economic	Direct medical costs	Health care costs	Social: Age (< 50 years) / Health condition: nodules
74	Chen et al. (2021)	Qualitative study	544	Patients and couples	Cancer	Both	Not specified	Asia	China	Local	Social	Support networks	couple relationship	Social: Family social networks (couples) and gender (patients - women and couples - men)

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
75	Longo et al. (2006)	A cross-sectional	282	Patients	Cancer	Both	61 to 68	North America	Canada	Local	Economic-social	Direct medical costs + Direct non-medical costs + Quality of life	Out-of-pocket health expenses, Travel or tickets and Work absenteeism	System Health: Wide coverage / Social: Unemployment, low income and family social networks / Health condition: Stage of the disease
76	The ACTION Study Group. (2015)	A cross-sectional	4 585 surgery patients from eight countries • Cambodia: 111 • Indonesia: 782 • Laos: 50 • Malaysia: 644 • Myanmar: 732 • Philippines: 528 • Thailand: 651 • Vietnam: 1,086	Patients	Cancer	Both	≥ 18	Oceania	Australia	Regional	Economic-social	Direct medical costs + Indirect costs + Gender equality repercussions	Catastrophic Health Expenditures, Mortality and Gender Inequity in Health Care / Low SES	System Health: Health Insurance Status / Social: Low SES
77	Chen et al. (2020)	A cross-sectional	273	Patients	Cancer	Women	20 to 79	North America	USA	Local	Social	Poverty + Right to health	Worse economic situation and Worsened health insurance	Social: Low acculturation
78	Rosenzweig et al. (2019)	A cross-sectional	145	Patients	Cancer	Women	Not specified	North America	USA	Local	Economic-social	Direct medical costs + Quality of life	Financial Toxicity and Quality of Life	Health condition: Cancer stage (metastatic) / Social: Low income
79	Bauer et al. (2020)	Observational study	49	Patients	Cancer	Men	Mean: 64.3	North America	USA	Country	Social	Poverty	Experience financial hardship, Experience financial toxicity, and Experience financial stress	Social: Employment status, race (ethnic minorities), and income level (< 35,000)
80	Imber et al. (2020)	Review article	Not specified	Publications	Cancer	Does not apply	Does not apply	North America	USA	Global	Economic	Direct Medical Costs + Indirect Costs	Financial Toxicity, Health Care Costs, and costs due to lost labor productivity	Social: Age (older adults), low SES, ethnic minorities (African Americans) / Syst. Health: Quality of health care
81	Chirikos et al. (2002)	Case-control study	105	Cancer survivors	Cancer	Women	Not specified	North America	USA	Local	Social-Economic	Quality of life + Indirect costs	Functional impairment, costs due to lost labor productivity, loss of productivity and income	System Health: Access to health insurance / Social: Discrimination

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
82	Huang et al. (2021)	A cross-sectional	55 countries from six regions: Africa, Asia, Europe, Latin America and the Caribbean, North America and Oceania.	Indicators by country	Cancer	Both	Not specified	Asia	Taiwan	Global	Economic	Direct medical costs	Health care costs on HS	Social: Sex (female)
83	Dahlberg et al. (2009)	Cohort study	53	Patients	Cancer	Women	32 to 88	Europe	Sweden	Local	Economic	Indirect costs	Survival time and Costs of health care (medications & hospitalization)	Health condition: Subtype of tumor and Stage of the disease (cancer) / Social: Age (< 60 years) / Sist. health: Type of therapy and medication
84	Krahn et al. (2010)	Case-control study	42 484	Patients	Cancer	Men	Not specified	North America	Canada	Country	Economic	Direct medical costs	Medications, hospitalization and emergencies	Health condition: Stage of the disease (advanced) and comorbidities. / Social: Advanced age and low income.
85	Vyas et al. (2017)	Cohort study	69,307	Clinical records	Cancer	Women	≥ 66	North America	USA	Local	Social-Economic	Right to health + Direct medical costs	Utilization of health services, Costs of health care (initial phase) and Determinants of costs	Social: Age (66–69 years), race (African-American), high income / Sist. Health: Quality of health care / Health condition: Advanced stages, comorbidities or mental conditions.
86	Ventura-Alfaro et al. (2016)	Ecological study	182,322	Hospital discharges	Cancer	Women	≥ 25	North America	Mexico	Local	Social	Right to health + Social capital	Access to Health Insurance, Health Disparity, and High Mortality Rates	System Health: No access to health insurance / Structural: Low rate of marginalization
87	Vignes et al. (2020)	Cohort study	134	Patients	Cancer	Women	Median: 54	Europe	France	Local	Social	Quality of life	Work capacity and quality of life	Social: Labor networks and work environment
88	Cid et al. (2016)	Economic analysis	1 682 056	Hospital discharges	Cancer	Both	Not specified	Latin America	Chile	Local	Economic	Direct Medical Costs + Indirect Costs	Costs of health care on HS, Costs due to work absenteeism and Premature death	System Health: Type of health insurance / Social: Sex (Men), age (≥ 65 years) / Health condition: Type of cancer

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
89	Doshmangir et al. (2021)	Systematic review with meta-analysis	33 (19)	Publications	Cancer	Does not apply	Does not apply	Asia	Iran	Global	Economic	Direct medical costs	Catastrophic health expenses	Structural: Countries with low HDI / Sist. Health: Access to health insurance, health financing mechanisms / Social: Sex (female), age (older adults) and low educational level. /
90	Ahmadi et al. (2021)	A cross-sectional	138	Patients	Cancer	Women	32 to 56	Asia	Iran	Local	Economic-social	Direct Medical Costs + Poverty	Out-of-Pocket Health Spending, Catastrophic Health Spending, and Impoverishing Health Spending	Public policy / Health system: lack of health insurance coverage / Social: Rural areas, radiotherapy, Age (45 to 64), illiterate and single.
91	Wan et al. (2013)	A cross-sectional	BCa Metastases: 139, BCa: 432 and Controls: 820.	Patients	Cancer	Women	18 to 64	North America	USA	Local	Economic-social	Indirect Costs + Quality of Life	Lost Work Productivity Costs, Disability and Leave Costs	Health condition: Stage of disease
92	Oliva-Moreno et al. (2018)	A cross-sectional	22,716	Deaths	Cancer	Women	Not specified	Europe	Spain	Local	Economic	Indirect costs	Cost per Potential Years of Life Lost and Premature Death	Social: Age and employment status
93	Corman et al. (2019)	Economic analysis	558,717	Deaths	Cancer	Women	Not specified	North America	USA	Local	Economic	Indirect costs	Costs due to lost labor productivity	Social: Age and employment status
94	Allaire et al. (2016)	Case-control study	Cases: 9912 and Controls: 9912	Patients	Cancer	Women	18 to 44	North America	USA	Local	Economic-social	Direct medical costs + Quality of life	Outpatient Care and Medications and Depression	Social: Age (< 45 years) / System. Health: Quality of health care
95	Granados-García et al. (2019)	Observational study	346	Patients	Cancer	Women	41 to 67	North America	Mexico	Local	Economic	Direct medical costs	Health care costs on HS	System Health: Quality of health care / Health condition: Stage of the disease
96	Trogdon et al. (2020)	Case-control study	Bed: 4805 and controls:	Patients	Cancer	Women	≥ 18	North America	USA	Local	Economic	Direct medical costs	Health care costs	Social: Sex (female) and age (18 to 44 years) / System. Health: Quality of health care / Health condition: Metastatic cancer.

