STOMACH CANCER IN JAPAN:
A HISTORICAL APPROACH

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AN INTRODUCTION TO CANCER

Among the threats to the developing regions of the world, few are as mysteriously dangerous as cancer. By definition, cancer is an abnormal cell growth and proliferation within an individual, usually due to the loss of many of the control factors found in normal cells. It passes the immune system often undetected because, unlike virally or bacterially infected cells, cancer cells are entirely your own cells, generated by your own body, and they are metastasizing based on the coding and expression patterns (though abnormal) of your own DNA. When untreated, cancer is generally fatal.¹

Hence, cancer is a disease of contemporary standards, and its characterization, though expanding day-by-day, is still fairly limited. It affects all populations of multiple groups and species. It also spares few sites of the body, capable of affecting various organs, made of various tissues, comprising of cells of totally different functions. More specifically, it can strike at the eye, or in the stomach, colon, skin, tongue or brain. It can affect men in their prostates and females in their breasts. One would think that, since cancer is able to strike at almost any site, its occurrence must be entirely random in a given population, reflecting no consistency in its incidence rate for that population. However, studies show quite the contrary. Cancer shows up in patterns, affecting men in different ways than women, or people of one region different than those of another one. Annual rates in one region for one people are of consistently different propensity than others.

Why would it strike in patterns, you ask? Research in biotechnology, genetics and epidemiology conclude that there are multiple factors in this. For one, there are the genetic

¹ For more information on the definition of cancer and a detailed, relevant background on cancerogenesis, refer to section 4.3 of the following text: Steven A. Frank, Dynamics of Cancer, (Princeton, NJ: Princeton University Press, 2007), .
factors. Clearly, different races have differences in their genetic composition. They often carry different groups of SNPs—single nucleotide polymorphisms—which are only one nucleotide differences between two alleles of the same gene. Many researchers believe that, since one ethnic group often shares a subset of SNPs, this fact may contribute to their increased or decreased susceptibility to a cancer. Another factor, still very recent and uncertain in its implications, may be due to DNA methylation and epigenetics\(^2\), which interests itself in changes in gene expression. This is a fairly new field in cancer research and will, therefore, not be further discussed here. The final factor, the one that concerns us the most, is the set of environmental factors. Through studies juxtaposing observed cancer incidence rates and the surrounding factors, epidemiologists and statisticians have concluded time and time again that there is often a set of environmental factors strongly associated with the genesis of cancer.

**Cancer is influenced by the Environment**

So to what level is the environment involved in cancer development? Author and researcher John Cairns said:

“Almost all cancers appear to be caused by exposure to factors in the environment. The most promising approach to the control of the disease is to identify those factors and eliminate them...”\(^3\)

Clearly, as Cairns suggests, the extent is comparatively deep, as the future of the control for this disease is looking to environmental factors. In effect, although most types of cancer have some genetic and epigenetic basis, it is highly dependent on the environment, which, as we can easily

\(^2\) Manel Esteller, *Epigenetics in Biology and Medicine* (New York, NY: CRC Press, 2008), pages 261-266. These introductory section of the book interestingly outlines the field of epigenetics as a study of the interactions between environment and genes in genetic expression, specifically making the implication that epigenesis may not be a separate, third factor; rather it would be a connection between the two known factors for cancer incidence: the genetic susceptibility and mutational trigger, and the known, causative environmental factors.

deduce, is dependent on the nature of society. Social changes often change disease susceptibility, and cancer is not the only example of that. Historical study not only provides us with a study of society but also with a special interest in the changes experienced by that society over a period of time. Cultural change often results in social change, which may include those environmental factors, found associated with a kind of cancer. The question of our interest would, therefore, be: does history agree with scientific and epidemiological study? Can we effectively say that cultural change has corresponded to cancer change? Or, perhaps better-worded, is the association apparent in retrospect? It is the answer to this very question that this paper will explore, incorporating both scientific and historical references for analysis.

**ANALYSIS TECHNIQUES OF THIS PAPER**

*Choice of Japan*

The answer to this question will be explored by a thorough a detailed study of 20th century Japan. Japanese history from 1868 to the present day arguably reflects more outstanding change within a short period of time than anywhere else in the world, making it an optimal choice for studying the correspondence between cancer rate fluctuation and changes in society.\(^4,5\)

Starting out as with a somewhat-feudalistic social order in the earlier nineteenth century, Japan becomes a full-fledged, modernizing nation state under the Meiji regime by the century’s end.

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\(^4\) Ann Waswo, *Modern Japanese Society: 1868-1994*, (Oxford, Oxford University Press, 1996), p 1-5. It is worth mentioning that this historian, in her introductory chapters, exclaims that in, in the early 1870s, Japan was equivalent to ‘what we might now term a third world or developing country’, and, in later pages, describes the present-day Japan as an ‘economic giant’ with a trading position of the ‘first world type’. By saying this, she is implying both the lack of modernizing and westernizing agency among the majority of the influential Japanese individuals still lingering at the end of the Tokugawa era as well as illustrating the almost unparalleled degree of change experienced by these people within the following century and a half.

\(^5\) Patrick Smith, *Japan: A Reinterpretation*. (New York: Pantheon, 1997); In his recent compilation of this book, Smith takes a non-traditional view on Japanese history throughout the 20th century, exclaiming that many traditional accounts of the developments in Japan are insufficient or skewed by personal agenda. Nonetheless, the purpose of citing this source in this portion of the paper is to portray the sense of consensus among historians of diverse opinions that Japan experiences cataclysmic degrees of change in the last century.
The twentieth century only adds more variables to the evolving society, with three national wars, two world wars, the Cold War, rapid economic rise and collapse, industrialization in new faculties, and American occupation during the middle of the century, all in a globalizing world stage. The bottom line is that we choose Japan because we are interested in the relationship between cancer incidence and social change, and Japan certainly undergoes plenty of those within the century that we are studying.

We also choose Japan because we have data. University research centers, such as the one in Tohoku, have compiled and organized cancer incidence and mortality statistics starting as far back as 1899. Cancer specialists, including molecular biologists, geneticists and epidemiologists, have also done extensive studies on cancer specific to the Japanese (along with others) as they have a characteristic trend in stomach cancer, which may help us understand it. More generally, these research results have been published in a number of journals, accessible to the common public in Japanese and English. Finally, most importantly, there are the extensive records of the rich Japanese history. These are especially available due to the recentness of our time period of interest. With this fortunate circumstance, several secondary and primary sources will be cited throughout this paper to provide historical context for our object of study. Having abundant information from varying disciplines will not only add more angles to our analysis, but it will also add accuracy to our conclusions.

*Methods of Analysis*

This thesis is organized by study of the social factors that scientific studies have found to be associated with cancer risk: certain variations of food, socioeconomic status, and industrialization and war. The impact and evolution of each of these cancer-related social factors will be heavily discussed in each chapter, and then the expected effects will be juxtaposed to the
observed cancer rate to call for accuracy. Every chapter will incorporate the historical and scientific value of these factors, using primary and secondary sources in both fields. The point would be to see whether or not there is a relationship between the claims made by the scientific studies and the events in the changing, dynamic Japanese society. If there is a visible relationship, we can at least suggest that current scientific conclusions are consistent with historical record gaining a new angle of accuracy. If their conclusions do not align completely with historical change, it does not necessarily prove that the studies are inaccurate; rather, it shows that there may be limited awareness on both ends: to the knowledge of present-day research and to the end of my own awareness of Japanese history. There may be factors beyond our current knowledge. Finally, as noted before, the study given only observes the changing environmental factors; if the genetic and epigenetic factors (also proven to affect risks of cancerogenesis) were better known and applied to the situation, any gaps in analysis might be better explained. I ask the reader to please bear these factors in mind.

Furthermore, due to limitations in time and resources, only one type of cancer will be explored in this paper—stomach cancer. Nonetheless, there is overwhelming evidence that suggests most cancers have an environmental basis. Narrowing, however, was necessary to provide a thorough, well-understood analysis within the page limits. The focus on stomach cancer specifically is very realistic—it plays a major role in Japanese society. Stomach cancer has soaring rates of incidence in Japan, even today. It currently over-doubles rates found in neighboring China and Korea, and it surpasses most other national rates by even more than that. However, there have been significant fluctuations and changes in rate of its occurrence since the

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beginning of the twentieth century. The basic pattern of stomach cancer incidence outlined throughout the course of the 20\textsuperscript{th} century, a key interest for this paper, is a slow-but-steady increase in its incidence until about the 1950s and 1960s (depending on the age group being studied), during which it generally plateaus and then begins to steadily drop in most (though not all) age groups. A few graphs have been provided to give the reader a more comprehensive understanding. This presents raw data that will be interpreted and reinterpreted by historical analysis—with the aid of scientific knowledge—by this paper.\textsuperscript{78}

[SEE APPENDIX]

\textit{Acknowledged Limits of this Paper}

As a final note before delving into the historical portion and the analysis, I would like to acknowledge the limits and unconventional nature of this thesis topic. I am putting forth this analysis with a lot of reluctance due to fears that I am breaching rules of the disciplines that I actually want to bridge. I want to make my reader aware of this from the start. Additionally, throughout the development of this thesis paper, advisors contributing to this project had raised a few major issues; I would like to take this opportunity to address these issues and make the reader conscious of them.

Again and again, I have been told by concerned advisors from the genetics department, the second of the two disciplines affiliated with my study that ‘two things can happen at the same time and not be related.’ I realize that this paper is roaming unusual terrain by suggesting a relationship between changing social factors and carcinogenesis, and applying an analysis technique that cannot fully verify this relationship. It is true that we will never know the real

\textsuperscript{7} See Mitsuo Segi, \textit{Cancer Mortality in Japan: 1899-1962} (Sendai, Japan: NIH: August 1965) for full information on the cancer statistics until the 1960s

\textsuperscript{8} See Suketami Tominaga, \textit{Cancer Mortality and Morbidity Statistics} (Tokyo Japan, Japan Scientific Societies Press, 1999) for cancer statistics from the 1960s to the present
triggering cause for each of the cases occurring throughout the 20th century. There may even be factors affecting it which researchers are not aware of and which I, therefore, will not have incorporated into this study. However, the fact is that, by these terms, this paper remains predominantly within the reigns of historical analysis rather than scientific analysis, as no historical study is capable of presenting facts with 100% certainty of how to interpret them (which is generally expected of scientific studies). Like me, most historians are not witnesses to what they write about or analyze, but this fact does not make their analysis incorrect or worthless. If well-argued and well-supported, it has to be appreciated for its interpretative understanding of past events. Overall, history, as a field, is only composed of a sequence of interpretations on what happened before today. This piece seizes this advantageous quality of historical analysis to merely suggest a well-supported, well-researched and well-argued idea, which would otherwise have a reduced value in the scientific community.

The minimal utility of historical primary sources in the backbone of my thesis was certainly a source of reticence and ambivalence. In fact the primary source that comprises the backbone of this thesis is almost purely statistical, since it is a compilation of recorded cancer incidence rates, organized on a twentieth century timeline. But disciplinary departments are a convention; the fact that my timeline on cancer rates falls into the statistics department does not devoid it of any historical value; rather, I believe that this is one of those instances in which knowledge is overlapping. What I am presenting still qualifies as a primary source, at least to some extent, because it is a firsthand record of the past cancer rates, unaltered and un-interpreted by those who compiled the information. Interpretation, therefore, for its historical significance is still open to people’s ideas, just as with any conventional historical primary source (i.e. memoirs, record documents, or any other media form).
I would also like to mention the uniqueness of evidences provided by history, a fact that inspired me to continue writing this thesis, despite the hesitance I was initially feeling. In my secondary source background reading of Japanese history, I used a book by Andrew Gordon, entitled *A History of Modern Japan*. In this book, Gordon describes the early working conditions for women, especially in textile mills, mentioning that their superiors may have abused many of the women at their work. The evidence for this was not statistical and, therefore, not concrete, with no solid reports confirming the issue; rather, it was based on the songs that these women wrote, subtly describing the harassment that they were undergoing. Though it is not legitimately verifiable and would not be, therefore, valued by scientific research, it holds value in the historical community; this disparity implies to me that there is still some unique contribution which can be made to our understanding of this disease, especially when it comes to environmental factors. Though it cannot be confirmed objectively the way that scientific study is required to, it is a source of new evidence to be analyzed, and a new way to make simple suggestions about cancer.

Nonetheless, despite my faith in this thesis topic, I will make it clear that I am not expecting to find a cure through this sort of analysis, and, if my alignment to past events with cancer rates is inconclusive, I am open to all results. I have tried extensively to find other historians interested in cancer study, but none have provided effective and relevant information, which would set precedent for what I want to do with this.

**OUTLINE OF 20TH CENTURY JAPAN**

It is important for the reader to first become well-acquainted with the basic history of all 20th century Japan. The purpose of this is to get a vivid, moving-picture-type understanding of the evolving Japanese society throughout the time period we are studying. More specifically, it is
of key importance for the reader to attempt getting a feel for the phase changes in this century, as will be generally outlined. Each evolving variant of Japanese society, as we will see, is rooted in the general attitude of a few powerful leading administrations or popular culture, and is influential to the changes on carcinogenic factors. Later, as we begin analysis of carcinogens and exposure to them, I will take a related time block from this general understanding, which coincides with the time period we are then discussing and elaborate further to study relationships. In some sense, this historical backdrop is a primer to be built upon in later chapters of this thesis.

Our general background begins in 1868, with the Meiji restoration in Japan. Following a few years of conflict, the Meiji emperor returned to the throne, ending the 270-year-long Tokugawa period in Japan. This was the first major phase-shift in Japan that interests us, as it was a turning point for the general attitude, which would bring major social consequences to this society. Japan went from being a feudal and bureaucratically governed group of scattered lands run by Japanese overlords, daimyo and samurai, to a more unified, centralized state. Coined a ‘revolution from above’, the Meiji state leaders steadily began to consolidate Japan as a unified entity. The new Meiji state, unlike the bureaucratic format before, was interested in an open modernizing and westernizing initiative and realized that this would require steadfast centralization and the implementation of several new policies. Indeed, the government did exactly that—consolidating all samurai power and other local leaders at Tokyo and pushing for mass conscription in the military. Education, at least to the elementary level, was made

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9 Peter Duus, *The Rise of Modern Japan*, (Boston: Houghton Milltown Company, 1976), 71-75. For more information on the nature of this unified effort, see Chapter 5 of the book by historian Duus, in which describes the revolution as a unified effort being made by the winning aristocratic leaders. He exclaims that, in a sense, this revolution came with intentions by the new ruling party to reshape and rebuild Japan as a nation-state, and his choice to describe the revolution as ‘from above’ reflects a new, strong centralizing source for change.
mandatory for all Japanese residents. Taxes were increased to strengthen the treasury and begin industrialization, particularly in the fields of textile, coal and metal mining.\textsuperscript{10}

It is important to mention, however, that the Tokugawa regime, which preceded the Meiji Restoration, despite its anti-western sentiments, did generate some pro-modernizing progress. For one, the change from feudalistic society in the earlier Tokugawa to the more bureaucratic government structure was an early initiative to facilitate later centralization. There was also the increase in general literacy rates, mostly due to the large class of 2 million samurai seeking to be literate.\textsuperscript{11} These two changes were based on the progressive interest of these overlords to better culture themselves; hence, the public images of samurai and daimyo were not at all similar towards the end of the Tokugawa regime as those of the beginning. Moreover, medicinal scholarship was one of the most quickly advancing fields in Japan.\textsuperscript{12}

Returning to the Meiji State developments, however, we see that there was an intended, pro-western drive that distinguished the Meiji objectives from the Tokugawa period. The Meiji state worked domestically to create national identity through a number of nation-building projects. These were similar to the nation-state projects implemented by European countries during the 18\textsuperscript{th} century. More specifically, it did this through the strategic building of three

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\textsuperscript{10} Andrew Gordon, \textit{A Modern History of Japan: From Tokugawa Times to the Present}, (Oxford, Oxford University Press, 2003). For a detailed discussion on drastic change of pro-modernizing, 20\textsuperscript{th} Century Japan, refer to Chapter 3 in this book, in which Historian Gordon explains to detail the degree of change that the incoming of the Meiji regime constituted. As an expert in modern Japanese history, this scholar believes that Japan experienced dramatic changes from the previous era—an idea on which the validity of this thesis topic relies.

