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Racial and Ethnic Differences in Poison Center Utilization

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Racial and Ethnic Differences in Poison Center Utilization

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1998

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Abstract

Racial and Ethnic Differences in Poison Center Utilization
By Gregory Ian Spain

Past research has shown that poison centers can significantly impact both health outcomes and health care costs when they are involved in the care of a suspected poisoning victim. The centers are able to help effectively manage a large number of suspected poisoning cases in the home, as well as to more rapidly and appropriately treat those with toxic exposures that do need the aid of a medical provider. Past research has also shown that there may be underutilization of poison center services by racial and ethnic minorities, who may be at increased risk for poisonings and complications of poisoning due to sociodemographic and genetic factors. To date though, there has been no direct measure of minority poison center utilization as racial and ethnic information is not typically gathered. This study is the first known effort to directly measure minority utilization.

Over a six month period a convenience sample of callers contacting the Georgia Poison Center were asked about the racial and ethnic background of the suspected poisoning victim. These data were then compared against U.S. Census data to estimate relative utilization of poison center services. The study data support the hypothesis that racial minorities contact the poison center at a lesser rate than would be expected based on local demographics. Hispanics, the lone ethnic minority evaluated, were not shown to be underutilizing services though when compared to non-Hispanics.

Comparisons were also made between groups concerning demographics and the spectrum of toxins implicated. Gender, age and poisoning intent classification were generally concordant between the groups. Overall there was also great similarity in the implicated toxin categories, with a few specific areas of deviation which may be of interest for future study.

The study was limited by the non random nature of the sample data gathered. In comparing the demographics and substance spectrum of the study sample with that of the overall Georgia Poison Center population, as well as national poison statistics, it was shown that the sample may be fairly representative, and thus this pilot study provides a solid argument for continuing to explore this area of research.

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Table of Contents

Introduction

Value of Poison Centers

Poison centers serve a valuable role in both the prevention and treatment of poisonings. Precisely measuring their impact though can be problematic. Poison center statistics are compiled on the national level by the American Association of Poison Control Centers (AAPCC) into the National Poison Data System (NPDS). In past studies this data has been utilized for comparison with local demographics, Emergency Medical System (EMS) call volumes and transport statistics, death records, rates of hospital emergency department utilization and hospital admissions data to evaluate the incidence of poisoning as well as the effectiveness and value of poison centers. All of these data sources have their limitations though, and there are still gaps, such as when someone presents to a private medical practice with a suspected poisoning and neither a hospital nor a poison center is contacted. The true incidence of poisoning thus is almost impossible to estimate. This means the true proportion of suspected poisoning victims who actually use poison center services, and by extension a poison center's value to the community are thus equally difficult to gage.

Most studies looking at the contributions of poison centers use indirect measures and hypothesize about outcomes and costs based on suppositions of what would or would not have happened to patients if they had used poison center services. There are two natural experiments on record though that point out what happens when this valuable resource is unavailable. The Louisiana poison center was shut down for a period of time in the late 1980s due to funding cuts. A study looked at a seven month period from late 1988 to mid 1989 and found significant differences in how poisonings were handled in comparison with neighboring Alabama who had maintained their poison center services [1]. They found a significantly lower rate of at home treatment for suspected toxic exposures in Louisiana, and a significantly higher rate of emergency

department visits and physician office visits for suspected exposures as well. For example they estimated an excess of 2,108 clinic or emergency department visits attributable to a lack of access to poison center services in Louisiana for that seven month period. They estimate that the medical costs for an entire one year closure of the center could have been as high as $1.4 million (1983 dollars), whereas the budget cuts that caused the temporary closure of the center were approximately $400,000. The second example occurred in 1993, when the Michigan Poison Center was forced to cut back its coverage area due to a lack of funding [2]. During that time period approximately 8000 callers were given a prerecorded message to contact a physician or go to an emergency department as their area code was no longer serviced by the poison center. A private insurance study presented to congress found that costs for poisoning related medical services did indeed increase significantly for the services areas no longer served as compared to those still within the poison center's catchment area, though exact dollar amounts were not divulged.

Research comparing aggregate information from 14 state inpatient and emergency department databases compiled for the 2003 Healthcare Cost and Utilization project with TESS data (Toxic Exposure Surveillance System, predecessor to the NPDS) showed a significant correlation between emergency department utilization and poison center call rates, with visits declining as call rates increase [3].They estimated that every 1% increase in call volume results in a 0.18% decrease in emergency department utilization.. This equates to a net savings of $203 per emergency visit avoided, or $1.40 in costs saved on emergency services per $1 spent dollar spent on poison center services. This is again based only on evidence of a correlation between emergency department usage and call center utilization, but the relationship was shown to be significant and consistent throughout the states studied, which as a group contain 29% of the U.S. population.

Looking at cases where EMS personnel contacted poison centers prior to transporting a patient for medical treatment, it was found that only 16% of suspected poisoning cases required further medical care at a hospital [4]. The total estimated cost savings was $205,000 in EMS transport costs alone for the 384 cases that were included in the study, or approximately $637 per transport avoided.

Length of hospital stay is also significantly affected by poison center involvement, with a study matching New Jersey hospital records with their corresponding poison center call records concluding that involvement by a poison center reduces the average inpatient length of stay from 6.16 days to 3.92 days, at an average cost savings of $6000 per day [5]. Similarly, a study in Kentucky comparing hospital discharge data with poison center records also found significant differences in the length of stay and total inpatient hospital costs for cases where the poison center was involved [6]. The benefits for poison center involvement were magnified for patients with preexisting medical conditions. There was also a significant interaction with age, where both length of stay and costs decreased at a proportionally greater rate the younger the patient was.

Another study estimates that every 1% increase in poison center call volume in rural areas decreases hospitalization rates by 0.19%, or roughly 1 hospitalization prevented per 43.3 calls to a poison center [7]. This represents an estimated cost savings of $7321 per hospitalization avoided, with the estimated cost per poison center call being $32.11.

These findings are significant as poisonings seem to be occurring with greater frequency in the U.S. , and cases are presenting directly to emergency departments at an increasing rate [8]. Due to the large proportion of pediatric calls that comprise the overall poison center case load, pediatric cases are considered an important metric for the incidence of poisoning and poison center penetrance. Where penetrance is defined as the proportion of exposure related calls to a center compared to the size of the

population served, typically the number of calls per thousand served is used. A recent study comparing NPDS (National Poison Data System, compiled by the AAPCC) data and U.S. Census data showed that overall poison center penetrance is related to pediatric penetrance and that there is an inverse relationship between pediatric penetrance and the volume of poison center calls related to pediatric poisonings made by health care providers [9]. Another study found that there has been a 28% increase pediatric emergency department visits related to poisoning when looking at NPDS data for 2001-2008 [8]. They further found that the percentage of cases that result in admission are also on the rise, perhaps due to the greater prevalence of sustained release medications as well as simply having more toxic medications more widely available. The number of cases referred to the emergency department by poison centers has stayed stable though, despite a 22% increase in the overall call volume [8], potentially meaning that poison centers have successfully taken an increasing load off of the emergency medical system. More than half of children though presenting to an emergency department with suspected poisonings present there directly without a poison center being contacted first, an increase of 60% from 2001-2008 [8]. They also found that many of the cases that present to the emergency department, especially those arriving by personal vehicle rather than ambulance, have been shown to be low acuity cases that could have been treated at home with poison center guidance.

Even in cases of potentially severe poisonings it has been shown that as high as 83% of calls to the poison center concerning patients requiring hospitalization were initiated by the hospital [6]. Data from the National Electronic Injury Surveillance System showed that from 2001-2005, 81% of pediatric cases presenting for suspected poisoning to a health care provider were confirmed as toxic exposures, though a poison center had been contacted in only 19% of those cases [10].

There is thus a preponderance of evidence, both direct and indirect that poison centers do provide a valuable service to the communities they serve, and by extension there would be value in efforts to increase utilization. Most centers have significant outreach efforts, working both to advertise their services and to ensure people know how to access those services. Poison center penetrance is effected by a variety of factors though, with income, educational attainment, race, ethnicity, and distance from a poison center, and the total population served all associated with call volumes [9]. It has been shown in the past that blanket outreach efforts such as mass mailings may be ineffective [11, 12], so targeted efforts specifically addressing those who are underutilizing services may be worth pursuing.

Minority Underutilization

Minority populations have become a particular target of interest for the problem of poison center underutilization It has been found that race, ethnicity and English proficiency are amongst the most important factors determining rates of poison center utilization, with minority status and low English proficiency both strongly associated with lower levels of poison center penetrance [9]. Other factors such as lower socioeconomic status and educational attainment levels were also found be significantly associated with low penetrance, and though there are associations with minority status and lower levels of those two factors, being African-American or Hispanic continued to be significant when socioeconomics and education were adjusted for in the study. An analysis of NHIS (National Health Interview Survey, conducted by the Centers for Disease Control) data has shown that while there is a slightly higher poisoning incidence for white children, there is no significant difference between races for rates of childhood poisonings, which represent the bulk of U.S. poisonings [13]. Despite that similarity in poisoning incidence, they also found that the odds of a poison center not being contacted are 4.3 times greater for African American children than for Caucasian children.

