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Arab Maternal and Child Health and Use of Preventive Services

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Table of Contents

Executive Summary	3
Introduction	4
Methods	8
Results	15
Discussion	30
Conclusions	40
Recommendations	43
References	44

List of Tables:

Table 1: List of Descriptive Variables	10
Table 2: Descriptive Statistics	18
Table 3: Descriptive Statistics – Continuous Variables	20
Table 4: Bivariate Analysis	22
Table 5: Strong Correlations After Stratification	23
Table 6: Knowledge of Lead Poisoning	24
Table 7: Knowledge of Environmental Lead Sources	25
Table 8: Testing Children for Lead	26
Table 9a: Emergency Department Use – Descriptive Statistics	26
Table 9b: ED Use	27
Table 10a: Asthma - Descriptive Statistics	27
Table 10b: Child with Asthma	27
Table 11a: Gestational Diabetes - Descriptive Statistics	28
Table 11b: Gestational Diabetes	28
Table 11c: Testing for Gestational Diabetes	28
Table 12a: Post-Partum Depression - Descriptive Statistics	29
Table 12b: Post-Partum Depression	29

Appendix A: Questionnaires and Consent Forms

Executive Summary

An investigation of maternal and child health issues in the Arab community of Southeast Michigan focused on several key outcomes including lead poisoning, asthma, emergency department use, gestational diabetes, and post-partum depression.

The data was gathered by telephone interview of Arab mothers in either Arabic or English. Information from the pre-developed questionnaires included obstetric history, prenatal care, immigration status, acculturation and linguistic ability, asthma history, emergency department use, lead poisoning knowledge and prevention, smoking status, and socioeconomic indicators. Information was gathered from 327 women who were contacted through Arab Community Center for Economic and Social Services (ACCESS) programs, a Women Infants and Children (WIC) clinic in Dearborn, and ACCESS outreach in Hamtramck. The aforementioned key outcomes were evaluated through bivariate and multiple logistic regression analysis with respect to acculturation, health behavior, and socioeconomic variables.

The results demonstrated the importance of English capability and positive economic predictors in health knowledge and receiving preventive services with respect to lead poisoning. The combination of asthma and cigarette smoking appeared responsible for a significant number of emergency department visits for Arab children in the past year. Considerable rates of both gestational diabetes and post-partum depression highlight the need for appropriate screening of these conditions in the Arab community.

Preventive medicine would optimize the health care of the mothers and children of the Arab community studied. Building on current efforts by ACCESS with respect to lead poisoning screening and increasing the rates of out-patient screening for gestational diabetes and post-partum depression would likely save personal hardship and financial resources that would otherwise be lost to morbidity. Expanding on the already extensive anti-smoking campaigns exercised by ACCESS may aid in a decrease in the prevalence of asthma and the need for respiratory related emergency medical services in this community.

Introduction

The State of Michigan, where possibly the largest concentration of Arabs lives outside of the Middle East and North Africa, is heavily industrialized putting people, especially children, at risk from an environmental health standpoint. As Arab Americans are not recognized as a minority by federal departments such as the census bureau, it is often difficult to get accurate information on health statistics of this population. In attempts to serve the poorest contingent of the Arab population in the Detroit metro area, organizations such as the Arab Community Center for Economic and Social Services (ACCESS) dedicate federal and private funds that they receive towards primary health care and preventive services including lead poisoning prevention.

Bonded together primarily by their common language of Arabic, the Arab population of the Detroit area is estimated to be over 207,000 and some argue as high as 250,000 persons strong (Hammad, et al, 1999). Many of the newer immigrants have fled civil strife and political unrest in nations such as Iraq, Yemen, Lebanon, and the area of Palestine to establish a home in the United States. Language and cultural barriers associated with movement from a homeland to a new country with virtually no material belongings means that many of the newcomers are poor and unqualified for employment. Immigrants may also be unaware of economic opportunities and health care in their community.

Children's health issues for many Arab Americans in Detroit are similar to those of other poor children in inner cities of America. Old housing exposes a majority of children in the community to lead-based paint. Although the Centers for Disease Control and Prevention (CDC) recommends lead screening for all children at the ages of 1 and 2 years who receive federal assistance including Medicaid, it is questionable whether or not this is performed. A study of practicing California pediatricians showed less than half of them exercising CDC screening principles. Only in the sub-group of physicians whose patient base consisted of over three-fourths receiving financial assistance was there a majority of physicians practicing universal lead screening (Ferguson and Lieu, 1997). Numerous studies have shown a decrease in intelligent quotient score with increased lead levels (CDC, 1991). Though there is no defined threshold at which lead level neurologic damage will

result, the American Academy of Pediatrics believes a level as low as 10 µg/dl may cause cognitive and developmental deficits in children (AAP, 1993). Even so, it remains CDC guidelines that the level requiring medical and environmental intervention is ≥ 20 µg/dl (CDC, 1997).

In 1984 17% of American children were thought to have blood lead levels in excess of 15 µg/dl (ATSDR). Though major environmental advances have eliminated lead in gasoline and lead-based solder in packaging for canned foods, lead remains in the environments of urban children. Lead content of new paint for residences was limited by the Consumer Products Safety Commission (CPSC) in 1978, but older homes remain covered with the older lead-based paint. Paint manufactured before 1950 contained more lead than paint produced after that year (Lead-Based Paint Hazard Reduction and Financing Task Force, 1995) making 1950 a policy cut-off for lead risk in households. Older household paint is the major source of high-dose lead poisoning in the United States (CDC, 1991).

Because flakes or dust of exterior paint are in a higher concentration the closer one is to a home, one study showed that children who played within 3 feet of the outside of a home had an increased risk for high lead levels (Dalton, et al, 1996; OR=3.4). A 1983 study demonstrated a regression that predicted increasing blood lead levels by increasing soil lead concentrations (Schilling and Bain, 1988). Lead remains in typically the upper 2-5 cm of undisturbed soil having arrived from sources such as household exterior paint, leaded gas emissions, or industrial lead smelters. Children may ingest this through hand to mouth activity either while playing or at mealtime (EPA, 1986).

A 5-item questionnaire developed by the Centers for Disease Control and Prevention was designed to classify children at higher risk for having elevated blood levels. Trials of this questionnaire as an adequate screening tool have been mixed. A study in Rochester, NY where the study population had a 28% prevalence of elevated blood lead levels (BLL) > 10 µg /dl showed the questionnaire to have a 70% sensitivity and 81% specificity (Schaffer, et al. 1994). In a population with a much lower prevalence of elevated BLLs (2.9%) the questionnaire's sensitivity (57%) and specificity (51%) were little better than chance (France, et al. 1996).

The newest guidelines from the CDC call for universal screening by BLL of all children meeting one of the following criteria:

- 1) They reside within a zip code where $\geq 27\%$ of the homes were built before 1950.
- 2) They receive services from public assistance programs (e.g. Medicaid, WIC).
- 3) The parents of the children answer “yes” or “I don’t know” to one of three questions which are an abridged version of the original CDC 5-item questionnaire:
 - a. Does your child live in or regularly visit a house that was built before 1950?
 - b. Does your child live in or regularly visit a house built before 1978 with recent or ongoing renovations or remodeling (within the last 6 months)?
 - c. Does your child have a sibling or playmate who has or did have lead poisoning? (CDC, 1997).

According to these guidelines and observing census tract data for percent of pre-1950 homes, every child living in Detroit or Hamtramck, with the exception of those in one census tract on the far west side of Detroit, should be screened for a BLL (DHD, 1997). Housing units in Dearborn are of similar age to those in Southwest Detroit and the assessor's office of Dearborn suggests greater than half of the homes were built before 1950 (personal communication).

Asthma is a major contributor to childhood morbidity in inner cities. Industrial air pollution and heavy trucking routes may lead to or exacerbate this condition (Northridge, et al. 1999). Second-hand smoke is also implicated in the causality of asthma and other respiratory diseases among children. It is often difficult to assess true passive smoke exposure without objective confirmation as many people conceal the fact they may be exposing their children to second-hand smoke (Hohler E, et al. 1999). Though few studies have investigated respiratory diseases and pre vs. postnatal smoking behavior, one study suggested that pre-natal but not post-natal smoking was associated with wheezing (Stein, et al. 1999). Unfortunately, for Arab children, their parents have an alarmingly high prevalence of smokers among them.

Use of emergency departments (ED's) in hospitals may indicate rates of trauma or serious acute illness in populations. ED use could also result from necessity as often insurance difficulties make emergency departments the most affordable source of health care.

Gestational diabetes is often a predictor of type II diabetes morbidity later in life. Though a search through medical literature reveals little information regarding diabetes and Arabs, the Arab American Coalition of the American Diabetic Association states that diabetes prevalence of Arab Americans is as high as 16%, much higher than that of the U.S. population as a whole which is around 5.9% (<http://www.diabetes.org>). Little to nothing is known about gestational diabetes and its impact on the Arab American community.

Post partum depression (PPD) is another common condition impacting maternal and child health. Though most women recover spontaneously from this, they may go through PPD without treatment and in some cases fall into a deeper depression with elements of psychosis. A depressed mother does not form a strong bond with her child and though the psychological implications of this are difficult to assess they are undoubtedly real. With the added stresses of immigration to the United States and histories of fleeing areas of civil strife it seems plausible that the Arab immigrant women would be at a greater risk of this morbidity than women of a non-immigrant population.

While literature presents programs or viewpoints regarding why immigrants are not as well informed about health information as their non-immigrant counterparts, little to nothing can be found by way of statistical analyses regarding this issue (Hattar-Pollara and Meleis, 1995; Beine, et al., 1995; Edwards, et al., 1992). Language barriers and also whether or not an individual has legal documentation to be in the U.S. may be factors affecting use of preventive services (Chavez, et al. 1985).

Primary health care is essential in its assessment of the needs and knowledge of a target population. Through a survey administered to some of the poorest women in the Arab community of Dearborn and Detroit, it was attempted to assess knowledge and practices of lead poisoning prevention and to identify immigration, linguistic, socioeconomic, and health behavior predictors of that maternal knowledge and practice. Data was also collected on maternal health issues such as gestational diabetes and post-partum depression, as well as child health issues related to asthma and emergency department use. Similar predictors were used in the analysis of these maternal and child health issues.

