Gender inequalities as contributors to dementia in Latin America and the Caribbean: what factors are missing from research?

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The current knowledge of modifiable risk factors for dementia comes mainly from high-income countries. In Latin America and Caribbean countries, where the burden of gender and socioeconomic inequalities is greater than in high-income countries, the prevalence of dementia is also higher and disease onset is earlier, especially among women, even after adjustments for life expectancy. In this Personal View, we discuss socioeconomic modifiable risk factors for dementia established by previous studies and postulate further harmful and often hidden factors faced by women that might influence the gender-specific timing of onset and general prevalence of dementia. We emphasise some of the effects of gender roles, their direct and indirect effects on dementia, and how they disproportionately impact women. Finally, we highlight the importance of bringing hidden risk factors to open discussion to promote research with high-quality data and to encourage public policies to promote and preserve women's health.

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Background

A low socioeconomic status has consistently been shown to be associated with an increased incidence of physical (eg, cardiovascular disease)[1] and mental disease (eg, mood disorders) during midlife,[2] and with the onset of dementia after the age of 60 years.[3] From a lifecourse perspective, dementia is a consequence of accumulated factors during early, middle, and later life periods[4–6] in which genetic and socioeconomic factors might interact, leading to an increased or reduced risk of dementia.[6]

In 2020, the *Lancet* Commission on dementia prevention, intervention, and care[4] provided an updated list of 12 risk factors for dementia across the lifecourse—specifically, in early life (education), during midlife (hearing loss, traumatic brain injury, hypertension, alcohol abuse, and obesity), and in later life (smoking, depression, social isolation, physical inactivity, diabetes, and air pollution)—which, if modified, could prevent or delay around 40% of cases of dementia worldwide. However, although the Commission's estimates are of high relevance to the field of dementia, they are not fully representative of the reality in countries in Latin America and the Caribbean (LAC): for example, the authors conceded that some risk factors that are common in low-income and middle-income countries, such as malnutrition in early life or poor health during pregnancy, were not explored in their study.

Few studies so far consider sex-specific and gender-specific biological and socioenvironmental perspectives in lifecourse approaches to dementia.[7–9] In 2018, Andrew and Tierney[7] proposed, beyond the conventional explanation based on women's longevity and biology, that gender differences between men and women could lead to reduced cognitive reserve for women and, consequently, to less protection from dementia. The authors argue that a complex interaction exists between factors related to gender differences: compared with men, women often attain lower education and wealth and lower occupational complexity in their jobs, and have higher indices of physical inactivity, possibly due to differential opportunities and gendered social roles.[7] In 2017, Langa and colleagues[10] reported that increases in educational attainment among women in the past two decades were associated with a greater decrease in the incidence of dementia in women than in men in the USA. This finding is in agreement with that of Nebel and colleagues,[8] who stated that sex and gender differences should be a priority for the understanding and development of therapeutic approaches to dementia. Furthermore, O'Neil and colleagues[11] suggested that social gender roles can influence health behaviours (eg, drinking, smoking, physical activity) during the lifecourse.

Another modifiable risk factor for dementia is insufficient physical activity.[4] According to an Organisation for Economic Co-operation and Development report,[12] in 2016, 35% of adults in 22 LAC countries with available data were insufficiently physically active, with 42% of women and 30% of men not engaging in enough exercise. Another study estimated the overall prevalence of insufficient physical activity in LAC to be 39·1% in 2016—higher than in any other world region.[13] With the exception of east and southeast Asia, women worldwide have higher levels of physical inactivity than men, and the proportion of women who are insufficiently physically active is higher in LAC than in any other geographical region.[13]

Although biological factors play a role (appendix p 1), the development of dementia is not due to sex alone; otherwise, the incidence of dementia in the LAC population would be similar to that in high-income countries, when in fact men and, in particular, women in LAC have a higher prevalence of dementia than their counterparts in high-income countries.[14,15] Moreover, gender inequalities and differences in gender roles across the lifecourse might reinforce gender disparities in the prevalence and incidence of dementia.[16] In this Personal View, we present evidence of why the inclusion

