Original Article

# Quality of prenatal care as it relates to the source of prenatal care

*Abstract*

**Context:** Prenatal care is commonly understood to have a beneficial impact on pregnancy outcome. Child survival is directly dependent on good maternal health and nutrition. **Aim:** To study the variation in counseling of prenatal care measures at different sources of care. **Materials and Methods:** A cohort of 5,380 observations from the New York State Pregnancy Risk Assessment Monitoring System were analyzed to study the relationship between site/source of prenatal care and quality/content of prenatal care, and the influence of maternal characteristics therewith. Statistical Analysis Software, version 8 (SAS-V8) was used for analysis. **Results:** The most common source of care was doctor of medicine/health managed care organization (75.89%) followed by hospital clinic (11.22%), community health center (6.5%), health department clinic (4.05%), and others (2.3%). Health department clinic showed a greater prevalence proportion for counseling in all of the five prenatal care measures (talked about breastfeeding, illegal drugs, nutrition, baby's growth, and smoking) when compared with the remaining four sources of care. Majority of private clinic attendees were whites (87.8%), older mothers (20.7%), and/or high income groups (67.8%). Young mothers preferred visiting health department clinic (22.5%). Average income mothers preferred accessing healthcare from the community health center (26.9%). **Conclusion:** Variation in quality of care among various sources of care is likely to occur. Maternal characteristics could also influence the selection of source of care.

**Key words:** Maternal characteristics, source of prenatal care, quality of prenatal care

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## INTRODUCTION

As per World Health Organization (WHO) estimates, worldwide about 358,000 women die during pregnancy and childbirth every year.[1] The annual rate of decline in maternal mortality is less than half of what is needed to achieve the Millennium Development Goal (MDG) target of reducing the maternal mortality ratio by 75% between 1990 and 2015. This will require an annual decline of 5.5%. The 34% decline since 1990 translates into an average annual decline of just 2.3%.[2]

Prenatal care is commonly understood to have a beneficial impact on pregnancy outcome. It provides an opportunity for healthcare providers to counsel mothers about behaviors that increase the likelihood of favorable maternal and fetal outcomes, and also about adverse pregnancy outcomes such as maternal morbidity/mortality, preterm birth, low birth weight, small-for-gestational age, and still birth.

Evidence related to the content, frequency, and timing of visits in antenatal care is known to have a definite influence on the outcome of pregnancy. Maternal reports on the quality/content of prenatal care (QPC) are likely to differ by the site/source of prenatal care (SPC) and maternal characteristics could influence the selection of SPC.

The present study has been conducted with an aim of studying the variation in counseling for prenatal care measures at different sources of care. In this context, the objectives include studying the relationship between the source of prenatal care and the quality of care administered, and simultaneously studying the influence of maternal characteristics on the selection of source of prenatal care.

A study by Colley *et al.*,[3] showed that Pregnancy risk assessment monitoring system (PRAMS) is a unique and valuable maternal and child health data source. Petersen *et al.*'s,[4] study results show that

women in publicly funded and hospital clinics are more likely to receive adequate prenatal advise during pregnancy, than women in private offices and Health Managed Care Organizations (HMOs).

In a study by Sable and Patton,[5] the proportion of women who received prenatal advise to breastfeed and who intend to breastfeed were higher among married, Caucasian non-Hispanic, and primiparous mothers and women who were not enrolled in the Woman, Infants and Children Program. Leppert *et al.*'s,[6] study found that women aged 13-19 years (adolescents) were at increased risk for low birth weight babies (<2,500 g) and for preterm infants (<38 weeks gestation) even after controlling for antenatal care, ethnicity, and other factors.

Mustard and Roos[7] study shows that infants born to women in the poorest income quintile had lower birth weight than infants born to wealthier women, the reason being inadequate prenatal care among this group. The adequacy of prenatal care utilization (APNCU) index to study low birth weight and the bias therewith was studied by Koroukian and Rimm,[8] where-in an increasing number of prenatal visits were associated with improved birth outcomes.

