



## Impact of Plant-Based Dietary Protocols on Primary Disease Prevention Noncommunicable Chronic Diseases: Clinical Evidence and Applicability in Health Models Population

Impact of Plant-Based Dietary Protocols on the Primary Prevention of Non-Communicable  
Chronic Diseases: Clinical Evidence and Applicability in Population Health Models

Author: Fabio Martinez Dias

Graduated in Nutrition, from UNASP - Adventist University of São Paulo

### SUMMARY:

The adoption of plant-based dietary protocols has established itself as one of the most effective strategies for the primary prevention of Chronic Noncommunicable Diseases (NCDs), such as type 2 diabetes, cardiovascular disease, obesity, and some types of cancer. This nutritional model, prioritizing whole foods of plant origin, demonstrates a direct impact on reducing systemic inflammation, metabolic modulation, improving insulin sensitivity, and balancing the gut microbiome—all central mechanisms in the pathophysiology of NCDs. This article analyzes, from a clinical and epidemiological perspective, the main scientific evidence supporting the effectiveness of plant-based nutrition on a population scale, in dialogue with World Health Organization (WHO) guidelines and public health models. The research also investigates the feasibility of implementing these protocols in strategic preventive policies, highlighting the results of longitudinal studies and measurable impacts on systemic healthcare costs, hospital prevention, and increased healthy life expectancy.

**Keywords:** plant-based diet; primary prevention; chronic diseases; public health; nutritional epidemiology.

### ABSTRACT:

The adoption of plant-based dietary protocols has emerged as one of the most effective strategies for the primary prevention of Non-Communicable Chronic Diseases (NCDs), such as type 2 diabetes, cardiovascular diseases, obesity, and specific types of cancer. This nutritional framework, centered on whole plant-based foods, demonstrates measurable impact on systemic inflammation reduction, metabolic modulation, improved insulin sensitivity, and microbiome balance — core

mechanisms in the pathophysiology of NCDs. This article analyses, from a clinical and epidemiological perspective, the leading scientific evidence supporting the effectiveness of plant-based nutrition at a population level, aligned with World Health Organization (WHO) preventive guidelines. It also examines the feasibility of implementing such protocols within public health systems, highlighting longitudinal outcomes and cost-saving effects linked to reduced hospitalization, disease risk mitigation, and increased healthy life expectancy.

**Keywords:** plant-based diet; primary prevention; chronic diseases; public health; nutritional epidemiology.

## 1. Global context of Non-Communicable Diseases (NCDs) and the role of preventive nutrition

Chronic Non-Communicable Diseases (NCDs) represent the greatest public health challenge of the 21st century, accounting for approximately **74% of all deaths worldwide**, according to projections by the World Health Organization until 2021. Unlike infectious diseases — whose control depends largely on specific interventions — NCDs develop silently over years due to the accumulation of inflammatory processes, metabolic dysregulation, insulin resistance, endothelial dysfunction, and oxidative stress, factors often associated with Western dietary patterns rich in saturated fats, ultra-processed foods, refined sugars, and low phytochemical diversity (MONTEIRO et al., 2019).

This is not just a medical problem, but **an economic and civilizational one**, as its effects extend beyond hospitals and affect productivity, active longevity, social development and the sustainability of public and private health systems.

In this context, contemporary scientific literature converges on the conclusion that **intervening before illness occurs—and not just after diagnosis—is the most efficient, scalable, and economically viable strategy** for curbing the progression of NCDs on a population scale (WHO, 2020). So-called *primary prevention*, the central focus of this analysis, is not based on drug treatments or emergency corrections, but on the **intelligent modulation of key metabolic triggers** that take decades to manifest clinically. And, within this ecosystem of factors—such as insufficient physical activity, smoking, chronic stress, and sleep deprivation—none has as broad, rapid, and structural an impact as **diet**.

While other pillars influence health, nutrition **literally builds the biochemistry that creates or stops disease**.

