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# Vaccine: Public Health and Prevention in Times of Financial Austerity

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## Authors' contributions

*This work was carried out in collaboration between all authors. Author VJMQ designed the study review and wrote the first draft of the manuscript. Authors TZ and VB managed the literature searches, analyses of the analysis. All authors read and approved the final manuscript.*

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## ABSTRACT

This narrative review paper briefly and anecdotally discusses the current reality and future requirements across nations to invest in public health prevention strategies to ensure global health. Many novel public health campaigns have been underway and much of the research literature to date have explored a myriad of modalities to promote global health in the context of human and health security. We propose that a back-to-basics approach may benefit states and health policy. In light of the long emergency that is financial austerity for many nation-states with regional conflict displacing millions, prevention may be the best option for public health institutions to maximize best medical outcomes for populations. Comment is also made about disease prevention and the exploding non-communicable disease wave hitting both the developed and developing world. This review paper makes the case for prevention of disease and emphasizes the benefits of vaccination.

*Keywords: Vaccine; primary prevention; health security and economic austerity.*

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## 1. INTRODUCTION

The long emergency of financial crisis through global market manipulation and speculation negatively impacts disease prevention strategies across global health and health security programming. Vaccination and primary prevention of disease, which are methods aimed at elimination of a disease before it infects, remains the single most cost effective and low-tech approach to reaching global health security for billions of people. Especially in times of economic austerity and limited financial resources for ministries of health, governments and international aid programs. Our methods are a simple review of some of the challenges in treatment that developing nations have with increasing disease burden and that of how primary prevention may be a cheaper alternative. This paper is a review of the basic concepts of primary prevention, vaccination and how in times of economic austerity, prevention can mitigate disease burden and secure health in a cost efficient manner.

## 2. PRIMARY PREVENTION

Halting disease before it infects, before the disease develops is the very definition of primary prevention; where vaccine offers the immune system the ability to protect against future pathogens. This is inherently helpful for developing children to make them immune to potentially lethal disease that they may encounter throughout the developed and developing world. This is the bulwark of primary prevention – making the patient immune to disease before they encounter disease naturally. In essence, primary prevention is cheap and applicable to population groups with disparate economic and social status; therapeutic medicine is expensive and largely available only to those who can pay the price. Health care spending can best be controlled by shifting investments from expensive low-value services such as long term and non-curative treatment to more cost-effective interventions that eradicate or cure disease [1].

After all, if we eliminate or eradicate a disease, there are always stakeholders who may no longer reap the profits of repeatedly treating disease through therapeutic medicine. This economic incentive to keep treatment of disease as the focus, as opposed to cure, may generate a feedback loop of research funding on treatment and away from a cure; this loop can be broken and vaccination is in effect a cure as it limits disease and disease spread and remains cost effective across nations [2].

### 2.1 Prevention and Conflict: A Brief Case Study of Syria

The deteriorating health security condition observed throughout the Middle East and North Africa in the wake of the Arab Spring highlights the connection between population health and state stability. The relationship between state stability, mandate to govern and legitimacy of basic institutions, such as health and hygiene, are directly linked [3]. After all, if the state cannot provide basic infrastructure and predictable state institutions to help its people, how can it regulate vaccine programs or test the safety and efficacy of medicines.

This is seen in a state of acute crisis in Syria with that of polio. Polio was a once regarded near abolished and eradicated disease from the human experience. Polio, or poliomyelitis, inflicts mostly the under five year old population, can lead to irreversible paralysis and death in as short as a few hours. The last strongholds of this disease place all children at risk. Syria once had a stable and adequate polio vaccine program until the conflict overwhelmed regional health bodies to continue their work.

