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# Strategy for primary prevention of non-communicable diseases (NCD) and mitigation of climate change in Italy

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► Additional online supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/jech-2020-215726>).

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Received 20 October 2020

Revised 11 February 2021

Accepted 21 March 2021

Published Online First

29 April 2021



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**To cite:** Vineis P, Beagley J, Bisceglia L, et al. *J Epidemiol Community Health* 2021;**75**:917–924.

## ABSTRACT

This paper derives from a document commissioned in 2019 by the Italian Minister of Health, and outlines a general strategy for primary prevention of non-communicable diseases in Italy, with a special focus on cobenefits of climate change mitigation. Given that action against climate change is primarily taken via energy choices, limiting the use of fossil fuels and promoting renewable sources, an effective strategy is one in which interventions are designed to prevent diseases and jointly mitigate climate change, the so-called cobenefits. For policies capable of producing relevant co-benefits we focus on three categories of interventions, urban planning, diet and transport that are of special importance. For example, policies promoting active transport (cycling, walking) have the triple effect of mitigating greenhouse gas emissions, preventing diseases related to atmospheric pollution, and increasing physical activity, thus preventing obesity and diabetes. In particular, we propose that for 2025 the following goals are achieved: reduce the prevalence of smokers by 30%, with particular emphasis on young people; reduce the prevalence of childhood obesity by 20%; reduce the proportion of calories obtained from ultraprocessed foods by 20%; reduce the consumption of alcohol by 10%; reduce the consumption of salt by 30%; reduce the consumption of sugary drinks by 20%; reduce the average consumption of meat by 20%; increase the weekly hours of exercise by 10%. The aim is to complement individual health promotion with structural policies (such as urban planning, taxation and incentives) which render the former more effective and result in a reduction in inequality. We strongly encourage the inclusion of primary prevention in all policies, in light of the described cobenefits. Italy's role as the cohost of the 2020 (now 2021) UN climate negotiations (COP26) presents the opportunity for international leadership in addressing health as an integral component of the response to climate change.

## INTRODUCTION

This paper sets out a policy proposal based on the scientific principles underpinning primary prevention programmes in Italy, including the imminent threat from climate change. The document was commissioned in 2019 by the Minister of Health of the time (for details see note a) and outlines a number of priority objectives to pursue via collaboration across different sectors (transport, education and food and agriculture). It includes monitoring

and evaluation methods to quantify the achievement of these objectives. The paper is composed of four sections:

1. Principles for disease prevention in Italy.
2. Specific priority goals.
3. Beyond the specific goals: some priority issues.
4. Conclusions.

## PRINCIPLES FOR DISEASE PREVENTION IN ITALY

Today, we can progress from research to action in the prevention of many diseases. This is particularly necessary for addressing health problems of increasing importance in all societies, such as non-communicable diseases (NCDs) including cardiovascular, respiratory, cancer and neurodegenerative diseases, rising rates of obesity or emerging public health threats like the increase in antimicrobial resistance. Because of its huge impact, special attention must be paid to climate change and its effects on health, particularly in urban settings.

Considering the following principles when developing public policies may increase their positive outcomes:

1. Integration of different levels of intervention, from the national to the local level.
2. A virtuous circle in which investments in one sector (such as transport) have positive effects (including economic) on other sectors, such as health.
3. Use of available digital technologies that facilitate implementation of prevention programmes.
4. Identification of different contexts in which prevention programmes, including health education, can be offered in a structured and continuous manner (schools, workplaces).

Because the challenges faced (particularly climate change) are of a complex, multidisciplinary and structural nature, which transcends country borders, addressing them requires strategic planning and structural interventions (ie, those changing the wider societal context), not only on a regional and national level, but also on a supranational if not global level.

Interventions to reduce exposure to risk factors for NCDs in industrialised countries could realistically achieve a reduction of between 30% and 40% of premature deaths from NCD (<https://www.who.int/news-room/factsheets/detail/noncommunicable-diseases>). The best-established risk factors include tobacco use, poor diets and low levels of physical activity (<http://www.healthdata.org/sites/>

default/files/files/country\_profiles/GBD/ihme\_gbd\_country\_report\_italy.pdf). More recently, the impact of environmental exposures, particularly to air pollution, has been proposed as a risk factor for cardiorespiratory diseases and lung cancer, with a large impact on avoidable deaths and life expectancy.<sup>1</sup> Considering that NCDs represent globally 70% of all causes of mortality, preventive interventions could offer good opportunities for prolonging years of life in good health (and hence also economic productivity) while reducing healthcare costs.

Until now, the most commonly adopted approach to prevention has been at an individual level, such as the prevention advice given by general practitioners. There is evidence that some interventions (counselling) are effective when tested in experimental settings, but organisational challenges (involving skill-sets and incentives) can be problematic when trying to implement the same interventions on a larger scale. While individual-based prevention approaches are necessary, they have been found to be insufficient, and in some situations have exacerbated inequalities, with greater adherence to prevention plans by those in more educated social strata (partly due to financial barriers). The prevention of disease must therefore be carried out via a combination of both individual and structural interventions that would benefit all sectors of society, including via policies such as urban planning to facilitate active transport (eg, walking and cycling) or the promotion of sustainable food. These interventions also offer benefits in terms of climate change mitigation, leading to a win-win situation through the so-called 'cobenefits'.

