



USAID
FROM THE AMERICAN PEOPLE

COMPARISON OF TWO METHODS FOR DETERMINING PROVIDER ATTENDANCE DURING NORMAL LABOR AND DELIVERY

RESULTS FROM BENIN, ECUADOR, JAMAICA, AND RWANDA

QUALITY
ASSURANCE
PROJECT

OPERATIONS
RESEARCH
RESULTS

APRIL 2006

This publication was produced for review by the United States Agency for International Development.
It was prepared by Bart Burkhalter and Larissa Jennings.



OPERATIONS RESEARCH RESULTS

COMPARISON OF TWO METHODS FOR DETERMINING PROVIDER ATTENDANCE DURING NORMAL LABOR AND DELIVERY

RESULTS FROM BENIN, ECUADOR, JAMAICA, AND RWANDA

Bart Burkhalter and Larissa Jennings

April 2006

DISCLAIMER

The views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

The Quality Assurance Project (QAP) is funded by the U.S. Agency for International Development (USAID) under Contract Number GPH-C-00-02-00004-00. The project serves developing countries eligible for USAID assistance, USAID Missions and Bureaus, and other agencies and nongovernmental organizations that cooperate with USAID. QAP offers technical assistance in the management of quality assurance and workforce development in healthcare, helping develop feasible, affordable approaches to comprehensive change in health service delivery. The project team includes prime contractor University Research Co., LLC (URC), Initiatives Inc., and Joint Commission Resources, Inc.

Recommended citation: Burkhalter B and L Jennings. 2006. Comparison of two methods for determining provider attendance during normal labor and delivery: Results from Benin, Ecuador, Jamaica, and Rwanda. *Operations Research Results*. Published for the U.S. Agency for International Development (USAID) by QAP.

About this series: The *Operations Research Results* series presents the results of country or area research that QAP is circulating to encourage discussion and comment within the international development community. Please visit www.qaproject.org for more information on other QAP operations research studies.

ABSTRACT

The Quality Assurance Project (QAP) compared two data collection methods used to determine the number and type of providers who attended 245 obstetric cases in hospitals in Benin, Ecuador, Jamaica, and Rwanda. Each case was viewed as having four phases (labor, intrapartum, postpartum-mother, and postpartum-newborn) resulting in 980 possible phases, referred to as “phase-cases.”

In all, 801 phase-cases were observed and assessed using both data collection methods. In the first method, an observer recorded the names or identification number of all providers attending the case in a table on the first page of a pre-printed data collection form (the “Page 1 method”). In the second method, the same observer recorded the identity of the provider next to each required task on the form as the provider performed the task (the “Task-by-task method”). The form is appended to Burkhalter et al. (2006).

This report discusses the number of providers recorded by each method and addresses the problem generated by the fact that the two methods resulted in identical lists of providers in only 46% of the 245 obstetric cases. To address this problem, we present an analysis that generates a best (“Combined”) method from the two original methods (Page 1 and Task-by-task). The average number of providers recorded was 3.65 by the Task-by-task method, 3.44 recorded by the Page 1 method, and 4.02 when the data from both methods were combined. An estimated 2% of providers were not recorded by either method.

Over all countries, the Task-by-task method missed fewer providers than the Page 1 method in the intrapartum (12% compared to 51%), postpartum-mother (27% compared to 38%), and postpartum-newborn phases (14% compared to 40%), but missed more providers in the labor phase (36%) than the Page 1 method (22%). Based on the Combined data, the labor phase had the highest average number of attending providers at 2.8; intrapartum had 1.8 attending providers, postpartum mother had 1.7, and postpartum-newborn had 1.6. The labor phase was also most likely to be attended by at least one skilled provider (doctor, nurse, or midwife): 96% of the time. This rate for intrapartum was 90%, for postpartum-mother 84%, and postpartum-newborn 79%. Among all attending teams and phases, 88% included at least one skilled provider. Skilled provider attendance varied by country, ranging from 73% to 99%.

