

# **Schizophrenia and Other Psychotic Disorders in Guam: Revisiting Selten and Cantor-Graae's Hypothesis on Social Defeat**

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## **Abstract**

Recent research indicates elevated incidence rates for all psychotic disorders among ethnic minorities and migrants populations across Europe and in several other countries. The differences in rates cannot be explained by genetic predisposition. In addition, there is some evidence suggesting that the pathways to the onset of psychotic disorders involve complex interactions between individual biological processes with that of the social environment. The variability in incidence rates and the particularly high rates in some populations have prompted researchers to examine socio-environmental risk factors that may be implicated in the biogenesis of psychosis. Researchers Selten and Cantor-Graae in their studies with animals suggest that the neurological responses in defeated animals resemble the neurological activity in individuals with psychoses. The current paper reviews some of the literature on psychotic disorders, discussing the conceptual framework of the social defeat hypothesis and its application to Guam's population. In addition, implications for future research and proposed directions for mental health services in Guam are highlighted.

## **Introduction**

Psychotic disorders including schizophrenia are among the top 10 causes of disability in developed countries worldwide according to the World Health Organization (WHO, 2001). An estimated prevalence of 1.1% of the adult population translates to over 50 million people around the world suffering from schizophrenia at any given time. Psychotic disorders such as schizophrenia are a group of mental illnesses that are characterized by a psychological break from reality, denoting one or more symptoms of hallucinations, delusions, disorganized speech, odd perceptions and sometimes bizarre behaviors (American Psychological Association, 1994). Each year, 1.5 million people are diagnosed with schizophrenia around the world. In terms of financial cost in the U.S. alone, schizophrenia consumes \$63 billion a year in terms of direct services, social services, and institutionalization, according to the National Institute of Mental Health (NIMH). The non-monetary loss to families and society at large is immeasurable.

Prognosis for individuals with schizophrenia in developing countries is often better than in developed nations. Researchers suggest that community integration of individuals with mental disabilities is often more likely where institutionalized rehabilitation is not economically feasible. A large scale epidemiological study in ten countries (WHO, 2001) determined that the prognosis for individuals with schizophrenia is significantly improved for those in developing nations where individuals with psychosis reside with family members (Jablensky et al., 1992; Leff et al., 1992). Better outcomes were found when there was high family involvement and community integration of those with schizophrenia in Europe as well (Schomerous, Heider, Angermeyer, Bebbington, Azorin, Brugha, & Toumi, 2006).

Rates of psychoses in the Pacific islands region yield contrary results regarding prevalence, however (Hezel & Wylie, 1992; Sullivan, Allen, & Nero, 2007). The Micronesian island of Palau has a prevalence of 16.7 per 1000 persons. At 1.7%, Palau has one of the highest prevalence rates in the world with a male to female ratio of 4 to 1 respectively (Hezel & Wylie, 1992; Sullivan et al., 2007). While researchers have not been able to identify bio-behavioral markers to explain the high prevalence rates in Palau, Sullivan and colleagues (2007) suggested the high number of males with schizophrenia may be associated with the interplay between genetics and socio-cultural variables that require further investigation.

An incidence study conducted in Guam using a three year cohort determined that Chamorros, Guam's indigenous group, had an incidence rate ratios (IRR) of psychosis almost double that of Whites or Asian groups (Chamorro IRR=1.06; Whites IRR=0.63; Asian IRR=0.59) while groups from other Micronesian islands (Chuukese IRR=2.62; Palauan IRR=7.16; other Pacific Islander IRR=1.98) had even higher rates of psychosis (Sharma-Gopinath, 2010).

The variability of psychosis rates among ethnic groups is not a new phenomenon and appears to be consistent with findings by recent studies conducted in Europe including several meta-analyses. A meta-analysis published in the *American Journal of Psychiatry* in 2005 reviewed and synthesized 18 published studies from 1977 to 2003 on schizophrenia and migration in Europe. The results confirmed a relatively higher risk for all immigrant groups compared to natives (Cantor-Graae & Selten, 2005). Another study that followed the meta-analysis continued to confirm these findings (Selten & Cantor-Graae, 2007). The perplexing aspect about such variability is that biogenesis does not explain these differences. While family history continues to be the primary marker for increased risk, specific genetic pathology has yet to be identified in the etiology of psychotic disorders (Lewis, Levinson, & Wise, 2003).

