CAN AIRCRAFT NOISE ≥115 dBA ADVERSELY AFFECT REPRODUCTIVE OUTCOME IN USAF WOMEN?

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PROJECT

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This proposal was submitted on May 24, 1985.

A PROPOSAL TO DETERMINE IF AIRCRAFT NOISE 115 dBA CAN ADVERSELY AFFECT REPRODUCTIVE OUTCOME IN USAF WOMEN

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The University of Texas
Health Science Center at Houston
School of Public Health, 1985

Supervising Professor: Robert Oseasohn, M.D.

It has been suggested, mainly through animal studies, that exposure to high noise levels may be associated with lower birth weight, reduced gestational length and other adverse reproductive outcomes. Few studies have been done on humans to show this association. The Air Force employs pregnant women in areas where there is a high potential for exposure to high noise levels. This study proposes a method to determine if there is an association between high frequency noise levels ≥ 115 dBA and adverse reproductive outcomes through a review of records and self-administered questionnaires in a case-comparison design. Prevelance rates will be calculated and a multiple logistic regression analysis computed for the independent variables that can affect reproduction.

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AUTHOR: Patricia Ann Brubaker

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CHAPTER 1

INTRODUCTION

The past two decades have seen an ever greater number of women joining the work force, not only in the civilian sector, but also in the military services. In the United States Air Force (USAF) alone, more than 11 percent of the active duty forces are women. There are now 66,000 women members compared to 33,000 less than 10 years ago.[1] This has been brought about by changes in the military itself, and changes in the laws of the land. Up until 1964, married women were not allowed to enter the military. If a woman did get married while she was on active duty, she was allowed to leave the military service voluntarily, simply because she was married. This was not true for the man. This was eventually considered discrimination and the policy discontinued. This change rapidly increased the numbers and proportions of married women in the services.[9] Currently, 63 percent of all Air Force members are married.[1]

A second form of discrimination existed in the military services. If a woman became pregnant on active duty, it resulted in an automatic discharge as soon as the pregnancy was diagnosed. This was true up until 1976, when after many lawsuits, the courts decreed the policy was irrational. The courts stated

that there was no other temporary disability for man or woman that resulted in a mandatory discharge. There had to be an individual determination made on each person's ability to serve before they could be discharged.[9]

Another major change to affect the military services was Title VII of the Civil Rights Act of 1964, amended by the Equal Employment Opportunity Act of 1972. This led to the opening up of more job opportunities for women in the military services, jobs that traditionally had been open only to men. This led to women being exposed to chemical, biological, and physical agents which they had not previously encountered. Or, if they had encountered them, it was not a routine situation nor a prolonged exposure. Today, women in the Air Force encounter these exposures routinely during an eight hour work day, forty hours (or more) work week. These agents, in and of themselves, or in combination with each other, can be totally innocuous or can produce morbid and even mortal consequences for a worker.

With the changes that have occurred in the military and other work places, there is a potential problem that needs to be addressed. The Air Force population is young and healthy and the majority of the women still capable of reproduction as well as the men. With 66,000 women in the Air Force, one can see the potential number of pregnancies that might ensue at any given time. Obviously, not all of these women will get pregnant either by choice or for other reasons. However in 1981, there were 3,461 single live-births delivered in Air Force installations.[3]

The fact remains that we do have pregnant women in the work force receiving regular exposures to agents that may or may not be hazardous to mother and/or infant.

These women are working in positions that heretofore were performed by men and there are no historical data that might be used to determine harmful effects on fetal outcome. Of the estimated 63,000 chemicals in use today, only a relatively small number have been tested for possible effects on the reproductive system. Much of this research has been on animals and the data extrapolated to man. Retrospective analyses have been accomplished on humans to show cause and effect between chemical agents, biologic agents and the resultant adverse effects on the reproductive system and fetal production. There is still abundant research that should be conducted to identify all the agents that can produce harm to maternal health and fetal growth and development.