Wehby *et al.*'s,[9] study suggests that more frequent use of prenatal care can increase birth weight significantly in Brazil. Beeckman *et al.*'s,[10] study shows a significantly lower category of content and timing of antenatal care among lower educated women (odds ratio (OR): 0.58; 95% confidence interval (CI): 0.37-0.92), women of Maghreb origin (OR: 0.38; 95% CI: 0.22-0.66), and women with a higher discontinuity of care (OR: 0.56; 95% CI: 0.34-0.90).

## MATERIALS AND METHODS

PRAMS is an ongoing population-based surveillance system of maternal behaviors and experiences, before and during pregnancy and shortly after delivery of a live born infant. PRAMS was developed in 1987 by the Centre for Disease Control and Prevention (CDC) as part of their initiative to reduce poor pregnancy outcomes. Birth certificate is the primary tool for population-based surveillance of the condition of infants at birth and maternal status during pregnancy. Alternatively, PRAMS provides an important supplement to data from vital records for planning and assessing perinatal health programs on a state level.

Every month PRAMS samples approximately 130 live births from the New York State's birth certificate registry between 2 and 4 months after delivery. Mothers are sent up to three questionnaires with telephone follow-up for nonresponders. The survey consists of 68 questions that cover the period before conception, pregnancy, and the first few months after delivery. All samples were reported in an unweighted format.

### Statistical analysis

Our research study design is retrospective record-based cohort in nature. Using PRAMS data from 1996 to 1999, a total of 5,380 observations were used to study the relationship between SPC and QPC. Descriptive analysis (bivariate) and subsequent regression analysis were done using Statistical Analysis Software, version 8 (SAS-V8) with callable software: Survey Data Analysis (SUDAAN). Simple stratified analysis was done using weighted data in SUDAAN.

### The variables used in the analysis include

SPC: Hospital clinic (HC), health department clinic (HDC), Doctor of Medicine (MD)/HMO, community health center (CHC).

QPC: Outcome measures include reporting of counseling received during prenatal visits. QPC include whether talked about breastfeeding, illegal drugs, nutrition, baby's growth, and smoking,

Maternal characteristics (race: White, non-white; age: <20 years (young), 20-29 years (middle), 30+ years (older); income: <15,999$ (low), 16,000-29,999$ (middle), >30,000$ (high).

## RESULTS

The relationship of SPC with QPC was analyzed for the 5,380 PRAMS respondents. The possibility of potential confounding factor such as maternal characteristics was considered. Among 5,380 observations from 1996 to 1999 of the New York State PRAMS dataset, the most common SPC was MD/HMO ($n$ = 4,083, proportion (p) = 75.89%) followed by HC ($n$ = 604, p = 11.22%), CHC ($n$ = 218, p = 6.5%), HDC ($n$ = 350, p = 4.05%), and others ($n$ = 126, p = 2.3%) [Table 1 and Figure 1].

The following figure illustrates the counseling efficiency of each SPC stratified by the QPC variable. The total values have been depicted (in terms of the percentage talked), irrespective of the maternal characteristics. HDC (>84%) counseled best and MD/

**Table 1: Source of prenatal care as it relates to quality/content of prenatal care (total values)**

| QPC | Sample size (*n*) | Source of prenatal care | | | |
|---|---|---|---|---|---|
| | | Hospital clinic | Health department Clinic | MD/HMO | Community health center |
| Breast feeding | 4,182 | 539 | 210 | 3,127 | 306 |
| Illegal drugs | 3,405 | 526 | 194 | 2,389 | 296 |
| Nutrition | 4,513 | 550 | 214 | 3,430 | 319 |
| Baby's growth | 4,474 | 519 | 203 | 3,430 | 322 |
| Smoking | 3,956 | 513 | 209 | 2,919 | 315 |

The table shows the number of mothers counseled about QPC in each of the SPC's. The total numbers are included. QPC = Quality of prenatal care, SPC = source of prenatal care, MD = Doctor of Medicine, HMO = Health Managed Care Organizations

HMOs counseled badly (≤84%) for all the prenatal care measures, irrespective of the maternal characteristics.

