The Importance of Doctors in Our Ever-Changing World

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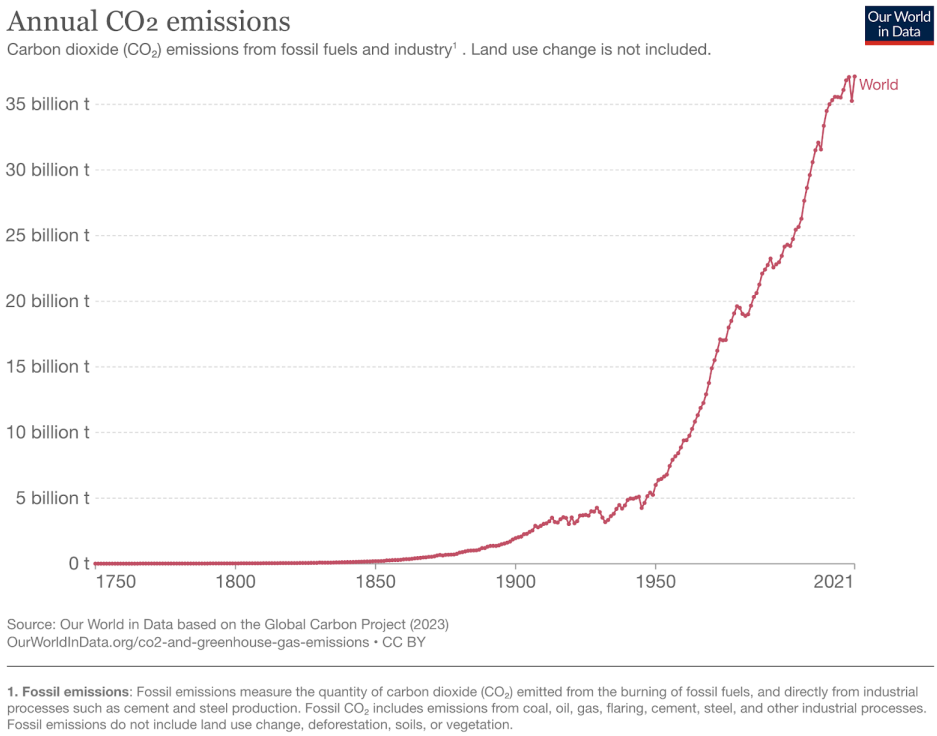
Abstract

Change is an inevitable part of the world we live in. It is a well-known fact that human innovation is driving society forward, with recent discoveries in the last century leading to higher standards of living, increasing the average life expectancy. Furthermore, the discovery of penicillin paved the way for modern antibiotics, which are now commonly used to treat bacterial infections. Yet all of these good intentions have a darker side. This paper aims to tackle the problems created by human (and sometimes natural) induced changes in our world, including climate change, population aging, and antibiotic resistance, and how all of these issues impact the public health sector. This review article summarizes the results from existing pieces of research while adding new insights through the author's own experiences working as an intern under several different medical specialties. Results from various sources all point toward increasing demand for healthcare professionals in our ever-changing world.

Introduction

We live in a world of constant change. Civilization was founded on the basis of agriculture and remained this way for hundreds of years, with humankind cultivating the land for food and turning to the natural world for resources. Then in the late 18th century, the world started to turn industrial, with the movement continuing to this day in various developing nations. The Industrial Revolution quickly transformed the ancient agricultural economy into one based on the mass production of manufactured goods. Such change was possible due to human curiosity and innovation, and such change had a domino effect on society, shifting human populations to the city and making goods more accessible (Britannica, 2023). As the standard of living increased, so did the average human lifespan, and as the average human lifespan increased, so did the number of individuals suffering from chronic conditions increase. Innovation is a double-edged sword. With all the good that it brought, the production of electricity generated an abundance of air pollutants and greenhouse gases, driving forward climate change and harming the environment and human health. According to Our World in Data, before the Industrial Revolution, annual CO2 emissions were around a few million tonnes, but in 1950, that number went up to six billion, and in 2020, global CO2 emissions were over thirty-five billion tonnes (Ritchie et al., 2020). In such a world of change, what role does the field of healthcare and medicine have to play? The goal of this paper is to explore the ever-changing world we live in and the reasons why it is now that medical professionals are needed more than ever before.