See Online for appendix

of a gender perspective is essential when assessing risk factors for dementia in LAC countries, which have some of the highest rates in the world of persistent structural differences between socioeconomic groups (vertical inequalities) and between men and women (horizontal inequalities). Vertical and horizontal inequalities in LAC coexist often; for example, people living in rural areas, women, and minority ethnic groups (eg, Indigenous peoples and people of African descent) have increased incidences of poverty and extreme poverty.[17] Moreover, women in the region are more likely to have received less formal education and less likely than men to hold paid jobs, which leaves women at a greater risk of low or no income, and low or no pension entitlements in later life. Importantly, inequalities between women and men seem to persist even when women have a similar social origin or educational background, as the wage gap and differential work conditions (eg, higher rates of informal working) result in unequal pay for work. Therefore, we aim to discuss socioeconomic aspects of already established modifiable factors for dementia in LAC and, additionally, to identify and discuss further harmful and often hidden risk factors that might influence the gender-specific onset time and prevalence of dementia. Furthermore, when assessing risk factors for dementia in LAC, we consider the inclusion of variables that are often not assessed in surveys of the lived environment and socioeconomic characteristics of older adults. Considering the vast sociodemographic differences across LAC, the purpose of this Personal View is not to exhaust the subject, but to raise fundamental issues that should be addressed in future research.

Cultural background and gender roles

Across the lifecourse, individuals hold roles defined by social norms and expectations. In this context, gender—a socially constructed role that varies across societies—dictates norms and expected behaviours. Davis and Williamson[18] argued that people from individualistic countries tend to have more autonomy and independence because the individual tends to prioritise their personal goals and promote gender equality. Conversely, people from collectivist countries are expected to respond coherently to the group norms at the expense of their personal goals. As a result, the collectivist culture, which is highly prevalent in LAC, reinforces patriarchal institutions, such as the government, family, and religion, whereby gender norms are emphasised and encouraged by the family structure and supported by society. Compared with individualistic countries, collectivist societies tend not to view women as having the same autonomy and equity of rights as men,[18] but rather tend to devalue women's personal goals and favour collective obligations, often associated with household and caregiver roles, regardless of a woman's preferences or abilities.[18]

In 2010, the UN Development Programme introduced the Gender Inequality Index to measure gender disparity across countries on the basis of three dimensions: reproductive health (ie, maternal mortality ratio and the adolescent fertility rate), empowerment (ie, parliamentary seats held by each gender and by secondary and higher education levels), and the labour market (ie, women's participation in the workforce).[19] Data show that, although progress has been made since 1990, gender equity has not yet been achieved in LAC, and this persistent inequity is a substantial barrier to human development that women face in the region.[20] Even the most economically developed countries in LAC, such as Argentina, Uruguay, and Chile, have a higher Gender Inequality Index (an indicator of higher inequality) than high-income countries such as Australia, the UK, and the USA,[21] which might at least partly explain sex differences in the prevalence and incidence of dementia across these regions.

A systematic review and meta-analysis[22] has reported that the unemployment ratio of women to men is also associated with an increased incidence (although not prevalence) of dementia in women. Sex differences in both incidence and prevalence of dementia could, to some extent, be caused by gender inequality, as reflected by its associations with educational attainment; however, no specific analyses were carried out with LAC data in that systematic review.[22]

Gender roles often lead to inequality and have large negative effects on women across the lifecourse in various domains (eg, educational achievement and labour market participation), which can lead to reduced wages and increased labour informality for women.[23] In addition, physical inactivity, restricted access to health care, and gender-based violence are also factors that might be associated with an intergenerational transmission of disadvantages, furthering detrimental effects in later life.

Consequences of gender roles and their effect on health and later life

Teenage pregnancy

As reflected by the Gender Inequality Index, reproductive health contributes to gender inequality in LAC countries, which have the second highest rates of teenage pregnancy in the world, behind only sub-Saharan Africa.[24] Although adolescent fertility is in decline globally, it has remained stable in LAC from 1990 to 2000, with only a slight decrease since. In 2010–11, between 9·4% and 30·7% of all deliveries in the total (ie, indigenous and non-indigenous) population of Brazil, Costa Rica, Ecuador, Mexico, Panama, and Uruguay were from mothers aged 15–19 years old (appendix p 2).[24] Teenage pregnancies often lead to adolescent women moving into the role of a carer instead of pursuing formal education, making young mothers less likely to finish secondary education, enter the workforce, or acquire economic independence than women who do not have children during

adolescence.[25] As a result, adolescent pregnancy perpetuates intergenerational cycles of low education, poverty, and poor health, and is a risk factor for worse mental health, reduced social support,[26] and increased rates of substance consumption among young mothers.[27] Teenage pregnancy can also lead to neonates with low birthweight,[28] which can result in an increased risk of ischaemic heart disease and impaired glucose tolerance—both risk factors for dementia—in the affected children. In addition, adolescent mothers have an increased risk of pre-eclampsia,[29] which is another risk factor for dementia.[6,30] Improving socioeconomic conditions for adolescent women could, therefore, improve not just their health but also the later-life health of their children, which would be an important step towards reducing persistent intergenerational inequalities.

