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How to Reduce the Incidence of Premature Births, and Their Associated Costs, Via a Fivefold Corporate Wellness Program

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HOW TO REDUCE THE INCIDENCE OF PREMATURE BIRTHS, AND THEIR ASSOCIATED COSTS, VIA A FIVEFOLD CORPORATE WELLNESS PROGRAM

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An Abstract Presented to the Faculty of the
Graduate School of Lindenwood College
in Partial Fulfillment of the Requirements for the
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Abstract

This thesis will focus on the incidence of premature births and how to reduce the frequency and costs associated with premature delivery. The emphasis is towards the development of a wellness program within a corporation which will accomplish these objectives within its population of female employees.

Research has shown that many of these premature births could be prevented if five major factors were controlled through health education and lifestyle changes. The five risk factors that increase the possibility of delivering prematurely are: lack of exercise prior to pregnancy, alcohol intake, cigarette smoking, increased stress levels, and use of harmful drugs, legal and illegal. These are the risk factors that can be controlled through behavioral changes, and waiting until one is pregnant is sometimes too late.

Due to the ability for a female to plan for pregnancy by using artificial contraceptives and monitoring one's monthly cycle, females may now take a more proactive approach to preparing for pregnancy. Rather than reacting to an emergency situation involving complications in pregnancy, females may use preventative measures to avoid the short-term and long-term effects of a premature birth. Not only do preventative measures help the female, but they help the company as well by decreasing costs associated with premature births.

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Dedicated To:

... all of those parents who have suffered or who are suffering the long-term emotional and physical aftereffects from the birth of a premature infant

... all of those females who have not been fortunate enough to know beforehand the harmful effects of their lifestyles during pregnancy

... all of those corporations, hospitals, researchers, health professionals and nonprofit organizations who have contributed towards healthier preganancies

... all of those corporate wellness pioneers who struggle daily to educate and motivate corporate management as to the benefits of preventative healthcare

... all of those children born prematurely who suffer permanent birth defects as a result of their mothers' unhealthy lifestyle during pregnancy

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I thank the corporation for which I work for having given me the opportunity to affect the lives of many females for the better. Many of these females have never before been given advice about preventative health measures by a professional on-site at work. To see these women smile upon achievement of a specific goal gives meaning to what I do. To see their self-esteem return after years of internal and external abuse to their bodies is rewarding.

I thank all of those co-workers, numbering over 300, who have helped me work towards the development of a wellness program. I thank a Facilities representative who delivered an easel in 24 hours to a cafeteria so we could promote a new multi-site aerobics program. I thank a senior level executive for having the guts to take on the difficult task of recruiting management support to expand the wellness program. I thank a fitness staff co-worker who walked with me weekly on our jogging track listening to my frustrations and successes.

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Chapter I

INTRODUCTION

In recent years, a trend towards cost-cutting, via downsizing and layoffs in the corporate world, has developed. This has been due to factors such as a weak economy, increased global competitiveness, and rising healthcare costs. Companies accustomed to offering extensive benefit programs are now finding that they can no longer afford to give employees the same benefits as given twenty years ago. The expenditures for health claims are decreasing corporate profit-margins to the point that many are barely able to survive in a competitive global market. Because of this trend, companies no longer freely spend dollars on wellness programs without first determining how these programs aid in decreasing their healthcare costs (Corp X).

There are many areas where companies spend millions of dollars to pay for employees' health benefits. A few of these are: cardiovascular disease, cancer, pregnancy, back injuries, psychosis, and substance abuse. Often it is difficult to pinpoint the blame on specific causes of these costs for various reasons:

A. The company may want to avoid lawsuits for diseases or injuries incurred as a result of the employee's specific job and the causes remain unknown.

B. The employee may not be educated to the point where he/she clearly understands the possible causes of health problems, thus being unable to

live a lifestyle that is prevention-oriented versus emergency-oriented.

C. When employees are screened in physical exams, they may not fully disclose all of their health problems, either for fear of retribution that might affect their jobs, or solely out of denial, in that any symptoms of possible health problems are "really not that serious" or "painful" and therefore, not worth mentioning.

D. The company may not keep accurate records or data on healthcare costs due to the associated administrative or computer system costs (Corp X).

Because of these and other inherent difficulties in pinpointing causes for rising healthcare expenditures, some companies are going ahead and developing corporate wellness programs for the employee population in the hope that a combination of health education and revision of lifestyle behaviors will indirectly affect and reduce healthcare costs. Other companies are not in a financial position to be that proactive due to limited funds and budgets from an already low profit-margin. Many companies are hesitant to waste more dollars on existing or new wellness programs that cannot be substantiated financially.

Some healthcare expenditures are difficult to isolate and others are relatively easy. One disease that is difficult to isolate is cardiovascular disease. If one tries to study the causes and effects of this disease, one finds that it is quite complex. As more and more research is conducted, scientists find that cardiovascular disease does not yet have definite origins, either in regards to the timeframe or bodily function, in that it is uncertain at what age this disease begins to develop, with the exception of genetically inherited weaknesses. In

addition, there are many interrelated illnesses such as stroke, myocardial infarction, atherosclerosis, high blood pressure, thrombosis, and mitral valve prolapse that develop from multiple and uncertain factors (McAllister,50).

There are also multiple treatments for this disease that can be followed in isolation or in conjunction with other treatments, and it is uncertain which of all the treatments is most beneficial. Treatments such as surgery nearly guarantee short-term success, but not long-term. Treatments such as moderate exercise are dependent on the individual for adherence. Treatments such as medication may lead the user to believe that they are "OK" and thus able to carry on with their poor lifestyle habits such as high-fat eating and high-stress tasks (McAllister,52).

Yet, one healthcare cost that can easily be tracked for increases and decreases in expenditures is pregnancy. The reasoning is simple. Many of the reasons for above average pregnancy costs are due to short-term lifestyle behavior patterns. There are a few exceptions, yet the most costly pregnancies take place due to behavior that could have been changed prior to the pregnancy. Examples of behavior patterns that lead to premature births or retardation of the fetus are: overuse of alcohol, extensive cigarette smoking, eating disorders, heavy physical activity, and extensive emotional stress. If the female can improve her behavior patterns prior to pregnancy, she is much more likely to have a successful pregnancy at minimal cost to the provider. Even if unhealthy patterns are not corrected until after conception, but during pregnancy, the baby still has a chance for a more successful and less costly medical outcome

(Ernhart,34).

The issue of pregnancy costs is a concern to corporations. Many females continue to experience discrimination in the workforce based on their desire to have children and continue to work. In the 1990's, fewer families have the option of one spouse staying home to raise the children due to the rising cost-of-living in most large cities or metropolitan areas. Therefore, females need to work in order to bring in additional income to pay for housing, schooling, transportation and everyday needs, such as gas, groceries, and clothing.

Yet, employers may see things from a different perspective. If one were to compare the average costs incurred by an employee aged 20-40, the average female costs the company more money than the average male in healthcare dollars. True, the male may later suffer from cardiovascular disease, but that does not take place normally until he is near retirement age, and he may not even be working for the same company by then. So from a financial perspective, the company may have some inherent biases for a young male employee. Still, due to all the legislation, both state and federal, that protects the female worker, the company must avoid discrimination towards the female in the workplace (Corp X). So if the companies are forced to give equal opportunity for employment to both males and females, companies must attempt to reduce expenditures for females in the age bracket of ages 20-40.

The proposed solution is as follows: companies should implement a wellness program, specifically designed to reduce healthcare expenditures for females, especially in the area of pregnancy. One of the highest costs of

pregnancies is that of a premature birth, which will briefly be described.

When a female gives birth, that birth may take place on a normal schedule, i.e. at 9 months, and with the baby weighing a normal weight, i.e. 2500 grams or more. This period of pregnancy prior to birth is defined as the gestation period. Sometimes, the gestation period will be shorter than expected and the baby will be born premature and weighing less than 2500 grams. When a baby is born premature, the costs for that birth rise dramatically due to the extra care needed to help the baby develop normally outside of the mother's body.

The costs associated with premature delivery are much higher than a delivery at term, approximately 37 weeks. The average cost for a normal birth is $2000. The average cost for a premature birth ranges from $40,000 to $1,000,000 (Rhodes,396). These figures may vary according to the company, healthcare providers, duration of stay at hospital for both mother and child, the extent of complications during and after delivery, and any accompanying birth defects to the baby (i.e. incomplete spinal cord growth, organ transplants needed, etc.). Approximately 20% of births take place with either the baby born prematurely or born with abnormalities, and this small percentage costs more than the 80% of females who have normal births altogether (Calhoun,731).

One instance noted, from an anonymous interview with a nurse, is that of a baby born with incomplete growth of the esophagus, connecting the throat to the stomach. That baby spent over 9 months in the hospital until it could be released safely to go home with its mother. The average cost per day for a premature birth is $2000 per day. It is estimated that this particular baby cost the company a

minimum of over $540,000 via their health benefits (Anonymous).

When a baby born prematurely or with birth defects is placed in an intensive care unit in the hospital, the costs associated with the care of the baby in that unit are high. A healthy baby only requires minimal care such as feeding, bathing and warmth. A baby born prematurely may need extra physical attention from nurses and additional equipment, such as a respirator. Since most premature babies lack fully developed lungs, they must be on respirators, which are very expensive, in addition to feeding tubes and other machinery.

The average cost per day for the baby varies depending upon the baby's condition upon birth. The average cost per day in the hospital for the mother varies according to her condition post-pregnancy as well.

One example of the high costs of premature births is that of CORP-X. According to a report from their corporate benefits department, CORP-X spent approximately 8 million dollars in 1992 on pregnancies within the company to both employees and employees' spouses. Over half of that amount was spent for premature births, totalling approximately $5 million. The company's average cost of the normal pregnancy was only $350, whereas the average cost for a premature birth was $7500, or twenty times the cost of the normal birth.

Though significant, these figures are questionable as to their accuracy. In comparison to other estimated costs from hospitals in the same surrounding metro area geographically, these figures are below normal (St.John's). These figures were possibly generated from a partial report covering only portions of the pregnancy costs and not including other costs. It is not certain which of the

following made up the report: hospital charges, delivery charges, doctor's fees, the child's costs, the mother's costs, etc.(Corp X). In addition other non-medical costs to Corp X were definitely not included such as temporary employment wages, EAP usage, decreased productivity during employee's absence, and others.

This company offers pre-natal care through their insurance companies via the employee's benefit program. The pre-natal care that is offered is often underutilized, not followed, or is simply not thorough enough to induce a behavioral change in the female during pregnancy (Corp X).

The costs of pregnancy, such as maternity leave and hospital charges, could be dramatically decreased with a quality wellness program that educates females prior to pregnancy on topics associated with having a healthy pregnancy and delivery for both the mother and child. If females only receive pre-natal care during the pregnancy, stunted growth or defects may have already occurred to the fetus in the first trimester, especially for those who drink alcohol in large doses or smoke cigarettes more than a pack per day. Whereas if females could begin to lead healthier lifestyles prior to pregnancy, they would be more likely to have a successful outcome from their pregnancy. One example is that of a female from Corp X who had to take maternity leave three months prior to delivery due to extremely high blood pressure experienced during pregnancy. Although her doctor attempted to give her various medications, without harming the fetus, her blood pressure continued to remain dangerously high and she was forced to take bed rest, rather than continue to work (Corp X).

Prior to the review of recent research, the physiology of pregnancy will

be explained to help the reader clearly understand the later documentation. Two areas to be covered are the changes occurring in the mother's body and the associated physiological changes in the child that occur during pregnancy. Prior to pregnancy, the female is normally not prepared either emotionally or physically for such transformations to take place. One of the physical changes that occurs is that of the female's posture due to extra abdominal weight gain.

Illustration 1

POSTURE OF THE MOTHER: BEFORE, DURING AND AFTER PREGNANCY

PRE-PREGNANCY AT 8 MONTHS POST-PREGNANCY

In the illustration above are the external changes in posture and weight that can be seen by the human eye in the cycle of pregnancy. Stick figures are used to accentuate and simplify the main changes in the body.

As shown in the illustration, the average female's posture worsens during pregnancy and often continues in her poor posture afterwards. She normally gains weight during pregnancy, and often her weight post-pregnancy is higher than pre-pregnancy. This extra weight, in combination with a change in pelvic positioning and posture, places additional strain on the lower back predisposing the female to low-back injuries in the future. As the child ages, the mother will be bending over many times each day to pick up the child from either the floor or bed, and this lifting of the child, as he/she weighs more, will further stress the low-back area. The female's gain in weight definitely puts additional strain on her body physically (Obstetric,195).

During pregnancy the female goes through many emotional mood swings, often based upon hormonal changes taking place internally in her body. The body must adapt to support another life feeding off of her system, thereby other bodily functions may suffer. As she gets heavier and bigger, if married or has a relationship with someone, she will find it difficult, if not impossible to have normal sex with her partner. This will be a source of frustration for both parties involved as well. Mentally she may wonder whether this is the right thing to do, knowing full well she can get an abortion if she does not want to go through with the procedure. For those unexpected pregnancies, this issue may be a source of arguments and concern for both partners (Olkin,12).

The female usually goes through a period during her first three months of pregnancy when she experiences morning sickness. For some females it is a nightmare, for others, they may experience very little side-effects. Symptoms of

this are nausea, vomiting, dizziness, weakness, etc. which take place often at the most unexpected moments. If the female is working this may be a source of embarrassment and fatigue while at her worksite. If she is a white collar employee, she may have to excuse herself from a meeting unexpectedly. If she is a blue-collar employee, she may be unable to stand and operate machinery due to the dizziness experienced during work.

The female may also be forced to restrict her normal range of activities for protection of the fetus. This may interfere with her previous exercise or work patterns. She is thus forced to change her lifestyle habits whether she likes it or not. She may be accustomed to sleeping until 7am, and she finds herself waking up at 5am a few times per week feeling sick and unable to sleep. She may be used to running 10 miles per week, and she is told to only walk 3 miles per week.

Besides the female changes that take place, it is important to note the anatomical changes that take place to the fetus as it grows inside the mother's body. A simplified growth chart (Table 1) is shown below. In the development of the brain, the organs, and the bone structure, much growth occurs in very brief time periods within the pregnancy.

Table 1

THE DEVELOPMENT OF THE FETUS

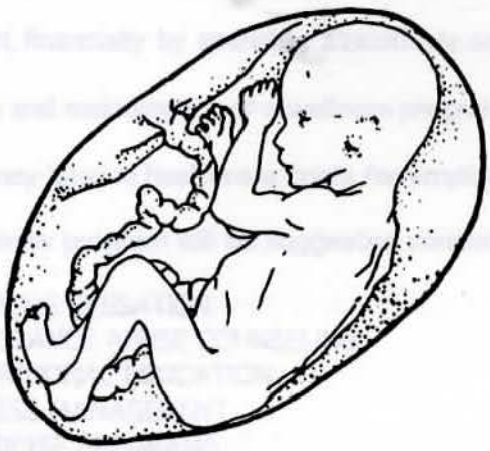
Age	Length	Weight	Development
4 WEEKS	4 MM	0.4 G	HEART & BRAIN DEVELOPMENT MOST ORGANS DEVELOPING
8 WEEKS	3 CM	2 G	EYES, EARS, NOSE, MOUTH, FINGERS, TOES
12 WEEKS	11 CM	19 G	BRAIN CONFIGURATION COMPLETE SKIN
16 WEEKS	19 CM	100 G	SCALP HAIR, EXTERNAL SEX ORGANS, KIDNEYS & HEART MOSTLY FORMED
20 WEEKS	22 CM	300 G	LOWER BODY INCREASES IN LENGTH
24 WEEKS	32 CM	600 G	BONE & SKIN DEVELOPMENT
28 WEEKS	36 CM	1100 G	LUNG DEVELOPMENT
32 WEEKS	41 CM	1800 G	OSSIFICATION OF BONES PRESENT
36 WEEKS	47 CM	2200 G	HAIR DEVELOPING, WEIGHT INCREASES
40 WEEKS	52 CM	3200+ G	FULLY DEVELOPED FOR BIRTH

SOURCE: Obstetric & Gynecologic Diagnosis & Treatment. Ed. Pernoll, Martin L., MD. 7th ed. East Norwalk: Appleton & Lange, 1991.