\textsuperscript{11} See Waswo, 22, where Waswo briefly discusses the warrior education during the Tokugawa period, which was designed to ‘imbue warriors with a civil-service ethic’ implying their sophistication and drive to be civilized and, arguably, progressive, rather than backwards and primitive.

\textsuperscript{12} James McClain, \textit{Japan: A Modern History}, (New York, W.W. Norton and Company, Ltd, 2002) 102-105, this scholar, in slight contrast to historian Andrew Gordon, emphasizes some of the progressive angles that the Tokugawa had, for which it is often overlooked. For a detailed
The home ministry took on the new slogan ‘Increasing Production and Promoting Industry’, which actually intended to encourage the growth through the private sector, as in the west, rather than through government involvement. Mass conscription was utilized for the building of national identity, the protection of the nation-state and the ultimate goals for imperial expansion. Moreover, to preserve this strong sense of national identity, older, property-bearing institutions also had to be removed; an example of this would be the resorption of all lands from the daimyo, with the daimyo being converted into local governors. By these initiatives, the government hoped to establish a strong sense of patriotism among the Japanese people, as this was necessary for the state could expect to effectively westernize and expand territorially. People had to be motivated for change. Both nation-building and national expansion resulted in increased public awareness and involvement.

In addition to a revolutionary domestic agenda, the Meiji State also distinguished itself by a new take on foreign policy. Though it initially did not want to become an aggressor through imperial expansion (which it feared might hinder the domestic development of the nation-state), the Meiji government ultimately decided to support these efforts, desiring to catch up to the developed Western powers. In the international arena, Japan achieved world power status with notable victories in two wars: Sino-Japanese (1894-1895), Russo-Japanese (1904-1905); these eventually led to the annexation of Korea (1910-1945). Imperial expansion put Japan in a new place on the world stage. In many ways, the Japanese victory in the Sino-Japanese war portrayed

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13 See Gordon, 62-70, where author Gordon discusses the importance of these three nation-building programs in creating a centralized, authoritative government.

14 See Duus, 85

15 Ibid., 76-80, where Duus mentions that the abolition of daimyo domains was a ‘radical’ move, central to the Meiji Restoration, as it impacted the most people, and eased the restructuring of power and land to facilitate a new administrative authority.
Japan’s ability to defeat its larger and reputedly stronger neighbor, China, giving the nation the initial recognition that it needed. Involvement in subsequent wars had a similar effect.

The root of the domestic and foreign policy changes instilled by the Meiji state was in the Meiji Constitution, which was officially adopted in the year 1890 making Japan the first Asian nation to adopt a constitution. Though the Meiji Restoration seemingly restored the Meiji Emperor to the throne, his own constitutional authority was kept minimal; the emperor did have at least indirect influence over the army, navy, and the executive and legislative branches. Additionally, he shared power with a bicameral diet. The idea was to adopt a system of checks and balances so that no governmental sector could foster full authority—an idea that was adopted specifically because of its successful reception in the west. In many ways, the document mirrored was influenced by Prussians, for its simultaneous bureaucratic and monarchical nature. The Meiji government effectively incorporated these changes into Japanese society until 1912, when the Meiji emperor died and the era of the ruling clique of elder statesmen shortly ended. Though the Meiji State had ended, however, the direction in which Japan was headed had shifted permanently.

More liberal attitudes prevailed under the Taisho period that began after the death of the Meiji emperor. Overall, the Taisho period was remarkable for its efforts to support the average citizen. Often referred to as the Taisho Democracy, the new government consisted of a new “weaker” emperor and strengthened bureaucratic cabinet of elected officials. The format was the same as the Meiji era, since the constitution had remained the same, but the rising politicians were distinct from the ones before, believing that the role of the Diet was to serve the needs of the people. Government was evolving to be more responsive to the public, and this was obvious

16 Duus, 115
17 Gordon, 173
by the political and social changes that were to follow. Eventually, a growing leftist faction resulted in the formation of political parties, including the Japanese Communist Party in 1922. The socialist movements, in particular, expressed extra concern for the common man in terms of his political and financial entitlements. Prominent politicians, such as Yoshino Sazuko, and cabinets, such as the Kenseikai Cabinet, were especially noteworthy in doing promoting a notion of concern for the general public. More specifically, public programs, affordable insurance, labor unions, and universal manhood suffrage, though the last of those was limited only to males, were emphasized under the reign of the Taisho. Equality for women and women’s rights emerged as social issues, led by groups such as the Federation of Women’s Organizations of Western Japan. From these observations, it is important to note that there was a shift evident both in government attitude and popular attitude.

It was also during the Taisho Period that Japan became involved in the First World War, teaming with the Allied Powers, which included nations such as the United States, Russia, Australia and Britain. In August 1914, Japan entered the war by declaring war on Germany. Though they were on the winning side by the end in 1919, the Paris Peace Conference that followed created tensions between Japan and western powers, including the United States, Britain and Australia. More specifically speaking, the proposition of racial equality was made by Japanese representatives during the conference, and these three powers had flatly rejected the suggestion. The consequences were cataclysmic; Japan shifted gears entirely, losing respect for the Allied Powers. There was a ripple effect; the American and British act swayed popular opinion in Japan, and the people also lost their admiration for these countries. This tension would

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18 See McClain, 330-332
19 See Ibid., 379-383
ensue into the Second World War, during which Japan sided with the Axis Powers and followed their goals of territorial expansion into Southeast Asia, eventually combating the United States directly through the Japanese attack on Pearl Harbor.

The late 1920s and the 1930s both fall under the Showa Period in Japan, which began with the enthronement and coronation of the Showa emperor in 1926 (1928) and ended with his death in 1989. It was during this period that Japan became more actively militaristic, reformatting the Japanese infrastructure to minimize political and ideological diversities and promote ‘ultra-nationalism’ under the new cabinet after 1932; most of the left-winged, socialist movements of the earlier parts of the decade were discouraged by the rising right-wing generals and military officials. Japan became a militaristic state in the late 1920s and 1930s. This militarism and ultra-nationalism was expressed through the second Japanese occupation of Manchuria (1931), invasion of China (1937), the advancement into other countries of the Far East (1940) and the eventual attack on the United States at Pearl Harbor (1941). In essence, Japan seemed to redirect its focus from the domestic sphere to foreign policy matters, restructuring domestic policy only to serve the efforts to expand territorially.

The escalated tension in the Pacific ultimately resulted in the Japanese attack on the United States at Pearl Harbor in December 1941. A so-called Pacific War began in Southeast Asia, across the Atlantic. Though Japanese forces were initially successful in conquering and establishing puppet governments in the Far East countries, they began to lose steadily when the Allied forces led an effective opposing initiative and gradually reconquered these areas. Eventually, the United States invaded the Japanese homeland, leading to the climatic atomic bombing of Hiroshima and Nagasaki in the summer of 1945. The war was catastrophic for Japan, both politically and socially. The emperor was forced to surrender after the dropping of the
atomic bombs, leading to the U.S. occupation for the next seven years. The country was in shambles—mass orphanage, mass illness, mass poverty and starvation encompassed the population. Some hoped that occupation would effectively serve the purpose of repairing all collapsed faculties of the society.

In many ways, the occupation did end up helping Japan. Under the supervision of General Douglass MacArthur, a new constitution was enacted in 1947, which drained all political power from the emperor and reoriented Japan toward democratization. For the most part, the country was also stripped of defense forces, though this changed after the increase of Cold War tensions. There was a regeneration of emphasis on human rights, despite the forceful methods of the so-called democratic American campaign. Universal suffrage, for instance, was introduced to the Japanese population and equality was promoted. Industry was damaged by the effective dissolution of the established zaibatsu, which were analogous to near-monopolizing industrial companies of the United States, but this was done in an effort to encourage Japanese equality. Moreover, occupational forces were able to revive the depleted natural resources and the food production which had brought the collapsed country on a standstill.

Though it remains controversial, many historians claim that there were many significantly negative side effects to the U.S. occupation. Some historians speculate that, though the occupation provided for fruitful changes, the country evolved to foster a culture of surrender.20 Brothels employing thousands of women were set up to service the US occupation army and they arguably served to derogate the masculinity of Japanese men.21 Children,

20 John W. Dower, *Embracing Defeat: Japan in the Wake of World War II* (W. W. Norton & Company, 2000). For a more complete analysis of the consequences of occupation, refer to this book, which describes the evolution of the Japanese postwar culture as the demoralized *katsutori* culture, resulting from, as he coins it, the *kyodatsu* condition of exhaustion and despair. The outcome of a demoralized people, according to Dower, was the full-fledged embrace of American culture, as seen with the Japanese, who began to accelerate in the direction of Westernization.

especially those living in the aftermath of the atomic bomb attacks, were not only left homeless and uneducated, but they adjusted to demoralized street life. For instance, many of them developed cigarette addictions as early as the age of seven, and participated in pimp-prostitute games in place of the western childhood game of ‘house’. The point of this mention is to illustrate the level of humility that the country was pushed to—generations deep—which would have a strong impact on the national identity. The children would have a lasting impression, resulting in a lasting change of direction for Japan. The rising generations would have a drastically different outlook on matters in comparison to their predecessors, who also had been children of change. By American forces occupying it, Japan only accelerated in its fast-paced evolution. In many ways, the post-war Japanese population faced severe demoralization.

Nevertheless, after occupation, Japan excelled in the world stage. The American Occupation ended in September 1951, and the new Japanese government, still within the Showa period, remodeled itself by adopting aforementioned democratic policies, and, to this end, it succeeded. In terms of economy, the national income and GNP skyrocketed, surpassing that of even the United Kingdom. With some advancement coming from the war and some coming from American influences, the Japanese industrial sector experienced technological progress that had been unparalleled in all of its contemporary Asian countries. The economic successes, alongside social and cultural transformation, led Japan into a modernized, arguably Americanized, lifestyle that remains even today.

In summary, the twentieth century was a period of tumultuous revolution for Japan; it became a pioneer Asian country in its extreme advancement from an underdeveloped nation at the start of the century to a modernized and progressive nation by the century’s end.
CHAPTER 2: FOOD

As mentioned in the previous chapter, there is a very clear pattern in 20th century cancer incidence. A consistent increase in stomach cancer rates is followed by a plateau in the 1960s and then a plummeting rate for all age groups under 75 years of age. There is a lot of significance in knowing these details, because each age group is in a completely different stage of life in the rapidly evolving Japanese society.

A reasonable means of evaluating twentieth century stomach cancer trends is by studying the simultaneous trends in the Japanese diet. This choice is understandable because diet has shown a consistent relationship to stomach cancer incidence—several scientific studies have noted that irregular consumption of specific vitamins, salts, or different components of the five food groups show clear relationships to stomach cancer incidence. Few of them, however, study food or diet evolution from an historical context. This chapter observes the effects of governmental, societal, and environmental changes on dietary patterns, with emphasis on dietary components known to provide an escalated environmental risk. After addressing dietary trends, scientific studies will be presented to examine the claims of scientists or epidemiologists on a given dietary component. Though we start with knowing the cancer rates, we begin our analysis by observing these governmental, societal and environmental variants of Japanese society and then seeing the degree that they parallel with the scientific studies on cancer.

22 Omer Gersten, “The Cancer Transition in Japan since 1951,” Demographic Research, 7 no. 5 (August 2002), 271-306; this resource provides an interesting interpretation to the reducing stomach cancer rates, saying that there was also a simultaneous increase in the occurrence of so-called self-induced cancers (i.e. cancers linked to “risky” behaviors, such as smoking and drinking). This provides an interesting agreement to the concept of social changes at the societal level being linked to cancer rates at the national level, as individual habits and evolving social norms seem to reflect a macroscopic impact.

23 Shoichiro Tsugane “Diet and the Risk of Gastric Cancer: Review of Epidemiological Evidence,” Gastric Cancer, 10 (2007), 75-83; this review article goes through the major dietary components that have been deemed by epidemiologists as increasing or decreasing risk factors, particularly with respect to Japanese cancer rates.
PREMODERN JAPAN

Early Japanese Food Culture

Before incorporating Western influences, Japan’s culture—specifically food culture—was rooted in the influences of the neighboring Chinese and Korean cultures, and Japan’s geographical location by the Pacific. The traditional diet was largely vegetarian with some consumption of fish. Religious influences also had an affect on diet, encouraging a vegetarian regimen. Japanese food expert, Michael Ashkenazi, states that three main ingredients constituted the Japanese diet: rice, miso (soybean paste) and fish stock. Key things to note would be the lack of dairy and meat consumption in the Japanese diet; red meat and poultry were social taboo indicative of barbarism and milk was generally consumed for medicinal purposes. Dairy consumption was generally not preferred for pleasure and meat consumption was regarded as disrespectful and cruel to the animals killed. These attitudes had not shifted throughout history, and Japan entered the 19th century with a population largely devoid of these dietary components.

Rice consumption in the Japanese islands dates as far back as 5,000 BCE in Japan, well before the millennium of our interest. Clear records of its mass consumption are found in the 3rd century BCE, and this intake only continued to increase until the 20th century. Of the three types of rice produced in Asia—japonica, indica, and javonica—the kind popular in Japan was overwhelmingly japonica. Which is ideally suited to the Japanese environment; Japan has heavy rainfall, including an annual monsoon period, and, as a result, its landscape consists of sizably large, natural (though infertile) wetlands, ideal for rice harvest, which requires lots of water. By

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the arrival of the 20\textsuperscript{th} century, rice consumption was high and well-spread; the average Japanese individual consumed at least some quantity of cooked \textit{japonica} rice daily.

Early on, salt became a heavy component of the Japanese diet. Easy access to sea salt made salt-fermenting a preferred form of food preparation. Both fish and vegetable dishes and side dishes were prepared with this technique. Indeed, Japanese people consume heavy quantities of salt. In terms of seafood and meats, a food called \textit{Shiokara} or fish paste was a popular side dish at the time of the Meiji Restoration. This item required pickling fish shellfish, squid (or rarely meat) in a salty solution, with salt content 25-30\% its volume. This produced a very salty fish paste, often eaten as a side dish. Another popular fish-salt dish was fish sauce, similar to fish paste in preparation but consisting of leaving fish and salt unopened for a longer time\textsuperscript{26} 36. Most of these dishes were consumed predominantly in rice-cultivation “paddy farms”\textsuperscript{27} due to the convenience of simultaneous “hydrophilic” rice harvest and fish habitat. Consumption of fish paste/shiokara dates as far back as the late seventh century, and is usually produced with marine fish.

In addition to salt-fermented meats and fish, the Japanese diet also consisted of salt-fermented vegetables. Two well-known products of this process, widespread in Japanese and East Asian food culture, are miso and soy sauce. Starting in the \textit{mid-eighteenth century}, Japanese culture began to heavily incorporate soybean derivatives, including well-known items like tofu, miso and soy sauce, into every major meal. Miso is made by mixing salt and fermentation starter, which is an infecting mold known as \textit{Aspergillus oryzae}, to soybean for a period of 48 hours\textsuperscript{28} It’s most popular use is in pickling foods, as it generally takes a paste form.

\textsuperscript{26} Ishige, 36.
\textsuperscript{27} \textit{Ibid.}, 38
\textsuperscript{28} Ashkenazi, 32-33
Soy sauce became a central part of Japanese dining a short while after miso, but it served a very similar purpose. Many argue that it has taken over the role of miso in the seasoning and pickling of Japanese foods. The ingredients and preparation techniques are very similar, utilizing the fermentation of soy beans with salt, and roasted grain.