Our analysis shows that the Combined method was superior to the Page 1 method in 37% of the phase-cases and superior to the Task-by-task method in 23% of the phase-cases. The superiority of the Combined method varied by country, ranging from 25% of phase-cases in Rwanda to 57% in Benin when compared to the Page 1 method. Compared to the Task-by-task method, the superiority of the Combined method ranged from 14% of phase-cases in Rwanda and Ecuador to 35% of phase-cases in Jamaica. These findings suggest that using the Page 1 or Task-by-task method separately will require substantial improvements in these data collection processes. In settings where data collection methods are poor, the Combined method was superior in determining the number and type of all attending providers.

ACKNOWLEDGEMENTS

The data presented in this report are from a larger study on safe motherhood in four developing countries. We acknowledge a debt to the co-authors and country coordinators of the larger study, to the organizational partners that made those studies possible, and to the study staffs in the countries and at the University Research Co., LLC (URC) in Bethesda, MD, who enabled and undertook the larger study. We are also grateful to the United States Agency for International Development (USAID), which funded the study and this report.

The co-principal investigators include Wendy Edson and Steve Harvey. The country coordinators include Maina Boucar, Sabou Djibrina, Jorge Hermida, Patricio Ayabaca, Maurice Bucagu, Sourou Gbangbade, and Affette McCaw-Binns. The organizational partners include:

Benin: Valère Goyito, Director of Family Health, Benin Ministry of Health; Rene Perin and the directors, obstetricians, gynecologists, and medical staff of the five study hospitals. Many thanks as well to Aguima Tankoano, Chief of Party, Benin Integrated Family Health Program (PROSAF); Alain Akpadji,

Administrator, PROSAF; and to Debbie Gueye and Tisna Veldhuyzen van Zanten of URC for their invaluable help with study logistics.

Ecuador: Carmen Laspina, Director, Atención Integral de Salud; Ramiro Jara, Director, Hospital Cantonal Otavalo; Fernando Endara, Director, Hospital San Vicente de Paul; Marcelo Davalos, Director, Hospital Ginecológico Isidro Ayoral; Fernando Orbe, Director, Hospital de Yaruquí; and Francisco Delgado, Director, Hospital Pablo Arturo Suarez.

Jamaica: Karen Lewis Bell, Deanna Ashley, Georgiana Gordon-Strachan, and Erica Hedmann of the Jamaica Ministry of Health; Jennifer Knight-Johnson, USAID Mision in Jamaica; Douglas MacDonald, Victoria Jubilee Hospital in Kingston; Sister Merly McLaren, School of Midwifery, Victoria Jubilee Hospital; Barrington Dixon, Cornwall Regional Hospital; Horace Betton and Richard Hall, St. Ann's Bay Hospital; and John McCrae and Hyacinth Bromley, Black River Hospital. Administrative support was provided by Rose Scringer, Keisha Spencer, Maureen Tomlinson, Luana Humphries, Donna Simon, and others.

Rwanda: Thomas Karengera and Claude Sekabaraga, Rwanda Ministry of Health; the Directorate of Kigali Central Hospital; and Apolline Uwayitu, Elizabeth Drabant, and Barbara Sow of the USAID Mission in Rwanda.

In addition, we thank the technical advisors who provided excellent support throughout the larger study, including Colleen Conroy, Marge Koblinsky, Jeanne McDermott, Allisyn Moran, Elizabeth Ransom, Cindy Stanton, Mary Ellen Stanton, and Patricia Stephenson, and the U.S.-based support team, including Elisa Knebel for literature review, Rais Mazitov and Marta Woodward for data input, Ebie Dupont for administrative support, and Cathy Antonakos for data analysis and technical support. We make special acknowledgement to Mary Drake and Ruth Long for their in-depth review and compilation of the attending provider data by the two methods in Benin, Ecuador, and Rwanda.