Italy has plans to contribute to the achievement of Sustainable Development Goals (SDGs) and the European Union (EU) Green Deal, however, these plans have not been clearly formalised, except (partially) in the National Plan for Prevention 2020–2025 (NPP) (that can be found in the website of the Minister of Health: [http://www.salute.gov.it/portale/temi/p2\\_4.jsp?lingua=italiano&tema=Prevenzione&area=prevenzione](http://www.salute.gov.it/portale/temi/p2_4.jsp?lingua=italiano&tema=Prevenzione&area=prevenzione)) and in the National Plan for Energy and Climate (<https://www.mise.gov.it/index.php/it/2040668>). The NPP mentions several times SDGs and also the need to liaise preventive strategies to the green economy. However, it was felt by our working group that such connections were episodic rather than organic and a more cohesive strategy was needed, under the conceptual umbrella of cobenefits as described in the present contribution.

### Health and disease in Italy: life expectancy

Life expectancy at birth in Italy has significantly increased in the last three decades, from 73.6 years in men and 80.6 in women in 1990, to 80.6 and 84.9, respectively, in 2017. However, as is the case in other high-income countries, a longer life is accompanied by disabilities, the need for long-term care (which increases the costs of the welfare state) and is associated with higher individual carbon footprint. Both regional and social inequalities persist in Italy. In fact, in 2017 life expectancy in the province of Naples (South) was 78.6 in men and 82.3 in women, vs 81.6 and 85.8 in the province of Trento (North). Healthy life expectancy (<https://www.istat.it/it/archivio/91926>)—amounting to 58.4 in men and 54.8 in women in the South of Italy vs 61.3 and 55.8 in the North—highlights both regional and gender disparities. There are also strong regional differences for avoidable deaths (the main proportion of which are preventable deaths), with Campania at the bottom, and the Regions of the South generally greatly disadvantaged compared with those in the North ([https://www.mortalitaevitabile.it/\\_mevi/2019/MEVi2019-rapporto.pdf](https://www.mortalitaevitabile.it/_mevi/2019/MEVi2019-rapporto.pdf)). Furthermore, the gap between social classes is such that life

expectancy in the lower classes is up to 6 years lower than that in the more affluent classes.

### The importance of the early years

Experiences that have a negative impact on health begin in the early years, with effects which accumulate throughout the life course. One such example is illustrated by work from the 'Lifepath' research consortium ([www.lifepathproject.eu](http://www.lifepathproject.eu)) that shows how in Finland (and similarly in many other countries including Italy) risk factors are significantly more present in more deprived than in more affluent social classes. According to a Lifepath paper, this inequality starts being evidenced early on in life in the behavioural risk factors (such as diet and exercise), translates to biological markers in later years (such as cholesterol and triglyceride levels), and in adverse health outcomes in mid-late life (diabetes, cardiovascular diseases).<sup>2</sup> Interestingly, the difference in adverse health outcomes between more and less affluent social classes is amplified throughout life, as evidenced for the body mass index, triglyceride levels and blood pressure. This phenomenon of risk accumulation throughout the life course, particularly in lower socioeconomic status, provides an incredibly important window of opportunity for preventive interventions in the early phases of life and mitigation of social inequalities.<sup>2</sup>

The health trajectory during the life course of an individual could be broadly divided in two phases: during the first phase, individuals start getting exposed to environmental stressors and a pool of resilience and capacity to respond to environmental threats (of microbial, chemical, physical, psychological and social nature) is created, representing an ascending curve. In the second phase, later in life the health capacity starts decreasing and the risk of disease increases, representing a descending curve. These trajectories are more slow-growing in the first phase and decline more rapidly in the second phase in more deprived communities ([www.lifepathproject.eu](http://www.lifepathproject.eu)), again exhibiting the permanent effects that adverse health impacts early in life have throughout the duration of the lifetime.

The findings of the Lifepath consortium gain significant importance in a context of climate change, which is impacting on the health of people around the world, including in Italy, from an early age, with these effects set to increase in the future unless urgent action is taken. The 2019 report of the Lancet Countdown has demonstrated that the changing climate is making extremes of weather more frequent and intense, generating direct damage, as well as impacting on the food and sanitation systems that sustain us. The risks to our food and water security are only expected to increase under the current trajectory to a 3°C of warming by the end of the century, with permanent and irreversible impacts on the health of children. Climate change is also changing the environmental suitability for the transmission of infectious diseases, many of which affect children the most, like diarrhoeal disease and dengue fever. People around the world are being exposed throughout their lifetimes to dangerous levels of fossil fuel-derived air pollution. Importantly, the health impacts of climate change are felt most acutely by the most vulnerable and disadvantaged, oftentimes those that contribute the least to the problem. Any effort to improve population health and reduce social inequalities requires a commitment to reducing exposure to risk factors with emphasis on those that affect the years of life—and climate change-related risk factors must be at the centre of these interventions. Investments in prevention should be targeted starting from the first years of life, and tailored to each life stage. This aim could be achieved