With the advent of ultrasound, many mothers can view their baby's growth on a television screen, thus educating them about their pregnancy. In Diagram 2, one can see how the fetus grows and survives in the abdomen.

Illustration 2

The Fetus In Utero



SOURCE: Harrison, H. The Premature Baby Book. New York: St. Martin's Press, 1983.

Anatomically, the fetus is attached to the mother via an umbilical cord, which is the fetus' main source of nutrition and food used for growth. If this cord is damaged or improper substances are fed through this cord to the fetus, the fetus could experience abnormal growth patterns or lack of growth. This is why excessive alcohol, illegal drugs, some medications and poor diet patterns often contribute to abnormal births involving low-birthweight and early delivery. In addition, if the uterus, the organ where the fetus is growing, is damaged by either external collision or internal disease, the fetus may not survive or may survive abnormally in a retarded or disabled condition (Himes).

In summary, the purpose of this thesis is to attempt to substantiate, with research and other statistical data, the need for a fivefold wellness program in a corporation, for the purpose of reducing the incidence of premature births and their associated costs to the company. An attempt will be made to demonstrate how a company can benefit financially by spending a relatively small amount of money on the implementation and maintenance of a wellness program so as to save much larger amounts of money later in healthcare costs for employees.

A fivefold wellness program will be suggested consisting of:

1. SMOKING CESSATION
2. SUBSTANCE ABUSE COUNSELING
3. NUTRITIONAL EDUCATION
4. STRESS MANAGEMENT
5. EXERCISE PROGRAMS

It is the author's contention that it is necessary to implement, not one or two, but all five parts of this program in order for it to be effective. As stated by McAllister, "on-site staff assistance in the areas of stress management, nutrition, exercise, smoking cessation, and substance abuse" should be provided for the program to be successful (60). Research will be presented to document the advantages of covering all five areas so as to reduce the possibility of premature births to female employees. After the review of research, a proposal will be delineated, describing the methodology desired to implement the suggested program. Because most corporations do not target the prevention of premature births in this manner at present, the incidence of premature births has not decreased dramatically despite advances in modern medicine utilizing medications

and machinery (Iams,266). It is hoped that the information presented in this study will provide impetus for companies to invest more in the well-being of their female employees in a preventative manner.

Endnote>

[A specific corporation, named CORP-X for the purpose of retaining anonymity, will be used as an example, whereby cost-reductions in healthcare costs would benefit the company both publicly and internally. All associated departments and employee names will be altered, in addition to the corporation's product, history, and geographical location to protect confidentiality. Data from the corporation pertaining to healthcare expenditures will be accurate, based upon existing reports, with the exact numbers being approximated. It is hoped that this thesis will provide preliminary evidence to support the implementation of a premature birth prevention program at CORP-X and at many other companies in need of such a program as well.]

Chapter II

Literature Review

Five types of research will be reviewed for the purpose of learning more about various contributing and preventative factors to premature delivery during pregnancy. Those five areas to be covered, and in the order listed, are: stress, nutrition, exercise, smoking and substance abuse. There exist other possible causes of premature births, but these five areas are known to have the greatest effect on pregnancy outcome.

Stress

First is the subject of stress. As a noun, stress is defined as "a mentally or emotionally disruptive or disquieting influence" (Stress 1205). As a verb, stress is defined as "to subject to pressure or strain" (Stress 1205). In recent years more research has been conducted to correlate physical illnesses and mental stressors. Medicine has become more mind/body-oriented, such that doctors and researchers are increasing their awareness that many illnesses are caused or made worse by one's mental state. Stress is seen as a factor that weakens one's mental state and contributes to many illnesses such as cardiovascular disease and cancer.

Stress can also be a causal factor in premature births. In a recent study by Wadhwa, 90 mothers were given questionnaires regarding prenatal stress and pregnancy-related anxiety. The women in the study were "older, white, educated, upper-middle class, multiparous women" with "a low incidence of smoking,

alcohol, and substance abuse" (Wadhwa 863). Without these three factors, it was easier to isolate stress as a causal factor in preterm births. Some of the items tested on the anxiety scale were:

1. I feel well informed about the labor and delivery of my baby.
2. I am confident with my doctor and other healthcare workers.
3. I have a lot of fear regarding the health of my baby.
4. I think my labor and delivery will go normally.
5. This pregnancy has caused me to be financially insecure (861)

The results of the study showed that "women who reported higher levels of prenatal pregnancy-related anxiety were more likely to be delivered of an infant of shorter gestational age and more likely to deliver a pre-term infant" (862). Because the study used females who were financially affluent, the results might have been underestimated, presuming that those who were less affluent and under more financial stress during pregnancy might have suffered even more than those in this study. Physiological responses to stress have been well documented in other literature and it has been shown that when under duress, the autonomic nervous system does not function properly. When the mother's nervous system is affected, so is the child's nervous system affected such that perhaps some of the retardation and lowered immunity to infection might be directly related to stress itself (864).

Other sources have documented stress as a factor in preterm births as well. In the 1991 edition of one medical text it is stated, "There is also evidence that the mother's emotional state during pregnancy may have a direct effect on fetal outcome" (Pernoll 188).

Additionally, Olkin lists several types of stress experienced during the three trimesters of pregnancy. They are listed as follows:

The First Trimester
- a sense of estrangement or detachment
- mood swings ranging from joy to sadness
- decreased sexual interest
- ambivalence about the pregnancy
- beginning change in body image

The Second Trimester
- a sense of enhanced well-being
- heightened body awareness
- heightened sexual awareness
- awareness that you cannot control your body's changes
- introversion over future mothering role
- heightened anxieties and/or phobias

The Third Trimester
- physical discomfort
- changes in sexuality
- mental expectation about life with a new baby
- increased anxiety over the unknown future
- decreased self-esteem if the woman stops working
- fear of losing control
- a distorted body image
- conflicts caused by shifts from dependence to independence (Olkin 13)

As the pregnancy continues, the mother becomes more aware of the current and future changes she encounters due to a new responsibility of a child. So as stress builds throughout the pregnancy, she needs education and support to learn how to deal with these changes.

According to the National Institute of Health and Medical Research in France, the risk of premature birth increases greatly when the female is under stress during the pregnancy. A study was conducted consisting of 1500 women of varied socioeconomic levels. 1375 delivered at term and 125 delivered

prematurely. Each female was asked 40 questions through a self-administered questionnaire and given a PPAT, Pregnancy Psychologic Attitudes Test, with scores ranging from 0-6. The questionnaire was given to each female during a prenatal visit to the doctor between their fifth and sixth months of pregnancy. It was found that the risk of premature birth increased 50% for every one point increase in the score. Thus this questionnaire had good predictive validity in determining which female would deliver prematurely based upon psychological stressors experienced during pregnancy (Mamelle 995).

Finally, another study assessed a woman's attitude in relationship to preterm labor (PTL). A questionnaire of 67 questions in six different areas was given to 434 women; 389 delivered at term and 45, or 10.4%, delivered prematurely. This study replicated prior research studies showing that the desirability and acceptance of the pregnancy were important psychological factors in predicting whether a premature delivery would occur. The resulting hypothesis from this research is that the female is more predisposed to PTL when a negative emotional relationship exists between the mother and fetus (De Muylder 429).

In determining that psychological stress affects the outcome of pregnancy, it is recommended that females preparing for pregnancy and currently pregnant receive psychological counseling. Educating the female on how stress affects one's pregnancy may assist the female in being more attentive to both internal and external factors affecting her mental state. Providing her with emotional support will encourage her to take care of herself mentally and physically so as to create

a positive environment during pregnancy.

Nutrition

Research has been conducted in the areas of diabetes, phenylketonuria (PKU), weight-gain, caffeine, and nutritional needs and how these relate to pregnancy outcomes.

There are two main types of diabetes: the diabetes that the mother has prior to pregnancy and the diabetes that is brought on by pregnancy. Preexisting diabetes does increase the risk of delivering a baby pre-term. Diabetic mothers are more susceptible to high blood pressure during pregnancy and are more likely to deliver babies with congenital defects. Due to fluctuating insulin levels in the uterus and through the placenta, the baby's ability to produce surfactant decreases and the baby is more susceptible to respiratory distress syndrome (RDS) a common occurrence in premature babies (Harrison 60). Diabetes that is brought on by pregnancy normally disappears post-delivery, but the mother should be counseled on additional nutritional requirements during the pregnancy.

The condition of PKU is best alleviated through pre-conceptional nutritional counseling. When a female has PKU her blood phenylalanine levels tend to be greater than 20 mg/dl during pregnancy. When this happens, the fetus is more susceptible to congenital heart defects and mental retardation, and there is an increased chance for intrauterine growth retardation, which leads to premature births. If the female is restricted in her phenylalanine intake within her diet prior to conception, the fetus will more likely experience a normal growth pattern. If dietary restriction does not occur until post-conception, the

fetus has little to no chance of being protected from growth defects (Guidelines 51).

In 1991 the American College of Obstetricians and Gynecologists, ACOG, suggested that an appropriate gain in weight during pregnancy would be 22-27 pounds, with overweight women gaining less and underweight women gaining more (Pernoll 173). In 1990 the Institute of Medicine suggested that women gain 25-35 pounds during pregnancy (Lederman 154). In 1987 Olkin stated that 21-30 pounds weight gain was desirable. Based upon these suggestions, it is recommended that females gain 25-30 pounds during pregnancy. If the female gains less than 20 pounds her chance for a premature birth increases. If the female gains more than 35 pounds, her baby will be more obese and it has been theorized that the infant will have more problems with obesity later in life (Lederman 153).

The amount of weight gained prior to pregnancy has been shown to be related to the age at which the female becomes pregnant for the first time. In one study it was determined that females giving birth for the first time after age 35 were 6.4 pounds heavier than before pregnancy, one year post-pregnancy (Lederman 153). The fear of gaining weight during pregnancy and not being able to lose that extra weight after pregnancy is a real concern to many mothers. If females were encouraged to exercise during and post-pregnancy, their chances of permanent weight-gain would be decreased. This fear among females relates back to the previous discussion on pre-natal stress and its association with premature births.

Fear of weight gain may be alleviated by educating the mother about the reasons for that weight gain. In Table 3, ACOG gives a breakdown of normal weight gain based upon a gain of 10,000 g or 10kg.

Table 3

Pregnancy Weight Gain Breakdown

fetus>	3500 g
placenta, amniotic fluid, uterus>	650-900 g
interstitial fluid>	1200-1800 g
blood volume>	1200-1800 g
breast enlargement>	400 g
maternal fat>	1640+ g

SOURCE: Pernoll, Martin L., MD. Obstetric & Gynecologic Diagnosis & Treatment. 7th ed. East Norwalk: Appleton & Lange, 1991. 192.

Recent research indicates that high amounts of caffeine, as with alcohol, lead to an increased chance of miscarriage. A study, conducted at the Montreal University-affiliated Sainte-Justine Hospital, demonstrated that two cups of coffee or five cups of tea or four cans of cola doubled the mother's chances of miscarrying; three to four cups of coffee tripled her risk of miscarrying (Of Caffeine, 1). It is hypothesized that since caffeine raises the mother's heart rate, it raises the heart rate of the fetus even more so due to the transference of caffeine through the umbilical cord at a greater percentage than through the mother's body. This increase in caffeine to the fetus may contribute to an earlier

than expected delivery with more complications.

Lastly, nutritional recommendations must be made to the mother so as to provide the proper nutrients to her child when in utero. The American College of Obstetricians and Gynecologists lists the following supplemental nutritional requirements as follows:

> Protein: in the last half of pregnancy, 80 g/d (grams per day)
> Calcium: in later months and during lactation, 1.5 g/d
> Iron: 30-60 mg/d
> Vitamins & Minerals, namely Folic Acid: in last half of pregnancy, 1 mg/d (Pernoll 193)

ACOG also states that for "the average woman weighing 127 pounds, there would be a normal dietary intake of 2300 kcal/d. An additional 300 kcal/d is needed during pregnancy and an additional 500 kcal/d during breast-feeding" (Pernoll 192).

Aikey-Keller also gives additional suggestions in her text titled Preconception. In addition to the above-stated requirements, other vitamins are important as well. Vitamins A and D aid in the fetus' formation of healthy and strong teeth, bones, vertebrae, and skull. The B vitamins help prevent maternal anemia, increase fetal growth, and decrease nervousness in the mother, thus decreasing stress levels which might lead to preterm delivery. Vitamin C helps decrease the chances of the mother experiencing bleeding gums and helps strengthen the walls of the blood vessels and the placenta, aiding in the prevention of a premature rupture of the placenta or the transmission of infectious bacteria through the placenta (Aikey-Keller 23,24).

It is important that these nutritional needs be met so as to aid in the development of the fetus' metabolic pathways. In addition the mother should drink plenty of fluids, especially water, while pregnant since the female is more susceptible to dehydration while pregnant. To avoid any possibility of getting an infection through an impure water source, bottled water is preferable to tap water. Any infection contracted by the mother may be passed on to the fetus, thus increasing the chance for premature delivery due to an internal infection that contributes to discomfort within the uterus. Lastly, malnutrition often leads to underdevelopment of the fetus. If the child is born underweight, he/she is more likely to be delivered with complications, requiring more initial medical assistance via staffing and machinery (Harrison 54).

Exercise

It has been well-documented that prolonged standing during work activity increases the chances of premature birth (Iams 266). Although corporations attempt to set up guidelines for pregnant working mothers, each female has a different capacity for work strain and should be treated individually according to symptoms experienced such as dizziness, high blood pressure, and others (Pernoll 196). A main cause for concern by corporations should be the female's exposure to teratogenic substances and chemicals at work that can lead to birth defects and premature delivery. The female should be relocated to another area temporarily or permanently to avoid damage to the fetus during pregnancy.

Recent research studies are showing that exercise during pregnancy is not harmful to the fetus, but rather contributes to a healthier delivery. According to

a study conducted by Maureen Hatch at the Columbia University School of Public Health in New York City, babies born to exercising females weighed more than babies born to non-exercisers. It is believed that "while blood flow to the fetus decreases during exercise, afterwards more nutrients and oxygen are pumped to the baby, which may account for the larger birth weights....those women who burned over 2,000 calories a week had babies about ten ounces heavier" (Young 42).

According to comments made by mothers from a local hospital it was found that "women who have remained active during pregnancy state that exercise helps their body to deal with the changes of pregnancy by":

1. promoting good posture
2. minimizing low back pain
3. thwarting excessive weight gain
4. ameliorating gestational diabetes
5. improving mood swings. (Himes)

Exercise was also found to have an effect on gestational diabetes. One research study demonstrated how exercise, rather than insulin, could be used as a means to facilitate the use of glucose uptake and thus avoid possible insulin therapy complications. (Remember, gestational diabetes is one of the risk factors for premature delivery and complications.) No adverse effects were found with the mothers or fetuses who were put through an exercise program of cycling or walking, despite the onset of gestational diabetes (Artal 1466).

The study compared treadmill exercise versus bicycle ergometer exercise and found the bicycle to be preferable for two reasons. First, there was a

"preferential carbohydrate use over lipids during non-weight-bearing mild exercise in comparison with weight-bearing mild exercise in pregnancy" (Artal 1468). This is in agreement with past research which states that weight-bearing exercise burns more fat. But since the objective with gestational diabetes is not to burn fat, but rather to facilitate glucose uptake, non-weight-bearing would be preferable. Second, fewer risks of injury were associated with non-weight-bearing exercise due to the increased laxity in joints and ligaments that occurs during pregnancy. The purpose of increased laxity is to allow the hip/pelvic joints to accommodate the birth of the baby through the birth canal via an increased opening and spread of the associated joints and ligaments. Yet this laxity also occurs in other joints thus predisposing the female to injury (Himes).

Another study demonstrated clear benefits to pregnant females who exercised during pregnancy. 87 women participated in the study. The females exercised regularly for at least six months prior to conception. Their modes of exercise were running and aerobics both prior to pregnancy and for the entire duration of pregnancy. They were compared to a control group of females who exercised prior to pregnancy as well, but stopped after the first trimester.

