World Health Organization

Chairs:
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Letter from the Chairs

Dear delegates,

My name is Marco Fleming and I'm a current sophomore at MIT studying Electrical Engineering and Computer Science. I joined MUN this year after hearing about the competition from a friend. I was initially interested as MUN is completely different from anything I had ever tried before and I wanted to try something new. Soon after, I became a committee chair and was fully committed to MUN. I chose to work on the World Health Organization (WHO) because I knew absolutely nothing about medicine and again wanted to try something new. Since becoming a chair, I have learned things completely unrelated to everything I have done before and am excited to hear everyone talk about their ideas at the conference!

My name is Allen Huang and I'm a current freshman at MIT prospectively studying Computation and Cognition. I'm new to MUN this year, but I'm really excited about the topics that we'll be covering in the WHO panel. Like Marco, I joined MUN because it's different from a lot of the experiences I've had in the past with extracurricular events, and I'm looking forward to hearing you share your ideas and open new perspectives in debating them.

Thanks,

Marco Fleming and Allen Huang

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Topic I: Ensuring Equity in Healthcare Access and Treatment

Introduction to the Problem

The widespread use of machine learning to harness the increasingly vast amounts of data being collected from every sphere of life has become prevalent in American society. Proposed uses range from handing down criminal sentences to determining what medical treatments patients need. Although using data to drive decision-making seems to be more objective and less biased than human decisions would be, the construction of these predictive algorithms still requires human input on how data is categorized, organized, and prioritized. More often than not, these predictive algorithms tend to be confounded by the biases of the humans who organized or provided the raw data that they were trained upon. For example, criminal "risk score" assessments which tend to reflect race and income level of defendants in predicting recidivism.

Artificial intelligence (AI) and machine learning (ML) based technologies have the potential to transform healthcare by deriving new and important insights from the vast amount of data generated during the delivery of healthcare every day. Example high-value applications include earlier disease detection, more accurate diagnosis, identification of new observations or patterns on human physiology, and development of personalized diagnostics and therapeutics. Health systems today have become increasingly digitized, relying on complex systems of prediction algorithms to identify and help patients with their health needs. These algorithms, usually commercially developed, are often opaque, their scrutiny hindered by the proprietary nature under which they were released. The

possible biases of predictive algorithms in allocating healthcare resources, therefore, are of increasing concern given the difficulty of studying their inner workings. A recent study published in *Science* (Suggested Reading #1) found racial bias in one such proprietary algorithm widely used in healthcare systems across the United States, which discovered that black patients were routinely recommended for less intensive care than white patients, reinforcing existing racial inequalities in access to health care.

The World Health Organization (WHO), as one of the world's leading public health bodies, has significant responsibility and influence in the steps that societies take to ensure health equity in their populations. WHO must be resolute in its goal of ensuring equity in healthcare access and treatment across societies, while respecting the autonomy and privacy of individuals whose data are collected and the intellectual property rights of major corporate and governmental stakeholders.

Key Terms

Algorithmic Bias

> Systematic and repeatable errors that result from computer systems that systematically and unfairly discriminate against certain individuals or groups of individuals in favor of others. A system discriminates unfairly if it denies an opportunity or a good or if it assigns an undesirable outcome to an individual or group of individuals on grounds that are unreasonable or inappropriate.

Health Equity

Equity is the absence of avoidable, unfair, or remediable differences among groups of people, whether those groups are defined socially, economically, demographically or geographically or by other means of stratification. "Health equity" or "equity in health" implies that ideally everyone should have a fair opportunity to attain their full health potential and that no one should be disadvantaged from achieving this potential.

Health Information System (HIS)

A digital system, such as an Electronic Healthcare Record (EHR), designed to collect, store, and manage healthcare data. According to the WHO's definition, a health information system provides the underpinnings for decision-making and has four key functions: data generation, compilation, analysis and synthesis.

Key Issues

The main issue in question is whether or not governing bodies should seek to regulate possible biases in healthcare algorithms, and if so, to what extent and nature these regulations should reach.

Some questions to consider in the proposed solution:

1. Is algorithmic bias an inevitable consequence of the structural inequalities baked into our data? In other words, will algorithms always be inherently biased?

2. What human rules are "acceptable" for an algorithm to take into account (i.e. gender differences in auto insurance rates)? Which are not? How can we decide which rules it is ethically permissible to allow AI to use?
3. To what extent would an ideal society use AI to make decisions as opposed to human decision makers?

