Chapter 4

Using Lot Quality Assurance Sampling to Monitor the Prevalence of Abortions and the Quality of Reproductive Health Care in Armenia

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Additional information is available at the end of the chapter

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Abstract

Monitoring abortion prevalence is essential to plan control efforts. Lot Quality Assurance Sampling (LQAS) is an inexpensive, reliable method for monitoring abortion prevalence and access to quality reproductive health (RH) services. This chapter presents survey results from 2000 in three sites of Armenia (Gyumri, Gavar and Goris) using LQAS principles (i.e., 44%, 95% CI: ±6% of women had an induced abortion in their lifetime, a total abortion rate (TAR) of 2.0 abortions per woman). Modern contraceptive use was lowest in Goris (16%. 95% CI: ±7%) and highest in Gyumri (43%, 95% CI: ±11%). Only 37% (95% CI: ±9%) of women with an induced abortion received family planning information and 21% (95% CI: ±4%) of mothers were counselled about family planning after delivery. While limited access to family planning information and contraceptives is still an issue in Armenia, recently new reproductive health priorities—such as infertility, sex-selective abortions and abortions due to socio-economic difficulties—have become more common and can be investigated using LQAS in both community surveys and health facility assessments. This study demonstrates that measuring national abortion prevalence and access to services mask underlying variations; the awareness of which is essential for health program planning.

Keywords: abortions, reproductive health, Armenia, lot quality assurance sampling (LQAS), surveys

1. Introduction

According to the World Health Organization (WHO), an estimated 225 million women in developing countries wish to postpone or prevent bearing a child, but do not use any modern means of contraception [1]. Having become pregnant, many women terminate their pregnancy. In developing countries, 56% of all abortions are unsafe, compared with just 6% in the developed world [2]. Although legal and illegal medication abortions have become more common and have likely contributed to reductions of severe morbidity and maternal death, unsafe abortions in low- and middle-income countries still remain among the leading causes of maternal morbidity and mortality. The ethical aspects of terminating a pregnancy for non-medical reasons [3–5] are surely another concern.

Abortions, especially when repeated, pose many health risks to a woman, including the risk of death. Women who choose an abortion are approximately four times more likely to die in the following year than women who carry their pregnancies to term [6]. Studies of records for an entire female population in Denmark showed that the risk of death remains higher in each of the first ten years following the abortion. Moreover, the risk of death increases with each abortion: 45% after one abortion, 114% after two abortions and 192% after three or more abortions [7]. The risk of cervical cancer is 2.3 times higher in women with a history of one abortion and 4.92 times higher in women with a history of two or more abortions as compared to women with no history of abortion. Other studies have found a similar trend for the risks of subsequent ovarian and liver cancers; the elevated risk exists for both single and multiple abortions [8–11]. Approximately, 10% of women who abort will suffer immediate complications, of which approximately one-fifth are considered life-threatening [12]. The most common complications after abortions in later pregnancies include placenta previa, pre-term deliveries, handicapped newborns and ectopic pregnancies [13].

Abortions in the former Soviet states traditionally have been the main method of birth spacing, and Armenia, the focus of this chapter, has a similar profile in this regard [14]. According to the Armenia Demographic and Health Survey (ADHS) 2010, despite the decline over 10 years in the proportion of pregnancies resulting in induced abortion (a reduction from 55% in 2000 to 45% in 2005, and to 29% in 2010), 31% of all women of reproductive age reported having at least one induced abortion, with approximately two-thirds having had more than one abortion in their lifetime [15, 16]. The total abortion rate (TARe[1]) for Armenia in 2010 was 0.8 abortions per woman, which is lower than 1.8 in 2005 and significantly lower than 2.6 in 2000; this trend, however, might be attributed to the significant decline in the pregnancy rate over the same period [16]. This report highlights the fact that with the introduction of ultrasound determination of an unborn child's sex, gender-selective abortions became a common procedure in Armenia. In ADHS 2010, 8% of women having an abortion in the three years prior to the survey reported the desire to deliver a boy as the main reason for the termination.

