SEASON OF BIRTH AND STIMULANT BASED DISORDERS

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INTRODUCTION

SEASON OF BIRTH AND STIMULANT BASED DISORDERS

According to a national survey carried out by the Department of Health and Human Service's Substance Abuse and Mental Health Services Administration (SAMHSA) there may be an estimated 7 million adults with active and chronic co-occurring disorders/dual diagnosis of severe mental illness and substance use disorders in the United States (SAMHSA-National Survey on Drug Use and Health, 2004). Another survey estimates that at any given time there may be an estimated 10 to 12 million individuals with dually-diagnosed disorders (Epstein, Barker, Vorburger, & Murtha, 2004). The data for youths may be even more drastic as a national survey stated that 40 percent of youth who received mental health services were, also, diagnosed with a co-occurring disorder of substance abuse disorder (SAMHSA, 1999). Also, one regional survey of youth service providers from 26 states reported that 48 percent of recent admissions of youths 12 to 18 reported diagnoses of severe mental disorders and substance abuse disorders (SAMHSA, 2005).

In 2007, SAMHSA reported an estimated 23 million people who met DSM-IV-TR (American Psychiatric Association, 2000) criteria for substance abuse or dependence reported for treatment within the previous 12 months. The report also stated that an estimated 25 million people reported serious psychological distress during the same period. A previous survey had originally estimated the number of adults with serious mental illness at 15 million adults (SAMHSA-National Household Survey on Drug Abuse, 2002). In this report, it was reported that 20.3 percent of the surveyed adults reported being dependent on or having abused alcohol or illicit drugs within the previous 12 months.

The US Surgeon General's report on mental health reported "41 to 65 percent of individuals with a lifetime substance abuse disorder also [have] a lifetime history of at least one mental disorder, and about 51 percent of those with one or more lifetime mental disorders also have a lifetime history of at least one substance abuse disorder (U.S. Department of Health and Human Services (DHHS), 1999)." Additional surveys have suggested almost 90 percent of individuals with a lifetime of co-occurring disorders will have had at least one mental disorder prior to the onset of substance abuse disorders (SAMHSA, 2002). Based on these statistics, one might deductively reason that the prevalence of substance abuse disorders and mental health disorders as well as the dual diagnosis of substance abuse disorders and mental health disorders will continue to be a challenge for health and mental health professionals.

While individuals with one disorder are able to obtain adequate services, when needed, there continue to be reports of clients who do not receive adequate treatment, and, in some cases, there are reports of clients who do not receive any treatment when they are diagnosed with both (US DHHS, 1999). Typically, individuals with co-occurring disorders may be excluded from mental health programs due to their substance abuse, and from substance abuse programs because of their mental disorders (SAMHSA, 2002). As such, governmental organizations, such as SAMHSA, have initiated programs geared toward co-occurring disorders. Treatment models have moved toward providing care for both disorders rather than the traditional method of treating one disorder at a time. The current trend in research has focused on the epidemiology of mental health and substance abuse disorders, developing more effective preventative measures, creating better assessment measures/tools, and continuing to expand effective treatment of co-occurring disorders (Merikangas & Kalaydjian, 2007).

Although the precise etiology of co-occurring/mental health disorders are still unknown (US DHHS, 1999), there has be some progress in tracing the maturation of dual mental health issues. Early findings suggest symptoms of mental disorders initially occur during adolescence, and are followed by substance abuse disorders 5 to 10 years later (Kessler, Nelson, McGonagle, Edlund, Frank, & Leaf, 1996). As cited in the report to Congress (SAMSHA, 2002), the gap between the display of mental health disorders and the onset of substance use disorders has been suggested as a "window of opportunity" for preventative measures (Ziedonis, 1995). "It suggests not only the value of early diagnosis and treatment of mental disorders in youth, but also the critical role for alcohol and drug testing as important tools for prevention, early identification and intervention (p. 7)."

Schuckit & Hesselbrock (1994) suggest mental illness and substance abuse can co-occur by chance or by the interaction of the disorders. For example, individuals with psychological disorders may use alcohol or drugs to self-medicate their mental health symptoms. Additionally, they suggest that it is more important to screen for the overlap of mental illness and substance abuse than to find the reason the disorders co-occur.

They list three possible relationships between mental health and substance abuse disorders:

1) Mental health and substance abuse disorders may occur independent of each other;

2) Mental health disorders, such as schizophrenia and anti-social personality disorder, may place an individual at greater risk for substance abuse disorders;

3) Mental health symptoms or psychiatric syndromes may be induced by drug abuse intoxication or withdrawal.

A review of the literature by Mueser, Drake & Wallach (1998) offered 4 general models that summarize the current thinking regarding the etiology of co-occurring severe mental illness and substance use disorders:

1) Common factor models which suggest "high rates of comorbidity are the result of shared vulnerabilities to both disorders (p. 719)." Genetics and antisocial personality disorder have been identified as two possible common factors.

2) Secondary substance use disorders models which suggest "that severe mental illness increases patients' vulnerability to develop substance use disorders (p. 722)." Categories of vulnerability include behaviors of self-medication, alleviation of dysphoria, and supersensitivity to psychobiological and environmental stressors.

3) Secondary psychiatric disorder model which suggests substance abuse may create opportunities for symptoms of mental illness in people who would not otherwise development a severe mental illness.

4) Bidirectional models which suggest "ongoing, interactional effects between severe mental illness and substance use disorder account for increased rates of comorbidity (p. 725)." This model is considered the most appealing but remains "largely theoretical and untested (p. 725)."

Mueser, Drake & Wallach (1998) reiterate their belief that the availability of illicit street drugs has adversely effected the increase cases of dual diagnoses. They state additional research is necessary to boost data regarding the relationship between substance use disorders and specific mental disorders such as anti-social personality disorder and bipolar disorder.

Although there is not one dominating theory to explain the origin of dually diagnosed illnesses, Mueser, Drake & Wallach (1998) reviewed and found modest, but inconsistent, support for a genetic-common factor model of dual diagnosis in which an individual with a mental disorder is biologically vulnerable to develop a substance abuse disorder if they use even small amounts of alcohol or other drugs. Their findings suggest that individuals with dual diagnosis had more relatives with substance use disorders than similar patients with only mental illnesses; hence supporting the idea that genetic vulnerability played a role in the development of some case of substance use disorder in individuals with severe mental illnesses.

Rusk & Rusk's (2007) review of the literature regarding the biological origins of psychiatric disorders emphasized the complexity of substance abuse and mental health disorders as having biological, psychological and social components which contribute to the difficulty of implementing adequate and appropriate preventative steps, diagnosis, and treatment. Part of the complexity and difficulty of treating mental health and substance abuse disorders is that they primarily affect the same part of the body -the brain. This paradigm has the potential to create complications during treatment especially when incorporating pharmacological tools. While one drug may relieve the burden of one disorder, it may potentially create an opportunity for expansion of the other (Rusk & Rusk, 2007).

While, the potential sources of mental illness and substance use disorders continue to be unraveled and newly discovered, one area that has been, and continues to be a focal point of interest is neuro-biological origins of these disorders. In particular, neurological development and neurological abnormalities have been cited as a potential source for severe mental health issues (Hare, Price & Slater, 1974). The Surgeon General (US DHHS, 1999) recognized the importance of proper neurological development/function as the most viable source for mental health and substance abuse disorders. In his report, the General states that "any discussion of the etiology of mental health must include discussion of the nervous system."

One specific area of neurological research has focused on an individual's season of birth (i.e., the month they were born) as a potential source of neuro-developmental abnormalities. There is a growing body of evidence to support a relationship between an individual's season of birth and abnormal neurological development of proper neurotransmitter functioning which can lead to mental health disorders (McTigue & O'Callaghan, 2000). Chotia & Adolfsson (2002) provide strong evidence for the influence of season of birth on proper monoamine neurotransmitter turnover, and subsequent monaminergic modulation of the temperament and character traits on individuals. They argue that the development of personality, including the character traits, is likely to parallel the abnormal development and functioning of the turnover of monamines, and their interactions in the brain. Further, the authors suggest that the rate of turnover of the monoamines in adults is related to conditions/circumstances around their season of birth.

Specifically, season of birth may influence the proper development and functioning of serotonin 5-hydroxytryptamine (5-HT) uptake receptors (Brewerton, 1989; Rezaul, Persaud, Takei & Treasure, 1996). In particular, monoamine neurotransmitter turnover functioning has been noted for having seasonal trends with particularly lower functioning during the winter months (Chotai & Åsberg, 1999). Moreover, there has been some evidence to suggest that improper serotonin neurotransmitter functioning has a significant relationship with mental health issues such as depression (see Åsberg, Eriksson, & Mårtensson, 1986), eating disorders (see Klump, & Culbert, 2007), and aggressive behavior and personality disorders (see Soloff, Price, Meltzer, Fabio, Frank, & Kaye, 2007).

While neurological development has been an important biological issue related to the season of birth and mental illness, another important biological factor has been the environmental conditions during the season of birth. There has been an increased interest in the season of birth effect since the emergence of evidence that prenatal exposure to influenza may be an important etiological agent in psychosis (Wright, Takei, Rifkin, & Murray, 1995). Wright et al. reported that the mothers of individuals with severe mental illness (SMI) reported more instances of influenza infection during the second trimester of gestation than mothers who experienced infections during the first and third trimester combined. Additional theories of environmental interactions resulting in severe mental illnesses have included prenatal and perinatal care (Hultman, Sparén, Takei, Murray, Cnattingius, 1999), obstetrical complications, extreme temperatures, and vitamin deficiencies (Castrogiovanni, Iapichino, Pacchierotti, & Peiraccini, 1998).