**Table 1** Health and social policies that are universal or aimed at four different age groups or different socioeconomic groups (examples from different countries, not just Italy) (reproduced from Vineis and Wild)<sup>6</sup>

Age groups	0–4	5–18	19–66	67+
<b>Universal policies or aimed at age groups</b>	Universal health coverage	Universal health coverage	Universal health coverage	Universal health coverage
	Childcare benefits	Childcare benefits		State pensions
	Immunisation programmes	Immunisation programmes		
		Universal-free education		
			Prevention measures in the workplace	
	Banning smoking in public areas	Banning smoking in public areas	Banning smoking in public areas	Banning smoking in public areas
	Sugary beverages tax	Sugary beverages tax	Sugary beverages axe	Sugary beverages tax
	A ban on transfats	A ban on transfats	A ban on transfats	A ban on transfats
	Traffic-light food labelling, including calorie information	Traffic-light food labelling, including calorie information	Traffic-light food labelling, including calorie information	Traffic-light food labelling, including calorie information
	Promotion of active transport (bicycle, walking)	Promotion of active transport (bicycle, walking)	Promotion of active transport (bicycle, walking)	Promotion of active transport (bicycle, walking)
	Promotion of safe play areas for children (both in the home and outdoors)	Promotion of safe play areas for children (both in the home and outdoors)		
	Replace individual transport with high quality public transport (trains, buses, underground)	Replace individual transport with high quality public transport (trains, buses, underground)	Replace individual transport with high quality public transport (trains, buses, underground)	Replace individual transport with high quality public transport (trains, buses, underground)
	0–4	5–18	19–66	67+
<b>Aimed at socioeconomic groups</b>				Flexible retirement policies
	Household policies (spacious and healthy living conditions)	Household policies (spacious and healthy living conditions)	Household policies (spacious and healthy living conditions)	Household policies (spacious and healthy living conditions)
			Unemployment benefits	
	Social support systems	Social support systems	Social support systems	Social support systems
	Emergency support in times of recession	Emergency support in times of recession	Emergency support in times of recession	Emergency support in times of recession
	Free transport in the under 5 s	Reduced cost transport for school age children	Free transport for jobseekers	Free transport

through a combination of both universal, and group-specific policies of which multiple examples exist in several countries including Italy (table 1).

### The politics of cobenefits

The Intergovernmental Panel on Climate Change’s 2018 Special Report of Global Warming forecasts that current levels of CO2 emissions would see the world reach a warming of 3°C–5°C by the end of the century; therefore, emissions must be reduced by 45% by the year 2030 compared with 2010 levels, and to net zero by 2050 to limit global warming to a safer 1.5°C (<https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/>). With the current 1°C of global warming, climate change is already putting at risk the last 50 years of gains in public health (Lancet Countdown, 2020: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)32290](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)32290)). Any action taken to mitigate climate change (and the associated air pollution) will therefore benefit the health of generations to come. In addition, multiple climate change mitigation actions would have additional positive effects on health, leading to win-win situations through health co-benefits. For example, reducing greenhouse gas emissions would simultaneously reduce air pollution, much of which comes from the same sources (the burning of fossil fuels). Air pollution, and particularly its smaller particulate

component (known as particulate matter (PM2.5)), is linked to an increase in morbidity and mortality related to lung cancer, cardiovascular and respiratory diseases. A large proportion of this pollution is attributed to the use of energy in the domestic sector and to land-based transport emissions, varying depending on the country.

Due to the impact of co-benefits and the prevention of climate change-associated disease, tackling climate change is the ‘greatest global health opportunity of the 21st century’ (Lancet commission 2015: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(15\)60854-6/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)60854-6/fulltext)). In order to maximise this opportunity, it is crucial to bear in mind the effect on health when considering climate change mitigation policies<sup>3</sup>; this requires an integrated approach across all governmental and societal sectors (including education, transport, energy, agriculture and food, labour and waste management). For example, climate change mitigation policies that focused solely on reducing carbon dioxide (CO2) emissions risk losing the positive effects on health that would arise from actions that also minimise air pollution (see note b). Hence, sound climate change policy should focus on investing in renewable energies and not only in greenhouse gas absorption technologies which would not address the damaging health effects of PM2.5. This represents a great opportunity for Italy to promote investments on renewable resources, considering its strong background in

technological innovation, of small-sized and medium-sized businesses and innovative start-ups, and its dependency on other countries for non-renewable sources.