We also acknowledge our team of data collectors and other supporters:

In Benin, Noël Zonon Adannou, Sylvain Coudoro, Christophe Houngbeme, Thomas Dogue, Faoussath Badirou Fatoke, Hyacinthe Ahomlanto, Agèle Nouratou do Rego, Jeanne Houndeton, Jeanne Topanou, and Epiphane Gainsi.

In Ecuador, Lourdes Alvaro, Adriana Ayabaca, Tannya Guerrero, Isabel Vanessa Hervas, Jorge Jarrín, Fanny Logroño, Luis Mejía, Teresa Menéndez, Alex Meza, Pilar Peñafiel, and Rodrigo Rosero. Thanks to Luis Vaca, María Elena Robalino, Gabriela Izquierdo, and Lorena Carranza for their technical and administrative support.

In Jamaica, Ian Banberry, Donna Bonnaman, Sybil Brooks, Esmena Brown, Cynthia Brown-Dixon, V.P. Burton, Ada Campbell, Loxley Christie, Juleen Dixon, Laura Donaldson, Pauline Dorsen-Wright, Vivian Elliot, Vivienne Forbes, Barbara Johnson, Erica Hedmann, Elaine Maragh, Merton Marshall, Esmie May-Grant, Elizabeth McDougal, Calixto Orozco Muñoz, Joan Nicholson, Donette Simms-Stewart, Glenton Strachan, Marjorie Thelwell, Althea Thomas-Ennis, and Carmen Townsend.

In Rwanda, Vincent Kanimba, Sengorore Athanase, Mukaminega Martha, Odette Mukanusanga, Mukankubito Eineck Joviane, Thérèse Nyirabazungu, Astérie Mukarukeribuga, and Thérèse Barengayabo.

CONTENT

1. INTRODUCTION.....	1
II. METHODS	1
A. OVERALL RESEARCH STRATEGY	1
B. STUDY SITES	1
C. DATA COLLECTION PROCEDURES.....	2
D. ONE FORM, TWO DATA COLLECTION METHODS	3
E. DETERMINING THE “BEST” DATA SOURCE.....	4
F. POOLED DATASET	5
III. RESULTS.....	5
A. NUMBER OF OBSERVED CASES	5
B. DIFFERENCES BETWEEN THE TWO METHODS	5
C. IDENTIFYING THE BEST DATA COLLECTION METHOD	7
D. PROVIDER TEAM SIZE.....	8
E. SKILLED ATTENDANCE.....	9
F. UNDETECTED PROVIDERS	10
IV. DISCUSSION.....	11
REFERENCES.....	12
APPENDIX: ESTIMATING THE NUMBER OF UNDETECTED PROVIDERS.....	13

LIST OF TABLES

Table 1. Number of Sites by Type and Country	2
Table 2: Determination of Best Data Source Based on Providers Listed.....	4
Table 3. Phase-Cases by Phase and Country	5
Table 4. Percentage of Differential Phase-Cases by Phase and Country.....	5
Table 5. Average Number of Providers per Case by Method: All Countries	6
Table 6. Percentage of Cases in Better Data Categories by Phase and Country	7
Table 7. Performance of Page 1 and Task-by-Task Methods Relative to the Combined Method by Phase and Country.....	8
Table 8. Average Number of Providers Attending by Phase and Country	9
Table 9. Distribution of Number of Attending Providers by Phase and Country.....	9
Table 10: Skilled Attendance by Phase and Country	10
Table A-1. Number of Detected and Undetected Providers by Phase and Country	13

LIST OF FIGURES

Figure 1. Excerpt from Page 1 of Data Collection Form.....	3
Figure 2. Performance of Two Data Collection Methods as Percentage of Combined Method Pooled over All Countries and Phases.....	8

1. INTRODUCTION

Funded by the U.S. Agency for International Development (USAID), the Quality Assurance Project (QAP) supports efforts to institutionalize quality assessment methods in developing country health systems. Such efforts need to identify the best methods for assessing quality of care in diverse settings (Hermida, Nicholas, and Blumenfeld 1999). In response, this paper describes the results of a comparison of two data collection methods used to determine the number and type of providers attending normal labor and delivery in 14 hospitals in Benin, Ecuador, Jamaica, and Rwanda. It also proposes a third, superior method that builds on the first two.