Recent medical (biological/psychiatric) research of the season of birth effect appear to be providing validating evidence of the relationship between season of birth and mental illnesses which social science (scientist) has/have recognized and observed/studied from as early as the 1920s. In 1929, Tramer (Dalén, 1975) may have been the first to report on a relationship between season of birth and mental illness. He reported a relationship between December to March (winter) births for schizophrenic patients at a Swiss psychiatric hospital.

Since Tramer's initial study, the season of birth effect has been studied to expand data regarding its effects beyond the status of astrological curiosity or trivial concept (McTigue & O'Callaghan, 2000). A review of the literature by Castrogiovanni, Iapichino, Pacchierotti, & Peiraccini (1998) listed studies which reported a significant relationship between season of birth and mental health disorders. Examples of the research topics include schizophrenia (winter birth effect), bipolar disorder (winter-spring effect), Autistic disorder and neuroses (Spring-summer effect), and alcohol abuse (spring-summer effect).

Although the body of evidence regarding the season of birth effect continues to expand, experimental results have not always been conclusive or consistent. While some relationships have been significant, others have only resulted in non-significant relationships. Still others have produced weak but insignificant relationships which may provide opportunities for additional research or critique of the methods used.

A large study by Fouskakis, Gunnell, Rasmussen, Tynelius, Sipos, & Harrison (2004) followed-up with 696,025 Swedish subjects who had previously reported for in-patient hospital care for psychosis. The researchers obtained a variety of client bio-psycho-social data including season of birth, birth weight, rural or urban settings, and maternal characteristics to determine if a relationship existed between season of birth and natal variables for severe mental illnesses. They reported seasonal differences in the birth weight of babies bone during different seasons of the year, but found "no statistically significant evidence of cyclical effects in relation to schizophrenia or other non-affective psychoses (p. 261)." Additionally, they reported no season of birth effect in men and women for schizophrenia. Nevertheless, the researchers recommended continued research as their findings may be suggestive of other biological mechanisms concerning the prevention of schizophrenia and other severe mental illnesses.

Although it has not been thoroughly consistent, there is a growing body of evidence which supports season of birth's influential/effect relationship with mental health disorders. Early findings lay support for the influence season of birth has on disrupting the proper biological development of neurological transmitters. It has been argued that the abnormal development of neurotransmitters may contribute to increased diagnosis of mental health issues/disorders. Based on the theory of common factors for dual-diagnosis, there may be an additional relationship between substance use disorders and mental health disorders.

Dually diagnosed health issues of substance use disorders and mental health disorders continue to be an issue for the general public and mental health professionals. It has been suggested that one of the major hurdles of treating this population is being able to properly diagnose for both disorders. Efforts continue to better understand the influential forces behind dual diagnosis.

Purpose of the Study/Research Questions

This research will investigate the relationship between season of birth and stimulant based disorders, season of birth and dual diagnosis, and season of birth and stimulant based dual diagnosis. Additionally, to the best of knowledge, there has not been another report addressing the relationship between season of birth and stimulant-substance related disorders.

There have only been two other studies which investigated dual-diagnosis of substance abuse and mental illnesses. Kell (1995) reported on the seasonality of birth amongst comorbidity of mental illnesses and opioid dependent individuals. Modestin, Ammann, & Würmle (1995) reported on the season of birth effect in a comparison of individuals with schizophrenia, affective disorders, and alcoholism disorders, but did not overtly state they were addressing dual diagnoses.

With these suspicions of season of birth contributing to dual-diagnosis, analyzing an individuals season/date of birth may be a simple and inexpensive screening/assessment tool which can be utilized for mental illnesses by professions during the screening process/intake process/bio-psycho-social assessments, or at the very least, the season of birth may be something for the mental health practitioner to consider during assessment/diagnosis. Furthermore, appropriate assessments/diagnosis may contribute to better/proper treatment for the patient. It is hoped that this research will contribute to the growing body of work addressing the relationship between season of birth and the onset of substance abuse and mental health disorders.

This study will examine the relationship between seasons of birth and individuals diagnosed with stimulant-substance related disorders. Additionally, this study will investigate gender and racial diversity within the area of season of birth and stimulant based disorders to keep with previous studies and to examine for possible influences by these respective variables. This research will investigate and address the following questions:

1. Does the distribution of births for individuals diagnosed with a stimulant-based disorder, regardless of mental health diagnosis, differ from the distribution of the births of the general population of the United States? Does the distribution of births for women in this area differ from the general population? Does the distribution of births for men in this area differ from the general population? Does the distribution of births for racially diverse individuals in this area differ from the general population?

2. Does the distribution of births for individuals dual diagnosed with a substance disorder and any mental health disorder differ from the distribution of the births of the general population of the United States? Does the distribution of births for women in this area differ from the general population? Does the distribution of births for men in this area differ from the general population? Does the distribution of births for racially diverse individuals in this area differ from the general population?

3. Does the distribution of births for individuals dual diagnosed with a stimulant based dual diagnosed (i.e., stimulant substance disorder and any mental health disorder) differ from the distribution of the births of the general population of the United States? Does the distribution of births for women in this area differ from the general population? Does the distribution of births for men in this area differ from the general population? Does

the distribution of births for racially diverse individuals in this area differ from the general population?

METHODS

SEASON OF BIRTH AND STIMULANT BASED DISORDERS

Subjects

The data in this study were gathered from 2598 client records receiving inpatient services from a community substance abuse treatment facility in the Southwestern region of the United States. Clients received services at the agency between November 1999 and November 2008. As part of the admission process, individuals were informed that their demographic data may be used in research for agency data collection to better improve the quality of services for clients, and as required by state agencies for data collection. All clients had the option of declining to have their information used for data collection. Only subjects who agreed to have their information used were included in this study.

Criteria for a client file to be included in this investigation required the client have completed inpatient services for a substance disorder. Completion of treatment services was determined by the inclusion of a certificate of completion and/or a final entry by the service provider stating the client had completed the inpatient treatment program. Client's receiving outpatient services were omitted from this study.

Client files which did not provide documentation of completion of services were not used in this research. To this end, there were 640 incomplete files. The treatment facility has also been utilized as the local the detoxification facility for public intoxication, where individuals are granted an opportunity to remain at the facility for a set time rather than be arrested. Client files for public intoxication services were not used in this research. There were 924 public intoxication files. Therefore, 1034 client files met the eligibility requirements to be included in this investigation.

Only unidentifiable demographic information was collected from the client's files. The information gathered were the client's gender (male or female), birth date (as determined by state or federal identification cards i.e., state issued drivers license, state issued identification cards, or Federal tribal identification cards/Indian identification cards), race (for the purpose of this report Native Americans were only classified if they possessed a Indian identification card; in cases which a client may have been of mixed race e.g., half Caucasian-half Asian, the client was asked to determine the racial category with which they most identified), the client's reported drug of choice (stimulants- amphetamines, cocaine; depressants- alcohol, sedatives; hallucinogens, etc.), client's clinical diagnosis for a substance disorder, and the client's clinical diagnosis of mental illness or a substantiated diagnosis of mental disorder.

Of the total sample, 69.1% (n = 715) of the subjects were male. Racially, 72.3% (n = 748) of the subjects identified themselves as Caucasians, 8.6% (n = 89) identified themselves as African-American, 0.7% (n = 7) identified themselves as Hispanic, 0.2% (n = 2) identified themselves as Asian/Pacific Island, and 18.2% (n = 188) identified themselves as American Indian.

Of the total sample, 22.9% (n = 237) were born in the Spring season, 28.2% (n = 292) were born in the Summer season, 24.9% (n = 257) were born in the Autumn season, and 24.0% (n = 248) were born in the Winter season. Arranged by months, 8.03% (n = 83) were born in January, 7.61% (n = 79) were born in February, 8.32% (n = 86) were born in March, 8.03% (n = 83) were born in April, 6.58% (n = 68) were born in May, 7.06% (n = 73) were born in June, 10.74% (n = 111) were born in July, 10.44% (n = 108) were born in August, 9.38% (n = 97) were born in September, 7.54% (n = 78) were born in October, 7.93% (n = 82) were born in November, and 8.32% (n = 86) were born in December.

Of the total sample, 50.19% (n = 519) were diagnosed with a stimulant substance related disorder. The remaining participants were diagnosed with alcohol related disorders (36.46%, n = 377), or Other Substances (13.35%, n = 138). The category of Other Substances included Cannabis, Inhalants, and Opiate based substances.

Of the total sample, 34.04% (n = 352) were previously diagnosed, or were diagnosed during treatment with a mental health disorder. As such, the same percentage of the sample qualified to be identified as having dual diagnosis of a substance related disorder and a mental health disorder: 34.04% (n = 352) met criteria for dual diagnosis; 65.96% (n = 682) did not met criteria for dual diagnosis. Of the dual diagnosis sample, 49.72% (n = 175) were diagnosed with a stimulant substance related disorder and a mental health disorder; 35.23% (n = 124) were diagnosed with an alcohol related disorder and a mental health disorder; and 15.06% (n = 53) were diagnosed with an Other substance disorder and a mental health disorder.

Defining Criteria

For the purposes of this study, stimulant-substance related disorders were defined as either amphetamine related disorders or cocaine related disorders meeting criteria for diagnosis via the DSM-IV. Due to the limited information available in the files, the distinction between abuse or dependence disorders was not available.