One such agent that needs to be studied in greater detail is noise as a potential health problem to pregnancy. This is especially true for the Air Force where women are now employed in ever greater numbers on the flight line where exposure to high frequency noise is likely. The Air Force has an ongoing program that requires a work place evaluation for each pregnant woman to determine if she should be removed from her job during the pregnancy in order to protect her and the fetus.[5] (Appendix 6) If there were increased knowledge about the nonauditory effects of noise, rational evaluation decisions could

be more easily determined. Such information would help to ensure the health and safety of the worker and her fetus and prevent removing a worker arbitrarily when she is needed for the mission.

A review of the literature reveals no studies on the nonauditory effects on women working on the flightline. The purpose of this paper is to propose a plan for a case-comparison study to determine if there is an association between high frequency noise levels ≥115 dBA and adverse reproductive outcomes.

CHAPTER 2

LITERATURE REVIEW

After receiving several Medline searches and assistance from Major John Elmore, Chief, USAF Hearing Conservation Data Registry, ten articles were obtained that dealt with noise and reproduction. Of these, four were studies directed at humans and airport noise[6, 10, 12, 15] and the others were controlled studies on mice, rats, mink, and rabbits.[2, 4, 11, 14, 17] The tenth article was a review of the above articles and a discussion on noise as a potential hazard to pregnancy.[8]

The research performed with the animals was to establish an association between noise stimulation, especially high frequency noise, and the effects on reproduction. The first article by Cook et al., studied the effects of high frequency noise on prenatal development and maternal plasma and uterine catecholamines, specifically norepinephrine and epinephrine in the CD-1 mouse.[4] They were looking for physiological correlates that might be associated with the decreased pregnancy maintenance, reduced fetal weight, fetotoxicity and teratogenesis that other authors had observed in research on the effects of high frequency noise on reproduction in rodents. They believed that catecholamines are the likely candidates because of their

sensitivity to physical stressors. Abnormal reproductive outcomes observed were decreased fetal weight, decreased maternal weight gain, entire litter resorption and an excess of malformed fetuses. Their study also demonstrated elevations of uterine and plasma catecholamine levels in noise exposed rats. Previous studies had shown that uterine blood flow reductions and adverse reproductive effects were related to acute plasma catecholamine elevations. They conclude that, although a crucial link between elevations of catecholamines and reproductive toxicity had not been demonstrated, the two may be related.

A study done by Brewer[2] was undertaken to determine the effects of noise pollution on animal behavior. The investigation was in response to legal claims against the USAF alleging that reproduction in various species of animals, fish, poultry and birds was adversely affected by sonic booms. Poultry eggs, poultry and mink were all studied at different times, by different agencies, and reported on in this article. All of the study groups had comparable controls. The conclusion of all of the studies was that the overall effects of sub-and supersonic aircraft were minimal.

Teratogenic potential of noise in mice and rats was studied by Kimmel et al., in 1975.[11] They actually did two experiments in one study. The first experiment was designed to determine if a quieter (30-45 dBA) than normal laboratory would effect reproduction any differently than normal laboratory noises of 50-60 dBA. In this experiment the quieter noise level

was associated with a decrease in maternal weight gain while other studies, (including their second experiment in this study) have associated decreased maternal weight gain with increased noise levels. The second experiment involved exposing mice and rats on certain days of gestation to increased levels of noise above the normal. The mice had a decreased maternal weight gain and increased incidence of resorptions compared to the control group. There was no significant effect on the fetuses. In the rats there was significant decrease in maternal weight gain, but no reproductive toxicity. Hence, the conclusion in this controlled study was that increased noise had maternal and fetotoxic effects in mice, little effects in rats and was not teratogenic in either species. The authors state that the effect on maternal weight gain may be due to the stress of the chambers.