Research Funding, Difficulties and Tasks

A major difficulty found in examining the effects of algorithmic bias is the proprietary nature of the software most commonly deployed in these predictive algorithms, which, although used in the provision of a public good, still remains the intellectual property of a private corporate entity. Another major difficulty in examining the effects of algorithmic bias is the unique nature of each potential case of algorithmic bias or discrimination, since inequities in healthcare access and provision are the results of a wide variety of societal inequalities, whose effects on the raw data algorithms are built on are variable and unpredictable.

Previous Attempts to Address the Issue

The European Union has recently put forward a set of guidelines for trustworthy, ethical AI implementation. (Suggested Reading #7) Whether or not these measures will be effective in safely implementing this new technology will only become evident with time.

The *Science* paper which most recently uncovered evidence of algorithmic bias in healthcare prediction programs noted that the most effective way to reduce bias was not in modifying existing

algorithms, but in being more careful in how the data fed into the algorithm is labeled and preprocessed.

Bloc Positions

European Union

The European Union has often taken an activist role in regulating how its citizens' data is collected and used, most recently with the wide-ranging General Data Protection Regulation, which overhauled data protection regulations that affected wide swathes of the consumer tech sector. It is expected to take a more aggressive stance toward the regulation of technological advances to safeguard citizens' privacy and human rights.

United States of America

The United States, with its global tech megacorporations, is a leading stakeholder in the debate over novel societal uses of cutting-edge computational technology. The United States will seek to balance protecting its citizen's individual rights under the law with corporations' intellectual property and commercial interests, which drive economic growth.

The People's Republic of China

The People's Republic of China is aggressively pursuing artificial intelligence research with wide-ranging applications in military and civilian society, and is quickly emerging as a leader in the use of predictive algorithms to monitor and influence society. The Chinese

government will likely prioritize scientific advancements in AI use over safeguarding human rights or ensuring equitable access.

Developing Nations

Developing nations may take mixed positions on algorithmic bias, with some nations favoring more aggressive approaches toward implementation given the shortage of trained medical care providers and rapidly expanding populations, while other nations may wish to minimize allowing technology to exacerbate existing societal inequities and tensions.

Suggested Reading:

1. https://science.sciencemag.org/content/366/6464/447
2. https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing
3. https://www.who.int/topics/health_equity/en/
4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4024462/
5. https://www.brookings.edu/blog/techtank/2019/01/03/artificial-intelligence-and-bias-four-key-challenges/
6. https://www.brookings.edu/blog/usc-brookings-schaeffer-on-health-policy/2019/03/05/will-robots-replace-doctors/
7. https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai

Topic 2: Cancer Control Policies for Prevention and Early Detection

Introduction to the Problem

The objective of the World Health Organization (WHO) is the attainment by all peoples of the highest possible level of health. [1] Cancer was responsible for about 9.6 million deaths in 2018: making the second leading cause of death in the world. Such tragedies are saddened by the fact that about 30-50% of them could have been prevented by changing key risk-factors. [2] As one of the world's leading public health bodies, WHO has the responsibility to take the lead in the next steps to combat the global effects of cancer. So, what is cancer and how do we prevent it? According to the WHO, cancer is a generic term for a large group of diseases characterized by the growth of abnormal cells beyond their usual boundaries that can then invade adjoining parts of the body and/or spread to other organs. [2] Cancer control policies aim to reduce the number of people who are affected to improve the overall quality of life. Control approaches can be split into two main categories: individual-focused and population-focused. Individual-focused approaches consider illness as a motivator and target the individual through clinical and public health recommendations and guidelines. Population-focused approaches consider health and wellness rather than illness in an attempt to prevent issues before they even arrive through laws, regulations, and policies. Historically, population-focused cancer control approaches have been more efficient than the individual-focused approaches. One of the most successful strategies in the United States was tobacco control for the prevention of lung cancer. Before 1950, no clear evidence connected tobacco to lung cancer.

Cigarette companies used doctors' authority on health as advertisements to promote the benefits of smoking their brand (see Figure 1, end of guide). [3] However, the 1964 US Surgeon General's report on Smoking and Health sparked the conversation which lead to the sharp reduction in smoking cigarettes and the eventual decline in lung cancer (See Figure 2). [4] One of the most significant pieces of tobacco control policies in the last ten years was the Family Smoking Prevention and Tobacco Control Act. [5] This act gave the FDA the power to regulate several aspects of the tobacco industry. Such regulations include manufacturing, marketing, and sale of the products. The provisions banned sales to minors as an attempt to only allow informed adults to make the choice of smoking, banned vending machine sales to prevent minors from purchasing tobacco products, limited the number of cigarettes in a package, and many more restrictions in which the overall visibility of tobacco brands and products has been reduced as an attempt to restrict tobacco products to people who are sure that they are making this decision for themselves and know the risks involved with the decision.