Methods

Overview

This study focuses on the following outcomes:

1. Is immigration and acculturation status in the U.S. associated with knowledge of lead poisoning? Outcome variables include knowledge of lead poisoning, determined by a subject having heard of “lead poisoning”, and naming a source of environmental lead. Age of immigration may have a joint effect with length of years lived in the U.S. Confounders may include country of birth, language capability, education, lead risk factors, health behavior (e.g. tobacco use), asthma in household
2. Is length of years lived in the U.S. associated with seeking lead screening for one’s children? The outcome variable is receiving preventive measures, determined by a subject’s children having been screened for lead burden. Potential joint effects and confounders are expected to be similar to those for the first outcome variable.
3. Are economic indicators associated with use of the emergency department for children? The outcome was determined by asking whether any of a subject’s children have been taken to an emergency department in the past year. Predictor and confounding variables evaluated will be among those used in assessing lead poisoning associations.
4. Is health behavior (e.g. smoking) associated with asthma in children? The outcome variable is based on a question of whether a subject has been told that any of her children have asthma. Again, predictor variables to be evaluated will be similar to those concerning lead poisoning.
5. Is length of years lived in the U.S. associated with gestational diabetes or being tested for gestational diabetes? A reason for this could be related to a change in dietary factors. The outcome variables are based on self-reports of having high blood sugar during any one of a subject’s past pregnancies or having been tested for gestational diabetes by drinking a sugary juice. Predictor variables and confounders to be examined will be similar to those regarding the lead poisoning outcomes.
6. Is spousal support associated with self-reported depression in the post-partum period? The outcome is based on response of the subject to the question of whether or not she felt sad or depressed for at least two weeks during a three month post-partum period after the birth of her most recent child. Predictor variables are similar to the previous outcomes but also include

person of greatest support during most recent pregnancy, both subject and partner desire for most recent pregnancy, and quality of marriage.

Questionnaire Development and Recruitment

The original questionnaire was developed in English and pilot-tested on a cohort of English speaking mothers of Arab descent at a Women Infants and Children (WIC) Clinic in Dearborn, Michigan. The English questionnaire was translated into Arabic and then translated back into English to check for any alteration of meanings caused by the translation. The Arabic version was pilot tested on Arabic-speaking mothers who either worked for ACCESS or were clients.

Women were determined eligible if they met two entry criteria: 1) They were of Arab descent, defined as tracing one's predominant ancestry to any of several Arab nations in the Middle East or North Africa; 2) They had at least one child age 12 or under. Only one woman per household was included for purposes of analysis.

Recruitment procedures were performed using several sources that provided contact with mainly poor, Arab women with young children. A continuous sample was obtained from the Wayne County Women Infants and Children (WIC) Clinic located at 9704 Dix Avenue in Dearborn, Michigan. Women who came into the clinic between July 3, 1999 and August 6, 1999 were asked if they could be contacted by phone in order to conduct a maternal/child health survey. A continuous sample was also taken from those families who had contacted the Arab Community Center for Economic and Social Services (ACCESS) to enroll in insurance programs including MI-Child, which receives funding from Medicaid sources.

A sample of Yemeni women, located primarily in the city of Hamtramck, was obtained through outreach workers who were attempting to establish an outpost of ACCESS in that area of Detroit. Initial people called in Hamtramck were selected from the personal knowledge of the outreach workers and subsequent referrals from the women who were being surveyed. A small initial sample was composed of charts randomly selected from the ACCESS Clinic records on 9708 Dix Ave., Dearborn, adjacent to the WIC Clinic. These charts were of patients who had been seen at the clinic between 1991 and May 7, 1999. Home phone numbers in the charts were called and the person was

asked if a woman with a child of 12 or less years of age lived in the household. Because of a very high failure rate from this random chart pull the other methods were used to recruit the majority of participants. With the other methods, home phone numbers were called and once it was determined that an eligible woman lived in the home the interviewer asked permission to conduct the survey; the exception to this being the women from the WIC clinic who were contacted in the manner previously discussed.

On completion of data collection a total of ten households in the data set were found to have more than one mother who was interviewed. For each of these households, one woman was selected at random to determine which record would be kept in the dataset. In cases where women in a household were separated by >15 years the younger one was selected. The selection of only one woman from each household was performed to prevent unwanted bias of the results by specific households. The selection of the younger women in those situations was done for convenience to include a higher number of younger children which is the population targeted to benefit from this study.

Women were asked if they would prefer to be interviewed in Arabic or English. All interviews were conducted via telephone. All interviewers were Arab women who lived in the greater Detroit metro area and who were fluent in English, Arabic, or both. Those who were fluent in only one language conducted interviews only in the language of their fluency.

Data Analysis

Data was entered from the questionnaires into a computer database using EpiInfo version 6.04. Descriptive statistics could be obtained for the following variables listed in Table 1.

Table 1: List of Descriptive Variables

Variable Category	Variable
Ethnicity and acculturation	Ethnic heritage of the subject
	Ethnic heritage of the subject's partner
	Language of interview
	Language primarily spoken at home
	Literacy of the subject in Arabic or English
	Literacy of the subject's partner in Arabic or English
Immigration Status	Country of birth

	Years lived in the United States (if immigrated)
	Age of immigration
Child/Obstetric histories	Current age
	Use of prenatal care
	Self-reported gestational diabetes
	Self-reported post-partum depression
	Support during last pregnancy
	Gender
	Birth history
	Feeding history for first year of life
	Miscarriages both prior and after immigration
Asthma	Which child diagnosed with asthma
	Medication use
	Hospitalizations
Emergency Department Use	Which Children were taken to the ED
	Was it for illness or injury
	Were injuries treated with stitches or casting
	Was the child hospitalized
	What was the reason for using the ED
Lead Poisoning	Knowledge of lead poisoning
	Knowledge of lead sources
	Screening history
	Lead exposure risks
Smoking Exposure	Cigarette use inside and outside the home
	Rangila use
	Smoke exposure during pregnancy
Socioeconomic Status	Type and size of home
	Number of people in home
	Home Ownership
	Employment
	Income
	Health insurance
Education	Level of subject's education
	Level of subject's partner's education
Marital Status	Current marital status
	Age at first marriage
	Quality of marriage
Database	Source of subject's recruitment

Observing descriptive statistics of the variables on the interviewer is expected to correlate highly with language of the interview as interviewers typically focused on one language. These relationships may also transfer to those variables correlated with language and also to variables correlated with the interviewer including database source since the interviewers tended interview women from a specific database.

Descriptive statistics were performed on all the variables to check for inconsistencies in the data across the different sources of subject pools. Bivariate logistic analysis was performed to obtain crude odds ratios for unstratified data and chi-square tests were used to evaluate significance of association between predictor and outcome variables. The data was then stratified by all other variables significant to the particular outcome to evaluate third variables as potential confounders or effect modifiers. With confounding, a Cochran-Mantel-Haenszel (CMH) pooled summary statistic was reported. For variables still independently significant after controlling for possible individual confounding, the CMH was reported with respect to the third variable that decreased the significance of the relationship the greatest. This was done in order to underestimate the impact of the predictor variable on the outcome. Multiple logistic regressions were then used to explore important interactions between predictor variables and the outcome. 95% confidence limits were reported for all parameter estimates. Analyses were performed on all acceptable surveys completed prior to the end date of August 9, 1999.

The outcome variables knowledge of lead poisoning, naming a lead source, and history of screening for lead poisoning were recoded as numeric variables with values 0 or 1. These were then placed into a multivariate logistic regression model with several predictor variables. The multivariate equation was determined using a stepwise procedure. The r^2 value of the equation was reported and p values, odds ratios, and 95% confidence limits were reported for the predictors significant in the model at an alpha level of 0.05. Stepwise multiple logistic regression analysis for all outcomes put all variables listed in table 3 (results) into the procedure with the exception of husband's literacy and husband's education to reduce multicollinearity with the maternal variables. The continuous variables of years lived in the U.S. and the age differential between motherhood and immigration were also included. Because of a large number of refused responses for income (N=24 missing), this variable was added to multivariate models after the stepwise procedure and it was determined then whether income should be included. After significant variables were determined a minimum of all bivariate interactions and squared products of the individual variables were placed with the individual predictors in the same stepwise procedure to see if the fit of the equation could be improved. Data of all continuous variables were centered prior to this procedure. Derived variables were formed in either EpiInfo and SAS. Multivariate logistic regression modeling was performed in The SAS System for Windows version 6.12.

The outcome variables knowledge of lead poisoning, including knowledge of lead poisoning and knowledge of at least one source of lead were evaluated in the above manner. Use of preventive measures, specifically screening of children for lead poisoning was also evaluated. All variables listed in Table 1 could be used as predictor variables against these outcomes.

The outcome variables of emergency department use, child asthmatics, gestational diabetes, testing for gestational diabetes, and post-partum depression were also evaluated using descriptive statistics across the different databases. All predictor variables used in the descriptive statistics were then placed in multivariate logistic regression models for the individual outcome variables. The same procedure as was used for the lead poisoning multiple regression analysis was used for these outcomes without evaluating variable interactions. However, both the asthma and emergency department use models were also tested against additional variables for smoking including subject smoking, cigarette use, rangila use, and smoking during pregnancy. Additional predictors were included in the full model for post-partum depression that dealt with support and desire of the most recent pregnancy as well as quality of marriage and whether or not her recent childbirth was her first. Contrary to the data regarding lead poisoning and having tested for gestational diabetes, these other outcomes represent negative health effects when reported. Therefore, risk ratios or odds ratios depict the association of the predictor with the disease or need to use emergent facilities.

Any variable involving number of years or number of children was evaluated as a continuous variable. A derived variable of the algebraic difference in years between the birth of one's first child and one's year of immigration was meant to be a marker of years of American acculturation prior to becoming a mother. If the subject was born in the U.S. she was treated as if she immigrated at age zero.

Due to the ethnic make-up of the study population ethnicity was subdivided as two dummy variables representing Lebanese and Yemeni, with Iraqi/other being the reference group. For country of birth, whether or not one was born in the United States was the point of comparison. Language capability was evaluated as several dichotomous variables. For language primarily spoken at home one variable designated whether or not Arabic was the only language primarily spoken at home. For

language read and written by the subject again there were two variables where those illiterate were designated (0,0) and those literate in both languages were designated (1,1). Literacy in Arabic only or English only were designated (1,0) or (0,1) respectively. A likewise procedure was done for the partner's reading and writing ability. Education was a dichotomous variable typically depicting whether or not one moved beyond primary school though whether or not one completed secondary school was also evaluated.