In an attempt to reconcile the conflicting results, the association of excessive noise and teratogenic effects, another study was conducted on CD-1 mice by Nawrot et al.[14] It should be noted that, in this particular study, the authors point out there is a difference in the mouse and human audibility curves at hearing threshold levels. These threshold curves imply that high frequency noises may be midfrequency for the mouse and low frequency would not be very loud despite its high level of dB sound pressure level of 125 dB. In this study, the authors used a broad band of high frequency, high intensity, temporally uniform noise over 12 hours. The results show a decrease in pregnancy rate and fetal weight and a slight increase in late-stage fetal death at low levels of significance. However,

the increase in fetal death, coupled with previous data provides a case for the hypothesis that high frequency noise can promote late stage toxic effects. Nawrot et al., believe that intense low- and midfrequency noise are more effective in inducing some reproductive aberrations, (pregnancy rate, embryolethality, maternal weight gain) than high frequency noise. This suggests that those effects may be related to mechanical or vibration induced causes.

The last animal study on the association between high frequency noise levels and reproduction by Zondek and Tamari[17] was performed with rats and rabbits. The authors showed that sound stimulation causes an increase of the anterior pituitary gonadotropic reaction in adult rats and rabbits which is manifested by prolonged or persistent estrus, enlargement of the ovaries, and increase of the corpora lutea. However, the opposite effect was discovered on fertility: it was decreased. The overall sound intensity was about 110 decibels.

These animals studies demonstrate that there may be an association in the laboratory between high frequency noise levels and an adverse reproductive outcome. Almost all of the studies used control groups that were comparable to the exposure groups. All used statistical analysis to show assocation and significant difference. However, one must be very careful when extrapolating from one species to another and implying causal relationship. As one article points out, there may be a difference in the hearing threshold of humans and mice and that the noise levels that are associated with an adverse reproductive

outcome in animals would not affect humans.

Studies in humans have dealt with the possible association of urban airport noise with teratogenesis, birth weight and human placental growth. All have used retrospective case-comparison designs. None were laboratory based.

In the first study reviewed, Edmonds et al., used data gathered from Metropolitan Atlanta, Georgia.[6] They used the weighted day-night average sound levels in decibels over a 24 hour period (L_{dn}) as an indicator of chronic stress rather than peak noise levels. This was divided into three subgroups of 65-69, 70-74, $>75L_{dn}$. The rates of seventeen categories of birth defects occurring in high noise areas were compared with rates in other census tracts in the area. These data on birth defects were gathered from the Metropolitan Atlanta Defects Program which is a surveillance system utilizing multiple methods of ascertainment of birth defects. Confounding variables were taken into consideration. The results of their analysis overall showed no association between the seventeen defects and high noise areas. However, because of findings in another study in Los Angeles[10], the authors elected to look at neural tube defect data by individual defect. Here they found a significant association in the highest noise area for one defect--spina bifida with hydrocephalus. A case control study was then accomplished on all neural tube defects using matched pairs for all three noise areas. They found no statistically significant association, but could not rule out slight association. It was concluded that there was little or no need for concern.

The study that led Edmonds et al., to examine neural tube defects was undertaken by Jones and Tauscher at the Los Angeles International Airport.[10] They concluded that there were more than expected abnormal births born to mothers residing in the noiseist census tracts on approaches to the airport. Their information was taken from birth certificates for 1970,1971, and 1972. They compared the 90 dBA contour residential area around the airport with the rest of the county. The authors point out that their data do not mean that jet landing noise causes teratism. One must also consider the heavy automobile traffic in the area. However, they believe that the research that has been done by others does not mean their findings can be dismissed.

The third article deals with relationships between birth weight and aircraft noise.[12] Data were taken by Knipschild et al., from six infant welfare centers in villages in the vicinity of Amsterdam Airport in the Netherlands. The study group was limited to mothers, age 20-34, who delivered single births in hospitals and to births for whom registry forms were complete. The aircraft noise was measured as high or low using the criterion of L_{dn} equal to 60-65 dBA. The variables of twins and age were eliminated by the limits of the study, and the variables of birth order, sex of the infant and family income were looked at separately. Smoking habits were examined among women in one village and it was found that the relationship between aircraft noise and birth weight was not confounded by this factor. Their data indicate there is an association between low birth weight and high noise areas and that this is more true for female

infants than male infants. The methodological limitations identified by the authors were nonparticipation of two-thirds of newborn infants due to incomplete records, being a twin, delivery at home or not having visited an infant welfare system. The fact that noise levels characterized the external environment and the mothers may spend more time indoors, limiting their exposure, may provide a bias. Their conclusion is to do more research.