[1] Total abortion rate (TAR) is "the total number of abortions a woman will have in her lifetime if current levels persist. This lifetime risk is a cohort measure and can be calculated with age-specific abortion rates or approximated by multiplying the abortion rate by the length of the reproductive period (30–35 year range) (MEASURE Evaluation: http://www.cpc.unc.edu/measure/prh/rh_indicators/specific/pac/abortions-per-1-000-live-births).

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UNFP's report concurs by documenting that "with 114 boys born for every 100 girls in 2012, Armenia has one of the highest sex imbalance levels in the world…The imbalance is particularly dramatic for third births: the record level of 173 sons born for every 100 daughters has no known equivalence anywhere else in the world" [17]. Gender-specific abortion is particularly a concern in countries like Armenia having a low total fertility rate (TFRe[2]). Being below replacement levels at 1.7 live births per woman in 2010 the gender-imbalance can result in an increased reduction in the population size [18, 19].

As the TAR has important policy and demographic implications, low- and middle-income countries require an inexpensive and reliable method to monitor TAR, as well as the means to monitor the use of modern family planning methods and the availability and quality of reproductive health (RH) services. However, when measured at a national level, TAR can mask the sub-national variations that exist. Such variations affect policy formation and should be identified to assure the needs of differing subpopulations are addressed [20]. Lot Quality Assurance Sampling (LQAS) is one method that can be used locally for routine monitoring that produces reliable data for managing health programs and for improving health services [21]. With respect to preventing abortions in Armenia, LQAS can serve policy makers and planners by providing much-needed information specific for each region of the country [22, 23].

Although LQAS surveys can produce data of comparable quality to the demographic and health surveys (DHS) [24], they are intended to complement those surveys rather than compete with them. While DHS and multi-country indicator surveys (MICS) are international gold-standard survey methods, they are costly and they measure national indicators at approximately five-year intervals. LQAS is used for a related but different purpose: to frequently track priority indicators related to program coverage, the use of services and/or the quality of care in order to improve program services. Although LQAS data can be aggregated to produce prevalence measures for indicators used at the central level for policy making, its major advantages are to detect the variations in coverage at the sub-national level and to determine if targets and standards of care are met [25, 26].

While LQAS surveys are routinely implemented in many countries of Latin America, Africa and East and Southern Asia to assess a variety of public health programs and the quality of health care, they are less often used in the countries of Eastern Europe, South Caucasus or Central Asia [27, 28]. This chapter reports on a reproductive health survey carried out in three sites in three different regions of Armenia. While this survey was carried out in 2000, it is one of the first documented studies of abortion prevalence in the South Caucasus, and its results are still timely and pertinent to current global health issues.

The study was conducted as a baseline assessment for the USAID-funded Network for Health in Armenia project, which aimed to increase women's access to reproductive health and healthy family information and services through a coordinated effort of three private voluntary

[2] Total fertility rate (TFR) is the number of children the average woman would bear in her lifetime if she experienced the currently observed age-specific fertility rates throughout her reproductive years. The fertility rates refer to the three-year period before the survey (Armenia DHS 2010).

organizations (PVOs), government agencies and non-governmental organizations (NGOs). CARE International in Gyumri, Save the Children in Gavar and the Adventists Development and Relief Agency (ADRA) in Goris directed the three pilot sites (or program catchment areas). The pilot sites formed the nucleus of the regional networks and were linked to the central network in the capital under the leadership of ADRA.

2. Study methodology and results

2.1. Sampling method

The survey design used the LQAS method, which is an established analysis technique, originally developed as a classification method for industrial quality control during the 1920s and adapted to health sciences in the mid-1980s [29, 30] to manage units in a health system charged with delivering services, referred to in LQAS as supervision areas (SAs). In each SA, a random sample ('n') of individuals is assessed. A decision rule or cut-off value, designated as 'd', is selected to optimize identification of low performance SAs for a specified indicator. The 'd' depends on the sample size, thresholds for classifying high and low performance and the choice of two misclassification errors: the risk of overestimation when low coverage exists (β error) and the risk of underestimation when high coverage exists (α error). The upper threshold, 'p-Upper or pU', for identifying acceptably performing SAs is often suggested by program stakeholders, and the low threshold, 'p-Lower or pL', is usually 30% lower.