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
97	Seal et al. (2013)	Observational study	5,160	Patients	Cancer	Both	18 to 64	North America	USA	Local	Economic	Direct medical costs	Catastrophic health expenses	Social: Age (18 to 50), sex (men) and region / Sist. Health: Type of health insurance (preferred providers) and Quality of health care / Health condition: Stage of disease (metastasis) and comorbidities
98	Bernard et al. (2011)	Economic analysis	5,815	Patients	Cancer	Both	Not specified	North America	USA	Local	Economic-social	Direct medical costs + Right to health	Out-of-pocket health expenses and access to health insurance	System Health: Private insurance / Social: Age 55 to 64 years, single, unemployed, low income, low education, non-metropolitan areas / Health condition: comorbidities
99	Houts et al. (1984)	Economic analysis	139	Patients	Cancer	Both	16 to 86	North America	USA	Local	Economic	Direct Non-Medical Costs + Indirect Costs	Out-of-Pocket Non-Medical Health Expenses and Lost Wages (Family)	Social: Distance to places of care, age (youth) and marital status (widow, separation or divorce),
100	Lauzier et al. (2011)	A cross-sectional	800	Patients	Cancer	Women	23 to 88	North America	Canada	Local	Economic-social	Direct medical costs + Direct non-medical costs + Right to health	Out-of-pocket health expenses (radiotherapy), Travel or tickets and Lack of access to health services	Social: Distance from health care services (> 50 km)
101	Hanly et al. (2015)	Economic analysis	344 150 from 30 countries separated into four regions.	Deaths	Cancer	Both	15 to 64	Europe	Ireland	Regional	Economic	Indirect costs	Cost per Potential Years of Life Lost and Premature Death	Social: Sex (men) / Health condition: Type of cancer (lung, breast or rectum)
102	Bordonaro et al. (2021)	Literature review	32	Publications	Cancer	Does not apply	Does not apply	Europe	Italy	Global	Economic-social	Direct medical costs + Quality of work + Quality of life	Out-of-pocket health expenses, work absenteeism and quality of life	System Health: Type of insurance coverage / Social: Age and family income / Health condition: Stage of disease and functional status

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
103	Lauzier et al. (2013)	Cohort study	Patients: 829 and couples: 391	Patients and couples	Cancer	Women	23 to 88	North America	Canada	Local	Economic-social	Direct Medical Costs + Indirect Costs + Poverty	Out-of-pocket health expenses, Lost income and Worst economic situation	System Health: Financial Assistance / Social Policy: Financial Assistance Programs / Social: Loss of Income
104	O'Neill et al. (2015)	A cross-sectional	61	Patients	Cancer	Women	34 to 70	North America	Haiti	Local	Economic-social	Direct non-medical costs + Indirect costs + Poverty	Out-of-pocket health expenses: direct and non-direct, Loss of income and Worst economic situation	System Health: Out-of-pocket expenses for health / Social: head of household (woman), low SES and income
105	Rodriguez-Acevedo et al. (2021)	Cohort study	1965: 451 ProCa, 396 BCa, 160 CRCa and 106 LCa	Participants	Cancer	Both	40 to 69	Oceania	Australia	Local	Economic-social	Direct medical costs + Right to health	Out-of-pocket health expenses and type of health insurance	Social: Sex (female) / Health condition: Type of cancer (BMa) / Sist. Health: Type of health insurance (private) or no access to health insurance
106	Alemayehu And Damen(2013)	A cross-sectional	227	Patients	Cancer	Women	≥ 15	Africa	Ethiopia	Local	Economic	Direct Medical Costs + Direct Non-Medical Costs + Indirect Costs	Health care costs (Ambient Care, hospitalization and medicines), Non-prescribed medicines, food and transportation and Loss of income	Health condition: Stage of the disease (Stage II), comorbidities and longer hospital stay / Social: Greater distance from residence, number of employees in the home and occupation (farmer)
107	Francisci et al. (2020)	Cohort study	49,272	Patients	Cancer	Women	All ages	Europe	Italy	Local	Economic	Direct medical costs	Hospitalization, diagnosis and treatment	Health condition: Stage of the disease (recent Dx and advanced stages III and IV) / Social: Age (< 50 years) / System. Health: Quality of health care

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
108	de Oliveira et al. (2016)	Observational study	394,092	Patients	Cancer	Both	Mean: 63	North America	Canada	Local	Economic	Direct medical costs	Health care costs on HS	Social: sex (both) / Health condition: Stage of the disease (recent Dx and terminal) and type of cancer (hematological and breast cancer)
109	Sherwood et al. (2008)	A cross-sectional	80	Caregivers	Cancer	Both	Not specified	North America	USA	Local	Social-Economic	Quality of life + Indirect costs	Lost Productivity, Experienced Work Absenteeism and costs due to lost labor productivity	Social: sex (caregiver.-female), Labor status (employee) / Health condition of the patient: limitations in instrumental activities
110	Johnsson et al. (2009)	Cohort study	102	Patients	Cancer	Women	18 to 64	Europe	Sweden	Local	Social	Quality of life + Quality of work	Loss of productivity and income and Return to work	Social: Type of work (demanding) / Sist. Health: Quality of health care
111	Mariotto et al. (2011)	Economic analysis	13 772 000	Cancer survivors	Cancer	Both	All ages	North America	USA	Local	Economic	Direct medical costs	Health care costs on HS	Health condition: Stage of the disease (terminal phase), type of cancer (woman: Breast, Men: prostate) / System. Health: Quality of health care
112	Chino et al. (2014)	A cross-sectional	174	Patients	Cancer	Both	>21	North America	USA	Local	Social	Quality of life + Poverty	Satisfaction with health care and experience of financial difficulties	Social: Low SES and age (older) / Sist. Health: Technical quality of health care
113	Bradley et al. (2005)	Case-control study	496	Cancer survivors	Cancer	Women	30 to 64	North America	USA	Local	Social	Employment level + Quality of life	Lower probability of employment and Health Condition	Social: Race (African-American), employment status (fewer working hours), time of diagnosis, and disease stage (advanced)
114	Yamauci et al. (2017)	A cross-sectional	Unidentified	Estimated population	Cancer	Both	20 to 69	Asia	Japan	Local	Economic	Indirect costs	Labor Productivity Loss Costs, Unemployment Costs, and Health Care Costs	Social: Sex (women) and employment status / Health condition: Type of cancer (CaMa)

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
115	Holm et al. (2013)	Cohort study	3,439	Patients	Cancer	Both	≥18	Europe	Denmark	Local	Social	Quality of life	Rehabilitation and Health Condition	Social: Sex (female), low educational level, low SES and living alone.
116	Torp et al. (2011)	Cohort study	1,115	Patients	Cancer	Both	28 to 64	Europe	Norway	Local	Social	Quality of work + Quality of life	Job Changes and Loss of Productivity Experience	Social: Sex (men), low support from the supervisor and high physical and psychological work demands.
117	Masià et al. (2019)	A cross-sectional	175	Patients	Cancer	Women	32 to 70	Europe	Spain	Local	Social	Support networks + Quality of life	Social support, Quality of life (sexual) and Loss of productivity and income	Health condition: Stage of the disease / Syst. Health: Quality of health care / Social: low SES
118	Dean et al. (2019)	A cross-sectional	129	Cancer survivors	Cancer	Women	Mean: 65	North America	USA	Local	Economic-social	Direct medical costs + Poverty + Indirect costs	Out-of-pocket health expenses, Worst economic situation and costs due to lost labor productivity	Social: Age / Sist. Health: Access to health insurance and quality of care
119	Hanly et al. (2014)	Observational study	8,067	Deaths	Cancer	Both	15 to 64	Europe	Ireland	Local	Economic-social	Indirect Costs + Share Capital	Potential Years of Life Lost, Premature Death and economically active population	System Health: Quality of care and health coverage in medicines / Social: sex (both)
120	Darbà y Marsà (2019)	Economic analysis	212,632	Deaths	Cancer	Both	Not specified	Europe	Spain	Local	Economic	Indirect costs	Premature Death and Cost per Potential Years of Life Lost	Social: Sex (men) and age (50 to 59 years)
121	Max et al. (2002)	Economic analysis	9,043	Hospital discharges	Cancer	Men	Not specified	North America	USA	Local	Economic	Direct Medical Costs + Indirect Costs	Mainly hospitalizations and premature death	Social: Age (> = 65 years), race (African American, Asian) / Health condition: Comorbidities / System. Health: Quality of health care
122	Saito et al. (2014)	A cross-sectional	105	Patients	Cancer	Women	36 to 49	Asia	Japan	Local	Social	Employment level	Less likely to be employed or unemployed	Social: Employment status (contract or part time).