The confluence of climate change mitigation policies and those of disease prevention can also lead to substantial economic benefits. Exposure to PM<sub>2.5</sub> at 2018 levels would result in a monetised cost of 20.9 billion euros in Italy in 2018 (Lancet Countdown 2020: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)32290-X/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)32290-X/fulltext)) (a conservative figure which only takes anthropogenic PM<sub>2.5</sub> into account, and uses the lower bound estimate for Value of a Life Year suggested by the EU) (Part III of the 2009 EU Impact Assessment Guidelines, that is, €50 000 for all countries, for all population cohorts). Other estimates are available,<sup>4,5</sup> though a general consensus has not been reached. As we said, a significant reduction (up to 30%–40%) in the incidence of chronic diseases (tumours, diabetes, cardiovascular diseases, respiratory and neurological) can be achieved with prevention policies unrelated to provision of health services (food, transport, agriculture) (<https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases><sup>6</sup>). The financing of these policies via the relevant Ministries would lead to substantial savings in the healthcare sector and, through policies that reach all sectors of societies, would have a very positive impact on the reduction of social inequalities. For both traditional NCD prevention measures and wider climate change mitigation interventions, the cost of inaction far outweighs the cost of action (see <https://apps.who.int/iris/bitstream/handle/10665/276405/9789241514972-eng.pdf?ua=1>; and <https://www.who.int/nmh/publications/ncd-profiles-2018/en/>). This is particularly so as the negative externalities associated with greenhouse gas emissions are not currently reflected in market values, particularly considering that in Italy carbon emissions in 2017 were taxed at only 0.16 US\$/tCO<sub>2e</sub> (Lancet Countdown 2020: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)32290](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)32290)). The direct consequence of these non-costed externalities is resulting in a sustainability debt, which will be borne by future generations, and which is currently not reflected in common economic or financial indicators like Gross Domestic Product (GDP).

### Three priority areas delivering health co-benefits

For policies capable of producing relevant cobenefits three categories of interventions, on urban planning, diet and transport are of special importance.

#### Urban planning

Interactions between the health and safety of populations can emerge from the widespread application of local adaptation and mitigation plans of action against climate change, included in urban, territorial and sectoral planning. More than half of the world's population now lives in urban areas (United Nations 2018: <https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf>). Shaping urban environments to ensure the promotion of health and sustainability therefore offers great potential for both NCD prevention and climate change mitigation. Exposure to extreme heat, increasingly frequent due to climate change, negatively impacts on health leading to greater risks of heat stroke, acute kidney injury and congestive heart failure.<sup>7</sup> It also contributes to worse air quality and increased energy demand. In 2018 the Italian population was exposed on average to an increase of 1.2 degrees more than the average of 1986–2005. In 2019, there were also millions of additional heat-wave exposure events in the most vulnerable population—those

over 65—than for the 1986–2005 average. In addition, a steadily increasing ageing and rural to urban migration make the Italian population particularly vulnerable to extremes of heat. Exposure to extreme heat is also having a strong negative effect in labour capacity: in 2018 there were 127 248 000 potential hours of work lost due to exposure to extreme heat in Italy across the service, manufacturing, construction and agricultural sectors, with almost 20 000 000 lost in the agriculture sector—one of the most vulnerable. This could also have indirect effects on food insecurity (data are from Lancet Countdown 2020: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)32290](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)32290)).

These adverse health effects are further exacerbated in urban settings, where the heat island phenomena—which can be increased by the shape and distribution of developed and undeveloped areas, by the absence of green spaces, and by the quality of the materials that cover the waterproofed surfaces—increases the concentration of heat within the urban fabric.<sup>8</sup> This can lead to urban areas being warmer than rural areas, with variable estimates and reaching up to 10°C. A cost-effective way of reducing the urban heat island effect is by increasing green space coverage in urban areas, which also helps diminish air pollution, contributes to climate change mitigation by absorbing atmospheric CO<sub>2</sub>, and reduces demand of energy for cooling (US Environmental Protection Agency 2007)([http://www.euro.who.int/\\_\\_data/assets/pdf\\_file/0005/321971/Urban-green-spaces-and-health-review-evidence.pdf?ua=1](http://www.euro.who.int/__data/assets/pdf_file/0005/321971/Urban-green-spaces-and-health-review-evidence.pdf?ua=1)). In addition, it would offer significant health co-benefits: exposure to green space is associated with higher levels of physical activity and reduced obesity, improved mental health<sup>9</sup> and well-being, lower rates of cardiovascular disease,<sup>10</sup> improved pregnancy outcomes, and lower risk of overall mortality among others.

The Italian territory is particularly vulnerable from several points of view. The country's fragile housing stock is among the factors that increase the vulnerability of the population to heat-waves. There is also hydrogeological frailty. Floods have caused very serious damage to infrastructures, but also to people, with a significant burden of disease. Such types of damage are expected to increase with climate change. Measures to mitigate the effects of these damages could be superimposable to those of heat islands, including resilient green spaces and the improvement of infrastructural networks for water channelling.

It is not only direct heat that negatively affects health: in anti-cyclonic atmospheric conditions and in excessive heat, in fact, there are greater levels of pollutants such as ozone and PM, which also increase mortality and morbidity.<sup>11</sup>

Given the high impacts of air pollution and heat exposure in Italy, incorporating green spaces in urban designs offers a cost-effective opportunity to deliver both public health benefits and climate change mitigation, and it is crucial that public health experts are involved in urban planning decisions to ensure these benefits are maximised.

Moreover, promoting active transport through the provision of safer cycle lanes and pedestrian routes should also be prioritised when planning urban layouts, as further discussed in section c below.