> The exercisers had a lower incidence of abdominal (6% vs 30%) and vaginal operative (6% vs 20%) delivery than the control group
> Active labor was shorter (264 vs 382 min) or 4.4 hrs vs 6.4 hrs in those who delivered vaginally
> Acute fetal stress was less frequent in exercise group (50% vs 26%)
> Exercisers had infants with lower birth weight (3369 vs 3776 gm)
> Preterm labor was similar in both groups (Clapp 1799).

This refutes past theories that exercise contributes to preterm labor. Rather, exercise during pregnancy resulted in a less stressful delivery for both the mother and child. The lower birth weight was primarily a difference in fetal fat mass. This was due to the fact that most of in utero fat deposition occurs after the thirty-fourth week; so while the females were exercising throughout their third trimester, this exercise decreased the amount of fat accumulation inside the uterus within the fetus (Clapp 1803).

In contrast, those in the study that stopped exercise after the first trimester had a large decrease in cardiovascular capacity whereby their "performance fell to 2% to 5% of preconceptional levels by the end of the fifth lunar month" (Clapp 1801). They also experienced "a weight gain in excess of 18 kg which was associated with a significant increase in the incidence of both protractive disorders and operative delivery," which are more painful to the mother and more costly to the provider (Clapp 1802).

Table 3

Exercise and Pregnancy Outcomes

Table I. Maternal exercise performance

	Control (N = 44)	*Exercise (N = 87)*	*Significance*
Duration-intensity index before pregnancy	9840 ± 303	15,070 ± 332	0.01
During pregnancy* (%)	14 ± 17	68 ± 16	0.01
Last half of pregnancy* (%)	5 ± 10	65 ± 17	0.01
9-10 mo of pregnancy* (%)	2 ± 5	60 ± 18	0.01

Values are mean ± SD.
*Percent of prepregnancy value.

Table II. Onset of labor

	Control (N = 44)	*Exercise (N = 87)*	*Significance*
Preterm (<day 263)	9% (n = 4)	8% (n = 7)	NS
Term (mean ± SD)	282 ± 6	277 ± 6	0.01
PROM at term	29% (n = 13)	30% (n = 26)	NS
Induction of labor	13% (n = 6)	13% (n = 11)	NS

Actual number of cases is shown in parentheses. *PROM*, Premature rupture of membranes.

Table III. Labor management

Parameter	*Control (N = 44)*	*Exercise (N = 87)*	*Significance*
Artificial rupture of membranes	50% (n = 22)	23% (n = 20)	0.01
Stimulation for abnormal labor pattern	20% (n = 9)	13% (n = 11)	0.01
Second stage arrest	14% (n = 6)	2% (n = 2)	0.01
Epidural anesthetic used	50% (n = 22)	28% (n = 24)	0.01
Method of delivery			
Spontaneous	50% (n = 22)	88% (n = 77)	0.01
Forceps	20% (n = 9)	6% (n = 5)	0.01
Cesarean section	30% (n = 13)	6% (n = 5)	0.01

Actual number of cases is shown in parentheses.

Table IV. Management—Vaginal deliveries only

Parameter	*Control (N = 31)*	*Exercise (N = 82)*	*Significance*
Active labor (min) (mean ± SD)	382 ± 275	264 ± 149	0.01
Active first stage (min) (mean ± SD)	302 ± 191	223 ± 134	0.01
Parous	52% (n = 16)	53% (n = 43)	NS
Forceps use	29% (n = 9)	6% (n = 5)	0.01
Episiotomy done	81% (n = 25)	46% (n = 38)	0.01
Epidural anesthetic use	41% (n = 13)	29% (n = 24)	0.01
Abnormal labor pattern	35% (n = 11)	20% (n = 16)	0.01

Actual number of cases is shown in parentheses. *Active labor*, 4 cm dilatation to delivery.
Active first stage, 4 to 10 cm dilatation.

Table V. Fetal condition and outcome

Parameter	*Control (N = 44)*	*Exercise (N = 87)*	*Significance*
Meconium in fluid	25% (n = 11)	14% (n = 12)	0.01
Abnormal heart rate*	25% (n = 11)	14% (n = 12)	0.01
Nuchal cord	55% (n = 24)	26% (n = 23)	0.01
1 min Apgar score <7	25% (n = 11)	14% (n = 12)	0.01
Birth weight (gm) (mean ± SD)	3776 ± 401	3369 ± 318	0.01

Actual number of cases is shown in parentheses.
*Fetal heart rate pattern resulting in physician action.

Source: Clapp, J.F. III, MD. "The Course of Labor After Endurance Exercise During Pregnancy." American Journal of Obstetrics & Gynecology 163 (1990): 1799-1805.

In Table I the exercise group had higher scores than the control group before and during pregnancy. These exercisers had higher intensity levels and more endurance in exercise than the control group, especially in the last few months of pregnancy. This is significant in that exercising in the last few months aids in the prevention of higher than normal body fat percentages for the newborn babies. In Table II there is no statistical difference between both groups as to date of delivery. This shows that cardiovascular exercise does not contribute to premature births. In Tables III and IV less complications occurred during labor and the delivery required less assistance by either forceps or cesarean section. This is significant for Corp X in that females should be able to return to work earlier with fewer days in the hospital and fewer days of maternity leave, as the incidence of premature births decreases. Table V shows fewer abnormalities in the neonate at birth, especially in Nuchal Cord incidence. The term Nuchal Cord refers to problems related to the umbilical cord at birth. Usually it refers to the baby being born with the umbilical cord around the neck, but it also may refer to a knot or obstruction or any other problem with the cord itself which prohibits the baby from functioning normally, leading to malnutrition during development or difficulty in receiving oxygen.

Another study by Clapp and Capeless in 1990 measuring the effects of exercise on pregnant females found that "exercise in late pregnancy and running had the most significant quantitative effects" (Clapp & Capeless 1809). This study monitored "42 recreational runners and 35 aerobic dancers who exercised for at least 30 minutes, three or more times each week before conception and

who were delivered at term (>266 days and <294 days) after continuing their chosen form of exercise at or above 50% of the preconceptional level throughout pregnancy" (Clapp & Capeless 1806). Their diets were monitored to be certain that there were no major changes and they did not smoke or drink alcohol during pregnancy. Post-delivery "all infants left the hospital within 72 hours of birth" (Clapp & Capeless 1808). This is a definite advantage to the providers of health care who would be charged less for fewer days spent in the hospital due to few or no complications in birth.

Smoking

Smoking has long been a controversial issue to pregnant females. Many females continue to smoke throughout their pregnancy due to past preconceptions and experiences. One of the justifications used is that if their mothers smoked during pregnancy and they are fine, there is no reason for them to stop smoking for their children. However much research has been conducted over the years that clearly demonstrates that smoking has a harmful effect on the fetus (Aikey-Keller 31).

Smoking has several effects on the body. By inhaling the smoke into one's lungs, lung damage occurs over time and the person increases his/her chances for obtaining lung cancer. Smoking also artificially increases one's metabolism, which is why many smokers stay thin, yet when they stop smoking they gain weight. Weight gain occurs because the body's metabolism is no longer functioning independently of all chemicals, and without the nicotine, the metabolism slows. Additionally, smoking affects the baby in utero in that the

nicotine that the mother absorbs into her system is also absorbed into the baby's developing body through the placenta (Aikey-Keller 31).

> The nicotine in cigarettes produces spasms in the arteries which may cause miscarriage, stillbirth or low birth weight. Also smoking during pregnancy has been linked to premature births as well as impaired memory and learning disabilities in children. Studies also show that smoking while pregnant can lead to SIDS (Sudden Infant Death Syndrome), a condition in which an infant will suddenly stop breathing in its sleep, and possibly die (Having a Healthy Baby).

According to a joint study from the National Center for Health Statistics and the Centers for Disease Control and Prevention "mothers who smoked during and after pregnancy more than tripled the risk of their child's dying from SIDS" (Young).

When trying to conceive, it takes longer for conception to occur if the female continues to smoke. Both fertilization and implementation of the egg along the lining of the uterus becomes more difficult. Additionally while pregnant, smoking causes hypoxia, or a decrease in the oxygen going to the placenta and uterus. This contributes to fetal growth retardation, affecting the weight and length of the fetus while it is growing inside the mother's abdomen. Some researchers believe that the nicotine in cigarettes affects sperm quality, although this has not been proven repeatedly in studies (Aikey-Keller 32).

There are two occurrences, which require a premature birth to save the mother and child, that are more likely to take place during pregnancy when the mother smokes: placenta previa and placenta abruptio. "Placenta previa refers to a placenta that implants low in the uterus, partially or entirely covering the

opening to the birth canal. In the second half of pregnancy, as changes occur in the lower uterus, part of the placenta may dislodge" (Harrison 19). Premature delivery may be induced if the bleeding is excessive from this event. "Placenta abruptio refers to the detachment of a normally positioned placenta. If the edges of the placenta detach, painless vaginal bleeding (apparent hemorrhage) follows" (Harrison 19). This event also occurs more frequently in women who have kidney disease, diabetes, high blood pressure or suffer from malnutrition.

Smoking also retards intrauterine growth.

> Nicotine, cyanide, and other ingredients found in cigarette smoke may be directly toxic to the fetus. Carbon monoxide from cigarette smoke displaces oxygen circulating in the mother's and baby's bloodstream. Chronic oxygen deprivation may result. Smoking may have an adverse effect on protein and carbohydrate metabolism, and it may also cause vitamin B and C deficiencies in both mother and fetus (Harrison 54).

Yet with all these potential harmful effects widely known, mothers still continue to smoke during pregnancy.

There exists a strong disincentive to quit smoking: weight gain. According to one study, females who stopped smoking in the first trimester gained an average of five pounds more than both the non-smokers and the persistent smokers. "The additional weight gain of those who stopped smoking may reflect upward readjustment of plasma volume, which has been shown to be lower in smokers. The normalization of plasma volume would contribute to the improved fetal growth observed when women who previously smoked ceased smoking early in pregnancy" (Lederman 152).

The main factor in smoking cessation during pregnancy is the support

provided to the mother. The study found that although 15% quit smoking without encouragement, an additional 25% would quit if they were provided support with a program designed to minimize weight gain (Lederman 152). This is where exercise could help the female. At Corp X four females who worked in the same department and became pregnant at approximately the same time, quit smoking during pregnancy. After pregnancy, one of the females immediately began exercising two to four times per week for 30-60 minutes each session and maintained her immediate post-pregnancy weight, which was approximately 5 lbs more than before the pregnancy. The other three female employees did not exercise and they all gained 10-40 pounds post-pregnancy. Currently, two of the three overweight females are considering smoking again so as to lose the weight they had gained post-pregnancy (Corp X).

Substance Abuse

The fifth aspect of the fivefold wellness program which affects pregnancy outcome is that of substance abuse involving alcohol, illegal drugs, prescription medications and over-the-counter medications. Unless they are absolutely essential, all types of medication should not be taken by the pregnant female (Pernoll 193). There are a few medications and their potential side affects that should be noted.

According to a reputable pharmacy, there are four types of medications that should be avoided. Certain tranquilizers, such as Librium and Valium, should be avoided during the last weeks in pregnancy because they may lead to a slowed heart rate and difficult breathing in the child, and a premature delivery may need

to be induced to aid the child. Accutane, a drug taken for acne, has been documented to cause birth defects in the unborn. Any painkillers taken in the last three months of pregnancy that contain salicylate, such as aspirin, can prolong pregnancy and lead to excessive bleeding before and after delivery (Having a Healthy Baby).

Additionally, many females use the Pill, or estrogens and progestins in combination as a contraceptive, in order to prevent pregnancy. Oral contraceptives leave estrogen and progestin in the body even after they are no longer being taken by the female. It is recommended that one stops using oral contraceptives one to three months prior to conception so as to avoid birth defects acquired during pregnancy (Aikey-Keller 187).

Babies born addicted to illegal drugs often suffer permanent damage both to their brains and externally in the form of facial abnormalities. Babies that are born to cocaine-abusing mothers often require longer hospital stays to rehabilitate from the addiction (Calhoun 731). "Forty percent of the infants were born prematurely" in a study which observed facial abnormalities of cocaine-exposed infants (Fries 413). "Cocaine is a vasoconstricting drug" that decreases the flow of blood through the vessels (Aikey-Keller 30). For a pregnant woman, that means the uterus and placenta do not receive an adequate blood flow. The baby is not being properly nourished by the placenta, and its growth is stunted. The baby is smaller than normal and may be intolerant of labor" (Aikey-Keller 31). Babies "born to heroin addicts weigh less than 2500 grams as a result of prematurity, poor growth in the womb, or both" (Harrison

24). It is recommended that the pregnant female avoid all stimulants and depressants due to the harmful and unnatural effects that can occur to the unborn (Olkin 38).

Alcohol consumption, while pregnant, is not safe in any amount. When a mother drinks heavily during pregnancy she assumes the risk of the baby being born with a disease called Fetal Alcohol Syndrome, or FAS. Babies diagnosed with FAS often have craniofacial abnormalities and learning disabilities, and they are often born underweight (Fetal Alcohol Syndrome). According to the National Centers for Disease Control and Prevention, "recorded cases of fetal alcohol syndrome caused by women drinking during pregnancy more than tripled between 1979 and 1992, but actual cases may be ten times higher" (Fetal Alcohol Study). One of the probable explanations as to why the numbers may be ten times higher is that often an accurate health history is not kept on file for each patient, nor are the patient's activities outside the office monitored by a physician frequently. The patient may feel hesitant to reveal an alcohol addiction due to feelings of guilt or shame. In addition, the patient may not disclose the quantity of alcohol consumed out of ignorance as to the effects of alcohol on the developing fetus (Corp X).

From a physiological perspective, alcohol intake by the mother affects the mother and fetus differently. Although alcohol will generally leave the mother's system at a rate of 1 to 1&1/2 hours per drink, it may take 8-12 hours for the same amount of alcohol to leave the system of the fetus. It only takes ten minutes for alcohol ingested by the mother to pass through the placenta into the fetus.

Once the alcohol is in the system of the fetus, damage occurs, especially to the fetus' brain. The most critical period of brain development is the first trimester, yet the brain grows in mass during the third trimester (Ernhart 34). Within the first trimester, the first few weeks after conception are the most critical. If the female continues to drink and does not realize that she is pregnant, permanent damage to the brain may occur, depending on the quantity consumed.

No definitive amount of alcohol intake has been determined through research as of yet. In one study an attempt was made to establish limits or degrees of safety, but an exact amount could not be determined (Ernhart 33). In this study, 359 neonates from disadvantaged, urban women were studied. Abnormalities were observed in a clear dose-response manner. It was discovered that "the consumption of more than three ounces of absolute alcohol per day, that is, six cans of beer, glasses of wine, or mixed drinks per day, at or about the time of conception greatly increases the risk for alcohol teratogenicity" (Ernhart 38,39) During the first 2-8 weeks post-conception, embryogenesis, or the formation of the fundamental parts of the embryo occurs. In addition, positive effects were seen when the mothers became abstinent before the third trimester. This occurred because intrauterine growth retardation was prevented, and with a normal growth pattern the babies could be born on a normal schedule, rather than premature. Still, it was recommended to abstain totally from alcohol prior to conception and during pregnancy to avoid any birth defects due to alcohol intake (Ernhart 39).

An additional study by Rosett in 1981 "noted an improved neonatal

outcome when the mothers were able to reduce maternal alcohol consumption before the third trimester" (Pernoll 196). The significance of these findings is that counseling be provided to the female both prior to and during pregnancy so as to avoid difficulties in birth and defects to the newborn child. This counseling would be a part of standard prenatal care.

The five aspects to a fivefold wellness program have been reviewed in terms of their foundations via research. Although brief, the purpose was to underscore why all five areas are significant in the life of a pregnant female and the birth of her baby.