Key Terms

Cancer

According to the WHO, cancer is a generic term for a large group of diseases characterized by the growth of abnormal cells beyond their usual boundaries that can then invade adjoining parts of the body and/or spread to other organs.

Cancer Control

According to the WHO, cancer control aims to reduce the incidence, morbidity and mortality of cancer and to improve the quality of life of cancer patients in a defined population, through the systematic implementation of evidence-based interventions for prevention, early detection, diagnosis, treatment, and palliative care.

Diagnosis

The identification of the nature of an illness or other problem by examination of the symptoms.

Early Diagnosis

According to the WHO, early diagnosis aims at reducing the proportion of patients who are diagnosed at a later stage.

Key Issues

Breast Cancers

Breast cancers are the most common form of cancer, with over 2.09 million cases estimated worldwide. [7] Approximately one in eight women will be diagnosed with breast cancer in her lifetime. [8] One of the dangers of breast cancers is that someone can have no symptoms when the tumor is small and at its most treatable state. In fact, about 70% of women who have been diagnosed with breast cancer had absolutely no knowledge of any symptoms that could have given them any indication of their cancer. Currently, mammography is the most effective way to diagnose

breast cancer early, although the uncomfortable nature of the scan and potential risks of prolonged X-ray exposure associated with mammography serve as major deterrents for women to seek proactive screening.

Some questions to consider in the proposed solution

1. Which countries might be most affected by breast cancer?
2. Could current efforts to combat breast cancer be improved, or are more drastic or innovative initiatives required (and if so, what)?
3. How much of an impact can your solution have? How can any changes to current practices be enforced?

Difficulties with access

The Centers for Disease Control and Prevention (CDC) has a National Breast and Cervical Cancer Early Detection Program which aims to improve access to breast cancer screenings in the US. Efforts such as these to combat breast cancer are expensive and only about 9.8% of women in the US are eligible for breast cancer screening.

Some questions to consider in the proposed solution

1. Should there be a global fund dedicated to researching new methods, or ways to make breast cancer screenings more cost effective? If so, where would the funding come from?
2. Do some countries have a greater stake in the problem of breast cancer? If so, Should they be required, encouraged, or otherwise pressured to invest more resources into research?
3. How should research resources be allocated? What should be prioritized?

Major Parties Involved

The Top 10 Countries affected by Breast Cancers

Rank	Country	Age-standardised rate per 100,000
1	Belgium	113.2
2	Luxembourg	109.3
3	Netherlands	105.9
4	France (metropolitan)	99.1
5	New Caledonia (France)	98.0
6	Lebanon	97.6
7	Australia	94.5
8	UK	93.6
9	Italy	92.8
10	New Zealand	92.6

Lung Cancers

Lung cancers follow breast cancers as the second most common cancer form, also with nearly 2.09 million cases estimated on the global scale. [7] In addition to genetic factors, lung cancers are often caused by exposure to airborne carcinogens. Notable carcinogens are found in tobacco cigarettes, as mentioned above. Potential global restrictions on tobacco could be implemented as a means of cancer prevention. However, these actions would impact the global tobacco industry, advertising agencies, and many other types of industry, so the implication of restrictions like these would need to be considered and discussed thoroughly before being implemented. Unlike breast cancer patients, patients with lung cancers typically become more symptomatic earlier in the pathogenesis of their

disease - given that growths in the lung can more easily impact its local organ function (oxygen uptake) than a growth in the breast could.

A Deeper Look at Screening for Cancers

Screening can come in a variety of methods, each fit for the type of cancer that doctors are looking for in a patient. These screens can include scanning (like mammography), physical examination (like palpation of breast/testicular tissue), blood tests to look for biomarkers (like the prostate-specific antigen (PSA) in prostate cancers), and histological analysis of the cells/tissues of interest (from a Pap smear for cervical cancers, blood analysis for leukemias, or from any sort of biopsy, see Figure 3). Screening for lung cancer is often conducted in the form of a computed tomography (CT) scan of the chest, but only patients with high risk (i.e. heavy smoking patterns ongoing now, or at some point in the last fifteen years, and between 55 and 80 years of age) are screened. [9] This is because all forms of screening comes with its own risks. As mentioned previously with mammography, repeated screening using radiation can inadvertently cause cancer in the screened region of the body. Additionally, scans can be interpreted with false positives - regions of tissue that appear to be cancerous on a scan, that in fact aren't cancerous. False positives often lead to biopsies or other more invasive surgeries, which increases the risk of unnecessary complications for a patient. Additionally, many screening methods can lead to overdiagnosis - particularly an issue in prostate cancers. Using a threshold for PSA levels in the blood as a marker for cancers can reveal growths in older men (>65 years of age) that are cancerous. However, despite the increased PSA in the blood indicating a progression of the disease, treating these prostate cancer with surgery, chemotherapy, or radiation can be more risky than will be beneficial for the patient - it is estimated that 80% of men