Violence began in April 2011 at the peak of the regional Arab Spring where many people took to the streets in protest of violent regimes, many unwilling to develop policy broadening the economic opportunities and social freedoms to all its citizens. Regional public health infrastructure, to include water, sanitation, roads, re-supply of district medical facilities began the short time of decay while the central government placed most of its funding and resources into bombing and systematically attacking its citizens. Simple and very cheap vaccine programs lost focus, children under five lost access to schools, community access and regional health reach. October 2013 saw the first diagnosed case of polio. By mid December 2013, over 24 children had the disease [4]. As the state and its institutions, no matter how dysfunctional or poorly resourced they may seem at first glance, decay and the little that was once offered in the form prevention is lost.

## **2.2 Global Health Prevention and Money Flows**

At present, and before the 2008 economic collapse of liquidity, health policies, practices, and allocated resources that promote the goals of primary prevention were losing out in competition with treatment-oriented healthcare policies and practices, particularly with in excess of 90% of healthcare budgets globally being allocated to care, and less than 10% being allocated to prevention [5].

Said plainly, it was more profitable to make drugs to treat disease than to prevent it – this was the economic paradigm. As the global economic system is still undergoing restructuring and dynamic change, the acute need to prevent disease at the cheapest cost remains an absolute necessity. Local and state-level investment in primary prevention, and acceptance of vaccination programs must increase dramatically to assure continued improvement in overall global health and subsequent quality of life.

Healthcare resources are under strain and sometimes first to be knocked-off ministerial budgets in times of economic crisis. Illustration of this can be best described with the epicenter of the EU crisis revolving around Greece in the 2011 and 2012 run-up to a myriad of bailouts and a deep discussion and soul searching of collective EU financial policy. For example, the directive sent down by the Minister of the Greek health system for 2011 called for a 40% reduction in hospital budgets - the outcome was disastrous with most hospitals failing to achieve the target and poor health outcomes and lack of primary healthcare access as a key result [6].

## **3. THE ECONOMICS OF PREVENTION**

Present global health strategies released by governments, state and local agencies and aid programs focus on treating diseases with the greatest social and political impact; those diseases with starving children, can raise funding quickly and offer fast results to make end of the years reports padded and seemingly worthwhile. This is a policy decision that tends to promote inequity in care, and does not necessarily address the most pressing health needs in a region, a subset population or more widely, the global population.

Even though primary prevention is the most cost-effective form of healthcare, globally, the resources and finances necessary for primary prevention are difficult to describe. It is hard to let a politician know how much money she will save or how many lives she will save if there is no control group, no cohort where many more people get sick and many more die in relationship to those who receive a vaccine. The economic effectiveness of structural and

program specific investments in primary prevention may not be seen for decades (such as increased longevity, decreased infant mortality, and hence reduced demand on healthcare services across and through time).

Unfortunately, policy-makers often have a much shorter time horizon for policy and results, sometime only until the next election. Except when epidemics or disasters occur, prevention offers few immediately obvious benefits, and often has little immediate political benefit and affects the state and population a generation down the road, not the next ballot or confidence vote. This conundrum is a major obstacle to support for prevention programs at the macro and state budget level.

### **3.1 Non-communicable Disease: Paradigm Shift**

Primary prevention does not only involve shots and jabs into the arm by form of vaccination, although it serves as a textbook illustration. Human behaviour can also be intervened to prevent disease by changing daily diets, encouraging non-smoking behaviour; sexual practices modification and limiting the use of drugs and alcohol. As governmental healthcare budgets tighten and focus shifts increasingly to acute care services, these and many other forms of prevention must be seen as the cheap and easy way to health. Spending money on healing and treating symptoms of the very ill and sick at the end stages of cancer and other non-communicable diseases (i.e. cardiovascular disease and heart failure, diabetes and renal disease and cancer etc) is the most costly form of healthcare.

Non-infectious disease, or non-communicable diseases, represent a growing concern for public health officials and are magnified by an aging population in the developed world, a growing population in the developing world with a changing disease burden from not only infectious disease but now also non-infectious disease. These come with high costs of treating preventable illnesses, and the negative health effects related to environmental degradation, geopolitical instability and the socio-political upheaval seen with the recent economic collapse of 2008.