In the surveys used for this chapter, 19 locations were selected in each Network SA. The SA sample size, n = 19, guarantees that both misclassification errors do not exceed 0.10, as all corresponding values of 'pL' are 30% below 'pU'. SA having pL< p <Pu are classified according to their proximity to either pL or pU. SA with an intermediate performance has an equal chance of being classified as either high or low. The strength of LQAS is that it is very effective for identifying areas that are among the *worst of the worst* in terms of the indicator of interest. As an example, let us assume that the target for an indicator (such as exclusive breastfeeding) is set at 80%. The upper threshold, 'pU', is 80% for identifying high (or acceptably) performing SAs, while the lower threshold, 'pL', is 50%. The sample size 'n=19' and decision rule 'd=13' are selected to ensure α-errors of ≤10%, and β-errors ≤ 10%—or more formally:

- $P(X<d \mid n, pU \geq 80\%) \leq \alpha \leq 0.10$
- $P(X \geq d \mid n, pL \leq 50\%) \leq \beta \leq 0.10$
- $\alpha + \beta < 0.20$

The decision rules and error terms associated with varied sample sizes are found in [23, 24].

In Armenia, our intention was to apply LQAS for recurrent community monitoring by each of the three Network's members and the Network as a whole. The program area in each of the three sites was divided into administratively meaningful units or supervision areas. In each case, the Network member SAs were city areas, towns and surrounding villages. A supervisor —such as a doctor, or a nurse, or a midwife—managed each SA. With LQAS, data collectors

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randomly select small samples (n=19) in each SA, which they use to judge performance. These data, when aggregated for a PVO or for the Network, formed a stratified random sample of the members' catchment area. All catchment areas in aggregate form the Network catchment area.

SAs with intermediate performance are classified as high or low depending on how close they fall to the relevant thresholds. There are three major advantages of using LQAS as compared to other probability sampling methods.

First, in addition to permitting calculation of a conventional average coverage for a program area, the method allows program managers to determine the relative performance of the different SAs that comprise the catchment area. For example, a typical health program area could include several communities with a total population of several thousand people. In baseline surveys, the supervisors determine whether any SA is below average and, therefore, needs special assistance. Based on baseline results, the annual (or semi-annual) performance benchmarks are established for recurrent monitoring. Then, in monitoring, the LQAS is used to determine whether SAs reach these performance benchmarks.

Second, LQAS uses a small sample size for making judgements. In addition to necessitating fewer interviews than for other conventional sampling methods, the smaller sample size leads to a quicker analysis and interpretation by local managers. For most applications, a sample of 19 individuals is required in each SA to judge whether it is below average or has reached a service delivery target. For calculation of a coverage proportion for the catchment area, the individual SA level results produced with the samples of 19 are aggregated while being weighted by the population size of the SA. Assuming there are five SAs, the total sample size would be 95. With p=50%, this sample results in a coverage measure for the catchment area having a confidence interval that does not exceed ±10% of the true coverage. Ideally it should be five or more SAs; however, having four SAs is also acceptable since the confidence interval increases only slightly (≤11%).

Third, as LQAS uses a small sample to judge whether a health worker's performance reaches a predetermined standard, data collection in densely populated areas does not seriously compete for time health workers can allocate to other health care activities. Hence, it is a practical management tool that is ideal for recurrent data collection.

2.2. Study procedures

A multi-stage sampling procedure was used to select the respondents. The first stage was a probability proportional to size (PPS) sampling method, meaning the larger the relative size of the community, the higher its chance of being selected. To carry out a PPS, a sampling frame was constructed, consisting of a list of all the communities in each SA with their population size. Each community population size is added to the next one to create a series of cumulative population sizes. So, if the first community has 453 people and the second one has 500, the first cumulative population size is 953 (or 453+500). Once all community population sizes have been summed, the sampling interval is calculated by dividing the total by the sample size (n=19 in this case). Assuming that the total population size is 43,518; when divided by 19 the result

is 2290.42, which is the sampling interval. A random number between 1 and 2290 is selected using a random number table to identify the first of 19 random interview locations; for argument's sake, let us say this number is 1406. Subsequently, the sampling interval is added to the 1406 to identify the second interview location, which results in 1406 + 2290.42 = 3696.42.