Graph taken from Our World in Data.

What does it mean to be a doctor or healthcare provider?

Before grappling with the implications of the medical field in our changing world, one must first understand what it means to be a doctor or healthcare professional. As Dr. Peter Watson puts it, “I usually manage to say something about being a medical detective-it is my job to try to make an accurate diagnosis of what is causing a patient to be unwell and then organise an effective treatment plan…We are medical detectives and problem solvers.” (Peter, 2019). Whether you are an oncologist, surgeon, or general practitioner, you aim to seek out the criminal in your patient’s body and compromise its plans. Additionally, some doctors argue that medicine is more about managing expectations than actually curing diseases, as studies have shown that expectations influence treatment outcomes in patients with various medical conditions, possibly due to the placebo and nocebo effects (Laferton et al, 2017).

But sometimes, the chief complaint cannot be truly alleviated, as the illness may not even be treatable. According to the World Health Organization, “Cancer is a leading cause of death worldwide, accounting for nearly 10 million deaths in 2020, or nearly one in six deaths.” With early detection and proper treatment, many types of cancer have a high cure rate, but for patients with more advanced stages of cancer, medical professionals seek to provide them with a quality of life through palliative care. Thus, contrary to popular belief, doctors do not always aim to cure patients of their disease. While this is often their primary goal, certain circumstances prevent this from being attainable, and therefore, doctors may aim to lessen symptoms, prevent illnesses from worsening, and provide autonomy to their patients.

Climate Change and Public Health

Climate change affects our external environment as well as our internal environment. Data from the World Health Organization (WHO) show that 99% of the world breathes air containing dangerously high levels of air pollutants that exceed the WHO guideline limits. Burning subsistence fuels like biomass in indoor settings releases an abundance of indoor air pollutants. With around a third of the global population (2.4 billion people) cooking using subsistence fuels, household air pollution was responsible for an estimated 3.2 million deaths per year in 2020 due to illnesses including stroke, ischaemic heart disease, chronic obstructive pulmonary disease (COPD), and lung cancer (WHO, 2022). Although many of these illnesses cannot be cured, medical professionals can help to alleviate the symptoms, which can increase the five-year survival rate of the patients. Additionally, quoting the World Health Organization, “the combined effects of ambient air pollution and household air pollution are associated with 6.7 million premature deaths annually” (WHO, 2022). As the combustion of fossil fuels releases more and more air pollutants and potent greenhouse gases, the average global temperature continues to rise.

One of the more direct impacts of global warming on human health would be an increased risk of hyperthermia from prolonged periods of high temperature. According to the United Nations, the 2003 heatwave in Europe claimed approximately 35,000 lives. Furthermore, in a study conducted by the Hadley Center for Climate Prediction and Research in the United Kingdom, greenhouse gases were proven to increase the likelihood of heatwaves (Kasotia, 2007). Hyperthermia can cause a loss of electrolytes, and in extreme cases, may require medical intervention to administer intravenous fluid (IV fluid) to rehydrate the body and replenish those electrolytes.

Increasing global temperatures cause the tropics to also expand further north and south. The tropics, primarily found near the equator, are characterized by high humidity and temperature. Many studies have shown that the tropics are shifting towards higher latitudes due to human-induced climate change (Yang et al, 2020). As the tropics expand, so does the habitat range of pathogen vectors. The conditions of the tropics are ideal for various animals to thrive, including the mosquito. It is known that many infectious diseases come from animals, with many of these pathogens being spread via mosquito bites. When a mosquito feeds on the blood of a host animal, it takes in any viruses and bacteria living in the blood and unknowingly transfers them to other hosts. According to the World Mosquito Program, “Roughly 390 million people are infected each year with dengue, and hundreds of thousands more are affected by Zika, chikungunya and yellow fever.” (Monash University, n.d.). These are just some of the more common diseases spread by mosquitoes, and if not treated, will have detrimental effects on humans. For example, some people with dengue fever develop complications that can result in internal bleeding, shock, and even death, with approximately 36,000 people dying from this illness annually (Monash University, n.d.). To this day, many of these illnesses have no cure, proving once again the importance of disease management, where medical professionals aim not to cure the patient’s illness, but to provide them with a quality of life and prevent the disease from worsening.

