Published in final edited form as:

Matern Child Health J. 2014 July ; 18(5): 1196–1204. doi:10.1007/s10995-013-1350-6.

Adapting the Pregnancy Risk Assessment Monitoring Survey to Enhance Locally Available Data: Methods

Ann M. Dozier,

Department of Public Health Sciences, University of Rochester, 265 Crittenden Blvd. CU 420644, Rochester, NY 14642-0644, USA

Elizabeth Brownell,

Division of Neonatology, Department of Research, Connecticut, Children's Medical Center, Cincinnati, OH, USA

Joseph Guido,

Department of Biostatistics and Computational Biology, University of Rochester, Rochester, NY, USA

Hongmei Yang,

Department of Biostatistics and Computational Biology, University of Rochester, Rochester, NY, USA

Cynthia A. Howard,

Department of Pediatrics, University of Rochester, Rochester, NY, USA

Andrew Doniger,

Rochester, NY, USA

Deborah Ossip, and

Department of Public Health Sciences, University of Rochester, 265 Crittenden Blvd. CU 420644, Rochester, NY 14642-0644, USA

Ruth Lawrence

Department of Pediatrics, University of Rochester, Rochester, NY, USA

Ann M. Dozier: ann_dozier@urmc.rochester.edu

Abstract

Despite the increasing emphasis on pre- and interconception planning, perinatal data available to local municipalities and organizations is often limited to that on the birth certificate. A partnership between a local health department and an academic medical center sought to overcome this gap. Using the core questions from the Pregnancy Risk Assessment Monitoring System (PRAMS) and a stratified random sample methodology (by income) in a county with ~8,000 annual births we mailed 2,462 surveys to mothers who gave birth between May 2009 and April 2010. Mailings occurred at 4–5 months postpartum. Low income mothers (those with a Medicaid-funded delivery

and/or prenatal WIC enrollment) were oversampled based on a projected response rate of 35 % (rate for non-low income was 55 %). Over 1,000 usable surveys were returned and linked with birth certificate data. Target response rates were achieved. 9.4 % of addresses for low income mothers were undeliverable (vs. 4.2 % of non-low income). Both low and non-low income respondents were more likely to be over age 18 and White. After statistical adjustments the survey dataset was demographically similar to the original birth data. Personnel and non-personnel costs per usable survey exceeded \$20. Collecting local data using a modified PRAMS methodology is feasible but requires expertise in survey, data management and birth certificate data and local knowledge about survey response patterns. These types of data can serve to inform policy and program planning and provide data to support relevant funding requests.

Keywords

Pregnancy risk assessment monitoring system; Health department; Local surveillance methods

Introduction

The availability of perinatal data at the local level is typically limited to that included in the birth certificate (BC). Other data sources such as the Pregnancy Risk Assessment Monitoring System (PRAMS) are conducted at the state level and, due to different states' sampling procedures, may not be usable at the county level (e.g. sub-group analyses) because of the small number of respondents (i.e. <400) and reported events (e.g. low birthweight) [1]. Absence of usable local data is problematic given the increasing emphasis on preconception and intrapartum periods. To overcome this gap a postpartum survey was conducted through a partnership between an academic medical center and a county health department. The project was part of a study of breastfeeding among low income mothers.

Monroe County, New York, an upstate New York county (pop: ~740,000) that includes a major metropolitan city, Rochester, has a longstanding history of collecting, reporting and using data to inform community priorities [2, 3] including the Youth Risk Behavior Surveillance survey and a local version of the Behavioral Risk Factor Survey [4]. Monroe County began publishing health report cards in 2003 (Adult, Adolescent and Maternal Child). The latter relies heavily on BC data (~8,000 annual births). No maternal data are available beyond the immediate post delivery period; infant health data only include birth outcomes (e.g. birthweight) and selected maternal risk factors (e.g. tobacco use); pre-pregnancy risk factors include major medical risk factors (e.g. hypertension) and some limited prior pregnancy information (e.g. prior births). Other maternal information (e.g. employment, contraception) and prenatal care details are absent. More complete perinatal data would identify disparities (e.g. race/ethnicity, income) and risk factors, inform local priorities and programs and overtime, track progress.

To overcome these limitations we implemented a modified Pregnancy Risk Assessment Monitoring System methodology (PRAMS) [5]. PRAMS includes state-specific, population-based data on maternal attitudes and experiences before, during, and shortly after pregnancy. Since 1998 this surveillance project of the Centers for Disease Control and Prevention

(CDC) now partners with 40 state (and New York City) health departments [6]. Each survey includes both core questions, asked by all sites, and state specific questions. The core questions cover prenatal care, obstetric history, risk behaviors, physical abuse, contraception, and early infant development and health status [7]. Publications describe assessments of reliability and epidemiologic analyses [8–10]. Key state and federal reports rely on the PRAMS data [11] including Healthy People 2020 [12].