Costs

At this point the associated costs to a corporation, via hospital and doctor bills to the insurance carrier, will be discussed. In this study a small sample of pertinent data, both written and verbal, will be reviewed so as to document the extent of these costs. Again, the costs reviewed will not be extensive, but they will serve as a means to aid in the understanding of premature birth costs.

One of the most expensive premature birth costs to a corporation is a disease named Bronchopulmonary Dysplasia, or BPD. This disease develops when a newborn is placed on mechanical ventilation post-birth due to incomplete formation of the lungs, usually in a premature birth (Rhodes 393). Depending upon the severity, care for the child may last one month to four years.

According to a recent study documented in the July, 1993 issue of Clinical Pediatrics, 59 infants received initial care for this chronic disease for a time period ranging from 39 days to 1349 days or approximately four years (Rhodes

397). Over 55% of the care was given in the hospital whereas under 45% consisted of home care on oxygen therapy. Oxygen therapy was required to aid the infant in breathing and in lung development until the child could breathe without assistance.

In this study, the "population was predominantly white, middle-class, and rural, with a small suburban component" (396). "The average gestational age was 29 weeks and the average birthweight was 1,259 g" (396). Of the 59 infants studied with BPD, only one was delivered at term, 42 weeks; the others were delivered earlier than 35 weeks gestation. Costs were reviewed and reported separately to allow for a breakdown between hospital and home care costs. In addition, a "96-item questionnaire was designed and administered to assess the financial and emotional impact of home care" (395). Home care was analyzed so as to document the effects of home care on the parents, since in the last ten years there has been a trend towards the increased use of home care to cut costs. All charges incurred were adjusted to billing rates for 1989/1990; thus in 1994 there is the strong probability that these costs would be higher (394).

The total cost for BPD per neonate ranged from $50,000 to $1,000,000. The costs were broken down into four types: initial hospitalization, continued hospitalization, home therapy, and rehospitalization. To begin, initial hospitalization will be discussed. The median duration of hospital stay was 120 days, ranging from 30 to 772 days. The mean cost for each neonate, mother not included, was $197,668, ranging from $43,364 to $864,504. During this

initial stay, the parents drove to and from the hospital a total of 800-35,000 miles, with hotel stays numbering 10-275 visits, not nights. The charges included other expenses and the percentage breakdown was as such:

> hospital charges: 82%
> physician fees: 12%
> community hospital charges: 5%
> parental expenses: 1%
(Rhodes 397)

These charges do not include measurements of the parental stress associated with traveling to and from the hospital or work-related or family-related stressors.

After the initial hospitalization, parents were instructed to administer oxygen therapy at home, and return the infant to the hospital for further rehospitalization as needed. Thus the actual costs for home therapy and rehospitalization, as shown in Table IV, were compared to estimated costs for continued hospitalization. Then the costs were broken down into the 10 neonates requiring private-duty nursing and the 49 without private nursing. From the cost comparison, it was shown that home therapy was 25% of the cost of continued hospitalization. In addition, those infants requiring private-duty nursing were 4-16 times more expensive than those not requiring private-duty nursing.

Table 4

Hospital VS Home Treatment for BPD

	Actual Home Care	Actual Rehospitalization	Totals	Estimated Continued Hospitalization
Median:	$5195	$7448	$12,643	$48,116
Range:	$650-$132,303	$1020-$91,867	$1670-224,170	

	Private-Duty Home Care	Non-Private Home Care	Private-Duty Cont.Hosp.	Non-Private Cont.Hosp.
Median:	$68,136	$4,262	$134,934	$33,995
Range:	$16,056-$132,303	$650-$23,278		

Source: Rhodes, Torunn T. M.D. "Financial and Emotional Cost Of Bronchopulmonary Dysplasia." Clinical Pediatrics July 1993: 398.

Although it was demonstrated that there were substantial savings in home therapy care, there also existed a definite increase in both financial and emotional stress. 39 of the 57 families in Rhodes' study reported financial stress and 20 of the 24 families experiencing an income loss reported stress. The four families with loss of income but minimal stress had incomes after losses greater than $25,000. "Almost one-half of the mothers reported crying more often, and over one-half reported being constantly mentally exhausted, depressed and worried that they might be unable to provide care for their infants as a result of physical exhaustion" (Rhodes 398). See the following bar graphs taken from Rhodes study.

Illustration 3

The Costs of BPD

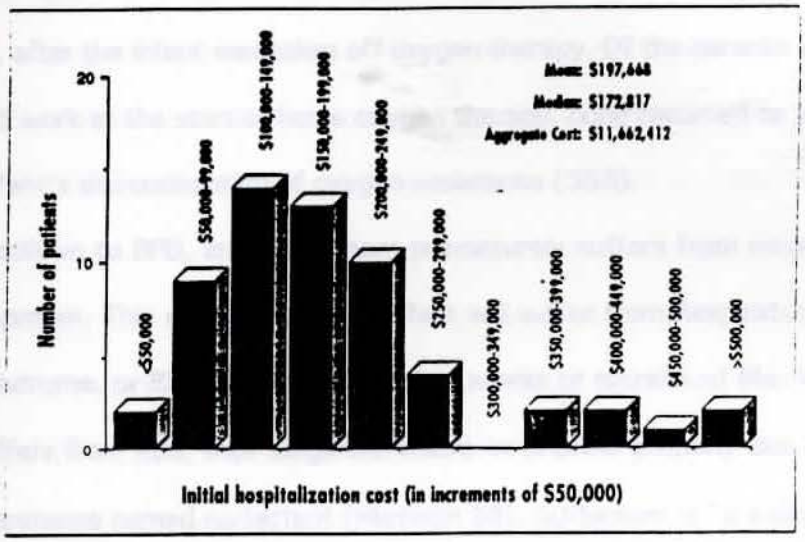


Figure 1. Distribution of initial hospitalization cost in 59 infants with BPD at DHMC, 1981-1989.

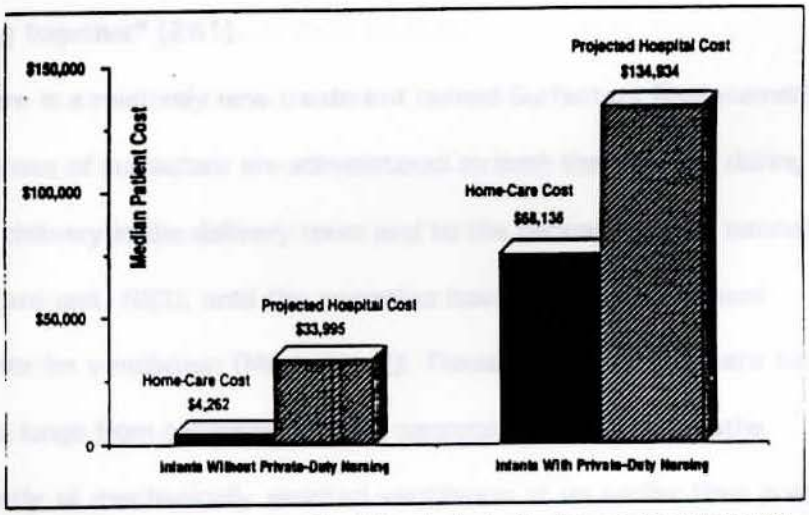


Figure 3. Home-care cost vs projected hospital cost for the duration of oxygen therapy in 10 infants with home nursing care and 49 infants without home nursing care, DHMC, 1981–1989.

Source: Rhodes, Torunn T. M.D. "Financial and Emotional Cost Of Bronchopulmonary Dysplasia." Clinical Pediatrics July 1993: 397,399.

In summary of this study, there were numerous costs not calculated into the estimates of home therapy such as increased electric/gas bills, medications, rehabilitative equipment, and others. A significant cost not addressed was that of lost income, after the infant was taken off oxygen therapy. Of the parents who discontinued work at the start of home oxygen therapy, none returned to work upon the infant's discontinuation of oxygen assistance (398).

In addition to BPD, any infant born prematurely suffers from incomplete lung development. This means that that infant will suffer from Respiratory Distress Syndrome, or RDS, during its first few weeks or months of life. When a neonate suffers from RDS, their lungs are unable to breathe properly due to the lack of a substance named surfactant (Harrison 58). Surfactant is "a substance formed in the lungs that helps keep the small air sacs, or alveoli, from collapsing and sticking together" (261).

There is a relatively new treatment named Surfactant Replacement Therapy. Doses of surfactant are administered to both the mothers during premature delivery in the delivery room and to the neonates in the neonatal intensive care unit, NICU, until the neonates have met certain clinical requirements for ventilation (Manisalco 2). These doses of surfactant help prevent the lungs from collapsing and the neonates are able to breathe independently of mechanically assisted ventilation at an earlier time post-delivery. This helps to decrease the major costs of mechanical ventilation in the NICU (1).

In one study a group of surfactant-treated infants was compared to a

control group that was not administered surfactant to determine if the hospital charges were less in the surfactant-treated group. This hypothesis was based on previous estimates whereby premature infants requiring assisted ventilation were approximately four times the cost of a normal infant not needing assisted ventilation. The women studied gave birth between 25 to 29 weeks gestation and all 1983/1984 NICU charges were converted to 1987 dollars; in 1994 those costs would be higher. The ancillary charges were studied, excluding physicians' fees. The ancillary charges included: pharmacy, blood bank, laboratory, x-ray, operating room, and respiratory charges. The duration of stay for all infants ranged from 25.3 to 63.5 days (Maniscalco 2,3).

"The highest charges were incurred during the first full week of hospitalization" averaging $943 per day ..."surfactant-treated patients had a significant 25% reduction in ancillary charges. For patients with birth weights greater than 1000 g, the charges were $18,500 less to produce a survivor," although average total costs for both groups averaged $60,000 (4). The explanation for the similarity in total costs "was that the surfactant-treated nonsurvivors lived longer than the control nonsurvivors" (4). Yet a difference existed between groups in that only 8% of the surfactant-treated infants died, whereas 29% of the control infants died; so mortality was lower in the surfactant group (4).

Another study compared costs of 32 VLBW, very light birth weight: <1500 g, to 34 term infants, >3000 g (McCormick 534). The average birth weight for the VLBW babies was 1132 g, whereas the average birth weight for

the term infants was 3458 g. "The parents were predominantly white, married homeowners in their late twenties with greater than high school education. Almost all of the fathers were in the home and employed" (535). Twelve months prior to delivery, 40% of the VLBW mothers were working and 72% of the term mothers were working. Diaries and quarterly interviews were the means utilized to estimate both direct and other medical costs (533).

For the first year post-delivery, the VLBW infants averaged $10,139 in direct costs and $743 in other costs, totalling $10,882. The term infants averaged $1179 in direct costs and $1105 in other costs, totalling $2284 as shown below. The direct medical costs revealed the greatest difference in charges for rehospitalization and twice as many physician's visits. The highest charges were in the first six months, especially the first quarter where direct charges for VLBW infants averaged $3653 and term infants averaged $212 (536).

Table 5

Costs of Neonatal Intensive Care Unit

TABLE 2. Direct Medical Expenditures per Quarter for Neonatal Intensive Care Unit (NICU) Graduates and Term Comparison (Comp) Infants Over the First Year*

	First Quarter		Second Quarter		Third Quarter		Fourth Quarter		Total Year	
	NICU (28)	Comp (26)	NICU (23)	Comp (26)	NICU (25)	Comp (26)	NICU (22)	Comp (27)	NICU (16)	Comp (15)
Hospital care	3054 (8694)	115† (588)	1957 (4984)	57 (294)	2160 (9011)	0†	204 (959)	389 (2021)	8250 (12 892)	900† (2766)
Physician visits	127§ (87)	86‡‖ (68)	157 (178)	59†¶ (34)	125 (77)	42† (37)	138 (108)	51 (42)	564¶ (341)	232†‖ (90)
Other direct medical expenditures	398 (402)	18† (20)	395 (389)	12† (15)	141 (245)	11† (11)	72 (156)	18 (19)	1311 (938)	63† (33)
Total	3653 (8794)	212 (601)	2509 (5315)	126 (301)	2426 (9026)	54† (43)	415 (953)	459 (2025)	10 139 (13 172)	1179† (2774)

TABLE 3. Other Expenditures per Quarter for Neonatal Intensive Care Unit (NICU) Graduates and Term Comparison (Comp) Infants Over the First Year*

	First Quarter		Second Quarter		Third Quarter		Fourth Quarter		Total Year	
	NICU (28)	Comp (26)	NICU (23)	Comp (26)	NICU (25)	Comp (26)	NICU (22)	Comp (27)	NICU (16)	Comp (15)
Transportation	57 (62)	9† (8)	49 (81)	6† (6)	34 (35)	3† (3)	23 (19)	6† (12)	180 (164)	23† (25)
Child care	191 (539)	139 (385)	266 (1012)	191 (563)	110 (332)	288 (636)	46 (121)	278† (583)	563 (1797)	1082 (2462)
Total other	248 (569)	148 (386)	315 (1009)	197† (563)	144 (338)	291 (636)	69 (116)	285 (582)	743 (1850)	1105 (2458)

Source: Maniscalco, W.M., MD, J.W. Kendig, MD and D.L. Shapiro, MD. "Surfactant Replacement Therapy: Impact on Hospital Charges for Premature Infants With Respiratory Distress Syndrome." Pediatrics 83.1 (1989):4.

Other recent studies state that premature, underweight births cost five to six times the cost of a term delivery at approximately $30,000 versus $5000 in 1990, and for those infants weighing less than 1000 g, costs may exceed $100,000, not including loss of wages or nonmedical costs (McCormick 538). Rehospitalization will occur with 40-50% of VLBW survivors and average monthly expenditures may be $1000 per month for the first three years of life (539). The long-term costs associated with a VLBW infant are significant additions to the initial hospital costs associated with delivery. In an interview with Donohoo, a Wellness Director for a healthcare company, she stated that according to her most recent data from 1993, her company had two major sources of healthcare costs. The largest cost was cardiovascular disease and the second-largest cost was pregnancy (Donohoo).

Finally, a study by Calhoun analyzes the hospital charges associated with drug abuse (731). In this study, a group of mothers who used cocaine was compared to a drug-free control group. Of the 91 cocaine users, "15 also tested positive for marijuana, four for methamphetamines, and one for heroin" (732). Significant cost differences were found. Although cost differences existed between the mothers in both groups, the most significant costs were those incurred by the baby. Prior to discharge, the cocaine study group infants incurred $13,222, whereas the normal infants averaged $1297, according to 1990 costing, ten times the cost for a normal birth (733).

Statistically, "cocaine-positive mothers were more likely to deliver

prematurely (37 versus 2%) and to have low birth weight (2613 versus 3340 g)... neonatal intensive care use (30 versus 3%) and extensive hospitalization (11 versus 3 days)...cocaine-positive individuals were more likely to smoke (85 versus 31)" or 93% versus 34%, "and to have had fewer than four prenatal visits (64 versus 17)" or 70% versus 19% (732). Additionally, there was an increased likelihood of fetal growth retardation in that 12% of the cocaine-exposed infants had retardation, whereas none of the control infants had retardation. This data reveals that cocaine-positive mothers were "18.5 times more likely to deliver prematurely" (733).

According to Calhoun, "there is recent evidence that intensive educational and rehabilitative programs can significantly lessen the prevalence and impact of drug abuse during pregnancy, even when instituted late in gestation" (733). If drug-abusing females were encouraged to go through rehabilitation to stop using drugs either prior to conception or during pregnancy, the costs of hospitalization for the baby could be dramatically reduced.

Wellness Programs

Corporate fitness and wellness programs have been in existence for over twenty years. The purpose of these programs has been to provide a means for employees to take care of their health at a site on the company's premises. The prevalence of these programs has been based on several factors in the past:

1. support from corporate management
2. cultural and geographical aspects
3. corporate profit-margins
4. lack of local facilities in metro area (Corp X)

But in today's atmosphere of national and international competitiveness, along with a push to cut costs due to rising health care costs, there will be a few new factors, in addition to a few of the old ones, determining whether wellness programs will exist in companies:

1. support from corporate management
2. support from corporate benefits departments
3. ability of wellness program to be self-sufficient financially
4. ability of wellness program to document health care cost-savings (Corp X)

Prior to a discussion of a recommended wellness program focused on cost-reduction, several other guidelines and programs will be reviewed. This will provide the background necessary to understand the purpose and significance of a corporate wellness program for employees.