Alternatively stated, a poison center is contacted in only 62% of suspected poisoning cases involving African American children, while it is 87.5% for white children.

This poison center underutilization can translate to an overutilization of emergency department services. A study utilizing the NEISS (National Electronic Injury Surveillance System) as well as the Hospital Administrative DSS (Decision Support System) found that an African American child was 1.4 times as likely to present to the emergency department for a non-toxic exposure than a Caucasian child was [10]. Each of those visits for a non-toxic exposure costing approximately $220. This study also provided a national racial breakdown for emergency department suspected poisoning visits, which were 34.4% African American, 52% white, 2.9% Hispanic and 10.3% undetermined. This differs quite drastically with the racial breakdown presented by U.S. Census data (Table 1), with African Americans presenting for medical care at a rate nearly 3 times higher than would be expected based on U.S. demographics and the suspected incidence of poisoning. The study by Polivka et al (2010) further showed a significant difference in the ratio of non-toxic to toxic poison exposures presenting to the emergency department in comparing those children enrolled in Medicaid as compared to those with private insurance, with the Medicaid group being 1.4 times as likely to present.[10]. An overall conclusion of the study being that African Americans along with Medicaid recipients should be targeted specifically for educational efforts concerning poison center services.

While the strongest evidence for poison center underutilization is for African Americans, other racial and ethnic groups are likely implicated too. It has been shown that low poison center penetrance on the local level is associated with populations composed of a higher percentage of non Caucasians, especially African Americans and Hispanics, as well as communities with a higher percentages of non-English speakers [8]. This supports a previous study using poison center and U.S. census data that

concluded that there were statistically significant differences in the ethnic and racial composition of counties in New Jersey when comparing their levels of poison center penetrance [14]. Specifically it was noted that counties with large Hispanic or Latino populations had low poison center penetrance. These findings are of course only correlational as racial data was not collected by the poison center. This conclusion is supported though by an analysis of the NHIS results, which does collect racial data. This data showed that African Americans caregivers, those of Hispanic descent, and those who were educated outside of the United States were all significantly less likely to contact a poison center before seeking care at an emergency department [13].

Through focus groups with mothers enrolled to use WIC services (Women Infants and Children, a support program for low income women and children under 5 years old) it was found that there are a number of barriers in that community in accessing poison center services [15]. Non English speakers were shown to be significantly less likely to be aware of the existence of poison centers, and those who knew of them were generally unclear of their function. English speaking participants in the study were more likely to know poison centers existed, but were still largely unaware of how to access them. Within this group there was great concern about the quality of information that would be provided, whether attempting to call would simply delay treatment, if the call center workers would be able to understand them, and if they personally would be competent to follow any directions the call center workers would give. They also had a number of false impressions about poison centers, such as that they were staffed by “scientists” rather than medical professionals, and that poison centers should be called if there was a chemical exposure but not for something like a medication overdose. The possibility of being accused of negligence should they seek care was also expressed. These worries and misperceptions led to most of the study participants feeling that calling 911 would be a more expeditious and effective way to treat any

suspected poisoning, or going directly to a trusted physician for care. While not addressed in this study, recent legislation targeting illegal immigrants may further the reluctance some minorities feel in contacting poison centers, as they are viewed as government entities, and thus delay contact with either poison centers or EMS until a point of desperation is reached due to deteriorating medical status.

Past research thus gives a fairly clear picture of minority underutilization of poison center services, albeit via indirect measures, as racial and ethnic data are not usually collected by poison centers with the rest of the case data. For example the NPDS (National Poison Data System) and its predecessor the TESS (Toxic Exposure Surveillance System), both compiled by the AAPCC, do not contain any racial or ethnic data. This may be due to the assumption that the information is of limited clinical value, and that race is a charged enough social topic that it isn't worth potentially losing rapport with callers by inquiring about their race, especially during a high stress situation such as where a mother is worried about their child having been poisoned. Callers may be reluctant to disclose due to the perception that the level of care they receive may be altered by the call center worker knowing their race. However, there are several reasons why race and ethnicity may be an important piece of information that can be utilized by a poison center for more effective toxicological evaluation and treatment.

Minority Vulnerability: Medical outcomes and mortality

Minority populations may be at increased risk for poisoning incidents, which may partially explain the greater proportion of health care visits. A survey in Texas targeting Hispanic families, both English and Spanish speaking, showed that only 27% of those in the study knew of the existence of poison centers and when to utilize their services [16]. Furthermore they found that acculturation to the U.S. was strongly correlated with risk behaviors associated with poisonings, and those who were less acculturated were more

likely to improperly store medications and cleaning agents. An association between having more children in the home and an increase in risk behaviors was also found. Another study found that African Americans and Hispanics were less likely to have safety devices in the home to secure potential toxins, and were also less likely to engage in safety behaviors such as storing medications out of reach of children [17]. The study further found that Hispanics were significantly less likely to have the poison center number posted in an immediately accessible place when compared to African Americans or Caucasians. A study looking at Pakistani households found a significant difference when compared to other cultures in not only storage of prescription antibiotics in the home, but also their utilization without the guidance of a medical professional [18]. It was also found to be common for medications to be unlabeled and without an expiration date, all of which could lead to unintentional exposures as well as therapeutic error. While this study only focused on one ethnic group, the findings are likely applicable to many minority immigrant populations in the U.S. that have differences in both access to and patterns of utilization of medications in their home countries. Ethnicity thus could be a useful factor for consideration when poison centers are trying to discern the likelihood of a toxic exposure in a case.

Thus continued efforts to specifically identify patterns of poison center underutilization and use that data for targeted education campaigns could significantly reduce aggregate health care costs [3-5, 19]. These efforts could also potentially impact individual costs and health outcomes, though the cost savings for individuals have not been formally addressed in the literature. These costs are assumed to be significant though, especially since those who present directly to the emergency department are statistically more likely to be of lower socioeconomic status [10], and thus perhaps less able to tolerate financial hardships.

In addition to the possible value racial and ethnic data would have for improving prevention, numerous studies have also pointed to racial and ethnic differences in response to medications and other chemicals, which may eventually prove to be significant in how patients are triaged and treated by poison centers and EMS. Early research in the field of race based toxicology was of questionable value due to the assumed goals of those investigations. An example is the World War II era study on the racial differences in skin response to mustard gas that was used to posit that black soldiers were more resilient to the effects, thus making the argument for sending them to the front lines ahead of white soldiers [20]. A modern study did show that racial differences may exist, comparing the skin response of Caucasian and Japanese women after acute and chronic exposure to topical irritants [21]. Though the motivation for exposure studies like this has shifted towards beneficence in modern times, the risks associated with them make it unlikely for this type of research to be pursued. Some of the study participants in the topical irritants study for example unexpectedly had skin reactions akin to a 2nd-3rd degree burn, and they may be a risk for permanent changes in skin pigmentation. It points out that all exposure studies are potentially harmful, and that indirect or incidental measures are the most ethically acceptable ways to discover the deleterious effects of toxins, such as looking at differences in reactions to medications, or environmental or occupational exposures. It also points to how differential treatment based on race may be valuable even for those exposures that may not present a mortality risk.

There also is evidence for significant differences in baseline physiologic characteristics amongst the races that may be clinically significant for medical treatment when there is a potentially toxic exposure. A hospital based study comparing Caucasians and African Americans showed that there are significant differences in both the onset of hypertension as well an individual's blood pressure, with African Americans having a

longer history of the disease and a higher baseline blood pressure [22]. It was found that treatment regimens needed to be longer for maximal treatment response in African Americans, and hydrochlorothiazide proved to be more effective in lowering blood pressure in that population. Biological factors and social habits varied between the groups, such as African Americans being more likely to smoke, and less likely to drink alcohol, while having higher waist to hip ratios, potassium serum concentrations and levels of urinary potassium excretion. Even with all those factors figured into a linear regression model though, "race" still accounted for 11% of the interindividual variability in response to hydrochlorothiazide. Similar differences were found previously in a study evaluating a broad spectrum of antihypertensives, with the overall finding that race itself was shown to be a statistically significant factor in predicting response to antihypertensive drugs [23]. Another recent study attributes the blood pressure differences in African Americans to variances in metabolism and hormones, after finding that African Americans still proved to have more recalcitrant disease, even though all those within the study population had similar access to care [24]. This difference was present despite the fact that the majority of African Americans in the study received more counseling on lifestyle modifications, like sodium restriction, and were placed on a greater number of medications. Evidence has also been found that race and ethnicity are significant factors in predicting poor blood glucose control, with Hispanics and non Hispanic African Americans both showing poorer control vs non Hispanic Caucasians [25]. This was true even though the populations had similar access to medical care being from a Veteran's Affairs (VA) hospital cohort. While the current research does not elucidate any particular substance as being problematic for specific minority populations, the differences found in the studies point to the need for further research in the areas of pharmacologic and toxicological response variations.

