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Do the Lifetime Prevalence and Prognosis of Schizophrenia Differ Among World Regions?

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Do the Lifetime Prevalence and Prognosis of Schizophrenia Differ Among World Regions?

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by

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Abstract

Much cross-cultural research has been done on the topic of schizophrenia, but few studies thus far have focused on lifetime prevalence and prognosis together, grouped by world region. Additionally, there has been severe bias in which countries and regions have been studied both historically and currently. Any study that had statistics on lifetime prevalence per 1000 people and/or DALYs, from a specified country or region, was included in this thesis. Results showed that lifetime prevalence of schizophrenia does not differ among WHO regions, but DALYs and thus prognosis do differ. Several major conclusions can be drawn from these results. One is that prognosis differs even though prevalence does not. Another is that schizophrenia is not a region-specific disorder. A third is that the reason that prevalence does not differ among regions could be due to biological causes of schizophrenia being more powerful than environmental causes. A fourth is that the reasons that prognosis differs in different regions are plentiful, but can all be derived from social support and community. The implications of these conclusions can be used to better the prognosis of people with schizophrenia worldwide, but further cross-cultural research in underrepresented countries is essential.

Keywords: schizophrenia, lifetime prevalence, prognosis, cross-cultural

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1. Introduction

Schizophrenia is a mental illness which has been widely researched by psychologists. Though the concept of schizophrenia, and the disorder itself, existed before 1911, this is when Eugen Bleuler first introduced the term in Europe. In *Dementia Praecox, or the Group of Schizophrenias* (1952), Bleuler explained that the previous name of dementia praecox (coined by Emil Kraepelin) implied too much of a link to dementia, and thus the new and separate name of schizophrenia would be more appropriate. Schizophrenia comes from the Greek "split mind," which references a person with schizophrenia's split between emotion and thought, and their general dissociations from reality. Because of this, schizophrenia is currently often confused with dissociative identity disorder (DID), which is actually a split of personality. Schizophrenia has been included in all five versions of the Diagnostic and Statistical Manual (DSM), however its name and definition have evolved with time. For example, the original DSM called it 'schizophrenic reaction' (APA, 1952). Currently, the DSM-5 states that schizophrenia is "defined by abnormalities in one or more of the five following domains: delusions, hallucinations, disorganised thinking (speech), grossly disorganised or abnormal motor behaviour (including catatonia), and negative symptoms" (APA, 2013, p. 87). These symptoms can be categorised as positive (i.e. the presence of delusions, hallucinations, and disorganised speech) or negative (i.e. social withdrawal, catatonia, and apathy). Symptoms must persist for at least six months for a diagnosis to be made. The onset of schizophrenia

usually occurs in the teenage years or early to mid-twenties, with cases of childhood schizophrenia being exceedingly rare.

Schizophrenia is a particularly difficult disorder to diagnose. First, the DSM-5 instructs psychologists and psychiatrists to consider other, potentially less severe disorders, and then to consider other disorders that may produce psychosis. A diagnosis of schizophrenia seems to be the last resort. In addition, some symptoms such as disorganised speech, delusions, and hallucinations may be difficult to evaluate completely due to linguistic differences between countries and cultures. Furthermore, the lack of a physical basis for the disorder may mean that diagnosis is potentially more arbitrary than disorders with a clear physical cause. The definition of schizophrenia and its diagnostic criteria has come far in the past few decades, but more data on the disorder are needed.

While there is no one proven cause for schizophrenia so far, there has been research into many different biological, psychological, and environmental causes. Biological causes include genetic links (Nicodemus et al., 2008; Lewis et al., 2003; Badner & Gershon, 2002), viral infections such as influenza during pregnancy (Watson, Mednick, Huttunen, & Wang, 1999), and biological sex, as the disorder is slightly more common in males. Psychological causes include comorbidity between schizophrenia and drug abuse disorders (Volkow, 2009). Environmental causes include low birth weight, hypoxia during birth (Nicodemus et al., 2008), migration across countries in a person's or their ancestor's life (Cantor-Graae & Selten, 2005), and stress. There are many gaps in this research, particularly cross-culturally, and thus more research should be done to determine the causes of schizophrenia in order to treat it more effectively.

The first hypothesis of this thesis is that the lifetime prevalence of schizophrenia will not be significantly different among WHO regions. Much of the research already done suggests that in general, lifetime prevalence does not significantly differ among regions. In addition, there has so far been no clear reason as to what would be causing differing lifetime prevalence rates among WHO regions. The second hypothesis is that the prognosis of schizophrenia will be significantly different among WHO regions. The background literature has suggested that cultures with less stigma against mental health issues, cultures with more social support, and developing countries generally have a better prognosis than cultures with more stigma against mental health issues, cultures with less social support, and developed countries. Therefore, I predict that the African Region, South-East Asia Region, and Eastern Mediterranean Region will generally have a better prognosis than the Region of the Americas, European Region, and Western Pacific Region.

2. Background Information

2.1 Historical Background of Schizophrenia

The background literature will be categorised into six world regions: African Region, Region of the Americas, South-East Asia Region, European Region, Eastern-Mediterranean Region, and Western Pacific Region. These regions were pre-determined by the World Health Organisation (WHO), grouped together for geographical and perhaps cultural proximity. The WHO regions being used here are broad and therefore contain many different and unique cultures within them, and I will respectfully acknowledge this. In addition, it is understood and

recognised that within regions ethnicities and races will be diverse, but since these are much harder to track populations will be categorised by region.

Much of the research thus far on schizophrenia in different regions has been Western-centric. Arguably this Western bias in the research has potentially been detrimental to progressing our knowledge of schizophrenia. Even within these Western regions, there has been bias in the literature. Biases are not alone perpetrated by Western cultures, and this an also be seen in past research. This section of the literature review showcases the history of schizophrenia, and point out areas where there have been racial and/or cultural biases. These biases tend to manifest in stigma, lack of research, and unsuccessful treatment regimens. Research on schizophrenia in specific parts of the European Region is plentiful, especially surrounding minority communities and treatment regimens. A 1991 Census found that clinicians in the UK tend to over-diagnose the African-Caribbean community with schizophrenia, which demonstrates bias and that diagnosis of schizophrenia can often be arbitrary (Sharpley, Hutchinson, Murray, & McKenzie, 2001). People in this minority community diagnosed with schizophrenia were much more likely to be imprisoned. Historical treatments of schizophrenia in Europe have largely been ineffective, but persisted regardless because there was no alternative. For example, insulin coma therapy (ICT) and electroconvulsive therapy (ECT) were commonly used in the mid-20th Century (Jones, 2000). Lobotomies were also used as a treatment during this time, but this tended to cause a significant loss of higher functioning in people and is thus no longer used (Fields, 2010). Another European study examined the incidence of schizophrenia in ethnic minorities in London and found that minorities have a higher overall incidence of schizophrenia despite making up a smaller proportion of the population. This was especially true in areas where

minorities were less densely populated, suggesting that the increase in incidence stems from more stressful life events and less community to act as a support system (Boydell et al, 2001). Much of the research above took place in Western Europe, and there are a lot of gaps in research in Eastern Europe and non-English speaking European countries. Future research should focus on these underrepresented areas, and in discovering what treatment regimens would be more successful for people with schizophrenia.