The PRAMS participants are women with a recent live birth. Each state randomly samples 1,300–3,400 women annually. In New York State approximately 135 mothers are selected monthly (annualized = 1,620); annually 125 are from Monroe County. Oversampling ensures that adequate data are available in smaller but higher risk populations [13]. Dillman's survey method is used beginning with a pre letter, reminders and survey mailings [14]. Non-responders are contacted and interviewed by telephone. Mailings start 2–4 months after delivery; the entire process is completed by 95 days postpartum.

By adapting the PRAMS survey and methodology to county specific use, we could dramatically increase the quantity and timeliness of local perinatal data. Further we avoided the issues associated with survey design including establishing reliability and validity. The following describes the methods, respondent characteristics and costs of conducting this type of survey in a medium sized county.

Methods

Pre-Survey Planning

A detailed review of current PRAMS methodology identified necessary modifications including which PRAMS version to use, additional items, mailing schedule, incentive structure, sampling and randomization procedures and data management. These were undertaken by the survey team with epidemiologic and biostatistical consultation in collaboration with the county's Department of Public Health (DPH) and the New York State Department of Health. This 6 month process included approval from the New York State Office of Vital Records. The University of Rochester's IRB deemed the survey and administration procedures as surveillance and hence not human research. IRB approval was obtained for planned secondary data analyses.

Participants

The sampling frame included all live births to mothers residing in Monroe County in a 12 month period. Each month a stratified randomized sampling procedure identified birth mothers to receive the survey. Since survey funding was provided through a NIH community based participatory research grant targeting breastfeeding among low income mothers (LIM), sampling procedures over-sampled LIM. “Low income” mothers either had a Medicaid-funded delivery or were on WIC prenatally (BC data). NYS used the mother's postpartum residential BC address to determine county of residence. Survey recipients were selected using a monthly, county generated, randomized file from which state PRAMS recipients ($n = 122$), mothers of multiples, non-Monroe County mothers and mothers whose addresses were undeliverable (per postal pre-review) were excluded. Total births available

for randomization dropped from 8,315 to 8,178. The number selected each month was based on a predicted survey response rate of 55 % for non-low income mothers (NLIM) and 35 % for LIM. We sought 80 completed surveys each month (half from LIM) assuming that not all returned surveys would be usable. While these predicted response rates are lower than other population surveys, they are consistent with recent local experience surveying postpartum mothers.

Instrument

We started with the most recent PRAMS survey (version 6). Given longstanding community interest in lead and other environmental exposures [15] we added six PRAMS environmental questions [16]. Due to the significant number of deaf individuals in our community we included questions about maternal hearing status and added American Sign Language to the languages spoken at home. The National Center for Deaf Health Research provided the item wording [17]. The final survey, entitled the Mother and Baby Health Survey (MBHS) included 91 questions. Because we used the PRAMS survey and methods, no additional reliability or validity testing was undertaken [18, 19].

Data Collection

Monthly mailings to the selected mothers included the survey and a cover letter jointly signed by the PI [Dozier] and the Director of the DPH [Doniger] explaining the purpose of the survey. The initial survey mailing used the mother's address from the BC and occurred when the infant was 4–5 months old. We chose this time frame because of our interest in breastfeeding duration through 3 months. A self-addressed stamped return envelope was included with a return address of the PI's institution. Based on the Dillman method, non-responders were sent a reminder postcard between two to three weeks and a second mailing (of the full survey instrument) 4 weeks after the first mailing (5–6 months postpartum).

Six weeks after the initial mailing trained research staff attempted telephone contact to non-responders (using the number listed on the BC). When contacted, mothers had the option to complete the survey over the telephone or receive another mailed survey. Upon reaching the month's quota of 40 mothers per group (LIM; NLIM), attempts to contact non-responders were terminated. In 5 out of 12 months quotas were achieved without requiring follow-up calls. Of the 314 calls made (299 to LIM), 217 resulted in no-contact and 77 (74 to LIM) requested a third survey. Of the latter, 14 (all but one from LIM) returned the survey (18.2 %); an additional 20 mothers completed the survey over the telephone (19 LIM).

Our approach to incentives is consistent with local survey methods. Rather than NYS's approach (a non-cash gift sent with the survey) our survey participants could enter a raffle (1:28 chance) to receive a cash prize ranging from \$50 to \$250. A sticker to attract recipients' attention was placed on the outside of the envelope. To enter the raffle mothers returned a separate form with their contact information. Prize drawings occurred after each 500 returned surveys.

Data Management

Surveys were tracked by mailing and return date. Double data entry and validation occurred using Epi Info Version 6.04d and MS Access 2007. Other data checks included confirming that the infant's date of birth was within our time frame May 2009 and April 2010 and that the response was received no more than 10 months postpartum.