In addition to the consumption of soybeans, there were many other vegetables common to the Japanese population. Having a predominantly vegetarian diet, vegetable intake was fairly high in Japan, resided by an overwhelmingly vegetarian population. It is important to remember, however, that not all vegetable consumption is the same. Many of the fermented vegetables included the traditional Japanese kind: radishes, tubers, gourds, leeks, wild greens, bamboo shoots and mushrooms. The population was largely devoid of certain Western-style vegetables, including cabbage, carrots, onions, tomatoes, beet root, celery, asparagus, cauliflower, string beans, green peas, and parsley. Intake of these types of vegetables only grew after western settlement in the area.

Carcinogenic Value of Pre-Modern Food Culture

Having considered the major elements of the Japanese diet up to the time of the Meiji Restoration—namely rice, salt, salt-fermented meat and vegetables (i.e. soybean derivatives)—the carcinogenic nature of these foods can now be assessed using the epidemiological literature available. Before doing so, however, I would like to point out the connectedness between cancer rates and the observed dietary patterns cannot be determinately assessed because we do not have records showing reported cancer cases from the period of 1868, the year of Meiji Restoration, until 1899. Hence this portion of the scientific-to-historical comparative study will serve purely

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29 Ashkenazi, 40-41
30 Cwiertka, 56
the purpose of speculation; it will also give the reader an ability to apply the knowledge of its carcinogenic nature later in this paper, when we discuss dietary regimens in later time period for which we do have the reported cancer cases. Since these dietary components continue to be central to the Japanese diet throughout most of the twentieth century, it is important to bear in mind the carcinogenic character of these foods. As will be seen, later changes in the diet only add new, western foods to the traditional Japanese foods, instead of completely replacing them.

Furthermore, for every such comparative analysis, the comparison will use as few epidemiological sources based on Japanese studies as possible. This is to avoid circular or coincidental reasoning; if, for instance, an epidemiological study observes a subset of the diet of the Japanese population and concludes that salt appears to be one such risk factor, it may only be coincidental, because the Japanese people just traditionally have an unusually high consumption of salt. It may or may not actually play a role in the cancer occurrence. However, if salt is truly an environmental risk factor playing a role in carcinogenesis, there should be an unusually escalated salt intake in most (if not all) populations with high stomach cancer rates. It is only with this inter-population consistency that we can eliminate any coincidental reasoning for the strong association.

The first study that we will incorporate, by De Stefani et. al, is an epidemiological study, involving a population being observed in Uruguay. This was a case-control study, with 240 stomach cancer cases being compared with 960 normal individuals, or controls. The population being studied was approached from three angles: for the individual food group analysis, for the

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factor analysis and for the analysis of empirical scores of risk. Dietary patterns were compared between stomach cancer patients and healthy, normal individuals from the entire group. The main conclusions that concern us are the carcinogenic effects of salt, rice, green tea, soybean and its derivatives, and fish. According to this study, the carcinogenic effects of increased rice, salt and tubers intake are illustrative of positive association between consumption and incidence of the stomach cancer. In other words—the more that these foods are consumed, the more likely an individual will be at risk for getting stomach cancer. On the other hand raw vegetables, total fruits, and legumes were inversely associated with the risk of stomach cancer, implying that increased consumption of these foods reduces the risk.

A similar study was conducted in Thailand by researchers Krittika Suwanrungruang et. al. This study also used case-controls, with 101 stomach cancer cases being compared with 202 controls. As in the previous study, dietary patterns were compared between cases and controls, and the conclusions were similar to those of the previous study. The conclusions of comparing Thai stomach cancer patients to normal individuals show that high consumption of salt, especially sea salt, and salt-fermented foods show an increased risk stomach cancer incidence.

It is important to note that neither Thailand nor Uruguay (from the previous population) has stomach cancer as the most commonly occurring cancer. This most likely reduces the influence of inherent, genetic factors which may be contributing to the carcinogenesis, since these dietary patterns are evident in individuals of all types of genetic/ethnic backgrounds. Hence, despite the genetic variation, we can suspect, based off of these studies, that Japan

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32 De Stefani, 211, this means that the study looked for food groups that could be related, sought other factors that could be related and implemented an empirical scoring system which would help them analyze collected data.

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probably had a high stomach cancer rate to begin with, if compared with the rest of the world at that time. This is particularly due to their unusually high intake of what we now know as dietary risk factors for stomach cancer, including sea salt, salt-fermented foods, miso, soy sauce, tubers and perhaps even rice (though this last one is not universally accepted). Again, we have this suspicion without evidentiary support, however, because we do not have access to stomach cancer incidence records dating back prior to 1899. If correct, however, we can perhaps speculate that the dietary patterns prior to westernization could have already been contributing to unusually high stomach cancer rates.

MODERNIZATION AND DIET

*Meiji Japan & the Strategic Promotion of Meats*

The 1868 switch to the Meiji Regime brought with it, as mentioned before, the intense drive to westernize, which was the first shift in attitude to affect our study. The Meiji Regime was unique in that it sought to westernize Japan at every level—from the mass governmental level all the way down to the individual level. The agenda of the new emperor was, therefore, permeating; it understood the deep need for Japan to develop a renewed concept of the Japanese identity. With this came several of the aforementioned programs, and the drive to a new direction, overall; government-enforced programs were found in the education sector, expansion and strengthening of the army and public works. There was also, however, the effect on diet.

Diet was directed under the same ideal that, if westernization was needed for success, the Japanese diet would also need to be westernized. Hence, meat and dairy products, heretofore not consumed widely due to belief in it being a barbaric practice, were reintroduced into the Japanese lifestyle. The government realized that it needed an influential campaign to do this, and it, among many other things, decided to set the emperor as an example. In 1873, the Meiji
Emperor began projecting himself as a consistent meat eater, and the act gradually became considered the mark of a civilized person\textsuperscript{34}. Here began the evolution of the meat-eating status: from an act performed by barbarians to lifestyle of the elite. It was a strategic means to encourage people to eat these foods, as there was an obvious and growing shift in the general attitude; diagrammatically speaking, a shift in popular attitude meant a shift in the direction the country was going.

There was a rippling effect after the emperor projected himself as a meat eater. With the gradual acceptance of this practice by members of the elite came the establishment of an entirely new lifestyle, coexisting with a more traditional Japanese lifestyle. As historian and Japanese cuisine expert Katarzyna Cwiertka notes, the introduction of Western cuisine to Japanese elite lifestyle was by the policies of \textit{bunmei kaika}, which divided their lifestyle into a western sphere and a Japanese sphere. Bunmei Kaika introduced the higher Japanese elite to western etiquette, dress, and foods so that they may literally try walking in Western shoes.\textsuperscript{35} Though the adjustment to western diet and lifestyle in Japan was steady, it was not rampant, and was accessible to the affluent or to government officials\textsuperscript{36}. The shift not only legitimimized western culture in Japan, it also made it a lifestyle to strive for (for many, not all). Below is a sample menu at the one of these upscale restaurants\textsuperscript{37}:

\textsuperscript{34} Ishige, 142
\textsuperscript{35} Tomoko Aoyama, “The Divided Appetite: Eating in the Literature of the 1920s” \textit{Being Modern in Japan: Culture and Society form the 1910s to the 1930s} (Honolulu, HI; University of Hawai’i Press: 2000) p 156 discusses the fact that dietary habit was a source of class distinction; Aoyama notes that this idea was prominent in literature available to the upper classes of the time.
\textsuperscript{36} Cwiertka, 20-22
\textsuperscript{37} Maenobu, \textit{Meiji seiyo ryori kigen}, p. 85 (Extracted from Cwiertka)
An additional method that the government utilized for the encouragement of Western meat-eating habits was by the creation of the Gyuba Kaisha, the Cattle and Horse Company in 1869. Mandated by the Ministry of Finance, this company was established to absorb all cattle from the previous Tokugawa cans and freely slaughter them for meat. Interestingly, this served two purposes: the first being the symbolic purpose of removing all remnants of the Tokugawa regime (reflecting effective takeover), and the second being the pro-western adjustment to a meat-diet lifestyle, demonstrating government support for the practice. The main idea was to cut ties with all anti-western, anti-modern notions of the past and charge with full force in the direction of progress.

The most successful attempt by which Meiji bureaucrats introduced beef into the mainstream Japanese diet was through beef stew, which rapidly rose to popularity.\(^{38}\) Beef was

\(^{38}\) Ishige, 148-151
the most strongly endorsed meat by the government, reflecting both a stark contrast to the attitudes of pre-modern Japan and a new directive to consciously modernize. Some Meiji officials even encouraged beef consumption as a source of ‘moral and intellectual capacity.'

Beef stew was a cheap alternative by which the early Meiji made the attempt to stimulate mass consumption of beef, specifically catering to mass accessibility. It was generally prepared with miso and soy sauce, a point that will be readdressed later, and was readily available by city restaurants. The elevated image that beef had recently received made popular attitudes shift, with a change from reserving it for the aforementioned medicinal purpose to the idea of it being a normal and acceptable form of food.

Generally speaking, animal meat was gaining more acceptance as a food into the Japanese lifestyle, which was radical for a civilization that has been largely vegetarian in preceding generations. Besides beef, horse meat was slowly coming into the household as a cheaper alternative to beef. Chicken and pork also became accepted. By the years 1934-1948, the average meat consumption per individual had grown to 6.3 grams, including 2.2 grams of beef and 1.9 grams of pork. These numbers show that meat eating steadily infiltrated the population at large.

**Extent of Meat Intake**

Since it was gradually impacting the population at a large scale, meat-eating is an important variable that must be further studied for relationship to stomach cancer. Before

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40 Alastair B. Ross, et. Al. “Lifestyle, Genetics and Disease in Sami”, *Croatian Medical Journal*, Vol. 47 (2006), 559; In this article, Ross, et. Al interestingly conclude that the higher susceptibility to stomach cancer could be related to the high intake of smoked reindeer meat and low intake of foods containing fiber, which are both evident in Japanese society, as most of the staple meals contain little fiber and the substituted horse meat consumption may be similar to reindeer meat consumption.
41 Miyazaki 1987 72-73
evaluating this relationship, however, there are some important factors to consider. First of all, not all of the population was equally affected. Though the government intended to expand industrially and form modern cities, its real influence was limited to the higher class, as the Westernized lifestyle was reserved for members of the elite. For the mass population, this lifestyle was something to dream about, as there was minimal social mobility during the years of the Meiji. Moreover, not only was the western diet not affordable by the lower classes, it was also not familiar in most domestic spheres. Meats and dairies were far from being prepared at the home on a daily basis, and were, therefore, only consumed on occasion by the upper classes of society.

Furthermore, reception of meat was not completely positive or completely negative. It would more accurately be described as a mixture of these two. For centuries, meat-eating had been shunned as a taboo by Japanese society and was, therefore, not a common practice. This attitude shift would not permeate the population overnight. Residents and contributors of rural areas in agricultural Japan were still unreceptive to the idea of killing their respected cattle for meat. In the earlier portion of the Meiji regime, individuals still experienced reluctance to sell their cattle to the growing Dutch population if they learned it was to be slaughtered for beef. Eventually, after being rejected by all local farmers, the Dutch residents had to have the meats shipped to them by distant farmers in the Kansai district. From this, it is clear that a good deal of the Japanese population still adhered to traditional values; however, the major difference was that the most influential members of society—namely, the elite—were embracing the western practice of meat eating. In later years, when social mobility would increase, the adoption of meat

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42 See Ishige, 148, where Historian Naomi Ishige discusses that families living in rural areas in the agricultural sector would refuse to sell cattle to the new Dutch residents in Japan if they discovered that the cattle were being killed for their meat; in fact, the cow was regarded as a member of the family and dead cows were given burials by convention.
eating would be one of the many elite practices that rising middle class individuals would strive for.

As seen throughout this study of the Meiji state, the major dietary change in the late 19th and early 20th centuries was the increased consumption of meats—red meats in particular—while dairies still remained overwhelmingly unfavorable. According to most epidemiological studies, there is an effect of increased meat intake on the susceptibility to stomach cancer. One such study conducted from May 2006 to June 2008, epidemiologists at the Canadian Cancer Registries Epidemiology Research Group concluded that meat and red meat consumption were both positively associated with the risk of stomach cancer. This study was conducted with certain known conditions—a population of 19,732 Canadians who were patients suffering from stomach cancer was asked of its regular dietary habits. This data, collected over a two-year time period, was compared to a control group of 5,039 Canadians without the cancer. Key dietary differences were noted over a two-year time-span before this conclusion was assertively made. The results of this study showed that more meat intake elevated the individual’s risk of stomach cancer. Regarding our studies, a positive association observed between the occurrence of stomach cancer and the consumption of meats implies an increase the number of total cases should be observed, since the new consumers of meat in Japan are now more susceptible.

Though elevated meat intake is not verifiable as the cause for this trend, a clear rise is evident in the number of stomach cancer cases throughout the late Meiji and Taisho periods, as poultry and red meat intake steadily increased through government-run and other social stimuli. Therefore, it is reasonable to suggest that the increase in meat intake around this time period may have been one of the contributing factors to the increase of stomach cancer cases. It is important

to add that dairy consumption, which did not experience the same increased intake despite the
government’s simultaneous attempt to encourage it, is not being incorporated into this statistical
interpretation. Though the Meiji state had tried to instigate the same response throughout the
Japanese population, it was largely unsuccessful due to a general distaste for dairy products.

*Taisho Democracy & the Widespread Acceptance of Western Diet*

With the arrival and establishment of the Taisho democracy in 1912 came more of the
liberal attitudes, as mentioned earlier, which held increased value for the mass public. Here
began an era of universal suffrage and acknowledgement of individual rights. Hence, the
government made every effort to improve everyone’s lives. Some government initiatives to
suggest this have been mentioned in the introductory chapter. All in all, the view was that these
practices were progressive and would keep Japan focused on its aims to modernize.

The increasing attention given to the common man and the newfound concern for his
welfare resulted in the efforts by government to improve his life experience. In a sense, this
included making his dietary options equal to his aristocratic counterpart; the view held was that
Western foods cannot be exclusively reserved to the elite and, in support of this idea, the
government invested extensive efforts to spread the Western diets. In effect, however, one of the
many unintended side effects was the trickling down of new, carcinogenic variants in the diet,
such as red meat and, to a mild extent, dairy, to a wider array of people. Two circumstantial
points allowed for this—the spread of Western diet to different social classes and the spread of
this diet to the domestic sphere. The net effect was that during the Taisho period, a growing
number of people consumed Western style diets at home.

*Expanding to New Social Classes*
Department stores, a new phenomenon during the Taisho period, were another means by which the diet could spread to other social classes. There was a growth in the number of department stores in Japan during the 1910s and 1920s, including the Mitsukoshi Department store that opened in 1914. A side effect from the expansion of these department stores was the simultaneous expansion of affordable, in-store restaurants, serving both Western foods and Japanese foods. Department stores became frequented shopping centers for the growing middle class, and this became an excellent window of opportunity for them to grow accustomed to Western foods. The following is a picture of a typical food menu at one of these in-store restaurants, extracted from Cwiertka’s book:

44 See McClain, 281

45 See Cwiertka, page 53, where the author mentions that traditional Japanese foods, such as sushi meals, noodles and bottled liters of soy sauce had risen to prices very similar and sometimes even exceeding the prices listed in the menu sheet above
Though rates may seem very comparable to the rates shown in the up-scale menu shown in an earlier paragraph, the other menu was at a Western-style restaurant in the 1890s, and this one is being presented after 1910s, during a time of inflation. The key observation to make from this menu is the newfound accessibility to and affordability of these products in comparison to the years preceding the existence of these department stores. Note especially that the exact same pricing applied to the Japanese confectionery and Western confectionery. With more affordability came more frequent consumption and, therefore, wider acceptance of these foods into the general diet.