## **4. THE POLICY OF PREVENTION: CURRENT TRENDS AND DIFFICULTIES WITH FUNDING**

A key pitfall in the current market-oriented diagnosis and treatment-oriented approach to medical problems lies in the rapidly growing financial demands of this kind of medicine. Diagnosis and therapy have high demands in terms of money and resources, as does medical research, but the benefits are self-evident. The effectiveness of acute-care medicine is reflected, in part, in rising life expectancies seen in most countries. In the Czech Republic, this is especially obvious over the past two decades, mainly due to the use of modern methods of interventional cardiology and the introduction of a wide spectrum of chemotherapy in clinical practice [7]. However, these approaches to maintaining population health are costly and unsustainable, yet reasonable and effective primary prevention efforts are not funded at appropriate levels. Why is this?

A key reason is likely that the “costs now, benefits later” structure of preventive medicine requires economic foresight and a philosophy of risk mitigation that does not entail an expectation of immediate, obvious effect [8]; this is in contrast to the immediate effects seen with most medical therapy. Said differently, vaccines can save many lives, but can also be greatly under-valued and unnoticed by the general public and policy-makers.

The other significant hurdle in the way of implementation of primary prevention is the difficulty to preserve a long-term plan. As the policy makers change, there is a general lack of an architect who would see a design implemented into health care itself. With that in mind, should a long-term plan have a chance for success, it would require large public support. Yet it is often exceedingly difficult to as much as explain the benefits of the primary prevention to the wide public, much less to convince them for a larger time period.

One of the main reasons for this is that the disease burden in the developed world versus the still developing world shared few qualities until now. In the 20<sup>th</sup> century, morbidity and mortality due to easily preventable diseases like pertussis, TB, rotavirus or polio was severe. Vaccination programs took target at these and many other illnesses with gaps in implementation and only budding global and collective concern. Many countries faced cultural and societal barriers to achieve a herd immunity rate of more than 92% and many states faced cold-chain logistical challenges and of course cost. Nowadays, it is difficult to even keep the current vaccination programs afloat in scattered regions as some of the diseases are perceived as eradicated or superfluous. Some cultures and civic groups promote vaccination and immunizations as causing more harm than benefit with very little or no clinical or medical evidence to substantiate such claims.

An egregious example of this can be best illustrated by the Andrew Wakefield paper in 1998 that was published in the *Lancet* and has since been redacted. Wakefield promoted bogus data that the measles, mumps and rubella (MMR) vaccine lead to autism [9,10]. Many parents opted out of the MMR leaving children at risk of contracting a preventable disease. It is indeed difficult to convince the general population, that it needs to prevent something it doesn't see.

As for developing nations, here the motives are much less clear. On one hand, it seems beyond logical sense that the death rates due to easily preventable diseases would be completely erased through vaccination and rather a reduction in incidence across the long term with continued compliance in any vaccination program. In general, least developed nations often face significant if non-existence resources, for public health and healthcare. Access to rural populations is difficult and reaching a population target of over 80% with full vaccination compliance can be daunting [11].

Healthcare economics is the discipline that oversees the economic aspects of all facets of healthcare; it involves both private and public agencies and organizations. Research in healthcare economics helps dictate where healthcare resources are placed to optimize medical outcomes at the best cost while ensuring the lowest risk to patients, vaccine and related programming are oftentimes at the centre of healthcare economics in state institutions. Resolving the observed increase in chronic disease and illness is most cost-effective when tackled through primary prevention [12], which is the potential frontline for mitigating healthcare expenditures for healthcare systems that manage population healthcare delivery. A primary prevention programme such as vaccination can help alleviate the spiralling costs of acute and chronic healthcare expenditure by detecting disease early. Investment in primary prevention is clearly desirable. But, this investment must be based on evidence of effectiveness.