who die of natural causes above the age of 80 have cancerous cells or growths in their prostate. These cancers, were they detected prior to death, could have been treated with surgery or chemotherapy, both of which could have resulted in unnecessary mortality (as their cancer wasn't their natural cause of death), or at a minimum could have impacted their standard of living (increased medical costs, negative effects of surgery recovery/chemotherapy side effects, etc.) In many cases, while better screening is necessary for many cancer types, like endometrial and ovarian cancers, developing more sensitive screens for cancers like prostate cancer may be less beneficial than they are worth. This is highly dependent on the population of people that you set out to screen - a sensitive and non-invasive test for prostate cancer in younger men would be incredibly useful at decreasing cancer mortality rates, while using that screen on a wider age range could subject older patients to unnecessary and dangerous procedures. These are all things to consider when discussing improving cancer screening methods.

Citations

1. "Appendix 1 - World Health Organisation." *World Health Organisation - Health, Declarations, Resolutions, Charters, Programmes, Platforms, UN - Healthy Documents*, http://www.healthydocuments.org/appendices/doc49.html.
2. "Cancer." *World Health Organization*, World Health Organization, https://www.who.int/health-topics/cancer.
3. Little, Becky. "When Cigarette Companies Used Doctors to Push Smoking." *History.com*, A&E Television Networks, 13 Sept. 2018, https://www.history.com/news/cigarette-ads-doctors-smoking-endorsement.
4. "Cancer Facts & Figures 2018." *American Cancer Society*, https://www.cancer.org/research/cancer-facts-statistics/all-cancer-facts-figures/cancer-facts-figures-2018.html.
5. Products, Center for Tobacco. "Overview of the Family Smoking Prevention and Tobacco Control Act." *U.S. Food and Drug Administration*, FDA, https://www.fda.gov/tobacco-products/rules-regulations-and-guidance/family-smoking-prevention-and-tobacco-control-act-overview.
6. "Chapter 2 A Historical Review of Efforts to Reduce Smoking in the United States." *Tobacco*, Centers for Disease Control and Prevention, https://www.cdc.gov/tobacco/data_statistics/sgr/2000/complete_report/pdfs/chapter2.pdf.
7. "Cancer." *World Health Organization*, World Health Organization, www.who.int/news-room/fact-sheets/detail/cancer.
8. "Causes of Breast Cancer." *National Breast Cancer Foundation*, https://www.nationalbreastcancer.org/causes-of-breast-cancer.
9. "Who Should Be Screened for Lung Cancer?" *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, www.cdc.gov/cancer/lung/basic_info/screening.htm.

10. "Chronic Myelogenous Leukemia." *Chronic Myelogenous Leukemia*, medcell.med.yale.edu/histology/blood_bone_marrow_lab/chronic_myelogenous_leukemia.php.