Data cleaning procedures accounted for inconsistent responses. For example, if a mother indicated that her baby received something other than breast milk in the hospital but also reported that the infant did not receive any liquids except breast milk until the infant was 2 months old, then her 2 month response was corrected to indicate that the infant was not exclusively breastfed. In managing skip pattern responses we differentiated those who correctly followed the skip pattern (correctly missing) from those who mistakenly omitted questions ('eligible to answer but did not'). Responses to questions from those who should have followed the skip pattern were reset to skipped (correctly missing). If the survey completion date was omitted we used two options to calculate infant age: survey returned date and a survey mailed date (more conservative approach).

After data cleaning each survey was linked to the BC data through a unique ID. Responses were reviewed for consistency (i.e. comparing responses to two different but related questions) and all inconsistencies and missing data were discussed with the survey management team, including the PI. When possible, missing data were imputed using responses to other questions; all assumptions utilized for imputation were conservative. In cases where MBHS questions were also items in the BC, the latter was used.

Weighting

Survey weight calculations generally followed the CDC protocol except that our dataset did not include one of their eight variables: marital status [20]. The other variables were maternal age, education, trimester of first visit for prenatal care, parity, race, Hispanic ethnicity, and unknown birthweight. Specifically, the sampling weight was calculated as the reciprocal of selection probability for two strata determined by income as births to LIM were oversampled. Nonresponse weights for each stratum were the ratios of the number of sampled mothers to the number of respondent mothers within categories classified by education, age, race and ethnicity with some categories combined to ensure adequate numbers of respondents within each response category; the non-coverage weights adjusted for omission in the sampling frame due to initial undeliverableness as determined by the aforementioned postal screening process, and were calculated similarly to nonresponse rate.

Analysis

In addition to response rate calculations, we compared respondents' demographic characteristics (95 % confidence interval) with those of all mothers who were mailed the MBHS and of the cohort of mothers who gave birth during the relevant time period. We also compared the latter with the MBHS weighted data. Separate comparisons were undertaken for LIM and NLIM respondents. Key BC characteristics used in these comparisons included age (both continuous and categorical), Hispanic (yes/no) and multiparous (yes/no). In addition high school graduation was classified as yes, no or, for those under age 18, not yet

eligible. Consistent with New York State, Race (“select all that apply” from 15 options) was collapsed into White (respondents indicating only White), Black (indicating only Black), Other (indicating a single answer other than Black or White) or Mixed (those indicating multiple responses) [21]. Residence as inner city (yes/no) was identified through zipcode of residence and included nine zipcodes referred to locally as the “Crescent”, a geographic area with high rates of poverty and the target of many local perinatal programs. We also calculated the survey's costs including both personnel and non-personnel.

Results

Over 12 months, we mailed 2,462 non-duplicated surveys (average per month: 205; 124 to LIM; 81 to NLIM). Mailings began in October 2009 for births that occurred in May 2009. The first year of data collection ended with the August 2010 mailing for births in April 2010 (7.4 % returned undelivered) (Table 1). Of the 1,021 returned surveys 9 were duplicates. An additional 20 were completed by telephone (19 from LIM). No Spanish-speaking mothers selected this option. Eliminating duplicates and unusable surveys ($n = 10$) (e.g. significant portions missing; late returns) resulted in 1,022 usable surveys (41.5 %). Of these 501 were from LIM and 521 from NLIM).

While we achieved our target response rates, monthly response rates varied and as expected return rates were higher overall for NLIM relative to LIM. The monthly return rate for NLIM's was 57.0 % (range 49.3–62.7 %). Of the 970 surveys mailed to NLIM, 41 (4.2 %) were undeliverable (data not shown). Compared to all NLIM surveyed, the undeliverable mothers were more likely to be ages 20–29 (78.05 vs. 43.02 %), not be a high school graduate (14.63 vs. 4.92 %), or be Black race (31.71 vs. 9.72%). The overall response rate for LIM's was 37.2 % with monthly responses ranging between 31.1 and 43.1 %. Among LIM, 140 were undeliverable (9.4 %) (data not shown). Compared to all LIM surveyed, those with undeliverable surveys were similar except that more were Hispanic (20.71 vs. 12.80 %). The addresses used were four to five months old and the lower rate may reflect the transience of these mothers. The differential rates of undeliverables likely affected the distribution of characteristics among the responding mothers for both groups.

Table 2 provides comparisons of demographic characteristics (from the BC) across four different groups of *NLIM*: (1) all mothers randomly selected to receive the MBHS, (2) MBHS responders, (3) all county births and (4) weighted MBHS data. Based on lack of confidence interval overlap, differences comparing those who were mailed the survey, more responders were age 30–39 (58.0 vs. 50.1 %), had graduated high school (97.7 vs. 94.4 %) and were classified as White (87.9 vs. 80.5 %).