Various aspects of the attending team may influence the quality of care, such as the number of providers, their competence and motivation, their organization into functioning teams, and supervision and leadership. This study is part of a larger investigation of the quality of obstetric care in developing countries and the factors that influence it (Burkhalter et al. 2006).

II. METHODS

A. OVERALL RESEARCH STRATEGY

Trained observers were asked to use two different methods to record the names (or ID [identification] numbers) of providers attending each observed obstetric case. For many cases, the two methods did not generate identical lists of providers, indicating errors in the observers' records. By assuming that all errors were errors of omission (a provider was in attendance but not recorded) and that none were errors of commission (a provider is recorded but did not attend), we could estimate the average number of providers captured by each method. By definition, combining the lists yields an at-least-as-good or better list than either method alone. We were also able to disaggregate the resultant data by country and phase of labor/delivery, generating more accurate estimates of how many providers attended each phase of each case (referred to as a "phase-case") than either original method would permit.

B. STUDY SITES

Countries were selected where QAP had a field office and to represent Africa, the Caribbean, and Latin America. QAP purposively selected study hospitals according to the following criteria:

1. A range of levels of care (See Table 1):
 - At least one large urban referral (tertiary care) hospital with an active maternity department that manages a large number of maternal complications;
 - One or two mid-sized (secondary care, regional) hospitals, and/or
 - One smaller district hospital.
2. An average of at least two births per day, sufficient to permit observation of at least five cases over a two- to three-day period;
3. One or more facilities located outside the capital city but geographically close enough to be manageable within the time and budget available; and
4. Facilities where QAP was conducting program activities, if possible.

In advance of data collection, the in-country study coordinator visited all study sites and briefed the facility director on the study and gained permission to conduct it in that facility. The



coordinator also contacted the maternity department to coordinate patient flow observations. Based on the criteria proposed by Maine et al. (1997), all study hospitals qualified as Comprehensive Essential Obstetric Care facilities.

Table 1. Number of Sites by Type and Country

Country Name	Referral Hospitals	Regional or District Hospitals	Total
Benin	2	2	4
Ecuador	1	2	3
Jamaica	2	2	4
Rwanda	1	2	3
Total	6	8	14

C. DATA COLLECTION PROCEDURES

Using a structured checklist based on international standards for obstetric care (WHO 2000), the management of labor and delivery was observed in 245 hospital-based obstetric cases in the four countries. The observation period began when the woman arrived at the hospital and ended approximately two hours after the baby was born or when the woman left the hospital, whichever came first. The observation period covered four phases: labor, intrapartum, postpartum (PP) mother, and PP newborn, each of which is defined below:

Labor phase: For purposes of the study, the labor phase started when the woman arrived at the hospital and lasted until dilation was approximately 10 cm. Some women were already in labor when they arrived; others were not yet in labor when they arrived but began labor thereafter; and some went home without entering labor. In many cases the labor phase ended when the woman moved from the labor area to the delivery room.

Intrapartum phase: In this study, the intrapartum phase began when the labor phase ended (dilation about 10 cm) and ended when the placenta delivered.

Mother immediate postpartum phase (PP-mother): This phase included the two hours immediately following the delivery of the placenta. However, the observation time was often either longer or shorter than two hours (especially when the mother left the observation area early).

Newborn immediate postpartum phase (PP-newborn): This phase spans the same period as PP-mother but consists of monitoring and care of the newborn only.