Mortality records for toxic exposures show some racial patterns as well. White male southerners, especially those in Texas, Georgia and Florida are the mostly likely to die from snakebites, comprising 76% of U.S. snakebite fatalities but only 41% of the population [26]. African Americans by contrast constitute 7% of snakebite fatalities, but 12.9% of the U.S. population. These differences would logically seem to follow from a likely difference in exposure probability, though we have no data to rule out a supposition that white males might be more susceptible to rattlesnake venom, the most commonly implicated snake. Using AAPCC's existing collaborative network of poison centers would be the best way to aggregate such data though. Providing data on a more expansive population than hospital records or death records could, as in theory a greater number of exposures should be captured by the system, and the full spectrum of exposures and outcomes could be evaluated.

While not specific to a toxin exposure, a study looking at death records for New York City showed that African Americans comprised 58.2% of all out of hospital fatalities due to new pulmonary embolisms, while comprising on 25.1% of the city's population, which represents a statistically significant race adjusted incidence rate of 3.73 (95% CI 3.31-4.11)[27]. This supports evidence presented in past research that showed a significantly higher incidence rate of deep vein thrombosis, a common precursor to pulmonary embolism, with African Americans being twice as likely to develop one as Caucasians [28]. The age distribution for African American also skewed significantly younger when compared to Caucasians. Thus more evidence of yet to be elucidated physiological differences in baseline medical risk based on race.

Specifically related to poisonings, it has been found that the rate of poison related infanticide is significantly higher within the African American community than other racial or ethnic groups [29]. The study author's supposition is that race acts as a proxy for the socioeconomic status of vulnerable populations and other related factors such as

a greater possibility of the caretaker being a single mother or having a lower level of educational attainment. These factors in turn could lead to a greater likelihood for problems such as therapeutic error due to misreading a label, or more frequent attempts to quiet a fussy infant with medication due to a lack of needed social support or proper medical care. A conclusion partially supported by a study that found that African American mothers were more likely than mothers of other races to misinterpret medication labels, something they attribute to race being a proxy for lower educational attainment [30]. While these are valid and likely suppositions, there is no reason to rule out the possibility that African American infants could be more susceptible to the toxic effects of over the counter medications. Certainly a randomized clinical trial would never be proposed to evaluate such a hypothesis, but aggregate AAPCC data could help to build a better understanding of the effects of toxins within different racial and ethnic populations. Of far more immediate yield would be the fact that a more accurate estimate of the incidence of exposure within minority racial and ethnic groups could be gained.

Why differences exist

Genetic studies have started to present possible explanations for the medically relevant differences seen between racial and ethnic groups. A well known example of this is glucose-6-phosphatase dehydrogenase (G6PD) deficiency, which is due to allele variations and occurs with greater frequency among specific racial and ethnic groups. G6PD can have a prevalence as high as 25% in some African, Asian and Mediterranean populations [31], but is nearly absent in those of northern European descent. If exposed to certain toxins or chemicals, such as sulfa based drugs, the individual may have an acute reaction resulting in hemolytic anemia [32]. An incident where a toddler accidentally swallowed a few doses of trimethoprim/sulfamethoxazole would perhaps be treated differently then if the poison center workers knew the parents were of North African descent.

Another example of genetic difference is a study looking at a sample of Jewish men showed that 32% of them possessed a specific allele that is associated with an increased rate of ethanol elimination [33]. This increased rate of metabolism would also result in a more rapid accumulation of noxious byproducts such as acetalaldehyde, which is responsible for some of the unpleasant side effects of alcohol intoxication. The researchers posit that the high frequency of this allele may partially contribute to the lesser preference for alcohol consumption within the Jewish community as well as lesser rates of alcoholism. Other studies have linked racially related allele variations with drug responses, such as the CYP2A6*20 allele which is found in African Americans, but not in Caucasians, Japanese or Korean populations [34]. The allele leads to the production of a protein that normally is implicated in the metabolism of substances such as nicotine, coumarin and valproic acid, but in this case completely lacks enzymatic activity.

A study by Nakajima et al 2006, showed significant differences in the metabolism of nicotine to cotinine between whites, blacks, Japanese and Koreans [35]. The Japanese were shown to have a significantly lower metabolism and the Koreans significantly higher when compared to other groups in the study. The Japanese subjects within the sample group also showed the greatest frequency of total alleles that are associated with reduced or absent enzyme activity in the nicotine metabolism pathway. There was not a perfect correlation between allele frequency and nicotine metabolism with Korean subjects also having a relatively high total allele frequency. Other environmental factors are likely associated or very specific alleles in particular may be implicated, such as the CYPA6*4 which was found in 19% of Japanese study participants. A specific CYP-450 isoenzyme CYP2D6, is involved in the metabolism of approximately 25% of all commonly prescribed drugs, yet allele variations in the Caucasian population cause it to be inactive in 6% of those of Caucasian descent, as opposed to 2% of African Americans and 1% of east Asians [36]. Another CYP-450 isoenzyme, CYP2E1, is important in the

oxidative metabolism of industrial chemicals [37]. It has been shown that there is significant inter-individual and inter-ethnic variability in both genotype frequency as well as phenotypic expression, which could manifest in different clinical symptoms of toxicity.

A case control study of those affected with carbamazepine induced Steven Jonson's Syndrome (SJS) and its more severe variant Toxic Epidermal Necrolysis (TEN) compared to individuals who appeared to be tolerant to carbamazepine showed a significant difference in a particular allele frequency [38]. Of the cases, 88.1% had the allele, while only 11.9% of the carbamazepine tolerant population had it. Thus it isn't a perfect predictor of the condition, but the findings of this study are that someone with the allele has 54.76 times the odds of developing SJS/TEN if exposed to carbamazepine when compared to those without the allele.

There thus is significant evidence for there being racially related, medically important genetic variations within the population at large. While it is unknown if there are variations that would change the way that a typical at home medication overdose would be treated, broad effects such as those seen with the response to blood pressure medications in African Americans, or specific severe effects such as is seen when individuals with G6PD deficiency are given sulfa drugs, suggest that there is value of collecting racial and ethnic data in the field of toxicology.

There is also significant indirect evidence of underutilization of poison center services by racial and ethnic minorities. Underutilization of PC services has a variety of potentially negative consequences both for individuals and for our society as a whole. Those who are unaware of or unwilling to use the services are at risk of delaying treatment, increasing their risk of requiring hospitalization for toxic exposures and prolonging the necessary hospital course to ameliorate the effects of the toxin. They also may incur a greater financial burden with unnecessary visits to a care provider, missed

time from their occupation, and higher hospital bills for those toxic exposures that do require admission.

On the societal level, underutilization of poison center services leads to a greater number of 911 calls and emergency transports and a greater number of unnecessary visits for non toxic or low acuity cases which could have been managed at home. There is greater strain on the emergency medical and inpatient medical systems. Hospital admissions are potentially longer, with potentially more intensive treatments for those with toxic exposures who either delayed care, or whose care was performed suboptimally without the toxicological expertise a poison center can offer medical providers. Thus regardless of the type of exposure, toxic or non-toxic, the utilization of poison services has been shown to provide better patient outcomes and significant cost savings.

While, indirect measures seem to show that minority racial and ethnic groups are underutilizing poison center services, to date, no direct measure actually exists as this data is not collected by poison centers. Thus, our study attempts to fill this gap in the literature by estimating the true rates of utilization, as well as the feasibility of collecting this data through the poison center. Our study was performed in collaboration with the Georgia Poison Center (GPC), which is a non-profit entity that functions as an extension of the Grady Health System in downtown Atlanta, and is certified as a Regional Poison Center by the AAPCC. Our hypotheses were that call records would support previous research that had suggested underutilization of poison center services by racial and ethnic minorities, that the data would be feasible to collect with a greater than 90% response rate for those who would be asked, and that there would be no difference in the overall spectrum of toxins that the individual racial and ethnic groups were exposed to. Case data will be compared against overall GPC statistics as well as U.S. census data.

The health implications of this study would allow for more specific targeted education campaigns to increase awareness, as well as laying the groundwork for future

studies to investigate how to improve poison center services to meet the needs of those underserved populations. In addition to the aforementioned benefits, this data would also open up new avenues of toxicological study, potentially advancing work that has already shown that there may be differences in toxicological responses that can be predicted based on a person's racial or ethnic background.