Comparisons between the original birth file of NLIM and the MBHS weighted sample demonstrated that all the confidence intervals overlapped and that all of the original BC percentiles were within the confidence intervals of the weighted data.

Table 3 depicts the characteristics of the same four datasets but for the *LIM*. Overall the LIM responders were more likely to be high school graduates (74.2 vs. 64.0 %) and White (55.1 vs. 46.1 %). Comparison between NLIM's original birth file and the MBHS weighted

sample demonstrated that most of the MBHS weighted confidence intervals overlapped and included the original BC percentiles with two exceptions. The MBHS weighted sample included somewhat more LIM ages 30–39 (23.1 vs. 19.1 %) and fewer Hispanics (9.9 vs. 13.6 %).

While comparisons are not possible, data on language spoken at home and maternal hearing status are presented in Table 4. Over 90 % of respondents in both income groups indicated English (NLIM: 96.3 %; LIM: 92.6 %). Only 5.8 % of NLIM noted Spanish compared to 13.2 % of LIM. Only 1.7 and 3.0 % respectively reported American Sign Language use at home. As noted in Table 4, 8.6 % of responding mothers wrote in over 25 other languages or dialects.

Among our respondents eight reported being deaf or having a lot of trouble hearing. All but one of these mothers were deaf or lost their hearing before adulthood. Additionally ten mothers reported that their infants were deaf (NLIM = 0.4 %; LIM = 1.6 %).

Survey Costs

One deterrent to conducting this type of local survey is cost. Table 5 outlines the time and costs incurred to prepare and manage the survey mailings and returns and prepare the data for analysis. Faculty time (e.g. PI, biostatistical consultation) is not included. The non-personnel costs were \$2.40 per mailed survey with an additional \$0.37 of personnel costs. Telephone call follow-up averaged 34.50 min per month. Data management post survey return included tracking, data entry, verification and incentives representing 24.8 min per returned survey. The cost per usable survey (n = 1,022) is \$16.06 (staff and paid students). Significant additional time was spent jointly by various team members in meetings to finalize and/or review coding decisions representing seven additional minutes per completed survey. Based on an average hourly salary with benefits (\$33) this increased the per survey cost to \$22.89. These costs would differ depending on the labor market.

Discussion

This study demonstrated the feasibility of implementing a county-specific PRAMS-like survey to provide expanded surveillance of key and pre- and post-partum variables. We received over 1,000 usable surveys (41.5 %), representing both LIM and NLIM, and achieved our overall projected response rates for these groups. The total number of usable surveys exceeded our original target number of 800. This methodology generated sufficient local data and would only need to be conducted periodically to assess impacts of policy and program changes.

Taking into account local experience, our target and actual response rates were set purposefully lower than those sought by PRAMS [20]. Consistent with other PRAMS surveys, LIM and NLIM respondent mothers were older and non-minority compared to non-responders [11]. After weighting, differences between mothers sent a survey and the weighted MBHS showed few differences only for LIM (more older mothers and fewer Hispanic mothers). These differences are partially accounted for by the demographics of those with undeliverable addresses. Given the transient nature of the local inner city

population it is not surprising that the majority of the undeliverable addresses were from our LIM. While LIM typically remain within the area, multiple address changes are commonplace. The ability to follow-up with non-responders via telephone was important to the LIM's overall 37.2 % response rate.

The addition of locally relevant questions added important information given that there are no national or local data on the prevalence of deafness among mothers giving birth. Further the diversity of languages spoken at home provided important new local information.

Annualized survey costs are estimated at \$23,000. Given that this initiative provided previously unavailable data these costs can be considered reasonable. We implemented protocol modifications to reduce costs (e.g. raffle vs. individual incentive; stopping the reminder postcard after analysis of monthly return rates). Effort devoted to data cleaning (~120 h of team meetings over 1 year) represented a learning curve despite the team's familiarity with survey data management and the local BC data. In future administrations, this time and associated costs would likely be reduced.

Costs would differ by locality but could be further reduced by changes in the number of mailings, survey items or data entry procedures (e.g. pre-survey postcard might have increase responses) [13]. Using online surveys could reduce mailing and data entry costs and creates the possibility of using voiced questions. Whether this approach might improve response rates (e.g. among lower literacy mothers) and thereby lower costs is uncertain.

The MBHS data have a number of potentially important programmatic and planning uses. The local health department can (1) expand the data and trends report card and local data-driven planning efforts; (2) identify new or further clarify racial, ethnic, income or other health/outcome disparities and their associated risk factors, and (3) track progress on existing issues (e.g. safe sleep; infant mortality). The local perinatal network and other agencies serving women and children can use these data to inform and target their programming and funding initiatives.