Levels of education and occupational segregation

Low levels of education are among the most studied modifiable risk factors for dementia,[4,15] and are estimated to account for 7·5% of dementia cases worldwide and 10·9% of cases in Latin America.[5] Higher education is one of the main factors accounting for cognitive reserve—ie, a mechanism that protects cognitive performance even with in the presence of pathological changes as those seen in Alzheimer's disease.[31]

Although levels of educational attainment in LAC increased between 2000 and 2018 (appendix p 2), women in some LAC countries are not typically encouraged or incentivised to be financially and socially independent;[32] as a consequence, women are still in minority in the formal labour force. Moreover, women hold the vast majority of caregiving roles and have fewer working years available—which, adding to the fact that women often receive lower wages, have more uncertain working conditions, and receive less income in later life than men do, can perpetuate women's dependence on other family members.

Access to the health-care system and the caregiver role

Gender also can also affect access to health care because women are generally expected to care for others and prioritise the needs of their family and the head of the household—usually a man—at the expense of their own health (appendix p 2).[33] A study investigating barriers to women's access to health care in eight LAC countries showed that women living in cities are more likely to have access to health care than are women living in rural areas, and gender norms have a direct association with the use of essential health services: for example, the need to ask someone for permission to receive medical treatment reduces the pursuit of prenatal care, gynaecological examinations, contraceptive methods, and full vaccination of children.[34]

Women with a higher level of education in LAC are also more likely to have access to preventive medical care than women with a lower level of education, which results in reduced quality and access to health care for more socioeconomically vulnerable women,[35] with negative implications both in immediate and later life.

The caregiver role that women typically assume in society also seems to delay their health-care seeking and access.[16] Because women in most LAC countries often act in accordance to a social and moral obligation to provide care for children and relatives, the resulting family-focused care role can lead to reduced use of health services and long-term care institutions by older adults, who are considered to be under the responsibility of care of family members, especially women.[36] This scenario is aggravated by the fact that few services in LAC offer subsidised long-term elderly care,[37] which can reinforce a dependency on informal carers, typically women, who have—especially those caring for people with dementia—a higher burden of depression, anxiety, and stress symptoms than non-carers.[38]

In LAC, dementia is not typically recognised as a severe disease and, for this reason, it is often diagnosed late, or not at all.[37] According to Parra and colleagues,[39] services providing dementia diagnosis that comply with international consensus are scarce in LAC. Furthermore, because ageing is seen in LAC countries as a negative process of physical and mental decline, a scarcity of public awareness about dementia creates a stigma that hinders both diagnosis-seeking behaviours and the planning of public policies to provide care for caregivers and people with dementia in LAC.[37,40]

Social isolation and loneliness

Social isolation and loneliness interact, but are different concepts: social isolation is related to an objective scarcity of social contacts, whereas loneliness refers to a negative, subjective perception of solitude. Chronic loneliness and social isolation have been reported to lead to an increased risk of cardiovascular disease, stroke,[41] depression,[42] and dementia,[43] and social isolation alone is estimated to account for 4·2% of the unweighted population attributable fraction of risk of dementia in adults older than 65 years.[4] A proposed explanation for the influence of social isolation and loneliness on dementia prevalence is that these factors lead to reduced cognitive stimulation and poor health behaviours—ie, substance abuse, insufficient physical activity, and poor nutrition.[43]

Feelings of social isolation and loneliness also seems to affect individuals in collectivist societies more than in individualistic countries. Using data from European countries, Lykes and Kemmelmeier[44] found that, although more people live alone in individualistic countries, those in collectivist countries tend to report higher rates of loneliness. These findings could be partly explained by the fact that collectivist societies tend to have high expectations of social and family bonds, which can mediate an increased perception of loneliness if such expectations are not met.[45] Congruently, a 2022 meta-analysis reported increased rates of feelings of

loneliness in adults aged 30–59 years in collectivist and low-income and middle-income countries, as well as higher rates of loneliness in adults over the age of 60 years living in southern and eastern Europe, compared with those living in more individualistic western and northern European countries.[46] Possible explanations for these findings include the positive influence of socioeconomic factors, such as welfare generosity, better health, and higher social involvement in high-income countries than in countries with lower socioeconomic resources.[47] Taken together, these reports suggest that understanding sociocultural background and social bonds across different economic backgrounds could provide valuable insights into late-life physical and mental health.