Interestingly, migration has been determined to be one of the strongest predictors for developing schizophrenia and other psychotic disorders (Cantor-Graae & Selten, 2005; Selten & Cantor-Graae, 2007). Even further, the impact of migration is evident in the offspring of migrant individuals who have a substantially higher risk for psychosis compared to offspring of native-born individuals (Cantor-Graae & Selten, 2005; Selten & Cantor-Graae, 2007). A recent study comparing Mexican Americans and Mexicans in Mexico on psychotic symptoms yielded higher rates of psychosis for second generation Mexicans in the U.S. as compared to those in Mexico (Vega, Sribney, Miskimen, & Aguilar-Glaxiola, 2006). The higher risk for "second generation migrants" remains somewhat of an anomaly to the researchers since children of immigrants do not directly experience stressors associated with migration as their immigrant parents did (Cantor-Graae & Selten, 2005). The most remarkable feature of the "migration and psychoses" studies is that they challenge the heritability of psychosis as the sole explanation for its etiology. Recent attention on ethnic minority populations in Europe was ignited when increased rates for psychotic disorders were reported for African-Caribbean immigrants to the United Kingdom (Bhugra, Leff, Mallet, Der, Corridan, & Rudes, 1997; Fearon, Kirkbride, Morgan, Dazzan, Llyod, Huthinson, Tarrant, Fung, Holloway, Mallet, Harrison, Leff, Jones, & Murray, 2006). Simultaneously, higher rates were reported for other ethnic groups migrating to Denmark, Sweden, and Netherlands (Cantor-Graae & Selten, 2005). However, the Surinamese in the Netherlands have a five times higher incidence of schizophrenia than Dutch natives in the

Netherlands but similar risk is not indicated for individuals in Surinam (Selten, Zeyl, & Dwarkasing, 2005). Similar findings have resulted from studies conducted in the Caribbeans and the islands of Trinidad, Jamaica, and Barbados in which higher risk for schizophrenia is not indicated in the places of origin (Bhugra, 2004; Bhugra, Hilwig, & Mallet, 2000; Hikling & Rodgers-Johnson, 1995; Mahy, Mallet, Leff, & Bhugra, 1999). The increased risk for psychotic disorders observed in developed host countries in which migrant or ethnic minority status is indicated for the at-risk groups is simply not paralleled in sending countries (Cantor-Graae & Selten). And while migration is one of the risk factors that has received much attention in research recently, there is no conclusive understanding about its underlying processes or the role of psychosocial markers associated with migratory history that increase the risk for psychosis. The deductive understanding from the migration studies point toward an interaction between individuals at risk and the host environment. Even with the possibility of genetic predisposition, the question becomes, what is it about the host environment or the new environment that increases the vulnerability to the expression of the illness, that which is absent in a different environment? Researchers have identified several ecological factors that mediate or moderate the causal pathways to the increased risk of psychotic disorders.

Among ecological risk factors, several studies indicate significant correlations between psychosis and unemployment, urbanization, poverty, perceived discrimination, family dysfunction, and poor housing conditions (Cantor-Graae & Selten, 2005; Selten & Cantor-Graae, 2007). The causal direction of these factors is not always clear, but first onset incidence studies suggest these variables exacerbate risk in vulnerable individuals (Cantor-Graae & Selten, 2005). Neighborhood characteristics are highly associated with mental health. A recent Chicago based study controlling for demographic effects demonstrated a significant relationship between residential deterioration and mental health mediated by social contact, fear of crime, and social capital (Kruger & Gee, 2007). A study in the Netherlands demonstrated that social capital, defined as voting percentages per district, was highly associated with psychosis and psychiatric hospitalization (Lofors & Sundquist, 2007). A British study recently demonstrated that ethnic segregation, deprived neighborhoods, and poor voter turnout was significantly associated with risk for psychoses (Kirkbride, Morgan, Fearon, Dassin, Murray, & Jones, 2007). A 2008 study conducted in a deprived area of inner London by Coid, Kirkbride, Barker and associates strongly supported the socio-environment component in the onset of psychosis. The researchers also wanted to determine if the increased risk for ethnic minorities included both affective and non-affective psychosis (Coid et al., 2008). Their results indicated that elevated risk for psychotic disorders varied significantly between all ethnic minority groups and proposed several explanations for their findings. They discussed the effects of discrimination, social segregation, social defeat, and the buffering effects of social cohesion (Coid et al). The Asians (comprised of Pakistanis, Indians and Bangladeshis in this study) exhibited greater levels of cohesion within their ethnic groups. The shared culture, religion, and structure in the Asian communities provided the social networks and support for its members who otherwise may experience similar levels of discrimination as other ethnic minority groups in the UK (Coid et al, 2008). Another interesting observation was the higher rates of psychosis among Asian females. The authors suggested that one possible explanation is that this group is particularly at risk for social defeat given that in

these Pakistani, Indian, and Bangladeshi women are marginalized and hold a subordinate status even within their communities (Coid et al.).