#### Diet

Promoting nutrition styles similar to the Mediterranean diet, and in particular reducing the consumption of meat, would help to prevent many non-communicable and infectious (zoonotic) diseases. Agriculture contributes a large share of total man-made greenhouse gas emissions of which the majority is due to animal breeding. In Italy, the consumption of livestock products, which

takes into account trade balances, generated 41.2 megatonnes of CO<sub>2</sub> equivalents in 2019, 92% of which come from cattle (Lancet Countdown 2020: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)32290](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)32290)). The main greenhouse gas emitted from farming is methane, largely due to ruminating animals as a result of fermentation of the rumen. Furthermore, consumption of water associated with the meat industry is very high: a significant portion of global water usage in food production is in fact related to farming. In many regions in Italy, in particular in the Po Valley, manure spreading mechanisms are the main source of ammonia pollution and consequently of its transformation into PM 2.5, one of the most significant environmental hazards in these regions. Although meat is an important source of protein and contains different essential nutrients (including vitamins and iron), a high consumption of red meat contributes to the burden of chronic degenerative diseases, particularly cardiovascular diseases. In Italy, premature deaths from excessive consumption of red meat remain high, at over 18 700 in 2018. However, this is a reduction of 22% from the year 2000, which has driven a decline of 12% in agricultural emissions in that period, revealing the enormous health and environmental dividends of promoting healthier, plant-forward diets (Lancet Countdown 2020: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)32290](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)32290) X/fulltext). There are many alternative sources of protein—such as legumes—of which production is more respectful of the environment and which could partially replace meat. It is therefore essential to work with the agricultural sector to reduce greenhouse gas emissions and air pollution, taking into account the added health benefits while prioritising the conservation of jobs, and traditional values in Italian culture. Promoting an increase in plant-based food consumption both through health campaigns and through economic incentives would therefore lead to the double benefit of improving health and mitigating climate change.<sup>12</sup>

Italy can greatly contribute to the Farm-to-Fork strategy of the EU. Italy still has a large network of farmers with a food system that is less industrialised than in other countries. Household availability (in kcal/day/person) of ultraprocessed foods in Europe ranged from 13% in Italy (1996) to 51% in the UK (2008), according to the NOVA classification<sup>13</sup> (though in Italy it is likely to have increased from the late '90s, but we were unable to find more updated information). Biodiversity is an important component of Italian food, again as opposed to more continental habits. The Italian food system may be developed into a model that is respectful for the landscape, the environment, the quality of produce and with shorter distribution chains and larger biodiversity than in the current worldwide industrialised food system.

### Transport

Another sector which also offers the possibility of health and climate change mitigation cobenefits is the transport sector. Policies promoting active transport (cycling, walking) have the triple effect of mitigating greenhouse gas emissions, preventing diseases related to atmospheric pollution (lung diseases, lung tumours, cardiovascular diseases, possibly neurological diseases), and increasing physical activity, which is in turn associated with numerous health benefits including mental health. While public transport use does generally lead to people walking more than private vehicle use, it is not itself 'active transport'. This may be an important distinction to make as walking and cycling are entirely omitted from the SDGs, with the relevant target instead focusing only on public transport (<https://sustainabledevelopment.un.org/sdg11>). The implementation of 'Piani Urbani per la Mobilità'

Sostenibile' (Urban Planning for Sustainable Mobility) in Italy is therefore urgent, particularly for medium-sized and large cities. Research shows that if active transport (walking and cycling), common in cities where there has been high investment in this sector (eg, Copenhagen), were systemically encouraged, the local health systems of countries of the size of Italy could save 15–20 billion euros in 20 years.<sup>14</sup> 97% of the energy for road transport in Italy comes from fossil fuels, with biofuels accounting for most of the remainder. Analytical models on the combined effects of low emission transport and an increase in active transport in London have shown significant potential benefits, with a reduction in the risk of diabetes, ischaemic heart disease, heart attacks and other diseases related to a sedentary lifestyle, as well as reduced air pollution.<sup>15</sup> To that end, we propose emphasising that Italian cities join the C40 (a network of cities that combine health targets with climate change mitigation targets) (<https://www.c40.org/>) (Milan, Rome and Venice are already members).

A key but understudied issue in transportation policies is « intermodality », in particular as regards the interface between rapid mass transport and sustainable individual mobility. Intermodality, by differentiating the intended use of the spaces (eg, entire blocks of pedestrian or cycle paths only, with rail transport stops on the sides), guarantees an improvement of the quality of the urban environment, improves the safety of all actors on the road, creates spaces for socialising and aggregation and improves the permeability of soils (which protects against climatic events).

### SPECIFIC PRIORITY GOALS

As has been demonstrated, prevention policies are more effective if they do not only target the individual but also have an economic and structural nature.<sup>16 17</sup> The aim is to complement individual health promotion with structural policies (such as urban planning, taxation and incentives) which render the former more effective and result in a reduction in inequality. In this perspective we indicate a set of specific goals of health promotion, with relevant stakeholders.