Much research has been conducted in the Region of the Americas. In the USA, schizophrenia is and was often pointed to as a cause of gun violence. This perpetuates the idea that all people with mental illnesses are generally violent and unstable, when in fact only 3-5% of violent crimes are committed by people with mental illnesses. In fact, they are more likely to be victims of gun violence than perpetrators. It was also found that only 5% of gun-related killings between 2001 and 2010 were committed by people with mental disorders (Metzl, 2016). Metzl finds that over time, people diagnosed with schizophrenia are likely to become less violent, which could be attributed to the fact that the disorder is characterised by social isolation. In addition, during the American Civil Rights Movement of the 1960s, a diagnosis of schizophrenia was used as a weapon to dehumanise African-American citizens. African-American men were significantly over-diagnosed with schizophrenia during this period, and similar to the trend in the UK those people diagnosed with schizophrenia were much more likely to be imprisoned. The effects of the stigmatization of schizophrenia as a violent disorder still last today (Metzl, 2010). African-Americans diagnosed with schizophrenia in the US are three times more likely to be prescribed antipsychotic medications than their white counterparts who display similar symptoms (Banerjee, 2012). These findings display a clear bias in diagnosis of schizophrenia, and unsuccessful and biased treatment regiments. Further

research in this area should focus on underrepresented communities in North America, and improving treatments for schizophrenia.

The Region of the Americas is large, and also included Central and South America, and the Caribbean. In general, Latin American countries use less than 2% of their health budget for mental health resources, largely because of the cultural stigmatization of mental illness (Alarcón 2003). Those with schizophrenia in Latin American countries face homelessness, financial troubles, job loss, and general stigma from the community. The Caracas Declaration of 1990 aimed to reduce stigma and re-evaluate general approaches of mental illness. It was adopted by the majority of Latin American countries, but thus far, only Mexico is actively working towards making progress and change to the current system for an unknown reason. While there has been general research on mental illnesses in Central and South America, specific research on schizophrenia is lacking, potentially due to an internal bias and stigmatisation. Future research should focus on understanding why there is a significant stigma against mental health, how to combat this, and potential treatments.
The countries of the African Region are often left out of both historical and contemporary studies of schizophrenia, even when the research is specifically focused on cross-cultural differences and similarities, for unknown reasons. The data that do exist are concentrated on specific countries and ignore others. Prior to the introduction of ‘mental asylums’ by the British in 1912, those with schizophrenia in many countries in Africa were treated by traditional healers (Odejide, Oyewunmi, & Ohaeri 1989). This generally involved the use of herbal medicines, praying to gods, and the use of shrines. After 1912, some people with schizophrenia were transferred to asylums built by the British in Africa, some were transferred to asylums in France, and few others remained in the care of their family and community.

New treatments for schizophrenia that originated in Europe and North America, like the previously mentioned ECT and ICT, reached regions in Africa very belatedly (Akyeampong, Hill, & Kleinman, 2015). Currently, many regions of Africa are undergoing rapid urbanisation and development, but mental health resources still remain scarce. Community health workers are vital sources of care for those without access to mental health professionals (Burns, 2012). It is important to remember that while this research does give us some context for the history of schizophrenia in Africa, firsthand accounts of African voices - those with schizophrenia and family or community members - go largely unheard in favour of the researcher's voice. There are some countries in Africa in which a fair amount of research has been conducted, and then some countries in which there is no research. Future research should concentrate on representing regions of Africa which have not yet been researched, and improving treatment plans.

Literature on the history of schizophrenia was also scarce in the Eastern Mediterranean Region. Research has found documentation of psychotic symptoms and other symptoms similar to schizophrenia in the ancient Egyptian Book of Hearts, written sometime before 2000 BC. These symptoms were thought to be caused by spirits, or poison in the heart or uterus (Korn, n.d.). More recently, one study found that the a well-educated population in Pakistan attributed the cause of schizophrenia to God's will, superstitious ideas, loneliness, and unemployment rather than mental illness (Zafar et al., 2008). In 2016, the government of Pakistan ruled that schizophrenia is not a permanent condition and instead varies over time in the same person, and thus schizophrenia is curable and should not legally be considered a mental illness. This ruling was largely so the government could incarcerate a single individual with schizophrenia who had committed a crime (Dearden, 2016). Research is lacking in other

countries of the Eastern Mediterranean Region, which is where future research should focus. Specifically, research should focus on current and historical treatments of schizophrenia and potential stigma of governmental agencies against mental health issues there.

Little research could be found on the history of schizophrenia in the South-East Asia Region of the world, which is also the WHO region with the least number of countries. Prior to the arrival of the British, those people with mental illnesses were usually cared for by their families and the general community. In the 19th Century, the British brought western approaches to mental health to India. After the 1857 Indian Rebellion Britain enforced the Lunacy Act of 1858 for most of the 19th Century, in which only Western approaches to medicine were used in asylums and traditional Indian approaches were not used. In the 1930s, ECT and ICT gained popularity as treatments for schizophrenia, like in many places in Europe and Africa. In the 1920s, people in asylums began to be referred to as ‘patients’ rather than ‘lunatics’ in an effort to change the environment and attitude in mental asylums, but, “as late as 1945, the Assam Mental Hospital in Tezpur [was] described as in 'a mixed state of a prison, an asylum and a mental home'.” (“Medical History of British India”, 2007). In Thailand one study found that of 4,000 people in mental hospitals, 76% of them were diagnosed with schizophrenia. However, the actual prevalence of people with any mental illness in the population studied was very low (Ratanakorn, 1959). Most of the symptoms displayed were negative. Even though there was some research in India and Thailand, there was very little in other countries in the South-East Asia Region. The research that was conducted was only done after the arrival of the British, which introduces some bias. More general research on schizophrenia in the South-East Asia Region should be done as there is a lack of data thus far. Specifically, research on current treatments would be useful.