Feelings of loneliness seem to vary across the lifespan: a systematic review showed that men tended to feel lonelier than women in childhood, adolescence, and as young adults, but any sex-related difference seemed to disappear with ageing.[48] However, the specific social context of LAC countries was not considered in this meta-analysis. The few studies exploring social isolation and loneliness in LAC have produced a complex pattern of results, in which female adolescents reported higher rates of both social isolation and loneliness feelings than male adolescents;[49,50] findings that might be explained by multiple factors, including violence in the family, scarce social and family support, and bullying. Another study of loneliness in adults older than 65 years living in LAC, China, and India found that being a woman, widowed, and having a low socioeconomic status was associated with increased feelings of loneliness.[51]

Nutrition: food insecurity and overweight and obesity

Obesity is a known risk factor for dementia,[4] and malnutrition in all forms can increase the burden of several diseases, with detrimental effects on health throughout the lifecourse.

According to a report led by the UN's Food and Agriculture Organization,[52] in 2020, 267 million people in LAC did not have physical or economic access to enough food. Malnutrition is often further aggravated by the increasing affordability—and subsequently increasing consumption—of highly processed foods with high caloric density, which is leading to overweight and obesity in the general population becoming another widespread issue in LAC: for every person facing severe food insecurity in LAC, more than six are overweight or obese.[53] Data for the period of 1991–2002 show that, assuming zero wastage, the amount of available fruits and vegetables in LAC was sufficient for the population to meet WHO recommendations for the consumption of these products, suggesting that low-quality diets are related not to unavailability, but to unaffordability (eg, due to high unemployment rates) of healthy foods.[54]

Both food insecurity (ie, restricted or total disruption in access to food)[52] and overweight and obesity are more prevalent in women than in men (appendix p 2). Importantly, when women face food insecurity, their children are also more likely to be exposed to a poor nutritional environment, which can lead to low birthweight, suboptimal cognitive development, low educational levels, low labour market participation, energy-dense but nutrient-poor diets, and adverse lifestyle habits[6] (ie, smoking and high consumption of sugar-sweetened beverages). Food insecurity has also been hypothesised to be linked to high perceived stress, which might be a modifiable risk factor for mild cognitive impairment.[55]

Overweight and obesity (appendix p 2) are associated with metabolic dysfunction and structural brain alterations,[56] as well as with an increase in cardiovascular risk factors, such as hypertension and diabetes, especially during midlife—all of which can increase the risk of dementia. A study with data collected between 2000 and 2015 in São Paulo, Brazil showed a high prevalence of cardiovascular risk factors—namely overweight, obesity, diabetes, and hypertension—and of cognitive impairment in adults aged 60 years or older.[57] Cardiovascular risk factors leading to neurodegenerative damage can also be exacerbated by low-quality diets,[58] reinforcing the importance of investigating obesity as one of the risk factors driving the growing burden of cognitive impairment in the older population.

Gender-based violence

LAC comprises 14 (56%) of the 25 countries in the world with the highest rates of femicide (appendix p 2).[59] Violence against women takes place even among those with high educational levels: in fact, women reaching a higher educational level and participation in the labour market can be seen as challenging traditional gender patterns, which in turn can lead to an increased risk of gender-based violence.[60]

About 82% of worldwide victims of homicide by an intimate partner are women, and in LAC, the homicide rate by an intimate partner is five times higher for women than for men.[61] In many cases, violence occurs continuously over several years and eventually culminates in a lethal aggression.[61] A Pan American Health Organization comparative analysis of gender-based violence in 12 LAC countries reports that women who experienced intimate partner violence describe physical injuries such as bruises, burns, broken bones, and knife wounds.[62] Women who survive violent assaults often face severe consequences in mental and physical health, such as traumatic brain injury—a recognised risk factor for dementia.[4] These women tend not to seek medical or legal assistance for a variety of reasons,[62] even though most LAC countries have made substantial progress in the legislative recognition of gender-based violence over the past decade.[63]