Independent restaurants and dining halls also opened to service Western foods to the public. Many of them, having menus similar to the one presented above, also served a new, hybrid class of food called *yoshoku*, which began as Japanese food with a Western twist. Though
existing since the middle of the Meiji era, these restaurants took flight with the Taisho period, expanding to cater to a wider range of people from different socioeconomic statuses\(^\text{46}\). The growth of these sorts of restaurants persisted throughout the rest of the decade, and eventually led to the creation of Western-style restaurant franchises owned by individual business leaders by the end of the decade. The increased interconnectedness between the growing food-industries and the restaurant owners helped to facilitate this.\(^\text{47}\) The creation and marketing of yoshoku foods became an additional means by which the Japanese could slowly grow a taste for western foods.

*Domestic Sphere*

To bring this new Western cuisine into the domestic sphere, one of the primary means was through the home cooking lessons designed for women of the middle class. In the attempt to modernize and create separate spheres (as in the West), these lessons were administered in the urban areas of Japan. Enrollment in these classes gradually increased in popularity.\(^\text{48}\) Media also reflected this agenda to make Western style cooking easy for even those who cannot afford home cooking classes. The following shows the Westernizing themes of foods marketed in home cooking magazines\(^\text{49}\):

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\(^{46}\) See McClain 345-351, where he discusses the rise of the urban middle class families during the 1910s and earlier 1920s and their new accessibility to the urban middle class lifestyle, including frequent access to department stores

\(^{47}\) See Cwiertka, 54, where Historian Cwiertka discusses the example of Chuotei, a restaurant founded by an individual named Watanabe Kamakichi. Kamakichi was a cook for a Western family in the late 1880s, and this experience gave him the exposure he needed to Western-style cooking to open a small, but posh restaurant named Chuotei in 1907. Ten years after he opened it, the restaurant was bought out by business leaders from a trading company, which ultimately made Chuotei a popular middle-class restaurant chain. This is exemplary of the growing middle class and industrialization which made many such restaurants accessible to the growing middle class.

\(^{48}\) *Ibid.*, 87-89, where Cwiertka discusses the objective of the Japanese government to encourage the Victorian ‘cult of domesticity’, in line with the mass Westernization project already in effect. The successful impact of this project eventually led to growing enrollment in these classes, especially in cities such as Tokyo.

\(^{49}\) Mizumachida Tsuruko, ‘Keizaiteki na isshukanbun no sozai ryori,’ *Shufu no tomo*, IV/7 (1920), p 74 (Extracted from Cwiertka)
A Weekly Menu (side dishes to be served with rice)  
Suggested in 1915 by the Magazine  
Fujin sushi

<table>
<thead>
<tr>
<th>Day</th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>miso soup with natto, scrambled egg</td>
<td>grilled horse mackerel, simmered lotus root Korean style</td>
<td>deep-fried pork curlet, simmered wax gourd</td>
</tr>
<tr>
<td>Tuesday</td>
<td>miso soup with clams, simmered snap beans</td>
<td>myoga and mackerel in vinegar dressing, simmered taros</td>
<td>deep-fried aubergine simmered horse mackerel</td>
</tr>
<tr>
<td>Wednesday</td>
<td>miso soup with tofu, fried egg</td>
<td>simmered mackerel, scoured rape seedlings</td>
<td>yam soup, grilled chicken</td>
</tr>
<tr>
<td>Thursday</td>
<td>miso soup with tofu lees, simmered beef with ginger</td>
<td>Korean-style beef, seaweed (wakame) and myoga in vinegar dressing</td>
<td>mackerel sashimi snap beans with sesame dressing</td>
</tr>
<tr>
<td>Friday</td>
<td>egg with nori seaweed, aubergine simmered in miso</td>
<td>pork stew</td>
<td>grilled salmon, simmered sweet potatoes</td>
</tr>
<tr>
<td>Saturday</td>
<td>soup with grilled wheat gluten yaki, and myoga ginger, simmered snap beans</td>
<td>simmered vegetables, grilled fish cake</td>
<td>miso soup with pork, vegetables and sweet potatoes, cucumber in sesame-vinegar dressing</td>
</tr>
<tr>
<td>Sunday</td>
<td>miso soup with daikon radish narezuke pickles</td>
<td>hamburger steak, deep-fried lobster, apple jelly</td>
<td>beefsteak, mashed potatoes</td>
</tr>
</tbody>
</table>
Note the emphasis on meats and “Western-style” meal preparation; note also the minimal recommendation of dairy foods, which may suggest the minimal consumption of these foods by most individuals in the growing middle class. Finally, the government-enlisted publication of cookbooks was an additional source of encouragement for eating Western-style foods. Though
the impact of this domestication is hard to judge, it is very likely that there was a parallel between what was encouraged in magazines and what was being prepared at home.  

Carcinogenic Value

It is at this point we will start addressing current scientific claims. Our statistical records start in 1899, so we are uncertain about the effects of cancer rates until then, but it is certain that the effects of dietary change from the Meiji and Taisho periods would expectedly have some form of impact starting in the early 1900s and continuing into the 1930s and 1940s, especially until the end of the Second World War. To link our understanding of these developments in Japan and the predictions of what we expect to be seeing, a scientific study will be examined at this point.

With the minimal increase in dairy consumption alongside dramatic and steady rise in meat consumption, the expected results by scientific study are to see elevated stomach cancer rates. This is based on the scientific studies, as mentioned below. Though certain studies exist which put forth the claim that there is no determinable relationship between stomach cancer incidence and increased meat consumption and/or minimal dairy consumption, there is a significant number of sources that do establish this relationship. Comparing the conclusions of these studies with the historical background reveals to us that the results are as expected; stomach cancer rates are increasing with these dietary trends. Though to pinpoint a cause-effect relationship may be pre-emptive, the truth is that there is certainly a connection between expected and observed results.

50 Cwiertka, 100

51 Ehara, ‘Katei ryoro no hatten’, pp. 97-100 (Extracted from Cwiertka)

52 The relationship between dairy and stomach cancer will be assess in detail later; at this point, it is sufficient to note that some studies have found an inverse relationship between stomach cancer and dairy intake.
There have been a number of studies observing this association by epidemiologists, there have also been studies which try to understand why, pathologically or biologically, such an association would exist. The most widely held explanation is that the interaction between nitrile and amines/amides found in meats and other proteins may form N-nitroso compounds, which are believed/suspected to be carcinogenic. This is due to the idea that these compounds induce direct damage to the inner stomach lining, upregulating new DNA synthesis and cell replication. It is “biologically plausible” for there to be a positive relationship between meat consumption and stomach cancer because processed meat often contains nitrile and N-nitroso compounds verified carcinogens.\textsuperscript{53} It may act to irritate the gastric mucosa, lead to gastritis, increased DNA synthesis and cell proliferation. It is also plausible that certain SNPs may show more susceptibility to stomach cancer than others, due to slightly different chemical properties of the protein expressed by those certain SNPs.

In their experiment, epidemiologists Strumylaite et. al. also performed an epidemiological study on the Lithuanian population, for whom stomach cancer was a major health issue. This had been a case-control study, in which the diets of 379 cases were compared with 1,137 controls. This sample population was given a questionnaire of its dietary patterns/tendencies/habits, and this information was organized and evaluated. The results were consistent with previous conclusions—that heavily salted and salt-preserved foods were linked to stomach cancer—with the added observations that smoked meat and salted meat were also positively associated with the stomach cancer incidence, further confirming this relationship with

evidence from animal studies. This was unique in that it had not been studied before—no epidemiological studies had been conducted in Lithuania until this point.

In this way, we see that stomach cancer rates should expectedly rise with the increased meat consumption in Japan, as indicated by the successful attempts to increase meat intake by the Japanese government during the Meiji and Taisho periods. With more of the population having access to meat (as well as a positive reception of it), its intake steadily became a regular part of the Japanese life. Comparing these results to the statistical records, there is remarkable consistency as meat intake increased stomach cancer incidence continued to increase. Epidemiological predictions are consistent with historical records.

Next, we will incorporate a study that observes meat consumption across various populations of different ethnic backgrounds. Larsson et. al.’s study combined data from 10 cohort studies and 19 case-control studies to determine if processed meat consumption had any clear relationship with stomach cancer incidence. Epidemiological studies were pulled from different countries, including the United States, Japan, the Netherlands, Finland, Sweden, Poland, Italy, Canada, Spain, Germany, Puerto Rico, China, Mexico and Uruguay (which was De Stefani’s study mentioned earlier). Findings of this meta-analysis support a positive relationship between meat consumption and the risk of stomach cancer. Overall, an increase in processed meat consumption of 30 grams a day was associated with statistically significant 15% and 38% increased risks of stomach cancer in cohort studies and case-control studies, respectively. The significance of this study is that it suggests meat has a positive association with stomach cancer incidence regardless of the genetic background or ethnicity of the group being studied; this find further strengthens the possibility of it playing an underlying role in the rate increase of the Japanese population we are studying.
WARTIME DIET

Despite the growing prosperity and modernization of experienced in the Meiji-Taisho periods, along with the improvements in the average lifestyle, the drive to westernization was interrupted after the end of the Taisho period. When Japan entered the war in the 1930s, it began to invest all of the country’s resources in mobilization for the Second World War. These resources included food, and the result was the slow malnourishment and starvation of the population beginning in the late 1930s, resolving to food rationing in the 1940s. Especially in the final years of the war, the country was beginning to starve, with food production dropping dramatically.\(^{54}\)

Soon after the instatement of the Showa government, Japan got heavily involved in war: starting with the occupation of Manchuria as early as 1931 and lasting until the end of the Second World War in 1945. With the resources of the country set for the war initiative, the early Showa period became a time of slumping food production. This was especially true during the last five years of the war, right before US occupation, and it had dire consequences on the dietary habits of the entire Japanese population. Government initiatives, including the Rising Sun Lunch Box and the Meatless Day were early examples of wartime food deprivations which would persist throughout much of the 1940s. “Personal experience of Japanese urban residents confirms the statistical evidence that the Japanese experienced a serious food shortage during the last two years of the war.” This was reflected in the increased death rates towards the final years of Japan’s involvement in World War II. The following table reflects this data:\(^{55}\)

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\(^{54}\) Bruce Johnston, *Japanese food management in World War II*, (Stanford, CA; Stanford University Press; 1953)

\(^{55}\) Johnston, 234
Now, we will engage in the more specific dietary changes experienced by the Japanese population. With the tightening of resources, the most serious dietary change was the reduction in the overall consumption of rice. This centuries’ old dietary component was withdrawn from the Japanese population, and the main reasoning behind it, as claimed by government representatives, was the need to sustain the armed forces in the war efforts. Indeed, this did seem to be the reason, as, between 1940 and 1945, the amount of rice supplied to armed forces rose from 161,000 tons to 744,000 tons; in the meantime, the government substituted wheat, barley and soybeans for civilian rice rations in 1943. The government realized that its population was malnourished and suffering from starvation. To replace the reduced rice consumption, the government endorsed the consumption of a biscuit, *Kanpan*. Though virtually unheard of by most of the Japanese public during its introduction in 1937, this biscuit made up 96% of the

### Birth Rate, Death Rate and Rate of Natural Increase (per thousand population)

<table>
<thead>
<tr>
<th>Year</th>
<th>Birth Rate</th>
<th>Death Rate</th>
<th>Rate of Natural Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1933-1937</td>
<td>30.8</td>
<td>17.4</td>
<td>13.4</td>
</tr>
<tr>
<td>1946</td>
<td>25.0</td>
<td>17.7</td>
<td>7.6</td>
</tr>
<tr>
<td>1947</td>
<td>34.3</td>
<td>14.6</td>
<td>19.7</td>
</tr>
<tr>
<td>1948</td>
<td>33.4</td>
<td>11.9</td>
<td>21.6</td>
</tr>
<tr>
<td>1949</td>
<td>32.8</td>
<td>11.5</td>
<td>21.3</td>
</tr>
<tr>
<td>1950</td>
<td>28.3</td>
<td>10.9</td>
<td>17.4</td>
</tr>
<tr>
<td>1951</td>
<td>26.7</td>
<td>10.3</td>
<td>16.4</td>
</tr>
</tbody>
</table>

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56 Cwiertka, 117

57 *Ibid.*, 125
biscuit production by 1944. Unfortunately, Kanpan did not hold the same nutritional value as rice.

The worst of the dietary deprivation came in the late spring to summer of 1946 due to the government policies and the poor harvest. An account of this diet is provided in Dower’s book, *Embracing Defeat: Japan in the Wake of World War II*, describing the typical intake of gruel, soups with leafy vegetables, homemade bread, dumplings and sweet potatoes. He adds:

> The more ‘desperate’ diets consisted of acorns, orange peels, roots of the arrowroot plant, rice-bran dumplings and a kind of steamed bread made from a wheat bran that in normal times was fed to horses and cattle’ (Dower, 134).

There was no doubt that this short time was tragic for the Japanese population. However, the key consequence of this time period concerning our studies was the desperation of the Japanese population to restore the population to proper health and nourishment. The country had been demoralized as a whole by the war’s end. This desperation would help Japan later incorporate Western values, in an even stronger felt need for change. In fact, it might have been the grave level of desperation to improve the status of the country which led the government to directly get involved in changing the Japanese dietary regimen during the post-war period, which was in contrast to the ‘hands-off’ means of encouraging the western diet during the pre-war period.

Regarding the carcinogenic value of these events, no studies have been conducted whereby the effect of starvation to stomach cancer rates is examined. Looking at our statistical records, we see that stomach cancer rates continue to rise during this period of time. Though,

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58 Cwiertka, 119

59 At this point, the nutritional value and corresponding carcinogenic factor will be noted. Rice is a starch, making it a good source of carbohydrates and proteins. It also provides vitamin B, phosphorous, manganese and zinc, and, most conveniently, it can be grown in a variety of places. The carcinogenic character of rice, in terms of stomach cancer has little determined, though some have speculated that Japanese consumption of silicates/talc may be related to cancer incidence. Nonetheless, no conclusive studies have definitely yielded consistent data. Thus, the relationship between rice consumption and stomach cancer is yet uncertain.

60 In this context, “hands off” is being used to describe the government-encouraged but not government-imposed dietary changes in the earlier parts of the twentieth century.
with respect to just the dietary aspect, this evidence seems to indicate that starvation and malnourishment are directly associated with stomach cancer risk, this conclusion does not seem reasonable, as the actual cause for this observed rate may be the changing socioeconomic factors, which is discussed in the next chapter.

**POST-WAR RETURN TO PROSPERITY**

*The American Occupation & Dietary Replenishment*

Though the 1945 to 1952 American Occupation brought a gradual but steady end to the intense starvation, the food crisis largely remained during its first two years.\(^{61}\) Not only had reduced food production and redirected resources been the cause for starvation throughout a significant amount of the population, but the ending of food imports from the former colonized lands and overseas, and the poor yield of the rice crop had all been underlying reasons for this problem. The American occupational forces, under the lead of General MacArthur, were able to slowly replenish the general food supply and production. This, combined with a more direct and driven government initiative to westernize, helped bring the health of the population back to the pre-war standards.

*The Growth of Dairy Intake*

Most studies agree that, until the 1950s, dairy was largely missing from the Japanese diet, despite its encouraged consumption since the Meiji era alongside meat intake. Manufacture was minimal until the 1920s due to lack of its popularity; despite a six-fold increase between the years 1919 and 1939, the dairy production was at only about 340,000 tons of milk—equivalent to only about 8 calories per capita per day, a negligible amount.\(^{62}\) In the post-war period, however,

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\(^{61}\) Dower, 93

\(^{62}\) Johnston, 85
this began to change due to the government’s realization for effectively nourishing the starved population back to a healthy status.