Limitations

By using the PRAMS survey we were limited to how the questions were phrased and some questions of potential interest were not included (e.g. prior breastfeeding experience; breastfeeding confidence). The survey and telephone follow-up was only available in English and Spanish so some other ethnic groups were less well represented. Increasing response rates from these mothers would require significant language capacity not readily available and not used in other community wide surveys conducted locally. Adding this capacity was deemed to be not feasible. It is not clear why there were more undeliverable surveys among LIM Hispanic mothers. They may move more or their BC address was not their long term address. While our response rates are below typical survey standards they were based on and are consistent with other locally conducted surveys among new mothers. We were limited to the address and telephone number from the BC. With the mailing occurring over 4 months postpartum our undeliverable rate, even after post office validation, was higher than expected and likely due to transience. This later mailing represented a tradeoff between obtaining breastfeeding duration data and maternal recall for other earlier

factors (pre/during pregnancy). Since our primary goal was for within-county comparisons (vs. comparisons with other PRAMS) and the funding was focused on breastfeeding, the tradeoff was deemed reasonable. Our weighting while similar did not exactly match that used by the CDC. While obtaining data from deaf mothers was an important addition, however use of a survey that required English reading literacy is sub-optimal for mothers who rely on American Sign Language and results must be interpreted with caution.

A related consideration is the need to involve individuals familiar with the BC and survey methodologies. How many communities have access to these skills is uncertain. An inquiry to CityMATch indicated that among their approximately 170 member health departments (serving populations of >100,000) most either had epidemiologic expertise internally or through their state or a university.¹ The data generated by this methodology provides a new tool for health departments unable to use their state PRAMS data.

Conclusions

The methodology described herein is useful to create timely perinatal data not previously available at the local level. Given the extensive amount of data generated by this process, biennial or even less frequent survey administrations is justifiable to allow time for findings to be acted upon. Linkage with existing research endeavors proved to be an effective strategy. Data generated through this process have multiple uses across the community including formative and summative evaluation, community level priority setting, evidence to inform policies and practice changes, identification of new foci for programming and support for relevant funding requests.

Acknowledgments

The authors would like to acknowledge the invaluable efforts of the following individuals: Joseph Duckett, Alice Nelson, Holly Widanka, Connie Bottoni, Anna Solomnik, Julia Gutowski and Emily Vreeland. In addition Ann Kern at the Monroe County Department of Public Health who served as the point person between the county and the NYS Department of Health and Anne Radigan from the New York State Department of Health. The project described in this publication was supported by National Institutes of Health funding from (1) PHS Grant # RO1-HD055191, Community Partnership for Breastfeeding Promotion and Support (NICHD) and (2) University of Rochester CTSA award number UL1 RR024160 from the National Center for Research Resources and the National Center for Advancing Translational Sciences. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

References

1. Cochran, WG. Sampling techniques. 3rd. New York: Wiley; 1977.
2. Doniger AS. Enlisting managed care organizations to participate in community health improvement. *Journal of Public Health Management and Practice*. 1998; 4(1):vii–viii. [PubMed: 10183190]
3. Monroe County Health Information & Data/Health Action. [Accessed 14 April 2012] <http://www2.monroecounty.gov/health-healthdata.php>
4. Doniger AS, Adams E, Utter CA, Riley JS. Impact evaluation of the “not me, not now” abstinence-oriented, adolescent pregnancy prevention communications program, Monroe County, New York. *Journal of Health Communication*. 2001; 6(1):45–60. [PubMed: 11317423]

¹Personal communication. Carol Gilbert, M.S., Health Data Analyst, CityMatCH; May 9, 2013.