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
123	Banning et al. (2009)	Qualitative study	30	Patients	Cancer	Women	22 to 60	Asia	Pakistan	Local	Social-Economic	Social exclusion + Quality of life + Direct medical costs	Social stigma, Quality of life (family care) and Catastrophic health expenses	Social: Age (younger single women), ignorance about CaMa and treatment, religious beliefs, no family support, financial situation, stigma and marital status (single women).
124	Collins et al. (2017)	A cross-sectional	151	Patients	Cancer	Both	20 to 79	Europe	Ireland	Local	Economic	Indirect Costs + Direct Medical Costs	Accessories, transport and complementary therapies. and Outpatient care and treatment	Social: Sex (female), age (> 50 years) and distance from health services (> 25 km) / Sist. Health: (WITHOUT) health insurance
125	Lerner et al. (2010)	Case-control study	Cases: 94 and Controls: 118	Participants	Cancer	Women	18 to 65	North America	USA	Local	Social	Quality of life + Quality of work	Experience of work limitations, Experience of loss of PL and Experience of work absenteeism	Health condition: aHPV positive and physical limitations / Social: Marital status (married) and (less) years of education.
126	Arrossi et al. (2007)	A cross-sectional	120	Patients	Cancer	Women	Mean: 51	Latin America	Argentina	Local	Social	Quality of life + Quality of work + Right to health	Quality of life, job changes and access to treatment	Social: Loss of income and poverty
127	Yabroff et al. (2009)	A cross-sectional	688	Caregivers	Cancer	Both	All ages	North America	USA	Local	Economic-social	Direct non-medical costs + Quality of life	Caregiver time costs. and Quality of life: double workload.	Social: Sex (woman/wife), low SES, educational level (less than high school), income (< 20,000 per year), employment status (employees) / Health condition: Type of cancer (lung, ovarian or Non Hodking lymphoma)
128	Leopold et al. (2018)	Cohort study	5,364	Patients	Cancer	Women	25 to 64	North America	USA	Local	Economic	Direct medical costs	Health care costs on HS	System Health: Type of health insurance (high deductible health plan) / Social: Employment status

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
129	Carlsen et al. (2014)	A cross-sectional	14,750	Cancer survivors	Cancer	Women	18 to 57	Europe	Denmark	Local	Social-Economic	Employment level + Indirect costs	Unemployment and Early Retirement	Social: Age (older age), marital status (single), employment status (unemployment before diagnosis), low educational level, low income and labor activity (manual work) / Health condition: With mental illness.
130	Lauzier et al. (2008)	Cohort study	800	Patients	Cancer	Women	23 to 71	North America	Canada	Local	Economic-social	Indirect Costs + Poverty	Loss of salary and worse economic situation (family)	Social: Low educational level, employment status (self-employment or partial), distance to health care services (> = 50Km), social support networks (low) and time spent at work. / Health condition: Stage of the disease (metastasis) / Syst. Health: Quality of health care
131	de Boer et al. (2008)	A cross-sectional	195	Patients	Cancer	Both	Not specified	Europe	Holland	Local	Social	Quality of life + Quality of work	Less work ability, Work absenteeism experience and Return to work	Health condition: Low work ability and cognitive dysfunction / Syst. Health: Type tx (chemotherapy (+ radiotherapy)
132	Lewis et al. (2020)	Cohort study	13 715	Patients	Cancer	Women	Not specified	Oceania	Australia	Local	Social	Work quality + Gender equality repercussions	Labor changes, labor gender inequality (unpaid) and wage inequality	Social: Employment status (without paid work), remote areas, with a partner, with less education or with chronic health problems.
133	Weir et al. (2017)	A cross-sectional	119,161	Deaths	Cancer	Both	50 to 74	North America	USA	Local	Economic	Indirect costs	Potential Years of Life Lost and Potential Loss of Productivity	Social: Gender (male), race (Hispanic), and low-education counties.

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
134	Ekwueme et al. (2008)	A cross-sectional	1,870	Patients	Cancer	Both	Not specified	North America	USA	Local	Economic	Indirect costs	Mortality, Cost per Potential Years of Life Lost and costs due to lost labor productivity	Health condition: HPV-related cancers / Social: sex (female), age (30 to 34 years) and race (Anglo-Saxon)
135	Khorasani et al. (2015)	Economic analysis	53,350	Deaths	Cancer	Both	All ages	Asia	Iran	Local	Economic	Indirect costs	Premature death, Potential Years of Life Lost and Costs for Lost Labor Productivity	Social: Sex (men) / Health condition: Type of cancer
136	Reis Goncalves et al. (2018)	Economic analysis	Not specified	Patients	CKD	Both	≥ 18	Latin America	Brazil	Local	Economic	Direct medical costs	Health care costs on HS	Social: Sex (female), age (65–75), and race (blacks)
137	Foresti Lemos et al. (2015)	A cross-sectional	170	Patients	CKD	Both	45 to 72	Latin America	Brazil	Local	Social	Quality of life	Quality of life	Social: Sex (female), age (≥ 47 years) and low income.
138	Tsai et al. (2010)	A cross-sectional	Patients: 145 and Prescriptions: 8446	Patients and prescriptions	CKD	Both	Not specified	Asia	Taiwan	Local	Economic	Direct medical costs	Costs derived from transplantation and Costs for prescriptions (medications)	Social: Sex (female) and age (≤ 40 years)
139	Devins et al. (1997)	A cross-sectional	38 (19 couples)	Patients and couples	CKD	Both	Patient's mean: 45.9 / Wife's Mean: 40.6	North America	Canada	Local	Social	Quality of life + Support networks	Quality of life, couple relationship and family relationship	Health condition: End-stage renal disease (/ Syst. Health: Quality of health care / Social: Sex (woman with ESRD).
140	Srivastava et al. (2013)	Economic analysis	Not specified	Estimated population	CVD	Both	All ages	Asia	India	Local	Economic	Direct Medical Costs + Indirect Costs	Mainly hospitalizations and Mortality in men	Social: Age (25–59 years), sex (men) and SES / Sist. Health: Type of health insurance (Private)
141	Ding et al. (2017)	Observational study	10,301	Hospitalized patients	CVD	Both	52 to 67	Asia	China	Local	Economic	Direct medical costs	Health care costs	System Health: Type of insurance scheme / Social: Sex (male), age and health condition
142	Sacks et al. (2020)	A cross-sectional	5,466	Records of medical and pharmaceutical claims	CVD	Both	18 to 40	North America	USA	Local	Social-Economic	Gender equality repercussions + Direct medical costs	Gender Inequity in Health Care and Health Care Expenditures	Social: Age (18 to 40 years) and sex (both) / Sist. Health: Type of service (emergencies and hospitalization)

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
143	Le et al. (2015)	A cross-sectional	4,595	Participants	CVD	Both	≥18	Asia	China	Local	Economic	Direct Medical Costs + Indirect Costs	Health care costs over HS, Health care costs and costs due to lost labor productivity	Social: Sex (male), higher level of education and community with high income
144	Tang et al. (2014)	Observational study	5,750,440	Estimated population	CVD	Both	≥18	North America	USA	Local	Economic	Direct medical costs	Health care costs on HS	Social: Age, sex (female), race or ethnicity (non-Hispanic white)
145	Yong et al. (2018)	Observational study	49 588	Patients	CVD	Both	55 to 81	Asia	China	Local	Economic	Direct medical costs	Health care costs on HS	System Health: Type of health insurance (BMISE) / Social: Sex (both), age (> 80 years), environment and low income
146	Klein et al. (2021)	A cross-sectional	1 627 876	Weighted population	CVD	Both	≥18	North America	USA	Local	Economic	Direct medical costs	Health care costs on HS	Health condition: Comorbidities / Social: Sex (female), age (> 75 years), marital status (married), educational level (high school), High income / Sist. Health: Type of insurance (public Medicare)
147	Ali et al. (2018)	Cohort study	240	Patients	CVD	Both	All ages	North America	Canada	Local	Economic	Direct medical costs	Consultations, studies and treatment and Out-of-pocket health expenses	Social: Sex (female) and educational level (low)
148	Essue et al. (2012)	Cohort study	414	Participants	CVD	Both	18 to 65	Oceania	Australia	Local	Social	Poverty + Quality of work	Experiencing financial hardship and Experiencing changes in income	Social: Habits (alcoholism), type of work (manual) and previous problems / Sist. Health: lack of health insurance
149	Salvatore et al. (2021)	Cohort study	98,829	Patients	CVD	Both	≥1	Europe	Italy	Local	Economic	Direct medical costs	Health care costs on HS	Social: Sex (men), advanced age / System. Health: Quality of health care / Health condition: acute myocardial infarction