## Breastfeeding

Stratified analysis by breastfeeding as a maternal characteristic shows that HDC counseled best for non-white people (100%), older mothers (100%), middle-aged mothers (>98%), and high income mothers (>99%). HC counseled best for young mothers (>98%). MD/HMOs fared badly on most counts, whereas CHCs performed badly for older mothers (<68%) and middle income group (<82%).

## Nutrition

For the variable nutrition, stratified analysis shows that HDC counseled best among non-white (100%), mothers of middle and older age groups (>97%), and for all income groups (>96%). CHC counseled best among younger mothers (>99%). HC fared better for older mothers (>93%) and MD/HMOs performed badly across all strata of maternal characteristics.

## Illegal drug use

The maternal characteristic illegal drug use when analyzed with various SPCs shows that HDC counseled best among older mothers (>99%) and middle income group (>94%). CHC counseled best among non-white mothers (>95%). MD/HMOs counseled better among young mothers (>88%), but fared badly with regard to other maternal characteristics.

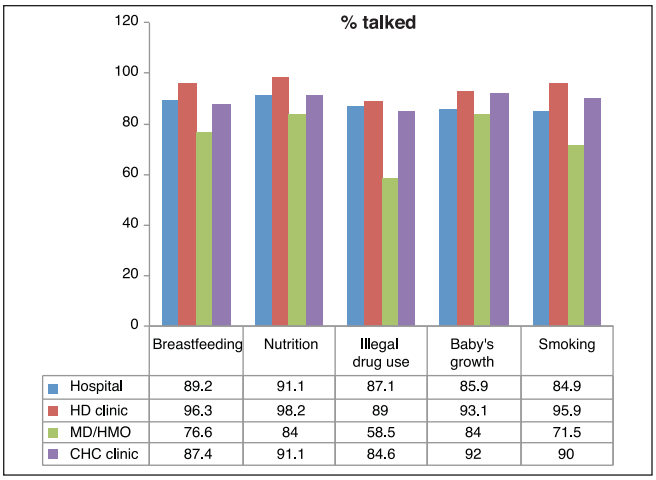


**Figure 1:** Source of prenatal care (total values) wherein the following QPC were talked about

## Baby's growth

A stratified analysis for the variable baby's growth shows that HDC performed best among non-white (>96%) and high income mothers (>91%). CHC fared best among low income (>95%) and young age group (>99%). HC and MD/HMOs counseled badly among most strata of maternal characteristics.

## Smoking

Smoking as a variable when analyzed with SPC shows that HDC counseled best across all maternal characteristics (³94%). CHC counseled better among non-white (>94%), low (>92%), and high income groups (>91%). HC fared better among low income group (>89%) and MD/HMOs counseled better among the lower age group mothers (>84%) [Table 2].

Among the mothers seeking healthcare at MD/HMO, 87.8% were whites. Data shows that a large number of non-white mothers sought healthcare from HC, as they comprised 30% of attendees at HC.

Young mothers preferred visiting HDCs (22.5%), middle-aged mothers preferred visiting HC (73.2%), and older mothers accessed healthcare from MD/HMOs (20.7%).

Low income mothers (<15,999) preferred visiting HC, as 53.6% of HC attendees were of the low income group. Average income group (16,000-29,999) accessed healthcare from CHC, as data shows that 26.9% of CHC attendees were of the average income group. High income group (30,000+) preferred visiting the MD/HMO, as evidenced by data which shows that 67.8% of MD/HMO attendees were of the high income group [Table 3].