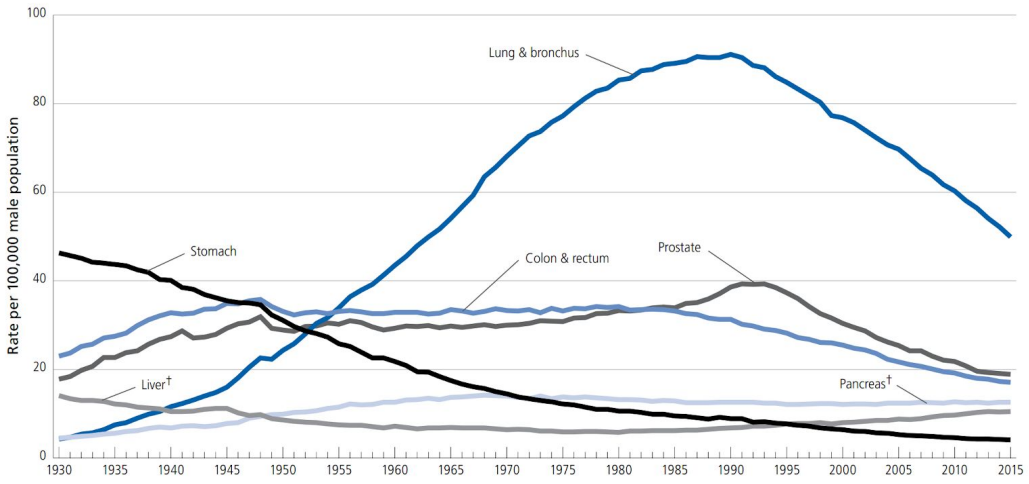
Helpful Links

1. World Health Organization: https://www.who.int/
2. American Cancer Society: https://www.cancer.org/
3. National Cancer Institute: https://www.cancer.gov/
4. Centers for Disease Control and Prevention: https://www.cdc.gov/
5. WHO Global Action Plan: https://apps.who.int/iris/bitstream/handle/10665/94384/9789241506236_eng.pdf;jsessionid=9120528B534B8BD987F13348B8491A34?sequence=1
6. What is Cancer Control? https://www.cancer.org/latest-news/what-is-cancer-control.html
7. How to prevent Cancer or find it early: https://www.cdc.gov/cancer/dcpc/prevention/index.htm
8. Impact of anti-smoking: https://www.cdc.gov/media/releases/2016/p0324-anti-smoking.html
9. CDC's National Breast and Cervical Cancer Early Detection Program: https://www.cdc.gov/cancer/nbccedp/
10. Alaska Comprehensive Cancer Control Plan 2016-2020: http://dhss.alaska.gov/dph/Chronic/Documents/Cancer/assets/AlaskaCancerPlan2016-2020.pdf

Figures

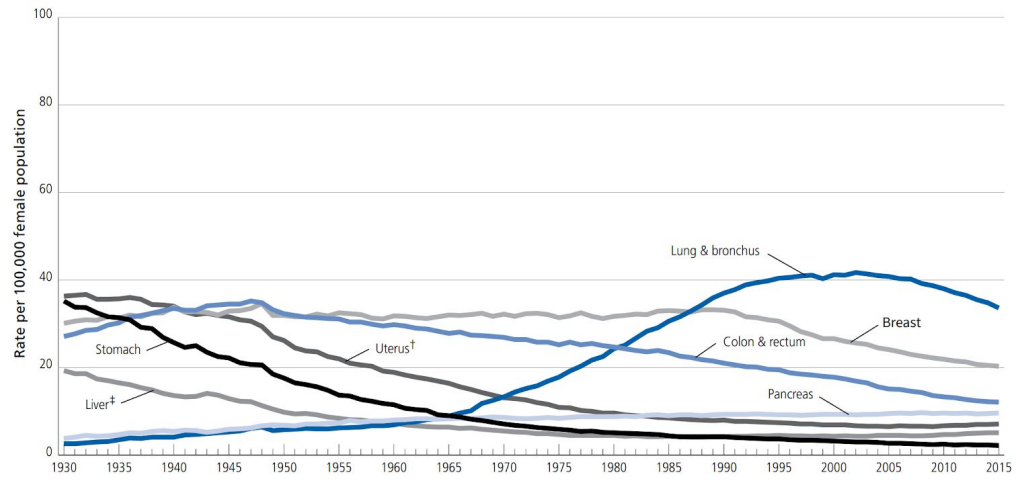
Figure 1: Physicians Backing Cigarette Smoking - Recruitment from Tobacco Companies

Figure 1. Trends in Age-adjusted Cancer Death Rates* by Site, Males, US, 1930-2015



*Age adjusted to the 2000 US standard population. †Mortality rates for pancreatic and liver cancers are increasing.
Note: Due to changes in ICD coding, numerator information has changed over time. Rates for cancers of the liver, lung and bronchus, colon and rectum, and uterus are affected by these coding changes.
Source: US Mortality Volumes 1930 to 1959, US Mortality Data 1960 to 2015, National Center for Health Statistics, Centers for Disease Control and Prevention.

Figure 2. Trends in Age-adjusted Cancer Death Rates* by Site, Females, US, 1930-2015



*Age adjusted to the 2000 US standard population. †Uterus refers to uterine cervix and uterine corpus combined. ‡The mortality rate for liver cancer is increasing.
Note: Due to changes in ICD coding, numerator information has changed over time. Rates for cancers of the liver, lung and bronchus, colon and rectum, and uterus are affected by these coding changes.
Source: US Mortality Volumes 1930 to 1959, US Mortality Data 1960 to 2015, National Center for Health Statistics, Centers for Disease Control and Prevention.