Research on the history of schizophrenia in the general Western Pacific Region yielded many results for Japan, but few results for other countries in the region. Prior to the 1800s in Japan, it was believed that most mental illnesses were caused by spirits (Nakamura, 2013). One treatment for this was hydrotherapy, which involves sitting under waterfalls, drinking clean water, etc. The same study found that from the 1800s to the 1950s, the main treatment for schizophrenia was home confinement. In 1900 the Law for the Confinement and Protection of the Mentally Ill was passed, essentially making the process of home confinement official - so much so that prison cells were being physically constructed in family homes for people living with schizophrenia. In 1940 a eugenics law was passed that allowed the sterilization of people with heritable mental illnesses, which included schizophrenia. In the 1950s, similar to many other parts of the world mentioned so far, institutions began to gain popularity as the main treatment. Then in the 1980s, more attention was placed on patient's rights due to requests from families of those will mental illnesses, and so hospitalisation became a popular treatment as it had better conditions than institutions. Several scandals in the 1970s and 1980s that exposed conditions of these institutions led to mass deinstitutionalisation. In 2003 families of people with schizophrenia requested that the name be changed from seishinbunretsubyō (translated as 'mind-split disease') to tōgō shitchō-shō (translated as 'integration disorder') in order to reduce stigma and confusion about what the disorder actually is. This official change has made psychiatrists more comfortable being honest with their patients about being diagnosed with schizophrenia (Sato, 2006). In China one study found that people with schizophrenia rarely receive consistent treatment. The main form of treatment is solely medication (Phillips, 2001). This research shows that Japan is making progress with how their system deals with schizophrenia, and China could benefit

from more research on treatment for the disorder. There is a clear bias here in terms of which countries from the Western Pacific Region have been studied, and these findings should be used to fill gaps in the literature.

To summarise the different cultural literature on schizophrenia that currently exists, it can be seen that much of the data is either biased (due to cultural stigmatisation of mental illnesses, or Western influences in research) or non-existent. It is important to remember that while Psychology itself is an old field, the term schizophrenia is fairly new in history. It may be that many countries have not studied or not been studied because they did not have the resources to fund and conduct in-depth research. This is not to say that none of the data we have thus far is not valuable, on the contrary: much of this data could provide context for the main portion of this thesis, which examines the similarities and differences of lifetime prevalence and general prognosis between WHO regions.

2.2 Lifetime Prevalence of Schizophrenia

Many studies have attempted to analyse the prevalence of schizophrenia globally. The total estimated number of people worldwide living with schizophrenia is 29 million, which is roughly 0.004% of the population. Research suggests that the incidence of schizophrenia (the proportion of new cases per year) remains relatively constant worldwide at 0.1-0.4% (Barbato, 1996). I will focus on the prevalence of schizophrenia, since this has been much more widely researched. Schizophrenia is generally measured in three types of prevalence: point prevalence (the number of cases at one point in time), period prevalence (the number of cases over a specific period of time), and lifetime prevalence (the proportion of individuals who have been affected by schizophrenia at any time in their lives). Due to an

abundance of data, I will focus on lifetime prevalence only, which is measured per 1000 people. Most studies thus far have examined the lifetime prevalence of schizophrenia on a global scale, and very little have examined the lifetime prevalence of schizophrenia in specific countries or regions. Some research suggests that prevalence does differ across regions, and few other studies find prevalence to be relatively constant worldwide (Jablensky, 2000).

A full summary of the lifetime prevalence statistics found is located in the Appendices section of this thesis (Table 1).

2.3 Prognosis in People with Schizophrenia

WHO created a measurement to quantify the impact of a disease, and the general burden it has on society (burden of disease). A Disability-Adjusted Life Year (DALY) can be thought of as, "one lost year of 'healthy' life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability" ("Metrics: Disability-Adjusted Life Year (DALY)", n.d.). More information on how DALYs lost are calculated for particular diseases can be found in the above referenced website. DALYs lost can be thought of as one way to quantify the general prognosis of people with schizophrenia, and the social cost of schizophrenia to society.

In 2004, WHO conducted a worldwide study in which they measured DALYs lost caused by schizophrenia for every country. In 1990, total DALYs lost worldwide due to schizophrenia was calculated to be just under 13 million, which puts schizophrenia at number 26 for highest DALYs lost on a list of diseases. WHO has predicted that by 2020, around 17

million DALYs lost will be caused by schizophrenia, moving it up to the 20th position in the list ("Age-Standardised DALYs per 100,000 by Cause, and Member State, 2004", 2004).

Prognosis for people with schizophrenia is both historically and currently poor. Approximately 1 in 10 individuals with schizophrenia succeed in committing suicide. As previously shown, treatment regimens among regions have not improved much in the past century, which is one explanation for why prognosis is generally poor. In general, 30 years after being diagnosed with schizophrenia, 25% of people are completely recovered, 35% of people have improved and live mostly independently, 15% of people have improved but are not mostly independent, 10% of people are in hospitals or institutions, and 15% of people are dead - the most common cause of death being suicide (Torrey, 1988).

There has been substantial research into what factors cause differing prognosis in people with schizophrenia. General factors which relate to prognosis can be found in Appendices (Appendix B). I will focus particularly on factors that relate to cross-cultural issues, such as: cultural stigma against mental illness, length of time a person spends without diagnosis and treatment, cultural differences in support, and economic development of a country.

Cultural stigma against mental illness is prevalent to some extent in all cultures, but some countries have more systemic stigma than others. For example, a recent study found that due to stigma in many Latin American countries, they spend less than 2% of their health budget on mental health issues, effectively creating a systemic barrier to better prognosis in people with a wide range of mental illnesses (Alarcón, 2003). A second study recently conducted in Latin America found that the stigma of mental illness is very prevalent, leading to poorer prognoses than countries with less stigma against mental illnesses (Mascayano et al.,

2016). A study conducted in several countries of Africa found that less stigma of schizophrenia leads to better prognosis. This stigma can be lessened by people with schizophrenia and their support systems (e.g. friends, family, community care workers, etc.) viewing it in a different perspective: as a short-term disorder with a high chance of recovery (Akyeampong, Hill, & Kleinman, 2015). Stigma is heavily rooted in culture and therefore could have a significant impact on the prognosis of people with schizophrenia living within that culture.

The length of time between developing symptoms of schizophrenia and being diagnosed (and subsequently seeking treatment) also has an effect on the prognosis of people with schizophrenia. One study found that generally, the longer a period of time that a person spends undiagnosed, the worse the prognosis is for that person (Banerjee, 2012). Another study, conducted in Singapore, discovered that long periods of undiagnosed and untreated schizophrenia lead to worse prognosis. Therefore, clinicians and non-clinicians alike would greatly help combat this by using more effective ways to detect the early signs of schizophrenia (Kua, 2012). Leaving people undiagnosed and untreated for extended periods of time is detrimental to their prognosis, and this could depend on how much of a support system that person has, how much education the country has on mental health issues, and also stigma of seeking mental health support and treatments.