Currently there are many wellness and prenatal programs in existence nationally in the United States and internationally. In a recent 1993 article from the journal titled Occupational Health & Safety, the substance and effects of wellness programs was discussed. The article refers to the (AHA) American Heart Association's 1993 recommendations based upon national statistics. In 1993, "someone will die in America approximately every 34 seconds from a disease that research has clearly shown was avoidable through strong, positive risk reductions" (McAllister 50). The purpose of wellness programs is to minimize the development of preventable, lifestyle-related diseases such as adult-onset Type II diabetes, cardiovascular disease, cancer, and obesity. For those employees who do participate in corporate wellness programs, larger

companies have documented a "$2-10 return on each wellness dollar invested," in addition to fewer workers' compensation claims, fewer on-site accidents, and decreased absenteeism (McAllister 54).

The article explains the purpose of wellness programs in relation to manufacturing equipment. When a company has a production schedule to meet, it plans ahead with preventative maintenance programs to decrease downtime. This is done to avoid future costs due to downtime associated with equipment replacement when equipment malfunctions. In addition to downtime costs there are the one-time replacement costs associated with each piece. The problem that exists in many companies is that managers fail to make the correlation with employees as well; they forget that despite increased automation, much of the machinery cannot be operated without employees. So if the employee is "down" due to illness, the production schedule slows due to either the inability to find a replacement worker immediately or due to the lag time required to retrain another employee to another type of job. The estimated lag time for a pregnant female is similar in that she make take maternity leave for 2-6 months, depending on pregnancy complications (Corp X).

In the past most wellness programs have been implemented at one of three levels, regarding initial investment and ongoing expenditures as shown in Table 6 on the following page.

Table 6

Three Levels of Corporate Wellness Programs

Level	Cost Per Year Per Employee	Content
1	$35-50	>Health Risk Appraisal (HRA) >printed material from local hospitals and national non-profit organizations providing health information/education
2	$75-100	>HRA >printed material >off-site programs lasting a minimum of 8-12 weeks provided by preferred vendors, such as fitness club memberships, etc.
3	$175-300	>HRA >printed material >on-site programs which provide staff, equipment, and facilities to promote healthy lifestyles such as healthy food in vending machines and cafeterias, fitness center, health education classes, counseling, etc.

SOURCE: McAllister, R., MPH, MSEH. "Wellness Strategies Help Workers Adopt Healthy Habits in Lifestyles." Occupational Health & Safety 62.8 (1993)

Depending on the support and understanding by corporate management of wellness programs, the programming may be basic or thorough. The basic programs may educate employees, but they may not support long-term, permanent changes in lifestyle behavior. "Methods used to implement wellness programs include risk assessments or health-risk appraisals, lifestyle questionnaires, health education, and on-site staff assistance in the areas of

stress management, nutrition, exercise, smoking cessation, and substance abuse" (60).

> The corporation that is truly committed to cutting healthcare costs by improving employee health will surpass educating and informing. It will not only provide employees the encouragement to make lifestyle changes, it will provide the opportunity to make changes. Research demonstrates that behaviors persisting over time are supported by their environments. Since most employees spend more than 50 percent of their waking hours working, wellness promotion may strongly impact employee health behaviors. Many U.S. corporations have tried implementing higher deductibles, higher co-payments and other cost-shifting techniques to abate escalating healthcare costs (60).

Yet employers found that it did not work, because by increasing the employee's financial burden, some could not afford the financial costs of healthcare.

An example of wasted dollars is given by McAllister.

> The company clearly loses if an employee feels he cannot afford high blood pressure treatment on a regular basis but eventually gets a $50,000 hospital bill for open-heart surgery. The hospital bill may be an insignificant part of the loss. The employee may be entitled to disability pay, a replacement employee may require training, and productivity may suffer. Investment of $50,000 in employee screening and education of all employees would yield a higher return (56).

A similar situation could occur with a pregnant female who delivers prematurely.

Lastly, McAllister suggests a potentially successful means of implementing a wellness program. There should be a health-related risk management team formed so as to monitor changes in employee risk factors and quality of healthcare. Incentive plans should be formulated to encourage changes in lifestyle behaviors. In the past, negative, penalty-oriented point systems were implemented with minimal benefit.

McAllister suggests that positive, reward-based

> point systems have been designed to reward individuals maintaining ideal weight, cholesterol levels and blood pressure and those participating in exercise, safety and health seminars. Incentives such as warm-up suits, exercise bags or time off can help attain interim and long-term goals. Possibly the most effective are out-of-pocket incentives: waiving the employee's insurance deduction if he or she participates in the program and waiving the family deductible if the spouse participates. Some forms report increasing employee participation up to 98 percent using this plan (58).

In addition to general wellness programs, it has been documented that by instituting a thorough prenatal program, females have more successful pregnancies and there is a decrease in the incidence of preterm births. According to a study conducted by Herron in San Francisco, the rate of preterm births was reduced. A population of middle-class, high-risk patients was screened and educated in obstetrical clinics and as a result their rate of preterm births fell from 6.8% to 2.4% (Iams 265). Their system of screening and education was based on a system used previously by Papiernik in France during a 12-year period. They reported a decline in the frequency of preterm births from 5.4% to 3.7%, and an additional decline, from 1.8% to 0.8%, in the frequency of births before 32 gestational weeks was found as well (265).

More aggressive premature birth prevention programs need to be instituted due to the "realization that more than 75% of perinatal morbidity and mortality in infants without congenital abnormalities is caused by complications of prematurity" (265). In the United States, "the rate of preterm has not changed in this country despite the introduction of potent drugs to arrest uterine

contractions" (265). In addition, even with the new technology and machinery, "improved gadgetry in neonatal care is not the answer" (266).

Other investigations have found "that a variety of infectious or inflammatory stimuli may mimic the normal mechanisms of labor initiation" (Iams 266). The response of the cervix and uterine muscle to such stimuli is highly variable, and may depend on such diverse factors as:

>maternal cigarette smoking
>anemia
>urinary tract infection
>qualitative and quantitative vaginal microflora
>cervical length and dilation
>coital activity during pregnancy
>maternal work activities that require prolonged standing (266)

These are risk factors that may be modified or even eliminated by prematurity prevention programs. "The focus of prenatal care ought to embrace openly the prevention of prematurity as a principal goal" (266).

One obstetric/gynecologic textbook documents the purpose of preconceptional education and healthcare.

> Ideally, a woman planning to have a child should have a medical evaluation before she becomes pregnant. This is the ideal time to stress the dangers of cigarette smoking, alcohol and drug use, and exposure to teratogens. Instruction on proper diet and exercise habits can be given. Vitamins taken 2-3 months before conception may be beneficial. Unfortunately, most patients do not seek preconceptional care, and the initial prenatal visit is scheduled well after pregnancy is under way. (Pernoll 188)

During this preconceptional period, the female should be screened mentally and physically. The female should be screened mentally for seven potential factors that might lead to the female not seeking prompt prenatal care

once pregnant. Several reasons might include:

1.inability to pay for health care
2. fear of, or lack of confidence in, health care professionals
3. lack of self-esteem
4. delays in suspecting pregnancy or in reporting pregnancy to others (this might include fear of revealing pregnancy to work superiors for fear of financial retribution via either job loss or loss of pay raise)
5. different individual or cultural perceptions of the importance of prenatal care
6. adverse initial feelings about being pregnant (examples might be an unplanned pregnancy or a situation involving a single parent)
7. religious or cultural prohibitions (i.e. pregnant and not married) (Pernoll 188)

Several physical tests should be conducted prior to pregnancy and the female should be informed regarding the following:

1. testing for a disease carrier state or other risk factors
2. problems that can and should be resolved prior to pregnancy (eg, anemia, obesity)
3. problems that cannot be resolved, but may require extra care prior to and during pregnancy (eg, chronic hypertension, diabetes mellitus)
4. the recurrence of complications experienced in previous pregnancies, including congenital abnormalities
5. the length of time to wait after use of oral contraceptives (eg, until one normal menstrual period occurs) or following spontaneous or induced abortion
6. problems associated with potential teratogenic effects of prescribed medications, illicit substances, alcohol, and smoking
7. exercise and diet in pregnancy
8. the importance of recording data of each menstrual period and beginning prenatal care as early as possible in the course of pregnancy (Guidelines 50,51)

In addition there are seven types of maternal chronic illnesses "that increase the risk for neonatal morbidity or mortality" and these should be addressed (Pernoll 297).

1.hypertension
2. diabetes (all types)
3. renal disease
4. thyroid disease
5. cardiovascular disease
6. alcohol or narcotic addiction
7. severe anemia (Pernoll 297)

Once pregnant, the female should be given three components of prenatal care: serial surveillance, education, and psychosocial support (Guidelines). To begin with surveillance, seven laboratory tests should be performed:

1. determination of hemoglobin or hematocrit levels
2. urinalysis for protein and glucose
3. determination of blood group and Rh type
4. irregular antibody screen
5. determination of rubella antibody titer
6. cytologic studies of the cervix
7. serologic testing for syphilis (54)

For an uncomplicated pregnancy, the female "should be examined approximately every 4 weeks for the first 28 weeks of pregnancy, every 2-3 weeks until 36 weeks gestation, and weekly thereafter" (55).

In addition to surveillance, the health care professional monitoring the female's pregnancy should inform the mother regarding factors that can negatively and positively influence the outcome of the pregnancy. "The importance of prenatal education cannot be overemphasized" (59). In addition to cessation of substance abuse and nutritional counseling, "moderate daily exercise is an important component of a healthy pregnancy" (59).

Lastly, psychosocial support should be provided for the female. "Pregnancy is a major event in a woman's life" and although she is expected to be

happy by those surrounding her, she may experience many conflicting feelings regarding her new responsibilities that are soon to be placed on her (60). Group encounters such as exercise, childbirth, and breast-feeding classes may be helpful in that she will gain support from other females experiencing similar emotions.

Before discussing the recommended fivefold wellness program for females, the desired target age group of females will be determined. In a recent study, it was shown that to target females according to age only, as a means of defining their reproductive years, is not completely accurate. "The typical woman in the United States has a potential reproductive life (between menarche and menopause) of 35.9 years" (Forrest 109) Yet there are five stages through which the female passes in her life which may vary in occurrence and length. These five stages are:

1. menarche to intercourse
2. intercourse to marriage
3. marriage to first birth
4. first birth to attainment of desired family size
5. attainment of desired family size to menopause (106)

Yet only stages 2., 3., and 4. are the stages in which pregnancy is likely. Even then, some females may not experience those stages in the order listed, while others stay in one stage and skip other stages to avoid children altogether (105). In addition, since this study was conducted in 1982 and 1988, the results may not be pertinent to 1994 since there is a trend for females to have children at later ages in the 1990s. (Refer to Table 7. below.)

Table 7

Menarche to Menopause

Table 1. Major Stages of Women's Reproductive Lives, and Fertility Goals and Sexual Behavior at Each Stage

Stage	Fertility goals		Sexual behavior		
	Childbearing	Future fertility	Partners	Frequency of intercourse	Predictability of intercourse
I. Menarche to intercourse	Postpone	Preserve	None	None	Low
II. Intercourse to marriage	Postpone	Preserve	Multiple?	Moderate/high	Moderate
III. Marriage to first birth	Postpone	Preserve	One?	High	High
IV. First birth to attainment of desired family size	Space	Preserve	One?	Moderate	High
V. Attainment of desired family size to menopause	Stop	Not important	One?	Moderate/low	High

Adapted with permission from Contemporary Ob/Gyn 1988;32:12, Medical Economics Publishing.

Table 2. Median Age at Major Reproductive Stage Transitions in 1982 and 1988, and Changes Between 1982 and 1988

Transition	1982	1988	Change, 1982–1988
Menarche	12.7	12.5	−0.2
First intercourse	18.0	17.4	−0.6
Marriage	23.3	24.3	1.0
First birth	25.0	26.0	1.0
Intend no more children	29.1	30.0	0.9
Sterility/infertility	35.6	35.7	0.1

Table 5. Time in Reproductive Life Stages According to Median Ages at Transitions for 1982 and for 1988 by Poverty Status and Race-Ethnicity

Stage	1982	1988					
		Total	Poverty status		Race-ethnicity		
			<200%	200+%	White	Black	Hispanic
I. Menarche to intercourse	5.3	4.9	4.7	5.2	5.1	4.2	5.6
II. Intercourse to marriage	5.3	6.9	7.5	6.4	6.2	11.7	6.2
III. Marriage to first birth	1.7	1.7	−1.7	4.1	2.9	−5.8	−1.2
IV. First birth to attainment of desired family size	4.1	4.0	4.2	2.7	3.5	4.6	7.5
V. Attainment of desired family size to menopause							
Desired family size to sterility/infertility	6.5	5.7	7.4	5.4	5.4	8.4	6.7
Sterility/infertility to menopause*	12.8	12.7	13.8	12.2	12.8	12.9	11.5

* A median age at menopause of 48.4 years was used for all subgroups.

Source: Forrest, J.D., PhD. "Timing of Reproductive Life Stages." Obstetrics & Gynecology 82.1 (1993): 106,107,109.

Although the average age range for possible pregnancy is 17-36, age

cannot be the sole determining factor in deciding which females to target for health education regarding pregnancy. Rather, women should be screened for their reproductive stages and then encouraged to participate in educational programs based upon their current stage, not their age or marital status (110).

In conclusion, a few aspects of research have been presented to initiate the investigation of providing a wellness program specifically targeted to females, as a means of reducing the incidence of premature births. The five aspects to a possible program that were discussed were: stress, nutrition, exercise, smoking, and substance abuse. They are all interrelated and interdependent in that each preventative aspect cannot be isolated in treatment of the female. In addition, costs of premature births were documented as well as other suggested wellness and prenatal programs. At this point the proposed fivefold wellness program will be presented. (The cost of the program will be estimated and the manner in which it would be implemented will be based upon the current needs and internal structure of Corp X.)

Chapter III

Fivefold Wellness Program Plan

Often, corporations attempt to implement a wellness program for their employees without preparing a detailed strategic plan that incorporates both obectives and methods for the program. The end result is healthier employees, but management has little or no data available to justify continuance of the program.

Several aspects to this proposed program will be addressed: estimated start-up and ongoing costs, estimated savings, a local area network computer system, an on-site database, departmental cooperation, means of implementation, employee involvement, hourly and salaried employee differences, and management support. These and other items will be addressed for the purpose of clearly explaining how this program would be implemented in a large corporation.

The most important factor is that of management support. Without support from executives, there will be substantial delays in beginning a fivefold program. One delay might be that of securing space within a company-owned building. If the program and the supporting departmental employees are placed in a leased space, this will decrease the cost-effectiveness of the program and ensure instability due to the fact that the space is not permanent and could be leased by another corporation. If the departments working on the project are in several different buildings, there will be wasted time spent communicating via

phone calls and interoffice mail, in addition to duplication of effort in various buildings (Corp X). Another delay might be the interdepartmental fighting over budgets determining which department would spend money for various implementation and ongoing costs. In addition to budgets, there might be interstaff competition over recognition from management due to poorly differentiated roles and responsibilities. There might be delays in the acquisition of the proper hardware, software, and networks in order to track employee and cost/benefit data. If the program is started prior to the acquisition of a complete computer system, year-end cost/benefit ratios will be inaccurate.

In order to gain management support, key executives must be made aware of the need for such a program. This need is most clearly determined by a report generated from the Benefits Department showing the top costs to a corporation via the health benefits provided to employees. Additionally, the Legal, Personnel, and E.O.P. Departments may provide reports on past lawsuits and potential lawsuits aimed at the company for discrimination against females. Lastly, a report from the Medical Department is essential to document the health of females before, during, and after pregnancy, so as to correlate this data with data in a report from the Fitness Club to determine how exercise, stress, and nutrition affect pregnancy outcome in several employees.