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
150	Santamarina et al. (2012)	Review article	Not specified	Publications	CVD	Does not apply	Does not apply	Europe	Spain	Local	Social-Economic	Quality of life + Indirect costs	Health Condition, Care for Sickness and Disability	Social: Age (advanced age), sex (female), low SES / Syst. Health: No health insurance / Health condition: Comorbidities
151	Shaw et al. (2008)	Cohort study	819	Patients	CVD	Women	21 to 83	North America	USA	Local	Economic-social	Direct medical costs + Quality of life	Factors influence time of death/ heart attack event, health care costs and quality of life	Social: Low income / System. Health: (WITHOUT) health insurance, affordability and accessibility
152	Conard et al. (2006)	A cross-sectional	539	Patients	CVD	Both	> 30	North America	USA	Local	Social	Quality of life	Health condition	Social: Age (< 60 years) and lower household income (< 30,000 per year)
153	Sun et al. (2015)	A cross-sectional	949	Households	CVD	Both	All ages	Asia	China	Local	Economic-social	Direct Medical Costs + Poverty	Catastrophic health expenses: due to hospitalization and impoverishment	System Health: Beneficiary 1 program / Social: Age (> 60 years), low SES, hospitalized relative, occupation (farmer) and marital status (married).
154	Yu et al. (2021)	Cohort study	101,252	Patients	CVD	Both	65 to 84	North America	Canada	Local	Economic	Direct medical costs	Health care costs	Social: Sex (both), area: (non-rural), SES (low 2 quintiels).
155	Shaw et al. (2006)	Cohort study	883	Patients	CVD	Women	45 to 76	North America	USA	Local	Economic	Direct medical costs	Health care costs	Health Condition: Obstructive Coronary Artery Disease
156	Le et al. (2012)	A cross-sectional	9,396	Patients	CVD	Both	≥ 18	Asia	China	Local	Economic	Direct Medical Costs + Direct Non-Medical Costs + Indirect Costs + Intangible Costs	Medical and non-medical, Morbidity and mortality and Loss of income (Psychological)	Social: Sex (men) and age
157	Nevarez-Sida et al. (2017)	Cohort study	283	Patients	RespD	Both	Not specified	North America	Mexico	Local	Economic	Direct medical costs	Health care costs	Health condition: COPD stage (moderate or severe)
158	Chen et al. (2016)	A cross-sectional	678	Patients	RespD	Both	≥ 60	Asia	China	Local	Economic	Direct medical costs	Health care costs on HS	Social: Age / Health condition: Disease stage: COPD exacerbations and severity

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
159	Kirsch et al. (2019)	A cross-sectional	39,307	Patients	RespD	Both	All ages	Europe	Germany	Local	Economic	Direct Medical Costs + Indirect Costs	Costs of health care on HS, Costs due to work absenteeism and Early retirement	Health Condition: Comorbidities
160	Dalal et al. (2010)	Observational study	37,089	Patients	RespD	Both	Not specified	North America	USA	Local	Economic	Direct medical costs	Health care costs	Health condition: Exacerbations
161	Malo et al. (2011)	Observational study	140	Workers	RespD	Both	28 to 53	North America	Canada	Local	Economic-social	Indirect costs + Quality of life + Support networks	Loss of income, health condition and couple relationship	Social: Sex (men), age (older age), educational level (primary and secondary), marital status (married), employment status (early retirement) and active in rehabilitation program.
162	Løkke et al. (2014)	Case-control study	COPD: 171,557 / Controls: 664,821	Patients and couples	RespD	Both	Not specified	Europe	Denmark	Local	Economic-social	Direct medical costs + Employment level + Quality of work	Costs of health care, Decrease in employment or couple unemployment, and Couple wage inequality	Social: Sex (both), age (65 years), working condition, low income and health expenses
163	Løkke et al. (2021)	Cohort study	49,826 (paired: 196,623)	Patients and controls	RespD	Both	≥40	Europe	Denmark	Local	Economic	Direct medical costs	Health care costs	Health condition: Exacerbations
164	Lisspers et al. (2018)	Case-control study	COPD: 17,479 / Controls: 84,514	Patients and controls	RespD	Both	≥40	Europe	Sweden	Local	Economic	Direct Medical Costs + Indirect Costs	Medications and hospitalization and Loss of income	Social: Age (50–55 years) / Health condition: Severe exacerbations
165	Srivastava et al. (2015)	Systematic review	32	Publications	RespD	Does not apply	Does not apply	Asia	India	Global	Social-Economic	Quality of life + Direct medical costs	Quality of Life and Health Care Costs	Health condition: symptomatic COPD (dyspnea) and comorbidities / Syst. Health: Quality of health care / Social: Age and sex (female)
166	Franco et al. (2009)	A cross-sectional	180	Patients	RespD	Both	All ages	Latin America	Brazil	Local	Economic-social	Direct Medical Costs + Indirect Costs + Poverty	Costs of health care (medications), Costs due to work absenteeism and Impoverishment	Health condition: Severe and uncontrolled asthma / Social: Work condition / Syst. Health: Access to health care programs

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
167	Nuño-Solinís et al. (2016)	A cross-sectional	126,894	Patients	T2DM	Both	≥ 35	Europe	Spain	Local	Economic	Direct medical costs	Health care costs	Social: Sex (men), age (80–84 years), low SES / Health condition: Comorbidities / System. Health: Type of health insurance and health institution.
168	Brown et al. (2007)	A cross-sectional	639	Participants	T2DM	Both	35 to 64	North America	USA	Local	Social	Employment level + Quality of life	Lower probability of employment and experience of lost productivity	Social: Sex (female), low educational level, being an immigrant and marital status
169	Elgart et al. (2014)	Observational study	774	Participants	T2DM	Both	20 to 75	Latin America	Argentina	Local	Economic	Direct Medical Costs + Indirect Costs	Costs of health care and Costs due to work absenteeism	Social: Work condition / Health condition: Complications from T2DM
170	Wong et al. (2018)	Cohort study	10,649	Patients	T2DM	Both	68 to 90	Asia	Hong Kong	Local	Economic	Direct medical costs	Health care costs on HS	Social: sex (both), age (> 85 years), ethnicity (Chinese vs. Non-Chinese) / health condition: T2DM with complications / System. Health: use serv. health (ambulatory)
171	ADA (2003)	Economic analysis	12.1 millions	Estimated population	T2DM	Both	Not specified	North America	USA	Local	Economic	Direct Medical Costs + Indirect Costs	Health Care Costs, costs due to lost labor productivity, and Costs for Disability and Death	Social: sex (both) and age (≥ 65 years) / Health Condition: Cardiovascular complications / System. Health: Nursing care at home
172	Bertoldi et al. (2013)	Literature review	42	Publications	T2DM	Does not apply	Does not apply	Latin America	Brazil	Country	Economic-social	Indirect Costs + Direct Medical Costs + Share Capital	Cost per Potential Years of Life Lost, Health Care Costs, and Pop. economically active	Social: sex (both) / Sist. health: lack of coverage, inequity in access to medicine and health services / Social policy

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
173	König et al. (2021)	A cross-sectional	T2DM: 325 and Without T2DM: 4490	Participants	T2DM	Both	18 to 91	Europe	Germany	Local	Economic	Direct Medical Costs + Indirect Costs	Costs of health care (medications), Costs due to work absenteeism and Early retirement	Social: Sex (male), high educational level, higher income/ Health condition: > 10 years with T2DM and complications
174	Wang et al. (2010)	A cross-sectional	1,530	Patients	T2DM	Both	Not specified	Asia	China	Local	Economic-social	Direct medical costs + Right to health	Determinants of direct costs, out-of-pocket health expenses and access to health insurance	System Health: Quality of health care
175	Cao et al. (2015)	A cross-sectional	2,970	Participants	T2DM	Both	Median age 57	Asia	China	Local	Economic	Direct medical costs	Factors in hospitalization costs and health care costs (hospitalization)	Social: Age and sex (man) / Syst. Health: Type of health insurance (payment methods), hospital stay and admission status (urgency) / Health condition: Complications and surgery
176	Arredondo et al. (2013)	Observational study	4,854,689	Patients	T2DM	Both	All ages	North America	Mexico	Local	Economic	Direct Medical Costs + Indirect Costs	Costs of health care on HS (medications, nephropathies and diagnosis), Costs due to disability and Mortality	System Health: Type of health institution (IMSS), quality of care, equity and access to care.
177	Wu et al. (2018)	A cross-sectional	19 015	Patients	T2DM	Both	< 35	Asia	China	Local	Economic	Direct medical costs	Health care costs	Social: Sex (man), age (> 50) and level of education (medium and higher) / Syst. Health: type of health insurance (rural residents) / Health condition: Complications > 1