Study personnel trained the data collectors during one-day sessions in each study country. Topics covered the rationale for the study, how it fit into the QAP country program, the Ministry of Health objectives (if applicable), and how the findings would be used to improve the quality of care. The data collection teams included obstetricians, gynecologists, pediatricians, midwives, and nurses. All data collectors were either retired or practicing in a facility other than those where they collected data. Observers were told that if during their observations they were concerned about the care or well-being of the mother or newborn, they should cease observing and intervene as they would normally do in practice.

In Rwanda and Jamaica, observers spent three consecutive 24-hour days, including a weekend day, at each facility. In Benin and Ecuador, observers spent non-consecutive 12-hour shifts, including days, evenings, nights, and at least one weekend day and night in each facility. Larger teams were generally used for large referral hospitals and smaller ones for smaller district hospitals. They collected data from February to July 2002: in Ecuador in February, in Rwanda and Benin in March, and in Jamaica in June and July.

D. ONE FORM, TWO DATA COLLECTION METHODS

This study's primary data source (Form 2.4, "Performance in Managing the 3 Stages of Normal Labor & Delivery," reprinted in Burkhalter et al. [2006]) was designed for the larger study. It was piloted in December 2001 in Spanish (for use in Ecuador) and later translated into English and French for administration in Rwanda, Jamaica, and Benin. It provided two methods to record data about the providers who attended each case, and observers were told to use both methods for every case.

The observer recorded attendance data for the Page 1 method in a table on the first page of the form (see Figure 1). For this method, the observer was to record in that table all the attending providers for that case, including his/her name or ID number, classification (i.e., doctor, midwife, nurse, etc.), and phases attended (i.e., labor, intrapartum, PP-mother, PP-newborn). Trainers instructed observers to record the name/ID of an attending provider in the Page 1 table as soon as he/she appeared, but in practice many observers recorded this information at the conclusion of the phase or observation period.

Figure 1. Excerpt from Page 1 of Data Collection Form

List of participating providers

11. Providers participating in this birth

Instructions: During the course of any labor and delivery, a series of different health providers may attend the patient. Please enter below the ID number of each provider participating in this case, indicating with an "X" the stage or stages in which he / she participates. At the same time, enter the provider's ID number on the register of providers kept separately.

No.	Provider ID Number*	Stage of birth			Provider Type
		Labor	Expulsive Phase	Postpartum (Mother)	
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					

Provider type:

1 = Attending physician
 2 = Medical resident
 3 = Midwife
 4 = Nurse
 5 = Intern
 6 = Auxiliary nurse / Aide
 7 = Other (describe)

* Also enter this number in the provider register, kept separately

Pages 2–8 of the form allowed observers to record attendance by task (e.g., suction the newborn), and researchers used those data for the Task-by-task method. These pages listed all the required tasks, and next to each was a space for recording the identity of the provider who performed the task. It was expected that the observer would record the performance of the task and the identity of the provider doing it as each task was performed.

For the present study, we collated the task-by-task data into a summary Task-by-task table. At the conclusion of this exercise, we had a Page 1 table and Task-by-task table, each with the name/ID, classification, and attended phases of individuals who provided care during each phase-case.

E. DETERMINING THE “BEST” DATA SOURCE

Ideally, the Page 1 table and the Task-by-task table would be identical for every case. However, sometimes the Page 1 table had names not in the other and vice versa. We generated four mutually exclusive categories to describe the resulting data set:

1. Both tables are identical (“Same”);
2. The providers in the Task-by-task table are a subset of those in the Page 1 table (“Page 1 better”);
3. The providers in the Page 1 table are a subset of those in the Task-by-task table (“Task-by-task better”); and
4. One or more providers in each table are in the other table, and each table has providers not on the other (“None is better”).

We defined the “best” data source for a particular phase-case as the applicable category among these four. For example, when all the names listed for a phase-case were identical in both tables, the applicable category and therefore the best data source for that phase-case is “Same.” When the Page 1 table included all names in the Task-by-task table plus some names not on the second table, the best data source is “Page 1 better.” When the Page 1 table and the Task-by-task each had at least one provider not listed on the other table, we classified it as “None is better.” Table 2 illustrates our classification system. It depicts four possible scenarios for three attending providers and shows the correct category for each.