A number of current studies provide evidence in the implication of socio-environment factors in the onset of psychosis. However, underlying these ecological factors are the subtle mechanisms that are more difficult to measure due to the complexity and non-static nature of social processes. Of the few hypotheses have been used to explain the increased rates of psychotic disorders in ethnic minority groups or individuals with history of family migration, the social defeat hypothesis provides a viable perspective into the complex interactions between social environment and onset of schizophrenia. Social defeat may be one component of multiple social adversities that work synergistically with other ecological and neuro-developmental risk factors in the socio-development of psychotic disorders (Morgan, Charalambides, Hutchinson & Murray, 2010).

### **Social Defeat and Subordinate Status**

Researchers Selten and Cantor-Graae (2007) suggested that social competition and social comparison rather than poverty are the viable explanation for the increased risk of psychosis in ethnic minority groups. For example, living in Bangladesh on a low income is different from having a low socio-economic status in a European city where others are more affluent in comparison. They theorized that the experience of humiliation underlies the mechanisms that produce adverse neurological responses. Utilizing studies with defeated animals (rats), they hypothesized that the chronic experience of social defeat can produce similar behavioral responses in patients with schizophrenia (Selten & Cantor-Graae, 2005). In their papers, they described social defeat as a subordinate position or an outsider status. The defeated animal research demonstrated that when an intruder (male rat) is placed into the cage of a resident (male rat), the intruder is attacked by the resident and forced to exhibit submissive behavior. Repeated experience of defeat for the intruder rat leads to behavioral sensitization with an enhanced behavioral response to dopamine agonists. According to Selten and Cantor-Graae (2007), “since neuro-imaging studies have demonstrated that amphetamine induced dopamine release is increased in neuroleptic naïve schizophrenic patients, these patients resemble aspects of the defeated animals” (p. 12).

While a minority status in itself is a position that may increase subjugation to discrimination and propensity for clinical misdiagnosis, individuals with an “outsider status” must come to terms with their new identity in the host environment. These individuals must make decisions about the extent to which they will assimilate and participate in the dominant culture. Acculturative stress, fragmentation of families, social isolation, and reassessment of self identity are common themes for these subgroups (Bhugra, 2004). Ethnic minorities and immigrants continuously struggle to achieve social status in the new social hierarchy. The gap between their expectations and contextual reality leads to chronic stress (Murphy & Mahalingam, 2006).

## **Acculturative Stress**

Acculturation is the process by which groups with different cultures come into contact with each other, and as a result, either or both cultures experience change (Berry, 2003). While acculturation implies a two way process, in reality, it often pertains to the adjustment process of the indigenous, transients, immigrants, and minorities who accommodate to the cultural norms of the dominant group. Acculturative stress refers to the stress experienced by individuals when transitioning and adapting to a new culture. Acculturative stress has often been correlated with negative mental health consequences, social difficulties, and somatic problems (Berry, 1998; Hwang, Myers, Abe-kim & Ting, 2007). Cultural assimilation refers to a more unilateral process by which an individual in a new environment gradually adopts the characteristics of the people in the new environment and abandons their culture of origin. There is a growing body of literature indicating that cultural assimilation has detrimental effects on health and mental health (Berry, 1998; Escobar, Nervi & Gara, 2000; Hwang et al., 2007; Vega et al., 2006). However, the cumulative effects of acculturative stress are also highly problematic for immigrants and colonized populations who must repeatedly negotiate the extent of participation in the culture of the dominant group (Berry, 1987; Beckerman & Corbett, 2008; Cheung-Blunden & Juang, 2008). While no study has examined the relationship between acculturation and psychosis specifically, the increased risk for psychosis in subordinate, marginalized, immigrant, and minority groups provides a compelling rationale for researchers to explore the potential moderating effects of acculturation in the onset of psychosis.