Health and obstetric history included a dichotomous variable of whether the subject breastfed any of her children. Dichotomous variables existed for having experienced a loss of pregnancy in the United States and for having given birth to all one's children in the U.S. Dichotomous variables were used for children with asthma in a household and use of the emergency department for children in the past year.

Smoking was represented through the presence of anyone smoking at home as a yes/no dichotomous variable. There was one dummy variable for whether or not a smoker was present in the home. Additional dichotomous variables singled out the type of smoker by whether or not a cigarette smoker was present and whether or not someone smoked rangila in the home.

Income was a dichotomous variable signifying whether or not a family earned greater than \$10,000 annually. Insurance was evaluated as a dichotomous variable representing whether or not one had insurance and a second dummy variable for whether or not those with insurance had private or employment-subsidized insurance. Employment of either the subject or subject's husband was used as a dichotomous variable. Home ownership was also represented as a dichotomous variable.

Geographic location was represented through source of recruitment or database, using two dummy variables with clients of ACCESS through either the Community Health Center (CHC) or MI-Child enrollment as the reference group. The dummy variables represented clients from WIC and the outreach program (Hamtramck).

A specific set of dichotomous predictors were formed for the evaluation of post-partum depression after the subject's most recent pregnancy. These included whether the pregnancy was planned,

whether the pregnancy was desired by the subject or by the subject's husband, and whether the subject was sick during the pregnancy. Quality of marriage was also used with those describing their marriage as "good" or "loving" being assigned a value of "1" and those describing their marriage as "average" or below average being assigned a value of "0".

Results

Of the 343 interviews that were fully or partially completed, 327 were eligible for analysis. Among those discounted, reasons included no living children (mothers pregnant for the first time), incomplete information regarding number of children, and incomplete information regarding outcome variables.

The initial list of potential subjects from a random ACCESS chart pull proved difficult as the overwhelming majority of those called were either not eligible or unreachable. The 36 subjects from the ACCESS database represented 13.9% of the households the interviewers attempted to contact. The other methods of subject recruitment were more successful. The MI-Child database had a 67.5% positive response rate from attempted contacts. Hamtramck had 96.3%, and WIC 76.1% positive response rates. In most instances where the woman of the household was reached she consented to participate (95.4%). Most of the subjects were recruited through the WIC Clinic, followed by Hamtramck outreach, MI-Child enrollees, and the ACCESS Community Health Center database (Table 2).

Descriptive Statistics – (Tables 2 and 3)

The largest ethnicity represented in the study was Yemeni followed by Lebanese, Iraqi, and Palestinian. In comparison to the Arab population of the Detroit area, the study's overall distribution of these ethnicities was skewed primarily because the overwhelming majority of the Hamtramck outreach group was comprised of Yemeni women. The ethnic distribution of the women's husbands/partners was similar with only 4.0% (n=13) of the women's partners differing from the subjects' ethnicity. While the woman's country of birth was usually the same as her ethnicity, 8.6% of the women were born in the United States. An average woman in the study was 28 years of age and had immigrated to the U.S. 6 years prior.

The majority of the women preferred and answered the questionnaire in Arabic. While most spoke Arabic only at home over half were literate in English and greater than three fourths were literate in Arabic.

The average woman was married and had born all three of her children in the United States, first giving birth at 20 years of age. Most of those giving birth in Saudi Arabia were Iraqi refugees. Most babies were breast fed up towards an average of 7 months.

Of 95 women reporting a total of 139 miscarriages, 74 occurred in the U.S. (mean number of miscarriages in U.S. per woman=0.779; ratio of miscarriages to live births=0.108) and 65 occurred in a country prior to U.S. emigration (mean number of miscarriages per woman=0.684; ratio of miscarriages to live births=0.172). Of 10 women reporting a total of 11 stillbirths, 9 occurred prior to emigration into the U.S. while 2 women each had one stillbirth in the U.S. 8 women (2.5%) lost a total of 11 children at some time after birth. The ages of the deceased children ranged from <1 month to 4 years. One child died in the United States.

The mothers had many concerns for their children's health, several of those concerns were about pollution and the environment. When asked if one of their children had asthma 12.8% (n=42) answered in the affirmative. Seven of those mothers had more than one child with asthma. Most of these children had some type of inhaler to treat the asthma and most of the children had required hospitalization for asthma at least once in their lives. A quarter of the households had used emergency departments in local hospitals in the past year.

Barely half of the women interviewed had heard of "lead poisoning". Only 14.8% of the mothers had tested any of their children for lead. For those who had not tested their children for lead, most did not know where to get tested. Of those tested, 14.9% of the households had at least one child with a high lead level. Three of these mothers followed up and found their children's levels had normalized. Most of the women who had heard of lead poisoning could name at least one source of lead with paint or water being named most frequently.

Regarding risk factors for environmental lead, very few homes had peeling paint, but a substantial number were undergoing or had some recent renovation. About a tenth of the women used some type of ceramic plateware from outside the U.S. for handling food. In getting cooking water from the tap one fifth did not use cold tap water or filtered water for cooking. An eighth of the

households had at least one person who worked in a job where there was a potentially high risk of lead exposure.

The socioeconomic status of the women interviewed showed most living in houses and over half owning their homes. Most families had lived in their homes for less than four years. Husbands were employed much more often than the subjects but still had a 17.4% unemployment rate. Husband’s typically had more years of education compared to the subjects. Most of the women had not completed secondary school. Most families had health insurance through Medicaid and had annual incomes below \$20,000.

Few women admitted to smoking but nearly half of all households included someone who smoked either cigarettes or rangila. Nearly half of all households had either cigarette or rangila exposure.

In highlighting differences seen across the sources of subject recruitment, the typical woman from the ACCESS Community Health Center database was Yemeni, 33 years of age and immigrated to the U.S. around a later age of 23 after having birthed her first child. She breast-fed her first child for over 10 months. Despite having lived in the U.S. a comparable number of years she was more likely to be literate in English as well as Arabic compared to her counterparts from the other databases. She was less educated than her counterparts and more likely to be working while her husband had a 40% chance of being unemployed. Her household income was low compared to the other groups.

The typical woman surveyed from Hamtramck was Yemeni and more comfortable with speaking English at home than women from the other groups. She was less educated and less likely to have a job but more likely to have health insurance compared to women of other cohorts. Her household income was comparatively high. A woman from the MI-Child cohort was likely Lebanese and well educated having completed secondary school. She was less likely to have health insurance and more likely to smoke or to have someone else in her household smoke when compared to her counterparts. A woman from the WIC Clinic likely spoke only Arabic at home and rented her home or apartment.

Table 2: Descriptive Statistics

		CH	Hmt	MI-C	WIC	Total	Total
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Variable Category	Sub-Category	%	%	%	%	%	N
Database	Source (% of Total)	11.0	23.9	16.8	48.3	100.0	327
	Number of Subjects (N)	36	78	55	158	100.0	327
Language of Interview	Arabic	88.9	41.0	61.8	78.5	67.9	222
	English	11.1	59.0	38.2	21.5	32.1	105
Ethnicity	Yemeni	50.0	96.2	5.4	37.3	47.4	155
	Lebanese	25.0	0	80.0	39.9	35.5	116
	Iraqi	13.9	0	7.3	17.1	11.0	36
	Palestinian	5.6	1.3	7.3	3.8	4.0	13
Country of Birth	United States	2.8	12.8	1.8	10.1	8.6	28
Language Spoken at Home	Arabic only	61.1	50.0	63.6	79.8	67.9	222
	English only	0	0	1.8	1.3	0.9	3
	Arabic and English	38.9	50.0	34.6	19.0	31.2	102
Literacy (subject)	None	13.9	18.0	1.8	10.1	11.0	36
	Arabic only	27.8	32.0	46.3	35.4	35.6	116
	English only	8.3	7.7	9.3	10.1	9.2	30
	Arabic and English	50.0	42.3	42.6	44.3	44.2	144
Literacy (husband)	None	5.7	3.8	1.8	5.7	4.6	15
	Arabic only	25.7	15.4	16.4	30.6	24.0	78
	English only	11.4	3.8	10.9	1.3	4.6	15
	Arabic and English	57.1	75.6	70.9	61.2	65.8	214
Pregnancies	Loss of pregnancy	30.3	29.5	39.6	31.8	32.4	103
	Loss of pregnancy in U.S	13.9	14.1	29.1	16.5	17.7	58
Country of 1 st Born Child	United States	27.8	66.7	74.6	63.9	62.4	204
	Yemen	36.1	32.0	1.8	10.8	17.1	56
	Lebanon	11.1	0	12.7	9.4	8.0	26
	Iraq	8.3	0	3.6	8.7	5.8	19
	Saudi Arabia	5.6	1.3	1.8	3.2	3.1	10
Breastfeeding	Breast Fed Any Child	88.9	78.2	85.4	83.5	83.2	272
Lead Poisoning	Knowledge of it	42.4	52.6	55.6	50.0	50.8	164
	Names Lead Source	42.4	53.6	52.9	53.2	47.9	149
	Tested Children	16.7	6.5	29.1	13.5	14.8	48
(of those tested)	High Lead Levels	16.7	16.7	7.1	19.0	14.9	7
(homes where child not tested)	Know Where to Get Test	16.7	37.9	41.7	41.1	37.6	80
Risk Factors	Peeling Paint	13.9	11.5	7.3	6.3	8.6	28
	Recent Renovation	23.1	44.9	40.8	23.8	32.5	92
	Ceramics, Imported	8.3	28.6	1.9	3.8	9.9	32
(cooking)	Warm/Hot Tap Water	38.9	18.0	12.7	17.4	19.3	63
	Exposure from Job	13.9	16.7	9.3	11.5	12.7	41
Asthma	Any Child in Home	19.4	14.1	9.1	12.0	12.8	42
Emergency Department (ED) Use	Any Child in Home	27.8	24.4	18.5	27.6	25.3	82
Housing	House	91.7	87.2	89.1	87.3	88.1	288
Type	Apartment	8.3	12.8	10.9	12.7	11.9	39
Ownership	Owns	61.1	61.5	76.4	45.9	56.3	184
	Rents	38.9	38.5	23.6	54.1	43.4	142
Employment	Subjects	18.8	5.1	10.9	9.6	9.6	31
	Subjects' Husbands	60.0	85.5	88.7	84.2	82.6	261
Education (subject)	None	11.1	18.0	3.6	11.4	11.6	38
	Primary only	41.7	43.6	16.4	17.7	26.3	86