Population Aging

People worldwide are living much longer than they used to. Globally, the elderly age cohort (65 and over) is growing faster than all other age groups. According to the WHO, in 2020, the number of people aged 60 years and older outnumbered children younger than 5 years. Furthermore, the number of people aged 80 years or older is expected to triple between 2020

and 2050, reaching 426 million by that time (WHO, 2022). While this means that people will get to live longer lives, this also means that chronic diseases will become more common. Nearly 95% of adults aged 65 and older have at least one chronic condition, such as diabetes, hypertension, or arthritis (NCOA, 2023). Thus, it is crucial to consider whether the quality or quantity of life is more important.

Geriatric medicine targets the unique and complex needs of older individuals. This medical subspecialty is important because of several reasons, including comorbidity and polypharmacy. Comorbidity is more common in the elderly population, with chronic illnesses often being linked to other conditions. As people age, they often use multiple medications (polypharmacy) to manage these chronic conditions. Early detection and treatment via regular screening and testing of these illnesses is a key step toward improving the lifestyle of the elderly population. One such illness that is common among the senior population is Parkinson's Disease. Parkinson's Disease is an illness marked by tremors, rigidity, or balance problems, and is caused by a loss of nerve cells in the substantia nigra, which produces the neurotransmitter dopamine. This disease has no cure, and often, multiple tests are required to make a proper diagnosis, adding to the complexity of treatment. Medical professionals can prescribe certain medications for individuals with Parkinson's Disease such as L-DOPA, but with all the good it brings, it carries a risk of side effects including nausea and hallucinations. Furthermore, this illness worsens over time, making doctors crucial in long-term care (Brain & Spine Foundation, 2019). As with many chronic illnesses, a holistic, multidisciplinary approach is important in the management of Parkinson's and other common elderly conditions.

One problem often overlooked is loneliness in the elderly. "As devastating as it has been, COVID-19 truly brought to light the issue of social isolation and loneliness especially among older adults—which in the past has often been overlooked," said Carole Fisher, President of the National Partnership for Healthcare and Hospice Innovation (Garcia, 2022). Leading researcher Dr. Julianne Holt-Lundstad also found that loneliness can increase the risk of mortality by 50%—higher than the effects of air pollution, obesity, and excessive alcohol use (Garcia, 2022). Health problems can lead to loneliness in older people. Yet the opposite is also true, loneliness can also worsen health problems, creating a downward spiral in an individual's health and well-being (Brighton and Sussex Medical School, 2023). It is therefore crucial that doctors, particularly general practitioners and family doctors, develop a good rapport with their patients so that they can provide a remedy for their loneliness. Additionally, the "loneliness pandemic" spreads far beyond the elderly population, infecting young adults struggling as they transition into adulthood.

Sometimes, elderly people do not even know when they are sick. This is especially true if they have some neurocognitive disorders such as dementia or Alzheimer's. Hence, elderly caretakers must be constantly aware of their senior individual's condition in case a visit to the general practitioner is necessary. General practitioners can then do a physical examination of the patient, bringing hidden symptoms to light. Without the intervention of a medical professional, the elderly patient's condition might worsen, causing discomfort. There are also situations where the senior citizen is unwilling to take their medication. Since doctors cannot compromise their patients' autonomy, they must find a way to persuade the elderly patient to take their medications to treat their illnesses.

On the other side of the spectrum, some elderly individuals believe that they have developed an undiagnosed medical illness when they are not ill. These people may suffer from illness anxiety disorder (IAD), where normal body sensations seem to be pathological when in

reality are not. The role of a medical professional in this situation is to develop a good rapport through good communication and acknowledge the patient's concerns to treat their dysfunctional maladaptive cognitive beliefs. Sometimes a referral to a psychiatrist or clinical psychologist may also be helpful, where antidepressants may be prescribed or psychotherapy may be used (Scarella, 2019). This is another reason why a multidisciplinary team is often needed in proper patient care.