In order to promote milk consumption, the government initiated a school lunch program for select urban populations starting in 1947, and then expanded the program to all schools by 1951. From this mandatory government program, the children received meals with strong bread and milk contents, with the milk being reconstituted from powder and water. This government initiative was a turning point in the dietary history of Japan due to its overwhelming success in assimilating dairy foods into the standard Japanese diet. As a consequence, the new generations consumed dairy at far greater amounts than their predecessors in the years prior. The following table shows this increase in various regions within Japan:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hokkaido</td>
<td>14.0</td>
<td>37.2</td>
<td>40.6</td>
<td>165.7</td>
<td>9.1</td>
<td>190.0</td>
</tr>
<tr>
<td>Tohoku</td>
<td>14.2</td>
<td>31.8</td>
<td>42.4</td>
<td>123.9</td>
<td>33.3</td>
<td>198.6</td>
</tr>
<tr>
<td>Hokuriku</td>
<td>14.4</td>
<td>30.6</td>
<td>37.0</td>
<td>114.1</td>
<td>20.9</td>
<td>156.9</td>
</tr>
<tr>
<td>Kanto</td>
<td>21.6</td>
<td>36.6</td>
<td>43.2</td>
<td>69.4</td>
<td>18.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Tokai</td>
<td>17.6</td>
<td>32.8</td>
<td>39.4</td>
<td>86.4</td>
<td>20.1</td>
<td>123.9</td>
</tr>
<tr>
<td>Kinki</td>
<td>21.4</td>
<td>33.4</td>
<td>41.6</td>
<td>56.1</td>
<td>24.6</td>
<td>94.4</td>
</tr>
<tr>
<td>Chugoku</td>
<td>16.2</td>
<td>34.2</td>
<td>43.2</td>
<td>111.1</td>
<td>26.3</td>
<td>166.7</td>
</tr>
<tr>
<td>Shikoku</td>
<td>13.2</td>
<td>31.4</td>
<td>37.2</td>
<td>137.9</td>
<td>18.5</td>
<td>181.8</td>
</tr>
<tr>
<td>Kyushu</td>
<td>12.2</td>
<td>30.0</td>
<td>38.8</td>
<td>145.9</td>
<td>29.3</td>
<td>218.0</td>
</tr>
<tr>
<td>All Japan</td>
<td>17.6</td>
<td>33.8</td>
<td>41.2</td>
<td>92.0</td>
<td>21.9</td>
<td>134.1</td>
</tr>
</tbody>
</table>


61 Cweirtka goes as far as to cite the differences in lactose tolerance between earlier generations and later generations, stating that later generations did not suffer from lactose intolerance.

64 Ashkenazi, 13
Moreover, the milk industry took off, with the popularization of flavored yogurts, ice cream, cheese and other fermented products starting in the 1950s; the following is a chart illustrates this dramatic increase in the consumption from 1965 until 1995.65

The Japanese finally accepted dairy into their diets and continue to eat comparatively larger quantities of it even today.

The Growth of Bread Intake

As mentioned earlier, bread consumption also grew rapidly in the post-war period, and this was largely due to the same government-endorsed school lunch program. The heavy

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emphasis on bread intake was also successful in influencing emerging generations to change the
level of starch content in their diets. To illustrate this, a sample menu is presented:\textsuperscript{66}

\textbf{Dishes Served in 1965 along with Bread and Milk
at Schools in Different Parts of Japan}

<table>
<thead>
<tr>
<th>Dishes</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whale Meat Simmered with Ketchup</td>
<td>Oita prefecture</td>
</tr>
<tr>
<td>Borscht, apple</td>
<td>Tottori Prefecture</td>
</tr>
<tr>
<td>Sweet and sour whale meat</td>
<td>Tokushima Prefecture</td>
</tr>
<tr>
<td>Beef curry</td>
<td>Mie Prefecture</td>
</tr>
<tr>
<td>Deep-fried breaded cod with Tartar Sauce, boiled potatoes, strawberries</td>
<td>Saitama Prefecture</td>
</tr>
<tr>
<td>Whale meat and liver in tomato sauce with cheese, tofu with peanut dressing, karinto</td>
<td>Okayama Prefecture</td>
</tr>
<tr>
<td>Pieces of deep-fried chicken dusted with seasoned flour and boiled cabbage</td>
<td>Hyogo Prefecture</td>
</tr>
<tr>
<td>Deep-fried breaded horse mackerel, French salad</td>
<td>Ehime Prefecture</td>
</tr>
<tr>
<td>Croquette, vegetables in vinegar dressing</td>
<td>Oita prefecture</td>
</tr>
<tr>
<td>Egg salad, cheese</td>
<td>Akita Prefecture</td>
</tr>
<tr>
<td>Stew, green tea confection</td>
<td>Gunma Prefecture</td>
</tr>
<tr>
<td>Fruit salad, cheese</td>
<td>Fukushima Prefecture</td>
</tr>
<tr>
<td>Spaghetti with meat sauce, breaded deep-fried pork cutlet</td>
<td>Kanagawa Prefecture</td>
</tr>
<tr>
<td>Spaghetti with meat sauce, boiled egg, tangerine</td>
<td>Wakayama Prefecture</td>
</tr>
<tr>
<td>Spaghetti mixed with dry curry, French salad</td>
<td>Ibaraki Prefecture</td>
</tr>
<tr>
<td>Sweet potato in tomato sauce, egg-drop soup</td>
<td>Kanagawa Prefecture</td>
</tr>
<tr>
<td>Tofu stir-fried with curry, margarine</td>
<td>Wakayama Prefecture</td>
</tr>
<tr>
<td>Miso-flavoured stew, jam</td>
<td>Miyagi Prefecture</td>
</tr>
<tr>
<td>Minced beef and tofu dumplings, shredded cabbage, Japanese summer orange</td>
<td>Yamaguchi Prefecture</td>
</tr>
<tr>
<td>Western-style oden, jam</td>
<td>Miyagi Prefecture</td>
</tr>
<tr>
<td>Deep-fried whale meat, soused Chinese cabbage</td>
<td>Oita Prefecture</td>
</tr>
<tr>
<td>Stewed soybeans and pork</td>
<td>Kyoto Prefecture</td>
</tr>
</tbody>
</table>

\textsuperscript{66} Kosuge, \textit{Nippon ramen monogatari}, pp. 75, 95 (Extracted from Cwiertka)
Note that rice is not on this menu at all; rather, all the carbohydrate content comes from surge and bread-based foods; this is reflective of the change in emphasis. Additionally, it is interesting to observe that that the new Japanese dietary programs did not seek to entirely replace traditional Japanese foods with Western or American foods; rather, the idea was to create school meals with components of both diets. This pattern can be observed in the menu selection shown above, where foods familiar to the Japanese tradition, including miso, soybeans, and tofu, are presented alongside western pro-western options, including jams, salads, fruits and spaghetti. In addition to providing an easy transition to a western-style diet, this resulted in the upholding of certain dietary components from the traditional Japanese diet. It is possible that remaining carcinogenic character of some of these traditional foods—especially salt and salt-fermented foods—in the mainstream diet is a reason for the continued high cancer rates, despite its comparative decline in recent years.

*Carcinogenic Value*

In comparison with the preceding years, there had been a substantial increase in the impact of the western diet on the major Japanese population at this point. This was primarily due to the direct involvement of the government in forcefully decreeing the diet upon the Japanese population through programs like this school lunch program. The emerging generations were highly accustomed to both the western style diet as well as the traditional Japanese diet. As shown from the charts and tables above, dairies quickly gained approval in the Japanese population after the 1950s.

The effect of dairy intake on stomach cancer incidence has been disputed over the years, with inconclusive results. In a study conducted by shrier et. al, data on the daily dairy intake

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67 A study conducted by two epidemiologists: Zhuo XG et. al and Watanabe, (“Factor Analysis of Digestive Cancer Mortality and Food Consumption in 65 Chinese Counties”) in China says that dairy intake seems to play no role—
across twenty-six countries was compared and analyzed for relationships to a number of cancers, including stomach cancer. The results showed that increased dairy intake seemed to play a protective role for individuals from developing stomach cancer, and the researchers cited the presence of phospholipids in milk and other dairy foods to increase gastric restitution and probiotics and yogurts to interfere with \textit{H. pylori} colonization as a possible reason for this.

Regarding our analysis, the proposed idea that dairy intake has a protective effect on the stomach, if true, could somewhat explain the dramatic reduction in stomach cancer rates seen about ten years after the start of the milk and bread school lunch programs.

With respect to the reduction in rice intake and the increase in bread intake after the instatement of the school lunch programs, it is difficult to assess what the effect is, since both have been found to be carcinogenic in nature.

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protective or harmful—concerning stomach cancer, but a similar study conducted in Taiwan by researchers Lee H-H et. al (entitled Epidemiologic characteristic and multiple risk factors of stomach cancer in Taiwan) found that milk was playing a protective role, and was, therefore, negatively associated with stomach cancer incidence.
CHAPTER 3: SOCIOECONOMIC STATUS

Another interesting environmental factor that has been studied in terms of stomach cancer incidence is the socioeconomic status of the population and the risk factor. Numerous studies by epidemiologists, including some mentioned in previous chapters, have seen a consistent relationship between socioeconomic status of an individual or a family and his susceptibility to stomach cancer. Interestingly enough, there is relatively strong evidence to suggest a significant relationship between the two, and most of these studies illustrate that they have an inverse relationship: the better the socioeconomic status, the reduced the risks for stomach cancer. Thus far, this relationship has been evident in several populations of varying ethnic backgrounds and nationalities, indicating that it is independent of genetic variables. Many scientists, in an attempt to understand the specifics of this relationship, have pondered on possible reasons for it, though these attempts have been to little avail. Nevertheless, this association is applicable to Japan, because the country goes through several, important changes in socioeconomic status from Meiji to present.

Before advancing from this point, it is essential to highlight a characteristic about the definition of ‘socioeconomic status’; namely, there is somewhat a different approach to this term by epidemiologists and historians. Epidemiologists have a specific definition of this term, which likely contrasts the broad approach by historians. Epidemiologists, statisticians and scientists define socioeconomic status (SES) as a scored social factor, based on occupation, income and education of an individual and his family. 68 Though most historians would agree with these three basic components, they may believe it has to be defined by much more, adding also the factor that these three components may vary from place to place. Moreover, they may argue that an

improved socioeconomic status in a specific region comes with a lifestyle having features very specific to that respective region. The reader should bear this in mind while interpreting the historical and scientific information that follows, because he may better evaluate the effectiveness of the bridge being established between disciplines. Since there are inherent differences in these disciplines and how they approach academic material, it is important to remember the subjective nature of historical definitions; it is hoped that we will gain a new angle, a product of less concrete thought, on the understanding of this relationship.

Due to the aforementioned broadness of the definition of ‘socioeconomic status’, this chapter will differ slightly from the previous chapter in how it observes the environmental risk factor throughout Japanese history. The reader will be presented a brief overview of evolving socioeconomic status in 20th century Japan since the Meiji, with references to the historical outline from the introductory chapter. Thereafter, subcategoric definitions of socioeconomic status will be expanded on, especially those specific definitions recognized by epidemiologists—namely, quality of education, income and occupation. As in the previous chapter, these factors will be studied by means of comparative analysis of epidemiological claims and historical knowledge, with an expected outcome being compared to an observed outcome of statistical data.

**SOURCES OF ERROR**

*Overlap With Diet*

There is some level of overlap between material discussed in this chapter and the previous chapter which must be acknowledged. More specifically, an improvement in socioeconomic status is likely related to a change in diet, indicating that there may be some redundancy with information discussed in the previous chapter. Though this is not exactly a
source of error in the thesis claim, the strong relationship between changing socioeconomic status and dietary change may force one to question the need to discuss it separately. This analysis deserves its own chapter because socioeconomic status covers a wider range of lifestyle changes, since it is so broadly defined. In fact, a change in socioeconomic status can be indicative of a number of things: including living standards, family structure, hygiene, health factors in the work environment, number of work hours and degree of education. Since all of these variables exist within the term ‘socioeconomic status’ and since more variables than simply dietary habit seems to incur stomach cancer, the evolution of socioeconomic status throughout the twentieth century must be studied in its own right.

*Unknown Time of Onset*

In addition to the overlap with diet, a second source of error would be that the time of onset is unknown. In other words, due to the uncertainties of how the relationship between socioeconomic status and stomach cancer exists, it is difficult to assertively say when a large scale socioeconomic change will impact the stomach cancer incidence rates of the whole Japanese population. We need to know how much socioeconomic change has occurred, how many people have been affected, or how long they must be affected before there is an linked change in stomach cancer rates. This may sway the accuracy of judgments made on the historical interpretations of the two, since most cohort or case-control studies conducted by epidemiologists are survey-based, where stomach cancer patients or control patients (who are not inflicted with the cancer) are asked about their socioeconomic status, diet or other factors, which then is collectively organized and examined to make epidemiological claims on the disorder. To this end, the most that can be done is the broader comparison; if the overall socioeconomic status improves over a time period and the overall stomach cancer rate seems to decrease during that
time period, it may be reasonable to at least suggest that they are related, as there will be both epidemiological evidence and historical evidence supporting the claim. Nonetheless, it is important to be aware of limits to these implications.

General Overview

As mentioned before, the twentieth century was phenomenal in that it was a century of socioeconomic change for the Japanese population. Throughout the twentieth century, the Japanese people underwent a steady rise in overall socioeconomic status from the end of the Tokugawa until the mid-to-late 1920s (the exact time of decline disputed among economic historians); thereafter, the United States stock market crash in 1929 along with the enthronement of the Showa emperor and beginning of the militaristic Showa period in 1926 slowly damaged the economy, and the concentration of the nation’s resources in the war effort brought the nation to a state of famine by 1943. This damaged economy faced a period of gradual turnaround through the American occupation and by the occupation’s end in 1952, there was a sudden boom in the Japanese economy, with the overall socioeconomic status surpassing that of the 1920s.

ECONOMIC GROWTH PERIOD I

Breakdown of the Tokugawa

The economic growth of the Meiji-Taisho period had many beginnings in the preceding Tokugawa period, a fact which played a supportive role with the aims of the Meiji State after its establishment in 1868. During the time of the Tokugawa Bakufu, which held primarily a

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See G. C. Allen, *A Short Economic History of Japan*, 4th ed., (New York: St. Martin’s Press, 1981), 15-16, where Allen claims an alternate hypothesis; that some of the roots of economic change during the Meiji-Taisho period actually lay in the Tokugawa. He says that the Japanese did not suddenly acquire that energy and restless ambition; rather, the Meiji inherited certain political and economic institutions—including commercial and industrial developments—that could easily adapt to serving the nation in its new role. Hence, the break, he says, between old and new Japan is less sharp than in the west. It is important to note this in terms of the general socioeconomic status during the beginning of the Meiji because it indicates a rising change in it, overall.
feudalistc social structure, three-quarters of the population—the majority—resided in Japan as members of the peasantry. The remaining quarter controlled the wealth and the land and included the Shogun, the daimyo, Tokugawa families and its vassals, and samurai. Though it is difficult to determine the socioeconomic status of the peasantry in terms of occupation, income and education (and therefore relate it to stomach cancer rates), it can be safely stated that their lifestyles were not of optimal condition, and that, in comparison to the later general socioeconomic status, this population was living very minimally. To specify, it is a well-supported fact that 40-50% of the crop yield went into paying taxes to the daimyo, who were the owners of the harvested land. The peasant majority, especially those residing inland, did not consume as much fish and salt because most of their diet consisted of whatever remained from their crop yield after taxation. Concerning the education, it was certainly true that overall literacy rates increased during the Tokugawa period, but this statistic generally reflected the educational standards of the wealthy quarter of the population, not the peasant majority. Hence, in terms of socioeconomic status at the very start of the Meiji state, it is arguably legitimate to suggest that the majority held a fairly low socioeconomic status.