Figure 2: Cancer Death Rates by Cancer Type: Note the decline in lung/bronchus cancer starting in the late 1990s. This is a result of public health efforts by the US government to discourage smoking starting back in the 1960s.

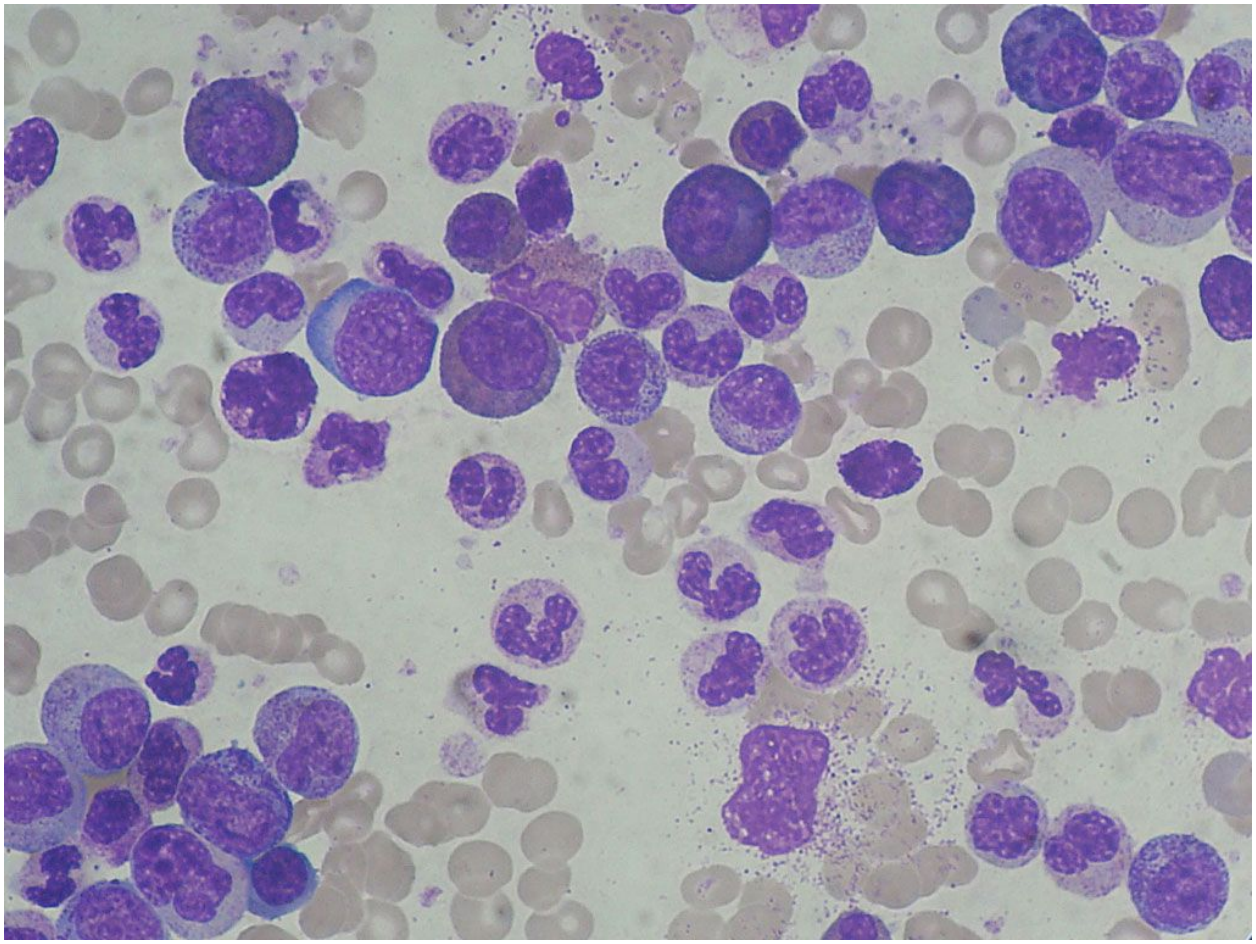


Figure 3: Histology of Chronic Myelogenous Leukemia - A leukemia-free blood sample would have much fewer purple cells in it. This sample shows evidence of expansion of these purple cells, which is often a sign of cancer. [10]