The third location is 3696.42 + 2290.42 = 5986.84. This process is repeated until all 19 interview locations are identified. One then looks at the cumulative population size in the sampling frame and identifies the community in which the 1406th person resides and then where the 3696th person resides and so forth. This is done for each of the 19 numbers. An Excel spread sheet is often used to automate selection of the communities using PPS.

The second stage is a random selection of the starting household using segmentation sampling [31]. This was done either by using a government map of a community or a city area or by drawing the map of a community while in the field at the time of interviewing. The idea was to avoid having to draw a map of the entire community showing the location of each household. Instead, the community was divided into segments of approximately equal sizes using the landmarks.

The essential point is that each segment should have approximately the same number of households. All segments were then numbered, and one of them was randomly selected. If the selected segment was of a manageable size having 30 or fewer households, then the interviewers drew a detailed map of this segment depicting all households. If the selected segment was still large, it was further divided into sub-segments to reach a manageable population size. In the next step, the households were enumerated and one was randomly selected.

In the third stage, a respondent is selected in the household. The respondents in this study, which are referred to herein as our client group, belonged to populations associated with the content of the three questionnaires and linked with the main health services under assessment. Each client group was sampled independently in each SA and had n=19 interviews:

- Mothers with children 0–11 months, interviewed to assess:
  - Antenatal care and safe delivery
  - Breastfeeding and child nutrition
  - Post-delivery family planning
- Women of reproductive age 15–49 years and not pregnant, interviewed to assess:
  - Use of modern contraceptives
  - Abortion-seeking behaviour
  - Post-abortion information provision
  - Knowledge of danger signs during pregnancy, delivery, after delivery
  - Knowledge of danger signs in a newborn
  - Knowledge of HIV and preventative behaviour

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- Men of reproductive age 15–54 years, interviewed to assess:
  - Knowledge of danger signs during pregnancy, delivery, after delivery
  - Knowledge of danger signs in a newborn
  - Knowledge of HIV and preventive behaviour
  - Use of modern contraceptives

For the purposes of this survey, a 'household' was defined as a group of persons who shared the same kitchen or hearth. A mother to be considered a member of the household should have lived in the household for at least 6 months. Any household could have representatives from more than one client group. In order to reduce inter-question correlations by sampling more than one sampling universe in the same household, the inclusion criterion stipulated that only one client group could be sampled in a given household. Therefore, interviewers were trained to delineate the composition of the household, and in case of more than one eligible person residing in the household, to select one for the interview using simple random sampling.

2.3. Questionnaire development and interviewer training

Each question in the questionnaire was associated with an indicator in the Network's M&E plan. Questions and option responses were taken from a field-tested Knowledge Practice and Coverage-2000 Instrument [32], which was adapted to local Network conditions. The instrument was translated into Armenian, back translated to English and then pre-tested in a suburb of Yerevan.

Training activities included a two-day training-of-trainers workshop in English, which took place in Yerevan, followed by three simultaneous five-day LQAS pre-survey training workshops in Armenian, which took place in Goris, Gavar and Gyumri. The workshops were supervised by a master trainer who was accompanied by a simultaneous translator from the Network and by members of the Network who were trained as LQAS trainers.

The data collection at each site began immediately following the five-day training and was supervised by a master trainer and trained members of the Network. Data collectors anticipated difficulty in finding eligible respondents due to two major concerns: first, many homes had been abandoned because of emigration; second, the fertility rate in Armenia was low, thereby limiting the number of households having women with babies less than one year old. Regardless of these concerns, the teams finished the data collection on schedule without major problems. Data collection in each SA took approximately 5 days, with two data collectors assigned to each SA.