Long-lasting exposure to violence can result in various negative health outcomes,[64] making gender-based

violence a public health concern. One of the few studies that explored the effects of intimate partner violence during the lifecourse and its association with dementia and risk of mortality in later life found that 782 (6·4%) of 12 259 women aged 70–75 years living in Australia reported intimate partner violence, and that these women had poorer psychological health and were more prone to depression than were those who did not report violence.[65] Research has also shown an association between various types of stress events and later-life cognitive impairment.[66]

Differential exposures to alcohol consumption and smoking

Smoking and alcohol consumption are patterned by gender; in LAC, epidemiological data show that men are more likely than women to drink and smoke.[67,68] Smoking can have diverse negative effects on health, including by increasing the risk of dementia (eg, by furthering propensities for myocardial infarction, cerebral atrophy, and decline of white matter in the brain).[69,70] Smoking habits in LAC are heterogeneous, but smoking is an acceptable social behaviour in most of these countries.[71] Although smoking is more common among men, who consequently are more affected by this risk factor for dementia and other negative health outcomes, the ongoing increase in the number of women smoking might lead to a detrimental health burden on women in the future, which reinforces the need for smoking prevention and cessation strategies for both genders (appendix p 2).

Alcohol consumption follows gender patterns similar to those of smoking in the LAC population (appendix p 3).[72] Gender expectations can affect alcohol consumption in various ways: for example, public drinking can be seen as more acceptable for men than for women.[73] Lifestyle is also an important factor to consider because it can promote alcohol consumption as an essential element of social events.[74] Although some controversy persists around the health effects of alcohol consumption (especially for low consumption), chronic alcohol misuse and long-term exposure to alcohol is known to induce structural and functional brain abnormalities that can increase the risk of cognitive dysfunction,[75] with possibly worse effects in women than in men.[76]

Although annual alcohol consumption per capita in LAC is lower than in Europe and North America,[77] this lower alcohol consumption does not appear to correlate with a lower prevalence of dementia in LAC, which suggests that the interplay before alcohol consumption and other risk factors needs to be explored in further detail.

Factors missing from current research

Although consortia initiatives are already underway in LAC to explore genetic and socioeconomic factors and interventions for dementia (appendix p 3), we emphasise that future studies must carefully consider some factors that might not be apparent at first sight. As discussed herein, gender roles in different stages and dimensions of the lifecourse might influence the prevalence and incidence of dementia, but sociodemographic idiosyncrasies in the highly diverse set of LAC countries need also be considered in the development of further research designs.

In the figure, we integrate and highlight factors beyond those already mentioned in prominent studies[4,6] that should be further explored when assessing and diagnosing