	Some Secondary	11.1	15.4	25.4	31.6	24.5	80
	Completed Secondary	33.3	21.8	52.7	38.6	37.0	121
Education (subjects' husbands)	None	5.7	1.3	3.6	3.8	3.4	11
	Primary only	22.9	22.4	16.4	18.0	19.3	62
	Some Secondary	14.3	25.0	21.8	28.2	24.8	80
	Completed Secondary	51.4	46.2	56.4	46.2	50.6	163
Marital Status	Married	91.7	93.6	96.4	95.6	94.8	310
	Separated/Divorced	5.6	3.8	3.6	3.8	4.0	13
	Widowed	2.8	2.6	0	0.6	1.2	4
Health Insurance	None	25.0	3.9	36.4	19.6	19.3	63
	Medicaid (of insured)	81.5	58.9	85.3	77.2	73.6	192
Income	<\$10,000	58.3	30.3	27.8	44.9	40.1	130
	\$10,000-\$20,000	25.0	19.7	59.3	48.1	40.7	132
	>\$20,000	11.1	34.2	7.4	4.4	12.7	41
Smoking	Subject	2.8	0	21.8	7.0	7.3	24
	Anyone – All types	50.0	41.6	65.4	43.3	47.4	154
	Anyone – Inside Home	50.0	40.3	61.8	38.8	44.3	144
	Rangila Use	11.1	5.1	23.1	5.2	8.7	28
Cessation During Pregnancy	Cigarettes	17.6	27.6	33.3	33.3	29.6	34
	Rangila	50.0	0	54.6	62.5	48.1	13

CHC – ACCESS Community Health Center; Hmtk – Hamtramck outreach group; MI-C – MI-Child; WIC – Women, Infants, and Children Clinic.

Table 3: Descriptive Statistics – Continuous Variables

	CHC	Hmtk	MI-C	WIC		Totals	
Variable	Mean	Mean	Mean	Mean	Mean	Median	Range
Lived in U.S. (immigrants only – years)	8.91	10.05	9.16	6.85	8.198	6.5	<1 - 29
Age at immigration (all subjects, 0 for U.S. born – years)	23.94	17.62	20.99	19.25	21.62	21	0-61
Age of Motherhood – Age of Immigration (years)	-4.24	0.88	1.08	0.92	0.383	0	(-39) - 27
Age (years)	33.64	29.22	30.24	27.53	29.06	28	16-63
Age at Marriage	18.43	16.82	19.63	18.46	18.26	18	10-35
Age at Birth of 1 st Child	19.72	18.56	22.04	20.16	20.05	19	13-36
Number of pregnancies	4.78	4.08	3.49	3.58	3.817	3	1-12
Pregnancies prior to immigration	2.58	1.21	0.95	1.37	1.39	0	0-12
Pregnancies in U.S.	2.14	2.87	2.53	2.20	2.41	2	0-11
Number of Births	4.28	3.53	2.85	3.01	3.245	3	1-10
Births prior to immigration	2.28	0.92	0.73	1.16	1.15	0	0-10
Births in U.S.	2.00	2.60	2.13	1.85	2.09	2	0-10
Gestational Age of Prenatal Care (months)	2.33	2.68	2.25	2.10	2.28	2	0.20 - 8
Breast Feeding Duration (1 st child; mos.)	10.06	4.68	5.62	7.52	6.87	5	<1-30
Age First Child Tested for Lead	4.00	2.20	5.10	3.22	3.68	3	1-9
Number of People per Household	6.24	5.82	4.92	5.52	5.6	5	2–13
Size of Homes (# rooms)	3.25	2.96	2.89	2.65	2.8	3	1-8
Years Lived in Present Home	4.83	5.42	3.44	2.97	3.84	3	<1–22
Cigarettes Smoked per Day (subject)	4.00	---	13.50	13.55	13.0	10	1-40
Years Smoked (subject)	10.00	---	12.58	12.44	12.0	11	1-30
Cigarettes Smoked per Day (others)	20.14	16.45	16.59	17.69	17.50	20	2-50

Years Smoked (others)	17.00	10.88	18.71	12.65	13.56	10	1-50
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CHC – ACCESS Community Health Center; Hmtk – Hamtramck outreach group; MI-C – MI-Child; WIC – Women, Infants, and Children Clinic.

Bivariate Analysis – Knowledge and Practices of Lead Poisoning Prevention (Tables 4 and 5)

For the purposes of assessing knowledge and practices in the community, analysis was performed to determine the influence of variables on a positive outcome. Thus, while traditionally epidemiology reports the likelihood of disease through risk ratios, the statistics presented here reflect the likelihood of subjects having knowledge of lead poisoning or lead sources, or practicing preventive medicine by testing their children for lead. All significant variables for a particular variable were stratified by third variables significant for the same outcome. The controlled strata with the highest p value was reported to demonstrate the most likely confounder, or to support the variable as independently associated with the outcome.

Variables that were statistically significant for all three outcome variables of health knowledge and practices regarding lead poisoning included the linguistic variables, speaking English at home and maternal literacy in English, and the economic variable of income. In addition to these, variables that were positively associated with knowledge of lead poisoning were whether one was U.S. born, maternal Arabic literacy, education of both the subject and the husband, having all children born in the U.S., and employment. After controlling for confounding only the linguistic variables and maternal education remained statistically significant. The other variables lost significance after controlling for maternal literacy.

Again with a subject’s ability to name an environmental lead source the linguistic variables and income were positively associated. Additionally, being U.S. born, education of both the subject and the husband, and having all children born in the U.S., were positively associated with the outcome. A history of having a loss of pregnancy in the U.S. and having a smoker in the household were negatively associated with the outcome. After stratification the linguistic variables and income were the only variables to remain statistically significant. Most of the other variables lost significance after controlling for English literacy. Loss of pregnancy in the U.S. lost significance after controlling for whether or not the subject was U.S. born.

Regarding whether or not children were tested for lead the linguistic variables, Lebanese ethnicity, rangila use, and maternal education were all positively significantly correlated. Several economic variables were also positively statistically significant concerning the outcome. These included income, employment, home ownership, and having health insurance. Yemeni ethnicity and the Hamtramck database were negatively correlated with testing one's children for lead. English spoken in the home, rangila use, and having health insurance remained statistically significant after controlling for all other variables. English literacy lost significance after controlling for language in the home and the other economic variables lost significance after controlling for income. The aforementioned strong correlation of Yemeni women in Hamtramck resulted in loss of significance of both variables when one was controlled for the other.

There were no statistically significant correlations when comparing the husbands' literacy levels and the outcome variables, nor did husband's education remain significant after stratification by maternal literacy. The correlations between language spoken at home or mother's literacy and knowledge or practices concerning lead poisoning remained significant when looking at only those women who immigrated to the U.S. There were no significant differences concerning knowledge or practices of lead poisoning when selecting only those women illiterate in English and comparing those literate in Arabic against those illiterate.

Table 4: Bivariate Analysis

Variable	Knowledge of Lead Poisoning		Named an Environmental Lead Source		Tested Child for Lead Poisoning	
	X2	P value	X2	P value	X2	P value
Positive Associations						
Born in U.S.	**9.478	0.002	**11.95	0.0076	2.519	0.112
Ethnicity (Lebanese vs. Other)	1.165	0.280	0.193	0.660	**4.942	0.026
English Spoken at Home	**21.84	<0.0001	**19.93	<0.0001	**14.08	0.0002
Arabic Literacy (Subject)	**3.894	0.048	1.564	0.211	0.971	0.324
English Literacy (Subject)	**52.34	<0.0001	**36.73	<0.0001	**11.05	0.0114
Education (Subject)	**27.66	<0.0001	**16.67	0.0052	**11.21	0.0475
Education (Subjects')	**19.49	0.0034	**14.62	0.0234	4.07	0.6671
All Children Born in U.S.	**11.770	0.001	**8.504	0.004	0.001	0.981
Employment	**4.895	0.027	0.000	0.999	**6.559	0.010
Home Ownership	0.024	0.876	0.045	0.831	**5.010	0.025
Health Insurance (Ins)	0.916	0.339	0.006	0.938	**5.876	0.015
Income	**9.322	0.002	**9.703	0.002	**5.351	0.021
Rangila Use	0.025	0.875	0.314	0.575	**7.018	0.008

Negative Associations						
Ethnicity (Yemeni vs. Other)	1.904	0.168	0.825	0.364	**4.173	0.041
Smoking	3.37	0.0665	**4.75	0.0293	0.22	0.6402
Loss of Pregnancy in U.S.	*1.741	0.187	**3.913	0.048	*3.233	0.072
Database (Hamtramck)	0.132	0.717	0.084	0.773	**5.542	0.019
Non-Significant (Other)						
English Literacy (Husband)	3.514	0.061	0.851	0.356	1.537	0.215
Arabic Literacy (Husband)	0.742	0.389	0.021	0.885	0.591	0.442
Number of Children	12.474	0.188	13.350	0.147	11.603	0.237
One Child Breast Fed	0.179	0.672	0.620	0.431	0.801	0.371
Asthma with 1 Child	0.532	0.466	0.538	0.463	0.131	0.717
Emergency Department Use	0.593	0.441	0.733	0.392	0.009	0.925
Medicaid or No Ins vs. Other	0.095	0.758	0.272	0.602	1.103	0.294
Database (WIC)	0.074	0.785	0.149	0.700	0.437	0.509