And it is precisely at this point that **plant-based dietary protocols** emerge as a strategy with differentiated preventive impact. Longitudinal population-based cohort studies have shown that dietary patterns centered on whole foods of plant origin—such as vegetables, fruits, legumes, unrefined grains, nuts, and seeds—are associated with significant risk reductions for type 2 diabetes, obesity, high blood pressure, dyslipidemia,

coronary artery disease and even certain types of cancer (MORRIS et al., 2015). Unlike calorie-restricted diets or temporary regimens, this is a **metabolically restorative nutritional model**, with a cumulative impact on inflammatory pathways, intestinal microbiota, glycemic regulation, and hormonal signaling.

It's important to emphasize that this preventive effectiveness occurs not only at the individual level, but also in **organized population contexts**. Research in globally recognized longevity communities, such as the "Blue Zones" mapped by Buettner (2019), shows that populations that maintain predominantly plant-based diets—across different continents and cultures—exhibit **drastically lower rates of chronic diseases and longer healthy life expectancy**, validating that dietary prevention is not just a clinical hypothesis, but **an epidemiologically consistent phenomenon** when applied with coherence and intergenerational stability. This finding positions preventive nutrition not as an "alternative" strategy, but as **a policy of strategic geopolitical interest**.

Another crucial issue is that **modern traditional medicine is still admittedly reactive**, focused on diagnosing and treating illness after it has manifested—often belatedly, when reversal is no longer possible without invasive interventions or long-term drug dependence. In contrast, the plant-based approach applied to population health completely shifts this logic: **it acts on the cause, before the damage occurs**, interrupting the initial mechanisms that favor chronic low-grade inflammation, lipotoxicity, and the decline in hormonal sensitivity. This strategic anticipation reduces not only mortality but, above all, the cost of decades of preventable morbidity—yielding massive gains for health plans, governments, and large organizations.

Thus, understanding plant-based eating as a primary prevention tool is not a nutritional trend, but a **structural necessity** for the financial and operational survival of contemporary health systems. It is from this perspective— **of social, clinical, and economic impact** —that the following sections of this article will delve deeper into its mechanisms, proven efficacy, and feasibility of implementation as **a scalable and replicable public policy strategy in different global contexts**.

## 2. Physiometabolic mechanisms of the plant-based diet in the prevention of NCDs

The preventive effectiveness of plant-based dietary protocols stems from this nutritional pattern's ability to **directly impact the main pathophysiological mechanisms that give rise to modern chronic diseases**. Among the most documented in the literature is the **reduction of low-grade systemic inflammation**, a silent condition that precedes and fuels diseases such as type 2 diabetes, atherosclerosis, visceral obesity, hypertension, and even cognitive decline (CRYAN; DINAN, 2019). Diets rich in phytochemicals, soluble fiber, and natural antioxidants—found in vegetables, fruits, legumes, and nuts— **regulate inflammatory cascades** .

such as **NF-kB and pro-inflammatory cytokines**, promoting metabolic homeostasis and protecting tissues against progressive oxidative damage. This anti-inflammatory modulation is one of the most compelling pillars explaining the preventive role of a plant-based diet even before the clinical onset of the disease.

Another fundamental mechanism is the **significant improvement in insulin sensitivity**—a key factor in preventing type 2 diabetes and in the early interruption of peripheral glucose resistance, which often begins decades before clinical diagnosis. Plant-based protocols, by avoiding saturated fat and promoting glucose uptake mediated by fiber and phytonutrients, **reduce hepatic and muscle lipotoxicity**, restoring more responsive cellular signaling pathways (KAHLEOVA; BARNARD, 2019). In clinical studies, this effect is so robust that, in many cases, individuals can reverse prediabetes without any drug intervention, provided the dietary protocol is properly structured. This reversal before the onset of the disease is the essential principle of primary prevention.

Also particularly relevant is the impact on the **gut microbiome**, which functions as an adaptive and dynamic organ, with a strong influence on inflammation, metabolism, immunity, and even eating behavior (CRYAN; DINAN, 2019). Plant-based diets favor the proliferation of beneficial bacteria that produce short-chain fatty acids—especially butyrate—that strengthen the intestinal barrier and **reduce neuroimmune inflammatory processes**, interrupting pathological cycles that silently trigger obesity, atherosclerosis, and other NCDs. The microbiota, modulated by natural plants, acts as **a biological preventative agent**, reducing the access of endotoxins to the circulatory system and regulating the release of neurotransmitters responsible for hunger and reward.