Table 2: Determination of Best Data Source based on Providers Listed

Collection Method	Page 1	Task-by-task	Best Data Source	Combined Table
Listed providers	A, B, C	A, B, C	Same	A, B, C
	A, B, C	A, C	“Page 1” better	A, B, C
	B, C	A, B, C	“Task-by-Task” better	A, B, C
	A, B	B, C	“None is better”	A, B, C

Since neither the Page 1 nor the Task-by-task method always yielded data on all providers, a revised estimate of the providers attending each phase-case was called for. The revised estimate includes all providers identified in the Page 1 table plus all in the Task-by-task table for any phase-case (called the “Combined table”). We consider the Combined table to reflect the most accurate measure of providers attending each phase-case for two reasons:

- The Combined table always includes all the providers identified by either method, and
- We assume that these data are subject to errors of omission and not to errors of commission. (That is, all listed providers were present, but some providers who were present were not recorded by one method.) To the extent this assumption is false, we underestimate the number of attending providers.

We refer to the process of combining the Page 1 and Task-by-task data results as the “Combined method.” in which both the Page 1 and Task-by-task methods are applied. Also, we distinguish between phase-cases where the two original methods yielded identical names (“same”) and all other cases where they were not identical (“differential”). Differential cases include cases from the “Page 1 better,” “Task-by-task better,” and “None is better” categories. The total of any sample equals the sum of the “same” and “differential” phase-cases.

F. POOLED DATASET

The term “pooled dataset” refers to the aggregate data from four country samples. Results under the pooled sections are summations of the previous country data and serve as a benchmark for reviewing generally the results discussed in this study.

III. RESULTS

A. NUMBER OF OBSERVED CASES

In observing 245 normal obstetric cases, we had the potential of observing 980 (245 x 4) phases of labor and delivery, but not every case generated observations of four phases. Most instances of an unobserved phase resulted from women who were observed during labor but did not deliver during or before the observation period. Overall, 801 phases (82%) were observed, with labor the most frequently observed (95%). In order to be able to discuss (obstetric) cases, phases of labor and delivery, and phases within cases, we devised the term “phase-case” to refer to the last. For example, the intrapartum phase of case #72 is referred to as a phase-case. Table 3 shows the number and percentage of phase-cases observed by phase and country.

Table 3. Phase-Cases by Phase and Country

Labor	100 (41/41)	87.8 (36/41)	95.1 (98/103)	95.0 (57/60)	94.7 (232/245)
Intrapartum	90.2 (37/41)	100 (41/41)	61.2 (63/103)	81.7 (49/60)	77.6 (190/245)
PP-mother	90.2 (37/41)	100 (41/41)	62.1 (64/103)	76.7 (46/60)	76.7 (188/245)
PP-newborn	90.2 (37/41)	100 (41/41)	56.3 (58/103)	91.7 (55/60)	78.0 (191/245)
All phases	92.7 (152/164)	97.0 (159/164)	68.7 (283/412)	86.3 (207/240)	81.7 (801/980)

Jamaica and Rwanda presented 67% of all observed cases (42% and 24%, respectively), while Benin and Ecuador presented the remaining 33%. However, because Benin (93%) and Ecuador (97%) have a higher percentage of observed phase-cases (Table 3), they account for 39%, rather than 33%, of the phase-cases.

B. DIFFERENCES BETWEEN THE TWO METHODS

Proportion of differential phases: Table 4 presents the percentage of differential phase-cases by phase for each country and the pooled dataset. The Page 1 and Task-by-task tables differ in over half (54%) the observed phases: They agree only 46% of the time. The magnitude of differences varies by country: The two tables differed in 69% of Benin’s cases, 59% of Jamaica’s, 55% of Ecuador’s, and 36% of Rwanda’s.