Table 1 (continued)

No.	Main author & year	Study design	Sample size	Units of analysis	Disease group	Sample's sex	Age (years)	Region	Country of research	Research context	Impact	Impacts dimensions	Outcomes	Factors associated to the impacts of NCDs
178	Ramachandran et al. (2007)	A cross-sectional	556	Patients	T2DM	Both	All ages	Asia	India	Local	Economic	Direct medical costs	Health care costs	Health condition: Duration of illness, complications / Syst. Health: Hospitalization, type of tx / Social: Setting (urban), income (low), SES (low)
179	Zhuo et al. (2013)	Cohort study	Not specified	Patients	T2DM	Both	≥25	North America	USA	Local	Economic	Direct Medical Costs + Indirect Costs	Health care costs and Morbidity and mortality	Social: Age and sex (female) / Health condition: Complications
180	Sittig et al. (2015)	Economic analysis	19,311	Patients	T2DM	Both	< 24 and > 75	Europe	Germany	Local	Economic	Direct medical costs	Outpatient care and medications	Social: Sex (female) and (older) age / Syst. Health: Quality of health care
181	Lavigne et al. (2003)	A cross-sectional	472: 78 with DM2 and 394 without DM2	Participants	T2DM	Both	< 64	North America	USA	Local	Economic	Indirect costs	Costs due to lost labor productivity	Social: Sex (female), employment status (evening shift) and job dissatisfaction (low income)
182	Williams et al. (2017)	A cross-sectional	20,442	Participants	T2DM	Both	≥18	North America	USA	Local	Economic	Direct medical costs	Health care costs	Social: Sex (female) / Health condition: T2DM Complications
183	Espinoza et al. (2020)	Qualitative study	30	Patients	T2DM	Both	Not specified	Latin America	Chile	Local	Social	Right to health + Quality of life	Quality of health care and health condition	System Health: Primary health care programs / Social: sex (both)
184	Le et al. (2013)	A cross-sectional	9,396	Participants	T2DM	Both	≥18	Asia	China	Local	Economic	Direct Medical Costs + Direct Non-Medical Costs + Indirect Costs + Intangible Costs	Medical and non-medical, Morbidity and mortality and Loss of income (Psychological)	Social: Sex (men), age, educational level
185	Seuring et al. (2015)	A cross-sectional	14,529	Patients	T2DM	Both	25 to 64	North America	Mexico	Local	Social	Employment level	Less likely to be employed or unemployed	Social: Sex (men), age (older age), employment status (informal work) and low SES.

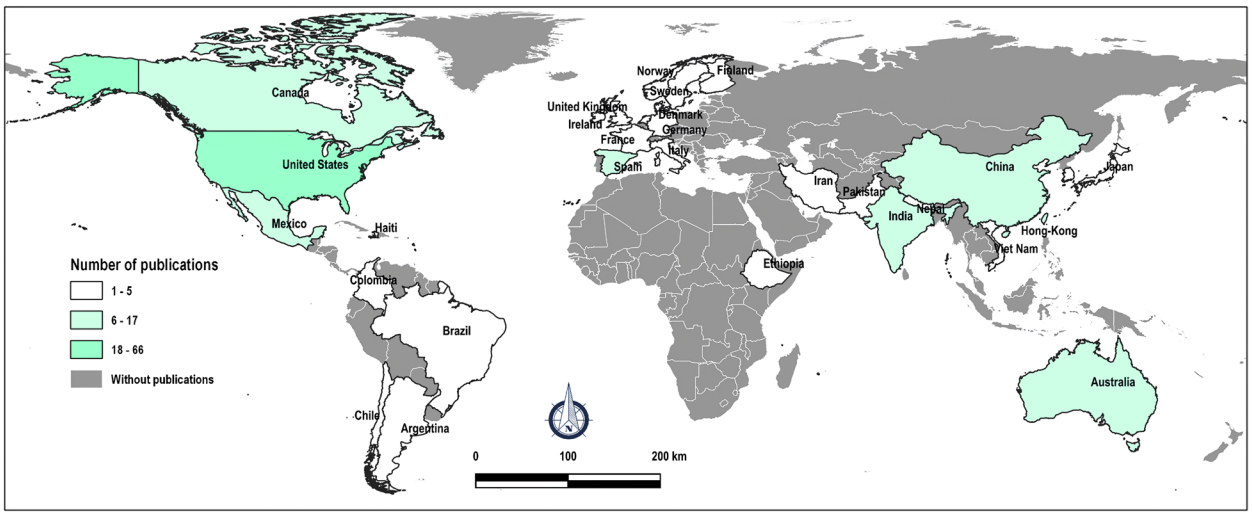

Fig. 2 Mapping of included publications in the qualitative synthesis by country and research context. Source: Elaboration based on the information extracted

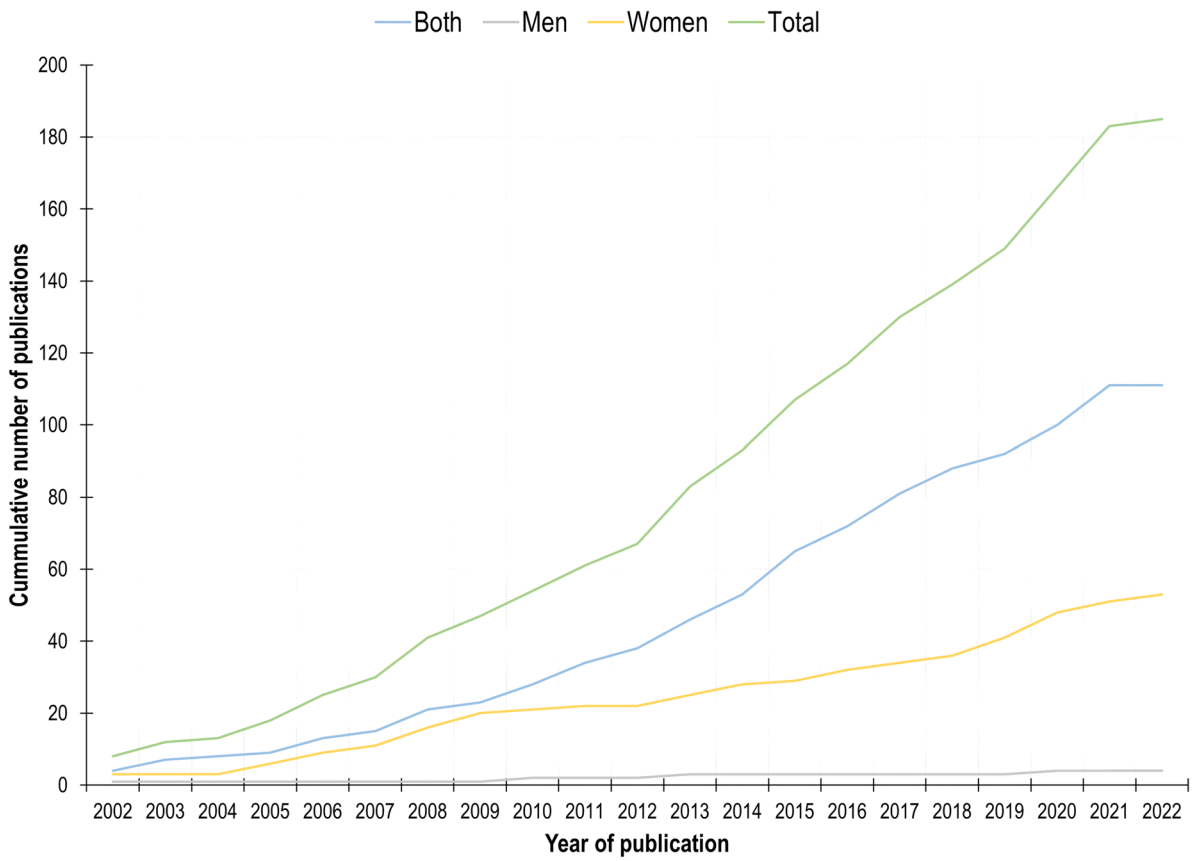

Fig. 3 Evolution of cumulative number of publications according to gender. Source: Elaboration based on the information extracted. ncr: no cases reported