Furthermore, whole plant-based foods promote **glycemic stability**, avoiding sudden spikes and drops in blood glucose, which accelerate vascular damage and promote premature metabolic aging (MORRIS et al., 2015). This glycemic predictability keeps the pancreas in an optimized functional state, prevents hormonal secretion dysfunction, and reduces cardiac overload associated with repetitive glycemic fluctuations. Unlike ultra-processed, hypercaloric diets, which silently erode the metabolic machinery, plant-based protocols **rebuild the body's bioenergetic balance**, promoting an internal environment that makes the development of NCDs biologically unlikely over time.

Another crucial aspect is the **direct impact of a plant-based diet on lipid regulation and cardiovascular protection**. Several controlled studies have confirmed that plant-based dietary models consistently reduce oxidized LDL, triglycerides, and markers such as hs-CRP and homocysteine—indicators strongly associated with cardiovascular risk (CLARK; MACH, 2017). This protection is permanent, as long as the pattern is maintained, and does not depend exclusively on weight loss, demonstrating that there are molecular factors independent of BMI.

that operate in this protection — a fact of profound interest for public health policies, as it indicates that the diet acts **before arterial damage is irreversible**.

Ultimately, this set of metabolic mechanisms reveals that **true prevention of NCDs does not depend on delayed drug solutions**, but on **nutritional education applied with a molecular and strategic vision**. A plant-based diet, when structured based on science and not just a dietary fad, becomes a **precise, scalable, and low-cost preventive intervention tool**, capable of interrupting the process of metabolic disease before its clinical manifestation. This logic is the central foundation that transforms nutrition from a simple medical recommendation into a true **biological infrastructure of civilizational protection**.

### 3. Clinical evidence and measurable outcomes in longitudinal studies and controlled interventions

The scientific soundness supporting plant-based dietary protocols in the primary prevention of NCDs is demonstrated by **controlled clinical studies, long-term population cohorts, and international meta-analyses**, which indicate consistent results across different countries, cultures, and age groups. A prime example is the study published by the *Adventist Health Study-2* (FRAZIER; ORLICH; FRASER, 2015), which followed more than 96,000 individuals for decades and observed **a reduction of up to 50% in the incidence of type 2 diabetes** among those who followed strict or predominantly plant-based dietary patterns. Similar results were found in cardiovascular disease, with a significant reduction in mortality from cardiac and ischemic events—even in individuals with no prior history of the disease.

In direct clinical interventions, meta-analyses by Barnard and Kahleova (2019) showed that structured plant-based diets were able to **reverse early insulin resistance and eliminate the need for medication in pre-diabetes cases**, provided they were administered with appropriate monitoring. This point is crucial because it demonstrates that **primary prevention can be a perfect substitute for drug intervention in the early stages of disease progression**, constituting a practice of extreme relevance for the long-term financial sustainability of healthcare systems. In the United States, studies conducted by the *Physicians Committee for Responsible Medicine* showed an average reduction of **1.2 percentage points in glycated hemoglobin** in just 16 weeks—results comparable to those of first-line drugs.

The evidence is also consistent in the field of cardiovascular prevention. Research published in the *Journal of the American College of Cardiology* (JACC) has shown that plant-based dietary patterns **reduce oxidized LDL cholesterol levels and blood pressure with greater**

**stability over time**, compared to controlled omnivorous diets, even with calorie equality. It is worth noting that this effect is sustained even without aggressive calorie restriction, reinforcing that **the biological quality of the food has a greater impact than calorie counting alone**. Plant-based protocols have also shown **a reduction of up to 70% in the relative risk of fatal coronary heart disease** in multicenter studies, including populations with a relevant family history.

In the field of obesity and metabolic syndrome, important advances have been documented. Lida and Tanaka (2018) demonstrated, in studies conducted in Japan, that plant-based diets combined with natural anti-inflammatory phytonutrients were able to promote **a reduction in visceral fat and markers of hepatic lipotoxicity**, indicators directly associated with the progression of NCDs. A particularly relevant finding is that individuals undergoing the diet not only lost weight **but also stabilized their body composition with minimal subsequent weight regain**, something rare in traditional weight loss protocols.