Per agency criteria, diagnosis of mental disorders was based on criteria set forth in the DSM-IV (American Psychiatric Association, 4th ed.). Criteria used for diagnosis of substance-related disorders were also based on criteria set forth in the DSM-IV (American Psychiatric Association, 4th ed.). For this project, the DSM-IV was used rather then the DSM-IV-TR (American Psychiatric Association, 4th ed-Text revision) because some of the client files were dated prior to the publication of the newer DSM-IV-TR, which was published in 2000.

All diagnosis of substance related disorders, or of mental health disorders were determined by a certified drug and alcohol counselor (as certified by the Oklahoma Drug and Alcohol Professional Counselors Association), a drug and alcohol counselor under supervision (as certified by the Oklahoma State Board of Drug and Alcohol Counselors), a licensed drug and alcohol counselor (as licensed by the Oklahoma State Board of Drug and Alcohol Counselors), or a licensed professional counselor (as licensed by the Oklahoma State Department of Health-Division of Professional Counselor Licensing). All counselors were certified by a state agency as having met the academic and legal requirements for certification and/or licensure as drug and alcohol counselors, or were in the process of obtaining certification or licensure as drug and alcohol counselors.

Per agency policy, in cases where the drug and alcohol counselor did not have the appropriate training to diagnose mental health disorders, the counselor gathered diagnostic information during the intake process or during assessment of treatment needs. The client was later seen by a mental health professional who had the training and credentials to assess a mental health disorder. When possible, substance treatment counselors contacted the client's mental health professional outside of the agency to validate the reported diagnosis and/or history of mental illness.

Defining dates of seasons

As there is no universal date for the beginning of seasons even when taking into consideration of solstices and equinoxes, the 1st day of March, June, September, and December were chosen as the beginning dates for the Spring, Summer, Autumn, and Winter categories, respectively. Others have grouped season of birth by quarter of year. Goldberg and Newlin (2000), categorized individuals born in January, February, and March as Winter births; April, May, and June as Spring births; July, August, and September as Summer births; and October, November, and December as Fall births.
In this report, individuals born in the months of March, April, and May were identified as Spring births; June, July, and August births were placed into the Summer season; September, October, and November births were placed into the Autumn season; and December, January, and February birth were placed into the Winter season. The start dates of seasons were selected to be consistent with the majority of existing studies examining relationships between season of birth and substance related disorders and/or mental health disorders.

RESULTS

SEASON OF BIRTH AND STIMULANT BASED DISORDERS

The demographic information was collected and grouped by gender, ethnicity, season of birth, month of birth, diagnosis of substance related disorder (also known as drug of choice), diagnosis of a mental health disorder, and dual diagnosis of substance disorder and mental health disorder (see Table 1).

Table 1: Demographics of Sample Data

N	1034	% of total sample	
Gender			
Male	715	69.1%	100 %
Female	319	30.9%	
Ethnicity			
Caucasian	748	72.3%	100 %
African-American	89	8.6%	
Hispanic	7	0.7%	
Asian/Pacific Islander	2	0.2%	
American Indian	188	18.2%	
Season of Birth			

Spring	237	22.9%	100 %
Summer	292	28.2%	
Autumn	257	24.9%	
Winter	248	24.0%	
Month of Birth			
January	83	8.03%	100 %
February	79	7.64%	
March	86	8.32%	
April	83	8.03%	
May	68	6.58%	
June	73	7.06%	
July	111	10.74%	
August	108	10.44%	
September	97	9.38%	
October	78	7.54%	
November	82	7.93%	
December	86	8.32%	
Drug of Choice			
Stimulant: Cocaine/Amphetamine	519	50.19%	100%
Alcohol	377	36.46%	
Other Substances	138	13.35%	
Mental Health Disorder			
NO Mental Health Disorder	682	65.96%	100 %
Mental Health Disorder	352	34.04%	
Dual Diagnosis			

NO Dual Diagnosis	682	65.96%	100%
Stimulant x MH Disorder	175	16.92%	
Alcohol x MH Disorder	124	11.99%	
Other Substances x MH Disorder	53	5.13%	

*Sums may not total to 100% due to rounding.

Statistical Procedures/Data Analyses

All statistical analyses were computed using Statistical Package for Social Sciences (SPSS) 13.0 for Windows Integrated Student Version (SPSS Inc., Chicago, IL); p-values were set at the 0.05 level. Before all else, a Chi-square test of goodness-of-fit was performed to determine whether the distribution of sample births was equal to the distribution the average of national monthly births. The monthly birth rates of the United States were determined by obtaining monthly birth rates for a 25 year period (1964 to 1988, Center for Disease Control and Prevention, 2010). Results indicated that the sample's distribution of births did not differ from the distribution of national birth rates, $X^2 = 13.66$ ($df = 11$, $p = 0.25$; see Table 2).

Table 2: Chi-Square analysis of monthly distribution of births for sample

	Observed Frequency: Sample	Expected Frequency: US Population (1964-1988)	Residual
January	83	84.5	-1.5
February	79	78.8	0.2
March	86	86.1	-0.1
April	83	81.4	1.6

May	68	84.8	-16.8
June	73	84.5	-11.5
July	111	91.2	19.8
August	108	92.4	15.6
September	97	91.1	5.9
October	78	88.9	-10.9
November	82	83.7	-1.7
December	86	86.6	-0.6
TOTAL	1034		

Test Statistics	
	Month
Chi-Square[a]	13.659
df	11
Asymptotic Significance	0.252

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 78.8.

Evaluation of the distribution of season of births as determined by set criteria was compared to the distribution of average national births to determine if the observed values were similar to expected values. Results indicated no differences between the sample's observed birth frequencies and expected birth frequencies of the general population, $X^2 = 3.22$ (df = 3, p = 0.359; see Table 3).

Table 3: Chi-Square analysis of seasonal distribution of births for sample

	Observed N	Expected N	Residual
Spring	237	252.3	-15.3
Summer	292	268.2	23.8

Autumn	257	263.6	-6.6
Winter	248	249.9	-1.9
TOTAL	1034		

Test Statistics	
	Season
Chi-Square[a]	3.220
df	3
Asymptotic Significance	0.359

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 249.9.

Research Question 1(a): Does the distribution of births for individuals diagnosed with a stimulant-based disorder, regardless of mental health diagnosis, differ from the distribution of the births of the general population of the United States?

A Chi-Square analysis was performed to determine if the season of birth for individuals only diagnosed with a stimulant based disorder differed from the distribution of births of the general population. Results did not indicate a difference between the distribution of seasonal births of individuals with a stimulant-based diagnosis, and the distribution of births from the general population, $X^2 = 1.370$, $p = 0.713$ ($df = 3$, $N = 519$; see Table 4).

Table 4: Chi-Square analysis of seasonal distribution of births for individuals with a stimulant based diagnosis.

	Observed N	Expected N	Residual
Spring	121	126.6	-5.6
Summer	139	134.6	4.4

Autumn	125	132.3	-7.3
Winter	134	125.5	8.5
TOTAL	519		

Test Statistics	
	Seasons
Chi-Square[a]	1.370
df	3
Asymptotic Significance	0.713

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 125.5

Research Question 1(b): Does the distribution of births for women diagnosed with a stimulant-based disorder, regardless of mental health diagnosis, differ from the distribution of the births of the general population of the United States?

A Chi-Square analysis was performed to determine if the season of birth for women only diagnosed with a stimulant based disorder differed from the distribution of births of the general population. Results did not present a significant difference in seasonal births between women diagnosed with a stimulant based disorder, and the distribution of births of the general population, $X^2 = 3.791$, $p = 0.285$ (df = 3, N = 205; see Table 5).

Table 5: Chi-Square analysis of seasonal distribution of births for women with a stimulant based diagnosis

	Observed N	Expected N	Residual
Spring	44	50.0	-6.0
Summer	63	53.2	9.8

Autumn	45	52.3	-7.3
Winter	53	49.6	3.5
TOTAL	205		

Test Statistics	
	Seasons
Chi-Square[a]	3.791
df	3
Asymptotic Significance	0.285

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 49.6.

Research Question 1(c): Does the distribution of births for men diagnosed with a stimulant-based disorder, regardless of mental health diagnosis, differ from the distribution of the births of the general population of the United States?

A Chi-Square analysis was performed to determine if the season of birth for men only diagnosed with a stimulant based disorder differed from the distribution of births of the general population. Results did not present a difference in seasonal births between men diagnosed with a stimulant based disorder, and the distribution of births of the general population, $X^2 = 0.707$, $p = 0.872$ ($df = 3$, $N = 314$; see Table 6).

Table 6: Chi-Square analysis of seasonal distribution of births for men with a stimulant based diagnosis

	Observed N	Expected N	Residual
Spring	77	76.6	0.4
Summer	76	81.4	-5.4
Autumn	80	80.1	-0.1

Winter	81	75.9	5.1
TOTAL	314		

Test Statistics	
	Seasons
Chi-Square[a]	0.707
df	3
Asymptotic Significance	0.872

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 75.9.

Research Question 1(d): Does the distribution of births for racially diverse individuals diagnosed with a stimulant-based disorder, regardless of mental health diagnosis, differ from the distribution of the births of the general population of the United States?