Interestingly enough, the historian G. C. Allen has argued that an evolution in the overall socioeconomic status helped breakdown the Tokugawa structure and integrate pro-western, pro-industrial aims of the Meiji state. Towards the end of the Bakufu, there was a remarkable rise of the artisan and merchant classes which helped break down the feudal provinces of the Tokugawa

70 Allen., 17

71 See Ibid., 18-20, where Allen discusses the fact that the lifestyle of the peasantry is not exactly known, but it is certain that this majority lived in land domains of the daimyo and paid 40-50% of their crop yield to them. In addition, their diet was unlike their superiors, consisting mostly of their crop harvest and rarely of fish or salts—important in terms of their possible stomach cancer rates. Since this part of the population, which constituted the majority, did not have equivalent access to fish or salt, it may have had substantially lower stomach cancer rates, though this would remain unconfirmed.
and stimulate commercial and financial activities of a regime that otherwise ran its economy based on peasant agriculture.\textsuperscript{72} The breakdown was effective enough to entice samurai, some of whom began to abandon their posts as keepers of the daimyo land and chose, instead, to begin apprenticeships under the merchant classes to eventually run businesses of their own. Owing to these changes, the economy could still grow during the transition period between the established Tokugawa Bakufu and the new Meiji State. This was in spite of the lack of oversight, as the Meiji state could not establish an economic policy immediately after being instated.\textsuperscript{73} Moreover, the emerging merchant classes reflected the roots of the socioeconomic evolution to come.

\textit{Meiji-Taisho and the ‘Hands Off’ Policy}

These roots in the Tokugawa helped mold the market-based economic policy that dominated during the Meiji-Taisho period, until its slow decline in the latter 1920s.\textsuperscript{74} This time period—from early Meiji to late Taisho—represents the first economic growth period that will be studied. In its earliest years, the government upheld little financial intervention, seeing that the economy was growing on its own. Rather than directly interfering with this growth, the new Meiji government indirectly contributed to the growth of the already-expanding merchant class. This expansion would help build the Japanese economy, strengthening the centralizing government and allowing the contributing Japanese enterprises to play active roles in the development of a Japanese nation-state.\textsuperscript{75} Early government involvement included the

\textsuperscript{72} See Allen, 26-27, where Allen mentions that the feudalistic order began to break down consistently as the merchant influence grew, which contributed not only to the feudalistic provinces, but also to the breakdown of the feudalistic class system, as even samurai began to gradually grow interested in entering the service of merchants and follow up on commercial occupations.


\textsuperscript{75} See Allen, 129, where Allen says ‘it is well known that, as countries advance in wealth, an increased proportion of their man-power is absorbed in the tertiary trades’
government encouragement of western culture (as mentioned in the previous chapter),
involvement in basic infrastructure, national security, the legal system and, very importantly,
educational expansion.\textsuperscript{76} The government involvement in these major areas alongside ongoing
growth of the economy resulted in a progressive evolution of the socioeconomic status of Japan.

The mid-Meiji to Taisho period continued to utilize this unique application of a ‘hands-off’ policy, with minimal government intervention in the economic growth. The market-based model had been endorsed by many of the prominent economic analysts at the time, including the well-known Matsukata or Takahashi Korekiyo. Most of the corporate governance was led by large shareholders, not the central government, and the newly-organized bank system facilitated much of the financing of indigenous industries.\textsuperscript{77} Eventually, during the late 19\textsuperscript{th} century, government involvement increased under the policy of \textit{Nissin-Nichiro Sengo keikei}, implemented after the First Sino-Japanese (1895) and Russo-Japanese (1905) wars, and an example of this would be the private takeover of the Japanese railway system in the 1880s and 1890s, with financial support from the government.\textsuperscript{78,79} These government initiatives were designed to guide Japanese industrialization. Despite the slight increase after these wars, the Meiji-Taisho eras of government involved comparatively little intervention to stimulate economic growth, and yet Japan saw a substantial growth period in its economy from at least 1900 to about 1920.\textsuperscript{80}

\textit{Two Emerging Middle Classmen}

\textsuperscript{76} Teranishi, 41

\textsuperscript{77} \textit{Ibid.}, 40

\textsuperscript{78} Ezra Vogel, \textit{Japan’s new Middle Class; the Salary Man and his family in a Tokyo Suburb}, (Berkeley: University of California Press, 1965)

\textsuperscript{79} Teranishi, translation: Post-War Economic Policy

\textsuperscript{80} \textit{Ibid.}, 43
Among many other goals, the Meiji wanted to use its centralized power to feed the
growing economy with capable manpower, and, to do so, it restructured the social class system
and facilitated the creation of a middle class. \(^{81}\) Herein lies the emergence of the ‘new middle
class’—the *sarari* man (salary man) as popularly termed. \(^{82}\) This growing body of individuals
formed the salaried labor force hired by federal governments and larger corporations, in contrast
to the so-called ‘old middle class’ of private business-owners and landowners. These two
subcategories of the middle class comprised the middle class until the 1920, during which there
was a consistent economic growth. It is important to note that, within this time period, there was
a rise of the new middle class and fall of the old, as is apparent in the chart provided by Vogel\(^ {83}\)

<table>
<thead>
<tr>
<th>Nonagricultural Labor Force</th>
<th>1920</th>
<th>1930</th>
<th>1940</th>
<th>1944</th>
<th>1955</th>
<th>1959</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Collar Workers</td>
<td>1496000</td>
<td>1517000</td>
<td>3524000</td>
<td>4842000</td>
<td>6100000</td>
<td>7300000</td>
</tr>
</tbody>
</table>

This would reflect the size and number growth of big businesses in Japan and especially
highlight the fact that there was an obvious rise in the socioeconomic status of much of the
Japanese population, well into the 1920s. It is important to note the new division of occupations
associated with this growth, which is a socioeconomic status factor later studied with respect to
stomach cancer.

Alongside the emergence of the salary man was the growth of a new type of labor force,
which was another product of the growth of the merchant class and the strengthening of the

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\(^{81}\) See Allen, 116, where historian he  says that the total population grew from 51 million to 64 million within the
short time-span of 1914 to 1930, and the national income grew well over twice as great. This is significant because a
population growth of about 25% corresponding with a national income growth of 50% represents the national
improvement of socioeconomic status, especially if there is a fair distribution of wealth.

\(^{82}\) Vogel, 5

\(^{83}\) *Ibid.*, 6
economy. However, in stark contrast to the salary man, who was analogous to the white-collar worker of the west, this growing labor force was more like the blue-collar worker, and he was generally one of many laborers recruited from rural Japan.\textsuperscript{84} This class of individuals included male workers in mining and heavy industry, and females working in textile.\textsuperscript{85} From the early years of the Meiji state until very end of the nineteenth century, this growing labor force had a very distinct lifestyle from its white-collar counterpart. The income of this group of individuals was far less, the occupational hazards were far worse, particularly for the male workers, and the initial degree of education was far lower.\textsuperscript{86}

\textit{Education}

Furthermore, to equip the population with the caliber for socioeconomic development, the Meiji government also realized early on that it needed to educate its people. Hence, in 1871, a mere three years after establishment of the Meiji, the Ministry of Education was implanted and the hiked tax-money was used to enforce mandatory education laws. Education not only served the purpose of engineering a national identity, but it also readied the Japanese youth to understand the western economic model and apply it. According to economic historian W. J. Macpherson, the education system underwent a complete remodeling in the early-to-mid Meiji period, specifically by help of the new influx of foreigners in the country.\textsuperscript{87,88} The influence of Dutch, French and English engineers, advisers, managers, and technicians helped the education system gear the population toward western-inspired expansion of many industries, including

\textsuperscript{84} Allen, 129

\textsuperscript{85} Hiroshi Hazama, \textit{Historical Changes in the Lifestyle of Workers} (an essay translated in Hugh Patrick, \textit{Japanese Industrialization and its Social Consequences}) (Berkeley: University of California Press, 1976), 26

\textsuperscript{86} \textit{Ibid.}, 27-31

\textsuperscript{87} Gordon, somewhere between 115 and 139

\textsuperscript{88} Macpherson, 37
coal-mining, tea, and iron. In a sense, the renovated education system was a way to reach out to
the mass public in order to effectively westernize; in effect, there was a remarkable change in the
socioeconomic status of the Japanese people.

Growing Merger of Lifestyles

Though initially the upper, white-collar working classes had educational, income-based
and other lifestyle-based advantages to the lower, blue-collar working classes, the beginning of
the Taisho period until the middle of the 1930s reflected a reducing gap between the two. More
specifically, this gap reduction was a result of the steady improvement in the socioeconomic
status of the industrial workers towards the end of the Meiji-Taisho period, particularly resulting
from the successful post-war boom of the economy and the interest of large corporations to
improve the lifestyles and attitudes of their employees.\(^89\) There was a clear increment in the
wages of the industrial workers as well as an improvement in their working conditions.\(^90\)
Additionally, there was a vested interest for the corporations to lighten the load on their workers
so that they stay with the company; in order to do this, the corporations gave their workers
bonuses, leisure time and even insurance plans. Consequentially, there was a distinct
improvement in the socioeconomic status of the working class.

The following chart reflects data indicating similar information, in terms of lifestyle:\(^91\)

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\(^{89}\) Two thoughts: the government wanted to improve the working conditions of their employees because they wanted
to keep their workers for life, rather than keep them unskilled an easily replaceable. Interestingly, as author Hazama
points out, the corporations had a vested interest to stimulate positive worldviews and education in its employees.
The second point would be the consequences, in addition to the occupational, wage and educational improvements
from these endeavors, there were also improvements in the amount of leisure time received by workers in this time
period, which resulted in more family time in comparison with workers during the Meiji period.

\(^{90}\) Allen, 117: Though it is difficult to assess the socioeconomic growth at the worker and laborer level, it is
estimated by experts that the real wages of industrial workers by 1930s throughout the country as a whole were 50-
60% above the 1914 level

\(^{91}\) Naikaku Tokei-kyoku, *Changes in Lifestyle of Industrial Workers* (Tokyo 1995)
As indicated by this chart, much of the spending habits had become similar between both the blue collar laborers and white collar salary men, indicating growing similarities in lifestyle and, therefore, socioeconomic status. Though it is true that these numbers are in percentages (of total wage or salary), and that there was a gap between wages of salaried workers and factory workers, there is sufficient evidence to suggest that this gap was, too, shrinking by the mid-1920s.\textsuperscript{92,93}

In addition to the evidence for occupational and income-based improvement in the labor classes, there is also evidence for education-based improvement. The following is a statistical chart of the education trends of the labor force:

\begin{table}
\begin{tabular}{|l|c|c|}
\hline
                      & \textit{Salaried Workers} & \textit{Factory Workers} \\
\hline
Food and Beverages   & 31.49                     & 37.92                     \\
\hline
of which:            &                           &                           \\
Grain Staples        & 11.09                     & 15.23                     \\
Other Basic Items:   &                           &                           \\
Fish                 & 3.02                      & 3.31                      \\
Meat                 & 1.12                      & 1.91                      \\
Dairy Products       & 1.04                      & 0.8                       \\
Vegetables and Dried Foods & 4.51                  & 5.29                      \\
Seasonings           & 2.78                      & 3.2                       \\
Luxuries             &                           &                           \\
Sweets and Fruit     & 2.91                      & 2.43                      \\
Liquor               & 1.59                      & 2.6                       \\
Beverages            & 0.52                      & 0.47                      \\
Restaurant Meals     & 2.91                      & 2.68                      \\
\hline
\end{tabular}
\end{table}

\textsuperscript{92} Hazama, 38

\textsuperscript{93} Ono and Watanabe, \textit{Changes in Income Inequality in the Japanese Economy} (an essay translated in Hugh Patrick, \textit{Japanese Industrialization and its Social Consequences}) (Berkeley: University of California Press, 1976) page 363; These authors suggest that there still lies much uncertainty in the evaluation of income differences during the prewar period, and that there is no way to change this fact. It is important to note this, therefore, in evaluating the degree of credibility of data presented—some experts are more keen to doubt their value than others.
Note that there is a clear increase of individuals that are being educated, and an even clearer indication that most laborers were literate due to the attendance of over 80% of the working population in mandatory primary school. Within a twenty-year period, the number of blue-collar working class individuals that had attended primary school had increased by 100%. This educational increase, the aforementioned increase in income and the similarities in spending reflect the slow but significant development of a middle-class population which was gradually beginning to live a uniform lifestyle. The increase in education also gave factory workers access to office-based white-collar jobs, especially if they were workers in large factories. It seems that throughout the Taisho period, there was an increasing sense of social mobility and an improvement in the general socioeconomic status of the Japanese population from the beginning of the Meiji to the end of the Taisho.

Moreover, it was evident that these improved living conditions were effecting a growing population of individuals. The number of peasants was decreasing and the number of individuals employed in manufacturing was largely increasing—4.7 million in 1914 to 5.9 million in 1930, indicative of a migration of farmers and peasants to cities for improved living standards. Moreover the numbers in transport and communications, commerce, administrative, professional and personal services grew from 5.5 million in 1914 to 8.5 million in 1930.\footnote{Ono and Watanabe, 129 This is especially important to note, especially because of the second increase, which includes occupations mostly in the white collar class. This reflects about a 55% increase in the number of}
observation to make from these numbers is the fact that the improving socioeconomic status was affecting a growing scale of individuals, and that the middle class lifestyle was becoming more accessible to a wider array of people. Compared to the earlier Meiji period, the Japanese society had become far more flexible, providing opportunities to members of the former lower classes.

From all the information mentioned above, two important ideas can be suggested about the Meiji-Taisho period with respect to socioeconomic status: there was a general improvement in the socioeconomic status of the country, resulting from the strengthening of the economy, and there was a general decrease in the lifestyle difference of the upper and lower parts of the Japanese white-collar and blue-collar individuals, which was growing rapidly. The second of these conclusions is strictly based on the education and income-based definitions of socioeconomic status; there were still occupational hazards to which the blue-collar factory workers were exposed to, which the white-collar office workers were free from. Nonetheless, the emerging merchant and middle classes were becoming similar to each other in many ways, as they slowly assimilated to the westernized way of life. These features characterize the socioeconomic changes of the first economic growth period.

**SCIENCE & EPIDEMIOLOGY OF ECONOMIC GROWTH PERIOD I**

At this point in our analysis, we will address epidemiological data and scientific claims. First and foremost, it is important to note that there have been several studies comparing socioeconomic status to stomach cancer incidence; as mentioned earlier, most studies have seen a strong association between the two, and these studies have been collected in varying countries—implying that such a relationship exists irrespective of genetic and some other variables. Also as mentioned before, most studies have found that there is an inverse relationship individuals comprising the upper working class, which generally has higher pay, more education and better working conditions.
between stomach cancer susceptibility and any of the epidemiologically defined socioeconomic factors—namely education, income or occupation. The better the income, education level or occupation of an individual, the less likely his chances of getting the stomach cancer. This claim will now be tested using the information we have seen through the historical background provided, the statistical records collected and epidemiological and scientific claims related to this topic.

Epidemiologists have studied all three statistically and epidemiologically recognized factors of socioeconomic status—education, income and occupation—with respect to stomach cancer. A select subset will be highlighted here. Most of these studies are indicative of an inverse association between overall socioeconomic status and stomach cancer incidence.