When evaluated on a population scale, comparative models between plant-based diets and conventional Western diets have shown a direct impact on **reducing hospitalizations for preventable causes**, significantly improving quality of life indicators, and increasing active life expectancy without drug dependence (WHO, 2020). Countries such as the United Kingdom, Canada, and Norway have already begun to **officially incorporate plant-based guidelines into public policies**, not as an alternative nutrition plan, but as **a preferred strategy for structured government prevention**.

Therefore, the accumulated evidence indicates that a plant-based diet **is not an experimental hypothesis or niche model**, but **a clinically effective, validated and replicable instrument**.

—capable of radically transforming the civilizational disease curve. This point is crucial for its structured application in public policies and population health, which will be discussed in more detail in the next section of this article.

#### **4. Alignment with WHO guidelines and international preventive health models**

The adoption of plant-based dietary protocols in public health policies is not an isolated trend, but a movement officially recognized by global institutions such as the **World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), and the American College of Lifestyle Medicine (ACLM)**. The WHO, in its guidelines published through 2021, explicitly highlights that **predominantly plant-based dietary patterns are the most effective and economically viable tool for**

**primary prevention of chronic diseases**, recommending a drastic reduction in the consumption of processed meats, saturated fats, and ultra-processed foods as a central strategy for preventive health policies (WHO, 2020). This is a historic repositioning, which

projects food no longer as an auxiliary recommendation, but as a structuring pillar of global health planning.

Successful international models already demonstrate the applicability of this paradigm. Between 2019 and 2021, the UK public health system (NHS) incorporated recommendations strongly based on plant-based diets for cardiovascular prevention programs and early-stage type 2 diabetes reversal. In Canada, the **Canada's Food Guide 2019** completely reformulated its dietary guidelines, positioning plant-based foods as a universal dietary staple, not just an optional alternative. Norway, considered a benchmark for advanced health policies, has included plant-based protocols in its national prevention programs, including for pediatric and adolescent patients—recognizing the importance of early nutritional education as an intergenerational epidemiological protection mechanism.

In the field of clinical medicine, the **American College of Lifestyle Medicine (ACLM)** established an official consensus before 2021 stating that integrative plant-based diets are the **safest, most effective, and evidence-based first-line intervention for primary prevention of NCDs**, with a better cost-benefit ratio than initial pharmacological interventions in at-risk individuals. This expanded view of nutrition as **a therapeutic strategy, not just an educational one**, reinforces that we are facing a global medical paradigm shift—one in which **it is no longer a matter of recommending a healthy diet, but of instituting structured preventive nutritional therapy** on a population scale.

This international alignment legitimizes the transition from individual clinical discourse to the design of **replicable, strategically standardized public policies with a very high social return**. The WHO emphasizes that **every dollar invested in plant-based dietary prevention programs generates multiple dollars in savings on hospitalizations and complex medical treatments** (WHO, 2020). This is economic sustainability applied to health—not just well-being.

Despite specific advances, Brazil still operates largely under a reactive and curative logic, with little strategic investment in primary nutritional prevention. However, regions with municipal plant-based school feeding programs have already demonstrated a measurable positive impact on dietary habits and metabolic biomarkers, demonstrating that **it is possible to adapt the model to local cultural realities without losing effectiveness**, as long as the pillars are technical, not merely ideological.

Therefore, adherence to plant-based principles is not an ideology or a niche, but a **technically validated response to the global NCD crisis**. It is a scientific policy, not an opinionated one. It is the intersection of epidemiology, systemic sustainability, and health sovereignty. And it is under this

logic that the next items will deepen **the operational viability and the measurable economic and social impacts of the application on a population scale.**

##### 5. Economic viability and impact on budgetary sustainability in public health

The implementation of plant-based dietary protocols as a primary prevention strategy for NCDs should not be analyzed solely from a biomedical perspective, but primarily as **a tool for economic optimization and budgetary sustainability of the health system.**

Studies conducted by the World Health Organization and the World Bank through 2021 indicate that **chronic noncommunicable diseases consume, on average, between 7% and 15% of the GDP of countries with public health systems,** especially in continuous pharmacological therapies, recurrent hospitalizations, and highly complex hospitalizations—almost always avoidable with early nutritional intervention. Preventive nutrition, therefore, emerges not only as a health issue but also as a tool for **strategic management of government and private resources.**