Other theories on the mechanisms that contribute to the high risk of psychoses in immigrants and ethnic minorities have been proposed by several researchers. Bhugra's model explored the complex interlinks between the effects of migration on mental health (Bhugra, 2004). The author suggests that the propensity for migratory and social environment factors to impact psychosis may not be immediate (Bhugra). As Bhugra stated, the Norwegian sample in Odegaard's 1932 study had higher rates of psychosis when they had lived in the U.S. for over 10-12 years. The author explored the various processes that can synergistically impinge on individuals. Common themes for at-risk individuals involved transitioning from collectivist cultures to individualistic or egocentric host environments, experiences of discrimination or racism, and feelings of alienation and isolation, compounded by family fragmentation, low self esteem, deculturation, and dejection (Bhugra, 2004). Bhugra suggested that the chronic stress of negotiating identities of the self on a personal, familial, interpersonal, and macro level may ultimately lead to the "split of the self" and cause schizophrenia.

## **Discrimination**

Perceived racial discrimination was significantly correlated with psychoses in a study which explored racism and mental disorders in ethnic minorities in England (Karlsen, Nazroo, McKenzie, Bhui, & Weich, 2005). Prevalence of psychoses was highly associated with reports of verbal abuse, racial attack or perception of employer racism (Karlsen & Nazroo, 2002). Continuous exposure to racial discrimination, whether real or perceived, leads to feelings of helplessness, disempowerment, anger, and paranoia (Hwang et al, 2007). Increased risk of

psychoses for non-white ethnic minorities was associated with experiences of discrimination in a study in the Netherlands (Veling, Selten, Susser, Laan, Mackenbach, & Hoek, 2007). Racism and discrimination were associated with delusional ideation with a dose response effect in another study in which the greater the number of discriminating experiences an individual reported, the more delusional ideation was observed (Janssen, Hanssen, Bak, Bijl, Graaf, & Vollebergh, 2003). Some researchers argue that the direction of the association between discrimination and delusions is difficult to determine since individuals with paranoid delusions are more inclined towards persecutory ideation (Selten et al., 2007). However, evidence exists to demonstrate that ethnic minorities who do not present with psychosis also experience distress due to racism and discrimination (Jarvis, 2007). Racial discrimination in North America impacts friendships, marriages, residence, employment, and income (Feagin, 2000; Reitz & Breton, 1998). Race and ethnicity are also correlated with differences in mortality, morbidity, and health related behaviors in the U.S. (Singh & Siahpush, 2002). While each of the regions described have unique socio-cultural and ecological environments and the experiences of unique cultural groups cannot be grossly generalized, it is evident that the detrimental effects of discrimination are universal. Whether such an impact is substantial enough to mediate the mechanisms that underlie psychoses is an area which needs further investigation. However, increasing evidence demonstrating the effects of ethnic disadvantage and societal marginalization on mental health suggest that such influences cannot be underestimated in the onset of psychosis. Furthermore, in a recent case control matched study, researchers found that non-Western migrants in the Netherlands with a psychotic disorder were more likely to have a negative ethnic identity or lack of affinity to one's ethnic group. The authors suggested that a lack of positive self identity may lead to increased vulnerability towards experiences of discrimination (Veling et al. 2009). It is possible that marginalization in which an individual feels alienated from the dominant culture but has lost touch with the culture of origin add further stress and exacerbate stress induced psychotic symptoms. In reference to the social defeat hypothesis, it appears that chronic adverse social experience may be implicated in the pathogenesis of psychotic disorders.

In reviewing the literature on schizophrenia and the social environment, this paper conceptually examines the application of the social defeat hypothesis in understanding the remarkably high rates of psychosis observed in some groups in Guam and discusses the need for further research.

### **Heterogeneity in Psychosis Incidence Rates among Ethnic Groups in Guam**

A recent study conducted in Guam found statistically significant differences in the incidence rates of psychoses among various ethnic groups (Sharma-Gopinath, 2010). However, unlike studies conducted in European countries, the Chamorros (native group) were at greater risk for psychoses than whites (European Americans), Filipinos and other Asians (non native groups). Furthermore, the Micronesians were at greatest risk for psychotic disorders compared to all other ethnic groups. To understand these differences in rates necessitates a closer examination of the social conditions prevalent for these groups in Guam. The primary indicators used to determine marginalized status in this research were based on homelessness, police arrests, income and education statistics. While social defeat and marginalization are best conceptualized

in broader terms, in order to statistically test the hypothesis, an Index of Inequality developed by Burns & Esterhuizen (2007) was utilized. This index was useful in assessing the effects of social comparison rather than just poverty. The correlation between indicators of marginalization (education, income inequality and police arrests) and the incidence of psychotic disorders were strongly associated for 4 major ethnic group categories (Micronesians, Chamorros, Asians and Filipinos, Whites and Others). The study revealed a relatively high rate of psychotic disorders among people from several Micronesian populations (Sharma-Gopinath, 2010). Individuals from the Republic of Palau were at the highest risk with an incidence rate ratio (IRR) of 7.2 for every 1000 persons in 464,272 person-years. Individuals from the Chuuk Islands, one of the fastest growing immigrant populations in Guam, revealed the second highest risk at an IRR of 2.6 per 1000 persons. Individuals from other Micronesian and Pacific island states were also at a high risk with a combined IRR of 2.0 per 1000 persons.