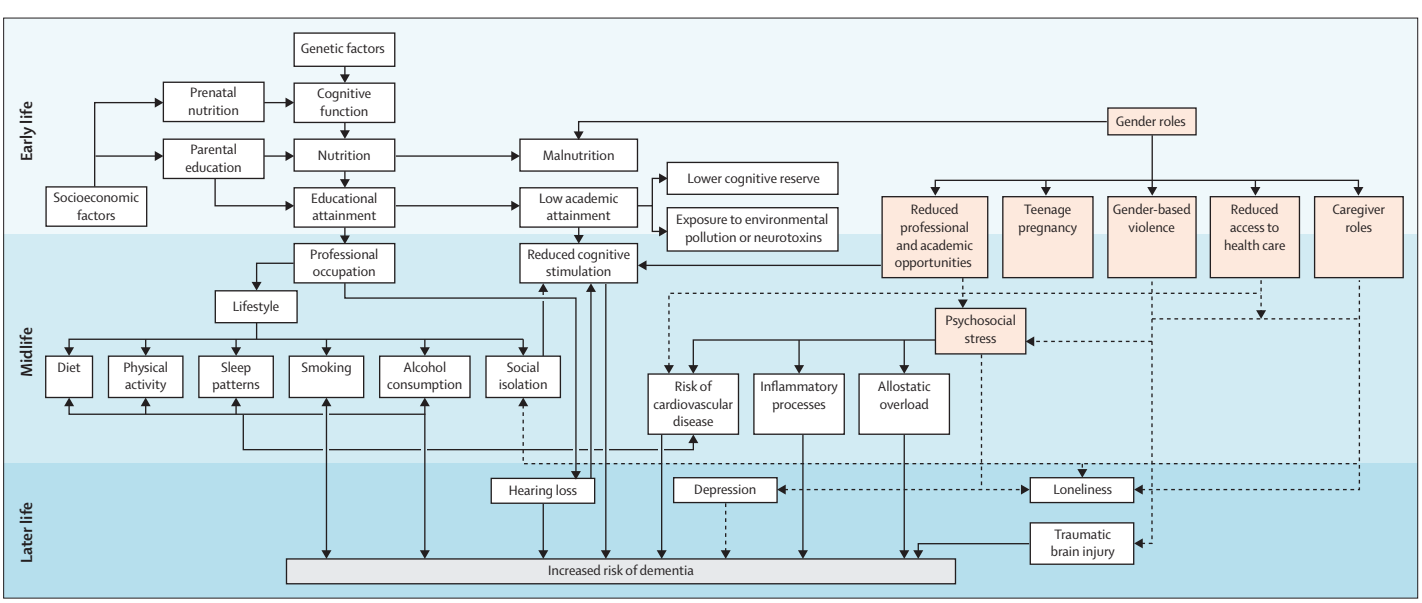

Figure: **The timeline of biological and socioeconomic risk and protective factors for dementia**
The factors in the white boxes are those indicated by previous studies to be modifiable risk factors for dementia. The orange boxes indicate factors that need further exploration in future research. The solid lines are risk factors already known to be risk or protective factors by robust scientific literature. The dashed arrows show possible mediators for cognitive decline and dementia at different stages of life.

dementia in LAC. In this Personal View, we emphasised the effect of gender roles on education, teenage pregnancy, access to professional opportunities, malnutrition, gender-based violence, smoking, and alcohol consumption, and the direct and indirect effects of these gender roles on the risk of dementia. All of these socioeconomic factors affect intellectual and physical development and have effects on health in later life, and although several mechanisms leading to dementia have already been identified, further research on the topic needs to include the gender perspective. Understanding how gender roles affect the lifecourse of the population of LAC will be instrumental to the development of adequate dementia intervention strategies. For example, adequate measures are needed to explore birth conditions for mothers and children, to identify women who were teenage mothers, and to establish whether these young mothers have health and social support, adequate job opportunities, access to health care, and importantly, whether they were exposed to food insecurity. Although surveys of older people often inquire about a history of malnourishment during childhood, knowing the extent, duration, and context of undernutrition and malnutrition is essential to understand its impact on dementia. Last, but not least, future investigations need to assess intimate partner violence and its consequences on mental and physical health.

Conclusion

Quantifying the possible effects of biological and socioeconomic aspects on the lifecourse is challenging, especially in a region as large and diverse as LAC, where horizontal inequalities (eg, between men and women) interact with vertical inequalities (eg, between different socioeconomic groups). In addition to collecting new data, the dementia research community must consider other factors that can directly influence the high incidence and prevalence of dementia in women living in LAC, both across the individual's lifecourse and factors that can be transmitted over different generations.

In many LAC countries, the research infrastructure needs enormous investments that local governments cannot provide due to financial hardships. The importance of global health should motivate non-governmental funders, charities, and donors, as well as funding agencies from high-income countries, to invest in better and more vigorous data collection in LAC.

It is important to recognise that crucial and positive changes have been taking place in some LAC countries, enabling increased educational attainment and job market insertion for new generations of women; however, gender norms are persistent and resilient, and likely to affect young women still for years to come. Men continue to occupy the most valued jobs and leadership roles and women retain the bulk of child caregiving responsibilities, which can be particularly impactful discrepancies in LAC, where rates of teenage pregnancy remain high. Women in the region continue to be more prone to food insecurity and obesity, and thousands continue to be affected by intimate partner violence, despite governmental responses and massive pressure from women's movements.

This Personal View is intended to encourage research that encompasses and discusses sex-specific and gender-specific factors, and public policies that develop a differentiated and effective capacity for dementia prevention that is sensitive to gender differences. Gender equity must be pursued alongside research of the risk factors for dementia, and especially considering that the burden of dementia currently disproportionately affects women, all efforts to improve women's socioeconomic conditions and health would be particularly welcomed.

Contributors

FSR and AKL conceptualised the manuscript. FSR did the literature research, produced the figure, and wrote the original draft. All authors had full access to all the data in the manuscript, revised the manuscript, and had final responsibility for the decision to submit for publication.

Declaration of interests

AKL reports remuneration from Roche related to consultancy activities. FSR and LC declare no competing interests.

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