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RESEARCH ARTICLE

Lack of Trust in Public Health as seen in Rejection of Face Masks

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ABSTRACT

Public health is a communal enterprise, for the benefit of the community, not for any one individual. So public health needs to be funded communally, usually by the government, and can require the participation of all. One of the responsibilities of public health is to control epidemics. For this it needs to have a public that supports its required standard procedures. Control of epidemics are a particular problem because they are caused by living organisms, which can increase exponentially. Time is of the essence when confronting a potential epidemic as is war when attacked by a foreign power. The government should organize epidemic response as it does a military response. To maintain trust in public health, I suggest that public health should establish clinics to promote the good health of the population, particularly clinics concerned with the health of babies and their mothers and clinics concerned with the maintenance of health of individuals with chronic health problems.

Introduction:

This essay is a product of my retirement from laboratory science and my conclusion that the covid19 epidemic was poorly handed by the American public health service. I am trying to understand why? Is there something about the mission and structure of public health that is likely to create bureaucratic incompetence? This essay is not a logical development of the topic, but a meander through the topic trying to understand the question through stories and selective history.

Public health has been designed to reduce the effects of infectious disease, toxins in the environment and lack of essential nutrients in food. While all people will agree with these goals, how they are carried out can lead to conflict. Conflict without resolution would lead to erosion of support for public health and then resistance to doing anything that might be inconvenient, like wearing a mask! Increasing trust in public health should be one of major goals of public health. The nature and structure of public health make increasing trust difficult, but it can be done. These issues will be discussed below in an unsystematic manner, allowing digressions that interfere with the intellectual flow of the argument since it is a complex problem involving people.

While I am not an MD, given my background, I feel I can comment on medical matters. My father, two uncles and a grandfather were all medical doctors. I went to Stanford University with the plan to become one. I completed all the courses required for admission to medical school. However, I went to graduate school rather than medical school because of the lying and cheating of many of the other premed students, who wanted to become doctors just for the money and status. My graduate training was in population genetics and evolutionary biology with Richard Lewontin. I then worked with Allan Campbell in bacterial genetics. Most of my research was on the population genetics and pathogenicity of *Escherichia coli* and *Borrelli burgdorferi* and on experimental evolution using the chemostat. Thus, I was a peripheral outsider to the community of public health professionals. I am now retired and so now must rely upon the press for my information about the covid-19 epidemic. I hope I have not gotten too much wrong in this essay.

Problems with the government:

It is clear that the government response to the covid-19 was inadequate (Covid Crisis Group, 2023). The theses in this book are: 1. The public health system was laid out to respond to the challenges of the 1890s and has not been updated since. 2. Public

health is in need of a command structure to respond to epidemics. 3. Public health has three cultures of governance. Before I mention these three cultures, I first want to emphasize that normally politics is a performance art, a laying out of concerns and values, of responding to emotions of worry and fear of the populace and designing laws that are a compromise on the statement of goals. However, in a disaster, these goals must be put in practice. Politicians must stop talking and do. Something they are ill prepared for. The above book uses the analogy of "war" for the required response to an epidemic. To carry this analogy forward, during peacetime, the requirement of military officers is to maintain equipment and facilities, to season recruits, to promote discipline and group cohesion, to practice tactics playing chess or bridge. Promotion is often based on how well the recruits are trained in parade formation. When war comes, other skills are needed and many of the leading generals need to be retired before the military can be an effective fighting force. Might Public health have this same problem? Promotion is based on corollary strengths, not the strength required during an epidemic? This is another question I cannot answer but should be addressed by the public health community. To return to the three cultures of governance. 1. The culture of programs and process. This is the culture of politics. 2. The culture of research and investigation. This is the culture of research science. 3. The culture of operations, to link goals with action. This is the culture of (war) games. This book says that this is the culture of action that failed in the covid-19 epidemic. There was no one with the position and skill to oversee the operation. While the operations got better over time, there remained a high death rate from the covid-19 epidemic. I do not think that government failure is the whole story. Lack of trust in the public health bureaucracy is an important part of it.