A series of Chi-Square analyses were performed to determine if the season of birth for racially diverse individuals diagnosed with only a stimulant based disorder differed from the distribution of births of the general population. Due to the lack of appropriate sample sizes, Asian and Hispanic racial groups could not be analyzed. Results did not present a difference in the distribution of seasonal births for Caucasians diagnosed with a stimulant based disorder, and the distribution of births of the general population, $X^2 = 0.826$, $p = 0.843$ (df = 3, N = 390; see Table 7).

Table 7: Chi-Square analysis of seasonal distribution of births for Caucasians with a stimulant based diagnosis

	Observed N	Expected N	Residual
Spring	97	95.1	1.9
Summer	106	101.2	4.8

Autumn	92	99.4	-7.4
Winter	95	94.3	0.7
TOTAL	390		

Test Statistics	
	Seasons
Chi-Square[a]	0.826
df	3
Asymptotic Significance.	0.843

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 94.3.

Additionally, the analyses of the seasonal distribution of births for African-American with a stimulant based diagnosis, $X^2 = 3.169$, $p = 0.366$ (df = 3, N = 62; see Table 8), nor the analyses of the seasonal distribution of births for Native America with a stimulant based diagnosis, $X^2 = 3.161$, $p = 0.367$ (df = 3, N = 62; see Table 9) produce significant differences in the distribution of seasonal births between the respective samples, and the distribution of births for the general population.

Table 8: Chi-Square analysis of seasonal distribution of births for African-Americans with a stimulant based diagnosis

	Observed N	Expected N	Residual
Spring	12	15.1	-3.1
Summer	19	16.1	2.9
Autumn	12	15.8	-3.8
Winter	19	15.0	4.0
TOTAL	62		

Test Statistics	
	Seasons
Chi-Square[a]	3.169
df	3
Asymptotic Significance	0.366

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 15.0.

Table 9: Chi-Square analysis of seasonal distribution of births for Native Americans with a stimulant based diagnosis

	Observed N	Expected N	Residual
Spring	11	15.1	-4.1
Summer	14	16.1	-2.1
Autumn	17	15.8	1.2
Winter	20	15.0	5.0
TOTAL	62		

Test Statistics	
	Seasons
Chi-Square[a]	3.161
df	3
Asymptotic Significance	0.367

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 15.0.

Research Question 2(a): Does the distribution of births for individuals dual diagnosed with any substance disorder and any mental health disorder differ from the distribution of the births of the general population of the United States?

A Chi-Square analysis was performed to determine if the season of birth for individuals dual diagnosed with any substance disorder and any mental health disorder differed from the distribution of births of the general population. Results did not present a difference in the distribution of seasonal births between individuals dual diagnosed with any substance disorder and any mental health disorder, and the distribution of the births of the general population, $X^2 = 1.289$, $p = 0.732$ (df = 3, N = 352; see Table 10).

Table 10: Chi-Square analysis of seasonal distribution of births for individuals dual diagnosed with any substance disorder and any mental health disorder

	Observed N	Expected N	Residual
Spring	81	85.9	-4.9
Summer	99	91.3	7.7
Autumn	92	89.7	2.3
Winter	80	85.1	-5.1
TOTAL	352		

Test Statistics	
	Seasons
Chi-Square[a]	1.289
df	3
Asymptotic Significance	0.732

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 85.1.

Research Question 2(b): Does the distribution of births for women dual diagnosed with any substance disorder and any mental health disorder differ from the distribution of the births of the general population of the United States?

A Chi-Square analysis was performed to determine if the season of birth for women dual diagnosed with any substance disorder and any mental health disorder differed from the distribution of births of the general population. Results did not present a significant difference in the distribution of seasonal births between women dual diagnosed with any substance disorder and any mental health disorder, and the distribution of the births of the general population, $X^2 = 3.085$, $p = 0.379$ (df = 3, N = 153; see Table 11).

Table 11: Chi-Square analysis of seasonal distribution of births for women dual diagnosed with any substance disorder and any mental health disorder

	Observed N	Expected N	Residual
Spring	28	37.3	-9.3
Summer	43	39.7	3.3
Autumn	42	39.0	3.0
Winter	40	37.0	3.0
TOTAL	153		

Test Statistics	
	Seasons
Chi-Square[a]	3.085
df	3
Asymptotic Significance	0.379

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 37.0.

Research Question 2(c): Does the distribution of births for men dual diagnosed with any substance disorder and any mental health disorder differ from the distribution of the births of the general population of the United States?

A Chi-Square analysis was performed to determine if the season of birth for men dual diagnosed with any substance disorder and any mental health disorder differed from the distribution of births of the general population. Results did not present a difference in the distribution of seasonal births between men dual diagnosed with any substance disorder and any mental health disorder, and the distribution of the births of the general population, $X^2 = 2.156$, $p = 0.541$ ($df = 3$, $N = 199$; see Table 12).

Table 12: Chi-Square analysis of seasonal distribution of births for men dual diagnosed with any substance disorder and any mental health disorder

	Observed N	Expected N	Residual
Spring	53	48.6	4.5
Summer	56	51.6	4.4
Autumn	50	50.7	-0.7
Winter	40	48.1	-8.1
TOTAL	199		

Test Statistics	
	Seasons
Chi-Square[a]	2.156
df	3
Asymptotic Significance	0.541

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 48.1.

Research Question 2(d): Does the distribution of births for racially diverse individuals dual diagnosed with any substance disorder and any mental health disorder differ from the distribution of the births of the general population of the United States?

A series of Chi-Square analyses were performed to determine if the season of birth for racially diverse individuals dual diagnosed with any substance disorder and any mental health disorder differed from the distribution of the births of the general population. Due to the lack of appropriate sample sizes, African-American, Asian, and Hispanic racial groups could not be analyzed. Results did not present a difference in the distribution of seasonal births between Caucasians dual diagnosed with any substance disorder and any mental health disorder, and the distribution of the births of the general population, $X^2 = 0.273$, $p = 0.965$ (df = 3, N = 262; see Table 13). Additionally, results did not present a significant difference in the distribution of seasonal births between Native Americans dual diagnosed with any substance disorder and any mental health disorder, and the distribution of the births of the general population, $X^2 = 3.018$, $p = 0.389$ (df = 3, N = 66; see Table 14).

Table 13: Chi-Square analysis of seasonal distribution of births for Caucasians dual diagnosed with any substance disorder and any mental health disorder

	Observed N	Expected N	Residual
Spring	61	63.9	-2.9
Summer	71	68.0	3.1
Autumn	67	66.8	0.2
Winter	63	63.3	-0.3
TOTAL	262		

Test Statistics	
	Seasons
Chi-Square[a]	0.273
df	3

Asymptotic Significance.	0.965

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 63.3.

Table 14: Chi-Square analysis of seasonal distribution of births for Native Americans dual diagnosed with any substance disorder and any mental health disorder

	Observed N	Expected N	Residual
Spring	17	16.1	0.9
Summer	22	17.1	4.9
Autumn	16	16.8	-0.8
Winter	11	16.0	-5.0
TOTAL	66		

Test Statistics	
	Seasons
Chi-Square[a]	3.018
df	3
Asymptotic Significance.	0.389

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 16.0.

Research Question 3(a): Does the distribution of births for individuals dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder) differ from the distribution of the births of the general population of the United States?

A Chi-Square analysis was performed to determine if the season distribution of births for individuals dual diagnosed with a stimulant based dual diagnosed (i.e., stimulant substance disorder and any mental health disorder) differed from the distribution of the births of the general population. Results did not present a difference between the seasonal distribution of births for individuals dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder), and the distribution of the births of the general population, $X^2 = 0.730$, $p = 0.866$ (df = 3, N = 175; see Table 15).

Table 15: Chi-Square analysis of seasonal distribution of births for individuals dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder)

	Observed N	Expected N	Residual
Spring	43	42.7	0.3
Summer	49	45.4	3.6
Autumn	45	44.6	0.4
Winter	38	42.3	-4.3
TOTAL	175		

Test Statistics	
	Seasons
Chi-Square[a]	0.730
df	3
Asymptotic Significance	0.866

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 42.3.

Research Question 3(b): Does the distribution of births for women dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and a mental health disorder) differ from the distribution of the births of the general population of the United States?

A Chi-Square analysis was performed to determine if the seasonal distribution of births for women dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and a mental health disorder) differed from the distribution of the births of the general population. Results did not present a difference between the seasonal distribution of births between women dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder), and from the distribution of the births of the general population, $X^2 = 1.817$, $p = 0.611$ ($df = 3$, $N = 95$; see Table 16).

Table 16: Chi-Square analysis of seasonal distribution of births for women dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder)

	Observed N	Expected N	Residual
Spring	20	23.2	-3.2
Summer	29	24.6	4.4
Autumn	21	24.2	-3.2
Winter	25	23.0	2.0
TOTAL	95		

Test Statistics	
	Seasons
Chi-Square[a]	1.817
df	3
Asymptotic Significance	0.611

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 23.0.

Research Question 3(c): Does the distribution of births for men dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and a mental health disorder) differ from the distribution of the births of the general population of the United States?

A Chi-Square analysis was performed to determine if the seasonal distribution of births for men dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and a mental health disorder) differed from the distribution of the births of the general population. Results did not present a difference between the seasonal distribution of births between men dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder), and from the distribution of the births of the general population, $X^2 = 3.362$, $p = 0.339$ (df = 3, N = 80; see Table 17).