Table 4. Percentage of Differential Phase-Cases by Phase and Country

Labor	56.1 (23/41)	41.7 (15/36)	61.2 (60/98)	42.1 (24/57)	52.6 (122/232)
Intrapartum	89.2 (33/37)	75.6 (31/41)	58.7 (37/63)	26.5 (13/49)	60.0 (114/190)
PP-mother	59.5 (22/37)	70.7 (29/41)	57.8 (37/64)	39.1 (18/46)	56.4 (106/188)
PP-newborn	73.0 (27/37)	29.3 (12/41)	58.6 (34/58)	34.5 (19/55)	48.2 (92/191)
All phases	69.1 (105/152)	54.7 (87/159)	59.4 (168/283)	35.7 (74/207)	54.2 (434/801)

Although not as large as the differential between countries, there are variations by phase as well, ranging from 48% for the PP-newborn phase to 60% for the intrapartum phase. However, these patterns do not hold across countries. While Benin and Ecuador have the highest proportion of differential phase-cases for the intrapartum phase (89% and 76%, respectively), Jamaica and Benin have the highest proportion for labor phases (61% and 56%, respectively). In Ecuador, only 29% of PP-newborn cases had differential phase-cases compared to 73% in Benin.

The failure of any clear pattern to emerge among these differential phase-cases indicates that the causes of omission errors are multiple, varying across countries. This led us to investigate other data collection methods (specifically the Combined method) rather than to make closer observations to identify and correct errors in the current methods.

Average number of attending providers per case: Table 5 provides details by country of the average number of attending providers listed in the Page 1 and Task-by-task tables. Note, however, that the Page 1 table asked observers to record which phases were attended by each provider listed. On a few occasions, observers completed the Page 1 table but did not record which phase(s) each provider attended. Consequently, we provide two columns for that table: The first column shows the average number of providers where the observer recorded which phase(s) was attended, and the second shows the average number of providers whether their attendance by phase was recorded or not.

When we pool the samples, the average number of providers recorded in the Page 1 table is 3.65 (with phase also recorded) and 3.44 in the Task-by-task table. The larger average is mostly due to Jamaica’s heavy weight in the pooled total: Without Jamaica, the average number of providers recorded in the Page 1 table is 3.58, compared to 3.53 in the Task-by-task table. In Rwanda and Benin, both methods yielded about the same number of recorded providers. When the providers recorded in either table are combined to produce a best estimate (Table 5’s “Combined” column), the average number of attending providers increases by approximately 0.5% in Jamaica, 4.1% in Benin, and 7.6% in Rwanda as compared to the largest estimate of either the Page 1 or Task-by-task method. In Ecuador, there was no difference in the number of providers in the Combined table and Page 1 table.

Table 5. Average Number of Providers per Case by Method: All Countries

Benin (n = 41)	3.93	4.12	3.95	4.29
Ecuador (n = 41)	4.34	4.37	4.02	4.37
Jamaica (n =103)	3.74	4.28	3.31	4.30
Rwanda (n = 60)	2.83	2.88	2.90	3.12
Pooled total (n = 245)	3.65	3.93	3.44	4.02

The average number of providers in either table (the combined dataset) includes all providers listed anywhere on the form. This includes providers listed by attending phase on the Page 1 table; providers listed on the Page 1 table without reference to phase attended; and providers listed in the Task-by-task table, which by design included information on phase attended.

C. IDENTIFYING THE BEST DATA COLLECTION METHOD

Table 6 gives the frequencies of the four categories of best data source (defined in Section II. E) by phase and country. Across all phases and countries, “Same” is the most frequent (46% of the cases), “Task-by-task better” is the second most frequent (31%); “Page 1 better” is third most frequent (17%); and “Combined better” is the least frequent (6%). For labor, the Page 1 table is substantially better at 31% than the Task-by-task table at 17%, but for the other phases, the Page 1 table is considerably worse: intrapartum (48% versus 9%), PP-mother (29% versus 18%), and PP-newborn phases (34% versus 8%).