Cultural differences in support is a third factor which ties in with cross-cultural issues in schizophrenia. One cross-cultural study found that people with schizophrenia in collectivist cultures (e.g. general African and Asian cultures) have fewer relapses and a milder course of illness than people with schizophrenia in individualistic cultures (e.g. general European and North American cultures). The study was unsure exactly why this is, but it could be due to the

fact that collectivist cultures tend to be higher in social support than individualistic cultures (MacDonald & Schulz, 2009). Continuing with this argument, another study found that social support and community are more important factors in prognosis than the type and severity of the symptoms presented (Elsheshtawy & Elez, 2011). A third study found that all people with schizophrenia who had good prognoses were living with their families, who provided social and emotional support (Kua, 2012). Clearly, the amount of social support provided is a significant factor in the prognosis of people with schizophrenia. This in turn is dependent on history and culture.

A fourth factor that influences the prognosis of schizophrenia is whether the country is a developed or developing country. Examples of countries that fall into the 'developed' category are: USA, Canada, Japan, most European countries, and Australia. Examples of countries that fall into the 'developing' category are: Mexico, China, Indonesia, Jordan, and Thailand. One study found that in general, developing countries tend to have a better recovery rate than developed countries, with 40% of people with schizophrenia recovering in developing countries to 25% of people recovering in developed countries (Torrey, 1988). A second study also supported the hypothesis that prognosis is better in developing countries (Bhugra, 2005). The main difference between these developed and developing countries is an economic one. Thus, the development level of a country in terms of economic growth influences general prognosis in that country.

Further factors which have been shown to influence prognosis, but are not particularly tied to cultural differences, can be found in the Appendices section (Table 2).

So far, we have seen that regions do tend to differ in terms of factors that influence prognosis of people with schizophrenia. I will use DALYs lost as a way to measure prognosis among different WHO regions.

3. Methods

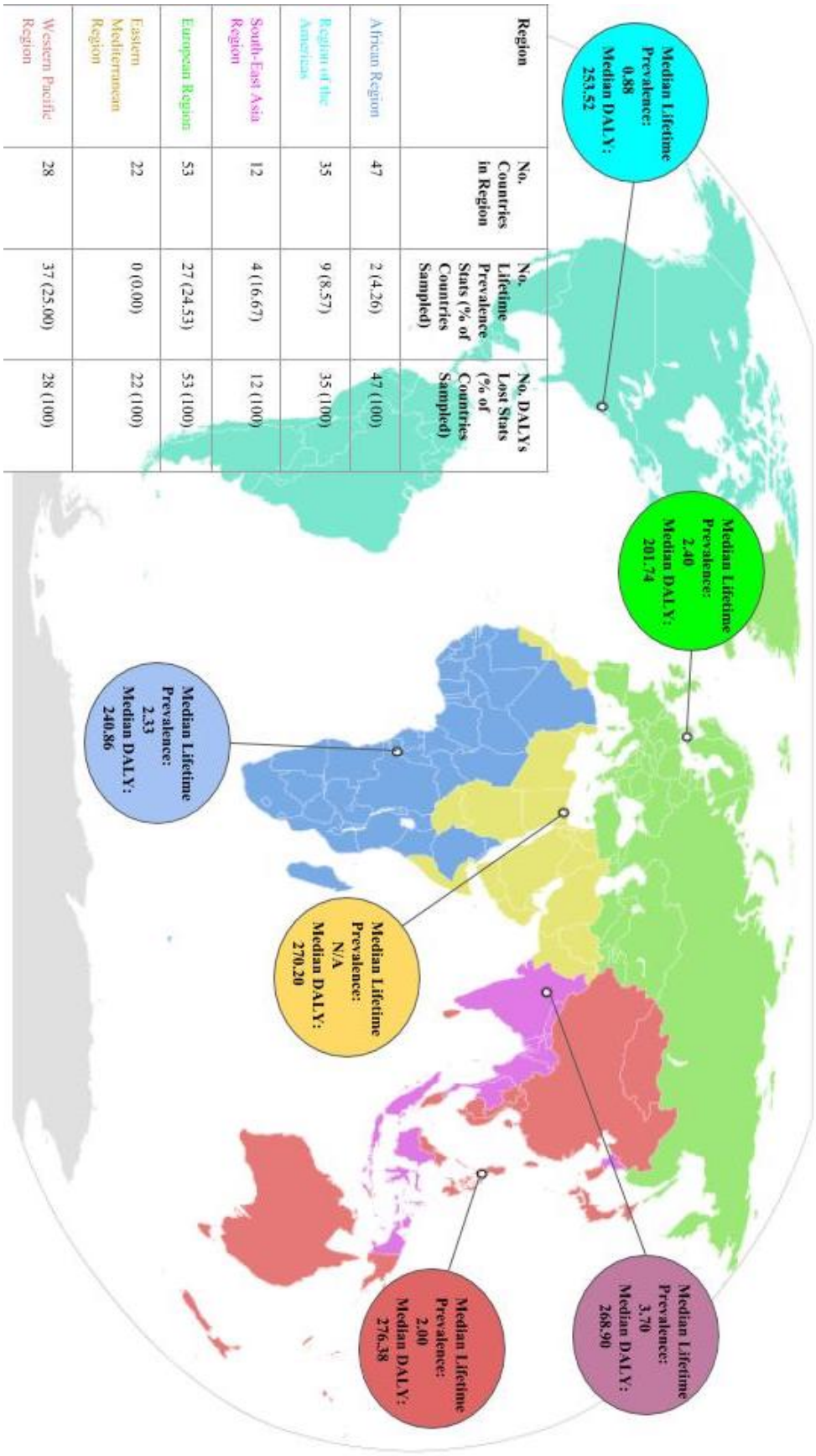
Lifetime prevalence data were gathered from previous studies. Some data were gathered by coincidence when searching for historical information. Other data was found using the search term "lifetime prevalence of schizophrenia in [country name]" in the Google Scholar database. WHO lists 195 countries and these were the country names searched. Then, in the interest of thoroughness, the search term "lifetime prevalence of schizophrenia in [WHO region]" was used to uncover any additional statistics. Due to an abundance of data and multiple different prevalence types, only lifetime prevalence was included. If provided, age-adjusted data was used instead of non-adjusted data. Lifetime prevalence per 1000 people only was included. Effort was made to include the most recent accurate lifetime prevalence data, though some data dates back several decades. Data was not included if it did not specify the prevalence type, since this could cause errors, or if it did not specify the region from which the data came, as this could not be classified correctly. Statistics were categorised by WHO region. Means and confidence intervals (CIs) were calculated for each region. The data were used to run a one-way ANOVA statistical test. Additionally, Levene's p was calculated to make sure that homogeneity of variances could be assumed, since each WHO region had a very different sample size ($p < 0.05$). No data could be found for lifetime prevalence of schizophrenia in any

Eastern Mediterranean country, or even just the region in general, and therefore it was discounted from this analysis.