5. Gilbert BC, Shulman HB, Fischer LA, Rogers MM. The pregnancy risk assessment monitoring system (PRAMS): Methods and 1996 response rates from 11 states. *Maternal and Child Health Journal*. 1999; 3(4):199–209. [PubMed: 10791360]
6. CDC-Pregnancy Risk Assessment Monitoring System-Reproductive Health. [Accessed 14 April 2012] <http://www.cdc.gov/prams/>
7. CDC-PRAMS Questionnaires. [Accessed 14 April 2012] <http://www.cdc.gov/prams/Questionnaire.htm>
8. Allen AM, Dietz PM, Tong VT, England L, Prince CB. Prenatal smoking prevalence ascertained from two population-based data sources: Birth certificates and PRAMS questionnaires, 2004. *Public Health Reports*. 2008; 123(5):586–592. [PubMed: 18828413]
9. Dietz PM, Adams MM, Kendrick JS, Mathis MP. Completeness of ascertainment of prenatal smoking using birth certificates and confidential questionnaires: Variations by maternal attributes and infant birth weight. PRAMS working group. Pregnancy risk assessment monitoring system. *American Journal of Epidemiology*. 1998; 148(11):1048–1054. [PubMed: 9850126]
10. Hosler AS, Nayak SG, Radigan AM. Agreement between self-report and birth certificate for gestational diabetes mellitus: New York State PRAMS. *Maternal and Child Health Journal*. 2010; 14(5):786–789. [PubMed: 19838778]
11. CDC-PRAMS MMWR. [Accessed 14 April 2012] <http://www.cdc.gov/prams/MMWRs.htm>
12. Healthy People 2020 Maternal, Infant, and Child Health. [Accessed 14 April 2012] <http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=26>
13. PRAMS Model Protocol 2009. [Accessed 1 June 2012] <http://www.cdc.gov/prams/Methodology.htm>
14. Dillman, DA.; Smyth, JD.; Christian, LM. Internet, mail, and mixed-mode surveys: The tailored design method. 3rd. Hoboken: Wiley; 2008.
15. Korfmacher KS. Collaborating for primary prevention: Rochester's new lead law. *Journal of Public Health Management and Practice*. 2008; 14(4):400–406. [PubMed: 18552653]
16. PRAMS Phase Five Questionnaire Topic Reference. [Accessed 14 April 2012] http://www.cdc.gov/prams/PDF/Phase5_TopicsReference.pdf
17. Barnett S, Klein JD, Pollard RQ Jr, Samar V, Schlehofer D, Starr M, et al. Community participatory research with deaf sign language users to identify health inequities. *American Journal of Public Health*. 2011; 101(12):2235–2238. [PubMed: 22021296]
18. Adams MM, Shulman HB, Bruce C, Hogue C, Brogan D. The pregnancy risk assessment monitoring system: Design, questionnaire, data collection and response rates. PRAMS working group. *Paediatric and Perinatal Epidemiology*. 1991; 5(3):333–346. [PubMed: 1881843]
19. Shulman HB, Gilbert BC, Msphbrenda CG, Lansky A. The pregnancy risk assessment monitoring system (PRAMS): Current methods and evaluation of 2001 response rates. *Public Health Reports*. 2006; 121(1):74–83. [PubMed: 16416701]
20. CDC-Methodology-PRAMS. [Accessed 14 April 2012] <http://www.cdc.gov/prams/Methodology.htm>
21. Technical Notes. [Accessed 1 May 2013] Vital Event Registration. Jan. 2009 http://www.health.ny.gov/statistics/vital_statistics/2007/technote.htm

Table 1
Survey mailing and response rates for total, low and non-low income mothers

	Total			Low income			Non-low income		
	#	% of		#	% of		#	% of	
		Mailed	Delivered		Mailed	Delivered		Mailed	Delivered
Total births in original file ^a	8,315			3,367			4,948		
Eligible for randomization process ^b	8,178			3,309			4,869		
Selected through randomization process (surveys) mailed	2,462			1,492			970		
Returned undelivered	181	7.4		140	9.4		41	4.2	
Returned completed	1,021	41.5	44.8	490	32.8	36.2	531	54.7	57.2
Completed by telephone	20	0.8	0.9	19	1.3	1.4	1	0.1	0.1
Duplicate returns	9	0.4	0.4	6	0.4	0.4	3	0.3	0.3
Unduplicated completed surveys	1,032	41.9	45.2	503	33.7	37.2	529	54.5	56.9
Usable completed surveys ^c	1,022	41.5	44.8	501	33.6	37.1	521	53.7	56.1

^a After state PRAMS recipients eliminated

^b After removal of duplicate mothers (i.e. twin births) and births to non-county residents

^c 10 unusable surveys removed

Table 2
Comparison of MBHS non-low income responders and with all non-low income births and MBHS weighted births. (Births between 5/1/2009 and 4/29/2010)