Methods

Population

The GPC covers the entirety of the state of Georgia (GA), and provides information to individuals and health professionals 24 hours a day, 7 days a week. The center receives over 100,000 calls per year currently, of which more than 70,000 per year are consultations for cases of a suspected poisoning. Pediatric calls for non toxic or low acuity exposures comprise the majority of the call load. Demographics for the state of GA from the 2010 U.S. census [39], as well as from the call records from the GPC for the study period are reported in table 2.

Data Collection

Suspected poisoning cases are typically called into the center via the nationwide toll free number (800-222-1222), but there are multiple methodologies for contact including email and live online chat, as well as a call being forwarded from EMS dispatchers and providers or a local hospital. Foreign language services are available through AT&T language line for non English speakers. Callers are connected with a Specialist in Poison Information (SPI), who has been specifically trained to gather data from callers about suspected poisoning victims and to direct them towards appropriate care measures if necessary, a process which is under the guidance of an on call toxicologist.

Information is recorded in a secure electronic database, with the SPIs collecting all of the necessary data to assess the situation, give advice, and later follow up on the

case. The general minimum standard data set collected is listed in table 3. Whenever possible all of this information is collected on the initial call, but the case information may need to be completed over a series of calls depending on the severity of the situation. Disposition of the patient is monitored in a running call log, and the patient is followed throughout their emergency department or hospital course if feasible. Patients who are not dispatched for medical treatment typically receive at least one follow up call from GPC to verify their condition.

During the span from August 2010 to January 2011, SPIs at GPC selected a convenience sample of cases for inclusion in the study. The race and ethnicity of the individual with the suspected exposure was added to the standard case data. These variables were categorized with the same methodology as was standard for the 2000 U.S. Census data (White, Black/African American, Asian, American Indian or Native Alaskan, Native Hawaiian or Pacific Islander, Multiracial and Other). Ethnicity of the individual was recorded as either Hispanic or non-Hispanic. It was also possible to denote if the caller declined to provide racial or ethnic information. During the study period 3,647 callers were asked to give their race and 2,788 to give their ethnicity as well. The overall sample represents approximately 1% of the center's call volume for the data collection period, with a >98% response rate to the requests for racial information. Callers were first given a short description of the study, and then asked if they would be willing to participate and provide the racial and ethnic data for the suspected poisoning victim. Callers were informed that they were not required to participate in order to receive further assistance, and generally were asked if they were willing to be included after the case had been resolved or after having being referred for further treatment. This data was sometimes collected during a follow-up call, though the point at the interaction when the data was collected was not recorded in the database. Racial and ethnic information has not been collected at this center before, nor is that information part of

the standard patient record at most U.S. poison centers. All data collected is subject to the same privacy policies as the rest of the poison center records and strict privacy is maintained as per HIPPA (The Health Insurance Portability and Accountability Act of 1996) standards.

Data Cleaning and Analysis

Call records for the cases included in the study were exported from the electronic database in multiple Microsoft Excel formatted files and then recombined and analyzed for this paper using SAS/STAT software, Version 9.3 of the SAS System for Windows. Copyright © 2010 SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA.

These multiple output files were created due to limitations of the database export interface, and the methodology by which the data was collected, making it necessary to export the data in two disparate formats. No personally identifying information was included in the data export.

One of the export formats presented all of the “cases” for which racial and ethnic data was collected, a case being an incidence of exposure to one or more substances. This file included all of the potential toxic exposures for each case, as there are up to seven implicated substances recorded in the database, and one delineated as the “primary” exposure. The “primary” exposure or substance generally is the one considered to be of greatest clinical significance due to the amount consumed or relative toxicity. Another database export format presented each of the “exposures” for which racial data was collected. This type of database export allows for classification of the different exposures into specific AAPCC “substance classes”, a categorization system that is commonly used in AAPCC reporting and research to generalize and generate statistics concerning exposures. The drawback to this export format is that cases with multiple exposures

would be counted multiple times, once for each exposure even if the exposures were within the same exposure class. A separate file had to be exported for each of the 64 general substance categories, which were then collated into a master file. To avoid skewing the data with multiple exposure cases, the two exports were then merged together to create a single data file that identified the substance class of the primary exposure only, so that descriptive statistics would include each case only once, and not separately for each of the exposures. The data merge was completed in SAS/Stat 9.3 using each case's GPC generated unique identifier number combined with the numeric "generic substance class code" for the primary exposure.

To make the data more easily comparable to AAPCC statistics, age was re-coded into an "age category" variable following AAPCC conventions. An additional simplified "race category" variable was also added, condensing racial coding into "black", "white" and "other". This was done due to the extremely low number of responses in several of the racial categories.

Descriptive statistics were then generated to summarize basic demographics of the data set, as well as to look at patterns of reporting within different racial and substance classes. This includes an overall breakdown of the racial and ethnic groups for the call sample, age range, gender, category of intent, and substance class stratification that were explored for the entire data set as well as for racial and ethnic sub categories. Due to the non random nature of the sample, no statistical test for significance was attempted on the data.

For comparison, the same basic descriptive demographic data was also compiled for all GPC cases for the time period of the study, and was condensed from the 2009 AAPCC annual summary report [40]. Population statistics were generated from 2010 U.S. Census data, including race, ethnicity, gender and age range distribution.

Results

Comparing the study sample to the overall GPC data for the study period as well as the 2009 AAPCC summary data, there was coincidence many areas. Gender distribution was proportionate throughout the samples, with both genders represented nearly equally in all the data sets (Table 4, Figure 1). Age distribution was also similar, with the overall ranking of the proportion of cases in each age group identical throughout the samples, though adults tended to be underrepresented in the study sample when compared to the full GPC data and the AAPCC 2009 summary data (Table 4). This was true even when age was fully stratified into the 10 categories normally used by the AAPCC to describe age distribution (Figure 2). Toxicological spectrum between the samples also proved to be similar between the data sets (Figure 3). The top three exposure categories were identical, "Analgesics", "Cosmetics" and "Cleaning Products", though with slightly altered rankings. Looking at the top 25 exposure categories, which represent more than 84% of all exposures in each of the samples, there was concordance in 21 of those 25, albeit with slightly altered relative rankings.

The study sample was then compared against 2010 U.S. Census data, looking at racial, ethnic distribution (Table 2). African American cases represented approximately 20% of the call volume of the sample, while comprising 31% of the population in the state of Georgia. Asian cases were 2% of the call volume, while comprising 3% of Georgia's population. All other races, including Pacific Islanders, American Indians, Alaskan Natives, and Native Hawaiians constituted 2% of the GPC sample, and 4% of the state's population. The specific categories mentioned in this last aggregate group actually represent three distinct categories in the 2010 U.S. Census data, but are lumped together in the GPC data as the study was set up using the 2000 U.S. Census racial categories. Those callers who identified as multiracial reversed the trend, comprising 4% of the sample but 2% of the population in Georgia. Hispanics represented 9.3% of the case

volume for those who had their ethnicity recorded, compared to 8.8% of the population of the state of Georgia. There were large differences in the sample size though of the callers where ethnicity data was recorded and where racial data was recorded, 2,826 calls vs 3,647 respectively, though both questions should have been asked of all those enrolled. The data collected thus suggests an underutilization of poison center services by racial minorities, but not by those of Hispanic descent, given the assumption from past research that there is no significant difference in the estimated incidence of poisoning between racial groups.

Demographics and characteristics of cases aside from toxin category were compared between the racial categories and between the ethnicity categorizations, with race simplified into “White” “Black” and “Other” (Table 5). As with the comparison between data sets, there is overall coincidence with some minor specific variations. Gender ratios were near identical, varying only by a few percentage points between the races and between the two ethnic categories. The age spectrum for each group has the same overall ranking pattern, with children under 5 years of age the most often called about, followed by adults and then children 6-12 years of age and teens. The under 6 years of age group represented 77% of the “other” racial group vs 61.5% and 66.8% of blacks and whites respectively (Figure 4). This difference was also seen when comparing Hispanics and non-Hispanics, with the under 6 age group representing 77.1% of Hispanic cases, vs 68.6% of non-Hispanic cases.

Intent categorization was also compared, which has 19 different subcategories in the GPC database, but was simplified into 5 general categories for this analysis: Intentional, Unintentional, Adverse Reaction, Withdrawal and Other/Unknown (Table 5). All of the racial groups had primarily unintentional exposures, 87%, 94% and 95% for ‘black’, ‘white’ and ‘other’ respectively. There was the notable difference in intentional poisonings though, these represented 11% of the black cases, versus 4% of white cases

and 3% of cases classified as other. The classification of “intentional” was not stratified further in this analysis to discern if the case was suspected to be a suicide or a homicide. The ranking and proportion of the intent categories were nearly identical between Hispanics and non-Hispanics.