The last article reviewed dealt with prenatal growth and environmental noise compiled by Schell.[15] The exact location of the study is not stated and he calls the community Airport City. The method of data collection was interesting. He and two associates visited homes of families contacted through the local elementary school. They were interviewed regarding their ethnic background, income and education, height and weight, children's illnesses and locations of mother's residences while pregnant. Birth weight was recorded from hospital documents kept in the home and gestational length was determined by asking mothers if the birth was early or late and by how many days, based on determinations of mothers and their physicians. This information was obtained on births that occurred between 1965 and 1977. The author does not mention when he gathered the information, but the article was written in 1981. There could be built-in memory bias. The level of peak noise was used as a measure of noise exposure instead of L_{dn} and varied throughout the community from 79-91 dBA. These measurements were obtained from studies generated in 1967 and 1975. Schell concluded that

maternal noise exposure is related to depressed prenatal growth based on bivariate correlations, but a direct causal relationship cannot be determined. He points out factors that might have biased this study such as buildings inhibiting the effects of noise levels on individuals, small sample size, and other sources of noise or even the lack of noise.

In summary, the literature review provided eight articles which tend to support the hypothesis that high frequency noise can produce adverse reproductive outcomes. Only two articles support the alternate hypothesis that there is no concern in regard to high frequency noise exposure and pregnancy.

CHAPTER 3

METHODS

Overview:

The purpose of this proposal is to determine if there is an association between high frequency noise levels 115 dBA and adverse reproductive outcomes. The study will compare the exposure to high frequency noise (≥115 dBA) among active duty USAF women with poor reproductive outcomes, and that among comparable USAF women without poor outcomes. The data will be collected from medical records, obstetrical records, and records maintained by the environmental health section (SGPE) and bioenvironmental engineering section (SGPB). A questionnaire will also be used to obtain additional information from the women on other relevant variables that have been assoicated with adverse reproductive outcomes.

Approval:

The study will have to be cleared through USAF channels before it can be undertaken. Since the protocol does not call for exposing women to an increased health risk and since it will

provide needed knowledge for both the military and civilian communities, it should not be difficult to obtain approval.

The subjects are informed on the questionnaire of the purpose and need for the study. They are advised that the completion of the survey is strictly voluntary and they will not be identified in the study by name or social security number (SSAN).

The consent of the individual women will need to be obtained in order for their medical records to be reviewed and for their inclusion in the study. Appendix 5 shows a sample consent form.

Study Design:

The design of this study will be a case-comparison study, observing, recording, and analyzing the reproductive outcomes of two groups of women. The strength of association between adverse reproductive outcomes and exposure to high frequency noise levels $\geq$115 dBA will be examined. Other variables that are associated with adverse reproductive outcomes will be included in the study.

Selection of Subjects:

Cases will include all active duty Air Force women who were delivered during a six month interval at Wilford Hall Medical Center and who exhibit one or two selected adverse reproductive outcomes. Adverse reproductive outcomes are defined

as either a decreased gestational period (duration of pregnancy less than 38 weeks) or lower than normal birth weight (≤2500 grams). For each case, two comparison subjects will be selected using a random number selection table. The criteria for comparison subjects will be: active duty Air Force women who have a duration of pregnancy equal to or greater than 38 weeks and an infant who weighs ≥2500 grams, and whose infants are born at the medical center. A sample size of 100 cases will be needed.