Face masks:

I realized that there was something wrong with the American response to the covid19 epidemic when I saw news clips from east Asia soon after the epidemic started. In those countries, most everyone on the street wore face masks. These were the people who had confronted another coronavirus out-break, SARS-cov-1, and stopped the outbreak through public health measures. For me, face masks became a symbol of a successful public health control of a coronavirus outbreak. The last section of this essay will discuss the theoretical justification for masks as the symbol for control of the covid-19 epidemic.

Data from COVID-19 pandemic death rates by country (Wikipedia on September 11, 2023)

suggest that something important is going on. The death rates per million people differ greatly between the United States and these countries from east Asia where masks were worn. For the United States, the death rate is 3,331/million compared to the death rates from Japan, South Korea, Taiwan of 602, 691, and 739/million respectively or about five times lower. I picked these countries because they all have large populations, and all are democratic countries with an advanced economy. Despotic countries may suppress the numbers to look good (China at 85) and other countries like India (375) may not record many of the elderly that die at home as covid-19 deaths. However, United Kingdom (3,391/million) and Australia (874/million) give an interesting comparison. An English friend said that the English disregarded the advice of the public health people. When I lived in Australia with young children, I was impressed with the local well baby clinic located near the grade school and their concern for the good health of babies and small children. These clinics were not part of the medical system and seem to have been attached to public health. If so, then Australians would have been conditioned to listen to the advice of the public health officials and found their advice to be helpful. Wearing face masks implied to me that the advice from public health organizations was trusted. Face masks are mildly irritating, particularly when you are also using your ears for glasses, hearing aids and a hat, but can be worn all day. Face masks are useful for preventing catching a virus and useful for preventing passing a virus on to others. Face masks interrupt the transmission of virus from one person to another. Evolutionary theory proposes that the transmission from one host to another is the most important step in the demography of a virus. Interrupting this step can decrease the r_0 , the growth rate of new infections, to less than one causing the virus to go extinct.

Trust:

A long time ago, I was active in a church based social service organization. People listened and worked with us rather than health officials from the county because they felt that we were primarily interested in their welfare rather than the county health officials who were just "bureaucrats" collecting a salary and following the rules. Maybe, our public health organizations are set up so that personal relationships are not seen to be important, leading to a loss of trust. I am not able to suggest another way to organize governmental public health rather than employing people with rules to prevent embezzlement. However, government services must have means to positively interact with the public.

Private versus public health:

Public health and private (individual) health should not be confused. They are very different, even though subjects overlap and many of the scientists and practitioners involved undergo very similar training. Public health is concerned with the health and well-being of a group, usually in a defined geographical area, while private health is the concern of the ill person and the healer designated to help the sick person to regain health. Since we all die, most of us will call on healers (be they medical doctors, nurses, shamans, medicine men, or traditional healers) at various times during our life. The need for healers will never go away. This is not necessarily true of public health professionals. The personal contact is massively important for healers. This is not necessarily true of public health professionals.

My grandfather was a medical doctor in South Holland, Illinois, a small rural town in the rich muck lands south of Chicago for over sixty years. After 50 years of practice and marriage, in 1952, the town gave him a celebration and the people he had delivered as babies wore a button that said, "one of Doc's Babies". The town celebrated him because he did house (farm) calls and delivered babies at home. He cared about his patients. He said just before he died that he really did help in birthing but had little effect over infectious disease except to provide care and concern until the advent of sulfa drugs and later antibiotics. I can't imagine he had a very good bedside manner, being so gruff, direct, and opinionated. But the personal care, the support of the dying, mattered. Private medicine is, in the end, based on personal relationships. Curing friends is a reward, but **loyalty** to the dying is part of it. The doctors in my family were opposed to socialized medicine. I think that this was because of the fear that medicine would be organized along the lines of a factory, which emphasized impersonal efficiency. I think that the factory model for medicine will be as unsuccessful as the factory model for agriculture as imposed in the communist countries. Living organisms are not automobiles.