2.4. Data processing and analysis

With LQAS, data can be analysed in two ways: through data hand tabulation and computer analysis. With hand tabulation, the master trainers lead the data collectors in a process of organizing the raw data taken directly from the questionnaires into tables to ascertain for each SA the number of individuals having the trait of interest. They use the decision rule to identify

indicators, which have reached or not reached the stipulated coverage target. Computer statistical packages can also be used to achieve the same goal after data has been entered into prepared data screens.

While the choice of whether to tabulate data manually or to conduct computer analysis depends on the purpose of the survey, availability of resources, time constraints and the level of details required in the analysis, the two methods complement each other and can be used simultaneously. Each method has its advantages; the main advantage of hand tabulation is that it makes strategic information rapidly available to make urgent programmatic decisions within a couple of days after the survey. If the purpose of the survey is to quickly identify priorities among SAs and to immediately start addressing them, then hand tabulation is an appropriate choice. Computer data entry and analysis take longer to complete, as much as several weeks in many cases. But if the purpose of the survey is to get detailed results, including socio-demographic data, and to conduct complex analyses—for example, a test for association, or even to calculate 95% confidence intervals for each indicator and to weigh the data for differences in SA population size or socio-demographic groups—then a computer database is necessary.

For this survey, both hand tabulations and computer analyses were used. Data hand tabulation was facilitated by the LQAS trainer in each site and conducted by supervisors and data collectors during post-survey workshops. At the end of the workshops, the tables with tabulation results were produced and priority supervision areas for each indicator were identified in each catchment area. Later, data cleaning, computer data entry and analysis were conducted, producing 95% confidence intervals for each indicator and weighting the results for SA population size. Comparison of weighted and unweighted results revealed that the difference between them is small and, therefore, not essential for program planning.

To establish the reliability of the hand-tabulated data, we compared the hand-tabulated results with unweighted computer data. The total error for hand-tabulated data was 3% on average, which is acceptable.

2.5. Identifying program priorities

In the following sections, prevalence measures for key indicators will be presented that measure coverage of the population with health services in the three Network sites.

Network reproductive health program managers used these measures to identify *priority SAs* in their catchment areas, meaning the SAs that fell below average. In the case of ongoing annual monitoring of coverage, a target is used to assess an SA's performance, but as this is the first application of LQAS in Armenia, the average is used as p-Upper so as to establish program targets. The average is also applied to identify SAs that are outliers whose performance is particularly low and below average. When LQAS is done annually, it is the authors' view that using both the average coverage and the coverage target provides more complete information, an approach consistent with identifying SAs that are among the worst of the worst. Once the average coverage is calculated, a data collector uses the Composite LQAS Table (**Appendix 1**) to locate the column header corresponding to the average coverage. If the average is not

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divisible by 5, then it is rounded-up to the next highest value, which is divisible by 5 in order to use the LQAS table. Therefore, if, for example, the average coverage was 66%, it would round up to 70%. In the next step, the data collector locates the row for a sample of 19 (or the appropriate sample size if different from 19). At the intersection of this column and row, one finds the decision rule. All decision rules were determined using cumulative probabilities of the binomial model as explained in Section 1. If the total number of correct responses in an SA is less than the decision rule, then the SA is below average or did not reach the target and is in need of special attention. For example, if average coverage for an indicator was found to be 70%, then the decision rule would be 11. Any SA having less than 11 correct responses for that indicator would be judged to be below average.

Appendix 2 demonstrates how data collectors used their data to make judgements about the SAs. It displays summary results for one of the program catchment area, Gyumri. The first indicator in this example is, 'Percentage of mothers attending an antenatal visit by a clinically trained provider.' In this catchment area, there were four SAs. The first series of columns shows the number of correct responses in each of the 4 SAs (13, 10, 13, 16), making the total correct 52. The next series of columns shows that the sample size in each SA was 19, for a total sample size of 76. The average coverage (68%) is calculated and recorded in the far right cell. The Composite LQAS Table was then used by data collectors to determine the decision rule using a rounded-up value of 70, resulting in a decision rule of 11. The highlighted cells indicate those SAs that were found to be below average. Two other indicators are included in this example to demonstrate how these LQAS data were used to identify priorities for local decision-making. The remainder of this chapter uses the aggregate measures only.