Table 17: Chi-Square analysis of seasonal distribution of births for men dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder)

	Observed N	Expected N	Residual
Spring	23	19.5	3.5
Summer	20	20.7	-0.7
Autumn	24	20.4	3.6
Winter	13	19.3	-6.3
TOTAL	80		

Test Statistics	
	Seasons
Chi-Square[a]	3.362
df	3
Asymptotic Significance	0.339

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 19.3.

Research Question 3(d): Does the distribution of births for racially diverse individuals dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and a mental health disorder) differ from the distribution of the births of the general population of the United States?

A series of Chi-Square analyses were performed to determine if the seasonal distribution of births for racially diverse individuals dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder) differed from the distribution of the births of the general population. Due to the lack of appropriate sample sizes, African-American, Asian, and Hispanic racial groups could not be analyzed. Results did not present a difference between the seasonal distribution of births for Caucasians dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder), and the distribution of the births of the general population, $X^2 = 1.558$, $p = 0.669$ ($df = 3$, $N = 138$; see Table 18). Additionally, results did not present a difference between the seasonal distribution of births for Native Americans dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder), and the distribution of the births of the general population, $X^2 = 3.018$, $p = 0.389$ ($df = 3$, $N = 66$; see Table 19).

Table 18: Chi-Square analysis of seasonal distribution of births for Caucasians dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder)

	Observed N	Expected N	Residual
Spring	36	33.7	2.3
Summer	40	35.8	4.2
Autumn	34	35.2	-1.2
Winter	28	33.4	-5.4
TOTAL	138		

Test Statistics	
	Seasons
Chi-Square[a]	1.558
df	3
Asymptotic Significance	0.669

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 33.4.

Table 19: Chi-Square analysis of seasonal distribution of births for Native Americans dual diagnosed with a stimulant based disorder (i.e., stimulant substance disorder and any mental health disorder)

	Observed N	Expected N	Residual
Spring	5	5.6	-0.6
Summer	6	6.0	0.0
Autumn	7	5.9	1.1
Winter	5	5.6	-0.6
TOTAL	23		

Test Statistics	
	Seasons
Chi-Square[a]	0.345
df	3
Asymptotic Significance	0.951

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 5.6.

Additional Analysis

Whereas the objective of this investigation was to explore seasonal distribution of births and substance abuse, additional analysis was carried out investigating quarter of year as a variable. Seasons were set and defined to be consistent with previous studies, however, when the months were grouped by quarters of the year (i.e., third quarter of the calendar year consisting of July, August, and September rather than the summer season of June, July, and August), a Chi-Square analysis of the quarterly frequency of births of the entire sample compared to the quarterly frequency of births of the general population showed a significant difference in the frequency of births, $X^2 = 9.722$ (df = 3, p = 0.021; see Table 20). However, repeated analyses of the research questions via comparison of frequency of birth by quarters of year did not produce additional significant results. Nevertheless, this classification system may be appropriate for further research.

Table 20: Chi-Square analysis of quarterly distribution of births for sample

	Observed N	Expected N	Residual
Quarter 1 (January, February, March)	248	249.4	-1.4
Quarter 2 (April, May, June)	224	250.7	-26.7
Quarter 3 (July, August, September)	316	274.7	41.3
Quarter 4 (October, November, December)	246	259.1	-13.1
TOTAL	1034		

Test Statistics	
	Quarters
Chi-Square[a]	9.722
df	3
Asymptotic Significance	0.021

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 249.4.

In addition to showing significant differences in frequency of births compared to the general population, the quarter system may hold additional contributions for future studies as individuals born in July, August, and September would have most likely been conceived during the months of November, December, and January, respectively. Assuming a normal gestation schedule, the fetus's second trimester would have been during the months of February, March, and April, a period between the Winter and Spring seasons. Moreover, according to the Centers for Disease Control and Prevention (CDC, 2010), February has been identified as the peak month for influenza activity, accounting for 50% of the cases reported. During this period, the mother and fetus would have been at risk for greater exposure to the influenza virus. The literature has suggested a relationship between second trimester exposure to influenza and diagnoses of mental illnesses (see, Chotai & Adolfsson, (2002), Chotai & Asberg (1999), Chotai et al (2001)). Expanding the scope of mental illnesses to include substance related disorders, which are recognized as mental illness, this categorization of birth months may contribute to further understanding of the relationship between season of birth and mental illnesses.

DISCUSSION

SEASON OF BIRTH AND STIMULANT BASED DISORDERS

Guided by Kell's (1995) and Goldberg & Newlin's (2000) examination of the relationship between an individual's season of birth and a diagnoses of opiate and alcohol disorders, respectively, this study investigated the seasonal distribution of births for individuals diagnosed with stimulant substance disorders compared to the distribution of births for the general population. Moreover, whereas the literature lays some support to the relationship of season of birth and mental health disorders, this study investigates the seasonal distribution of births for individuals who are dual diagnosed with a substance disorder and any mental health disorder, and for the seasonal distribution of births for individuals dual diagnosed with a stimulant substance disorder, and any mental health disorder. Consequently, these studies produced little statistical evidence to suggest there was a significant relationship of the seasonal distribution of births for individuals diagnosed with a stimulant, for individuals dual diagnosed with a substance disorder and any mental health disorder, nor for individuals dual diagnosed with a stimulant disorder and any mental health disorder.

Initial screening of the data suggested a possibility of excess births during the summer months for individuals seeking treatment for substance disorders. However, statistical analysis showed that the samples' birthrates did not differ from the distribution of national of birthrates. Analyses were conducted to examine the distribution of monthly and seasonal birthrates; neither produced significant results.

Subsequently, the investigation of the first research question was barren. The analyses of the distribution of births for individuals diagnosed with a stimulant disorder did not produce significant results. Further analyses of the seasonal distribution of births for women, men, and racially diverse individuals compared to national birth rates did not produce significant results. The results suggest there is no significant relationship between season of birth and the diagnosis for stimulant substance disorders.

The second research question which examined the distribution of seasonal births for individuals dual diagnosed with any substance disorder and any mental health disorder did not produce any results supporting a relationship between season of birth dual diagnosis of substance disorders and any mental health disorder. Non-significant results were also true for women, men, and racially diverse individuals in this area. The results suggest there is no significant relationship between season of birth and dual diagnosis of any substance disorder and any mental health disorder.

The third research question which examined the distribution of seasonal births for individuals dual diagnosed with a stimulant disorder and any mental health disorder, also, did not produce any results supporting a relationship between season of birth and dual diagnosis of stimulant substances and any mental health disorder. The findings were consistent for women, men, and racially diverse individuals in this area. Overall, the results suggest there is no significant relationship between season of birth and dual diagnosis of stimulant substance disorders and any mental health disorder.

The lack of significant results from the three research questions were contrary to expected results based on previous studies which showed slight relationships between season of birth and substance disorders. Most notably, although an analysis showed the results to be statistically insignificant, the frequency of births from the sample data appeared to have differences compared to the birth frequencies of previous studies. In particular, this data suggested an excess of births during the North American summer months of July and August. Previous studies which examined the relationship between season of birth and substance abuse have suggested a season of birth effect from September through February, the autumn and winter months (see, Kell, 1995; Modestin, Ammann & Würmle, 1995; Kunugi, Nanko, Watanabe, Sekiba, & Kazamatsuri, 1998; and Goldberg & Newlin, 2000).

Speculation for the differences in birth rates was attributed to the type of substances the studies examined. While the earlier investigations focused on opiates and alcohol, both depressants, this study focused on stimulants. Although statistically unsupported, there existed the possibility that substance abusers might have displayed seasonal birth characteristics based on the type of substance abused, or might have displayed overlapping or shared seasonal birth characteristics suggesting a relationship between season of birth and the abuse of any substance. It is hoped that future studies will support the existence of a relationship between season of birth and the diagnoses of specific abused substance.

Limitations

This study had several limitations. First, the seasons were defined by specific months of the year as determined by the researcher. However, seasonal changes are sometimes recognized as beginning and ending during assigned periods throughout the year. For example, in North America, summer and winter seasons are recognized as beginning during the solstice, and Spring and Autumn are recognized as beginning during the equinox. The seasons were defined to keep with previous research, but also had a benefit for analysis in which data did not have to be broken down to days and could be kept in months. The manipulation of seasonal definitions may have contributed to the lack of statistical significances.

Secondly, in the clients' files, their diagnoses of substance disorders were not distinguished to differentiate between abuse or dependence disorders. Distinguishing between DSM-IV criteria for substance abuse and substance dependence might have contributed to identifying the type of individual who is more likely to seek out treatment. Additionally, the majority of the files did not distinguish between the severity nor episodic nature of the client's mental health disorder. The client may have been diagnosed with a generic label of depression when they may have qualified for a specific diagnosis (i.e., major depression recurrent vs. major depression single episode vs. bipolar I disorder-most recent episode depressed). While the severity of the diagnosis was unknown, a decision was made to collection the diagnosis of any mental health disorder.

The limitations of the treatment facility may have also contributed to the characteristics of clients. As a non-medical treatment facility, the agency was unable to provide treatment to all potential candidates thus screening and eliminating the most severe substance abusers, and potentially, the most severely mental ill. Previous reports based their data from patient records of hospitals, which are potentially equipped to address all patient needs (see, Modestin, Ammann & Würmle, 1995; Kunugi, Nanko, Watanabe, Sekiba, & Kazamatsuri, 1998; and Levine & Wojcik, 1999). Additionally, the benefit of well-equipped medical settings allowed for contact with a larger sample. This is reflected in their sample sizes which numbered in the tens of thousands while this study consisted of little over 1000 participants.