Public health is not based on personal relationships in this way, but it is concerned with the health and welfare of a community, just not a person. Public health is to protect, promote and advance the health and well-being of a community or a population (this can be a town, a state, a country, a union of countries or, in exceptional cases, the world (as with the extinction of smallpox)). Public health is thus a communal exercise to prevent ill-health, disease, and trauma. Consequently, it intersects with politics and is supported by public funds and that means it must retain the trust of the public.

Vaccines:

Public health has a problem that traditional medicine does not. Public health can solve problems and after the problem is solved, the public forgets about the problem. But public health retains the need to prevent the reoccurrence of the problem. For example, using vaccines, smallpox virus has been driven extinct and many other infectious diseases have disappeared from rich countries like polio, leprosy, measles, whooping cough. The pain, sickness, death associated with these diseases is soon forgotten. But the requirement for vaccines continues. Needles hurt. Little children become afraid, they scream and cry, when vaccinated, much to the distress of their mothers. Something that has not been discussed (at least I have not seen it) is that with a vaccine you are putting into your body something that is evil, something you want to avoid. Why would you put live pathogen into your body unless you have a memory of the sickness and death caused by the disease? Public health must continually counter the natural human tendency to be suspicious of vaccines. But this pattern is common in public health. A problem is solved. The problem is solved, human health improves, but the maintenance of the solution must be funded and supported. We have a clean water supply, but the water treatment plants must be maintained. Chlorine purchased. Sludge disposed of. When clean water is assumed to be part of the natural environment, some will suggest that money can be saved by not chlorinating the water. This is a general problem: forgetting the problem and suggesting money can be saved by cutting resources to public health.

Food:

What you put into your body is also an important part of public health. This is related to the idea of healthy and unhealthy food. However, it is an area of great contention. What is a healthy diet? This leads to the wellness industry, with its emphasis on the Mediterranean diet. The major problem I see with the question of a healthy diet is that so much of the discussion is based on statistical correlations which are accepted and taken as truth rather than a hypothesis to be discussed. My favorite example comes from the correlation between heart disease and animal fat in Europe (Grasgruber et al 2016). Finland has high rate of heart disease and a high consumption of meat. Both drop as the statistic moves south to the Mediterranean countries. When I spent a sabbatical in Paris, many of the French scientists talked to me about the French exception to this correlation. The French had unexpectedly low rates of heart disease considering how much meat and animal fat they consume. One day at a Parisian

bistro, having lunch, a French family occupied the next table. All, adults and children, ate a huge portion of white asparagus. When I ate at the student cafeteria, The luncheon dinner plate was over half vegetable, a small portion of starch and an even smaller portion of lean, tough meat of indescribable provenance, probably a milk cow that had passed its prime. Maybe lack of vegetable consumption correlates better with heart attack rate than animal fat. We know that the ApoE4 allele frequency in human populations drops from north to south across Europe. ApoE4 is associated with a predisposition to heart attacks (Lumsden et al 2020). What is the cause of the correlation, animal fat as proposed, consumption of fresh vegetables, genetic differentiation, or lack of strenuous exercise? What should be the advice of public health officials given each of these causes? What advice should be given if all are important causes? Whatever, the outcome was that everyone tried to avoid animal fat, often turning to processed food, increasing obesity and heart disease. Public health officials should stop pushing advice derived from the outcome of correlation studies. Correlation is not causation. Public health officials should be very careful when speaking out against foods that people enjoy eating. Food scolds, be they either bloggers or industry promoters, do not increase the support for public health. My father, also an MD, ate his customary two soft boiled eggs, two slices of soft (fatty) bacon, and two slices of toast smeared with butter and jam every morning and enjoyed it, even after everyone was told that cholesterol was bad for you. In reply, he said that if he stopped eating everything that was unhealthy, would he live forever? Or even two years longer in an old age home? What is the proper role of public health in eating? Public health has adjusted and is now giving good advice on proper eating. Eat vegetables and fruit, cut down on meat and avoid extra sugar and salt. I am happy that one can cook with butter again without guilt.