However, a dose response for ethnic proportion was not observed. Not all ethnic groups that comprised a smaller proportion of the population had higher incidence of psychotic disorders. For example, individuals of African, Hispanic, or European descent made up a very small percent of the island's population, but were not represented in the risk for developing psychotic disorders. People of Asian and European descent were at a relatively lower risk, 0.56 and 0.63 (IRR) respectively, despite the fact that they also make up a smaller proportion of the population. The low proportions of an ethnic group in the population did not explain the incidence rates for all ethnic groups. The Chamorros, Guam's indigenous group who make up 37% of the population, had an IRR of 1.06, which is almost twice compared to Filipinos (IRR = 0.55), Asian (IRR=0.56), and Whites (IRR=0.63). The pattern of incidence in the population suggests that more complex socially mediated pathways may account for the inter-group variance. There appears to be an effect of minority status, more in terms of social class.

The ethnic groups most represented in the incidence of psychotic disorders were of Micronesian descent, non-native to Guam (Sharma-Gopinath, 2010). Some researchers have suggested that the migration to Guam is an advantageous endeavor for Micronesians in that they earn higher wages in Guam than in their native islands, they have more opportunity for employment and education in Guam, better access to medical care, and the proximity to home allows them to travel periodically to keep in contact with their familial networks (Marshall, 1995). Cumulatively, however, the Micronesians had the lowest income, lowest wages, lowest levels of education, highest number of arrests in proportion to their population, high levels of homelessness or living without reasonable or adequate amenities (i.e., running water, electricity), and overcrowding in homes (U.S. Census 2000).

In addition, while limited studies have explored the experience of the Micronesian migrant to Guam, there are documented reports of experienced or perceived discrimination by Micronesians in Guam (Smith, 1994). An increase in migration from the Federated States of Micronesia and the Republic of Marshall Islands resulted from the Compact of Free Association signed by these island states and the United States in 1986. A report by Smith (1994) in a survey of Micronesians assessed their coping and access to basic resources. The report was probably one of the few documented works that demonstrated the extent of difficulties experienced by Micronesians in Guam. The study interviewed 235 Micronesians and revealed that immigrants from these islands identified housing as their primary unresolved problem. Among other major

concerns were untreated medical conditions, transportation, unawareness of Guam's laws, victimization of crimes, inability to hold on to jobs, and cost of living (Smith, 1994). Of further interest, immigrants who demonstrated more difficulty in coping also expressed language barriers, perceived discrimination, "feeling unwelcomed by Guam residents" and lacking knowledge or access to public agencies. Micronesian men in this study were in particular distress over housing and employment. Few of the participants in the study gave examples of discrimination, such as being publically criticized or "scolded" at place of employment for which another ethnic employee was not; poor service or "sarcasm" at public agencies, and other such experiences. Micronesian individuals who coped better had more family or friends in Guam for support (Smith, 1994). Anthropological researchers, in their review of Micronesian migration, revealed some of the intergroup conflicts that have followed the compact impact treaty at social and legislative levels (Dobbin & Hezel, 1996; Rubenstien, 1991). However, a study by Turk-Smith (1993) assessing attitudes of Guam residents towards Micronesian immigrants, suggested mixed feelings of apprehension and acceptance. Residents were concerned about the effect of shared economic resources, infrastructure, observed behaviors of Micronesians, and fear of loss or change in their own culture (Turk-Smith, 1993). Certainly, concern over burdening the economy has been raised in Guam's legislature on several occasions by various locally elected officials (Dobbin & Hezel, 1996).

Problems with transportation, health care and alienation have been reported for Micronesians in Guam (Guam Bureau of Statistics, 2005; Smith, 1994). In addition, social problems such as alcoholism are indicated in Micronesian males and alcohol related domestic violence is also indicated (Guam Police Reports, 1999 to 2007). Chuukese and Chamorro males, specifically, have the highest rates of suicides in Guam (DMHSA, 2009).