Three economic concepts are applied to healthcare interventions in primary prevention: cost-benefit analysis, cost-effectiveness analysis, and cost-utility analysis [12]. These act to reconcile budgetary constraints and public health needs; their application drives health policy at many levels. Metrics of success in financial and healthcare outcomes are complex and

challenging but the future success of interventions such as vaccination are cheaper than treatment [13].

Cost-benefit analysis includes all costs and benefits associated with, for example, a vaccination campaign, and is helpful when comparing vaccine costs with the costs of treating the disease once infected. Cost-effectiveness analysis assesses the costs and savings associated with a medical intervention, as it relates to lives saved or to the number of people who do not become infected with, e.g., measles, after being inoculated. Cost-utility analysis assesses health outcomes in terms of survival and quality of life. A major shortcoming is that these analyses save money, not necessarily lives. One can argue that a vaccine campaign may be insufficiently effective for use in a given community. But, the argument may not consider the health and quality of life of anyone who acquires a vaccine-preventable disease. Unless otherwise noted, public health proponents endorse vaccination programs for any endemic disease that is effectively preventable through vaccination.

#### **4.1 Check Book Economics**

Many policy makers, decision makers and politicians find it hard to invest in the future, the future will not be voting for them, making decision in the present is far easier and the benefits more rapid. However, the cheaper and most cost efficient basis economic benefits of primary prevention: cheaper than treatment. This is the single most important tenant that will dictate how the world spends on healthcare I the next 100 years. Primary prevention holds the key to making this the most cost effective and equal global healthcare infrastructure.

Cost-benefit analysis in immunization programs, or in screening for various diseases, drives much public health policy. Such programs are considered money well spent for the betterment of health and society. But, other policy-makers may disagree, and argue against some primary prevention programs. This is more common when stakeholders or their representatives are poorly educated about vaccines and their benefits, or they subscribe to baseless myths associated with a vaccine.

Primary prevention must also respond to emergencies; it must have plans in place to act effectively and in a fiscally responsible manner. Doing so can be difficult, and is always expensive. In an emergency or epidemic situation, rapid assistance and support is key to successful outcomes. This type of emergency response requires significant human and material resources and finances to address the logistics, staffing, expertise and provisioning of medical supplies to meet the anticipated need. Most public agencies will spend any funds available to meet this demand. The resources needed usually must be manufactured.

#### **5. CONCLUSION**

A strategic challenge of 21st century medicine is the prevention of illness and the promotion and maintenance of health in an increasingly vulnerable global population. Primary prevention is the best vehicle to achieve this. It is a major contributor to reducing healthcare costs, maximizing healthcare outcomes with limited resources, and to improving the quality of life. The main contribution of public health policy with respect to human health has been in preventing and eliminating disease and premature mortality. Economic principles applied to public health policy seek to engender a culture of maximizing healthcare outcomes most cost-effectively with the greatest community benefit. The Precautionary Principle must be

followed in some public policy instances when seeking public health policies that will offer optimal outcomes in the public interest.

Primary prevention in public health is fundamental to the success and progression of societies, globally. For primary prevention regimes to effectively reduce preventable disease and promote health, public health must be provided with adequate financial and physical resources, along with political and policy-based support to meet the challenge.

Both public health care and therapeutic medicine are complementary components to maintain human health, thus they should not have to compete for resources. However, we are facing a resource and fiscal crunch and competition is inevitable. Even though the evidence is clear that primary prevention is the most cost-effective health care process to ensure population health, it is hard to compete with the dramatic and immediate effects of therapeutic medicine. This is especially so when policy-makers and stakeholders focus almost exclusively on short-term political and social goals. The true economic benefits and health successes of primary prevention are hard to document when 'nothing happens' (for instance, when pandemics and major disease burdens are averted). A concerted emphasis on primary prevention is needed for all public health policy to succeed in the long-term in support of sustainable health.

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Institutional Review Board (IRB) and Ethical Committee Approval were not sought nor are they necessary for this review paper.

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Authors have declared that no competing interests exist.

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