Social media (iphones):

It is clear that the effects of social media are a public health problem, particularly for the youth. While there is a temptation to place this problem under public health, this problem is a problem of human behavior combined with technology. I suggest that this problem is more like the ancient problem of alcohol. Social solutions seem to work best, having social rules of when and where drinking alcohol happens and how much is permitted by whom. Also, having rules restricting the availability and cost of alcohol. Individual health problems from alcohol are treated individually as a medical problem. Prohibition does not work well. Perhaps, a needed rule is all individuals under 21 are not

allowed to have an iPhone, but only a flip phone without a camera for phone and text.

Infectious disease:

The role of public health related to infectious disease is clearer. Public health measures were probably first instituted during outbreaks of new, highly pathogenic infectious diseases, like cholera and plague. Ships were held in the harbor for forty days, quarantined, to make sure no one was bringing plague into the town. Recently, villages isolated themselves when neighboring villages had outbreaks of Ebola. These measures were communal decisions. But it is likely individuals broke the quarantine, leaving the village to visit ill relatives or to get food or other goods to sell. Individuals entered the town from an infected village to escape the epidemic or even visit lovers or relatives. How should the rule breakers be handled? Forced to be quarantined? Politics is about how to use force within a community. How should force be used in public health? High taxes on rule breakers? Forced quarantine? I am not able to answer these questions, but it is critical for any discussion when talking about the communal applications related to public health.

Promote health:

So far, I have raised questions, unsystematically, related to why public health might be held in low regard. What might public health do to reverse this perception. My answer is to establish community institutions that promote health. Establish well-baby clinics with mothers to be and establish health maintenance stations! In well-baby clinics, trained personal would observe the baby, how it looks, how it is growing, seeing, hearing, responding etc. The baby would be sent a pediatrician if there are questions about the baby's health. I would expect that there would be no reason for most babies to ever see a doctor. Health maintenance offices would be sites where vitals can be checked for people with high blood pressure, diabetes and other chronic conditions, HIV titer in the blood checked, simple prescriptions renewed, and referred to the required doctor if conditions change. These offices would serve the role that current emergency medicine offices serve. These clinics and offices should not be staffed with MDs, but rather people interested in the health of people. In my youth, I worked as an operating room orderly. My estimation of the skill and judgement of the nuns and nurses that worked in these operating rooms was that they could manage these institutions.

Environment:

Another major objective of public health is to modify the environment to promote good health.

Poor health can be caused by lack of a complete diet (scurvy caused by a lack of vitamin C, beriberi caused by lack of thiamine, goiter by lack of iodine). The missing nutrient is then added to the diet. A harder problem becomes what causes diabetes, heart disease, cancer. Studying and discussing correlations seems to provide an answer. As microbiology was being established, correlations were discussed as to which microbial species caused what disease. Koch's principles were established to break this reliance on correlation and to prove which species of microorganism caused which disease. Is something similar possible for nutrition? What foods promote health?

Poor health can also be caused by the presence of toxins in the environment (lead in gasoline and paint, arsenic in wallpaper, microparticles (PM_{2.5}) in air pollution). How to counter and control these toxins is a major function of public health. An example, air pollution with particles smaller than 10 (PM₁₀), includes dust, pollen and spores. These contaminants have been around forever and the body has means of handling and getting rid of most of these. However, smaller particles (PM_{2.5}) are mostly produced by human activity and the body has no special systems to handle them. They are the ones public health should be concerned with. Another interesting case is nuclear radiation, where we are probably over-regulating. A sudden, large dose of radiation causes radiation sickness, often death. What happens when an individual is exposed to a continuous lower level of radiation of the same amount total? It is assumed that there is no safe level of radiation, even though a wide array of animals live within the exclusion zone at Chernobyl, seemingly happy and healthy (Wendle, October 9, 2015). The assumption seems to be that one can add radiation exposure over time and equate that with what happens to an animal body when the same amount is given in a short period of time. However, organisms are dynamic systems, able to counter the effects of natural radiation in the environment. Living organisms are not machines.