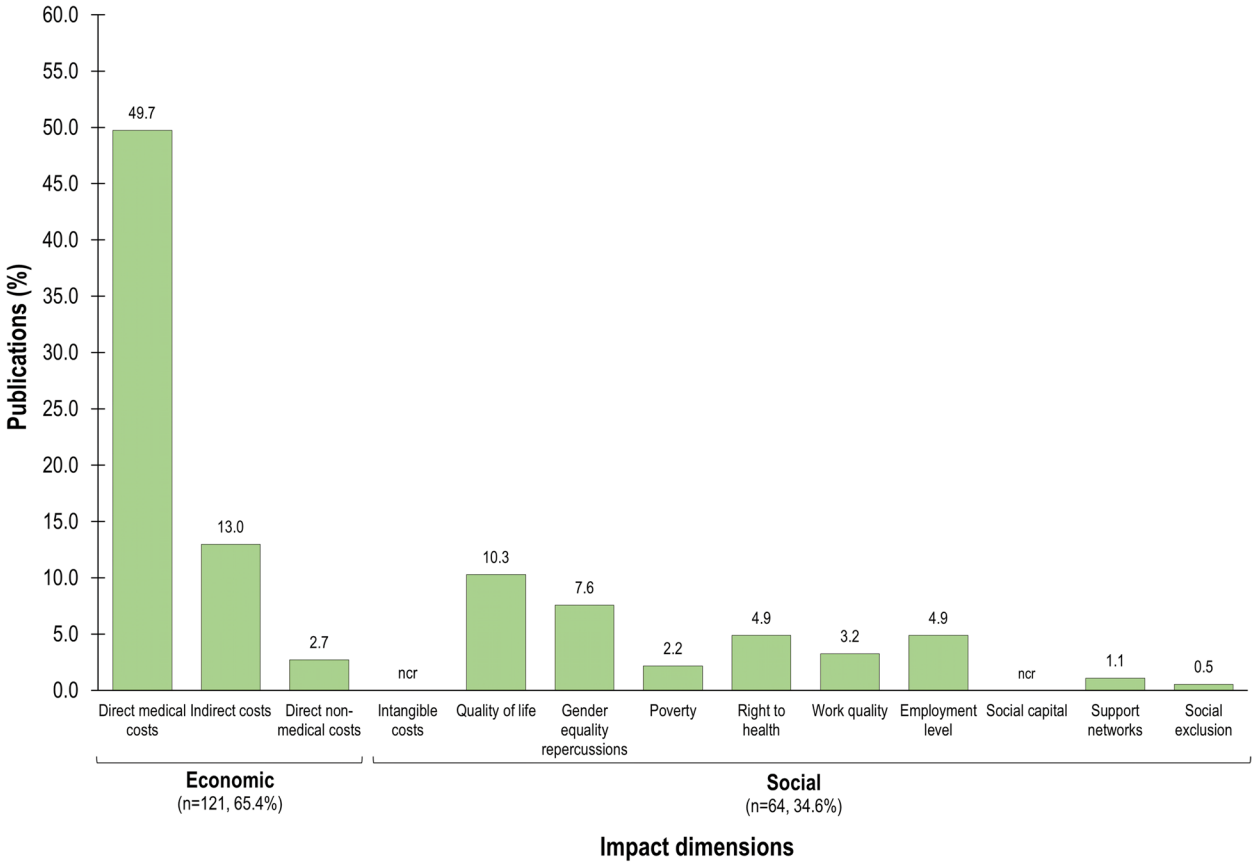

Fig. 4 Distribution of reviewed publications according NCDs impact dimensions. Source: Elaboration based on the information extracted. ncr: no cases reported

(highlighting direct medical costs (49.1%) and indirect costs (13.2%)), and 37.7% social impacts (13.2% impacts on quality of life, 3.8% right to health, 7.5% quality and level of employment, and 5.7% poverty, support networks and social exclusion) (Fig. 5). Of the four studies on men, three addressed economic impacts (2 direct medical costs and one indirect cost), and 1 addressed social impacts on poverty. Of the studies focused on both sexes (111), 68.5% addressed economic impacts (54.1% direct medical costs, 12.6% indirect costs, and 1.9% direct non-medical costs), and 31.5% social impacts (9% impacts on quality of life, 6.3% right to health, 7.2% gender inequality, 6.3% quality and level of employment, and 2.7% poverty and support networks) (Fig. 5).

Seventy-five publications (40.5%) identified gender as the primary determinant of economic impacts, highlighting the differences in employment status between men and women, influencing the income received, access to insurance and health services for diagnosing and treating NCDs. Of the 22 studies with a gender perspective identified, 18 (82%) identified gender as the factor with the most significant social impact, while the remaining 4 highlighted its economic consequences.

Regarding the factors associated to the impacts of NCDs, 97.8% of the studies focus on those related to sociodemographic factors and health and health system conditions (Fig. 6). Regarding the former, 82.2% focused on categories such as age, socioeconomic level, educational level, area of residence, the existence of complications, comorbidities, type and stage of cancer, and others. In 15.7% of the studies, factors related to the health system were identified (i.e., access to and type of health insurance, access to health services, or quality of health care). The three studies on public health policy analyzed public spending on paid parental leave, job training for men, and public employment services for women [32], as well as financial protection in health [33, 34].

Discussion

This review study identifies the main social and economic consequences associated with NCDs, highlighting mainly the role of gender as a social construct and mediator of

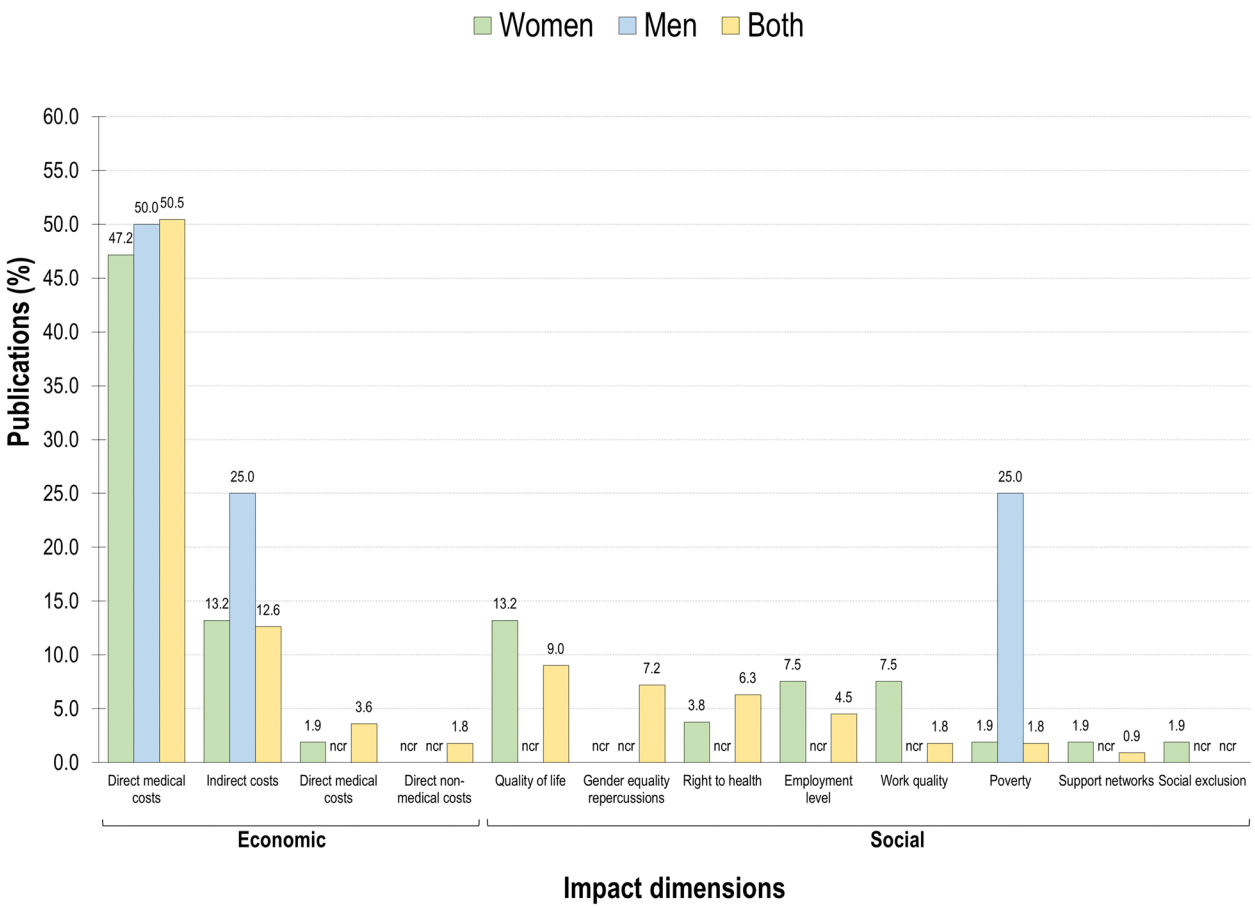

Fig. 5 NCD impacts between men and women. Source: Elaboration based on the information extracted

these consequences. Despite the notable increase in the cumulative number of publications from the second decade analyzed, with a predominance of women over men, we identified few published studies (just over 10%) that, from a gender perspective, addressed the social and economic health impacts of NCDs, as well as their correlates, which contributes to making invisible the multiple social vulnerabilities experienced, above all, by women.