Comparing the toxicological spectrum of the primary exposures, showed that overall there were similar trends amongst the racial categories, though with some notable exceptions. The rank of the top three exposures categories was identical for all three race categories (“Cosmetics”, “Analgesics” and “Cleaning Products”), and 21 of the top 25 exposure categories were shared amongst the groups out of a total of 64 possible categories (Figure 5). For each of the three racial groups the top 25 exposure classes contained more than 86% of the primary exposures. It was notable that “foreign bodies”, such as small toy pieces or coins, represented a greater proportion of cases in the ‘other’ racial category, “bites and envenomations” were more common in whites, blacks reported proportionately fewer exposures to “plants”, and ‘other’ races reported fewer cases involving “sedatives/hypnotics/Antipsychotics”. There were only minor differences in the toxicological spectrum of exposures between Hispanics and non-Hispanics (Figure 6), with the top 3 exposure categories being identical, and there being concordance in 23 of the top 25 exposure categories. The top 25 represented greater than 86% of all exposures in both groups. Notable differences were that Hispanics seemed to be less likely to call in concerning exposures to pesticides or antidepressants.

Discussion

Given the notably lower percentage of calls in each of the racial categories than would be predicted by the demographics of Georgia, the data in this study do seem to concur with the indirect measures in past research that suggested poison center underutilization by racial minorities. The number of cases involving African Americans was approximately 50% lower than expected, and less than half the expected number of

cases were observed for all other minority racial categories. There thus is support for the hypothesis that poison center services are underutilized by minority racial groups. The data do not support an underutilization of poison center services by Hispanics, with near parity in the observed and expected call rates. The reasons for the differences in the observed penetrance are beyond the scope of this study, though they do point to interesting possibilities for future studies.

The finding that minority racial groups call at a lesser than expected frequency is consistent with the findings described in past studies, which hypothesized generally that the disparity could be due to a lack of knowledge of the services offered, unfamiliarity with how to contact the center, or greater faith in EMS and emergency room services making it more likely that they will present directly to a hospital or call 911 rather than calling the poison center. The finding that this same effect is not witnessed in this data with the Hispanic population could be due to the pointed outreach efforts the Georgia Poison Center has made. If this effect is replicated in future studies, it could then suggest that the Hispanic outreach program is a good framework for working to increase utilization by other minority populations. Though, as there is no actual measure of the pre outreach Hispanic penetrance, this finding may just be an artifact of the Georgia Hispanic community.

The hypothesized similarity in toxicological spectra is largely supported, though there appear to be a few specific toxin categories that some racial an ethnic groups are more likely to call in about, such as “bites and envenomations” for whites, and “foreign bodies” for those in the ‘other’ racial category. The 25 most common toxin categories are largely shared between both racial and ethnic groups though, with overall similarity in degree of exposure and ranking of those exposure classes. These top 25, or even arguably the top 10 are where the bulk of the exposures are contained, and also where the greatest degree of variance is seen if any. Toxin categories where racial groups seem to be at a

uniquely increased risk are also a ripe area for future exploration. The difference for 'whites' and their exposure to "bites and envenomations" has some direct support from past research on mortality rates, but the greater risk for "foreign bodies" in the 'other' racial group is not directly supported, but may be explained by lesser levels of parental education about risks to toddlers, the group most at risk in this exposure category. Trying to discern the true cause points out another specific area where gathering racial and ethnic information would have value from a public health perspective.

The similarity of the demographics and toxicological spectrum of the sample data with the overall GPC data for the same time period as well as AAPCC 2009 summary data is encouraging, though the precision or significance of the sample cannot be estimated due to the non random nature of the data collection. The age spectrum, gender balance, intent classification, and toxicological spectrum all closely mirror both GPC data and AAPCC national data. The similarities are hopefully compelling enough at least to warrant a repeat study with more robust data collection parameters.

Limitations

The primary limitation of the study is that the data was collected in a non random fashion. Call center workers were given no formal instructions on how to collect the sample, and thus whether or not to ask a particular caller for their racial or ethnic data was completely at the discretion of the SPI. This could have introduced significant bias into the study as they may have felt uncomfortable, even unconsciously, asking certain callers those questions depending on what they might assume their race to be, perhaps based on vocal characteristics and speech patterns.

Similarly the SPIs may have been less likely to ask about race or ethnicity in cases where the exposure was assumed to be more of a concern. They may have forgotten to ask in the urgency of the moment, not been presented an appropriate time to ask, or simply felt it was inappropriate to ask given the circumstances. Here again there is great

potential for bias should there perhaps be an interaction between race and the acuity of toxin exposures.

Without a clear plan of data collection there are numerous other potential opportunities for bias, such as data collection being avoided during times of heavy call volume or when the center might have been temporarily understaffed. Collection may also have come in bursts, only when call workers were reminded to do so by supervisors, creating short periods of intense collection followed by significant lulls. Given the existing concerns about the quality of the data collection, analysis of the records to determine if any of this may have happened was not attempted.

Concerning the ethnicity data specifically, there is a notable difference in the response rates for the racial and ethnicity questions, though the questions were assumed to both have been asked about every case enrolled in the study. The reason for this disparity is not precisely known. There was no “ethnicity refused” option as there was for race, there also was no option for “unknown ethnicity”, which is a highly probably response should the data have been reported to the poison center by someone not intimately familiar with the individual’s background, such as a member of the hospital staff. A third party may more apt to make an assumption about a person’s race based on appearance alone than they are ethnicity. There also was potential for confusion for the SPIs collecting the data, as both racial and ethnic variables were recorded in the same field in the database, and some may not have realized that they were required to select both a racial and ethnic descriptor. Regardless of the reason, in this study the level of Hispanic poison center utilization can be addressed with less confidence due to the amount of potentially missing data in the sample

Another potential source for error was the fact that there was no pre-determined end point for the study. The investigators stopped when it was assumed there were “enough” cases for analysis. Even if the data had been collected with an appropriate

method of randomization, it could have been underpowered or overpowered. Correctly assessing significance of any findings would thus be problematic.

Anther very significant limitation in evaluating this data is inherent to all studies on race and ethnicity, the potential for reporting bias. Racial and ethnic classifications were all completely based on individual self reports or reports by third parties, which may or may not be accurate. There is the possibility that a person may misreport this data either purposefully or unconsciously, perhaps assuming the level of care or attention received would be affected by what they report, or simply being unaware of the racial or ethnic background of the case victim. There is also a possible lack of uniformity in how race is reported. While there is a category for those who are multiracial, it is not uncommon for someone who is a half or a quarter African American to chose or be referred to by that identity singularly, with similar cases of mixed heritage but singular identity being possible throughout the racial and ethnic categorizations.

Conclusion

Despite the limitations of the study, it arguably presents further evidence for racial underutilization of poison services. The data also gives evidence that while there is minimal difference in the overall spectrum of most implicated toxins in exposures, there may be some differences in specific exposure potentials between racial and ethnic groups. For example the greater incidence of snakebites in whites, and pesticides for races other than black or white. With stronger evidence of these differences it would be feasible to design targeted research efforts to further investigate the reasons behind the difference, for example being able to attribute the elevated level of cleaning product exposures in the African American pediatric population to a lack of safety latches in the home. Specific education campaigns could then be developed to build awareness of the existence of and how to access poison centers, as well as addressing risk factors inherent to specific racial and ethnic subgroups.

Research in medical and genetic differences between racial and ethnic groups may also provide arguments for collecting this data at poison centers. One important point for consideration is that the data this would supply would be nearly impossible to obtain otherwise. It is ethically untenable to perform studies on toxic endpoints in the human population, and thus the best way to evaluate racial differences in outcomes for toxin exposures is to utilize the data that is already being collected by poison centers by augmenting it with racial and ethnic data. It could be argued that such an analysis would be possible with existing hospital records, as race is a data point commonly collected in the medical record. The counterargument though would be that the data from all of the nation's poison centers are already being aggregated into an accessible format by the AAPCC, and that a system of equivalent functionality does not currently exist to mesh all the data for all U.S. hospitals and clinics, as well as the fact that hospital data only includes information for those cases presenting for care, and ignores cases successfully managed at home, essentially cutting out controls for the cases that present and require treatment. An additional argument for collecting racial and ethnic data would be that poison center records are one of the few remaining sources of medical data where this information is not collected, potentially limiting avenues for research when it is used in conjunction with other data sources. The most useful analysis will likely come from combing all of these disparate sources, for example if this study was to be repeated while simultaneously evaluating emergency department visit rates for poisonings.

Eventually, this data may even prove to be useful in providing individual care for those advised by a poison center. A person's race may be indicative of a variety of factors that can affect medical outcomes, such as likelihood of environmental exposures, genetic differences in metabolism or response to drugs, as well as socioeconomic or educational disparities that may put them at greater risk for exposure.