Prognosis was quantified by using DALYs lost, which had already been calculated by WHO for each country, but not manipulated to show regional differences. While manipulating the WHO data, it was found that the names of some countries had been updated since the study took place. This thesis uses the most recent official country names. Also, the Republic of South Sudan (which became independent from Sudan in 2011) did not exist when the original WHO study took place, and therefore has the same DALYs lost statistic as Sudan. All DALYs lost statistics were first categorised by WHO region. Then means and CIs were calculated. Additionally, Levene's p was calculated to see if homogeneity of variances could be assumed, since the DALYs lost data had a rectangular distribution, but $p > 0.05$. No data transformations were successful in making the distribution normal. The data were used to run a Kruskal-Wallis nonparametric statistical test. Then, nonparametric post-hoc tests were run in order to determine differences between specific WHO regions.

4. Results

A summary image of the mean lifetime prevalence per 1000 people and mean DALYs lost per WHO region can be found below. Additionally, this image contains the number of countries in each WHO region. It also shows the number of lifetime prevalence statistics found (and % of countries sampled), and number of DALY statistics (and % of countries sampled) found by the researcher of this study.



Region	No. Countries in Region	No. Lifetime Prevalence Stats (% of Countries Sampled)	No. DALYs Lost Stats (% of Countries Sampled)
African Region	47	2 (4.26)	47 (100)
Region of the Americas	35	9 (8.57)	35 (100)
South-East Asia Region	12	4 (16.67)	12 (100)
European Region	53	27 (24.53)	53 (100)
Eastern Mediterranean Region	22	0 (0.00)	22 (100)
Western Pacific Region	28	37 (25.00)	28 (100)

Figure 1. The median lifetime prevalence, median DALYs lost, number of countries, number of lifetime prevalence stats found (% of countries sampled), and number of DALY stats (% of countries sampled) found per WHO region.

The results of the ANOVA show that there is no statistically significant difference of lifetime prevalence statistics among WHO regions ($F = 1.40$, $df = 4, 74$, $p = 0.24$; Figure 2). For each WHO region included, the lifetime prevalence and 95% CIs were calculated: African Region ± 6.35 [3.15 to 9.55], Region of the Americas ± 1.27 [0.70 to 1.84], South-East Asia Region ± 4.06 [0.55 to 7.55], European Region ± 2.98 [2.01 to 3.95], and Western Pacific Region ± 3.10 [1.90 to 4.3].

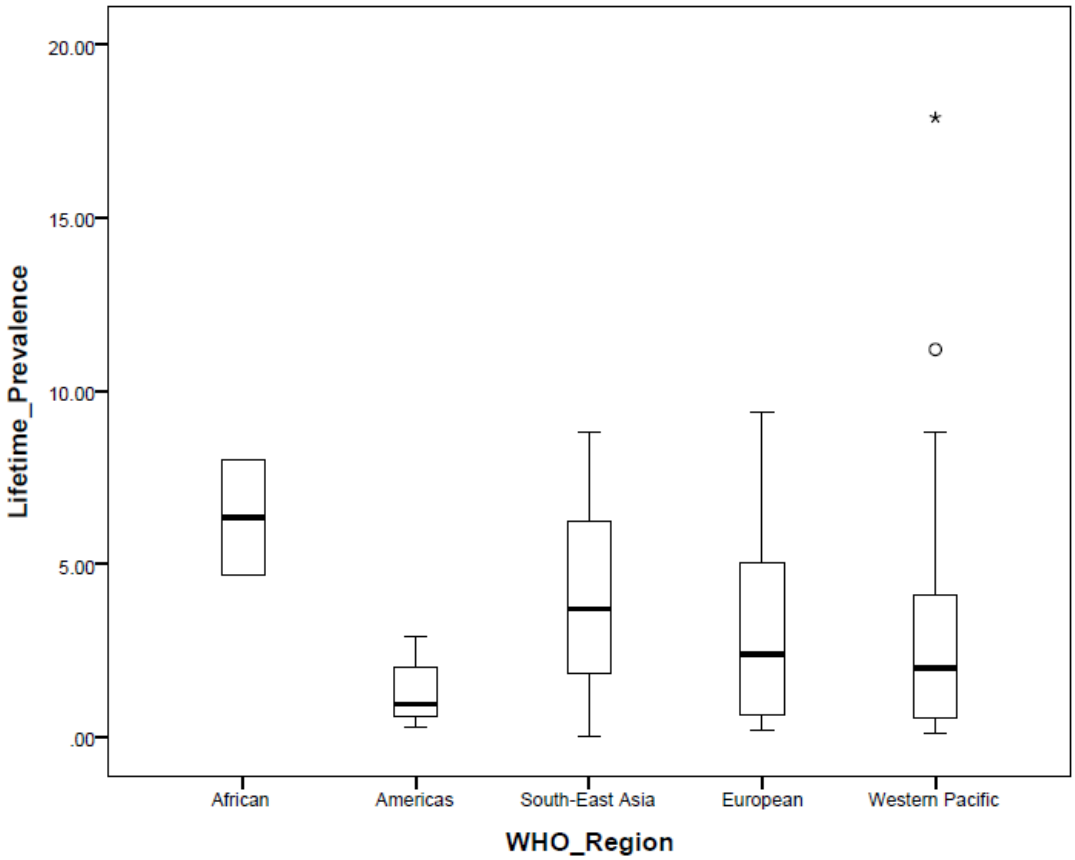


Figure 2. A boxplot showing the median lifetime prevalence per 1000 people, interquartile range, and points beyond these among WHO regions; N referring to the number of lifetime prevalence statistics found per WHO region (African n=2, Americas n=9, European n=27, South-East Asia n=4, Western Pacific n=37).

The results of the Kruskal-Wallis test show that the difference among DALYs lost in WHO regions was statistically significant ($X^2(6)= 108.58$, df = 5, $p < 0.001$; Figure 3). Additionally, post-hoc tests were conducted to determine which WHO regions were significantly different from each other, with a Bonferroni correction included (Table 1; Figure

4). For each WHO region, the mean DALY and 95% CIs were calculated: African Region ± 241.16 [239.76 to 242.56], Region of the Americas ± 250.33 [244.83 to 255.83], South-East Asia Region ± 280.27 [266.27 to 294.27], European Region ± 211.55 [203.15 to 219.95], Eastern Mediterranean Region ± 266.18 [260.22 to 272.02], and Western Pacific Region ± 271.49 [258.49 to 284.49].