Interestingly, however, the role of poverty and economics in relation to psychosis continues to be multi-faceted. While the Chuukese and other Pacific Islanders were over-represented in low socio-economic conditions, the high rates in Palauans were not explained by poverty measures. In review of the census data (U.S. Census, 2000), the Palauans in Guam were employed more in higher managerial or supervisory occupations, had higher wages, and had higher educational attainment compared to other Micronesians but lower to other ethnic groups. It is possible that the discrepancy between desired goals and goals attainment is more stress inducing in people who are inclined to move up the social ladder, but further investigation of stress mediated social processes is needed.

Palauans had the highest incidence rate for psychosis in this study. However, Palauans have a high rate of schizophrenia in the island of Palau (Hezel & Wylie, 1992; Sullivan et al., 2007). While it is difficult to make a direct comparison of the prevalence (studies from Palau) and incidence rates (Guam study), it appears that rates are high for Palauans both in Palau and in Guam. It is important to note that the studies conducted in Palau utilized a broad definition of schizophrenia. Authors Hezel and Wylie (1992) suggested that the onset of schizophrenia was associated drug use in their sample. The use of high potency cannabis has been strongly associated with broadly defined psychosis in yet another study (Di Forti, Morgan, Dazzan, Pariante, Mondelli, et al., 2009).

The Guam sample, based on clinical diagnosis, excluded all cases of substance induced delirium or psychotic symptoms in its analysis primarily because active substance use may have

presentation that resembles psychotic disorders (Sharma-Gopinath, 2010). The neurological damage caused by substance use may also resemble the flat affective states of prodromal stages of schizophrenia or schizophrenia symptoms. However, the co-morbidity of substance abuse problems and psychotic disorders is generally high as those with mental illness attempt to self-medicate or cope with their condition (Belleck, Bennett, Gearon, Brown & Yang, 2006). Despite methodological differences among studies, the high rate for schizophrenia in Palauans is significant enough in both studies to warrant further research.

It is also important to note Palauans have a high outbound exodus from Palau and a high return to Palau. The move away from home and culture of origin involves acculturative processes and acculturative stress as one adapts to a new host environment. Once a person has acculturated, moving back home involves a process of readjustment, integrating the new formed identity with the original self concept. An in-depth study of their social experiences in Palau and in their outbound exodus is warranted. Further research is needed to determine the effects of migration on schizophrenia in this group. It is possible that migratory and social experiences mitigate the pathways of stress that lead to psychotic symptom eruption in already vulnerable individuals.

Asians in Guam are the least researched ethnic groups in Guam. Statistics or literature on any of the Asian groups in Guam was not readily available. Asians are comprised of U.S. citizens, or Asian Americans, and recent migrants from the Asian sub-continent. Not including Filipinos, these ethnic groups make up 6.2% of Guam's total population. However, they have a strong presence in commerce and industry, as many of the developers, contract workers, and entrepreneurs are represented in this segment of the population. IRR for psychotic disorders in Asian group was 0.63 for every 1000 person in the population which was comparatively lower than other ethnic groups. One possible explanation is that Asians are better acculturated in Guam but studies have not been conducted. Asians in Guam also have higher socio-economic status and have economic resources to travel to countries of origin. Air travel within Micronesia is often higher in cost than to neighboring countries like the Philippines, Japan, South Korea and China. There are several Asian and Filipino television stations, film rental shops, and literature readily available in Guam. In addition, Asian restaurants and groceries are numerous. For Micronesians, the move to Guam from remote islands often involves more severe processes of adaptation. Furthermore, Asians are perceived by others to be more affluent compared to Micronesians and may experience better treatment. Further investigation is needed to ascertain these possible explanations.

Filipinos and other Asians have low rates of mental disorders in Guam. The incidence rate ratios of psychotic disorders for Filipinos and other Asians were lower than other ethnic groups in the study (Sharma-Gopinath, 2010). An exploration of resiliency factors, social networks and support, self concept and identity constructs, and social experiences will help us understand the protective mechanisms involved in disease-environment interactions. Caucasians or Whites (including but not limited to European-Americans) consisted of a mixed socio-economic group (Guam Bureau of Statistics, 2005). A good number were represented as professionals in the public and private sectors. They had the highest family income and per capita income averages (U.S. Census 2000). They also had highest levels of educational attainment compared to other groups (U.S Census). Reports of experienced racism are not uncommon in every day dialogue for this group, but research does not exist.