The arguments against collecting this data are few and largely without support. Once concern may be that collecting this data would require more time per call in inquire and potentially explain why the data is being collected. The high response rate in this study though potentially points to the ease of collecting this data, and the time required would be minimal as it generally is a straightforward response, especially if it becomes a normalized part of the data collection process. It could also be posited that callers would be reluctant to divulge this information, or offended that the call center workers would ask, potentially causing them to lose trust in the information being provided to them or decrease the likelihood of calling the poison center in the future with a potential exposure. These are valid concerns, but could likely be mitigated with a well researched script for data collection, as well as careful attention to timing of the question. Past research has shown that Hispanics and African Americans reported they would be more apt to use poison center services if they were exposed to examples of an interaction (Kelly 2000). Including racial and ethnicity questions in such educational materials would help to normalize the questions, and make it less likely to arouse suspicion in callers. Written educational materials could also make specific mention of gathering this type of data and the potential benefits of doing so.

Future directions

In designing future studies on this topic, a more robust study design is recommended. Principally there should be a system of randomization that would give credence to the accuracy of the sample. This would likely be easy to implement with the computerized call handling system in use at the GPC, with a small on screen cue delivered when a SPI should attempt to collect the data. This would include the ability to denote if they were unable to obtain the data for reasons other than refusal. A power analysis should also be done to discern a specific endpoint for the study to avoid the

possibility of it being under or overpowered, the latter the more likely scenario given the high rate of callers in the white and non-Hispanic categories.

Set scripts should be given to the SPIs for describing the study to participants, as well as suggestions for how and when to ask the question to a caller. Data collection should also be standardized and made simpler for the SPIs, with distinct variables for race and ethnicity, as well as the ability to note either that the caller refused to disclose this data or was unsure of how to respond, with a specific distinction between those two responses.

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Tables and Figures

Table 1, US Racial and Ethnic Breakdown

	2000 US Census		2010 US Census	
Ethnicity	*Frequency*	*%*	*Frequency*	*%*
Total Pop	281,421,906.00	100.0%	308,746,538.00	100.0%
Hispanic or Latino	35,305,818.00	12.5%	50,477,594.00	16.3%
Non Hispanic or Latino	246,116,088.00	87.5%	258,267,944.00	83.7%
Race				
Total Population	281,421,906.00	100.0%	308,746,538.00	100.0%
White	211,460,626.00	75.1%	223,553,265.00	72.4%
Black or African American	34,658,190.00	12.3%	38,929,319.00	12.6%
American Indian and Alaskan Native	2,475,956.00	0.9%	2,932,248.00	0.9%
Asian	10,242,998.00	3.6%	14,674,252.00	4.8%
Native Hawaiian, Pacific Islander	398,835.00	0.1%	540,013.00	0.2%
Some other Race	15,359,073.00	5.5%	19,107,368.00	6.2%
Multiracial	6,826,228.00	2.4%	9,009,073.00	2.9%
Adapted from the 2010 US Census summary report.				

Table 2, Comparison of Racial and Ethnic Demographics, State of Ga vs. GPC study sample

Racial/Ethnic Category	GA - US Census 2010	%	Study Population	%	Expected cases, based on GA population alone
White	5,787,440	59.7%	2,587	71.0%	2178
Black	2,950,435	30.5%	735	20.2%	1110
Asian	314,467	3.2%	61	1.7%	118
Pac Is/Alaskan/Other*	427,822	4.4%	74	2.0%	161
Multiracial	207,489	2.1%	166	4.6%	78
Race Refused	.	.	23	0.6%	
Total	**9,687,653**	**100%**	**3,646**	**100%**	**3646**
Hispanic	853,689	8.8%	258	9.3%	246
Non-Hispanic	8,833,964	91.2%	2,530	90.7%	3325
Missing†	.		858		
Total**	**9,687,653**	**100%**	**2,788**	**100%**	**2788**
Total w missing	n/a		3,646		

Table 3

Information regularly collected by GPC for suspected poisonings.	
Name	Exposure site (home, work, school, vehicle...etc)
Age	Substance(s) exposed to (formulation as well if known)
Gender	Amount ingested/injected/etc
Zip Code	Exposure route (ingestion, injection, vapor...etc)
Telephone number	Exposure reason (intentional/unintentional)
Medical Outcome	Management site (home, doctors office, emergency room)

Table 4, Demographic and Intent Comparisons Between Data Sets

		Race Study Data		Ethnicity Data		GPC Data Study Period		AAPCC National Data	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%
Gender	Male	1,878	51.5%	1,372	49.2%	16,653	51.8%	1,207,298	48.7%
	Female	1,761	48.3%	1,412	50.6%	15,291	47.6%	1,259,571	50.8%
	Unknown	7	0.2%	4	0.1%	209	0.7%	12,486	0.5%
	Total	3,646	100%	2,788	100%	32,153	100%	2,479,355	100%
Age	5 and under	2,426	66.5%	1,934	69.4%	16,078	50.0%	1,290,784	52.1%
	6-12y/o	243	6.7%	182	6.5%	2,198	6.8%	152,655	6.2%
	13-19y/o	123	3.4%	92	3.3%	2,057	6.4%	163,615	6.6%
	Adults, 20+	848	23.3%	578	20.7%	11,595	36.1%	853,039	34.4%
	Unknwn	6	0.2%	2	0.1%	225	0.7%	19,262	0.8%
	Total	3,646	100%	2,788	100%	32,153	100%	2,479,355	100%
Intent	Unintentional	3,376	92.6%	2,616	93.8%	26,309	81.8%	2,043,155	82.4%
Category	Intentional	201	5.5%	134	4.8%	4,715	14.7%	344,423	13.9%
	Adverse Reaction	50	1.4%	23	0.8%	707	2.2%	62,462	2.5%
	Unknown	7	0.2%	6	0.2%	198	0.6%	15,084	0.6%
	Other	12	0.3%	9	0.3%	224	0.7%	14,231	0.6%
		3,646	100%	2,788	100%	32,153	100%	2,479,355	100%