Economic models adopted by countries such as the United Kingdom, Canada, and the Netherlands demonstrate that structured programs based on plant-based nutrition have the potential to **reduce hospitalization costs for cardiac and metabolic diseases by up to 40% over 10 years,** according to projections from the *National Health Service* (NHS). Canada, in turn, estimates a reduction of over **US\$4 billion annually in NCD costs** with the consistent application of plant-centered dietary guidelines, especially when combined with school nutrition education and tax incentive policies for industrial food reformulation. These data demonstrate that **nutritional prevention is more cost-effective than any medical strategy focused on the later stages of the disease.**

Furthermore, **the indirect economic return** makes this model even more strategic. Reducing NCDs not only impacts medical costs but also **increases productivity, reduces absenteeism, and extends active working lives,** representing significant gains for companies and governments. International reports show that each year of preserved health in active adults represents, in many countries, **net economic gains that exceed the average annual costs of public nutritional prevention policies,** especially when applied on a population scale and integrated into educational, labor, and food policies.

It is important to emphasize that **the cost of implementing plant-based policies is considerably lower than the pharmacological cost** associated with delayed disease management.

While pharmacological treatments for controlling diabetes and hypertension can involve monthly and lifetime costs with a high cumulative impact, preventive nutrition, when

Structured through public logistics or community models, **it generates significantly low entry costs and exponential benefits in the medium term.** The cost-to-impact ratio is so favorable that, since 2020, the European Union has been evaluating subsidy programs for natural plant-based foods as an economic strategy, not just a health strategy.

This economic repositioning of nutrition transforms plant-based eating into **a strategic infrastructure for health and financial sovereignty**, not just an individual choice.

Governments that adopt such policies not only reduce deaths but also stabilize health systems and prevent progressive hospital collapses linked to the spread of NCDs. The logic is clear: **intervening before illness occurs costs less, generates better results, and protects the country's economic future.**

Thus, the data indicate that **transitioning from a curative model to a preventative model based on plant-based nutrition is a smart fiscal and social decision**, with direct, measurable, and sustainable returns. In the next section, we will delve deeper into how such a strategy can be operationalized into real public policies, respecting local food culture and structural viability.

## 7. Social, educational, and intergenerational impact of plant-based nutrition on public health

The structured adoption of plant-based dietary protocols not only promotes individual clinical benefits but also triggers **social, educational, and intergenerational transformations**, configuring a strategy for sustainable civilizational development. Studies linked to the *Lancet Commission on Obesity, Undernutrition, and Climate Change* indicate that plant-based diets have a direct impact not only on human health but also on **reducing food inequalities, strengthening nutritional security, and environmental preservation**—elements deeply connected to the health of populations in vulnerable contexts (LANCET, 2019). This demonstrates that the value of this model goes beyond the biomedical dimension and expands to a **strategic and ethical role in shaping more balanced and resilient societies.**

In the educational field, research shows that **children and adolescents exposed from an early age to predominantly plant-based eating patterns are less likely to develop childhood obesity, have better cognitive performance, and greater dietary autonomy as adults** (MOSCONI, 2018). Early nutritional education is more effective than later nutritional reeducation—and, therefore, public plant-based programs in schools and universities have a preventative impact on a generational scale. More than teaching "what to eat," this educational model teaches **the relationship with food as a way of building identity, self-awareness, and the future**, with proven effects on mental health, academic focus, and socioemotional performance.

This impact also extends to the behavioral and emotional realm. By reducing systemic inflammation and stabilizing neurotransmitters, plant-based diets promote **more stable emotional states, reduced mood swings, and a reduced predisposition to binge eating**, all of which contribute to **collective mental health** —a focus often neglected in public health plans. Studies show that a proper dietary transition not only prevents metabolic diseases but also **improves psychological balance and increases the perception of internal control**, reducing rates of social anxiety, irritability, and emotional dependence on food (CRYAN; DINAN, 2019).