** Statistically Significant at alpha=0.05 *Trends were in positive direction with outcome; X2=Chi-Square analysis

Table 5: Strong Correlations After Stratification

Predictor Variable	Controlled Variable	CMH	P Value	Risk Ratio	Confidence Limit: 95%
Knowledge of Lead Poisoning					
English Spoken at Home	English Literacy	**4.413	0.036	1.242	1.015, 1.521
English Literacy	English Spoken at Home	**32.779	<0.001	1.957	1.555, 2.462
Education (Subject)	English Literacy	**4.708	0.030	1.329	1.028, 1.718
Income	English Literacy	3.670	0.055	1.239	0.995, 1.543
Name a Lead Source					
Born in U.S.	English Literacy	3.626	0.057	2.034	0.979, 4.226
English Spoken at Home	English Literacy	**5.510	0.019	1.281	1.042, 1.575
English Literacy	English Spoken at Home	**21.704	<0.001	1.761	1.388, 2.235
Income	English Literacy	**4.428	0.035	1.267	1.016, 1.580
Smoking	English Literacy	2.804	0.094	0.829	0.665, 1.033
Loss of Pregnancy in U.S.	Born in U.S.	2.905	0.088	0.789	0.601, 1.036
Tested Children for Lead					
English Spoken at Home	English Literacy	**6.640	0.010	1.942	1.172, 3.218
English Literacy	English Spoken at Home	3.544	0.060	1.094	0.996, 1.201
Health Insurance (Ins)	English Spoken at Home	**4.976	0.026	1.128	1.015, 1.254
Employment	Income	3.587	0.058	1.121	0.996, 1.261
Home Ownership	Income	2.860	0.091	1.672	0.922, 3.033
Rangila Use	Lebanese	**4.310	0.038	1.231	1.012, 1.499
Database (Hamtramck)	Yemeni	2.768	0.096	0.913	0.820, 1.016

CMH=Cochran-Mantel-Haenszel; ** Statistically Significant at alpha=0.05

Multiple Logistic Regression # 1 – Knowledge of Lead Poisoning (Table 6)

Multiple logistic regression demonstrated literacy in English, education beyond primary school, and years lived in the United States to be positively correlated with the knowledge of lead poisoning. The inter-relatedness of these variables required further examination of the logistic regression to involve interactions. Pearson correlation coefficients were significant for education and English literacy ($r=0.43043$; $p<0.0001$), and years lived in the U.S. and English literacy ($r=0.38558$;

p<0.0001). Education and years lived in the U.S. also appeared related though not statistically significant (r=0.10519; p=0.0626).

Stepwise logistic regression analysis including all bivariate interactions as well as the squared products of all individual variables and the group interaction of all three variables simultaneously still included all three variables in the final model. The continuous data of years lived in the U.S. was centered prior to the stepwise procedure. Mother’s literacy in English (OR=3.329; CL=1.948, 5.691; p<0.0001), mother’s education beyond primary school (OR=2.113; CL=1.215, 3.673; p=0.0080), and the interaction of years lived in the U.S. and literacy in English (OR=1.089; CL=1.036, 1.145; p=0.0008) were significant in the model (p=0.0074).

**Table 6: Knowledge of Lead Poisoning; Equation:
Y = -0.7292 + 1.0179(English literacy) + 0.8429(Education) + 0.0606(Yrs. in U.S.)**

Variable	Parameter Estimate	p value	Odds Ratio	95% Confidence Limit
Intercept	-0.7292	0.0060		
English Literacy	1.0179	0.0004	2.767	1.577, 4.856
Education > primary	0.8429	0.0031	2.323	1.329, 4.060
Years lived in U.S.	0.0606	0.0023	1.063	1.022, 1.105

Multiple Logistic Regression # 2 – Knowledge of Environmental Lead Sources (Table 7)

After the income variable was added the model investigating naming of sources of environmental lead remained significant. Literacy in English (OR=3.203; CL=1.783, 5.5752; p<0.0001), difference in age of first childbirth and age of immigration (OR=1.041; CL=1.009, 1.074; p=0.0119), and annual income greater than \$10,000 (OR=1.830; CL=1.066, 3.141; p=0.0285) were all positively associated with knowledge of an environmental lead source in the final model. Experience of a complicated pregnancy in the U.S. resulting in loss of life was negatively associated with knowledge of sources of environmental lead (OR=0.300; CL=0.149, 0.607; p=0.0008).

Correlation analysis of the variables in the final model demonstrated colinearity of income with all other variables (English literacy: r=0.20776; p=0.0003; complicated pregnancy: r=0.17095; p=0.0028; age difference: r=0.20293; p=0.0005). The only other significant correlation proved to be English literacy with age difference of immigration from first childbirth (r=0.49184; p<0.0001). A stepwise procedure of multiple logistic regression examined all possible bivariate, trivariate, and

quadivariate combinations as well as squared products of the individual variables. Remnants of all four original variables remained significant in the final model. Literacy in English, experience of a complicated pregnancy, and annual income were all significant in the final model. Difference in age of first childbirth and age of immigration was significant as the product of its interaction with English literacy. The final model including interactions appeared statistically comparable to the model incorporating only individual variables (Max-re-scaled $r^2=0.1895$; vs. Max $r^2=0.1815$; respectively). Attempts to remove the income variable from either model secondary to its multicollinearity resulted in a decrease of the r^2 in both the models.

**Table 7: Knowledge of Environmental Lead Sources; Equation:
 $Y = -0.8318 + 1.2909(\text{English literacy}) - 1.1823(\text{Loss of pregnancy}) + 0.6015(\text{income}) + 0.0648(\text{Yrs. 1}^{\text{st}} \text{ birth - immigration})(\text{English literacy})$**

Variable	Parameter Estimate	p value	Odds Ratio	95% Confidence Limit
Intercept	-0.8318	0.0004		
English Literacy	1.2909	<0.0001	3.636	2.096, 6.309
Loss of Pregnancy	-1.1823	0.0012	0.307	0.150, 0.627
Income	0.6015	0.0293	1.825	1.063, 3.134
Years 1 st birth – immigration*English literacy	0.0648	0.0035	1.067	1.021, 1.114

Multiple Logistic Regression # 3 – Testing Children for Lead Poisoning (Table 8)

Multiple logistic regression analysis to model the variables determining whether a subject’s children were tested for lead revealed linguistic, economic, and geographic factors as significant. Literacy in English was added to the final model as it had been significant in the first two equations regarding knowledge of lead poisoning and it appeared to increase the fit of the final model though the variable was just below a level of significance. Use of English at home, employment, and health insurance were all positively associated with having tested children for lead poisoning. The database from where the subjects were recruited was also significant in the final model. With the ACCESS database including clinic patients as well as recent enrollees in the MI-Child program as a reference group, subjects from the other groups seemed less likely to have sought lead testing for their children. Rangila use was not significant in the model.

Correlation analysis of the variables in this final model showed significant correlations between language spoken at home and both database (Hamtramck: $r=0.21445$; $p<0.0001$; WIC: $r=-0.24555$; $p<0.0001$) and English literacy ($r=0.42053$; $p<0.0001$). Positive correlations were also seen between

English literacy and employment ($r=0.13720$; $p=0.0132$) and between whether or not one is from Hamtramck and health insurance ($r=0.21730$; $p<0.0001$). Stepwise multiple logistic regression with inclusion of bivariate interactions and the squared products of all individual variables produced a final model that was statistically comparable to the model without interactions (Max-rescaled $r^2=0.2623$; vs. max $r^2=0.2656$, respectively).

Table 8: Testing Children for Lead; Equation:

$$Y = -4.0771 + 1.0727(\text{English spoken at home}) + 1.8351(\text{Employment}) + 1.9564(\text{insurance}) - 2.3701(\text{Hamtramck}) - 1.0044(\text{WIC}) + 0.7810(\text{English literacy})$$

Variable	Parameter Estimate	p value	Odds Ratio	95% Confidence Limit
Intercept	-4.0771	<0.0001		
English spoken at home	1.0727	0.0046	2.923	1.392, 6.139
Employment	1.8351	0.0179	6.266	1.372, 28.605
Insurance	1.9564	0.0029	7.074	1.955, 25.594
Database - Hamtramck	-2.3701	<0.0001	0.093	0.030, 0.287
Database - WIC	-1.0044	0.0104	0.366	0.170, 0.789
English Literacy	0.7810	0.0554	2.184	0.982, 4.856

Positive correlations of predictor variables were seen between whether or not the husband completed secondary school and whether or not smokers were in the household. Correlations with both maternal and paternal level of education were also seen with the inclusion of English in language of the interview, language spoken at home, and language of literacy for both men and women.

Additional Outcome Analysis

Additional information regarding the outcomes of emergency department use, asthma, gestational diabetes, and post-partum depression follows. Some of the data found in the descriptive statistics tables (“a” Tables 9-12) is strictly informative while others were included in the full models used in the respective stepwise procedures. Final models report the significant variables for the outcomes.

Emergency Department Use

Over a quarter of all respondents had brought at least one of their children to an emergency department in the past year. The medical problem was usually some sort of illness versus having suffered trauma. Over a quarter of all visits resulted in hospitalization and nearly all injuries brought to the emergency departments were treated with some type of stitching or casting. The reason most

parents took their children to emergency departments was due to their own anxiety about their children's condition. Emergency department use was positively associated with non-Lebanese ethnicity, child asthmatics, and maternal smoking of either cigarettes or rangila.

Table 9a: Emergency Department Use – Descriptive Statistics

		CH C	Hmt k	MI-C	WIC	Total	Total
Variable Category	Sub-Category	%	%	%	%	%	N
Emergency Department (ED)	Any child in home	27.8	24.4	18.5	27.6	25.3	82
	Number of homes (N)	10	19	10	43	100.0	82
Medical Reason	Illness	60.0	72.2	70.0	76.2	72.5	58
	Injury	40.0	27.8	30.0	23.8	27.5	22
Treatment	Hospitalization	12.5	31.6	20.0	32.6	28.8	23
	Stitches/casting (injured)	75.0	80.0	100.0	77.8	81.0	17
Social Reason	Parental anxiety	77.8	56.3	12.5	61.9	57.3	43
	No open clinics	11.1	31.3	25.0	9.5	16.0	12
	Physician referral	0	6.3	12.5	21.4	14.7	11
	Other	11.1	6.3	50.0	7.2	12.0	9

CHC – ACCESS Community Health Center; Hmtk – Hamtramck outreach group; MI-C – MI-Child; WIC – Women, Infants, and Children Clinic.