The following priorities have been developed by our working group as a suggestion for the Ministry of Health and more generally for inter-sectoral cooperation across Ministries. We believe the next generation fund now offers a unique opportunity to orientate our economies towards healthier choices and the integration of health and the organisation of the territory and lifestyles.

### Goals of health promotion (and relevant stakeholders)

1. Promote physical activity in all age groups, with particular focus on children and young adults, increasing the weekly hours of physical exercise, both in school and other settings (urban planning to facilitate walking and cycling as modes of transport, and provision for recreational physical activity); involve general practitioners and paediatricians in the promotion of physical activity.
2. Protect children from marketing of foods high in sugars, salt and fat, reducing to zero children directed television advertising and online marketing (school, mass-media).
3. Reduce meat production and consumption, and improve animal farming quality according to the One Health principles (government, Ministries of Health and Agriculture).
4. Introduce a tax on sugary drinks (as in many countries) and on sugar in packaged foods (government, Ministry of Economy and Finance).
5. Reduce salt consumption through regulations and agreements with manufacturers (government).

6. Limit alcohol related damage by introducing an appropriate tax (government, Ministry of Economy and Finance).
7. Tobacco: full implementation of the Framework Convention for Tobacco Control. Increase in the price of cigarettes (such as a sustainable and effective increase by 10%—see <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5607587/>), supporting smoking cessation centres, prescription of pharmaceutical aids to stop smoking, marketing campaigns in the sport industry (government, Ministry of Economy and Finance) (see also below).
8. Reduce road traffic deaths and injuries. Set a standardised speed limit in all inhabited areas to reduce the impact of road traffic accidents and social inequalities (currently the more affluent areas are more protected); significantly reduce pollution from traffic emissions (government, infrastructure, municipalities).
9. Poverty alleviation and support measures for families living with relative and absolute low income, with particular focus on improvement of households and nutrition, given their double climate change and public health impact (government).
10. Reaffirm the commitment to universal healthcare, free and financed by general taxation; this should extend to the migrant populations, now 9% of the total population in Italy and likely to increase because of climatic changes (government, Ministry of Economy and Finance, Ministry of Health).
11. Invest in public transport and in active transport, focusing on cycle lanes, pedestrian city centres, low emission zones, electric public transport (government, infrastructure, municipalities).
12. Decisive actions on plastics: for example, beginning with the National Health Service infrastructure, reduce to zero the use of plastic bottles, aiming to reach school and workplace settings too (government).
13. Actions to reduce the consumption of biomass for heating purposes and to control manure treatment and spreading in agriculture to reduce ammonia formation (two important factors responsible for the pollution in the Po Valley and other areas in Italy) (government).
14. Implement a national network to achieve the objectives of climate change mitigation, including a policy of 100% renewable energy and a zero-carbon economy by 2050, also in the context of the circular economy and urban metabolism (government, infrastructure, municipalities).
15. Implement the National Plan of Adaptation to Climate Change (Ministry of the Environment and the Protection of Land and Sea) and the regional plans that stem from these (adopted at the State-Regions Conference) to the end of protecting land and urban areas from the socioeconomic and health effects of extreme events.
16. Conduct a scientific assessment of health vulnerability and adaptation to climate change, which should be used to identify vulnerable populations and most relevant risk factors in different regions, and to guide policy prioritisation and resource allocation both at a national and a local level.

The Italian National Prevention Plan (2020–2025) (now publicly available in the website [http://www.salute.gov.it/portale/temi/p2\\_4.jsp?lingua=italiano&tema=Prevenzione&area=prevenzione](http://www.salute.gov.it/portale/temi/p2_4.jsp?lingua=italiano&tema=Prevenzione&area=prevenzione)) indicates specific aims to be achieved for some of these 16 targets. It is important that the government not only introduces concrete mechanisms to evaluate progress but also that the technical bodies of the government are equipped with the necessary capacity and budgetary stability over time. Of

course, each of these goals can have almost infinite modulations. For example, in addition to the speed limit, another tool consists in directing traffic to mass mobility. This is achieved by favouring mass transport in terms of time (preferential lanes, priority traffic lights) and space (expansion of sections dedicated to other forms of transport to the detriment of cars). Another example is plastics: limiting single use plastic, not only plastic bottles should be addressed. This includes supermarket packaging as one of the main sources of single use plastics. Italy represents in fact a virtuous example of bag replacement with biodegradable options which is worth mentioning as an example of cobenefits. Concerning biomass, we refer the reader to a recent review of the literature.<sup>18</sup>

The suggestions above fall into very general categories and require to be then translated into specific policy actions, with measurable goals. Just as an example, we propose that for 2025 the following quantitative goals are established. These suggestions are purely indicative and require a realistic discussion and continuous monitoring. Systematic reviews are available<sup>17</sup> and similar proposals have been made in other countries, such as the PROMISE study in the UK: [https://www.richmondgrouppofcharities.org.uk/sites/default/files/the\\_promise\\_study\\_final\\_report.pdf](https://www.richmondgrouppofcharities.org.uk/sites/default/files/the_promise_study_final_report.pdf).