Finally, due to the exploratory nature of this study and the lack of existing data addressing seasonal distribution of births and stimulant based disorders, there was little to compare the findings from this research. Moreover, according to a review of the literature, this study appears to be the first to address the relationship between season of birth and stimulant substances. As such, many inferences were made based on existing research and data, but some arguments were speculative and based on inductive reasoning.

In conclusion, while the results of this study did not support a relationship between season of birth and the diagnosis of stimulant substance disorders, nor support a relationship between season of birth and stimulant substance based dual diagnosis, the growing literature suggests that season of birth may have an unmeasured influence to the diagnosis of mental and substance disorders. As such, season of birth may be a viable variable which may benefit from further study to determine the magnitude of its influence. In particular, the role of specific seasonal factors such as exposure to influenza during gestation and development, which have previously shown a significant relationship with the diagnosis of mental health and substance disorders should be explored. Future studies should focus on larger samples across greater geographic regions to gather more detailed results of this complex relationship between seasonal distribution of birth and various psychological interests, or be longitudinal to address the impact biological factors during the season of birth influence on individuals and the potential onset of psychological disorders. Additional research on the season of birth phenomenon may provide the evidence to produce a more definitive answer to the role season of birth may or may not have on the etiology of mental health and substance disorder.

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APPENDIX

Review of the Literature

This chapter will provide a review of the literature regarding research that has been carried out to examine the season of birth effect on various mental health disorders; it includes significant and non-significant studies. The first section will discuss the biological-environmental influences related to season of birth. This section addresses theories related to how season of birth may be influential to normal biological development and subsequent mental health disorders. The second section will discuss relevant research regarding the relationship between season of birth and various mental health disorders. The various mental health disorders to be discussed include intelligence, affect and personality disorders, severe mental illnesses, and substance use disorders.

Biological theory

Seasonal influence of mental health related illnesses is assumed to result in some form of brain damage/abnormality which in turn has an influence on the development of mental disorders (Castrogiovanni, Iapichino, Pacchierotti, & Peiraccini, 1998). Pinter & Forlano (1943) hypothesized that the theories of the season of birth effect could be divided into two types, exogenous and endogenous. The exogenous theory sought to find some explanation in physical factors such as temperature, sunshine, health of the mother and/or fetus, or in the difference of birth rates during different seasons of the year. The endogenous theory sought an explanation in seasonal changes within the organism independent of external conditions. This report will focus on the exogenous explanation of harm to the fetus.

It is theorized that the brain damage could occur prenatally, perinatally or postnatally, during the natural development of the central nervous system (Kell, 1995). McNeill's (1995) selected review of the literature suggests that continued research of events during the paranatal, perinatal, and neonatal periods and later development may provide valuable information to the prevention and treatment of severe mental illnesses.

Livingston, Balkozar, & Bracha, (1993) state perinatal problems can include premature birth and small or large size for gestational age. In general, the influence of season of birth on mental disorders is interpreted as resulting from harmful effects on the fetus during the pregnancy. While initial studies in this area have focused on severe psychotic disorders, Livingston, Balkozar, & Bracha (1993) suggest there is no reason to suppose that the neurodevelopmental risk-exposure should be limited to one disorder.

Among the most mentioned variables which could potentially cause harm to the fetus, viral infection (Fombonne, 1989; Bradbury & Miller, 1985) have been mentioned most. The occurrences of viral infections have been noted to peak in the winter months potentially having adverse effects on the mother and the newborns (Machón, Mednick, & Schulsinger, 1983). Dassa, Azorin, Ledoray, Sambuc, & Giudicelli (1996) have stated that the winter-birth effect may be a result of an "environmental agent, probably a neuropathogen, acting on the fetus." Ødegård (1977) hypothesized the infants born during the winter have an increased risk for "para-natal brain damage which predisposes them to the development" of severe mental illness in adulthood.

Milstein**,** Small, Shelbourne, & Small (1976) report that winter births may be, also, be more stressful, rendering an infant/ individual more vulnerable to brain damage or viral. "Others have postulated that temperature extremes may affect the hypothalamus of the limbic system adversely, predisposing to the development of schizophrenia, manic-depressive disease or other psychiatric disorder." Studies conducted in the Southern hemisphere, which have inverted seasons to the Northern hemisphere, have produced similar results, potentially suggesting validity of the winter season effect (Parker & Neilson, 1976).

Hare & Price (1969) have suggested that physical damage to the infant may be caused by protein deficiency in the mother's diet during the hot summer months of her early pregnancy, or from ascorbic acid deficiency, or from winter season infectious disease to which a child is more exposed. Additionally, they suggest that winter-born children are prone to nutritional deficiencies which may damage facilitate the manifestation of psychosis in "those genetically at risk."

Others explanations and variables include vitamin deficiency, malnutrition during pregnancy, obstetrical and perinatal complications, foetal damage due to extreme temperatures (Barak**,** Ring, Sulkes, Gabbay, & Elizur, 1995). Livingston, Balkozar & Bracha, (1993) have suggested that viral exposure during the second trimester is the most attractive hypothesis to account for the finding of a seasonal birth. Rock, Greenberg, Hallmayer (2006) believe that there may not be a single variable, but multiple variables as all factors contribute to “maternal nutritional deficiencies and hormonal fluctuations which [can] result in possible deleterious effects on the fetal development.”

However, winter birth and exposure to viral infections have not always resulted in negative consequences. McGrath, Saha, Lieberman, & Buka (2006) followed 11,321 male and 10,802 female infants for 7 years to explore the season of birth effect on anthropometric and neurocognitive measures. Using a battery of developmental and achieve scales (e.g., Bayley Scales for Infant Development, Wechsler Intelligence Scale for Children (WISC), and Bender-Gestalt), the researchers found support of winter born births were longer at birth, heavier, taller and had larger head circumferences. Additionally, during various age level measures, Winter-births had superior scores on the Bayley Motor, Graham-Ernhart, and the WISC. In general, the data supported their hypotheses that winter/spring babies were bigger on the anthropometric measure and smarter on the selected neurocognitive measures. However, the researcher’s caution that there findings may only apply to populations under the age of 7 years. They speculate that early developmental “credits” may be off-set with later “deficits” that may not appear until after age seven.

Intelligence-Children

The relationship between season of birth effect and intelligence has been investigated for some time. In 1931, Pinter evaluated the records of 17,502 children from New York City public schools for a season of birth effect and performance on intelligence tests. Their analysis produced statistical significant of lowest mean IQ scores for children born during the winter (January to March) months. They speculated that winter births were more susceptible to illnesses, and were born to mothers who were also more susceptible to winter illnesses due to their health. They close by stating that additional research must be done to provide conclusive support.

Forlano & Ehrlich (1941) reviewed intelligence test of 7,897 male New York City college students. The authors reported Autumn and Winter births had lower mean intelligence scores than Spring or Summer births. Bibby, Lamb, Leyden, & Wood (1996) found that children, especially males, born in summer perform better on tests of intelligence, mathematical ability, and communication skills. Multivariate analysis revealed that for both gender and season of birth IQ is the major predictor variable followed by reading comprehension, mathematical ability and communication skill. Kanekar & Mukerjee (1972) concurred that summer-borns scored significantly higher than the winter-borns on intelligence test.

Black (1973) offered an explanation of winter birth effect on intelligence. His data suggest that IQ was linearly related to mean temperature during the month of birth. “Within the temperature range from 35 to 70 degrees, higher mean monthly temperatures were consistently associated with high mean IQ.” He suggests that temperature and humidity fluctuations during winter birth may have caused subtle neurological damage which may be reflected in mental retardation.

Pinter’s findings continue to be supported by modern studies. Bibby, Lamb, Leyden & Wood (1996) evaluated 87 children (60 males, 27 females) with moderate learning difficulties from two Nottingham schools. Using a battery of intelligence, reading, and communication skills tests, the authors attempted to support a summer season birth effect. There was significance for higher IQ scores, higher mathematics skills, and higher reading comprehension for summer births; overall, boys achieved higher test scores than girls. These results were similar to findings from Black (1973) who studied 120 Massachusetts children using the WISC and WRAT to determine a season of birth relationship to levels of achievement in reading, spelling, and arithmetic. Children born in the summer scored significantly higher in mean IQ scores. While Black (1973) made no mention of gender differences, Bibby, Lamb, Leyden & Wood (1996) expressed concern that girls were underrepresented in the identification of learning difficulties and referrals for services. One could theorize that the differences in era may have contributed to lack of gender concern.

While some reports continue to support a positive relationship between summer births and higher intelligence scores, there are also reports which do not support these outcomes. Flynn, Rahbar, Bernstein (1996) examined two groups of second grade students (n_1= 2411; n_2 = 1972; over 51% boys in each group) from 26 Midwestern private and public school districts. For both groups, they were unable to produce significant relationships between season of birth and reading disabilities; gender differences were also not supported. The authors suggest that previous studies significant results may have been due to teacher and/or parent bias of referral of assessments for boys.

Studies with special needs children have generally been non-significant for season of birth effect. The possibility that special needs children may have neurological abnormalities beyond a season of birth effect has not been discussed. Williams, Davies, Evans, & Ferguson's (1970) examination of 695 handicapped (developmentally-delayed) British children was unable to reproduce similar results. However, the researchers suggest previous significant finding were due to educational systems method of admitting handicapped children to schools for the sake of the educational systems needs rather then the needs of the children. Specifically, summer born children are always the youngest in their group because schools are traditionally started in the autumn; hence children born during the autumn may be up to a year older then their cohorts.