Table 9b: ED Use; Equation:

$$Y = -0.9623 - 1.3026(\text{Lebanese ethnicity}) + 0.8993(\text{Asthmatic child}) + 1.3687(\text{Subject smokes})$$

Variable	Parameter Estimate	p value	Odds Ratio	95% Confidence Limit
Intercept	-0.9623	<0.0001		
Lebanese Ethnicity	-1.3026	0.0004	0.272	0.132, 0.561
Asthmatic Child	0.8993	0.0099	2.458	1.241, 4.868
Subject Smokes (Anything)	1.3687	0.0092	3.930	1.404, 11.006

Max-rescaled $r^2 = 0.1107$; $p < 0.0001$

Asthma

Amongst all survey participants, one in eight households had a child who had asthma. Most of these children regularly took an inhaler for treatment and had spent at least one stay in the hospital because of their asthma. Having an asthmatic child was conversely positively associated with emergency department use and negatively associated with having had all children born in the U.S.

Table 10a: Asthma - Descriptive Statistics

		CH C	Hmt k	MI-C	WIC	Total	Total
Variable Category	Sub-Category	%	%	%	%	%	N
Asthmatics	Any Child in Home (%)	19.4	14.1	9.1	12.0	12.8	42
	Any Child in Home (N)	7	11	5	19	100.0	42

Treatment	Inhaler	50.0	90.9	60.0	63.2	68.3	28
	Hospitalization	57.1	63.6	20.0	72.2	61.0	25

	CHC	Hmt k	MI-C	WIC		Totals	
Variable	Mea n	Mean	Mean	Mea n	Mea n	Median	Range
Age at diagnosis (1 st child – years)	1.80	1.12	1.20	2.00	1.67	1.00	0-12

CHC – ACCESS Community Health Center; Hmtk – Hamtramck outreach group; MI-C – MI-Child; WIC – Women, Infants, and Children Clinic.

Table 10b: Child with Asthma; Equation:

$$Y = -1.7885 - 0.8873(\text{All Children Born in the U.S.}) + 1.1273(\text{ED Use})$$

Variable	Parameter Estimate	p value	Odds Ratio	95% Confidence Limit
Intercept	-1.7885	<0.0001		
All Children born in U.S.	-0.8873	0.0096	0.412	0.210, 0.806
Emergency Department Use	1.1273	0.0012	3.087	1.559, 6.113

Max-rescaled $r^2 = 0.0891$; $p=0.0002$

Gestational Diabetes

Most women had used prenatal care in the past. Typically prenatal care was sought from a physician in a clinic. With this prenatal care most women had been tested for gestational diabetes. Gestational diabetes was negatively associated with employment and positively associated with being from the WIC database. Testing for gestational diabetes was significantly associated with both being born in the U.S. and the difference in years of immigration age from age when entering motherhood. The outcome was negatively associated with the former variable while being positively associated with the latter.

Table 11a: Gestational Diabetes - Descriptive Statistics

		CH C	Hmt k	MI-C	WIC	Total	Total
Variable Category	Sub-Category	%	%	%	%	%	N
Gestational Diabetes	Any pregnancy	25.0	7.7	12.2	22.7	17.3	51
	Any pregnancy (N)	9	6	6	30	100.0	51
Tested	Any pregnancy	85.7	84.0	90.9	85.8	86.3	276
Pre-Natal Care	With 1 st Child	83.3	91.0	100.0	93.6	92.9	303
	With most recent child	97.2	96.1	100.0	96.8	97.2	317
Health Practitioner	Doctor	91.4	83.6	98.2	98.0	94.0	297
	Midwife	0	12.3	1.8	1.3	3.8	12
	Other/Don't Know	8.6	4.1	0	0.7	2.2	7
Health Care Facility	Clinic	82.4	82.2	87.3	95.4	89.5	282
	Hospital	11.8	17.8	10.9	2.0	8.3	26
	Home/No Answer	5.9	0	1.8	2.6	2.3	7

CHC – ACCESS Community Health Center; Hmtk – Hamtramck outreach group; MI-C – MI-Child; WIC – Women, Infants, and Children Clinic.

**Table 11b: Gestational Diabetes; Equation:
 $Y = -1.1004 - 1.1044(\text{Employment}) + 0.7844(\text{WIC Database})$**

Variable	Parameter Estimate	p value	Odds Ratio	95% Confidence Limit
Intercept	-1.1004	0.0011		
Employment	-1.1044	0.0023	0.331	0.163, 0.674
WIC Database	0.7844	0.0147	2.191	1.166, 4.116

Max-rescaled $r^2 = 0.0752$; $p=0.0011$

**Table 11c: Testing for Gestational Diabetes; Equation:
 $Y = 2.1878 - 2.0743(\text{Born in U.S.}) + 0.0916(\text{Yrs. 1}^{\text{st}} \text{ birth - immigration})$**

Variable	Parameter Estimate	p value	Odds Ratio	95% Confidence Limit
Intercept	2.1878	<0.0001		
Born in U.S.	-2.0743	0.0055	0.126	0.029, 0.544
Yrs. 1 st Birth - Immigration	0.0916	<0.0001	1.096	1.053, 1.141

Max-rescaled $r^2 = 0.1258$; $p<0.0001$

Post-Partum Depression

Most women felt support from family members, particularly their husbands, during their most recent pregnancy. Nearly all the women desired their pregnancies and felt their husbands desired the pregnancies as well. Nearly one third were unplanned. Over a quarter of the women had felt sad or depressed for at least two weeks during their most recent post-partum period. Post-partum depression was positively associated with the difference in years of immigration age from age when entering motherhood and with having been sick during the pregnancy. It was negatively associated with being from the WIC database, having desired the pregnancy, and quality of marriage. Whether or not the child was the woman’s first baby was not significant independently nor in the final model.

Table 12a: Post-Partum Depression - Descriptive Statistics

		CH C	Hmtk	MI-C	WIC	Total	Total
Variable Category	Sub-Category	%	%	%	%	%	N
Post-Partum Depression	Most recent pregnancy (%)	41.7	35.9	34.0	19.0	28.3	89
	Most recent pregnancy (N)	15	28	18	28	100.0	89
Support During Pregnancy	Husband	45.2	56.0	59.2	62.8	58.7	176
	Other	45.1	32.0	36.7	31.0	33.6	121
	None	9.7	12.0	4.1	6.2	7.7	23
Desire for Pregnancy	Subject	75.0	97.4	81.5	82.2	84.9	276

	Subject's Husband	80.6	96.1	87.0	87.3	88.6	287
	Planned Pregnancy	72.2	51.3	69.8	77.2	69.2	225
Most recent pregnancy	Other illness	25.7	12.8	16.4	16.6	16.6	54
Outcome	Birth	86.1	89.7	83.6	82.8	85.0	277
	Still pregnant	11.1	5.1	14.5	15.9	12.6	41
	Loss of pregnancy	2.8	5.1	1.8	1.3	2.4	8

CHC – ACCESS Community Health Center; Hmtk – Hamtramck outreach group; MI-C – MI-Child; WIC – Women, Infants, and Children Clinic.

Table 12b: Post-Partum Depression; Equation:

$$Y = 0.5238 - 1.1344(\text{WIC Database}) + 0.0467(\text{Yrs. 1}^{\text{st}} \text{ birth - immigration}) + 1.2869(\text{Sick during pregnancy}) - 0.7639(\text{Desired pregnancy}) - 0.8764(\text{Quality of marriage})$$

Variable	Parameter Estimate	p value	Odds Ratio	95% Confidence Limit
Intercept	0.5238	0.2480		
WIC Database	-1.1344	0.0002	0.322	0.177, 0.584
Yrs. 1 st Birth - Immigration	0.0467	0.0016	1.048	1.018, 1.079
Sick during pregnancy	1.2869	0.0002	3.621	1.819, 7.210
Desired pregnancy	-0.7639	0.0445	0.466	0.221, 0.981
Quality of marriage	-0.8764	0.0102	0.416	0.213, 0.812

Max-rescaled $r^2 = 0.2091$; $p < 0.0001$

Discussion

The most striking results of this survey demonstrated the importance of language in knowledge and practices of mothers concerning lead poisoning with their children. Both language spoken at home and mother's literacy in English were important factors associated with mothers' recognition of lead poisoning, lead sources, and use of lead poisoning prevention services. Income also appeared important with knowledge concerning lead poisoning. Other variables including parental education, birth in the United States, and smoking behavior appearing to predict knowledge and practices were largely contingent on their own association with maternal literacy in English. Economic variables including having health insurance and employment were particularly important for attaining preventive services for lead poisoning.

This study did well in its adjustment to cultural and linguistic characteristics of its population. Questionnaires were prepared in both English and Arabic to provide consistency, within the respective languages, in delivery of questions. The Arabic version was translated back to English in an attempt to maximize the similarity of the two versions of questionnaire. Interviewers were all women to respect the gender boundaries that exist within the Arab culture. The majority of subjects

were familiar with ACCESS through services from the organization or from its proximity to the WIC clinic in Dearborn. This familiarity likely aided in a high acceptance rate of participation from the women who were reached by telephone.

Questions and all translation were developed and completed by Arab women from the Detroit metro area. This allowed for a survey that investigated social and cultural issues in a sensitive manner. Ideally, this should have optimized reliable, cooperative responses from the subjects who would be comfortable with this survey design.

The survey instrument allowed for a wide array of predictor variables both directly from responses and from derived variables. The survey provided a wealth of information regarding the backgrounds of both the subjects and the subjects' husbands that potentially could influence health knowledge and health practices specific to lead poisoning. Academic background and command of language, both Arabic and English, proved to be important as predictor variables. Immigration history was extensive regarding national origin, obstetrics, age of immigration, and years lived in the United States, all of which could significantly impact one's familiarity with health issues pertinent in the environment of the urban United States. A variety of economic indicators were used to evaluate socioeconomic status and health knowledge and practices.

Despite the good intentions of ACCESS, certain elements of mistrust may have influenced responses of some subjects. One interviewer who knew many of the women whom she surveyed was aware that several of the women smoked either cigarettes or rangila on a regular basis. Though responses regarding smoking were still recorded verbatim from the subject to minimize bias, this particular interviewer estimated that as many as 25% of those women she interviewed gave misleading information regarding smoking. Several who specifically asked the interviewer to withhold smoking information expressed embarrassment in admitting this behavior to the health center or were concerned that their answers could influence health benefits to them. These concerns were present despite assurances that all information given would be retained in a confidential manner.