#### Goals for 2025:

- ▶ Reduce the prevalence of smokers by 30%, with particular emphasis on young people (the prevalence of smokers would thus decrease from the current value of 21% to approximately 14%).
- ▶ Reduce the prevalence of childhood obesity by 20%.
- ▶ Reduce the proportion of calories obtained from ultra-processed foods by 20%.
- ▶ Reduce the consumption of alcohol by 10%.
- ▶ Reduce the consumption of salt by 30%.
- ▶ Reduce the consumption of sugary drinks by 20%.
- ▶ Reduce the consumption of meat by 20%.
- ▶ Increase the weekly hours of exercise by 10%.

The objectives must be clearly articulated according to regional characteristics, taking into account the regional differences in the prevalence of risk factors, for example, the national prevalence of childhood obesity is 10.9%, with values ranging from 6.9% in Bolzano to 14.4% in Calabria (<https://www.epicentro.iss.it/passi/>).

This is not the place in which specific tools to achieve the proposed goals can be considered. In a context in which direct financing for production is not allowed, there are other opportunities in terms of market orientation, for example, through forms of tax relief on work or the consumption of products of a certain type (such as the renewal of boilers for domestic use), and on the economic return in terms of product innovation, research and development especially for companies with high added value.

Also, it is premature to estimate the burden of disease preventable by implementing these actions. Estimates of the burden attributable to different risk factors are available for cancer, but no similar (systematic) exercises have been provided for other diseases. In the most recent exercise on cancer, in 2015 41% (or 142 000 of 346 000) of all new cancers diagnosed in France could be attributed to known risk factors.<sup>19</sup> The numbers and preventable attributable fractions (PAF) were slightly higher in men than in women (84 000 vs 58 000 cases and 44% vs 37%, respectively). Smoking (PAF: 20%), alcohol consumption (PAF: 8%), dietary factors (PAF: 5%) and excess weight (PAF: 5%) were the most important factors. Infections and occupational exposures each contributed to an additional 4% of the cancer

cases in 2015. PAF were different in other countries as expected; we have chosen France because the example is more recent and the country is more similar to Italy than UK, USA and Australia where similar exercises were conducted. However, these calculations are affected by strong limitations, including the high level of measurement error for certain exposures, particularly environmental chemicals. Also socioeconomic disparities are not given sufficient attention.

**Beyond the specific goals: some priority issues (online supplemental material).**

There are several issues that require permanent consideration in preventive policies, beyond our suggestions above. For reasons of space we describe two in particular (tobacco and social disparities: online supplemental material), but others can be cited, that are not further addressed here: gender specificities, the work environment, migrations, scientific research for primary prevention and communication. There are inevitably specific problems that are neglected in this proposal, and should be considered in the future, like for example e-cigarettes.

## CONCLUSIONS

The Italian State spends around €114 billion per year on healthcare; 5% of this amount funds the common prevention system (staff and other services, including food and animal safety and medical screenings). Over 200 million are a fund allocated to programmes of the National Prevention Plan, of which each region accesses a share. We take the view that this amount should be substantially increased, taking into consideration the fact that prevention has a positive impact not only on population health but also on the economy. Furthermore, we strongly encourage the inclusion of primary prevention in all policies, in light of the philosophy of co-benefits that we described. The National Prevention Plan offers a key opportunity to stimulate intersectoral policies (starting from collaboration between government departments), to pump innovation into prevention actions, and to spread the practice of evaluation of not only processes but of outcomes, creating realistic targets for the near future. We realise that many of the issues we have addressed cannot be considered separately. The most obvious example is social disparities, a topic that crosses all the others: tobacco smoking, for example, is unevenly distributed across social groups, and climate change itself has greater impact on more disadvantaged groups in society (including in high-income countries). However, little attention has been paid to the health promotion and prevention in disadvantaged sectors, and this is likely to consist more in structural interventions rather than educational activities or economic incentives. Also, it is extremely important that future policies address important philosophical issues that pertain directly or indirectly to the effectiveness of preventive initiatives in different social groups. We refer in particular to ‘agency and capabilities’, that are key in any preventive action: these terms have been introduced, among others, by Amartya Sen to stress the fact that public policies require responsible involvement of different agents, but also that effective implementation depends on the degrees of freedom that people have, according to their social circumstances (capabilities), as opposed to the usual market-based view focused on centrality of the consumer.

Italy’s role as the cohost of the 2020 UN climate negotiations (COP26) presents the opportunity for international leadership in addressing health as an integral component of the response to climate change. Finally, Italy, like all EU countries, is now developing plans for the Next Generation Fund, which is centred around the green economy and a greater integration between

health and environmental challenges. We hope this will be the occasion for a radical rethinking of economic strategies and not only a series of limited and short-term activities in support to certain sectors of economy.