Currently, there are approximately 500 women registered in the obstetrical clinic at Wilford Hall Medical Center. Of these, 120 are active duty military with most of them being active duty Air Force. It is estimated that at any one time, 23-24% of the obstetrical patients are on active duty and approximately 17-20 of these women are delivered each month. It is from this group of women, who have delivered, that the study group and comparison group will be determined.

It is not anticipated that this number of deliveries will decrease as the study progresses, because movement of women out of the area or out of the Air Force is lessened by two factors: First, women are temporarily disqualified for world wide duty during their pregnancies and are seldom moved by the Air Force. Secondly, the advantage of receiving medical care for herself and her newborn infant tend to reinforce the choice to remain on active duty.

Data Collection:

A detailed breakdown of the time required for the study is presented in Appendix 1. The resources and budget are listed in Appendix 2.

A questionnaire (Appendix 3) has been devised to obtain information from the women on the variables of rubella, age, history of smoking, alcohol intake, ethnic group, social status (defined by rank) and medications taken during pregnancy. These include known factors that can influence reproductive outcomes. The questionnaires will also elicit the type and location of work during the pregnancy.

Assistance will be needed from the obstetrical clinic and ward personnel in the medical center in identifying the women who have delivered. Staff will also be utilized to ensure the completion of the questionnaires. The questionnaires will be self-administered during the time of hospitalization for delivery. Instructions on how to complete the questionnaires will be given to the ward and clinic charge nurses so they may answer the patients' questions in a uniform manner.

The information given by the women will be utilized to obtain the appropriate records from SGPE and SGPB to determine exposure to noise. The information on the reproductive outcomes, length of gestation and weight of the infant, will be obtained from the obstetrical records at Wilford Hall Medical Center. In order to obtain these data, the patients' names and social

security numbers will have to be ascertained. However, once the needed information is obtained, it will be transferred to a coded data sheet (Appendix 4) and the questionnaires destroyed to assure confidentiality. All materials pertaining to the study will be maintained in a locked file in the investigator's office. The completed questionnaires in the medical center will also be under lock and key until picked up by the investigator. The investigator will obtain the information from the medical center monthly.

Data Analysis:

Reproductive outcomes will be classified into three groups:

1. Infants with gestational length $\geq$38 weeks and $\geq$2500 grams.
2. Infants with gestational length $\geq$38 weeks and $\leq$2500 grams.
3. Infants with gestational length $\leq$38 weeks and $\leq$2500 grams.

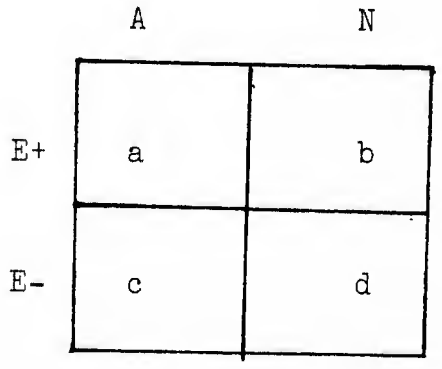
To determine if there is an association between high frequency noise levels and adverse reproductive outcomes, an odds ratio can be computed. The odds ratio can approximate the estimate of relative risk of adverse reproductive outcomes conditional on exposure to high frequency noise level 115 dBA. This can be done by computing the cross products ratio after presenting the data in 2 X 2 tables. A 2 X 2 table would be used for each category of adverse reproductive outcome. It would be set up in the following manner:

A = adverse reproductive outcome

N = normal reproductive outcome

E+ = routine exposure to noise 115 dBA

E- = no routine exposure to noise 115 dBA



Computing the odds ratio for the association of high frequency noise and adverse reproductive outcomes produces an incomplete picture. There are other variables, i.e., smoking, alcohol intake and age that can affect reproductive outcomes. Each of these independent variables can be statistically analyzed as to association with adverse reproductive outcomes. This again can be presented using 2 X 2 tables and computing odds ratios. By studying the other variables, additional information would be obtained on the relationships of associations between these variables and reproductive outcomes. However, this does not take into account the relationship of each variable to the adverse reproductive outcomes when the other variables could be affecting the statistical analysis of the association of high frequency noise and reproduction. In order to address this, a multiple logistic regression analysis would have to be computed on a computer using preexisting programs.