The sampling methods drew on a variety of sources to attain an adequate number of participants for the study. Internal validity may have increased had the subjects all been recruited from a similar

pool. Randomness is particularly questionable from the Hamtramck outreach cohort where subjects were largely recruited via word of mouth and were thus personally related to each other by some aspect of social familiarity. To optimize positive response rates and randomness in this population an ideal sample pool would have been to draw all subjects from a continuous sample of the WIC Clinic. The mobility of the population studied made it difficult to use what would otherwise be a reasonable alternative to collect a random sample of people seeking clinic services from ACCESS. Most of the information collected from the random chart pull in the ACCESS Clinic was outdated and hampered the timely recruitment of eligible mothers.

Descriptive statistics demonstrated differences amongst the characteristics of the various databases. These included ethnic, linguistic, economic, and education variables. These differences highlight the variation to be found within the greater cohort of 1st generation and immigrant Arab mothers to be found in the Detroit metro area. Though these differences exist the models developed as predictors of the outcomes took potential database differentiation into account and the database variable proved to be significant only in whether or not children had been tested for lead. Many variables appeared consistent across the groups including several descriptors of immigration and obstetric history.

While certain principles were suggested by the results the true impact of the predictor variables is likely underestimated secondary to the nature of subject recruitment and survey administration. As mentioned previously the population studied, which is largely immigrant, is highly mobile. The most recent arrivals to the Dearborn/Detroit area were most likely under-represented as it would take time for them to establish themselves in the area and to seek health services provided by either ACCESS or WIC. The MI-Child cohort may have played a role in recruiting some of these newer arrivals but the descriptive statistic shows that particular cohort to be above the average level in years lived in the U.S. of the entire sample. Along a similar vein newer arrivals or the poorest households of the community may not have the amenity of a telephone connection in their home. The poorest households may also have more difficulty arriving at WIC for appointments if they do not have access to reliable transportation and thus would be less likely to have entered the continuous sample.

A unique problem for this study involved the numeral systems used in the U.S. and the Arab countries of origin of the interviewers. Several of the numerals have different meanings for each system (e.g. 0 equals zero in the U.S., but five in many Arab countries. Note: One cannot say that 0 equals five in Arabic because the numeric system used in the United States is based on Arabic numerals. Ironically people of many middle-eastern Arab countries have adopted an East Indian numeric system that is partly responsible for the above-mentioned confusion). This problem was minimized as Arabic questionnaires appeared to be consistently filled with the Indian numerals and the English questionnaires with numerals used in the U.S. It did, however, present an additional origin of human error that warrants mentioning.

The generalizability of the study potentially covers the poorer immigrant Arab population of Dearborn, Southwest Detroit, and Hamtramck. Because the study was composed of women from several sources it is difficult to generalize the results to any individual source as much as it is difficult to generalize them to the poorer Arab immigrant population of all metro Detroit. This lack of generalizability has its greatest negative impact on quantifying the degree to which predictor variables are associated with outcome. However, it is likely that statistical significance of predictor variables seen in this study population would be seen in a generalized study of poor Arab immigrants in the Detroit metro area and could thus be focal points of health education and improving health care delivery. One may even argue that factors found to be significant in this study should at least be seriously examined when studying lead poisoning knowledge and use of preventive lead screening among other newly immigrated populations in the area (e.g. Kosovar Albanians, Hmong).

Lead Poisoning Prevention

Because of language barriers, especially for more recent immigrants, the outcome variable of whether or not one's children have been screened for lead may actually depict health knowledge as opposed to health practice. It is quite possible that many mothers who have taken their children to area clinics have seen their children undergo blood draws but never realized the purpose was for lead screening. The mother may not have asked or may not have understood what was occurring just as the physician or nurse performing the test may not have adequately explained what was being done secondary to the communication gap between an Arabic-only speaking mother and an English-only

speaking practitioner. However, even among those literate in English and those who speak English at home the rate of those households having tested children for lead was less than 30%. Though the outcome variable likely reflects the action of one's children being physically screened for lead burden it may be influenced to an extent by some lack of patient understanding of this medical procedure.

The inter-relatedness of the variables education, linguistic abilities, smoking behavior, and time lived in the U.S. made it necessary to determine which variables continued to be associated with the outcome variables after stratification. Analysis showed English spoken at home as the only variable to continue to be associated with all three outcomes even after stratification by other related variables. Maternal literacy in English was also strongly associated with the outcome variables and showed a strong tendency toward testing children for lead but this lost statistical significance when corrected for language spoken at home. Other variables including birth in the U.S., paternal education, and smoking behavior lost statistical significance for all outcome variables after stratification with maternal literacy.

These analyses demonstrated that English literacy of the mother and English spoken with or without Arabic at home were the strongest variables associated with knowledge and practices concerning lead poisoning. This association underlies several principles that likely are responsible. Both linguistic understanding and acculturation are likely key factors that lead the mothers of the study sample to a higher level of knowledge concerning lead poisoning and the drive to seek preventive services. The process of acculturation is a complex one. Many social influences will lead a person to acculturate and the general transition will likely lead to a greater acceptance of things American, including health care. There are countless ways to infer a level of acculturation, but the question of language spoken at home was an efficient method of assessing it. Other variables such as the difference between age of bearing one's first born child and age at immigration measure exposure to American society prior to initiation of motherhood or, conversely, duration of motherhood in an Arab country. This quantitative measure suggests a certain level of exposure to American life with respect to motherhood that would in turn lead to acculturation.

The Arab cultural practice of rangila use was positively associated with testing one's children for lead even after controlling for all other variables individually. This practice would seem to be an argument against American acculturation leading to receiving preventive services. The fact that it was not significant in the final model suggests there may have been a complex interplay between rangila use and the significant variables that actually was responsible for the apparent relationship between rangila and the outcome of lead screening.

The first model (table 6) developed included maternal literacy in English, maternal education beyond primary school, and years lived in the U.S. as predictors of having heard of lead poisoning. All of these variables were significantly associated with having heard of lead poisoning in individual bivariate logistic regression as well. The model suggests along with other bivariate analysis that maternal command of the English language is a crucial if not the most important predictor of knowledge of lead poisoning. It also suggests the importance of maternal education and duration of having lived in the U.S. Unlike advanced maternal education both paternal education and paternal literacy do not seem to be associated with health knowledge or health seeking behavior with respect to lead poisoning. This may indicate the greater maternal role regarding knowledge of children's health issues and involvement in children's health in this study sample.

The second model (table 7) again highlights the importance of maternal literacy in English. It suggests a greater than threefold increase in likelihood of naming a source of environmental lead when comparing a woman literate in English to a woman who is not. A greater amount of time having lived in the U.S. prior to entering motherhood as well as a higher annual income are also suggestive of a higher likelihood of naming at least one lead source. Having a history of loss of pregnancy resulting was negatively associated with knowing a source of environmental lead. In bivariate analysis it was also negatively associated with the outcome even after correction with maternal linguistic factors. However, the variable had shown a positive trend with whether or not one tested her child for lead burden. The inclusion of the variable in the analysis was to evaluate whether there would be an association with health knowledge or seeking preventive services secondary to the experience of an emotionally traumatic experience surrounding pregnancy or child rearing. Because of the contradictory nature of this variable in its relation to the three seemingly related outcomes it is difficult to theorize the reason behind this statistically significant correlation.

The final model (Table 8) regarding seeking lead screening for one's children again suggests the association of the linguistic factors speaking English at home and maternal literacy in English. Contrary to the previous two models, the economic variables income and employment were found to be significant and appeared to have the largest impact regarding the outcome. The model suggests a greater than six-fold increased likelihood in having sought preventive services if a parent was employed and a greater than seven-fold increase in likelihood if the family had some form of health insurance. Further examination of variable interactions suggests that these economic variables may not have as great an association with the outcome, but would be better described as interactions. In the interactive model English spoken at home was the most prominent variable suggesting a six-fold increase in likelihood of seeking preventive services where English was spoken. The cohort of the subject appears significant as those from WIC or Hamtramck are less likely to have taken their children for lead screening than the referent group from the ACCESS and MI-Child databases. This was included as an effect modifier in the model as bivariate analysis did not show any significance between database and the outcome variable after controlling for linguistic correlations. More so than the previous two outcomes, the final model suggests the importance of economics on attainment of health care. Where insurance and employment may not affect one's knowledge of lead poisoning they are an important part of whether or not people receive the preventive services they need for improved health.

Despite the relationships of economic variables and language with children being tested for lead poisoning the urban environment and socioeconomic status of the children in the study population should have led to nearly all of the subjects' children being tested for lead. The sheer numbers of children in the study who were never tested is a failure of the health system to serve them properly. This is not unique to this Arab population but is seen countrywide across the U.S. (Needleman, 1998). The most obvious example of children in this present study who have slipped through the cracks are the 390 children from 135 households that receive federal assistance through WIC and have not been tested for lead burden.

Emergency Department Use and Asthma

The variable with the greatest relationship with emergency department use appeared to be smoking behavior. Homes where smokers were present were approximately three times more likely to need emergent health services than homes without smokers present after controlling for other variables. Because asthma was also associated with emergency department use it could be the synergy of smoking and asthma history that causes rise to need emergency care. There could be any number of reasons why Lebanese parents are less likely to bring their children to emergency departments, unfortunately the survey does not allow for much beyond mere speculation to describe this relationship. Reasons could be anything from inherent differences existent in the databases from where most of the Lebanese hailed to cultural, behavioral, or economic factors that differentiate the Lebanese from other ethnic groups in this study sample.

The gravity of a child's condition during an asthma exacerbation is likely to be cause for its association with emergency department use. While asthmatics made up a quarter of the ED visits, an examination of the percentages suggests that nearly an eighth of all the visits in this study population were likely secondary to an asthma exacerbation. Though several studies in the past have demonstrated a relationship between smoking and asthma, it was not evident in this sample. The aforementioned cautious answering alluded to in some of the responses may be responsible for a masking of this relationship if in truth it existed. The association of having a first child born outside of the United States and having a child with asthma may represent differences in this diagnosis between one's home country and the United States. It could also be a difference in cultural interpretation, specifically concerning Iraqis with respect to the United States. In looking closer at which countries were the sites of initiation of motherhood and associated with higher asthma rates only Iraq and Saudi Arabia had rates higher than 20%, well above the overall average in the study. The result could be secondary to the stresses of war and refugee life since Saudi Arabia was typically the home for Iraqi nationals in this study.