After these preliminary reports have been presented, the next step is to prepare a cost/benefit analysis of the fivefold wellness program. Items to review are:

Costs	Benefits
1. staffing	1. revenue from payroll deductions
2. space allocation	2. healthcare dollar expenditure decrease
3. systems installation & support	3. improved employee morale
4. promotion/marketing	4. decreased absenteeism and replacement costs
5. operational expenses/supplies	5. increased productivity and performance
6. capital expenditures	6. higher corporate profit-margin
7. start-up vs ongoing costs	7. short-term vs long-term savings
8. repairs/maintenance	8. decrease in employees on leave of absence due to psychosis
9. facilities/utilities	9. improved employee/manager relations

Depending on employee population, the larger the size, the larger the benefits, in general. An estimated cost/benefit ratio is four to eight dollars saved for every one dollar spent. This is based upon other wellness programs at other companies which range between two to ten dollars saved for every dollar spent. This wide range has been the result of the varied quality of programs conducted at each company (Corp X).

For Corp X, the approximate start-up cost for a wellness program focused on preventing premature births would be $500,000, with an ongoing annual cost

of $250,000 per year. The initial cost is double due to capital and one-time start-up costs to train staff and initiate programs. After the first year, estimated benefits could total one to two million dollars per year due to savings in neonatal hospital costs ; annual operational costs would be equal or less than annual payroll deduction revenue from participating employees. These costs/benefits would be monitored and verified through a database and software programs designed specifically for Corp X and its supporting departments, which will be discussed at the end of this chapter.

The departments involved in this program would utilize current employees, in addition to hiring a few more external employees for job-specific tasks, for which the company cannot hire internally due to the education and experience required. An estimated ten additional employees would be hired. Departments and individuals involved in this program would be:

1. Medical
2. Safety
3. Benefits
4. Food Services
5. Recreation
6. Fitness
7. Employee Assistance Program
8. Voluntary Improvement Program
9. Library Services
10. Badging
11. Personnel
12. Equal Opportunity Program
13. Security
14. Facilities
15. Graphics
16. Mail Services
17. Union
18. Corporate Executive

19. Insurance Companies
20. Computer Systems
21. Payroll

Departments 1. - 7. would be located in the same building, with approximately 100 staff, whereas the other departments and individuals could be located in buildings peripheral to the Wellness Building, but with a LAN in place so as to facilitate communication. A LAN is a Local Area Network, whereby numerous computer terminals are connected via cable and users may communicate between terminals by sending messages and documents over the LAN.

The purpose in having the main departments in the same building or tract is for cross-referral when an employee asks for assistance, or requires assistance due to a health condition. Here are some examples of typical cross-referrals that might take place:

> Medical refers an alcoholic to EAP for counseling

> EAP refers an employee with psychosis to Fitness to exercise for improvement of self-esteem

> Fitness refers an employee to Benefits for a recommended podiatrist to treat a foot problem

> Medical refers a pregnant female to VIP for an onsite prenatal class

> Benefits refers a chronic abuser of doctors' office visits to VIP for a health education course on determining when to see a doctor vs self-diagnosis at home

> Safety refers an employee to VIP for a back-injury VIP class

> Personnel refers a new employee to Computer Systems to ergonomically adjust

their workstation

> EAP refers an employee on leave of absence for stress to Recreation to play on a softball league for gradual reintroduction into the workplace

> Medical refers a diabetic employee to Food Services to obtain information on workplace eating

One of the main keys to a successful wellness program will be employee participation. Initially, involvement must be optional, with the hope of implementing mandatory requirements through benefit-based incentive plans, over a five-year period through union contracts. To recruit large numbers of employees, the program must be promoted as a something good that management is doing for its employees because they care about health-related issues. If employees feel that they are being forced to participate soley to save money for the company, this will convey a negative image of management, and fewer employees will be persuaded to improve their lifestyle behavioral patterns. Means of promotion are: flyers, bulletin boards, newsletters, paycheck stubs, management memos, computer memos, banners, etc..

The program must be offered at a minimal cost to employees, less than surrounding commercial and hospital-based programs in order for employees to participate. A low-cost program will be possible due to the large numbers of employees utilizing on-site facilities.

Suggested incentives are:

• $10 less for monthly health insurance deductible for each of the following risks avoided:

1. normal resting blood pressure, below 140/90
2. normal resting heart rate, below 84
3. normal body fat %, below 30%
4. exercise 1x per week
5. participate in back-injury prevention program (or VDT tips seminar)
6. participate in cancer early-detection program
7. participate in stress management program
8. participate in pre-natal or post-natal programs
9. annual physical (overall, vision, dental, or others)
10. do not smoke

- paid day off work
- clothing: sweatshirt, sweatpants, T-shirt, shorts, socks, hat
- certificate signed by CEO
- free 3-day vacation for 2 at resort
- gift certficates for: $100 groceries, $100 shopping, $100 hotel, $100 airline, $100 restaurant, $100 subscription(s), $100 furniture, etc.
- reimbursement for one month of day care

Employees need motivation to alter their lifestyles. Participation in one or more aspects of a wellness program will greatly increase if incentives are provided.

For females who are of childbearing age, ranging from 18 to 45, it is necessary for them to improve their lifestyles prior to pregnancy to see the greatest cost-reductions in pregnancy-related health benefits occur within a corporation. If a female is healthy six to twelve months prior to pregnancy, her chances for a more successful, and less costly, pregnancy increase dramatically (Clapp 1799). It is not sufficient to offer prenatal visits to the doctor during pregnancy, for these visits normally do not include extensive health education and counseling on lifestyle behavioral patterns. Also, a working female spends far

more time at the workplace than at the doctor's office prior to and during pregnancy. She is more likely to incorporate behavioral changes at the workplace if she is in an environment that encourages a healthy lifestyle. The workplace environment must be supportive of the female.

The environment can be improved in several ways:

1. Vending machines offer nutritionally healthy items, rather than junk food
2. Cafeterias serve healthy foods, low in fat with minimal preservatives
3. Bottled springwater is provided within 200 feet walking distance to most workstations
4. Flextime is the standard, rather than the unusual, means of offering time to exercise and participate in other wellness activities
5. Workstations are clean and dust-free, eliminating multi-colored dividers
6. Managers are flexible in allowing employees to participate in on-site wellness programs
7. Confidentiality, regarding health conditions, is never violated or else employee is terminated
8. CEO and executives promote wellness through example and financial support
9. An exercise facility is offered on-site that accomodates the entire population during all work shifts
10. Quality wellness staff are provided on-site for the employees
11. Benefits Department conducts ongoing quality reviews of insurance providers and treatment results

12. A means of communication exists to report maltreatment of employees by providers to the Benefits Department
13. Females are offered flextime from child's birth until age 6
14. Employees are offered assistance at EAP to coordinate husband/wife work schedules
15. Organizational behavior consists of positive feedback and fair performance reviews

These environmental factors should be part of the corporation's strategic plan. These Wellness Standards could be publicized throughout the company on official framed posters, just as the company's ethical standards have been publicized in the past (Corp X). Over time, the morale of employees will improve as they become accustomed to management support of wellness activities. As morale improves, employees will become more motivated to take care of themselves and their health through exercise and proper diet. This physical well-being will aid in employee productivity and performance, thus ensuring quality in the workplace, leading to improved products and service for the company's customers.

In addition to a set of standards, the corporation should invest in an on-site wellness center. When a wellness facility is offered on-site, it is more convenient for the employee, in that they can give more time to both work and home because they do not have to drive to additional locations for wellness activities. For those who carpool to and from work, they are able to exercise only if it occurs in the middle of their workday, so as to be able to accomodate the

other employees' in group transportation. By being on-site, it is also easier to maintain quality control over the staffing and services provided to the employees (Corp X). For example, an employee could exercise either at a local off-site club or at the company's on-site fitness club. There exist a few differences between commercial and corporate facilities as shown in Table 8:

Table 8

Comparison of Corporate and Commercial Fitness Centers

Corporate	Commercial
1. Staff are salaried, thus allowing time to follow-up with old members.	1. Staff are paid on commission for each new member, thus ignoring old members.
2. Facility has option to choose best suppliers based on quality, not allegiance.	2. Facility works in cooperation with specific suppliers for price reductions in products.
3. Daily usage is monitored in a quality manner to substantiate correlations between exercise and health status and show any resulting decrease in claims.	3. Daily usage sign-ins poorly enforced due to lack of incentive by commercial owners to justify costs of program.
4. Staff have more qualifications i.e. B.S. and M.S. degrees and certifications.	4. Staff qualifications dependent on facility; some only require certification, no degree.
5. Testing is thorough and consistent.	5. Testing is nonexistent or optional.
6. Liability concerns are addressed.	6. Members are more at risk for injuries.
7. Workmen's compensation cases are handled in a quality manner, especially in the area of back injuries.	7. Commercial clubs have no concern for workmen's compensation claims. They have equipment that can lead to back injuries.
8. An on-site facility offers a means of unifying both hourly and salaried employees in a "team" activity.	8. Off-site, hourly workers choose different gyms at which to exercise than the executives,thus increasing "team" polarization.

Source: Corp X. Benefits, EOP, Medical, Recreation Departments. Personal Interviews. 1993-1994.

Specifically for the pregnant or post-pregnancy female, she will have fewer stressors on her if she is able to take care of her health on-site as much as possible. Since more research is beginning to correlate prenatal stress with premature delivery, the more a company can help females in relieving stress, the less a company will have to suffer from the costs of premature births. By offering females an on-site fitness center, in addition to on-site nutritional counseling, smoking cessation, substance abuse programs, and stress management programs, they will be appreciative of the help provided by the company and be more likely to return to work post-delivery. A common occurence, in companies with low employee morale, is when the female uses the company's benefits for the pregnancy and then never returns to work. This results in decreased productivity due to time delays in hiring replacement workers and the inability to have the ex-employee train the new employee.

A few issues should be addressed regarding union versus non-union females, their associated benefits and their associated illnesses. Union females, since they usually work in the manufacturing sector, stand 90% of their time at work, whereas non-union females, who usually have desk jobs, sit 90% of their time at work. This could be an issue in that union employees who stand for long periods during pregnancy are more likely to deliver prematurely (Iams 266). In addition, union employees may have more exposure to teratogenic substances and chemicals, thus predisposing the female to birth defects. Non-union employees who spend the majority of the day in front of computer screens may be at risk as well, although this has not been documented through research. Lastly, in general,

union employees often have lower levels of education, thus they need more health education to know how to take care of their health; this is confirmed through their diet and exercise patterns.

Another aspect, that should be addressed, is the quantity of programs that will be offered equally to all shifts. Especially in the manufacturing setting, second and third shift workers are often neglected when specific programs are offered to employees. For example, within a fitness center there should be a ratio of one staff person to fifteen employees at all times. This ratio should be maintained during both peak and slow usage times of operation. Additionally, health education classes should be offered at different times throughout the day so as to accomodate a wide range of starting, break, and finishing times to allow all employees equal opportunity to participate in the classes. Union workers, who normally have specific shift and break times, may not have as much flexibility as non-union workers, so many of the classes should be arranged around union manufacturing schedules, rather than non-union hours. Non-union management must be made aware of this issue, and be flexible and supportive of all employees in their desires to improve their health through exercise and education.

Essential to the program's success is the organizational behavior of the wellness staff involved in the project. Currently in Corp X, the outsourcing of various departments has occurred, with the threat of further outsourcing still a reality. Outsourcing occurs when companies hire contract employees with no benefits to maintain a low headcount, rather than hire more in-house employees with benefits and show a higher headcount. With outsourcing comes a myriad of

problems not normally encountered between in-house employees. First teamwork is difficult due to a lack of trust between in-house and outsourced departments. Second, contractors often have difficulty obtaining data from in-house employees due to this lack of trust. Third, when an in-house employee needs data from a source external to the company, there is an additional charge to produce this data, and few departments want to incur additional charges. Fourth, there is the basic issue of a contractor not being badged for certain buildings, thus prohibiting effectiveness in health promotion activities. Fifth, in-house employees are restricted in their ability to approach senior managers for fear of internal retribution for not utilizing the proper channels within a bureaucratic, hierarchial corporation. These and many other difficulties must be addressed, so as to devise an effective organizational structure in the wellness program.

It is recommended that a clear flowchart be formulated defining who is responsible for each wellness activity. Ultimately, there should be one individual overseeing the entire program so that employees cannot blame each other when mistakes occur. This individual should oversee both the outsourced and internal employees. This individual should be chosen carefully via screening and hiring by an organization that has past experience in managing corporate wellness programs. The individual should be familiar with management issues currently being addressed within the company, and should have the public relations skills necessary to communicate effectively with senior level managers. The wellness program's success will ultimately depend upon the knowledge, experience, and skills of this key individual.

The Wellness Director should have a minimum of the following:

1. B.S. in Sports-Medicine, Nursing, Pre-Med, Occupational Health
2. M.S. in Health Management, Business Administration
3. three to five years experience in corporate wellness
4. three or more certifications for teaching fitness-related classes
5. have demonstrated effectiveness in a past corporate program through a specific project

This individual will act as a central coordinator between various departments to facilitate program growth. As coordinator, this person will have a direct line to senior managers to be able to obtain approval for specific projects as needed. This coordinator will need extensive administrative support so as to be able to delegate effectively multiple projects to specific wellness team individuals. In addition this person will be responsible for generating reports and cost/benefit analyses for management so as to ensure program support.

To establish a wellness program and maintain a program successfully will require extensive support throughout a corporation. As long as costs are justified through a decrease in healthcare expenditures and illnesses the program should continue to grow and prosper. The primary means of justification will be a well-planned computer system. Following is a brief description.

Prior to initiating employee participation in a wellness program, a database with appropriate parameters and files must be set up. To do this, hardware and software must be acquired, installed, and evaluated. Separate work stations between departments participating in the wellness program should be

connected by a local area network or LAN, which will allow for sharing and sending of data between departments. Where necessary, a few of the workstations should also have scanners available to be able to scan and send documents over the LAN. The file servers would need to have huge amounts of storage capacity, due to the type of data entry and processing that would be required in the wellness program.

In addition, a wide area network or WAN should be set up between Corp X and specified vendors to facilitate ease of scheduling for special events, to send invoices to the proper departments, and to make special requests in a timely manner. A WAN should also exist between Corp X's various geographical sites nationally, so that the Human Resources department at each site can receive health education material and activity updates.

Either the purchase of, or design of, appropriate software should be completed. The choice of software will be dependent upon which statistics will be tracked in order to substantiate the program to upper management. The software cannot be used effectively without the appropriate hardware and storage capacity as well. The hard drive must be large and fast enough to process large amounts of data quickly and accurately. If the software program tracks wellness program usage, there may be a need for card-readers at specified entrances and exits, especially in a fitness center, since usage is correlated to equipment life, and capital equipment must be replaced periodically. At other sites or departments, after each visit is complete, an administrative worker could input the user's ID # into a terminal to record the visit.

An adequate maintenance and service contract should be acquired in order to prevent any major delays in data processing once employees begin to use the program. Back-up procedures should be established and terminal users should be trained in data back-up. The power requirements of each terminal should be determined and the appropriate outlets provided, ideally with dedicated electrical lines. Electromagnetic interference, dust, temperature, and humidity should be evaluated, with low humidity and a temperature range of 65 to 75 degrees Fahrenheit. Proper security should be established through the use of passwords and log-on IDs. Access should be limited, based upon each staff person's role in the wellness program.

Prior to data input, key wellness personnel should have the opportunity to use the system to determine whether it meets their needs sufficiently. At this time, any difficulties encountered would be addressed and any changes made. Wellness staff should be able to use the system easily and quickly, and their opinions should be of utmost importance, since they will be the end-users on a daily basis. Any training of personnel that is necessary should take place after the final changes are made, before the wellness program begins offering activities to employees officially.

Without an adequate computer system in place prior to start of the program, measurements will be inaccurate. For example, suppose the computer system does not function until one year after the program has begun. During the first year, there was no tracking of daily usage of the fitness center, the participation levels of wellness programs were tracked manually on paper, and

no baseline of healthcare costs was taken at the start. When the wellness team presents their accomplishments to upper management, their statistics will be few and varied. This does not lend credibility to the program, and no substantial cost-savings can be proven. This will weaken the strength of the program and management may be less likely to support it in the future, especially when capital requests are submitted.