Based on a number of studies, lower education seems to run a statistically significant high risk for stomach cancer incidence, especially in the male population. One such study exclusively compares education levels to cancer incidence in the Icelandic population.95 This research group chose to compare education levels with respect to cancer because of its accurate reflection of an individual’s social status in the Icelandic society. To conduct this study, a large sample of 60,194 men and 58,505 females, all with cancer, were surveyed and categorized for their educational background. Three levels were standardized: basic education, consisting of only 9-10 years of elementary educational experience; medium education, consisting of junior college or vocational training; and academic education, consisting of traditional university level educational experience with or without additional graduate studies.96 Results showed that there


96 They mention the general occupations associated with each of the three education levels; namely, these are male craft, agricultural or fishery workers and female service shop workers for the basic education level; male craft workers and female service class workers and clerks for the medium education level; doctors, lawyers, scholars, nurses, and other professions for the academic education level.
was a significant relationship apparent between level of education and cancer susceptibility. The study found that increasing education level exclusively in men corresponded with a lower risk for a number of cancers, including stomach cancer.\textsuperscript{97} This association was not found in women. It is possible that the occupational differences corresponding with educational differences may be one of the culprits for this discrepancy.\textsuperscript{98} Though the paper does not put forth any confirmed reasons explaining the observed association, it does mention that underlying dietary differences between higher and lower end educated people may explain it. Additional studies have also yielded similar results.\textsuperscript{99,100} In conclusion, there is a proposed inverse relationship between education level and stomach cancer risk for individuals.

Most studies have seen that certain occupations in the industrial sector show an especially high risk of stomach cancer. This relationship between occupation and stomach cancer incidence is observed in a study by S Krstev et. Al.\textsuperscript{101} In this case-control study, a population with 443 cases—newly diagnosed for stomach cancer—and 479 controls—randomly selected from the residents in Warsaw, Poland—were surveyed for occupational hazards showing elevated stomach cancer risks. Occupations that show an increased risk of stomach cancer in multiple studies include miners and quarrymen, asbestos workers, farmers, fishermen, masonry and concrete workers, machine operators, metal workers, chemical and rubber workers, carpenters,

\begin{flushright}
\textsuperscript{97} But also lung and urinary tract. In contrast, there seemed to an increased risk for higher education individuals to contract prostate cancer and melanoma among men and breast cancer for women.

\textsuperscript{98} However, it is important to note that the comparatively lower rates in women than in men is something observed in most studies—a generally observed but yet unexplained phenomenon.


\textsuperscript{100} Fujino et al, “Prospective Study of Educational Background and Stomach Cancer in Japan” \textit{Preventative Medicine}, Vol. 35 (2002) 121-127

\end{flushright}
transport workers, and sailors. A study conducted in with the Swedish population yielded a similar result, with increased risk for occupational positions including miners, quarrymen, construction and metal processing workers.\textsuperscript{102} By these studies, occupational exposures that have been linked to stomach cancer risk include various dusts, such as mineral, metal, coal, and wood dust, and exposure to asbestos, nitrogen oxides, N-nitroso compounds, and ionizing radiation.

According to the studies observed above, we see that these two faculties share an inverse relationship. In our statistical records of stomach cancer-related mortality throughout the century, we see that there is a slow-but-steady rise until the year 1933, during which there is a clear drop (4,000 less people died of the cancer), another slow-but-steady rise until the 1960s. What interests us right now is that first drop between the years before 1933 and the years after. This spike is very small, consisting of a drop of only 4,000 people in a population that, at the time, consisted of millions. Based off of what has been concluded from epidemiological claims and what is seen historically, it is possible to suggest that the early increase can be due to the increasing industrialization exposure of the growing working class to jobs in heavy industry. The increasing industrialization could have exposed the new working class to more environmental risk factors, including the metal, coal and wood-dust mentioned before.

With respect to the improving socioeconomic status before the end of the Taisho period, there should to be a drop in the stomach cancer rate. This drop is not seen in a dramatic fashion; with very little conviction, it can be suggested that the drop seen after the year 1933 could have resulted from the improving socioeconomic status of the Japanese working population in the

\textsuperscript{102} N Aragones, et. al. “Stomach Cancer and Occupation in Sweden: 1971-1989” \textit{Occup Environ Med} Vol. 59 (2002); this study included a sample population of 8763 male gastric cancer patients and 2725 female gastric cancer patients. Their occupational, age and residence information was collected and interpreted to see which occupations held a particularly high risk.
decade and a half preceding it.103 As mentioned before, labor conditions were also improving—the environment was cleaner, the education standards and education rates were on a steady incline and the larger corporations, which were survivors of the economic recession, were just starting to become interested in the welfare of their employees. However, the relationship between these socioeconomic changes and the drop of 4,000 cases in stomach cancer is questionable. On the other hand, the steady rise after 1933 can correspond nicely with the focus of the Showa government on heavy industries, which show an occupational susceptibility to cancer incidence.

These rates do not, however, correspond well with the fact that the rising living standards were consistent until the year 1937—well after 1933—during which living standards finally began to drop. Worker wages and educational standards were not affected until that year, when the wages plunged until the post-war period; by that time, they had fallen to 1/3 the pre-war period. In other words, socioeconomic status did not depreciate significantly until the latter half of the 1930s, and this should reflect a decrease in stomach cancer rates; rather, there is a notable increase. Though uncertain, it is suggested that there may be more factors in this. For instance, it is possible that the aforementioned variables—including the degree of socioeconomic change, the number of people affected by the improvement in labor conditions—may not be strong enough for a noteworthy impact on the overall socioeconomic status and cancer rates. There may be related factors, especially those corresponding with changes in the domestic sphere, which may also have not changed measurably to affect the cancer rates. These possibilities remain unexamined.

103 An alternative possibility is that there is a flaw in the data, considering that the time period preceding 1933 contained consolidated statistics for stomach and liver cancer, and statistical data collected for rates after 1933 include consolidated data for stomach and duodenum.
Generally speaking, there is a consistent rise in the stomach cancer rates of the population until the 1960s. There may be several explanations for this—broadly speaking, there may be far more factors involved than covered here. Perhaps a subset of the socioeconomic factors could not be affected enough to change the incidence rate. An example of this would be infection by a bacterium known as *Heliobacter pylori*, which is known to cause an increased risk of stomach cancer;\(^{104}\) though the overall socioeconomic status of many Japanese citizens had been improving, perhaps the types of improvement had little or no successful effect on the rate of *H. pylori* infection, leaving the population still highly susceptible to the cancer and lending no overall change in the incidence rate. This is a speculation, unconfirmed. Nonetheless, the bottom line is that, despite a considerable improvement in the socioeconomic status of the general Japanese population from the early Meiji period until the early Showa period (around 1937), we do not see the expected decrease on stomach cancer incidence rates; rather, there is a general and steady increase—with the exception of the drop in the year 1933—that seems to disagree with most epidemiological claims.

Another explanation for the discrepancy could be the focus on heavy industry during the 1930s. As shown in the both the Aragones and Krstev studies in Sweden and Poland, dusty and toxic environments posed as a strong occupational hazard which increased the risk for stomach cancer. The Showa government’s emphasis on shipbuilding, iron, steel and chemical sectors of production may have contributed to the upward incline after 1933, due to increased exposure of the industrial workforce to the hazardous conditions. In addition to this, however, there is the increase in grain-dust exposure of many of the part-time farmers—exposed to agricultural toxins

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\(^{104}\) Robert P. H. Logan “ABC of the upper gastrointestinal tract: Epidemiology and Diagnosis of *Heliobacter pylori* Infection” *Biomedical Journal*, Vol. 323 (2001); this paper discusses the relationship of *H. pylori* infection to gastric cancer and peptic ulcers,
alongside industrial hazards—may have experienced a similar increased risk factor.\(^{105}\) Since the number of part-time farmers increased during this period (as much of the original work force was involved in the war effort and the industrial sector still needed considerable manpower), their double exposure to hazardous toxins at the industrial workplace could have been compounded by exposure to grain-dust in the rural work-place. The combined effect would have resulted in a continuing increase in the number of stomach cancer cases seen in war-time Japan. As mentioned before, the improvement of labor conditions by large corporations may not have been sufficient improvement to effectively counter this risk, whether it be with respect to the number of workers impacted or the nature of the improvement.

Regarding education, the Meiji to Taisho period does not seem to correspond well with the increasing literacy rates and spread of mass education in the country. Though this disagrees with epidemiological claims, it makes sense to some extent because it indicates that increasing literacy or level of education does not alone determine the stomach cancer risk; rather, it only seems related to stomach cancer when an increased education is related to an improvement in lifestyle. In other words, simply being able to read does not reduce stomach cancer risk; however, in those times, individuals with access to proper education were generally also privileged in their lifestyles, and it was therefore due to these factors associated with education—not the education itself—which probably explains the relationship apparent between level of education and stomach cancer incidence.

Applying this fact to our study of the first economic growth period (and, as we will see, the decline period also), there seems to be an escalating rate of stomach cancer despite the

\(^{105}\) Marie-Elise Parent et. al, “Occupational Exposures and Gastric Cancer” *Epidemiology*, Vol. 9, No. 1 (Jan., 1998) 48-55; In the study entitled Occupational Exposures and Gastric Cancer by Parent et. al., the researchers found that there was an especially high risk for stomach cancer occurrence if there is excessive exposure to grain-dust, to which farmers generally have high exposure.
increasing level of education for the working force because the change in lifestyle associated with this new education system was not sufficient. More specifically, though the working population was privileged with a greater amount of education in comparison with that during the Tokugawa and early Meiji, it was still not seeing the associated change in lifestyle necessary to impact stomach cancer rates. The more educated labor class was still working in relatively hazardous conditions, still exposed to environmental toxins—especially at the work place—and, thus, still highly susceptible to developing the disease.

**DECLINE**

*War and Occupation Period*

The instatement of the Showa in 1926 brought forth a Japan with a new, militaristic government format, having more aggressive imperialist aims than the preceding Taisho government. The major product of this change, which heavily influenced the socioeconomic status of the Japanese population, was the strong interest of the Showa government to engage in war. Intending to invade and occupy Manchuria starting in 1931, and involve itself in the Pacific War from 1937 to 1945, this new militaristic regime sought every means to mobilize the country. In stark contrast to the hands-off, market-based economic policies of the Meiji-Taisho periods, the Showa government wanted to get directly involved in the economic growth by passing laws controlling imports and exports, armament and mobilization.

Hence, these policy changes generally involved reaching the objective of war preparation, and, to maximize war output and pull the economy out of the road to recession, the government decided to take more direct control of the Japanese industrial sector, with special interest in the heavy industry departments—steel, iron, and shipbuilding—rather than light
industries such as textile. Agriculture had also lost somewhat of its importance. The government utilized the bank closings and bankruptcies of many of the smaller enterprises to strengthen ties with those institutions that survived. It also began to directly fund these corporations with government subsidies and grants.

From an economic standpoint, these powerful policies became detrimental to the economy. The Showa government’s decision to redirect industry and cut down textile and non-militaristic industrial sectors left many people unemployed and dropped popular consumption. Moreover, this, along with the gradual depletion of raw materials—including oils, bauxite and iron ores—left the government unable to keep production rates at the higher levels of the earlier 1930s. The government, deeply involved in warfare, continued to spiral in economic disaster by the time of World War II surrender, during which industrial production had dropped dramatically, food production had declined by 30% and there was a 25% loss in national wealth. The country now faced deep inflation.

**Socioeconomic Consequences: Fall in the Quality of Life**

The events of this period had deep socioeconomic consequences on the population. The most hurt by it were the working classes and the poor. During the final years of the Second World War, workers’ wages had dropped to 1/3 the levels of 1931-36; the drop in production rates had downsized many industries, leaving much of the urban population devoid of

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106 Yoshikara Kunio, 9

107 Unfortunately, events occurred in the end of the 1920s and then through the 1930s by the 1925 Japanese earthquake, the decline of the market-based economic policies and the impact of The Great American Depression which would damage the economy and lead the country into a recession. More specifically, the market-based economic policies were slowly becoming incompatible with the Japanese society because of two factors: economic and political costs, and disintegration of social norms. Economic costs were increasing and the downsizing of the banking system to only a few banks began to incur instabilities—company bankruptcies and at least 30 bank closings left only a few of the larger, stronger survivors

108 Yoshikara Kunio, 16
employment and housing.\textsuperscript{109} Hence, with increasing unemployment and homelessness throughout the Japanese population, there is a significant decline in the socioeconomic status of the general working class throughout the late 1930s and then into the 1940s. The economic downturn would result in consistently poor living standards until the end of the American occupation.

A very interesting point to make regarding socioeconomic changes during this period would be the continuing growth of the industrial sector, despite the deployment of many of these workers into the armed forces for the war effort. Since the government wanted to continue maximizing its war-based output in heavy industry, it allotted workers in these industries to be given supplementary food rations; this motivated many peasants and rural families to transition into the industrial sector and work in these fields. Between the years 1937 and 1944, two million peasants switched to the lucrative heavy industry sector.\textsuperscript{110} This continues to show the socioeconomic changes in the population and the continuing growth in the industrial working class. The constant exposure to heavy industry materials may have kept the stomach cancer rates at an all-time high.

Luckily, the American occupation period following the war had positive consequences on the Japanese economy; namely, it was a period during which the Japanese government could gain economic growth potential, which could be brought to fruition during the post-war period. Occupation replenished the natural resources and raw materials’ supply, so that the industries could restore the prewar production rates. To curb the extreme inflation, the government cuts in

\textsuperscript{109} Hazama, 42
\textsuperscript{110} Cwiertka, 130
expenditure, instilled tax increases, and monitored prices hoping to maintain a 360 yen to $1 currency exchange rate.\textsuperscript{111}

**SCIENCE & EPIDEMIOLOGY OF DECLINE**

Applying records of the decade-long slump in socioeconomic status to the stomach cancer rates of this time period of decline (between the late 1930s until the late 1940s), we expect to see a clear rise in the incidence rates, as the studies have shown the two to be inversely related. In the observed results (in the appendix), we see that there is an agreement with the expected ideas: there is an unmistakable and continuous upward incline (continuing from the graph before), indicative of an increasing rate immediately preceding and immediately following the recessionary period. Once again, however, it must be noted that the rates between the years 1944 and 1946 are not found and therefore subject to speculation; nonetheless, the years right before and right after this period indicate no major change. It seems that there continued to be environmental factors—perhaps in the socioeconomic aspect—which maintained the steady increase rather than letting the rates plateau or drop.

One major reason for the continuing incline may be the still-present emphasis on the heavy industries during the end of the war period. As found in the Aragones’ study, a minimal five years of working with iron dust significantly increased individual stomach cancer risk susceptibility for the rest of a male worker’s life. Workers working in the heavy industry throughout the 1930s may have worked well over five years, especially since the corporations that had survived the preceding recession period were trying to keep the same workers for a longer period of time. Hence, more exposure to iron dust may have kept the heavy industry workers in hazardous environmental conditions for a longer period of time, maintaining the high

\textsuperscript{111} Yoshihara Kunio, 17
susceptibility and later inflicting them with the stomach cancer. It is possible that this may also explain the continuing incline during Economic Growth Period I.

This continuing incline may also be observed because there was a sizeable increase in the number of part-time farmers in Japan from the war-time period, especially during the years when food was scarce. Farmers were privileged during the hunger years, as they had access to their own crop yield. The number of farm families in whose members had supplementary jobs in industrial sectors increased from 31.4% in 1940 to a shocking 62.7% in 1944. The grain dust and iron exposure referenced before may have especially been the culprit for the increasing stomach cancer rates, since there had been a growing number of people who exposed to both throughout their lives. Therefore, the overall increase in the number of part-time farmers would further escalate the stomach cancer rates.