Antibiotic Resistance

The statement "with great power comes great responsibility" remains true in the field of medicine. The introduction of penicillin by Alexander Fleming in 1941 revolutionized the treatment of illnesses through the use of antibiotics. Antibiotics function by inhibiting or interfering with major cellular processes in bacterial and other microbes, making them useful in the treatment of bacterial or fungal infections (Zaman et al, 2017). Natural selection allows for specific genes useful in increasing fitness to be passed on to the next generation. Among the population of bacteria or microorganisms targeted by the antibiotic, there may be a small handful that has received a beneficially mutated copy of a gene, making them resistant to the medication. The surviving population will pass on their beneficial traits to the next generation, increasing the number of antibiotic-resistant bacteria. There already exist many antibiotic-resistant pathogens, such as Glycopeptide-Resistant S. aureus, due to the overuse of antibiotics (Rather, 2017), and just in Europe, an estimated 25,000 patients die due to multiple drug resistance (MDR) bacterial infections every year (Zaman et al, 2017). The issue of antibiotic resistance is so widespread and dangerous that it has become a global problem requiring a solution.

One of the most obvious contributing factors of antibiotic-resistant pathogens is self-medication. There are several reasons why people choose to take medicine on their initiative without proper medical advice. Firstly, some people lack the financial capability to afford to pay medical consultation fees. This is especially an issue since individuals with lower incomes tend to suffer from more chronic illnesses (Oates, 2017). In developing nations, antibiotics may even be sold as over-the-counter (OTC) medications. Secondly, people may think a visit to the doctor is too much of a hassle. Thirdly, humans have an innate desire to demonstrate their independence and self-sufficiency by managing their diseases (Rather, 2017). The lack of knowledge and education about proper antibiotic use is the prime reason for this crisis, and this is where medical professionals come in.

Several studies have shown that the use of antibiotics has long-term effects on the gut microbiome. In a study conducted by Queen et al, a positive association between antibiotic exposure and colon cancer risk was observed. The correlation of increased risk for colon cancer after antibiotic exposure was linked to antibiotic use more than 10 years before the cancer diagnosis, suggesting a long-term impact of antibiotics on the gut microbiome. Furthermore, studies have found that even a single short course of antibiotics can drastically alter an individual's gastrointestinal flora, changing the composition, diversity, metabolic function, and resistance gene expression of the microbiome (Queen et al, 2020). Dethelfsen et al. found that 5 days of ciprofloxacin, a narrow-spectrum antibiotic, was sufficient to reduce the richness and diversity of the distal colon microbiome (Dethelfsen et al, 2008).

As evidence that antibiotic use can have varied off-target and long-lasting negative consequences increases, the need for good antibiotic stewardship increases in urgency. Healthcare providers should not prescribe antibiotics for patients with viral syndromes,

noninfectious conditions, or asymptomatic colonization with bacteria, and for patients that require antibiotic therapy, the most effective and shortest course of action should be taken to minimize unwanted consequences (Queen et al, 2020). Quoting Zaman et al, “If the resistance to the antibiotics needs to be curbed, the only way shall be to educate the patients and the general public (Zaman et al, 2017).” Creating new antibiotics with no known resistance among bacteria will not stop the issue of antibiotic resistance; doctors and medical professionals must practice good antibiotic stewardship and educate the public to stop this crisis.

Although clinical trials are needed to further investigate this new kind of treatment, the use of bacteriophages in the treatment of bacterial infections may be an effective alternative treatment option. Bacteriophages are viruses specific to different bacteria, functioning by binding to receptors on bacterial cell walls to inject DNA into the cell, ultimately lysing it in the lytic phase. While regular antibiotics target both pathogenic and normal bacterial flora, bacteriophages are highly specific to their target (LaVergne et al, 2018).

Conclusion

Transformation and change are linked to the world we live in. Climate change, population aging, and antibiotic resistance are just three general ways we see our world change, and the evidence points towards a general need for healthcare providers. The world is changing right before our eyes, with human innovation and new technologies driving society forward. But is human innovation truly a force for good? With all the devastation it brought, do the costs outweigh the benefits? Climate change is driven by human-made factories and air pollutants, antibiotic resistance was birthed from the invention of penicillin, and while a higher standard of living does mean longer lifespans, it also means more chronic illnesses. But on the other hand, new carbon-capture technologies are being developed to reduce the concentration of CO_2 emissions into the atmosphere, alternatives to antibiotics like bacteriophages are being researched, and new cures for chronic illnesses are being discovered. Further research will be necessary to reach a conclusion for this.

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