Furthermore, well-implemented preventive nutrition helps **strengthen collective autonomy**. Populations that learn to identify natural foods as a self-care strategy become **less dependent on delayed medical solutions**, which strengthens health sovereignty—especially in countries with overburdened public health structures.

This allows for **a more efficient redistribution of medical resources to real emergencies**, rather than depleting them on preventable diseases. In this sense, the plant-based diet emerges as **an education for health sovereignty**, not a nutritional fad.

Finally, there is a profound **intergenerational** component to this model. Children raised in this paradigm become adults less prone to chronic disease and more capable of passing on healthy habits to their children— **creating a virtuous cycle of longevity and generational food intelligence**. This chain of self-continuity is what differentiates truly strategic programs from superficial policies. Prevention is only powerful **when it changes the future, not just corrects the present**.

Thus, it is understood that plant-based dietary protocols, when applied methodically, scientifically, and consistently, represent **one of the most efficient tools for structural transformation of public health, education, and food culture**, with a profound impact **beyond the individual sphere — directly affecting entire societies and the path of future generations**.

## CONCLUSION

An in-depth analysis of the effects of plant-based dietary protocols demonstrates that primary prevention of Chronic Noncommunicable Diseases (NCDs) is absolutely possible when diet is understood as a strategic tool for **metabolic engineering, neuroimmunological regulation, and structured social transformation**. Unlike traditional models based on delayed intervention and drug dependence, the plant-based approach operates **before illness occurs**, modulating the mechanisms that generate insulin resistance, systemic inflammation, and cardiovascular dysfunction long before clinical symptoms manifest. Contrary to popular belief, this strategy is not centered on restriction, but rather on **functional regeneration and biological intelligence applied to human health**.

Scientific evidence consolidated by longitudinal studies and controlled clinical interventions proves that **diets based on whole plant-based foods significantly reduce the risk of type 2 diabetes, obesity, hypertension, and cardiovascular disease**, with effects similar to—or superior to—those obtained by first-line drugs, especially when applied in the early stages of the metabolic pathway (BARNARD; KAHLEOVA, 2019). This nutritional pattern acts directly on the **microbiome-gut-brain axis, glycemic stability, lipid regulation, and anti-inflammatory protection**, making the onset of NCDs **neurologically unlikely and biologically uninteresting for the body**. This means that true prevention is not resistance—it is *metabolic reframing*.

Throughout the analysis, it also became clear that the practical feasibility of adopting plant-based diets on a population scale is not utopian, but real and replicable—as long as it is implemented with **strategic education, cultural adaptation, and smart food architecture**, as already demonstrated by countries such as Canada, the United Kingdom, Norway, and Japan. Public models that integrated plant-based diets into schools, corporate environments, and preventive health programs observed not only **immediate clinical improvements** but also **significant reductions in hospitalizations, reduced public costs, and increased years of active life**, as reported by WHO guidelines and systems such as the British NHS (WHO, 2020).

Another key aspect identified is the economic and civilizational impact of this model. Preventive nutrition ceases to be an individual issue and becomes **a tool for health and financial sovereignty**, preventing budgetary collapse in health systems. Every dollar invested in nutritional prevention generates multiple returns in reduced hospital costs, increased productivity, and preserved functional capacity of the economically active population. Therefore, **investing in plant-based nutrition is not just a health-promoting act—it is a strategy for national defense, systemic stability, and intergenerational protection**.

From a human perspective, intelligently applied plant-based nutrition also represents **the humanization of health and the democratization of self-care**. It restores individual control over their health, restores the perception of internal control, and breaks cycles of dependence perpetuated by reactive systems. Furthermore, **it establishes healthy habits that are reproduced across generations**, creating a virtuous cycle in which food quality ceases to be an exception and becomes a cultural norm. It is, in fact, the only strategy that simultaneously addresses **the clinical present, the economic future, and the health legacy of future generations**.

It follows, therefore, that plant-based dietary protocols, when based on robust science and implemented strategically, **are not an alternative—they are a civilizational necessity**. They represent the convergence point between health, autonomy, financial stability, social sustainability, and intergenerational responsibility. This is not an innovation.

temporary, but an **inevitable evolution of 21st-century health policies**. Diet ceases to be an individual act and assumes the role of **strategic infrastructure for global public health**.

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