Living organisms:

The critical aspect of infectious diseases is that they are caused by living organisms, not by compounds in the environment. Compounds in the environment can hurt human health, but, while they can increase, do not increase exponentially unlike living organisms. Living organisms are born, not manufactured, reproduce, and die.

Populations of living organisms **will** increase exponentially if given a chance. During exponential increase, numbers of organisms or populations initially seem inconsequential and then suddenly are

overwhelming. When the numbers of infections in the covid-19 epidemic were small, when the epidemic could be controlled, the political leaders of both China and the United States said that people should not worry. Suddenly, the hospitals were being overwhelmed. Exponential increase (or decrease) of populations is a concept that needs to be fully understood by anyone in public health. For example, why would you expect the equilibrium population density of an efficient predator to be much less than an inefficient one?

The best way of thinking about infectious disease is to consider each infection as an individual which dies when the infection is cleared or when the infected individual dies. But, also, an infection that can give birth to new infections. An epidemic happens when the birth rate of new infections greatly exceeds the death rate. An immune response can block a new infection from becoming established, preventing the birth of a new infection. However, for a novel pathogen there is no immune response. Thus, the spread of this pathogen will depend upon the birth rate and death rate of infections. Control of this pathogen will depend upon suppressing the birth rate of new infections.

Each species of virus has its own characteristics, so different viruses will require different strategies to suppress its spread. Covid19 is a virus that typically infects the mucus membranes of the nasopharynx. It spreads through droplets and aerosols in the air from person to person. It is my understanding that there is little or no transmission from person to a surface (be it hands, doorknobs, or clothing) to another person. An important characteristic of Covid19 is that it can be transmitted from an infected person before symptoms develop (Tindale et al 2020). In person without cellular immunity, the infection can spread to the lungs and throughout the body, causing death. Vaccination will prevent this systemic illness. But vaccination does not seem to prevent the birth of new infections, even if it does shorten the time to the death of the infection. This proposal should be investigated. How can we decrease the birth rate of new infections such that the death rate of infections is higher than the birth rate of infections, causing Covid-19 populations in humans to go extinct?

Face masks:

The original strain of Covid-19 had a birth rate (R_0) of 2.5 which increased (as expected by evolutionary theory) to 5.0 in the delta strain (Transmission of Covid-19, Wikipedia, September 24, 2023) and 9.5 in the omicron strain (Basic reproduction number, Wikipedia September 29, 2023). For Covid-19 to decrease in frequency and eventually become extinct, the birth rate would have to drop to less than one. The most obvious means would be to decrease the rate of spread of droplets and aerosol, blocking the spread by control of air flow, chiefly by good quality face masks. Face masks that capture 90+% of the particles, going out from the person exhaling and into the person inhaling. Both would be wearing face masks. Since asymptomatic infected individuals are a major producer of transmission, masks would have to be worn by all people whenever they are with others. This means that masks would have to be designed to be as comfortable as possible. However, I find it unlikely that enough people would wear masks consistently so that human strains of covid-19 could become extinct. We are past that time. A more likely scenario is that covid-19 becomes one of the many cold viruses that circulate in the human population. Evolutionary considerations suggest that there would be selection for it to become less virulent, since ill people tend to stay home away from others, reducing the birth rate of new infections. Another time with another pandemic, we might not be as lucky as with covid-19. It might have the virulence of smallpox, which kills about a third of the naive infected (Carlos and Lewis 2012) compared to 1.7% for covid-19 (Coronavirus (COVID-19) Mortality Rate, Worldometer, May 14, 2023).

Conclusion:

Public health failed in too many countries during the covid-19 pandemic. Part of the problem was an organizational failure amplified by political failure. Public health has structural problems stemming from the fact that it must be a communal activity. It needs a way to stimulate trust so that, when needed, best practices (like wearing face masks) will be followed by the people. It is proposed that organizations that promote individual health be established to increase trust in public health by the population.

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