	All MBHS mailed to non-low income mothers n = 970				MBHS non-low income responders n = 521				All births to non-low income mothers n = 4,972				MBHS Weighted non-low income mothers n = 4,708			
	n	%	CI lower	CI upper	n	%	CI lower	CI upper	n	%	n	%	n	%	n	%
Age																
18 and under	16	1.65	0.85	2.45	4	0.77	0.02	1.52	100	2.01	82	1.74				
19-29	419	43.20	40.07	46.32	191	36.66	32.51	40.81	2,009	40.41	1,783	37.87				
30-39	486	50.10	46.95	53.26	302	57.97	53.71	62.22 ^c	2,650	53.30	2,626	55.78				
40-49	49	5.05	3.67	6.43	24	4.61	2.80	6.41	213	4.28	218	4.62				
School																
<High school and age > 18	38	3.92	2.69	5.14	8	1.54	0.48	2.59 ^c	223	4.49	137	2.91				
High school or more and age > 18	916	94.43	91.99	95.88	509	97.70	96.40	98.99 ^c	4,544	93.40	4,489	95.35				
Age 18	16	1.65	0.85	2.45	4	0.77	0.02	1.52	100	2.01	82	1.74				
Race ^a																
White	781	80.52	78.02	83.01	458	87.91	85.10	90.72 ^c	4,023	80.91	3,806	80.84				
Black	94	9.70	7.83	11.56	29	5.57	3.59	7.54 ^c	467	9.39	421	8.93				
Other	77	7.94	6.23	9.64	26	4.99	3.11	6.87	429	8.63	368	7.80				
Mixed	18	1.86	1.00	2.71	8	1.54	0.48	2.59	53	1.07	115	2.43				
Hispanic																
Yes	56	5.78	4.30	7.24	21	4.03	2.34	5.73	307	6.17	245	5.19				
No	914	94.23	92.76	95.70	500	95.57	94.27	97.66	4,665	93.83	4,464	94.81				
Inner-city resident ^b																
Yes	178	18.35	15.91	20.79	77	14.78	11.72	17.84	1,014	20.39	854	18.13				
No	792	81.65	79.21	84.09	444	85.22	82.16	88.28	3,958	79.61	3,854	81.87				
Prior birth																
Yes	532	54.85	51.71	57.92	273	52.40	48.10	56.70	2,779	55.89	2,509	53.29				
No	438	45.15	42.02	48.29	248	47.60	43.30	51.90	2,193	44.11	2,199	46.71				

	All MBHS mailed to non-low income mothers n = 970			MBHS non-low income responders n = 521			All births to non-low income mothers n = 4,972			MBHS Weighted non-low income mothers n = 4,708		
	n	%	CI lower	CI upper	n	%	CI lower	CI upper	n	%	n	%
Mom mean age												
Mean	30.26				31.10				31.32		31.32	
[Minimum–maximum]	[14.00–48.00]				[15.00–46.00]				[15.00–46.00]		[15.00–46.00]	

Low income defined as mothers with a Medicaid funded delivery or enrolled in prenatal WIC
MBHS mother and baby health survey

^aRace (“select all that apply”) was collapsed into White (marked only White), Black (marked only Black), Other (marked single answer other than Black or White among the following categories: American Indian or Alaska Native, Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, Other Asian, Native Hawaiian, Guamanian or Chamorro, Samoan, Other Pacific Islander, Other) or Mixed (marked multiple responses)

^bInner city (yes/no) was identified through zipcode of residence and included nine zipcodes referred to locally as the “Crescent”, a geographic area with high rates of poverty and often the target of perinatal programs

^cConfidence interval of responders does not overlap with the CI nor does it include the % from the mailed to mothers (e.g. Among mailed surveys 50.10 % were to mothers age 30–39 (CI 46.95, 53.26). The CI from the responding mothers ranged from 53.71 to 62.22

Table 3
Comparison of MBHS low income responders and with all low income births and MBHS weighted births (Births between 5/1/2009 and 4/29/2010)

	All MBS mailed to low income mothers n = 1,492				MBS low income responders n = 501				All births to low income mothers n = 3,387				MBS weighted low income n = 3,196			
	n	%	CI lower	CI upper	n	%	CI lower	CI upper	n	%	CI lower	CI upper	n	%	CI lower	CI upper
Age																
18 and under	161	10.79	9.21	12.37	38	7.58	5.26	9.91	347	10.25			292	9.11		
19–29	1,014	67.96	65.59	70.33	328	65.47	61.29	69.65	2,338	69.03			2,098	65.68		
30–39	289	19.37	17.36	21.38	125	24.95	21.15	28.75	647	19.10			738	23.08		
40–49	28	1.88	1.19	2.57	10	2.00	0.77	3.22	55	1.62			68	2.12		
School																
<High school and age > 18	376	25.20	23.00	27.41	91	18.16	14.78	21.55 ^c	824	24.33			700	21.91		
High school or more and age > 18	955	64.01	61.57	66.45	372	74.25	70.41	78.09 ^c	2,216	65.43			2,203	68.97		
Age 18	161	10.79	9.21	12.37	38	7.58	5.26	9.91	347	10.25			292	9.11		
Race ^a																
White	687	46.05	43.51	48.58	276	55.09	50.72	59.46 ^c	1,563	46.15			1,466	45.89		
Black	638	42.76	40.25	45.27	167	33.33	29.19	37.48 ^c	1,462	43.17			1,298	40.64		
Other	123	8.24	6.85	9.64	40	7.98	5.60	10.37	266	7.85			295	9.21		
Mixed	44	2.95	2.09	3.81	18	3.59	1.96	5.23	96	2.83			137	4.26		
Hispanic																
Yes	191	12.80	11.10	14.50	49	9.78	7.17	12.39	462	13.64			318	9.94		
No	1,301	87.20	85.50	88.90	452	90.22	87.61	92.83	2,925	86.36			2,876	90.06		
Inner-city resident ^b																
Yes	907	60.79	58.31	63.27	279	55.69	51.32	60.05	2,095	61.85			1,952	61.12		
No	585	39.21	36.73	41.69	222	44.31	39.95	48.68	1,292	38.15			1,242	38.88		
Prior birth																
Yes	874	58.58	56.08	61.08	291	58.08	53.74	62.42	2,046	60.41			1,876	58.74		
No	618	41.42	38.92	43.92	210	41.92	37.58	46.25	1,341	39.59			1,318	41.26		
Mom mean age																