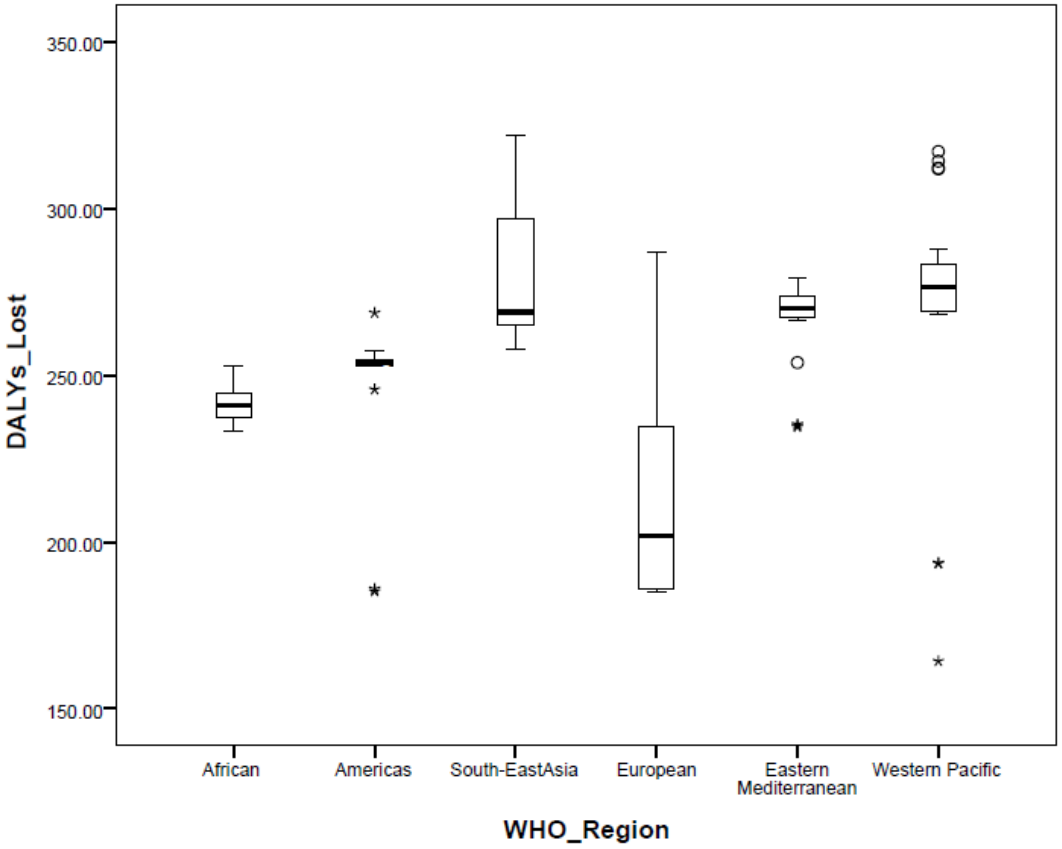


Figure 3. A boxplot showing the median Disability-Adjusted Life Years (DALYs) lost, interquartile range, and points beyond these among WHO regions; N showing the number of

DALYs lost statistics found per WHO region (African n=47, Americas n=35, Eastern Mediterranean n=22, European n=53, South-East Asia n=12, Western Pacific n=28).

Table 1. Results of the post-hoc tests, showing whether the observed difference between WHO region medians is statistically significant or not, and the direction of this difference.

WHO Region 1	WHO Region 2	Significantly Different?	WHO Region with Higher Median
African	Americas	No	Americas
	South-East Asia	Yes	South-East Asia
	European	No	African
	Eastern Mediterranean	Yes	Eastern Mediterranean
	Western Pacific	Yes	Western Pacific
Americas	South-East Asia	No	South-East Asia
	European	Yes	Americas
	Eastern Mediterranean	No	Eastern Mediterranean
	Western Pacific	No	Western Pacific
South-East Asia	European	Yes	South-East Asia
	Eastern Mediterranean	No	Eastern Mediterranean
	Western Pacific	No	Western Pacific
European	Eastern Mediterranean	Yes	Eastern Mediterranean
	Western Pacific	Yes	Western Pacific
Eastern Mediterranean	Western Pacific	No	Western Pacific

Region 1 ***Region 2***	**African**	**Americas**	**South-East Asia**	**European**	**Eastern Mediterranean**	**Western Pacific**
African	N	N	Y (2)	N	Y (2)	Y (2)
Americas		N	N	Y (1)	N	N
South-East Asia			N	Y (1)	N	N
European				N	Y (2)	Y (2)
Eastern Mediterranean					N	N
Western Pacific						N

Figure 4. A matrix showing significantly significant differences between two WHO regions in terms of DALYs lost (indicated by Y for a difference or N for no difference), and the direction of this difference (a (1) indicates that WHO region 1, shown in Italics, has the higher median DALYs lost; a (2) indicates that WHO region 2, shown in Bold, has the higher median DALYs lost).

5. Discussion

The results of the one-way ANOVA conducted on lifetime prevalence data show that in general, the lifetime prevalence of schizophrenia does not differ significantly across regions. This result supports the hypothesis that lifetime prevalence does not differ among WHO regions. It also supports previous research in the area, which stated that lifetime prevalence does not differ across regions (Jablensky, 2000).

There has so far been very little literature which suggests that lifetime prevalence of schizophrenia differs across regions. Prevalence is affected by the causes of schizophrenia (mentioned in Section 1), many of which are not related to country or culture, for example: genetic links (Nicodemus et al., 2008; Lewis et al., 2003; Badner & Gershon, 2002), biological sex, comorbidity with drug abuse disorders (Volkow, 2009), and stress. However, there are a few causes which appear to relate heavily to country and culture, including: viral infections such as influenza during pregnancy (Watson et al., 1999), low birth weight, hypoxia during birth (Nicodemus et al., 2008), and migration across countries in a person's or their ancestor's life (Cantor-Graae & Selten, 2005). Future research could potentially study countries and cultures which differ significantly in these factors to determine if there is a higher lifetime prevalence in places with more viral infections, lower birth weight, lower oxygen levels, and more migration. For now, the results of this study indicate that potentially these country- and culture-based causes have less of an effect than those causes not tied to country or culture.