The health, social and economic impacts of NCDs were mainly associated with malignant neoplasms and breast cancer, with a predominance of studies for North America, mostly in the United States. Among the health and social impacts primarily observed in women, there were reports of effects on quality of life, morbidity and working conditions. Some studies point to the "sacrifice" of work, education, and care and treatment of NCDs experienced by women in the face of budgetary restrictions to meet other household needs and even the care of men with NCDs. In this regard, the approach of integrating evidence coming from social and biological disciplines proposed by Rieker and Bird [35] could offer new perspectives for research, by formulating that the convergence of social and biological factors greatly influences the differences in health between men and women. Regarding sexual/biological factors, they raise several conjectures related to hormonal and physiological issues of natural selection on survival [35]. However, the present review focused on the role of gender, understood as a social construct within a specific historical and cultural context, as a mediator in the consequences of NCDs on population health, the health system, the household economy and the macroeconomy, and we did not highlight biological aspects that may explain these consequences.

With respect to health-related consequences, the evidence showed that men tend to present more chronic diseases with premature deaths. In contrast, women have a longer life expectancy and higher morbidity (due to disease and disability, in addition to a decrease in quality of life as they age). Gender differences can explain this paradox. Social factors, which were expressed in a gender-differentiated manner, focus on access to protective resources such as income or education, labor benefits (health insurance, pensions, or retirement),

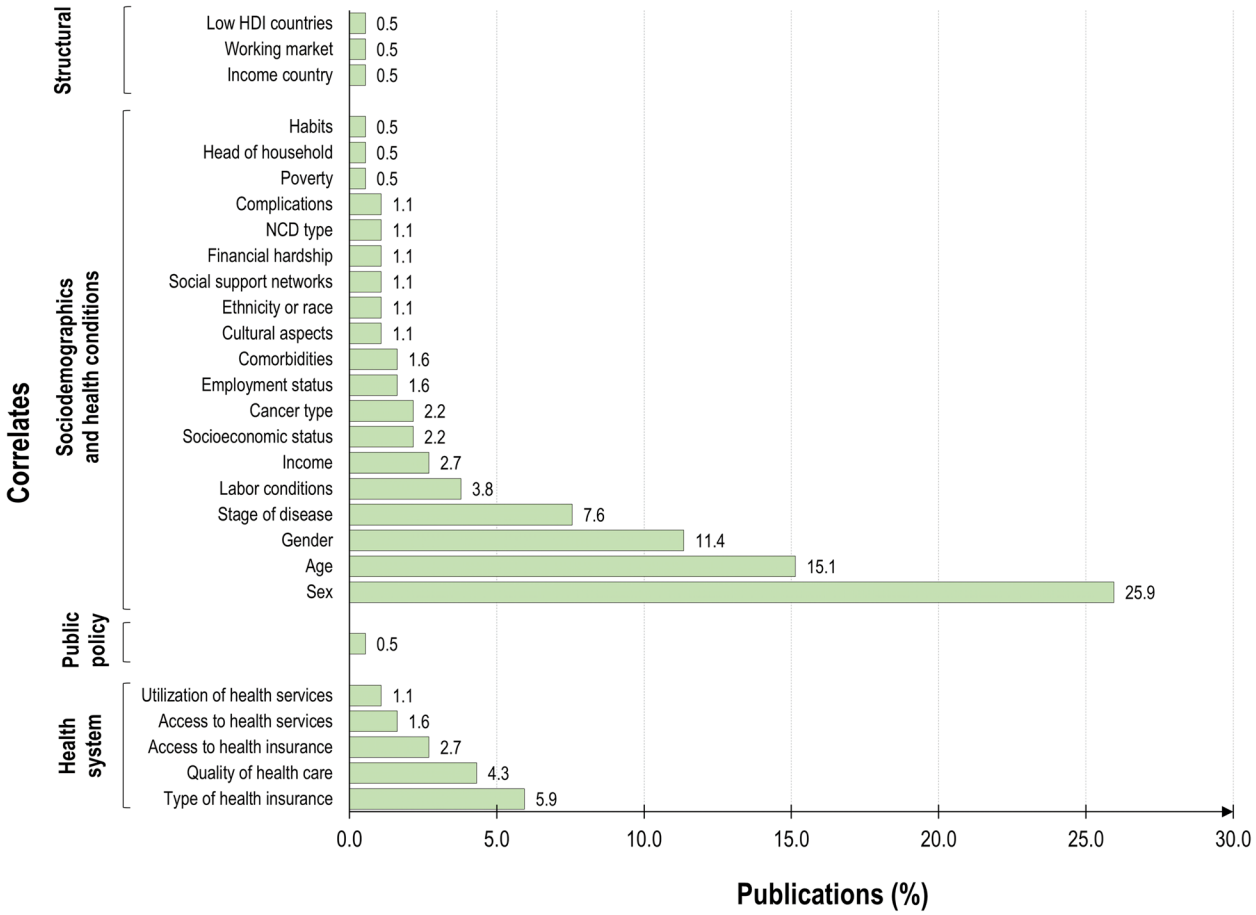

Fig. 6 Correlates of NCDs impacts. Source: Elaboration based on the information extracted

and other risk factors or behaviors that vary according to gender can influence exposure and health impacts. Regarding this, some authors suggest developing models that address how the gender and health paradox differs from socioeconomic and racial/ethnic health disparities based on the determinants of health, in order to explain how social differences between men and women (gender binary) influence or exacerbate health disparities. These models should allow for a more holistic analysis to achieve a better understanding of how these factors interact, thereby enabling the creation of public policies more suited to the specific health needs of each location or region [35].

The health and social impacts of NCDs, such as loss of quality of life, morbidity, mortality, and life expectancy, affect both the microeconomic level (individuals and households) and the macroeconomic level (healthcare systems and the national economy) [36]. At the household level, these impacts depend on the perceived illness and the pursuit of treatment, generating direct costs (hospitalization, medications, transportation, lodging, food) and indirect costs (caregivers' time, loss of productivity). The lack of medical care can also cause similar indirect costs. To cope with these costs, households adopt strategies such as substituting labor, using savings, changing consumption patterns, or selling assets, which can lead to poverty and loss of well-being [37].

Regarding economic impacts, most of the studies reviewed (65.4%) quantified direct costs, primarily medical costs and, to a much lesser extent, non-medical costs, while the minority focused on estimating indirect costs derived from productivity losses (lost wages) related to NCD complications, such as morbidity, disability, retirement or early retirement, as well as premature deaths, which demonstrates the need for studies of greater scope and impact of these types of conditions [35]. A more significant burden of direct medical costs was identified for men, especially in relation to buying drugs and payment of treatment and hospitalization services for neoplasms, as well as more significant catastrophic health expenditure in women during the diagnostic and terminal phases of cancer. Despite the heterogeneity in the contexts of

the studies reviewed, the results are congruent with those observed in other studies focused on the economic impacts of NCDs, which suggest that people from low- and middle-income households are those with a considerable negative effect [38–42], especially those headed by women [39]. In addition, it has been widely documented that women are at a great disadvantage in terms of financial resources to cover the costs of medical care, mainly due to the female work pattern, which assigns them the primary responsibility for household work (socially devalued), with few opportunities to participate in the labor market. This situation is detrimental not only to their ability to pay for the purchase of medical services but also to the possibility of contracting contributory insurance options, public or private, to meet their health needs [19].