Including all the SPCs, white mothers were best counseled about nutrition (84.9%) and least counseled about illegal drug use (61.7%) when compared with other QPCs. Non-white mothers were best counseled about baby's growth (90.1%) and least counseled about illegal drug use (70.8%). QPC

**Table 2: Source of prenatal care as it relates to maternal characteristics**

| Maternal characteristics | | Sample size (*n*) | Source of prenatal care (column %) | | | |
|---|---|---|---|---|---|---|
| | | | Hospital clinic (%) | Health department clinic (%) | MD/HMO (%) | Community health center (%) |
| Race | White | 4,416 | 419 (69.4) | 160 (73.4) | 3585 (87.8) | 252 (72) |
| | Non-white | 698 | 181 (30) | 49 (22.5) | 383 (9.4) | 85 (24.3) |
| Maternal age | <20 | 393 | 95 (15.7) | 49 (22.5) | 194 (4.8) | 55 (15.7) |
| | 20-29 | 3,779 | 442 (73.2) | 141 (64.7) | 2949 (72.2) | 247 (70.6) |
| | 30+ | 971 | 65 (10.8) | 23 (10.6) | 846 (20.7) | 37 (10.6) |
| Income | <15,999 | 1,149 | 324 (53.6) | 109 (50) | 560 (13.7) | 156 (44.6) |
| | 16,000-29,999 | 917 | 157 (26) | 53 (24.3) | 613 (15.0) | 94 (26.9) |
| | 30,000+ | 3,040 | 120 (19.9) | 52 (23.9) | 2770 (67.8) | 98 (28) |

The table reflects the choice of mothers regarding SPC stratified by their maternal characteristics. Appropriate column percentages are included. SPC = Source of prenatal care, MD = Doctor of Medicine, HMO = Health Managed Care Organizations

when assessed with age as a maternal characteristic, the data shows that mothers were best counseled about nutrition across all age strata. However, young mothers were less counseled about breastfeeding (85%), middle age mothers and older mothers were less counseled about illegal drug use (62.4 and 46.4%, respectively). Low and average income mothers were best counseled about nutrition (88 and 84.5%, respectively), whereas high income mothers were best counseled about baby's growth (87.3%). Across all income groups, illegal drug use was least counseled when compared with other QPC [Table 4].

Multivariate analysis was conducted using the SAS-V8. Results from the statistical model shows that QPC provided at HDC was significantly good ($P < 0.0001$) when compared with MD/HMO. Also, mothers with an income of $30,000+ were significantly likely ($P < 0.00001$) to receive good QPC when compared with low income groups (< $15,999). Older mothers (30+ years) were significantly likely ($P < 0.00001$) to receive good QPC when compared with the younger mothers (< 20 years).

Quantification of the association shows that QPC provided at HDC was twice (OR = 2.07, 95% CI: 1.6–2.518) better than that provided with MD/HMO. Also, mothers with an income of $30,000+ were one and a half times (OR = 1.56, 95% CI: 1.289–1.888) more likely to receive good QPC when compared with low income groups (<$15,999). Older mothers (30+ years) were also twice (OR = 2.096, 95% CI: 1.463–3.003) as likely to receive good QPC when compared with the younger mothers (< 20 years).

## DISCUSSION

The data for our study is derived from PRAMS surveillance wherein mothers are surveyed with questionnaires and telephone follow-up is

**Table 3: Quality of prenatal care as it relates to maternal characteristics**

| Maternal characteristics | | Sample size (*n*) | Quality of prenatal care (QPC) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Breast feeding | Illegal drugs | Nutrition | Baby's growth | Smoking |
| Race | White | 4,416 | 3,359 (76.1%) | 2,724 (61.7%) | 3,748 (84.9%) | 3,659 (82.9%) | 3,307 (74.9%) |
| | Non-white | 698 | 569 (81.5%) | 494 (70.8%) | 618 (88.5%) | 629 (90.1%) | 543 (77.8%) |
| Maternal age | <20 | 393 | 334 (85%) | 338 (86%) | 366 (93.1%) | 362 (92.1%) | 357 (90.8%) |
| | 20-29 | 3,779 | 2,890 (76.5%) | 2,358 (62.4%) | 3,224 (85.3%) | 3,175 (84%) | 2,869 (75.9%) |
| | 30+ | 971 | 606 (62.4%) | 451 (46.4%) | 776 (79.9%) | 751 (77.3%) | 624 (64.3%) |
| Income | <15,999 | 1,149 | 893 (77.7%) | 835 (72.7%) | 1,011 (88%) | 967 (84.2%) | 893 (77.7%) |
| | 16,000-29,999 | 917 | 667 (72.7%) | 606 (66.1%) | 775 (84.5%) | 737 (80.4%) | 665 (72.5%) |
| | 30,000+ | 3,040 | 2,438 (80.2%) | 1,847 (60.8%) | 2,650 (87.2%) | 2,654 (87.3%) | 2,362 (77.7%) |