CHAPTER 4

DISCUSSION

Using a case-comparison study to determine the relationship between high frequency noise levels ≥115 dBA and adverse reproductive outcomes has its limitations. Memory bias may influence what the mothers state on the questionnaires. A dose-response rate of noise cannot be determined for each individual. This could result in more or less exposure to noise than the records indicate and result in erronous categorizations. There are other sources of noise that the women may be exposed to during off-duty hours.

A prospective study beginning with healthy pregnant women and defining and measuring potentially hazardous exposures, would permit the calculation of incidence rates in the exposed and not exposed to high frequency noise. However, since the frequency of occurrence of adverse pregnancies are rare events, a case-comparison study is both practical and efficient at this state of our knowledge.

This case-comparison study is also limited by including only subjects stationed in the San Antonio area and delivered at Wilford Hall Medical Center. The center does, however, serve several bases, but the number of active duty women delivered per

year at Wilford Hall is relatively small (approximately 240) compared to the 1981 total number of 3,461 of Air Force wide active duty women delivered of single births.

The questionnaire has not been tested and before it can be considered a valid instrument, it should be validated. It is assumed that the obstetrical, SGPE and SGPB records are complete. This may not be factual for every base.

However, this study may show a statistically significant association between high frequency noise and selected adverse reproductive outcomes. This would be a strong justification that further studies in larger populations are needed.

APPENDIX 1

TIME ANALYSIS

Time Required:	Activity:
2 months	Obtain approval from USAF.
2 months	Obtain approval from facility commanders.
1 month	Prepare and print questionnaires and consent forms.
1 month	Instruct MTF personnel and distribute the forms.
6 months	Data collection.
2 months	Data analysis.
1 month	Compile report and submit to USAF for review and approval for publication.
3 months	Publish report and forward copies to Chief, Audiology Branch, Brooks AFB, and AMRL, Wright-Patterson AFB.
18 months	Total time involved.

APPENDIX 2

RESOURCES AND BUDGET

Space:	Existing office space and most equipment will meet study needs.
Personnel:	Presently assigned personnel will gather the data.
	Typist to do the reports, articles for publication and all other correspondence.
	Statistician and epidemiologist to assist with data analysis and interpretation.
	Medical editor to review report for submission to USAF and for publication.
Equipment:	A secure filing system at the collection points to maintain submitted forms.
	A telephone to make inquiries and follow-up.
	Access to computer for analysis of data.
Supplies:	Postage for correspondence.
	Paper, Pens, pencils, erasers, and other office supplies.
Travel:	Transportation to enlist assistance and discuss format for study.
	Travel to present report at meeting.

APPENDIX 3

PATIENT'S QUESTIONNAIRE

A study is being conducted to determine if there is any association between working conditions and the outcome of pregnancy. We want you to have the best environment in which to work and are concerned with you and your family's well being and health. Your understanding and cooperation in spending a few moments in answering the questions will help and allow for better planning for each individual. This health survey is voluntary and its value depends on the care with which you complete the form.

Your name and social security number are needed in order to get further information from the records. Once the information is obtained and put on a coded data sheet, the survey sheet is destroyed. Neither your name nor SSAN will be used in this study. Thank you for your cooperation.