Chamorros, the indigenous population who are often over represented in other mental health statistics in Guam (i.e., suicide; substance use), were also at-risk for psychosis. The psychotic disorders IRR for Chamorros was 1.1 for 1000 persons. While the IRR for Chamorros is lower than Micronesians, it is higher than other all other ethnic groups in the study. A review of Chamorro peoples' history reveals experiences of socio-political subjugation and oppression. At present, however, Chamorros have some level of political autonomy under the U.S. government. They comprise 37% of the population, making them the majority group. The government of Guam employs about one third of Guam's labor force in which the majority of workers are of Chamorro descent. Review of education statistics reveals a progressive increase in levels of educational attainment for the Chamorros (Guam Bureau of Statistics and Plans, 2005). People of Guam vote for their own governor, senators, and mayors. Chamorros often exercise their voting privileges during local elections, which is often a major socio-political event in Guam. Representation in policy and law making increases social capital for this group. However, the Chamorros continue to struggle with Guam's political status as an unincorporated territory of the U.S. Without legislative representation or voting privileges at the national (U.S.) level, the Chamorros in Guam have never experienced socio-political autonomy or equal political status since colonization by the Spanish. However, about 1/3 of the island is currently occupied by the U.S. military. Chamorros in Guam maintain a strong sense of loyalty towards the U.S. government since World War II when the U.S. freed Guam of Japanese occupation in 1944. In more recent years, some Chamorros have expressed a right to self determination and the United Nations has mandated the U.S. to establish a more permanent status for Guam (U.N. 64<sup>th</sup> General Assembly, Oct 9, 2009). While the current study focused on social risk factors in terms of ecology, a possible direction for future research in psychotic disorders is to explore socio-political factors. If the social defeat theory postulates that the chronic experience of subordinate status may be implicated in the etiology of psychotic disorders, then the literature on psychotic disorders will be greatly enhanced by research that examines chronic psychosocial stressors experienced by minority groups, immigrants, and colonized populations in other world regions outside the European continent. Furthermore, social processes such as discrimination and prejudice cannot be ignored in the stress-vulnerability models for psychotic disorders. For example, the census data for Palauans in Guam indicated that they had moderate earnings, higher levels of education, and more managerial jobs compared to other Micronesians, comparable to other ethnic groups in Guam. However, if an educated or skilled person does not get the same respect and treatment that others in the same position may receive, it may induce higher levels of stress. A study by Smith (1994) revealed that some Micronesian individuals expressed that they were treated differently by employers or did not receive the same treatment at public agencies as others. Chronic experiences of rejection and dismissal may be similar to social defeat, eliciting a neurological response similar to the study on defeated animals (Cantor-Graae, 2005).

In consideration of the socio-environment in the onset of psychosis, it is important to address the increased risk for immigrant groups and note that not all immigrants have an equal social status upon entering a host environment. For example, there is a vast difference in the social status of an individual who migrates to more developed areas in search of education, employment, and a better life compared to the individual who is recruited for a hard to fill position or someone who moves to the host environment for business development or

commercial expansion. Both individuals will have very different social experiences in the host environment depending on where they are on the social hierarchy. Thus, while poverty in of itself is not a predictor of psychotic disorders, socio-economic inequality is significantly associated the development of psychosis when compounded by multiple social adversity (Burn & Esterhuizen, 1997; Hjern, Wicks, & Dalman, 2004; Saha, Welham, Chant, & McGrath, J., 2006; Sharma-Gopinath, 2010).

### **Implications for the Future**

The recent literature on socio-genesis of schizophrenia and other psychosis has prompted researchers to examine the interplay between socio-environmental factors and biological processes in the manifestation of disease. Whereas schizophrenia was predominantly understood as a genetic disease, current research suggests more complex pathways of neurodevelopment are indicated in the onset of psychosis. Continued exploration of the vulnerability stress models in the onset of psychotic disorders are imperative (Yuii, Suzuki, & Kurachi, 2007).

A socio-developmental pathway model that synthesizes various disparate hypotheses and findings to explain the increased risk for ethnic minorities and migrant groups, integrating a broad range of social risk factors and neurodevelopment factors, is currently being studied in a large 3-year study across Europe (Morgan et al, 2010). Replication of similar research is needed in with identified at-risk groups both in the U.S. and Pacific island states which have alarming high rates. Research in the area of substance use and its co-occurrence with psychotic disorders often focuses on treatment of dual diagnosis, however more research that focuses on substance use in the pathogenesis of psychotic disorders is needed to explain the overlap of symptoms that is often observed in individuals with both a history of substance problems and a psychotic disorder, especially the frequent use of high potency cannabis.