The given table illustrates the proportion of mothers counseled regarding QPC, stratified by their maternal characteristics

**Table 4: The logistic procedure (SAS-V8)**

**Analysis of maximum likelihood estimates**

| Parameter | DF | Estimate | Standard error | Wald chi-square | Pr>Chi-square |
|---|---|---|---|---|---|
| Intercept | 1 | –2.3203 | 0.2288 | 102.8587 | <0.0001 |
| Hospital clinic | 1 | –0.6482 | 0.3590 | 3.2596 | 0.0710 |
| Health department | 1 | 0.6969 | 0.1156 | 36.3200 | <0.0001 |
| Community health center | 1 | 0.1629 | 0.2043 | 0.6359 | 0.4252 |
| 16,0000-29,999 | 1 | 0.0561 | 0.1243 | 0.2040 | 0.6515 |
| 30,000+ | 1 | 0.4446 | 0.0974 | 20.8143 | <0.0001 |
| 20-29 years | 1 | 0.3285 | 0.1718 | 3.6551 | 0.0559 |
| 30+ years | 1 | 0.7399 | 0.1835 | 16.2629 | <0.0001 |
| Non-white | 1 | –0.1533 | 0.1083 | 2.0057 | 0.1567 |

Odds ratio estimates

| Effect | Point estimate | 95% Wald confidence limits |
|---|---|---|
| Hospital clinic | 0.523 | 0.259-1.057 |
| Health department | 2.007 | 1.6-2.518 |
| Community health center | 1.177 | 0.789-1.756 |
| 16,000-29,9999 | 1.058 | 0.829-1.349 |
| 30,000+ | 1.560 | 1.289-1.888 |
| 20-29 years | 1.389 | 0.992-1.945 |
| 30+ years | 2.096 | 1.463-3.003 |
| Non-white | 0.858 | 0.694-1.061 |

The table depicts the results of multivariate analysis, wherein the model determines the statistical association of QPC at various SPC and the influence of maternal characteristics. Quantified values of the association are also included. QPC = Quality of prenatal care, SPC = source of prenatal care, SAS-V8 = Statistical Analysis Software, version 8

done for nonresponders. This conforms to the results from Colley *et al*.'s,[3] study; which shows that the mail/telephone methodology used in PRAMS is an effective means of reaching postpartal women.

Our study shows that among the 5,380 PRAMS respondents, the most common SPC is MD/HMO (75.89%). The prevalence risk of mothers accessing healthcare at the remaining SPC include HC (11.22%), CHC (5.5%), HDC (3.05%), and others (4.34%).

White women predominantly visited MD/HMOs (87.8%) compared to non-white women who majorly accessed healthcare from HC (~60%). Race was observed to be a consistent predictor of PRAMS response in Colley *et al*.'s,[3] study; the data regarding which was not analyzed in our study.

HDC was most sought after by young mothers (22.5%), whereas a majority of middle-aged mothers accessed healthcare at HC (73.2%). MD/HMOs as a SPC was preferred by older mothers (20.7%). In comparison, Leppert *et al*.'s[6] study concluded that the amount of antenatal care is a more important predictor of pregnancy outcome than was maternal age.