**ECONOMIC GROWTH PERIOD II**

*Post-War and Post-Occupation Economic Growth*

The major socioeconomic consequence of the post-war and post-occupation period regarding socioeconomic status would be the outstanding improvement in the living standards of the Japanese population, which surpassed the improvement of it in the first economic growth period. There was a rapid improvement of work and labor conditions, alongside a remarkable increase in the workers’ wage. In fact, by 1952, the year that the American Occupation ended, the workers’ wage had been restored to the pre-war level, and by 1972, it had quadrupled it.¹¹² This wage improvement was necessary to restore consumption levels, which also steadily

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¹¹² Hazama, 42
increased. Below are tables of wage data and consumption data, retrieved from Hazama’s work.\(^\text{113}\)

### Comparison of Wages in the Manufacturing Industry Before and After the War (base year, 1931-36)

<table>
<thead>
<tr>
<th>Year</th>
<th>Nominal Wage</th>
<th>Consumer Price Index</th>
<th>Real Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1931-1936</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>1947</td>
<td>32.9</td>
<td>109.1</td>
<td>30.2</td>
</tr>
<tr>
<td>1949</td>
<td>157.1</td>
<td>236.9</td>
<td>66.3</td>
</tr>
<tr>
<td>1951</td>
<td>235.2</td>
<td>255.5</td>
<td>92.1</td>
</tr>
<tr>
<td>1953</td>
<td>307</td>
<td>280.2</td>
<td>107.3</td>
</tr>
<tr>
<td>1955</td>
<td>340.4</td>
<td>297.4</td>
<td>114.5</td>
</tr>
</tbody>
</table>

### An International Comparison of Consumption Patterns (in percent)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Food</td>
<td>42.7</td>
<td>35.1</td>
<td>34.9</td>
<td>33.1</td>
<td>39.8</td>
<td>34.1</td>
</tr>
<tr>
<td>Clothing</td>
<td>11.2</td>
<td>9</td>
<td>8.6</td>
<td>8.3</td>
<td>11.8</td>
<td>11.8</td>
</tr>
<tr>
<td>Housing</td>
<td>10.5</td>
<td>10.6</td>
<td>14.3</td>
<td>14.7</td>
<td>7.1</td>
<td>11.2</td>
</tr>
<tr>
<td>Light/Fuel</td>
<td>3.7</td>
<td>3.6</td>
<td>4.3</td>
<td>3.2</td>
<td>2.7</td>
<td>2.2</td>
</tr>
<tr>
<td>Household Furnishings</td>
<td>4.5</td>
<td>6.2</td>
<td>7.1</td>
<td>8.2</td>
<td>13.8</td>
<td>11.1</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>87.4</td>
<td>36.1</td>
<td>30.8</td>
<td>32.5</td>
<td>24.7</td>
<td>29.6</td>
</tr>
</tbody>
</table>

The consumption levels not only helped revive the national economy, but also reflected the increased affordability of the Japanese population, which, too, would suggest an improvement in the general socioeconomic status.

In addition to the efforts of the government, the occupation and the large corporations, the efforts of the strengthening labor unions, too, seemed to play a role in the improving post-war socioeconomic status of the Japanese people. The demands of the new unionization initiatives allowed for more security in employment, better working conditions, company housing, discount

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\(^{113}\) *Ibid.*, 43
food, clothing and other necessities. any of these were specifically targeted to the blue-collar worker, whose welfare became a growing concern for post-war Japan. The work of labor unions contributed to the socioeconomic status because it provided necessities and even better working conditions to the growing working class. There was an intentional attempt being made to improve the lifestyle of the industrial workers.

These initiatives seemed to be successful, as companies started adopting common rhetoric for all levels of workers—sha’ in—and provided equalized wage scale, number of hours worked, meals consumed and leisure patterns. Total integration of the laboring, working, factory classes and the white-collar salary men seemed to be underway. This is expressed in the following table from Hazama’s work:

<table>
<thead>
<tr>
<th></th>
<th>Blue Collar</th>
<th>White Collar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep</td>
<td>7 hr. 51 min</td>
<td>7 hr. 51 min</td>
</tr>
<tr>
<td>Meals</td>
<td>1 hr. 29 min</td>
<td>1 hr. 26 min</td>
</tr>
<tr>
<td>Personal Hygiene</td>
<td>1 hr. 04 min</td>
<td>1 hr. 08 min</td>
</tr>
<tr>
<td>Work</td>
<td>8 hr. 05 min</td>
<td>7 hr. 30 min</td>
</tr>
<tr>
<td>Household Duties</td>
<td>1 hr. 03 min</td>
<td>1 hr. 16 min</td>
</tr>
<tr>
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<tr>
<td>Television</td>
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</tr>
</tbody>
</table>

This information from this table illustrates the growing similarities in lifestyle between the white-collar and blue-collar working populations.

**SCIENCE & EPIDEMIOLOGY OF ECONOMIC GROWTH PERIOD II**

Based off of the studies which we have discussed so far, which concluded that there had been an inverse relationship between socioeconomic status and stomach cancer incidence, we
should, expect to see lowering rates of stomach cancer as the living conditions of the population grow higher, since there had been an improvement in the overall socioeconomic status of the country’s population throughout the post-war era. Though there is a steady rise until the year 1962 in stomach cancer-related deaths, our statistical records also show a clear drop in both the incidence and mortality rates which starts in the mid-1960s and then persists throughout the remainder of the century. This indicates a reduction in the number of stomach cancer cases in the post-war era of Japan. In contrast to those corresponding with Economic Growth Period I, these statistical records are in accordance with the improvements in socioeconomic status of the Japanese population, since there was a visible overall improvement in the socioeconomic status of the country and a corresponding drop in the stomach cancer rates. The epidemiological claims seem more closely aligned in this case than in the first economic growth period.

It is uncertain why the socioeconomic changes of the first economic growth period are not as strongly or conclusively corresponding with incidence rates as the second economic growth period, but the reasons can be speculated. Further exploration of the differences in the socioeconomic statuses may perhaps help clarify this difference. Possible reasons could be the degree of socioeconomic change—perhaps certain factors were not as effective as they should be for there to be a significant impact on the occurrence. Additionally, the first economic growth period may not have been steady or lasting enough to produce any noticeable effect. Moreover, the preceding periods of decline may have played a role in affecting the stomach cancer incidence rates; perhaps the feudalistic peasant lifestyle which preceded the working lifestyle for a majority of the population of the first economic growth period may differently affect stomach cancer rates than the industrialized and war-based decline of the late 1930s to mid-1940s. These
hypotheses can be assessed only with deeper exploration of the differences between each economic growth period.

Moreover, the switch to oil from coal for energy source may have contributed to the reduction in the gastric cancer rates. After the occupation period, Japan began to quickly convert all of its energy dependence from domestic coal to foreign oil because of cost-efficiency. As the study by Young and Russell shows, there is an increased susceptibility for an individual to suffer from stomach cancer if he works in the iron, coal and state mining—without the labor force being heavily directed to these industrial directives, there may have been a significant rise in the exposure, which may have increased in the environmental risk factor. As all other previously analyzed points, this remains an unconfirmed possibility.

With respect to education, we finally see a visible change correspondence. The growing middle class continued to be educated throughout the post-war period, and there is a simultaneous decrease in the stomach cancer rates during the time period. This is in agreement with most epidemiological studies, and it is likely because the educated population finally gained the lifestyle associated with the increased education to reduce the stomach cancer rates.

**Conclusion**

From the studies mentioned in this paper specifically on the socioeconomic status and its role in the stomach cancer incidence rates, it is reasonable to suggest the following basic historical trend to explain the stomach cancer rate: Japan experienced a steady rate of socioeconomic improvement from the Meiji to the early 1930s, then faced serious economic repercussions from the Second World War which disrupted the improvement of the social class living standards, and finally resumed improvements in socioeconomic status at an outstandingly higher rate than in the pre-war period. From a general perspective, this corresponds with the
stomach cancer rates found on our statistical timeline; there is an overall increase throughout the Meiji period until the 1960s, during which socioeconomic status faces a more outstanding change and may, therefore, have impacted the stomach cancer rates more dramatically than any of the social changes prior.
CHAPTER 4: CONCLUDING THOUGHTS

Through our comparative studies of the historical changes in Japan and the statistical records on stomach cancer, we have found that there are some strong correspondences between the epidemiological claims and the historical observances, as well as some weak ones. The strong correspondence is apparent overall between both the socioeconomic changes and the food changes with the cancer rates. More specifically, the westernization of diet has provided a decreasing rate of stomach cancer due to the reduced consumption of certain traditional foods that may explain the higher rates of stomach cancer in earlier time periods. Additionally, the improvement of overall socioeconomic status has also corresponded with the recent decline in rates of stomach cancer incidence; both food modernization and socioeconomic status improvement have occurred in recent years, and the overall cancer rate has also dropped in recent years. Most recent epidemiological studies would agree with these results.

Strengths and Weaknesses of Information Assessed

The strengths of this paper include the comparatively novel analysis technique utilized. Though it is in its preliminary stages of development, this technique may prove to be fruitful for its contributions to both historical analysis and scientific analysis. The major benefit to history is due to its integrative nature; it can incorporate the results of scientific studies in order to analyze historical events. Additionally, the benefit to science and epidemiology is a new perspective on the degree of accuracy of finds of these fields. Though, as emphasized repeatedly throughout this paper, contradicting finds between fields do not necessarily imply inaccuracies in either, they may stimulate both fields to use expert knowledge within each to better understand strange discrepancies or disagreeing information.
Though there are weaknesses in this paper, they do not necessarily indicate a flaw in the epidemiological claims or a flaw in the historical records; rather, there are probably limitations in the understanding from all perspectives. This is, after all, a collaborative study, trying to bridge information between varying disciplines. The limits of knowledge in each field can play a heavy role in reducing the strength of such bridges, and the only way to overcome this obstacle is to further expand ones knowledge by conducting additional research in each field. Therefore, any weakness in this paper's analysis can be likely explained by limited awareness or experience of the thesis writer.

Despite this weakness, however, the good news is that we can acknowledge and evaluate the observed limits of this paper and keep it in mind for future studies. There are a number of crucial, related factors that this small study could not incorporate; I would like to take this opportunity to bring forth such factors and give the reader perspective on routes to further explore the bridges to perhaps find possible explanations for the unclear aspects of this paper.

*Limits and Lines of Future Study*

The most obvious limits to this paper (which have been mentioned already) involve how much and what type of data has been analyzed by this paper. Since there was a filtration process, where a subset of scientific studies were selected and only certain environmental risk factors were examined, most scientific studies would claim that there is an inherent bias in this study (hence, making it a more subjective study) due to the choices made on which sources to incorporate and to what degree they be incorporated. Specifically speaking, there is a limit to how much we can assess about the historical records. They remain interpretable to all that interpret them. I may not have covered several important factors in this study, and this may
further limit the conclusiveness of my results. Limitations in data will always hinder the strength of this paper.

An additional historical limitation which should be further explored would be the comparison of context; specifically, it would be the observation of historical similarities and differences of places with similar stomach cancer rates to Japan.\textsuperscript{114} It would be interesting to see if there is any degree of parallel between the socioeconomic or dietary lifestyles over a changing historical timeline that may have brought the population to its respective stomach cancer rates. Perhaps certain social factors common to the history of all these societies will surface. Comparing history to history may strengthen or weaken the currently recognized associated factors, or perhaps bring forth new possibilities for what could be affecting the susceptibility. Additionally, it would be interesting to observe places that have shared historical influences but with different stomach cancer rates. In line with this thought, a specifically interesting angle to take would be the juxtaposing studies of Chinese and Korean history, stomach cancer rates and dietary patterns. It is true that there are many overlaps in the dietary trends between these countries. However, stomach cancer rates still show a phenomenal difference, with the rates of Japan still being more than double the rates in China or Korea. What could be causing this consistent difference, which happens to keep the Japanese cancer rates high? What environmental factors could be culprits for this discrepancy? These are leads for comparative studies which could really aid in the understanding of the disease.

In addition to that reason is a less apparent but fundamental aspect not incorporated in this study—the differences in pathogenesis and histology of the stomach cancer incidences throughout Japan and other countries. The pathogenesis and histology of these different cancer

\textsuperscript{114} Areas with remarkably high rates of stomach cancer include certain parts of East Europe (including Poland and Sweden), Iceland, Uruguay, and certain areas of the United Kingdom.
has been barely touched upon in this paper, and, if studied, may provide new angles on our understanding. Not all stomach cancers are the same; rather, there seem to be some mutation-types more strongly related than others. To further complicate matters, certain mutation-types seem more prevalent in certain populations than others—a genetic phenomenon generally referred to as Single Nucleotide Polymorphism. This is currently being studied in Japan, with promising hopes for the future.\textsuperscript{115} The explanations are not conclusive yet, either; however, if bridged into this study, perhaps we can try to better understand why—outside of hereditary reasons (which comprise so few of the stomach cancer cases in comparison with the spontaneous types) certain mutations are more strongly related to the types of stomach cancer more prevalent in the Japanese population than others.

Other factors not studied here are the effects of the soil quality, the climate, the air quality and pollution content, which could all be affecting the stomach cancer rate. The acidity of soil is already being speculated as a possible association factor, and a study of the environmental history of Japan may illustrate a new twist to the affect on agriculture, consumption patterns and, therefore, the stomach cancer rates of the general population.\textsuperscript{116} Moreover, pollution levels have also already been studied.

Finally, there is the biggest variable with very little definite knowledge of it by scientists and very little incorporation of it by epidemiologists: the epigenetic factor.\textsuperscript{117} Epigenetics consists of the study of DNA editing on DNA expression. It is a confirmed fact that the attachment of certain molecules—such as methyl groups—to genes has a strong impact on their


\textsuperscript{116} Mistuo, 30-32; This discusses the effects of soil on the trends of stomach cancer seen in Japan at the time.

\textsuperscript{117} Manel Esteller, \textit{Epigenetics in Biology and Medicine} (New York, NY: CRC Press, 2008), pages 261-266
expression levels. Methyl groups generally reduce the expression level while other molecules may escalate, or up-regulate, their expression. These expression patterns are confirmed to be both hereditary and environmentally-induced; hence, with the up-regulation of cancer-inducing, oncogenes or the down-regulation of cancer-preventative, tumor suppressor genes, cancer susceptibility increases substantially. In this respect, there is the profound suggestion that the environmental factors surrounding an individual may affect his genetic expression patterns, and his expression patterns may affect the expression patterns in his offspring.

Studying regional differences in stomach cancer may also provide new insight for the objectives of this study. The analysis of this paper has been primarily at the national level rather than the regional level; there have, however, been studies indicative of dietary trends and urbanization at the regional level. Perhaps studying regional tendencies and regional histories for a new type of comparative analysis will further help the history of environmental risk factors for stomach cancer and how they relate to the observed rates.
### APPENDIX

**Figure 1:** Male and Female Stomach Cancer Mortality Rates (1909-1922)

<table>
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**Figure 2:** Male and Female Stomach Cancer Mortality Rates (1923-1932)

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Figure 3: Male and Female Cancer Mortality Rates (1933-1936)

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Figure 4: Male and Female Stomach Cancer Mortality Rates (1937-1943)

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Figure 5: Male and Female Stomach Cancer Mortality Rates (1947-1949)

Figure 6: Male and Female Stomach Cancer Mortality Rates (1950-1957)

Table 9 (1950-1957) – continued
Figure 7: Male and Female Stomach Cancer Mortality Rates (1958-1962)

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Figure 8: Stomach Cancer Mortality Trends until 1960s (Male Population)

Figure 9: Stomach Cancer Mortality Trends until 1960s (Female Population)
Figure 8: Stomach Cancer Mortality Trends after 1960s (Male and Female Shown)

CANCER MORTALITY IN JAPAN (1950–1995)

A Male

B Male

A Female

B Female

Fig. 3.4. Trends in the age- and sex-specific cancer mortality rate by age group (1950–95) (A) and by year (1955, 1965, 1975, 1985, and 1995) (B) in Japan
Cancer of the stomach (ICD, 9th revision, 151)
### Figure 9: Male and Female Stomach Cancer Mortality Rates after 1960s

#### Table VI-5-1. Trends of Age-specific Incidence Rates per 100,000 Population in Japan according to Sex, Primary Site, and Year in Japan

**— Stomach, Male —**

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