Table 6. Percentage of Cases in Better Data Categories by Phase and Country

		152 (93%)	159 (97%)	283 (69%)	207 (86%)	801 (82%)
Valid cases		152 (93%)	159 (97%)	283 (69%)	207 (86%)	801 (82%)
Labor	Same	44% (18/41)	58% (21/36)	39% (38/98)	58% (33/57)	47% (110/232)
	Page 1 better	12% (5/41)	28% (10/36)	49% (48/98)	16% (9/57)	31% (72/232)
	Task-by-task better	32% (13/41)	11% (4/36)	10% (10/98)	21% (12/57)	17% (39/232)
	Combined better	12% (5/41)	3% (1/36)	2% (2/98)	5% (3/57)	5% (11/232)
Intrapartum	Same	11% (4/37)	24% (10/41)	41% (26/63)	73% (36/49)	40% (76/190)
	Page 1 better	3% (1/37)	0% (0/41)	21% (13/63)	6% (3/49)	9% (17/190)
	Task-by-task better	81% (30/37)	76% (31/41)	35% (22/63)	18% (9/49)	48% (92/190)
	Combined better	5% (2/37)	0% (0/41)	3% (2/63)	2% (1/49)	3% (5/190)
PP-mother	Same	41% (15/37)	29% (12/41)	42% (27/64)	61% (28/46)	44% (82/188)
	Page 1 better	22% (8/37)	20% (8/41)	19% (12/64)	13% (6/46)	18% (34/188)
	Task-by-task better	24% (9/37)	44% (18/41)	28% (18/64)	22% (10/46)	29% (55/188)
	Combined better	14% (5/37)	7% (3/41)	11% (7/64)	4% (2/46)	9% (17/188)
PP-newborn	Same	27% (10/37)	71% (29/41)	41% (24/58)	65% (36/55)	52% (99/191)
	Page 1 better	11% (4/37)	0% (0/41)	14% (8/58)	7% (4/55)	8% (16/191)
	Task-by-task better	59% (22/37)	27% (11/41)	33% (19/58)	24% (13/55)	34% (65/191)
	Combined better	3% (1/37)	2% (1/41)	12% (7/58)	4% (2/55)	6% (11/191)
All phases	Same	31% (47/152)	45% (72/159)	41% (115/283)	64% (133/207)	46% (367/801)
	Page 1 better	12% (18/152)	11% (18/159)	29% (81/283)	11% (22/207)	17% (139/801)
	Task-by-task better	49% (74/152)	40% (64/159)	24% (69/283)	21% (44/207)	31% (251/801)
	Combined better	9% (13/152)	3% (5/159)	6% (18/283)	4% (8/207)	6% (44/801)

Note. Better data categories are: “Same” when the Page 1 and Task-by-task tables list the same providers for a phase, “Page 1 better” when the Page 1 table contains all the providers in the Task-by-task table and more, “Task-by-task better” when this table contains all the providers in the Page 1 table and more, and “Combined better” when the Page 1 table contains some providers not in the Task-by-task table and vice versa.

Based on the assumption that the total number of providers not identified by the Combined method is zero (i.e., that the Combined method identifies *all* providers), Table 7 presents our computation of how far short each of our two original methods falls below 100%. The Page 1 table equals the Combined table for phase-cases in the “Same” or “Page 1 better” categories, and the Task-by-task table equals the Combined table for phase-cases in the “Same” or “Task-by-task better” categories. We found distinct differences in the performances of our two methods as compared to the Combined method. For example, for the labor phase in Benin, the Page 1 table lists the same names as the Combined table for 56% of the phase-cases (23 of 41), whereas the Task-by-task table is the same as the Combined table for 76% of the phase-cases. In this example, the Page 1 table misses attending providers 44% of the time, and the Task-by-task table misses attending providers 24% of the time. This suggests that the Combined table is better than either of the other methods for the Benin labor phase.