Low income group (53.6%) preferred accessing healthcare from HC, whereas the average income group (26.9%) preferred CHCs. Among mothers seeking prenatal care at MD/HMOs, 67.8% were of the high income group.

Our study results show that counseling at HDC was most efficient with regard to all the prenatal care measures (breastfeeding, nutrition, drug use, baby's growth, and smoking), when compared with the remaining four SPCs. MD/HMOs counseled less, wherein a comparative analysis shows that preventive counseling for all the five topics was less (≤ 84%) when compared to the high (> 84%) percentage among all other SPCs. This is in concurrence with the results from Petersen *et al*.'s,[4] study which shows that women in publicly funded and hospital clinics are more likely to receive adequate prenatal advise during pregnancy than women in private offices and HMOs.

In our study, the data shows that irrespective of the maternal characteristics among HDC attendees the percentage of mothers who were spoken about breastfeeding was 96.3%, nutrition was 98.2%, drug use was 89%, baby's growth was 93.1%, and smoking was 95.9%. In comparison, among MD/HMO attendees the percentage of mothers who were spoken about breastfeeding was 76.6%, nutrition was 84%, drug use was 58.5%, baby's growth was 84%, and smoking was 71.5%. The results could be compared with Sable and Patton's[5] study, wherein only 37% of the study population reported that their providers advised them about breastfeeding.

Data analysis (considering all SPCs totally) for maternal characteristics influencing QPC shows that white mothers were best counseled about nutrition (84.9%) and least counseled about illegal drug use (61.7%). Non-white mothers were best counseled about baby's growth (90.1%) and least counseled about illegal drug use (70.8%).

The QPC data when assessed with age as a maternal characteristic shows that mothers were best counseled about nutrition across all age strata. However, young mothers were less counseled about breastfeeding (85%), middle age mothers and older mothers were less counseled about illegal drug use (62.4 and 46.4%, respectively).

Low and average income mothers were best counseled about nutrition (88 and 84.5%, respectively), whereas high income mothers were best counseled about baby's growth (87.3%). Across all income groups, illegal drug use was least counseled when compared with other QPC. In comparison, inadequate prenatal care was observed among low income women in Mustard and Roos's[7] study.

Multivariate analysis shows that good QPC was significantly associated with HDC (twice likely than MD/HMO), high income mothers (one and half times likely than low income groups), and older mothers (twice likely than younger mothers).

Based upon these prevalence data, we can conclude that variation in QPC among various SPC is likely. Maternal characteristics could likely influence the selection of SPC. Also the number of antenatal care visits could determine the birth outcome, which was not considered in our study. This association was considered in Koroukian and Rimm's[8] study which shows a direct association of increasing prenatal visits with improved birth outcome. Also, Wehby *et al*.'s,[9] study suggests that more frequent use of prenatal care can increase birth weight significantly. A significantly lower content and timing of care during pregnancy was found in Beeckman *et al*.'s,[10] study for women with a higher discontinuity of care.

## CONCLUSION

The study advances current knowledge about the practice of preventive health counseling during prenatal care. It shows that variation exists in QPC among various SPC and maternal characteristics might influence the selection of SPC.

Child survival is directly dependent on good maternal health and nutrition. The strategies which are being devised for improving maternal and child health and their subsequent implementation for survival of the said vulnerable group, are closely related and need to be provided through a continuum of care approach.

Indices of prenatal care such as the Kessner index, GINDEX (Graduated prenatal care utilization index) or APNCU[8] could be used. Such models analyze the relationship between the adequacy of prenatal care and birth outcomes.

### Limitations

- Preventive health counseling as reported by the patient might be different from what the healthcare provider reports. It could also be influenced by factors such as timing and number of prenatal visits.
- Recall bias is a potential problem. The quality of study data depends directly on the ability of study participants to recall (after delivery) and the counseling and behaviors that occurred during prenatal care.

- Additional research should be done to identify the temporal relationship between SPC and QPC and to identify for confounding factors such as maternal characteristics.

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