Roszkowski (1980) studied 419 clients from a Pennsylvania residential facility for the mentally retarded. The sample group was 67% male; the racial diversity was 70% Caucasian, 30% Negro, and <1% Oriental. He was unable to produce any evident of the season of birth effect. Orme (1979) had previously suggested an over-representation of winter births, and less-representation in summer births from this population.

Mascie-Taylor (1980) presented data for 384 mentally retarded adult individuals living in an English suburb. The purpose of the study was to determine consistency of previous reports which suggested higher IQs and personality traits for summer births within this special population. The author reported no significant relationships between season of birth and IQ scores. However, they reported summer born females scored consistently higher in extraversion scales.

Livingston, Balkozar & Bracha (1993) examined the extensive records of 902 adolescents from an outpatient facility in Arkansas. The records contained academic achievements, medical and psychological evaluations, and developmental history. Of the male students, the researches reported that summer births (May, June, July) more than doubled for instances of dyslexia compared to births from other months. –goes with the second trimester theory; as SB second trimester would be during December and early April. “The risk for maternal exposure to viral disease is maximal during these months, particularly for influenza and to a lesser extent, measles in the years for which we have infectious disease data.”

Mick, Biederman & Faraone (1996) evaluated 140 children diagnosed with Attention Deficient Hyperactivity Disorder (ADHD) and 120 control-group children to determine season of birth influence children. They were unable to produce/report significant correlation amongst children solely diagnosed with ADHD, but reported statistical significant for September births in children with comorbidity of ADHD and learning disabilities.

Landau, Cicchetti, Klin & Volkmar (1999) evaluated case files of 904 subjects from a Connecticut community. The 620 children with autism were from the DSM-IV field trial, and the, 284 with mental retardation were from the Yale Child Study Center; both groups meeting DSM-IV criteria for the respective diagnoses. The authors were unable to produce any significant findings for either group. Based on previous studies, they had expected to find a March and August birth effect for autism.

Wilson (2000) studied 1225 (639 males/ 586 females) students from an English comprehensive school to examine the season of birth effect on Special Education Needs (SEN) children. Compared to other studies, Wilson used a log-linear model for analysis as he felt chi-square was less sophisticated to facilitate the quantitative effect of two or more variables in the form of frequencies. The research was unable to produce any significant relationships between season of birth and cognitive abilities of SEN children. Moreover, Wilson argues that teachers and school systems may be responsible for the overrepresentation of male students in this population.

Wallingford & Prout (2000) reported on 1,222 children (822 boys, 400 girls; 825 Caucasians, 351 African Americans, 46 Other [Hispanic, Asian American, Native-American, etc.]), grades K – 5, who had been referred for special education from a

Southeastern school district. The researchers divided the seasons in to trimesters rather than quarters as has been reported by other researchers; there was no explanation provided. However, one might deduct that periods were based on 4 months up to, and 4 months after the cut off date for admission to school. They reported that summer born children (ages 5 to 7 years) received significantly more referrals for special education that other times of the year. This was consistent for both genders; however, the boys' data resulted in somewhat greater significance. The authors caution the interpretation of the data, as summer born children may be up to a year younger than members of their cohort who are in the same group, but were born after the September 1 cutoff date for student enrollment, thus artificially magnifying referrals of the younger summer born group.

Affect/Personality

As previously stated neurodevelopment interfere with monoamine neurotransmitter receptor development and/or functioning. A by-product of 5-HT breakdown is 5-HIAA. Low levels of monoamine metabolites 5-hydroxyindoleacetic acid (5-HIAA) have been associated with suicidal behavior, impulsivity, and depression (Sher, Carballo, Grunebaum, Burke, Zalsman, Huang, Mann, & Oquendo, 2006). Studies of people exhibiting violent suicidal behavior such as stabbing and using firearms, and impulsivity have been tested and have resulted in low 5-HIAA levels (Asberg, 1997). As such it is possible that season of birth may have affected the production of 5-HIAA as it interfered with 5-HT production.

Chotai, Forsgren, Nilsson, & Adolfsson (2001) studied 2,130 individuals from the general population of a northern Swedish town for the season of birth effect on Personality temperament and character dimensions. Personality temperament scales included novelty seeking (NS), harm avoidance (HA), reward dependence (RD), and persistence (PS); character scales were self-directedness (SD), cooperativeness (CO), and self-transcendence (ST). Women born during February to April scored significantly higher in NS scales, while Men born during the same period had higher scores in the PS scale. Of concern is that research with animals has suggested that novelty seeking habits are more susceptible to sensitization of dopaminergic tracts by stimulant drugs (Robinson & Berridge, 1993). This birth period is significant as earlier studies suggest people born in this period were more likely to choose hanging as a method of suicide (Chotai, Renberg, & Jacobsson, 1999). Nevertheless, the authors caution that further research was needed of other genetic and environmental factors, since each contribute some influence on the interaction of the individual's personality.

Middleton & Sumner (1953) evaluated 192 subjects, predominately females, from the New York City area for a relationship between season of birth and personality traits. Using the Bernreuter Personality Inventory, the authors were unable to find any correlation between season of birth and personality traits. However, they noted that winter born subjects scored higher, but not statistically significant, for self-confidence.

Smithers & Cooper (1978) evaluated the relationship between season of birth and extraversion or neuroticism personalities amongst 559 British (559 males, 98 females) university students. Their evaluation found support for both sexes of introverts among Spring (May) births, but also found support for extraverts in Spring and Autumn births. They offered three possible explanations for the season of birth effect. They state that the effort may be due to astrological (i.e., our personalities match the characteristics of our astrological birth signs), climatic (i.e., that there is a natural progression of increased births starting in the Spring to the end), or biological (i.e., there is an unknown biological rhythm which is contributing to the distribution of births) factors. Although the authors provided little or no explanation for their discussion, they recommended and acknowledged the need for further evaluation.

Gupta (1992) reported on 125 married male doctors for season of birth effect and personality types. Using the Eysenck Personality Inventory-Form A (1964), they found that summer births were more labile, and scored higher for impulsiveness, and venturesomeness. The authors caution that these personality characteristics have previously been associated with increased likelihood of criminal or antisocial behaviors.

Hartmann, Reuter, & Nyborg (2006) reported on two studies investigating the season of birth effect. The first study consisted of examining the records of 4462 male veterans for a relationship between season of birth and personality and intelligence measures. They report no significant relationship between season of birth and the four Eysenckian Personality dimensions of Psychoticism (P), Extraversion (E), Neurotcism (N), or Social Desirability (L:Lie). There were no females included in this study. The second study consisted of examining the records of 11,448 young adults (5749 males, 5699 females) for a relationship between season of birth and intelligence. Again, the researchers could not produce significant relationships between season of birth and intelligence scales.

Severe Mental Illness

Presently, there is a continuous growing body of evidence and literature linking season of birth and severe mental health issues. This area appears to be the most widely studied subject. Torrey, Miller, Rawlings, and Yolken's (1997) review of the literature showed consistent support for severe psychiatric and neurological disorders such as schizoaffective disorder and bi-polar disorder for individuals born during the December-March and March-May time periods, respectively. Castogiovanni, Iapichino, Pacchierotti, & Pieraccini's (1998) review of the literature suggested a birth excess of 10% in schizophrenic cases born during winter and spring. Additionally, the study showed a significant increase of bipolar disorders and major depressive disorders for births during the first quarter of the year.

Historically, Tramer (1929) may have been the first to report on the relationship between season of birth and psychotic patients (as cited in Dalén, 1975). His work on 3100 cases at a Swiss hospital, many with schizophrenia disorder, found an excess of births in December to March. Later, Barry & Barry (1961) reported similar findings for Massachusetts subjects diagnosed with schizophrenia disorder. They found significant results for individuals born in January through April.

Mick, Biederman & Faraone (1996) have speculated that maternal viral infection exposure could adversely affect the fetus and have impact on the development of the fetal brain which can later lead to psychopathology. Further they speculate that "because viral infections occur more commonly in winter than in other seasons, season of birth [could be] used to estimate the timing of putative exposure to viral infections." They suggest studying season of birth, because of it is straightforward and less vulnerable to investigator bias may contribute to better understating of the etiology and pathophysiology of mental disorders.

Still, others have confirmed a winter birth effect for severe mental illness, and have offered their interpretation of the results. From client records, Aschauer, Meszaros, and Willinger (1994) examined the birth distribution of 3,132 schizophrenic and schizoaffective patients at a Vienna psychiatric hospital. Their analysis of the data produced significant results of schizophrenic and schizoaffective births during the winter quarter. Additionally, they completed another analysis where the summer quarter was set as the first quarter of the year; the second analysis supported their original findings.

Dassa, Azorin, Ledoray, Sambuc, & Giudicelli (1996) evaluated 468 schizophrenic patients (172 females/296 females) from a district in Marseilles, France. The significance of this work is that this study reported a significant winter birth effect for females “without family history of psychiatric disorders,” but did not find one for males. The results suggest females who are not genetically predisposed to severe mental illness may be more vulnerable to season of birth effects.

Over a two year period, Woodruff, Guze, & Clayton (1974) sampled 500 patients from a Midwest psychiatrist hospital. They were unable to produce any significant relationships between season of birth and manic-depressive or schizophrenic disordered patients. However, these researches used astrological signs as their periods of birth rather than monthly or quarterly seasons of birth which may have played a role in data analysis.