	All MBS mailed to low income mothers n = 1,492				MBS low income responders n = 501				All births to low income mothers n = 3,387				MBS weighted low income n = 3,196			
	n	%	CI lower	CI upper	n	%	CI lower	CI upper	n	%	CI lower	CI upper	n	%	CI lower	CI upper
Mean [Minimum–maximum]	25.01		[14.00–45.00]		31.10		[15.00–46.00]		31.32		[15.00–46.00]		31.32		[15.00–46.00]	

Non low income defined as mothers who did not have a Medicaid funded delivery or were not enrolled in prenatal WIC
MBHS mother and baby health survey

^aRace (“select all that apply”) was collapsed into White (marked only white), Black (marked only Black), Other (marked single answer other than Black or White among the following categories: American Indian or Alaska Native, Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, Other Asian, Native Hawaiian, Guamanian or Chamorro, Samoan, Other Pacific Islander, Other) or Mixed (marked multiple responses)

^bInner city (yes/no) was identified through zipcode of residence and included nine zipcodes referred to locally as the “Crescent”, a geographic area with high rates of poverty and often the target of perinatal programs

^cConfidence interval of responders does not overlap with the CI nor does it include the % from the mailed to mothers (e.g. Among mailed surveys 64.01 % were to mothers over age 18 who had graduated high school (CI 61.57,66.45) CI from the responding mothers ranged from 70.41 to 78.09.)

Table 4
Responses to languages spoken at home and maternal and infant hearing status

	Non-low income respondents n = 521 n (%)	Low income respondents n = 501 n (%)
What languages are used in your home? ^a		
Did not answer	3 (0.58)	2 (0.40)
English	502 (96.35)	464 (92.61)
Spanish	28 (5.37)	66 (13.17)
American sign language	9 (1.73)	15 (2.99)
Other ^b	29 (5.57)	59 (11.78)
Which statement best describes your hearing (without a hearing aid)?		
My hearing is good with one or both of my ears	503 (96.55)	472 (94.21)
I have a little trouble hearing	8 (1.54)	22 (4.39)
I have a lot of trouble hearing	1 (0.19)	2 (0.40)
I am deaf	3 (0.58)	2 (0.40)
Did not answer	6 (1.15)	3 (0.60)
How old were you when you became deaf or hard of hearing?		
I was born deaf/hard of hearing	4 (0.77)	3 (0.60)
4–18 years old	3 (0.58)	7 (1.40)
19 years old or older	3 (0.58)	13 (2.59)
Did not answer	511 (98.08)	478 (95.41)
Is your baby deaf or hard of hearing?		
No	505 (96.93)	480 (95.81)
Yes	2 (0.38)	8 (1.60)
Don't know	5 (0.96)	8 (1.60)
Did not answer	9 (1.73)	5 (1.00)

^a Respondents could check all that applied

^b Other includes: Albanian, Amharic, Arabic, Australian, Bosnian, Cambodian, Chinese, Creole, French, German, Greek, Hebrew, Hindi, Hungarian, Italian, Jamaican, Karen, Kirundi, Kiswahili, Korean, Kutchhi, Laotian, Lebanese, Maay Maay, Mandarin, Native American, Nepali, Patois, Romanian, Russian, Swahili, Ukrainian, Urdu, and Vietnamese

Table 5
Survey mailing and data management personnel and non-personnel time and costs

Activity	Costs (\$) ^a	Time (minutes)
Survey mailing	Per survey mailed n = 2,462	
Materials (envelopes/printing) ^b	1.02	
Postage ^c	1.47	
Mailing preparation	0.37	2.20
Totals	2.66	2.20
Returned survey management ^d	Per survey returned n = 1,032	
Tracking responses	0.50	2.00
Double data entry	3.33	20.00
Post validation cleaning	0.25	1.00
Follow-up phone/additional mailing	0.43	1.75
Incentive/Raffle ^c	4.00	
Additional cleaning ^d	7.87	7.00
Totals	16.38	31.75
	Per usable survey n = 1,022	
Total mailing plus post-return	22.89	33.95

^a Costs are based on staff salaries and vary by worker

^b Non-personnel costs

^c Includes costs for all surveys mailed and post return data management costs for all surveys

^d An additional 7 minutes per survey was required for additional cleaning that involved a team of 2–5 individuals. An average salary cost was used