A dearth of research on mental health issues in Guam continues while some increase in mental health research has been documented for problems of substance abuse and the problem of suicide (DMHSA, 2007 & 2008). One reason for the shortage of research on other mental disorders in Guam may be linked to a shortage of mental health professionals in the region as the Guam Psychological Association in its response to military expansion urged the U.S. federal government to increase the number of mental health professionals in the region (GPA correspondence, 2010).

Implications of current findings are far reaching in Guam. As Guam's social and ecological context continues to change with the anticipated military expansion and economic developments in the next several years, it becomes particularly important for policy makers to consider the influence of ecological factors on mental health both in research and dissemination of services. Cultural anthropologists and regional researchers have suggested that rapid modernization and cultural changes are implicated in other health issues in the Micronesia region, such as suicide, substance problems and domestic violence. Furthermore, if there is an effect of urbanization on psychotic disorders as indicated by current research, then the rapid changes experienced by Micronesians who move from rural island states to cosmopolitan Guam would be particularly vulnerable to development of psychotic disorders. As many Micronesians continue to move from remote, sustenance based lifestyle of their island to a comparatively more

urbanized Guam, the implication of these shifts cannot be overlooked and require further exploration in research on psychotic disorders. It would also be interesting to examine if the urban-rural gradient shifts in Palau have correlations with prevalence of schizophrenia.

Research is also needed in the area of acculturative processes and psychotic disorders. Identifying adaptive behaviors in cross cultural zones may also enhance our understanding of psychotic disorders. While the external environment of the Micronesian in Guam demands adaptation to urban living, cultural values such as reciprocity, taking care of one's group members, and other collectivist values may become stress inducing in a vastly different social context. Cultural adaptations need further exploration in psychotic disorders research.

More research on marginalization, anomie, alienation, and social defeat is also needed in our understanding of social processes implicated in the onset of psychoses in general. Case studies and qualitative research may contribute to our in-depth understanding of psychoses-environment associations by exploring factors that are often difficult to operationally define and measure epidemiologically.

And while this study did not focus on the macro-environment of the socio-political climate of Guam for the identified years of the study, literature by indigenous writers and regional researchers suggests that the effects of colonization and intergenerational trauma are far-reaching and accumulative (Hanlon, 1998; Pier Taimanglo, 1998).

Furthermore, understanding factors that enhance mental health are perhaps under acknowledged in the study of psychotic disorders. Studies that explore resiliency and protective factors in the pathogenesis of psychological disorders can help direct future research.

Given reports of adverse social experiences for Micronesian ethnic groups, it would be important to develop programs that enhance self concept, self efficacy, and increase personal empowerment for Micronesians in Guam. While the cost of developing such programs may seem counter-intuitive at the policy making level, the costs of hospitalization and chronicity of mental disability supersede costs of community development programs. Also, increasing knowledge and understanding of Guam's neighboring islands may reduce apprehension by other ethnic groups in interacting socially with diverse islander groups. School curriculum should include education on the history and geography of the Micronesian islands. Cultural exchange programs, both in work place and education settings will enhance interactions between various ethnic groups, reducing perceived or experienced discrimination. Furthermore, literature on Micronesians often focuses on social, health, and mental health problems. This study is no exception. Inadvertently, such work may perpetuate the stereotype of the "problem group" when in reality, the problem exists in the social tapestry of intergroup relations.

Furthermore, mental health service providers in Guam should receive training and education about Guam and its neighboring islands. As diversity continues to increase in Guam, mental health service providers must be acutely aware of psychosocial issues relevant to the region and have an understanding of the populations they treat. Cultural bounds symptoms and behaviors have been indicated in problems of clinical bias and problems of misdiagnosis (American Psychological Association, 2003; Foulks, 2004; Metzl, 2009). Psychiatric and mental health treatment that is not inclusive of cultural norms and practices have been proven to be ineffective over the course of long term prognosis (WHO, 2001).

While social, economical, political and cultural change is inevitable in Guam's society, an understanding of mental health and the pathogenesis of mental disorders becomes imperative to the sustainability of social and mental welfare of its population. Studies on psychotic disorders indicate that socio-environmental and social risk factors significantly predict the onset of psychosis. In order to sustain, policy makers will have to take measures to reduce social adversity and increase social capital (McKenzie, Whitley, & Weich, 2002; Perkins & Taylor, 1996). Researchers in the region will need to continue exploring the subtle underpinnings of social problems and mental health service providers will need to incorporate epidemiological findings with an astute understanding of region specific issues in the development of treatment modalities (Rapadas, Balajada & Rubenstein, 2005).

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