## NOTES

(a) In March 2019, the Italian Minister of Health commissioned to the Consiglio Superiore di Sanità (CSS, consulting body for the Minister) a comment to a draft of the National Plan for Prevention 2020–2025 (the latter was subsequently approved in 2020). A working group including the authors of the present paper was formed and a first version of the document was discussed in the CSS; after some changes and corrections, the final document was approved unanimously by CSS and delivered to the Minister in July 2019 (JB and MR were added as coauthors to the present English translation). The present paper is largely based on the original document, with integrations and changes suggested by the reviewers. The original document is available in this website: <https://www.scienzainrete.it/articolo/piano-nazionale-della-prevenzione-proposta-strategia/paolo-vineis-autori-vari/2020-10-13>

(b) There are numerous compounds emitted into the atmosphere that contribute to climate change: carbon dioxide (CO<sub>2</sub>), carbon, nitrogen oxides, fluorinated gases and especially airborne particulate matter (designated a Group 1 carcinogen by IARC), to name a few, some of which also have consequences on health. If mitigation policies focussed only on carbon dioxide, the positive effects on health that would arise from broader actions would be lost. Policies based solely on carbon capture and storage (CCS), would not be accompanied by all the benefits of eliminating the other polluting derivatives resulting from the combustion of coal and petroleum, including particulate matter, polycyclic aromatic hydrocarbons, heavy metals and others.

**Acknowledgements** We are grateful to Franco Locatelli, Bruno Dallapiccola and Stefano Moriconi for thoughtful suggestions and to Francesca Burns and Vincenzo Salerno for technical support.

**Contributors** PV planned and designed the study. FF, RS, RC, LB and FM contributed text to different sections of the paper, JB and MR contributed text referring to Lancet Countdown. LC revised the whole manuscript.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient consent for publication** Not required.

**Provenance and peer review** Commissioned; externally peer reviewed.

**Data availability statement** Data sharing not applicable as no datasets generated and/or analysed for this study.

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## REFERENCES

- 1 Burnett R, Chen H, Szyszkwicz M, *et al.* Global estimates of mortality associated with long-term exposure to outdoor fine particulate matter. *Proc Natl Acad Sci U S A* 2018;115:9592–7.
- 2 Kivimäki M, Vahtera J, Tabák AG, *et al.* Neighbourhood socioeconomic disadvantage, risk factors, and diabetes from childhood to middle age in the young Finns study: a cohort study. *Lancet Public Health* 2018;3:e365–73.
- 3 Thurston GD, De Matteis S, Murray K, *et al.* Maximizing the public health benefits from climate action. *Environ Sci Technol* 2018;52:3852–3.
- 4 Markandya A, Sampedro J, Smith SJ, *et al.* Health co-benefits from air pollution and mitigation costs of the Paris agreement: a modelling study. *Lancet Planet Health* 2018;2:e126–33.
- 5 West JJ, Smith SJ, Silva RA, *et al.* Co-benefits of global greenhouse gas mitigation for future air quality and human health. *Nat Clim Chang* 2013;3:885–9.
- 6 Vineis P, Wild CP. Global cancer patterns: causes and prevention. *Lancet* 2014;383:549–57.
- 7 Székely M, Carletto L, Garami A. The pathophysiology of heat exposure. *Temperature* 2015;2:452.
- 8 Heaviside C, Macintyre H, Vardoulakis S. The urban heat island: implications for health in a changing environment. *Curr Environ Health Rep* 2017;4:296–305.
- 9 Gascon M, Sánchez-Benavides G, Davvand P, *et al.* Long-term exposure to residential green and blue spaces and anxiety and depression in adults: a cross-sectional study. *Environ Res* 2018;162:231–9.
- 10 Seo S, Choi S, Kim K, *et al.* Association between urban green space and the risk of cardiovascular disease: a longitudinal study in seven Korean metropolitan areas. *Environ Int* 2019;125:51–7.
- 11 Musco F, ed. *Counteracting Urban Heat Island Effects in a Global Climate Change Scenario*. Amsterdam: Springer Verlag, 2015.
- 12 Farchi S, De Sario M, Lapucci E, *et al.* Meat consumption reduction in Italian regions: health co-benefits and decreases in GHG emissions. *PLoS One* 2017;12:e0182960.
- 13 Monteiro CA, Moubarac J-C, Levy RB, *et al.* Household availability of ultra-processed foods and obesity in nineteen European countries. *Public Health Nutr* 2018;21:18–26.
- 14 Jarrett J, Woodcock J, Griffiths UK, *et al.* Effect of increasing active travel in urban England and Wales on costs to the National health service. *Lancet* 2012;379:2198–205.
- 15 Woodcock J, Edwards P, Tonne C, *et al.* Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport. *Lancet* 2009;374:1930–43.
- 16 Ebrahim S, Taylor F, Ward K, *et al.* Multiple risk factor interventions for primary prevention of coronary heart disease. *Cochrane Database Syst Rev* 2011;CD001561.
- 17 McDaid D, Sassi F, Merkur S, eds. *Promoting health, preventing disease*. WHO, OECD, European Observatory on Health Systems and Policies. McGraw Hill, 2015.
- 18 Malico I, Nepomuceno Pereira R, Gonçalves AC, *et al.* Current status and future perspectives for energy production from solid biomass in the European industry. *Renewable and Sustainable Energy Reviews* 2019;112:960–77.
- 19 Soerjomataram I, Shield K, Marant-Micallef C, *et al.* Cancers related to lifestyle and environmental factors in France in 2015. *Eur J Cancer* 2018;105:103–13.