There were two main categories of limitations to this study: limitations of the actual data itself, and limitations of how this study was conducted. Firstly, I will concentrate on the limitations of the research. There were 79 different lifetime prevalence statistics found across several different studies. Each of these studies gathered their data in different ways, such as using self-report data, surveys, census data, etc. Also, each study conducted their research on different populations within their country, such as the general population, populations in hospitals or institutions, etc. If the data came from an especially specific population then I tried to exclude that data, but often the researchers did not specify. Finally, the studies were conducted in different years, and within that the data found was also gathered in different

years. All of these factors could have contributed to a biased sample of lifetime prevalence data. There are also limitations to how this study was conducted. As this was a meta-analysis senior thesis conducted by one person in a time span of four months, there were not enough time, resources, or people to be able to thoroughly search for lifetime prevalence data. Though I tried my best to be as thorough as possible, I may have missed some data due to these reasons, potentially creating a biased sample. In future research, I would like to conduct the same study on lifetime prevalence with more time and resources.

There were huge gaps in the research on lifetime prevalence of schizophrenia across countries. With a more comprehensive set of data, I might have found different results. In the future, more research should be concentrated on those regions and specific countries which had no lifetime prevalence data thus far. In particular, this research should focus on the African Region, South-East Asia Region, and Eastern Mediterranean Region, for which I found two, four, and zero statistics respectively. A full table of which WHO regions and specific countries I found lifetime prevalence data for can be found in Appendices (Appendix A).

The Kruskal-Wallis test was used in lieu of a ANOVA when analysing DALYs lost, because when using the latter, Levene's $p < 0.05$. The results of the Kruskal-Wallis statistical test on DALYs lost show that there are significant differences among WHO regions. These results support the hypothesis that DALYs lost, and therefore prognosis, differ among regions. Post-hoc tests with a Bonferroni correction showed exactly which regions are different from each other (Table 1). There is no clear pattern of how the regions were divided. Although the results support my hypothesis, they did not support my predictions that the African Region, South-East Asia Region, and Eastern Mediterranean Region will generally have a better

prognosis than the Region of the Americas, European Region, and Western Pacific Region. However, there were some notable conclusions to be drawn from the data: The South-East Asia Region, Western Pacific Region, Eastern Mediterranean Region, and Region of Americas were all clustered together. Each of them was similar to the others in the cluster. All differed significantly from the European Region. The South-East Asia Region, Western Pacific Region, and Eastern Mediterranean Region were all significantly different than the African Region - only the Region of the Americas was similar to the African Region. The European Region was significantly different from every region, aside from the African Region. The African Region was less extremely separated from the other regions than the European Region, being significantly different from three regions: the South-East Asia Region, Eastern Mediterranean Region, and Western Pacific Region. It was similar only to the European Region, and the Region of the Americas. The WHO regions, ordered from highest median DALYs lost to lowest, are listed here: Western Pacific Region, Eastern Mediterranean Region, South-East Asia Region, Region of the Americas, African Region, and European Region.

There are several reasons for the general difference among WHO regions which I have detailed before (in Section 2.3): cultural differences in support systems, cultural stigma against mental illness, length of time a person spends without diagnosis and treatment, and economic development of a country. Although the results of the post-hoc test do not support my specific predictions, I do still think these cultural factors have a huge influence on the prognosis of people with schizophrenia. Perhaps the wide variety of cultures within the WHO regions had more of an effect than anticipated, causing the regions to cluster together in ways I did not predict. More research should be conducted to understand why the WHO regions cluster in the ways detailed above.

Since I have shown the research in these areas already, this section will focus more on why these factors influence prognosis. Firstly, research has shown that support and community are very important factors in prognosis (Elsheshtawy & Elez, 2011). Since schizophrenia is a disorder categorised by social isolation and stereotyped as dangerous, perhaps increasing support can lessen some isolation and detachment symptoms and provide the resources necessary to cope with daily life. Perhaps different countries and cultures within regions vary more than among regions. Secondly, previous literature has shown that stigma against mental illnesses can lead to poorer prognoses (Mascayano et al., 2016). Stigma can lead to systemic negligence of treatment of schizophrenia, and ostracisation of people with the disorder. This can lessen social support and treatment, leading to a worse prognosis. More research should be done within specific countries to see how stigmatised mental illness is. Thirdly, research has found that the longer a period of time that a person spends undiagnosed, the worse the prognosis for that person (Banerjee, 2012). This could be because the person spends longer without treatment. It also could be because the social isolation symptom of schizophrenia causes people to have a smaller social support system, and once again, maybe different countries and cultures within regions vary more than among regions. Fourthly, research has shown that people with schizophrenia in developing countries have better prognosis than people in developed countries. There is a difference of 40% recovery in developing countries to 25% recovery in developed countries (Torrey, 1988). I hypothesise that this could be due to developing countries having more social support and community, which has previously been shown to be linked to better prognosis. Once again, this may differ among countries within regions. Future research should concentrate on these factors, particularly social support (which seems to be a common theme in every factor), and exactly

how and why they influence schizophrenia within specific countries - especially those with little to no research thus far. This information could be used to improve the prognosis of people living with schizophrenia everywhere.

There were limitations to this part of the study also. DALYs lost were measured all in one year by WHO. Thus far no other organisations or studies have attempted to update this research, or just generally gather more statistics. The fact that the data were calculated by one organisation in one time period could mean that the data are biased. More research should be done on DALYs lost across regions. Additionally, future research should concentrate on other ways to quantify prognosis, rather than just DALYs.

One argument that has been used in the past to explain why prognosis of people with schizophrenia differs across regions is that prevalences also differ across regions. In short, if different regions have different prevalences, then it surely follows that they will have different prognoses also. However, the results of this study show that lifetime prevalence is constant across regions, but prognosis still differs. This finding cannot speak for other types of prevalence, but other literature does imply that all types of prevalence remain constant across countries (Bhugra, 2005).

This study was advantageous in several ways. It is a recent meta-analysis, which are rare for this topic, and it gathered data on both prevalence and prognosis, which few recent studies do. In addition, it relates prevalence and prognosis data and explains the implications of having prevalence be constant across regions whilst prognosis is not. Furthermore, I strived to be as unbiased as possible in seeking out data for prevalence and prognosis, despite the data itself being biased.

Research on the lifetime prevalence and prognosis of schizophrenia would greatly benefit from more cross-cultural research. Future research should specifically concentrate on gathering more lifetime prevalence statistics from under-represented countries and regions and on further understanding why the prevalence does not differ across countries. Future research should also concentrate on understanding why prognosis differs across regions, and finding more ways to quantify prognosis. One way to do this is getting more data on specific countries, and finding out how they fare in the four regional factors mentioned previously. A very important application of this future research in prognosis is creating new treatment regimens based on facets of those regions and countries which have better prognosis (though much more thorough research is required before this becomes a feasible goal). As mentioned before, historical treatments of schizophrenia have been proven to be ineffective, and improving treatments for schizophrenia should be a central goal of future research.