If the main objective of the program is to lower healthcare costs and decrease the incidence of premature births, which contribute to those costs, several baseline statistics should be gathered prior to the start. They should include statistics from the most recent full year, according to the company's accounting cycle or calendar year. The statistics should be acquired for each delivery and in totals, averages, highs, and lows.

1. # of days spent in hospital by mother
2. # of days spent in hospital by newborn baby
3. gestation period: incidence of premature births
4. weight of baby at birth
5. total cost per pregnancy (hospital, doctor, lab tests, x-rays, medication, machinery)
6. # of days taken for maternity leave: before and after delivery
7. room, board, and transportation costs after mother leaves hospital
8. health history prior to pregnancy: illnesses, accidents, etc.
9. risk factors: exercise, stress, nutrition, smoking, drugs

Some of the statistics may not have been tracked before, but those that

have been recorded should be entered into the database to use for a baseline measurement of effectiveness of wellness activities. Any statistics not yet observed, should begin to be tracked by either the Medical or Benefits departments, so that after five years, the effectiveness can be proven in a more substantial manner.

In addition to pregnancy-specific statistics, other statistics should be measured over time as well and these are:

1. daily, weekly, monthly, quarterly, and annual usage of program
2. usage of equipment based on minutes per machine or time per machine type
3. blood pressure changes over time
4. assessment data: changes in areas of fitness, nutrition, stress, smoking, substance abuse
5. % of total employee participation: union, non-union, male, female
6. benchmarks from competitor and local area companies
7. absenteeism
8. expense: staffing, capital, operating costs
9. revenue: monthly, quarterly, annually
10. program growth: square footage, equipment, staffing, programs
11. employee usage of: fitness equipment, classes, counseling, medical visits
12. user type: employee, spouse, dependent, retiree, visitor, vendor/contractor

13. use of benefits

14. estimated costs saved per pregnancy and premature birth avoidance

This data should be reported to management, in an anonymous manner, quarterly and annually. By measuring these statistics, longevity of the wellness program should ultimately be assured, as long as the benefits derived from the program exceed the costs.

Other corporations have documented savings from both their employee wellness programs and their more specific programs directed towards women in their child-bearing age groups. Coors Brewing Company has saved an estimated six dollars for every dollar spent; G.E. Aircraft has reduced healthcare costs below the national average among employees through a wellness program; and Physicians' Health Plan has saved thousands of dollars in 1992 and 1993 through a preventative wellness program offered specifically for females. In addition, other organizations also support wellness activities for their employees. The Federal government currently gives each employee three hours per week to exercise during the normal working hours, and IBM reimburses its employees up to $250 annually for participation in fitness programs (Corp X).

It is hypothesized that decreasing the incidence of premature births within a corporation will save the company millions of dollars in both the near and far future. Female employees will feel a sense of gratitude towards their employer for having taken all measures possible to ensure the delivery of a healthy baby. Since pregnancy and birth are such emotional events for females,

any support provided by the employer should be appreciated. This support from management will translate into a happier employee population with a desire to work and perform to the the best of their ability.

Chapter IV

Expected Results

With a fivefold wellness program in place for the entire employee population, along with a five-year strategic objective to decrease the incidence of premature births among that population, several outcomes will be seen.

1. decrease in duplication of effort company-wide
2. increase in employee morale
3. decrease in costs associated with premature births
4. increase in number of females returning to work post-pregnancy
5. decrease in number of females having premature births
6. increase in number of employees with healthy behavior patterns
7. decrease in overall healthcare costs
8. increased team effectiveness, unity, performance, and productivity
9. decrease in number of employee sick days
10. improved one-on-one, employee/manager relations

These ten results will be explained in terms of improvements within Corp X.

Duplication of effort is a common occurrence in companies with a large population base and with companies that have multiple geographical locations. Unless clear pathways of communication are defined, employees have difficulty knowing who to go to with specific problems that they have difficulty solving. With a fivefold wellness program in place that utilizes a LAN, communication is improved dramatically.

Here are a few instances of ineffective communication. The on-site fitness

center wants to offer aerobics classes, so they work to secure space internally, promote the program with flyers, and begin classes. Meanwhile, the women's physical fitness club loses its external space, which was being leased, and is left without a space to teach. If the fitness center had known about what was happening, they could have invited them to be on their schedule and to use their space.

In the area of stress management, several departments offer means of addressing this issue. The Employee Assistance Program's primary responsibilities include providing assistance to employees in the areas of substance abuse and psychological counseling. This department documents and verifies employee leave of absence for stress. The Voluntary Improvement Program's primary responsibility is to provide continuing education to employees in order to aid in work performance. This department also provides stress management classes and forums to large groups of employees. In addition, the Fitness Center's primary responsibility is to provide assistance to employees in developing individualized exercise programs based upon each employee's health history. They also provide one-hour, one-on-one, stress management consultations for the members of the fitness center.

Another example of wellness duplication of effort is that of blood pressure measurements. The Medical Department takes blood pressure readings, at several locations within Corp X, giving each employee a wallet-size logbook to track repeated measurements. They use a hand-held sphygmomanometer. This type of blood pressure measurement device must be recalibrated often and is not 100%

reliable due to minor error from the pointer on the gauge. The fitness center also takes blood pressure, at one location, and keeps a log at the fitness center for anyone desiring repeated measurements, to take an 8 1/2 x 11record of these measurements to the doctor. They use a table-based mercury manometer. This device rarely needs recalibration and is more accurate due to the rise and fall of mercury.

Lastly, when a female becomes pregnant, she is referred to an obstetrician off-site through her benefits plan. The doctor may suggest certain classes in Lamaze and pre-natal exercise for the employee to take at certain local hospitals. The female is not required to go to the on-site Medical facility at any point during the pregnancy. VIP offers pre-natal fitness classes for the employees, but there is no referral pattern established, so many females are unaware of the classes being offered on-site. All of these instances of duplication of effort would not take place in a well-designed program incorporating multiple departments.

Employee morale would increase with the implementation of a fivefold wellness program. Employees would see that management is making an extra effort to provide workers with a convenient on-site facility. They would see efforts towards a long-term commitment being instituted, which would increase internal trust. They would begin to feel better about themselves due to an improved mental and physical state. They would have the opportunity to have fun and exercise with other employees in a less stressful atmosphere, outside of the factory and office. They would see that Corp X is providing employee services

similar to its competition, so they would be less inclined to leave and work for a competitor. In the past five years, the company has only taken away from the employees; this is the company's opportunity to give something back to them. For these and many other reasons, a wellness program would boost morale.

Premature birth costs can be expected to decrease due to quality control measures instituted within a wellness program and due to the decreased incidence of premature births. For example, if a female is at risk for a premature birth, perhaps it might be cheaper to have her deliver at a level I hospital to decrease any costs associated with transportation from a level II or III hospital for the necessity of a neonatal intensive care unit. If a premature birth takes place, there should be a quality check to confirm whether the baby was administered surfactant so as to decrease time on a respirator. During pregancy, the female should be familiar with a contract she can sign with the doctor assuring her of rights upon entry into the hospital; the female should be able to voice any violations of these rights through a quality control system. If her rights were violated in any way, she might have incurred unnecessary stress, thus prolonging the period of labor and recovery. A wellness program with strong quality control measures would aid in the reduction of premature birth costs.

To estimate cost savings is difficult in a large corporation whereby actual costs expended by the corporation, insurance carriers, and individual employees are difficult to separate, due to a complex benefits system. Data accumulation and report generation are performed externally to Corp X, so reports with specific data are difficult to obtain. Based upon current knowledge of both corporate

benefits statistics and employee population, it is estimated that Corp X would save a minimum of one million dollars per year in pregnancy-related costs and more in other healthcare costs combined, after the fivefold wellness program has been in place for one year. This estimate is based upon a current annual expenditure of over five million dollars solely on pregnancies resulting in premature delivery.

Females would be more likely to return to work post-delivery if they had the support of a work-based wellness program. The program would provide flextime for all females in non-manufacturing positions, until their child reached the age of 6. The program would provide counseling on changing one's lifestyle patterns post-delivery on subjects such as sleep deprivation, cooking for the family, time management, relationships, etc.. There would be management support towards daily exercise. The cafeterias would serve healthy food options and the food served would be fresh and pure. These types of standards would allow a female to combine work and childcare in a healthier, less stressful, and more productive manner.

The number of females experiencing premature births would decrease. Due to a program that would be prevention-oriented, rather than crisis-oriented, awareness of the risks involved in certain behaviors would increase in the female population. There would be extensive health education prior to conception, so that when pregnancy does occur, the female can be more responsible in her beahvioral choices. Prior to conception, there would be enough time to lose weight, if the female is obese, and this could be done by incorporating exercise and healthy eating patterns in her lifestyle. She could also

undergo counseling for substance abuse, so as to decrease the risk of a premature birth from internal abuse. Behavioral patterns cannot change overnight, especially once the female is pregnant; therefore, to work towards changing those patterns prior to pregnancy, when there is less pressure psychologically on the female would appear to be the most practical approach.

Not only female but male employees would also benefit from the wellness program. Males that are married with a pregnant wife are under much stress as well. There is increased pressure to perform well at work so as not to lose one's job while she is pregnant, and maintain their health insurance coverage for the pregnancy. Being able to exercise daily on-site would also be a means of stress reduction in the male population.

Any employee who uses the wellness programis more apt to benefit by improved lifestyle patterns. The company will have fewer employees with obesity, alcoholism, high blood pressure, and other health problems. Productivity levels will rise as employees are better able to concentrate at work and have more energy to accomplish stressful tasks. There will be fewer workmen's compensation cases from accidents due to fatigue or carelessness. Performance levels will rise as employees become more motivated on the job, with less apathy and complaints.

The company will see a decrease in the overall healthcare costs due to the decreased incidence of major surgery and emergency room visits. Hospital stays will be shorter as employees are able to recover faster and easier. There will be fewer employees with health risks leading to health problems, which the

company pays for out of its benefits program. There will be less musculoskeletal injuries at work and at home, thus requiring fewer visits to orthopedic surgeons, neurosurgeons, chiropractors, and physical therapists. Employees will be on fewer and less costly medications due to quality control efforts. Some health conditions can be treated behaviorally, rather than with medications, but in most instances the primary means of treatment is medication. In addition, the employee can save the company by taking generic medication, when possible, rather than the name brand medication which can cost two to three times more. These are but a few of the possible ways in which healthcare costs would be reduced through a wellness program.

Team effectiveness would increase as a result of a wellness program. It is widely accepted that exercise decreases stress levels. Exercise can be useful when a manager and his/her employee disagree over an issue. Rather than letting the problem get out of control and occupying one's thoughts the entire day, decreasing productivity at work, the employee and/or manager could exercise for 30 minutes mid-day as a means to decrease tension. Another benefit to exercise is that it can serve as a means of building team unity. In an on-site fitness facility, both hourly and salaried employees exercise in the same place. When exercising off-site, they tend to exercise in different locations for two primary reasons: different types of preferred exercise, such as golf and bowling and different geographical locations of their homes. By exercising at the same facility, there is increased communication between the two types of workers. A fitness center also creates an environment where they can compete on an equal

basis, regardless of their educational background and respective positions within the company's internal structure. This forced equality boosts self-esteem based upon the individual's physical capability, rather than their job title or income. Additionally, respect develops between workers due to management's desire to spend time with their co-workers, without feeling threatened as in a performance review. In this way, when it comes time for a performance review, both sides understand and feel more comfortable with each other. This leads to improved and more effective reviews due to increased trust between the manager and employee.

Employee absenteeism sometimes varies between those employees that exercise and those that do not exercise. If an employee exercises, their health is improved and their immune system is stronger, so they are less prone to infection and missing days of work due to illness. In addition, fewer musculoskeletal injuries occur because of stronger muscles, ligaments, and in females, increased bone density. Less fractures and muscle tears occur when one performs moderate exercise. Fewer back injuries occur when employees are on an appropriate stretching and strengthening program to prevent back injuries. The three main predisposing factors towards a back injury are: tight hamstrings in the legs, weak abdominal muscles, and a tight and/or weak lower back. As a result one's posture may be poor as well. All of these factors can be improved through an exercise program, thereby decreasing the time taken off work by employees for back injuries (Corp X).

One-on-one relations between employees will improve as a result of

more team unity. With a wellness program, other personal factors that may be affecting employee productivity will be addressed and dealt with appropriately in a quality manner, as a work-related issue. One example is that of substance abuse. In addition to off-site programs, there should be an atmosphere of support at work for the employee trying to quit drinking. Currently substance abuse is viewed at Corp X as a confidential issue, which employees keep secret from their managers, due to fear of losing their jobs, real or unreal. The employee should be encouraged to exercise to reduce the stress involved in quitting, and co-workers should be verbally and physically supportive at work through internal memos, parties, and gifts. Outside of health-related issues, communication simply improves when co-workers are able to talk to each other outside of the factory or office. Quality fitness staff can increase this communication by sponsoring incentive programs and classes at the fitness center.

All ten outcomes are vital to any company that is concerned with supporting its employees so that they can compete effectively in a transitory, fast-paced, global market. In the 1990's workers are under more pressure and stress due to company downsizing, mergers and acquisitions, joint ventures, and outsourcing.

Chapter V

Discussion

As shown through the review of recent research, a person's behavior largely affects one's level of health in the long-term. Illness tales its toll on both the individual and any corporations who pay for employee health benefits. Rather than reacting to emergency health conditions, it is more cost-effective to implement prevention-based wellness programs as a means of avoiding high healthcare costs.

Pregnancy, unlike illnesses, is a normal event that occurs in females who desire to have a child. Thus it is necessary that companies with benefit plans take the necessary precautions in educating their female employees about the health risks associated with poor lifestyle patterns. If a prevention-based program is implemented, it is expected that the company will see substantial savings in its pregnancy costs. In addition, maternity leaves should be shorter due to the less time required due to complications before and after pregnancy. Prior to delivery the female should not have to be restricted to bed rest if she does not experience toxemia. After delivery, the female should be able to return to work earlier if she delivered the baby normally.

If a wellness program is implemented properly with the support of management, the cooperation of multiple departments, and a quality computer system, the program should be successful. With the support of management, the initial financial needs, necessary to launch a new program, will be met. With the

cooperation of multiple departments, changes and implementation will occur quickly, rather than slowly, so as to see results in a timely manner. With an initial setup and continued systems support for a computer database and network, wellness staff will be able to document and substantiate the expenditures, savings, and activities, so as to retain management support for the program.

Specifically regarding Corp X, a wellness program oriented towards decreasing the incidence of premature births could aid the company in decreasing the amount of dollars spent annually on healthcare benefits. Currently, Corp X is mainly focusing on how to decrease costs in the short-term by hiring contract personnel without benefits; by doing this, they immediately decrease the healthcare dollars spent on benefits claims with fewer employees on a benefits plan. But this still does not solve the problem of how to decrease the benefits costs of those employees left in-house. Rather than contracting, the company should focus more on reducing the claims paid out to employees by implementing a wellness program on-site with quality controls.

As discussed earlier, it would cost the company $200 per employee per year to have an on-site wellness program. If we estimate that the average duration of employment is ten years, $2000 would be paid out by the company during that time period. $2000 is much cheaper than the other alternatives relating to ill health such as a premature birth at $2000 per day, a heart attack at $50,000 in one week, or psychosis with a leave of absence pay of $2000 to the employee for one month plus an additional $2000 for a temporary employee. (These figures are estimates based upon current costs and pay scales at Corp X.)

To more clearly explain examples of cost differences between prevention-based and emergency-based healthcare, a few hypothetical costs for typical illnesses will be shown below in table format. The Prevention Program listed below addresses all five aspects of wellness, so that the program would benefit the entire employee population. Each employee might have different risks for various health problems, but a wellness program that is prevention-oriented should improve the health of all employees. For example, exercise not only helps lower blood pressure, it also can help prevent a premature birth due to toxemia.