Norris & Chowning (1961) studied 3,617 Canadian schizophrenics for a season of birth effect. As part of their analysis, the researchers compared the subjects’ distribution of births to the average distribution of Canadian births. While the season of birth was not statistically significant, the researchers were reluctant “to conclude that there is no relationship between mental illness and season of birth.” The researchers reported that based on a particular years distribution of national birth averages, the sample distribution may or may not be significantly different.

Shimura & Miura (1980) studied 8508 (7472 schizophrenics and 1036 manic-depressives) patient files (admissions from 1841 and 1940) from a Tokyo hospital to determine a season of birth effect. They noted an Autumn (September- November) excess for all patients. Of particular note, the authors noted an overall increase in admission based on the year of birth with more admissions after 1910. They speculate the shift may be contributed to major seasonal epidemic infections as has been observed in Western countries (Torrey, Torrey & Peterson, 1979).

For a period of sixty-eight months, Kramer & McDonald (1982) collected data from 6,412 patients of a private New York City hospital to examine the season of birth effect with patients of major psychiatric illnesses. They limited the data to subjects 21 years old or older, and excluded patients who only received emergency services. The data did not support a season of birth influence for either schizophrenic or affective disordered clients. The authors stated the importance of a private hospital as it allowed for replication, and allowed for evaluation of a different social class of clients as has been examined in prior studies.

Mino, Oshima, & Okagami (2000) examined the records of 13,969 psychiatric patients (8584 inpatient, 5385 outpatient) from hospitals across Japan to investigate the relationship of season of birth and mood disorders. They found significance for December to March births for bipolar disorder, and depressive disorder amongst male and female patients. Of note, they found male births peaked in December and January while female births peaked in March. The authors speculated that the differences in months of birth by gender may suggest that the "timing of the peak of seasonal excess of births in mood disorders differs according to sex and that the magnitude of the excess is larger in females than in males."

Tatsumi, M., Sasaki, T. & Iwanami, A. (2002) studied 2985 Japanese patients (1783 males, 1202 females) from Japanese hospitals to investigate the relationship between season of birth and schizophrenic disorders. Although, they noted a slight trend in male births across the birth periods, they reported no significant relationships for any monthly or quarterly births compared to national birth averages. Additionally, the researchers speculate that possible explanations for the lack of a relationship may be contributed to milder East Asian weather or to genetic differences in the population compared to Western populations; they recommend further studies "to understand the mechanism of the difference."

Carrión-Baralt, Fuentes-Rivera & Schmeidler (2004) studied 710 schizophrenic births in the Caribbean. They were inquiring whether an area with a consistent climate would be as affected by season of birth as other areas where seasonal changes are pronounced. Taking into consideration, the national distribution of births, and the distribution and frequency of schizophrenic births during a period of 35 years (from 1932 to 1967), the authors stated February births were 36.48% higher risk for developing schizophrenia than other months; the authors point out that this does not mean all February births will develop schizophrenia as most of the February births from the national distribution of births did not. The authors suggested a biological or environmental factor as the cause of the statistical notation. In particular, they suggest that the Hurricane season (from June to November) which brings extra rainfall may be a contributing factor. The increase of rain and humidity may create an optimal environment for viruses to cultivate and infect vulnerable individual such as pregnant mothers.

The interaction of seasonal environment had previously been studied by Ødegård (1977), who studied 62,190 files from the National Case Register of Norway. Comparing the monthly distribution of births for 69 years (1870-1939), the researcher noted a Winter birth (January-March) for schizophrenia. The author noted Norway's dark and cold winter climate as a potential health hazard. Further, the author suggests that parents who had children during the winter were "indifferent or incompetent family planners," thus putting the child at greater risk. The author believes these findings support the idea of "socio-biological differences between schizophrenics and the general population."

Recently, Rock, Greenberg & Hallmayer (2006) suggested a season of birth relationship to adult monoamine turnover and risk for suicide. They suggest that the because monoamine regulation has been linked to suicide and impulsivity behaviors, abnormal monoaminergic neurotransmitter as a result of season of birth effect may be contributing to suicidal behavior. Others studies have lead support to this hypothesis.

Salib & Cortina-Borja (2006) studied the season of birth effect amongst the qualified 26,915 suicides in England and Wales between 1979 and 2001. They found a significant excess of suicides with summer births. They hypothesized that season of birth may be a contributing factor for people to attempt or commit suicide based on vulnerability, and possible exposure to foreign virus during the gestation period. They suggest the season of birth effect "may reflect the timing of an errant early neural migration or differentiation process due to one or more of the these exposures, resulting in subtle histochemical abnormalities underlying the individuals' constitutional vulnerability and affective predisposition" to suicidal behaviors.

Substance Abuse

Due to the link between season of birth and severe mental illnesses, this author felt the next logical area to consider was substance use disorders due to the link between mental health illness and substance abuse disorders. Although, the quantity of studies is limited compared to research on season of birth and schizophrenic patients, the rests of substance use studies have been promising. Among the first to explore this area is Kell (1995), who examined seasonality of birth, comorbidity of anxiety, dysthymia, or combined, and opiate dependence from the medical records of 457 subjects whom had reported for substance abuse treatment. Demographically, the patients were 57% male and 93.5% Caucasian with an average physiological addiction to opiates for 16.9 years. He found significant correlations of season of birth amongst Oct-Jan births for anxiety (32.0 % vs. 25.1%), dysthymia (29.3% vs. 19.%), and combined (23.3 % vs. 14.4%) amongst opioid dependent persons.

Goldberg & Newlin (2000) produced similar results as Kell, providing further support for winter births amongst substance abusers. Their recent study examined the relationship between season of birth and various substances of abuse (non specific illicit drug abusers). Their survey was based on 42,862 adult (over 18 years of age) responses of a national household survey from the general population. Of the participants 58.4% (25,043) were women; 81% were White, 14.2% African-American, 3.9% were of other races, and 0.8% were of unknown race. They found no support of seasonality of birth and alcohol abusers, but found a significant relationship between winter season of birth and alcohol dependence for men. Moreover they found a significant pattern of season of birth and illicit drug use amongst all users. They report illicit drug users were more likely to be born during the late fall (December) and less likely to be born during the winter (January).

Kell and Goldberg & Newlin's studies used different variables to examine their data. Most notably, Kell used four month trimesters whereas Goldberg & Newlin used three month quarters for evaluation. Additionally, Goldberg & Newlin point out that their sample was based on a national population compared to individuals whom had reported for treatment suggesting that their data was more relevant and generalizable to the public.

Modestin, Ammann & Würmle (1995), Kunugi, Nanko, Watanabe, Sekiba, & Kazamatsuri (1998), and Levine & Wojcik (1999) examined seasonality of birth and alcohol abuse/dependence with similar results amongst their respective studies. Modestin, Ammann & Würmle studied the records of 1590 male patients whom had reported at least once to a psychiatric hospital in Berne, Switzerland. This study examined the relationship between season of birth and three separate variables (schizophrenia, affective disorders and alcoholism). They reported a winter birth rated excess for schizophrenia; the most pronounced were in the months of January to March. For alcoholism, although statistically small, the excess of births was found in March to July. The researchers speculate that there is no uniform theory for the seasonal differences or else all of the subjects would have had similar results.

Kunugi, Nanko, Watanabe, Sekiba, & Kazamatsuri (1998) examined the records of 2124 males that were treated for alcoholism in the alcoholic units of two Japanese hospitals. Although their results were not significant, they found modest support for August to October births. Due to the lack of consistency of results between their study and other studies, the researches speculate that their results as well as the results of other studies may have occurred due to chance.

Levine & Wojcik (1999) evaluated the records from the United States Army's Drug and Alcohol Program. Based on records of admission from 1986-1990, they evaluated 113,276 soldiers' files. Their population was limited to 17 to 39 year olds; they set the cut off of 40 years old due to the unique feature of Army retirement which occurs around the age of 40, after a 20 year career. The soldiers were predominately male (92.3%); information regarding racial diversity was not provided. Although not significant, the researchers found support for individuals born during the first half of the year. Rather than dividing the year into trimesters or quarters, these researchers compared to individuals born during the first half of the year (January to June) to individuals born during the second half of the year (July to December).

In conclusion while the supportive data regarding the relationship between season of birth and mental health disorders is inconsistent, there appears to be enough evidence to warrant further investigation of this phenomenon. If a simple notation of prenatal care and birthdates can be evaluated as effective screening tools, the preventative benefits would far outweigh the potential cost of treating mental illnesses. The purpose of this study is to contribute to the body of evidence regarding the season of birth effect, and to further evaluate the relationship between season of birth and mental health disorders, specifically substance use disorders..

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Scope and Method of Study: The purpose of this investigation was to study the relationship between an individual's season of birth and the diagnosis of a stimulant substance disorder. Additionally, this investigation examined the relationship between season of birth and individuals dually diagnosed with a stimulant based substance disorder and a mental health disorder. The sample consisted of 1034 case files (N=1034, 69.1% Male, 72.3% Caucasian).

Findings and Conclusions: Analyses did not produce significant results for a relationship between season of birth and drug of choice, season of birth and gender, nor for season of birth and racial differences. Analyses were also non-significant for season of birth and stimulant based diagnoses, and for gender differences or racial differences within this area. A post hoc analysis supported differences in birth rates based on quarter year births compared to season of year births which may support the need for further investigation in this area.

ADVISER'S APPROVAL: Dr. Donald Boswell