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8. Appendices

Appendix A

Table 2. A summary of all the data on lifetime prevalence that could be found, organised by WHO region.

WHO Region (Country)	**Lifetime Prevalence**	**Author, Year**
African (Ethiopia)	4.70	Kebede et al., 2003
African (General Sub-Saharan)	3.00	Baingana & Bos, 2006
Americas (Canada)	0.30	Warner & de Girolamo, 1995
Americas (USA)	2.90	Warner & de Girolamo, 1995
Americas (USA)	2.00	Warner & de Girolamo, 1995
Americas (Canada)	2.10	Warner & de Girolamo, 1995
Americas (Canada)	0.55	Ayuso-Mateos, 2006
Americas (USA)	0.70	Ayuso-Mateos, 2006
Americas (Chile)	0.95	Ayuso-Mateos, 2006

Americas (Canada)	0.60	Noaghiul & Hibbeln, 2003
Americas (USA)	1.30	Noaghiul & Hibbeln, 2003
South-East Asia (India)	3.70	Warner & de Girolamo, 1995
South-East Asia (India)	0.03	Elnagar, Maitra, & Rao, 1971
South-East Asia (Thailand)	3.80	Phanthunane et al., 2010
South-East Asia (India)	3.70	Eaton, 1985
European (Denmark)	3.30	Warner & de Girolamo, 1995
European (Denmark)	3.20	Warner & de Girolamo, 1995
European (Denmark)	2.70	Warner & de Girolamo, 1995
European (Finland)	4.30	Warner & de Girolamo, 1995
European (Germany)	2.40	Warner & de Girolamo, 1995
European (Germany)	2.20	Warner & de Girolamo, 1995

European (Germany)	2.30	Warner & de Girolamo, 1995
European (Iceland)	6.00	Warner & de Girolamo, 1995
European (Iceland)	0.40	Warner & de Girolamo, 1995
European (Norway)	5.60	Warner & de Girolamo, 1995
European (Sweden)	9.40	Warner & de Girolamo, 1995
European (Sweden)	5.10	Warner & de Girolamo, 1995
European (Sweden)	5.00	Warner & de Girolamo, 1995
European (Sweden)	0.70	Warner & de Girolamo, 1995
European (Scotland)	4.20	Warner & de Girolamo, 1995
European (Russia)	5.30	Warner & de Girolamo, 1995
European (Netherlands)	0.35	Ayuso-Mateos, 2006
European (Iceland)	0.35	Ayuso-Mateos, 2006

European (Israel)	0.75	Ayuso-Mateos, 2006
European (Italy)	5.20	de Salvia et al., 1993
European (Denmark)	2.70	Eaton, 1985
European(Spain)	1.70	Noaghiul & Hibbeln, 2003
European (Greece)	0.20	Noaghiul & Hibbeln, 2003
European (Iceland)	0.30	Noaghiul & Hibbeln, 2003
European (UK)	0.40	Noaghiul & Hibbeln, 2003
European (Germany)	0.60	Noaghiul & Hibbeln, 2003
European (Israel)	0.70	Noaghiul & Hibbeln, 2003
Western Pacific (Japan)	3.80	Warner & de Girolamo, 1995
Western Pacific (Japan)	3.20	Warner & de Girolamo, 1995
Western Pacific (Japan)	4.10	Warner & de Girolamo, 1995

Western Pacific (Japan)	2.20	Warner & de Girolamo, 1995
Western Pacific (Japan)	2.10	Warner & de Girolamo, 1995
Western Pacific (Japan)	2.40	Warner & de Girolamo, 1995
Western Pacific (Japan)	7.40	Warner & de Girolamo, 1995
Western Pacific (Japan)	11.20	Warner & de Girolamo, 1995
Western Pacific (Japan)	2.80	Warner & de Girolamo, 1995
Western Pacific (Japan)	5.00	Warner & de Girolamo, 1995
Western Pacific (Japan)	4.70	Warner & de Girolamo, 1995
Western Pacific (Japan)	3.80	Warner & de Girolamo, 1995
Western Pacific (Japan)	4.70	Warner & de Girolamo, 1995
Western Pacific (Japan)	3.50	Warner & de Girolamo, 1995
Western Pacific (Japan)	1.90	Warner & de Girolamo, 1995

Western Pacific (Japan)	17.90	Warner & de Girolamo, 1995
Western Pacific (China)	5.70	Warner & de Girolamo, 1995
Western Pacific (Taiwan)	3.10	Warner & de Girolamo, 1995
Western Pacific (Taiwan)	0.90	Warner & de Girolamo, 1995
Western Pacific (Taiwan)	2.00	Warner & de Girolamo, 1995
Western Pacific (Taiwan)	2.50	Warner & de Girolamo, 1995
Western Pacific (Hong Kong)	1.25	Chang et al., 2017
Western Pacific (Taiwan)	0.30	Ayuso-Mateos, 2006
Western Pacific (China)	0.55	Ayuso-Mateos, 2006
Western Pacific (China)	0.49	Xiang et al., 2008
Western Pacific (China)	0.39	Chan et al., 2015
Western Pacific (China)	0.57	Chan et al., 2015

Western Pacific (China)	0.83	Chan et al., 2015
Western Pacific (South Korea)	0.35	Ayuso-Mateos, 2006
Western Pacific (Hong Kong)	1.25	Ayuso-Mateos, 2006
Western Pacific (New Zealand)	0.35	Ayuso-Mateos, 2006
Western Pacific (Taiwan)	1.40	Eaton, 1985
Western Pacific (Taiwan)	0.90	Eaton, 1985
Western Pacific (Hong Kong)	0.10	Noaghiul & Hibbeln, 2003
Western Pacific (Taiwan)	0.30	Noaghiul & Hibbeln, 2003
Western Pacific (New Zealand)	0.30	Noaghiul & Hibbeln, 2003
Western Pacific (Australia)	0.50	Noaghiul & Hibbeln, 2003

Appendix B

Table 3. Factors that influence schizophrenia which are not necessarily related to cultural differences (Torrey, 1988).

Factor Affecting Prognosis	**Good Prognosis**	**Poor Prognosis**
Age of onset	Younger	Older
Gender	Female	Male
Family history of mental illness, including schizophrenia	No mental illness (except depression or manic-depressive psychosis)	History of mental illness is present
Suddenness of onset	Sudden	Gradual
Number of stressful life events	Several	Few
Symptom types	Positive symptoms	Negative symptoms
Initial response to medications	Good	Poor
Independence	Ability to function in society	Difficulty living outside of structured institutions