Figure 1, Comparison of Gender Distribution Between Data Sets

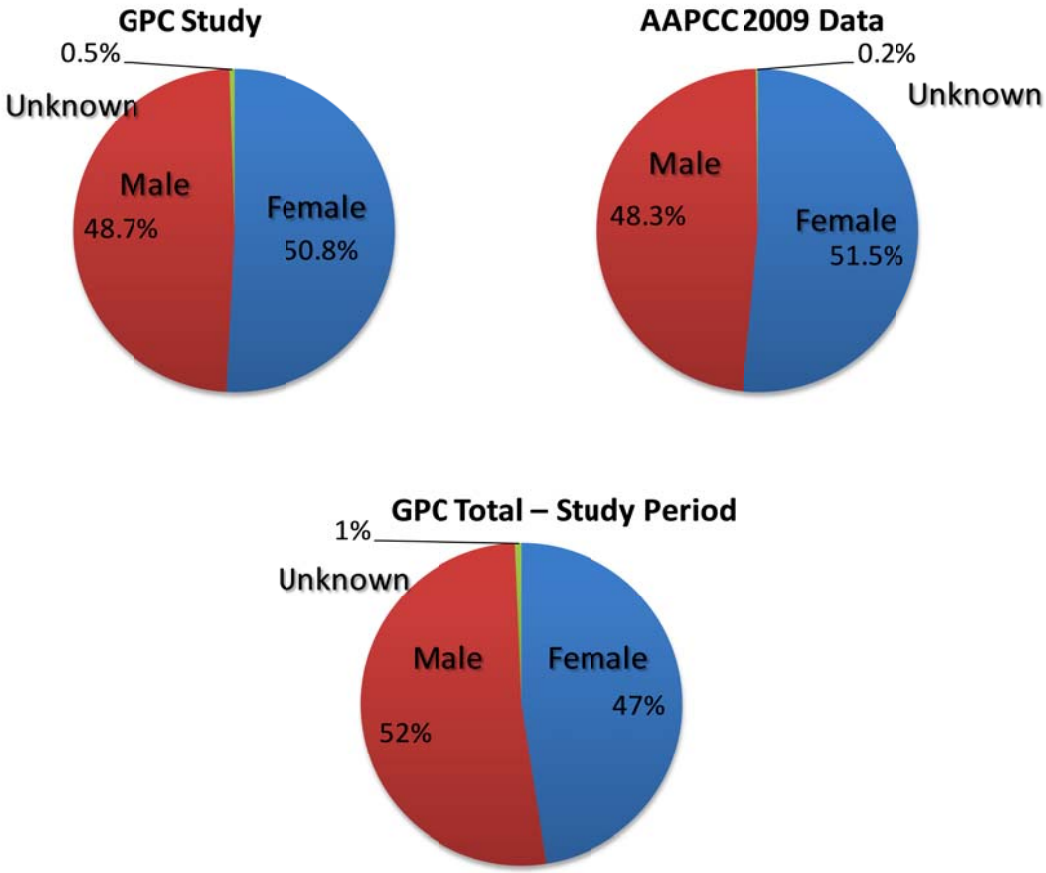


Figure 2, Comparison of Age Distribution Between Data Sets

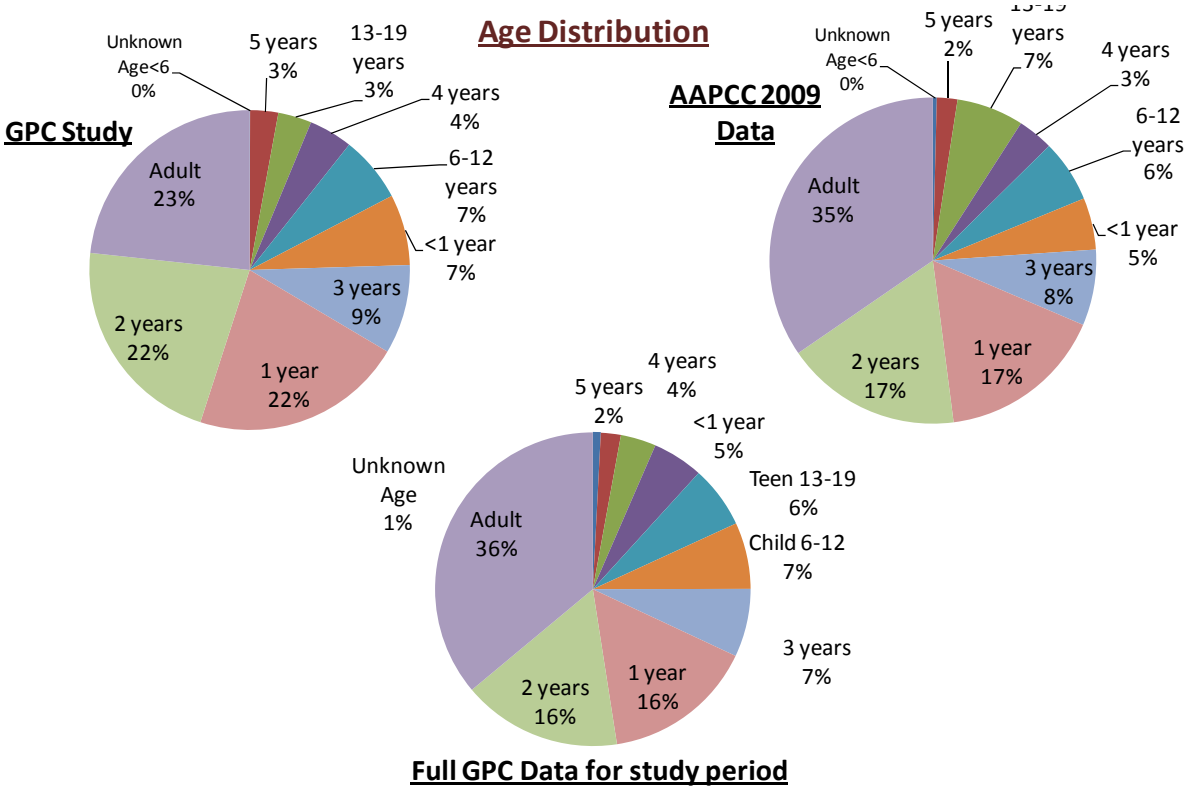


Figure 3

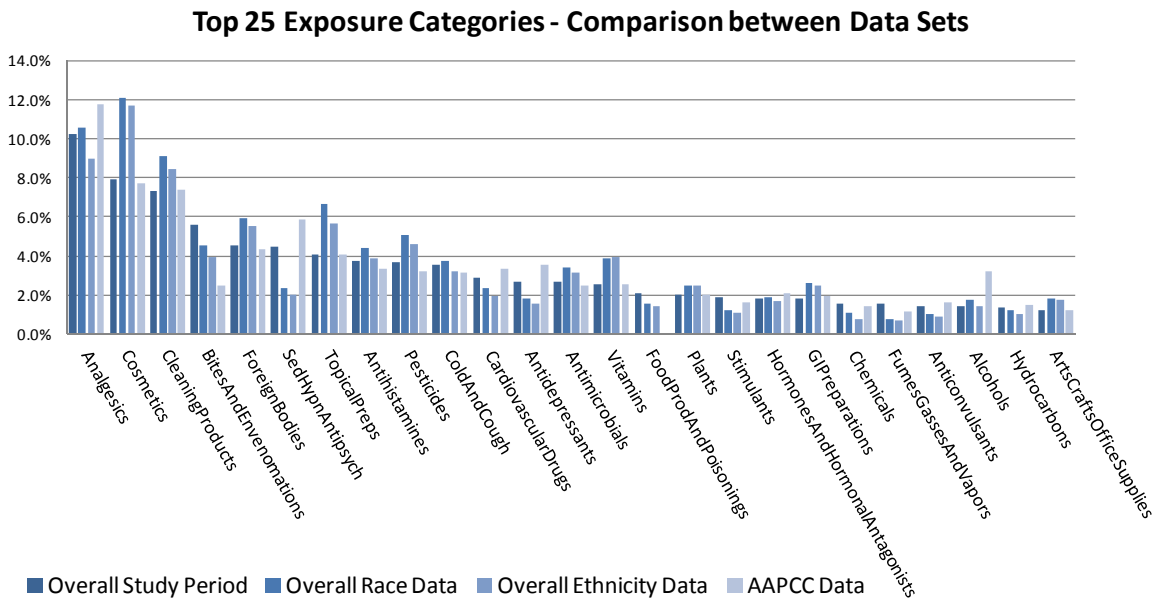

Top 25 Exposure Categories - Comparison between Data Sets
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
Analgesics
Cosmetics
CleaningProducts
BitesAndEnvenomations
ForeignBodies
SedtHypnAntipsych
TopicalPreps
Antihistamines
Pesticides
ColdAndCough
CardiovascularDrugs
Antidepressants
Antimicrobials
Vitamins
FoodProdAndPoisonings
Plants
Stimulants
HormonesAndHormonalAntagonists
GIPreparations
Chemicals
FumesGassesAndVapors
Anticonvulsants
Alcohols
Hydrocarbons
ArtsCraftsOfficeSupplies
Overall Study Period
Overall Race Data
Overall Ethnicity Data
AAPCC Data

Table 5, Demographic and Intent Comparisons Between Racial and Ethnic Groups

		Black		Other		White		Hispanic		Non-Hispanic	
		Freq	**%**	**Freq**	**%**	**Freq**	**%**	**Freq**	**%**	**Freq**	**%**
Gender	Male	354	48.2%	150	46.3%	1,257	48.6%	137	53.1%	1,235	48.8%
	Female	381	51.8%	174	53.7%	1,323	51.1%	121	46.9%	1,291	51.0%
	Unknown	0	0.0%	0	0.0%	7	0.3%	0	0.0%	4	0.2%
	Total	735	100%	324	100%	2,587	100%	258	100%	2,530	100%
Age	5 and under	452	61.5%	250	77.2%	1,724	66.6%	199	77.1%	1,735	68.6%
	6-12y/o	52	7.1%	15	4.6%	176	6.8%	15	5.8%	167	6.6%
	13-19y/o	36	4.9%	9	2.8%	78	3.0%	10	3.9%	82	3.2%
	Adults, 20+	195	26.5%	50	15.4%	603	23.3%	34	13.2%	544	21.5%
	Unknown	0	0.0%	0	0.0%	6	0.2%	0	0.0%	2	0.1%
	Total	735	1	324	1	2,587	1	258	100%	2,530	100%
Intent Category	Unintentional	639	86.9%	309	95.4%	2,428	93.9%	244	94.6%	2,372	93.8%
	Intentional	79	10.7%	9	2.8%	113	4.4%	10	3.9%	124	4.9%
	Adverse Reaction	12	1.6%	4	1.2%	34	1.3%	1	0.4%	22	0.9%
	Unknown /Other	5	0.7%	2	0.6%	10	0.4%	3	1.2%	10	0.4%
	Withdrawal	0	0.0%	0	0.0%	2	0.1%	0	0.0%	2	0.1%
		735	100%	324	100%	2,587	100%	258	100%	2,530	100%