(Check or write in the most appropriate answer):

1. Name:_____ 2. Date of Birth:_____
3. Ethnic Group: Caucasion:_____ Black:_____ Other:_____
4. SSAN:_____ 5. AFSC:_____
6. Did you have rubella during pregnancy: Yes_____ No_____
7. Did you work on the flightline during pregnancy? Yes___ No___

8. What is your normal duty?-_____

9. Did you smoke during this pregnancy: Yes_____No_____

   If yes, how many cigarettes per day:_____

10. Did you take any medication(s) during this pregnancy?

    Yes_____No_____ If yes, what?_____

    _____

11. What was your job during your:

    a. First trimester?_____

    b. Second trimester?_____

    c. Third trimester?_____

12. Did you use alcoholic beverages (beer, wine, or spirits) during pregnancy? Yes_____No_____ If yes, approximately how many drinks each week?_____

The return of this form, irrespective of how you answer the questions, has absolutely no effect on you or your careet.

APPENDIX 4

INDIVIDUAL DATA SHEET

1. Code number:_____
2. Age:_____
3. Ethnic Group:_____
4. Rank:_____
5. Location of work: First trimester:_____
   Second trimester:_____
   Third trimester:_____
6. Normal Occupation:_____
7. Rubella:_____
8. Medications:_____
9. Smoking:_____
10. Drinking:_____
11. Flightline:_____
12. Machinery:_____
13. Noise Exposure ≥115 dBA: Never:_____
    Seldom (weekly):_____
    Often (daily):_____
14. Reproductive Outcome: 38 weeks and 2500 grams_____
    38 weeks and 2500 grams_____
    38 weeks and 2500 grams_____

APPENDIX 5

CONSENT FORM

I,_____ have read and understand the information on the questionnaire that explains the need for this study and its intended use. I wish to participate and understand that all information will be kept confidential and used only for statistical purposes. I understand the need for the use of my name and social security number and further understand that they will not be used in any way in the report of this study.

_____

Signature Date

APPENDIX 6

AIR FORCE PREGNANCY PROGRAM

The USAF has a program in existence whereby the workplace of pregnant women must be evaluated to ensure the health and safety of the pregnant woman and her unborn child. This program was initiated in 1980 by Interim Message Change (IMC) to an existing Air Force Regulation.[5] This IMC, four pages in length, attempted to set down guidelines for the care of pregnant active duty personnel. The first paragraph of that IMC states in part:

> Supervisors must ensure that all workers are thoroughly informed of the potential hazards in the work environments. It is particularly important that female members understand the necessity of confirming pregnancy at the earliest possible time. Supervisors must be advised as soon as practicable. The proper management of pregnant active duty personnel requires cooperation among the patient, attending practicioners, environmental health personnel, patient affairs personnel, line supervisors and profile officers. Pregnant females will not be excluded from duties solely because of the potential for exposure to occupational hazards or toxic substances. Some duty restrictions may be appropriate, but complete excusal of the pregnant member from all military duties before delivery is seldom indicated. Duty restrictions, if required, should be determined based on objective medical reasons related to the environment.

The IMC details a plan of action on how this program is to be conducted and it involves all of the people listed in

the above paragraph. It begins with the female worker coming into the Medical Treatment Facility (MTF) and being diagnosed as pregnant. The physician or health care provider (HCP) has her report to the environmental health section (SGPE) with an SF 513, Consultation Sheet, requesting a workplace evaluation. At the same time, an AF Form 422, Physical Profile Serial Report, is drafted by the HCP for finalization by personnel in the physical standards section. The AF Form 422 is then sent to the MTF Commander or profile officer for approval and signature. The form lists any duty limitations that are directed by regulation for the pregnant woman, i.e., temporarily disqualified from world wide duty, removal from weight management program, no intentional exposure to ionizing radiation and excusal from routine immunizations, and any additional limitations the HCP feels or believes are necessary because of underlying medical conditions. Technically, it should not be completed until SGPE has had the workplace evaluation accomplished. However, there is a lag time, both between the time of the initial diagnosis through urinalysis, and the physical diagnosis by the HCP and the time SGPE is notified and gets the workplace evaluation done. By initiating the AF Form 422 first, it alerts the consolidated base personnel office (CBPO) and the supervisor that there is a strong possibility that this person is pregnant. CBPO can then ensure that the person is not mobilized or moved and the supervisor, who should know all of the hazards of the workplace, can take preliminary action to protect the worker if there is a need for protection. This form may need to be reaccomplished if SGPE finds, during the

workplace evaluation, more hazards exist than the supervisor suspected.