The NCDs affect the economic stability of families, especially in LMICs. The lack of medical insurance and social safety nets can lead to catastrophic health expenses, pushing households into poverty [36, 37]. In Kenya for instance, NCDs have reduced 28.6% the family income [43], with more than 1.5 million people falling into poverty because of the high costs of healthcare services, without any health insurance very frequently [44]. Studies on the impact of NCDs on households indicate that men and women experience a reduction in income of 20.1% and 15.2% respectively [45], due to lower labor force participation among women and reduced income for men due to lower labor force participation and hourly wages, while women reduce their working hours, and differences in the type of employment.

Regarding the consequences of NCDs on the health care system, the reviewed studies suggest a constant increase in the healthcare expenditure related with NCDs [37], which further strains public budgets. This increase is due to population aging, higher expenses due to age, and growing demand for technologies to address NCDs worldwide [46]. The rapid increase of these diseases has tested human resources, equipment, and healthcare infrastructure, generating greater demand for services [47]. This financial pressure is notable in LMICs, where funds do not grow in line with the needs for NCD-related care [36, 44]. These consequences are expressed differentially between men and women, and actions are required in the health system to address them. These actions include strengthening the capacity of healthcare providers to identify and respond to gender-related issues in the supply of health services and programs so that they respond to the health needs of men and women with gender-sensitive guidelines and protocols and support their implementation [13, 48]. Additionally, specific barriers to the use of NCD prevention and treatment services by men and women, including cultural norms that affect healthcare-seeking and treatment behaviors among men, women, boys, and girls in the community, need to be identified to design strategies aimed at reducing gender-associated disparities in access to and use of health services, addressing the specific disadvantages that women and girls tend to face that make them less likely to access NCD services in certain communities, such as lack of decision-making power and their economic inability to access and benefit from public health policy efforts in the prevention and treatment of NCDs [13, 48].

The studies also reveal that NCDs have serious long-term repercussions on the economy, causing income losses, reduced investment opportunities, and weaker social and economic development, especially in LMICs [49, 50]. It is estimated that these diseases undermine economic development with losses exceeding $600 billion in national income [37]. Furthermore, NCDs have a negative impact on production, productivity, and social well-being, affecting both household economies and macroeconomics [51]. Figure 7 summarizes the consequences of NCDs on health, the healthcare system, household economy, and macroeconomics [36, 37, 44, 45, 47, 49, 51–53].

The correlates of the impacts identified were mainly social, especially in women. The predominance of proximal determinants such as individual risk factors related to baseline morbidities, age, genetic load, sex, and ethnicity was notable as a starting point to provide an explanation or a possible relationship of these with the impacts of interest of NCDs. Only three of the 185 publications selected included aspects related to structural factors: public policy and the level of public health.

Our study should be interpreted considering the following limitations. First, regarding "advanced search engines", only the PubMed search engine has the options and filters for an adequate construction of the search algorithms. Second, the search was limited to a certain period. Third, only articles in two languages were included, which could have influenced those aspects where we had few results, such as the gender perspective. Fourth, gender impacts on NCDs have been scarcely documented.

This study offers three lessons for LMICs: First, our findings confirm that gender exacerbates negative consequences in health outcomes and therefore gender-sensitive health interventions should be implemented to prevent health harms that are caused or exacerbated by gender. Second, there is a clear disparity in research focusing on only one sex or gender, since most of the single-sex studies are dedicated to women. This implies an urgent call for new studies to disaggregate health outcomes by gender and to fund studies on gender-specific diseases and conditions, both for women and

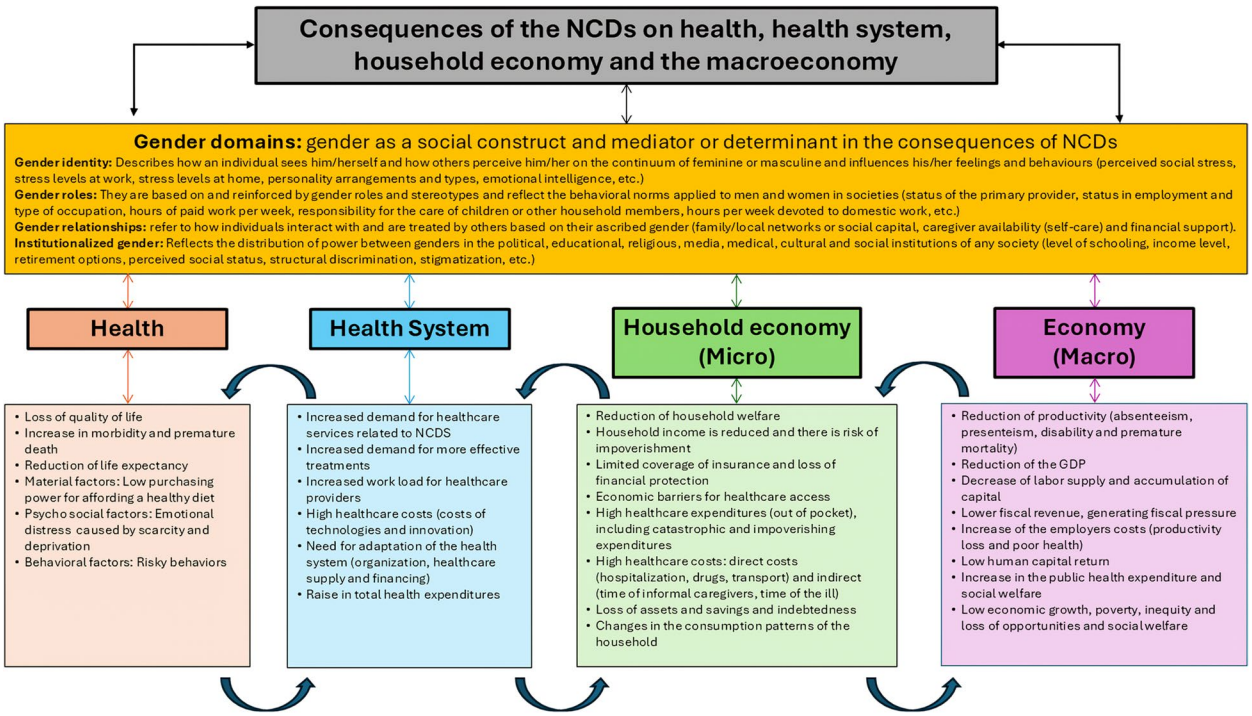

Fig. 7 Summary of consequences of NCDs on health, the health system, household economy, and macroeconomy. Source: Elaboration based on the reviewed literature [36, 44, 45, 47, 49–52, 54, 55]

for men. Gender-focused research could inform better design of health interventions. Third, health insurance that offers financial protection against health problems is essential to reduce negative impacts and disparities exacerbated by gender. Promoting UHC could assist in achieving other SDGs, considering that health insurance coverage is helpful to avoid impoverishing health expenditure for people living with NCDs and that this mechanism creates social solidarity.

In sum, NCDs represent a significant social and economic burden due to their impact on population health, healthcare systems, and household and national economies, which is likely to increase over time. This impact is closely related to gender, although studies addressing these differences between men and women are still scarce. Public policies aimed to enhance access and UHC are essential to guarantee effective financial protection in health, especially for the most vulnerable sectors of the population.

Abbreviations

UHC	Universal Health Coverage
NCDs	Non-communicable diseases
SDGs	Sustainable Development Goals
LMICs	Low and middle-income countries
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
COPD	Chronic obstructive pulmonary disease

Supplementary Information

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Supplementary Material 1. Appendix 1. Literature review details.

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Memorial dedication

We dedicate this manuscript to our colleague and friend Sandra Sosa-Rubí, PhD, who inspired us in the analysis of equity during her fruitful lifetime, and who passed away in March 2021.

Authors' contributions

CGM and IHP conceived the idea for this study, contributed equally to the work and accordingly share first authorship. CGM and ESM designed the study, while CGM led the formal analysis and performed the data curation. ESM and CGM wrote the first draft of the manuscript, with CMGL, EON, EOA and GN providing critical input on multiple drafts. All authors were involved in the review of the paper and approved the final version. ESM is the guarantor of the work; as such, he had full access to all the data in the study and accepts responsibility for the integrity of the data and the accuracy of the data analysis.

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Data availability
Material underlying this study are freely accessible using the following link: https://doi.org/10.6084/m9.figshare.25998223.

Declarations

Ethics approval and consent to participate
Not applicable. This study involved no human participants and was approved by the Research, Ethics, and Biosecurity Committees of the National Institute of Public Health of Mexico (ID: CI-507-2022/CB22-173).

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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