Gestational Diabetes

It was encouraging to see the impressive reports of using prenatal care by the women interviewed. Despite cultural differences previously discussed, it appears that the overwhelming majority of women surveyed were confident with the medical system at their disposal or are understanding of regulations regarding programs such as WIC to seek prenatal care. It is somewhat disturbing,

however, that some of the women using pre-natal care did not receive proper screening for gestational diabetes. It may have been resultant from a problem similar to the one speculated for whether or not one's children were tested for lead, where the test occurred but the woman was not aware of what that certain procedure was testing. However, the question was worded in such a way as to trigger the memory of the specific event of drinking the glucose solution (a "sweet juice") to perform the test. The variables significant for the model are contradictory. Having been born in the U.S. actually appears to be negatively associated with being tested while the derived variable, which is meant to measure acculturation prior to initiation of motherhood, is in an expected positive association with testing for diabetes. Simple bivariate analysis reveals no independent association between whether one was born in the U.S. and whether one was tested for gestational diabetes, thus it appears to be an effect modifier that when controlled for with respect to the other variable, increases the fit of the logistic regression. The true association seen in this population is that the longer a mother lived in the U.S. prior to the birth of her first child, the more likely it is that she was tested for gestational diabetes. Reasons for not being tested are unclear and could be the fault of the clinic where the care was sought and/or the fault of the subject herself depending on the individual circumstances.

The importance of testing for this condition is unquestionable especially for the population served by ACCESS. A study looking at ethnicity and gestational diabetes showed that several ethnicities including women born in the Middle East were at an increased risk of developing gestational diabetes compared to other ethnicities, including the ethnic majority, of the United States (Berkowitz, et al; 1992). That same study estimated that gestational diabetes complicates 1-5% of pregnancies, whereas in this study population 17.5% (N=48) of the women claimed to have the condition during their last pregnancies. Because of the complexity in diagnosis and problems with language barriers in health care for these women there could be some confusion concerning true diagnosis. Once someone has the initial screen, if her blood glucose appears high, a second more specific trial is performed for the actual diagnosis. If a woman has not had the situation explained to her adequately she may mistakenly think that a positive first test means she has a history of high blood sugar or diabetes during pregnancy. This speculation would seem unlikely in this study as the unstratified analysis of language spoken at home showed a significantly higher risk for women who

speak English at home that lost significance after correcting for whether or not a subject was from the WIC clinic.

If either the subject or the subject's husband was employed, it appeared the subject was less likely to have a history of gestational diabetes. If the subject was part of the WIC database this was associated with an increased risk of having gestational diabetes. Some studies have shown exercise to reduce the chance of developing gestational diabetes (Dye, et al, 1997). It could be in this study population that with employment, the subject is either working herself, or performing a greater share of domestic work for her home since her husband is not present as frequently to help when compared to a household where both partners are unemployed.

Post-partum Depression

The outcome examining self-diagnosed post-partum depression showed sickness during pregnancy, unwanted pregnancy by the subject, and poorer quality of marriage to be associated with feelings of depression. Contrary to the hypothesis that a woman more recently immigrated to the U.S. may have more emotional difficulty with a pregnancy, the analysis suggests the longer a woman lived in the U.S. prior to giving birth to her first child, the greater likelihood of her having feelings of depression. Regardless of this association, the condition is an important one to recognize. With over a quarter of the respondents admitting feelings of depression should indicate this condition as an important mental health issue for the population served by ACCESS. The Edinburgh Postnatal Depression Scale (EPDS) is a tool used to evaluate a woman for post-partum depression (Cox, et al., 1987) and has been validated in several languages. A validated Arabic EPDS questionnaire has been developed from the United Arab Emirates and may be administered in attempts to assess more accurately whether or not a woman is suffering from post-partum depression (Ghubash, et al., 1997). This would be beneficial for the individual mother on a clinical basis as well as for developing clinical strategies through a more accurate research assessment of the prevalence of postnatal morbidity in the ACCESS and WIC clinics. Typically prevalence is significant enough to screen all women. A study from the United Arab Emirates showed a prevalence of post-partum morbidity to be 18% by EPDS which was comparable to that found in many industrialized nations (Abou-Saleh and Ghubash, 1997). Use of the questionnaire may also uncover domestic problems that may exist within households that would otherwise go unnoticed. The dedication of ACCESS to issues of

domestic violence would mesh well with screening of all women for indications of post-partum depression and the possibility that domestic abuse is playing a role in the depression when present.

Conclusions

The study demonstrates the importance of language capability and economics in health education and seeking health resources particular to lead poisoning. Maternal command of English and acculturation of family, demonstrated by using English in the home, is associated with health knowledge and seeking preventive services. Time spent in the U.S. also seems to be associated with an increased likelihood of having knowledge of lead poisoning or lead sources. While paternal literacy does not appear to have a significant relationship with these outcomes the overwhelming contribution of men to the household income through employment is significantly associated with having sought lead screening for one's children. Health insurance is significant in attaining lead screening but it is overwhelmingly a product of federal assistance in this study sample and, therefore, less likely to be a positive indicator of socioeconomic status.

Possibly the most disturbing finding of the study is that not only do about half the women in the sample not know what lead poisoning is, the overwhelming majority have not had their children screened for lead burden. Most likely all households in the study fall into categories designated by the CDC that dictate the need for lead screening of all children. All those receiving public assistance should be screened; this includes the cohorts from WIC and MI-Child as well as some of the households in the other areas. The CDC also states that all children living in zip codes where $\geq 27\%$ of the homes were built before 1950 should be screened for lead (CDC, 1997). This would qualify the entire city of Hamtramck according to the assessor's office of that city (personal communication) and would most likely qualify most, if not all, sections of Dearborn.

Efforts are already ongoing to increase awareness of lead poisoning in Arab communities served by ACCESS and to enroll eligible families in lead screening programs. This study reveals a probable need for ACCESS to indeed extend its outreach to the Hamtramck area and to expand its efforts in lead education and administering lead screening in the areas it currently serves. Knowledge may be improved by increasing outreach in both English and Arabic with written materials in both languages. Clinics serving this population should take a leading roll in verbal patient education in the appropriate language and ensure that all children have been tested for lead ideally around 12 and 24 months of age. Any child over 2 years of age without previous history of lead screening should

also be tested. Surveillance of these actions should be performed to argue for adequate funding for active screening for high lead burden in the community. These measures may identify specific households with lead burdened children and enable them to connect with organizations already in place to remove lead from homes in the Detroit area.

Current efforts by ACCESS to target individuals with nicotine addiction and to prevention efforts directed at teens to limit the prevalence of tobacco use in the Arab community are properly directed and should continue. The inter-relationship between asthma and cigarette smoking is likely responsible for a significant number of emergency department visits and subsequent hospitalizations in this study population. Decreasing exposure of children to second-hand smoke should serve to reduce the need for emergency care services.

Many Arab women served by ACCESS seek their prenatal care in nearby clinics as the ACCESS Community Health Center does not offer these services. When receiving prenatal care women should receive all necessary care including screening for gestational diabetes. Given the higher rates of this condition in the Arab community attention to this matter is imperative. Evaluation within clinics offering these services must assess whether current policies of screening are compatible with social issues of the pregnant women. Difficulties with transportation or being absent from the home may limit a mother's willingness to make all prenatal appointments. The importance of this test should be stressed at the first prenatal visit in either Arabic or English, depending on the mother's linguistic ability, so as to not miss a subsequent opportunity due to unforeseen circumstances. Clinics may consider consolidating the number of visits requested of the patient if there are a significant number of missed appointments secondary to problems previously mentioned.

Women of the Arab community are not exempt from postnatal depression. Tools have been developed that could quickly assess a woman's mental state concerning depression within a few minutes. With resources already in place at ACCESS to serve women with mental health issues, coordination with the clinics that typically see women after a few weeks into the post-partum period could bring women into contact with necessary services. In less common but the most serious cases, women who would be otherwise undiscovered in situations of domestic abuse could be helped.

This study provided an overview of specific health effects, knowledge, and use of preventive services in the Arab community of areas of metro Detroit. Though it is most reflective of the Dearborn and Hamtramck areas, applications of this research would likely be beneficial for all areas in the region with large Arab populations. With this knowledge, future research may improve the focus of these same issues and organizations such as ACCESS may direct their efforts in affecting policy changes to improve local clinical care, benefiting the women and children of the Arab community.

Recommendations

Community based organizations such as ACCESS have a distinct advantage over traditional clinics and health systems in the delivery of health care to their target population. The reason being is that a fundamental facet of the organization is that it be culturally interlaced with the community it serves. In the case of ACCESS this involves its foundation by Arabs and Arab Americans and its employment of people of the Arab community knowing that their primary goal is to serve the Arab community of the Dearborn/Detroit area. Entrenched in the commitment of ACCESS to serve the Arab population are bicultural and bilingual services that accommodate the client in their period of acculturation which may last a few years but more commonly lasts a lifetime. The collaboration of other area clinics which serve an Arab clientele with ACCESS results in a mutual advantage for both clinics and ACCESS. Clinics provide the health care needed by the community, while ACCESS provides the cultural bridge for people to reach that health care. Resources of health education and stressing preventive services will maximize limited monetary funds and the positive impact of health care on the community.

Not only are resources needed that feed directly into the health care system, but improving overall education, particularly knowledge of English among Arab women will likely result in an improved use of health care services by the client. Social programs that aim at employing people of the Arab community will also likely have an indirect impact on improving health care. Both social programs and maternal education in English will aid immigrants with the problems of coping in a new cultural environment. Improving the socioeconomic status and English abilities of Arab women will empower them to seek and receive the health care which they and their

children deserve. These concepts of improving social standing and maternal education are likely applicable to all immigrant groups and potentially all disadvantaged minority groups.

Community based organizations are not alone in their responsibility for carrying out the abovementioned goals. Other government-funded clinics such as WIC should take a role in providing the preventive services recommended by the CDC or other government agencies. As both government-funded clinics and the CDC are working towards the same goal of improving health status of people in the United States it seems counter-productive that one would not be committed to advancing health care by the guidance of the other. The synergy of all government services, community-based services, and the people of the community, working together, is what will slowly minimize the disparities of health status between the different socioeconomic classes of the United States.

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