SGPE notifies the bioenvironmental engineering section (SGPB) of the need for a workplace evaluation by forwarding the SF Form 513 onto their section. SGPB personnel review their case file on the workplace, or do an indepth analysis if they don't have a current review, and forward this information back to SGPE. In the meantime, SGPE obtains from the worker's supervisor a statement describing the work environment, specific duties, and physical requirements of the member on her job. After SGPE has obtained both pieces of information, they interpret the data, obtain assistance as needed, and forward the information to the HCP for his/her further recommendations on any additional limitations that might have to be imposed. SGPE serves as a contact point for problems which the pregnant member may experience during her pregnancy which are related to the work environment.

This program has now been expanded, not only to include all active duty Air Force, but also all civilian women employed by the USAF. In these instances, the supervisor of the civilian pregnant woman is responsible for notifying SGPE of the need for a workplace evaluation. Her civilian physician is notified of any need for limitations and the details are worked out through the supervisor and physician.

Since SGPE serves as contact point for the women on any problems associated with the work environment, they maintain copies of the forms used in these evaluations. A logbook is

usually maintained for quick reference to information needed to assist if a problem does arise. This logbook provides the name, social security number (SSAN), telephone number of the woman, her supervisor's name and telephone number, her duty location, her job title, her Air Force Specialty Code (AFSC), and expected date of delivery (EDC).

As mentioned before, SGPB maintains a case file of each workplace on the air force base. In this case file or shop folder there is a current and historical picture of the operation and personnel assigned by duty title, AFSC, and duties performed. It also describes the physical layout of the workplace, i.e., the heating, cooling, ventilation, lighting, and size. The shop folder is updated whenever there is a change in operation, a change in use of the buildings, or a dismantling of operations. These data are maintained for several years.

In addition to the shop folders, SGPB obtain and maintain data on noise levels on and around an air force base. They can provide information on where noise levels $\geq$115 dBA exist and approximately how much exposure one can expect while being in a certain area. Without using personal noise dosimetry monitoring devices, they cannot five an indication of exact dose-response rates for each person. But by their surveys, they do know which stationary machines produce noise and in what dBA level and approximate times these machines run on a daily basis. They also know and have documentation on runway approaches and noise levels of aircraft and which areas are more subject to high frequency noise levels.

Therefore, the data should be available to identify pregnant women, their particular type of duty, and their occupational exposure to noise.

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VITA

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She attended public grade and high school in Shoshoni, Wyoming. After graduation, she went to Denver, Colorado and obtained her Registered Nurse Diploma from Mercy Hospital School of Nursing. She elected to join the Sisters of Mercy and went to Omaha, Nebraska. While there, she received a Bachelor of Science Degree in Nursing. However, sisterhood was not meant for her and she returned to Denver. She was employed for approximately five years as a civilian registered nurse. She entered the United States Air Force July 4, 1970, and was assigned to Myrtle Beach Air Force Base, South Carolina. She attended the School of Aerospace Medicine, Flight Nurse Course at Brooks Air Force Base in 1971. In 1972, she returned to the School of Aerospace Medicine where she received education and training as, what was then known as Aerospace Nurse, and later, the title changed to Environmental Health Nurse. Since 1973, she has been assigned to this career field at Hurlburt Field Air Force Base, Florida, George Air Force Base, California, Clark Air Base, Republic of Philippines, Wright-Patterson Air Force Base, Ohio, and Ramstein Air Base, Germany. While at Wright-Patterson, she attended classes conducted by Central Michigan University and obtained a Master of Art Degree in Management and Supervision with emphasis on Health

Care Administration. After graduation from the University of Texas Health Science Center School of Public Health she will be assigned to Kelly Air Force Base as Officer in Charge of the Environmental Health Section.

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This project was typed by Kathleen Gayle