Table 8

Cost Differences

Pregnancy

Situation #1>	*Prevention Program*	*Cost:*	*$1000/5 years*
	Term Delivery	Cost:	$4000
		Total Cost:	**$5000**
Situation #2>	No Prevention Program	Cost:	$0
	Premature Delivery	**Total Cost:**	**$50,000**/1 month
	(20 days on a respirator at $2000 per day and ancillary charges)		

Cardiovascular Disease

Situation #1>	Prevention Program	Total Cost:	**$1000**/5 years
	Cardiovascular **Fitness**	Cost:	$0
Situation #2>	No Prevention Program	Cost:	$0
	Cardiovascular **Disease**	Total Cost:	**$50,000**/5 months
	(heart attack, bypass surgery, and cardiac rehabilitation)		

For Corp X to implement a wellness program, specific goals and accompanying objectives need to be determined. An analysis should be conducted to determine exactly what statistics need to be tracked in order to measure cost-effectiveness on a quarterly basis. These statistics should be monitored by the wellness manager with the use of a reliable and accessible database. The database should be kept current and programs used to analyze data should be updated periodically. Only with accurate data can the manager determine whether the prevention-based program is achieving its objectives.

The goals and objectives should be geared towards the objectives of the corporation. As of March, 1994, Corp X had three strategic business objectives:

1. Improve our financial performance.
2. Be the preferred supplier to our customers.
3. Persist in achieving total quality in everything we do. (Corp X)

With these objectives being crucial at this time, it is imperative that Corp X observe its competitors on the supply-side so as to determine how Corp X can be better than the others. Not only should Corp X observe <u>what</u> processes are involved in the mainline production of the competitors' products, Corp X should observe <u>how</u> those processes are implemented. Many of Corp X's top competitors have fitness programs that far exceed their own, and perhaps these programs are part of what makes the competitors' employees more productive, creative, and/or enthusiastic.

A quality product cannot be produced without quality employees. Quality employees will not remain at a company that does not support a balanced outlook

towards production and performance. Productivity can only be improved to the extent that each employee can think clearly on the job and have the energy to perform at his/her potential. Working fewer employees more hours does not lead to a positive atmosphere and healthy relationships between co-workers. Corp X will need to discover other means of increasing its profit-margins besides downsizing and outsourcing, or else by the year 2000, Corp X will no longer have a strong team of employees.

The author contends that one of the main means to that end is a corporate-based wellness program. It will boost morale, increase productivity, decrease absenteeism, and improve the health and welfare of its employees. Males and females will be able to perform better under stress with wellness activities as part of their daily lifestyle. Females will feel secure in pregnancy knowing they are taking care of their bodies as they should and knowing that they will have a healthy, supportive environment to which they can return after the child is born.

The risks involved are few. There are limitations in that the field of wellness is relatively new to corporations and much of the data on current programs is not error-free. More research needs to be conducted on corporate wellness programs to determine the extent of the costs and benefits associated with such programs. One of the reasons why the research available is not totally accurate is that proper computer systems were not designed prior to the accumulation of data. Needs were not analyzed thoroughly which has led to incomplete and erroneous data accumulation. This is why a good database is so

vital to a wellness program.

Some limitations to the study include: 1) the number of previous research studies evaluated and 2) perhaps some author-based bias exists in that the author is a wellness manager, and not the executive officer of the corporation. Perhaps the author's viewpoint is different from the viewpoint of senior managers within Corp X, and this attempt at the development of a wellness program will be thwarted due to other priorities.

Still, the suggestion for the future of Corp X, and other companies as well, is that they implement a wellness program if possible. In order to use these programs as a base of information for further research, each corporation should focus in on one specific goal and work towards achieving it, rather that trying to achieve too many goals at once. The recommendation for Corp X is to focus on reducing the incidence of premature births for the following reasons:

1. The costs are obvious.
2. The behavioral causes are obvious.
3. The pace of research in this area is rapid.
4. Pregnancy costs are rising due to more females in the workplace.
5. Many premature births are preventable.
6. Corp X has data to substantiate the past and current costs.
7. If morale does not improve, maternity benefits will be misused.
8. The cost of program implementation is minimal.
9. Due to the rising costs of living, dual-income homes are necessary.
10. Teamwork will improve.

In closing, there are some current statistics which highlight the need for developing a prevention-oriented wellness program which focuses on reducing the incidence of premature births. "The Office of Technology Assessment reports that childbirth health care costs for a single very low birth weight baby can top $150,000, and this figure escalates every year" (An Ounce).

> "U.S. companies and their employees pay about $5.6 billion a year to care for babies born prematurely or with other complications to mothers covered by insurance plans. A growing number of companies have already established aggressive prenatal and so-called wellness programs aimed at helping employees and their dependents quit smoking and change other habits that can lead to babies with low birth weight and other problems. In addition to the human toll, medical costs for premature infants in extreme cases have exceeded $1 million. In one study, researchers found that in severe cases, charges averaged more than $70,000 for the infant alone, compared with the average for a normal newborn of $1,250. Other research indicates that prevention programs save $3.38 for every dollar invested" (Infant Health).

"According to the Washington Business Group on Health, 80% of employed women will become pregnant during their careers" (Swerdin).

To reduce the incidence of premature births and the associated costs to a corporation will not be an easy task. It will require teamwork between and within many departments and the project will require management's support. But after initial implementation, it will simply be a matter of continuing to offer quality programs to the employees so that the benefits are high and the costs are minimal. The bottom line is more important now than ever, and by implementing a wellness program, Corp X should be able to accomplish strategic business objectives in a cost-effective manner. Not only should Corp X benefit financially, but employee morale and teamwork should improve dramatically.

Vocabulary Addendum

Definitions>

Anemia: too few red blood cells (Harrison, 89)
Apnea: The absence of breathing for more than 15 seconds. (Harrison, 74)
Birth Weight: The weight of a neonate determined immediately after delivery or as soon thereafter as feasible. It should be expressed to the nearest gram. (Guidelines,310)
Bradycardia: a lower than normal heart rate...fewer than 100 times a minute for a baby. (Harrison, 74)
Cervix: Located at the back of the vagina, it is the opening into the uterus. (Aikey-Keller,211)
Continuous Positive Airway Pressure (CPAP): a steady stream of pressurized air delivered into the baby's lungs to keep them partially inflated at all times. (Harrison, 62)
Fallopian Tube: Either of a pair of slender ducts, that connect the uterus to the region of each of the ovaries, where conception occurs, prior to implantation of the egg to the uterus wall for growth. (Stress, 488)
Fetal Death: Death prior to the complete expulsion or extraction from the mother. (Guidelines,310)
Gestational Age: The number of completed weeks that have elapsed between the first day of the last menstrual period (not the presumed time of conception) and the date of delivery, irrespective of whether the gestation results in a live birth or a fetal death. (Guidelines,310)
Gestational Diabetes: A glucose intolerance triggered by the onset of pregnancy. It usually resolves itself after delivery. (Aikey-Keller, 212)
Gynecologist: A doctor who specializes in the study of women's reproductive, urinary, and rectal health. (Aikey-Keller, 213)
Infant Death: Any death at any time from birth up to, but not including, one year of age (364 days, 23 hours, 59 minutes from the moment of birth). (Guidelines,312)
Jaundice: a temporary yellowing of the skin and whotes of the eyes due to an elevated level of bilirubin in the baby's blood from inefficient enzyme activity in the liver (Harrison, 86)
Labor: the climax of pregnancy during which the fetus(baby) travels from the uterus to the outside world (Olkin, 172)
Low Birth Weight: Any neonate, regardless of gestational age, whose weight at birth is less than 2,500 g. (Guidelines,310)
Maternal Death: The death of a woman from any cause related to or aggravated by pregnancy or its management, but not from accidental or incidental causes. (Guidelines,312)

Neonatal Death: Death of a liveborn neonate before the neonate becomes 28 days old (up to and including 27 days, 23 hours, 59 minutes from the moment of birth). (Guidelines,312)
Neonate: a newborn child (Stress, 837)
Obstetrician: A doctor who specializes in the care of a woman during her prenatal period, labor and delivery, and postpartum recovery. (Aikey-Keller, 213)
Parity: *1. The condition of having borne offspring. 2. The number of children* borne by one woman. (Stress, 903)
Persistent Fetal Circulation (PFC) & Patent Ductus Arteriosus (PDA): two conditions occurring in most premature babies weighing under 1750 grams, whereby an opening in the heart does not close, causing inefficient circulation of oxygenated blood to the heart, lungs, organs, and extremities (Harrison, 70)
Placenta: The vascular, disc-shaped organ connecting the mother and fetus in utero. Nutrients and oxygen are filtered through this life-sustaining organ. (Aikey-Keller, 213)
Preconceptional: The time occurring before the conception of the child. (Aikey-Keller, 214)
Preterm: Any neonate whose birth occurs through the end of the last day of the 37th week (259th day), following onset of the last menstrual period. (Guidelines,310)
Postterm: Any neonate whose birth occurs from the beginning of the first day (295th day) of the 43rd week following onset of the last menstrual period. (Guidelines,310)
Respiratory Dystress Syndrome(RDS): a breathing disorder of premature babies caused by the baby's inability to produce surfactant, the fatty substance that coats the alvoloi - the lungs' tiny air sacs - and prevents them from collapsing. (Harrison, 58)
Term: Any neonate whose birth occurs from the beginning of the first day (260th day) of the 38th week, through the end of the last day of the 42nd week (294th day), following onset of the last menstrual period. (Guidelines,310)
Toxemia: Also known as preeclampsia, it is a pregnancy-induced condition resulting in high blood pressure. (Aikey-Keller, 214)
Uterus: The hollow muscular organ housed deep in the woman's pelvic cavity. It is designed to support the life of a fetus until birth. (Aikey-Keller, 214)
Vagina: the passage leading from the external genital orifice to the uterus (Stress, 1334)

Works Cited

Aikey-Keller, B., R.N. Preconception: A Woman's Guide to Preparing for Pregnancy and Parenthood. Santa Fe: John Muir Publications, 1990.

"An Ounce of Prevention." St. Louis Commerce September 1992: 54.

Anonymous Interview of Nurse. February, 1994.

Artal, R., MD, D.I. Masaki, MD, N. Khodiguian, PhD, Y. Romem, MD, S. Rutherford, MD, and R.A. Wiswell, PhD. "Exercise Prescription in Pregnancy: Weight-bearing Versus Non-weight-bearing Exercise." American Journal of Obstetrics & Gynecology. 161 (1989): 1464-69.

Boswell, Kathy, RN, BSN. Neonatal Intensive Care Unit Family Support Coordinator, St. John's Mercy Hospital. Personal Interview. 1994.

Calhoun, Byron C. MD, and Peter T. Watson, FACOG, MD. "The Cost of Maternal Cocaine Abuse: I. Perinatal Cost." Obstetrics & Gynecology 78.5 (1991): 731-34.

Clapp, J.F. III, MD. "The Course of Labor After Endurance Exercise During Pregnancy." American Journal of Obstetrics & Gynecology 163 (1990): 1799-1805.

Clapp, J.F. III, MD, and E.L. Capeless, MD. "Neonatal Morphometrics After Endurance Exercise During Pregnancy." American Journal of Obstetrics & Gynecology 163 (1990): 1805-1811.

Corp X. Benefits, EOP, Medical, Recreation Departments. Personal Interviews. 1993-1994.

De Muylder, X., MD, MS, S. Wesel, MD, M. Dramaix, MS, Candeur, M. "A Woman's Attitude Toward Pregnancy: Can It Predispose Her to Preterm Labor?" The Journal of Reproductive Medicine 37.4 (1992): 339-432.

Donohoo, Nancy, Wellness Director. Personal Interviews. 1994

Ernhart, C.B., PhD, R.J. Sokol, MD, S. Martier, MSSA, P. Moron, BS, D. Nadler, BS, J.W. Ager, PhD, and A. Wolf, PhD. "Alcohol Teratogenicity in the Human: A Detailed Assessment of Specificity, Critical Period, and Threshold." American Journal of Obstetrics & Gynecology 156 (1987): 33-39.

"Fetal Alcohol Study." USA TODAY. 7 May 1993.

Fetal Alcohol Syndrome. St.Louis: The Edgewood Program, St.John's Mercy Hospital, 1993.

Fries, M.H. "Facial Features of Infants Exposed Prenatally to Cocaine." Teratology. 48 (1993): 413-420.

Forrest, J.D., PhD. "Timing of Reproductive Life Stages." Obstetrics & Gynecology 82.1 (1993): 105-111.

Guidelines for Perinatal Care. 2nd ed. Elk Grove Village: American Academy of Pediatrics and Washington, D.C.: American College of Obstetricians & Gynecologists, 1988.

Harrison, H. The Premature Baby Book. New York: St. Martin's Press, 1983.

"Having a Healthy Baby." Help Your Health: You Can, We Can. Peoples Drug Stores, Inc. 1985.

Himes, Joe E., M.D. and Michael Sparacino, D.O. "Exercise and Pregnancy." Deaconess Sports Medicine Center 30 January 1993.

Iams, Jay D., MD. "Current Status of Prematurity Prevention." Editorial. JAMA 262.2 (1989): 265-66.

"Infant Health problems Cost Business Billions." Wall Street Journal 1 May, 1993: B1, B5.

Lederman, S.A., PhD. "Review: The Effect of Pregnancy Weight Gain on Later Obesity." Obstetrics & Gynecology 82.1 (1993): 148-155.

Mamelle,N., A. Measson, F. Munoz, M. Audras de la Bastie, P. Gerin, M.T. Hanauer, P. Collet, and J. Guyotat. "Development and Use of a Self-Administered Questionnaire for Assessment of Psychologic Attitudes Toward Pregnancy and Their Relation to a Subsequent Premature Birth." American Journal of Epidemiology 130.5 (1989): 989-997.

Maniscalco, W.M., MD, J.W. Kendig, MD and D.L. Shapiro, MD. "Surfactant Replacement Therapy: Impact on Hospital Charges for Premature Infants With Respiratory Distress Syndrome." Pediatrics 83.1 (1989): 1-6.

McAllister, R., MPH, MSEH, and C.E. Broeder, PhD. "Wellness Strategies Help Workers Adopt Healthy Habits in Lifestyles." Occupational Health & Safety 62.8 (1993): 50-60.

McCormick, M.C., MD, ScD, J.C. Bernbaum, MD, J.M. Eisenberg, MD, MBA, S.L. Kustra and E. Finnegan. "Costs Incurred by Parents of Very Low Birth Weight Infants After the Initial Neonatal Hospitalization." Pediatrics 88.3 (1991): 533-541.

"Of Caffeine and Miscarriages." Tufts University Diet & Nutrition Newsletter 11.12 (1994): 1.

Olkin, S.K., M.S. Positive Pregnancy Fitness. Garden City Park: Avery Publishing Group, 1987.

Pernoll, Martin L., M.D. Obstetric & Gynecologic Diagnosis & Treatment. 7th ed. East Norwalk: Appleton & Lange, 1991.

Rhodes, Torunn T. M.D. "Financial and Emotional Cost Of Bronchopulmonary Dysplasia." Clinical Pediatrics July 1993: 393-400.

St.John's Mercy Hospital NICU Nurse. Personal Interview. February, 1994.

"Stress." The American Heritage Dictionary. Boston: Houghton Mifflin, 1991.

Swerdin, Marcy, "Corporate Prenatal Programs: Healthier Babies, Healthier Bottom Line." The BNA Special Report Series on Work & Family. Bureau of National Affairs. January, 1991.

Wadhwa, P.D., MD, PhD, C.A. Sandman, PhD, M. Porto, MD, C. Dunkel-Schetter, PhD, and T.J. Garite, MD. "The Association Between Prenatal Stress and Infant Birth Weight and Gestational Age at Birth: A Prospective Investigation." American Journal of Obstetrics and Gynecology 169 (1993): 858-865.

Welch, Dawn. "In Shape: Dangerous Highs." Shape November 1993: 28.

Young, Stephanie. "Smoking and SIDS." "Exercise and bigger babies." Glamour February 1994: 42.