Figure 4

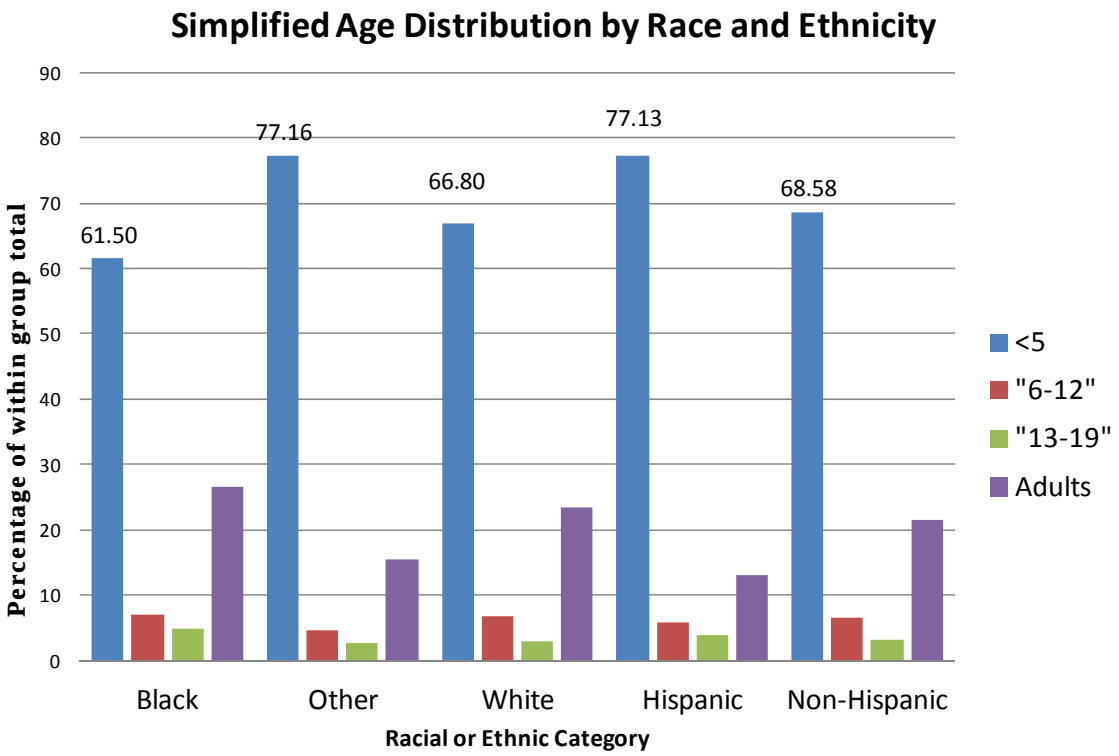

Simplified Age Distribution by Race and Ethnicity
Percentage of within group total
90
80
70
60
50
40
30
20
10
0
61.50
77.16
66.80
77.13
68.58
Black
Other
White
Hispanic
Non-Hispanic
Racial or Ethnic Category
<5
"6-12"
"13-19"
Adults

Figure 5

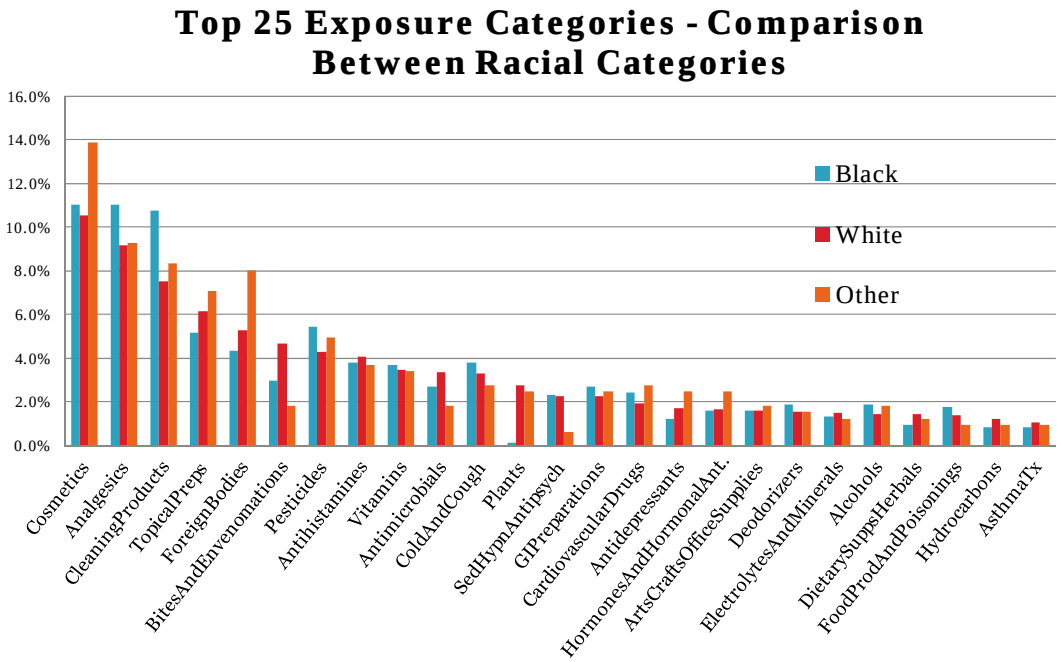
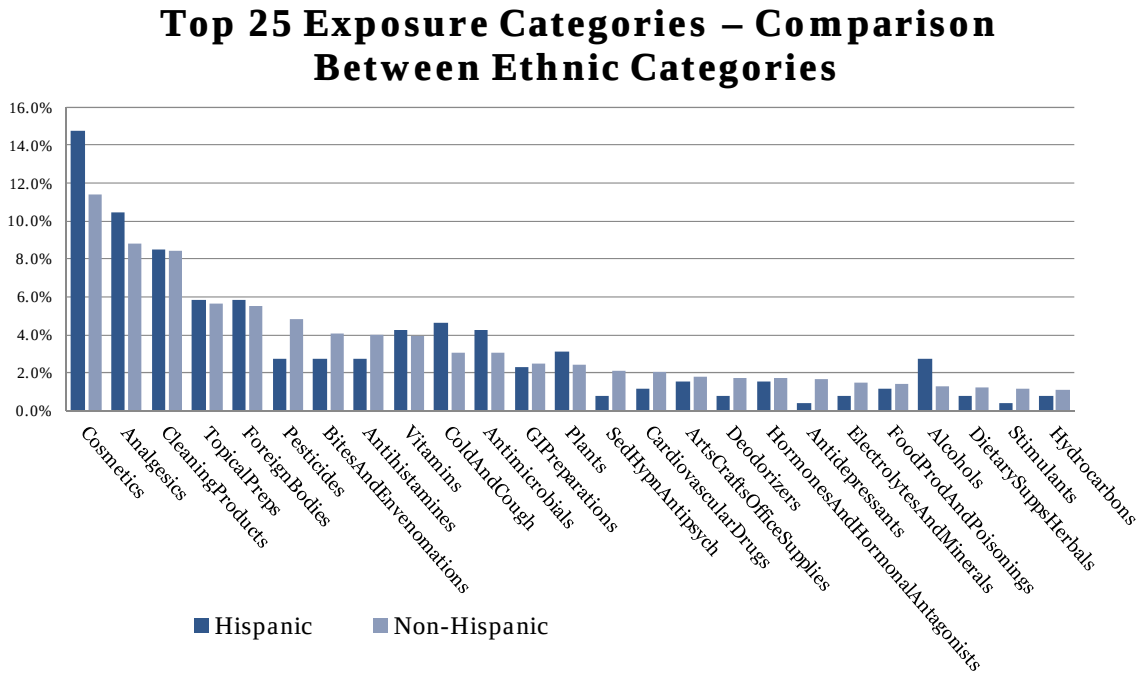

Top 25 Exposure Categories - Comparison Between Racial Categories
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
Black
White
Other
Cosmetics
Analgesics
CleaningProducts
TopicalPreps
ForeignBodies
BitesAndEnvenomations
Pesticides
Antihistamines
Vitamins
Antimicrobials
ColdAndCough
Plants
SedHypnAntipsych
GIPreparations
CardiovascularDrugs
Antidepressants
HormonesAndHormonalAnt.
ArtsCraftsOfficeSupplies
ElectrolytesAndMinerals
Deodorizers
Alcohols
DietarySuppsHerbals
FoodProdAndPoisonings
Hydrocarbons
AsthmaTx

Figure 6


Top 25 Exposure Categories – Comparison Between Ethnic Categories
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
Cosmetics
Analgesics
CleaningProducts
TopicalPreps
ForeignBodies
Pesticides
BitesAndEnvenomations
Antihistamines
Vitamins
ColdAndCough
Antimicrobials
GIPreparations
Plants
SedHypnAntipsych
CardiovascularDrugs
ArtsCraftsOfficeSupplies
Deodorizers
HormonesAndHormonalAntagonists
Antidepressants
ElectrolytesAndMinerals
FoodProdAndPoisonings
Alcohols
DietarySuppsHerbals
Stimulants
Hydrocarbons
Hispanic
Non-Hispanic