3. Results and discussion

This section presents the results of the computer analysis of data from three types of respondents: non-pregnant women aged 15–49 years, men aged 15–54 years, and mothers of children aged 0–11 months. For the sake of simplicity, we refer to these three groups as women, men, and mothers.

The findings are shown for each project site as well as for the Armenia Network for Health as a whole, aggregating the results from the three pilot sites. The computer results are weighted by the population size of each supervision area. Qualitative data presented along with LQAS results complement the findings.

3.1. Family planning

3.1.1. Abortions

As **Table 1** shows, 44% of women reported a history of at least one induced abortion, with a TAR being 2.0 abortions per woman. A higher TAR of 2.6 in ADHS 2000 [33] may be attributed to the fact that our project sites included one small city (Gyumri) and two towns (Goris and Gavar) and did not include the national capital as well as other towns. The abortion rate varied

across the three sites; Goris had a TAR of 1.4 abortions per woman, Gavar's TAR was 2.5, and Gyumri's was about 1.9. The ADHS 2000 results showed that on average an Armenian woman had 50% more abortions than births (2.6 TAR for 1.7 TFR). Further, comparison of the trends in TAR and TFR showed that although the TAR declined over the last 10 years (2.6 in 2000, 1.8 in 2005 and 0.8 in 2010), the total fertility rate remained stable over the same period (1.7), which is below replacement levels. The progressively fewer young woman becoming pregnant and giving birth, together with the overall reduced pregnancy rate [16] over time, may explain, at least in part, the decreasing TAR. Others suggest that with the introduction of medical abortions women practice self-administered abortions and do not necessarily seek medical assistance; as a result the total number of induced abortions is underreported [34]. At this point in its history, Armenia's health strategy needs to encourage and support families to wish to have more children, while also ensuring access to contraceptive methods and information, which will allow other couples to make informed choices and plan their family without an invasive procedure like abortion.

	Pilot areas			
Indicators	**Goris**	**Gyumri**	**Gavar**	**Aggregate coverage**
Abortions				
Percentage of women reporting an induced abortion in lifetime	48% (±11%)	40% (±13%)	43% (±10%)	44% (±6%)
Total abortion rate	1.40	1.85	2.52	2.03
Contraceptive method information and use				
Percentage of mothers counselled about the family planning after delivery	12% (±7%)	25% (±10%)	24% (±9%)	21% (±4%)
Percentage of women who report currently using a family planning method (CPR[a])	61% (±10%)	43% (±11%)	29% (±9%)	42% (±6%)
Percentage of women who report currently using a modern family planning method	16% (±7%)	43% (±11%)	24% (±8%)	26% (±5%)
Post-abortion family planning				
Percentage of women counselled about family planning methods after abortion	29%	45%	39%	37% (±9%)[b]

[a] Contraceptive prevalence rate (CPR) is the percentage of women who are currently using, or whose sexual partner is currently using, at least one method of contraception, regardless of the method used (WHO, http://www.who.int/reproductivehealth/topics/family_planning/contraceptive_prevalence/en/).
[b] CIs for separate sites are not indicated because of small sample sizes.

Table 1. Prevalence and 95%-confidence intervals of induced abortions, total abortion rate, family planning and post-abortion information provision in the three sites of Armenia.

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3.1.2. Contraceptive method information and use

The contraceptive prevalence rate (CPRe[3]) was 42%, which is similar to the ADHS 2000 national estimate (39%). However, we detected substantial variation within the Network. Goris had the highest CPR (61%), and Gavar the lowest (29%), while the CPR in Gyumri approximated the Network average at 43% (**Figure 1**). About a quarter of all women used a modern method of contraception; however, there was significant variation among the sites. For example, Goris, the site with the highest CPR, had the smallest proportion of women using modern contraceptive methods (16%), indicating that most women preferred natural methods (e.g., withdrawal, abstinence, rhythm). In contrast, in Gavar, where the CPR was the lowest (29%), 75% of women using any family planning method used a modern method. Gyumri, as the second largest city in Armenia, had the highest rate of modern contraceptive use (43%), while having the second highest CPR among the three sites.

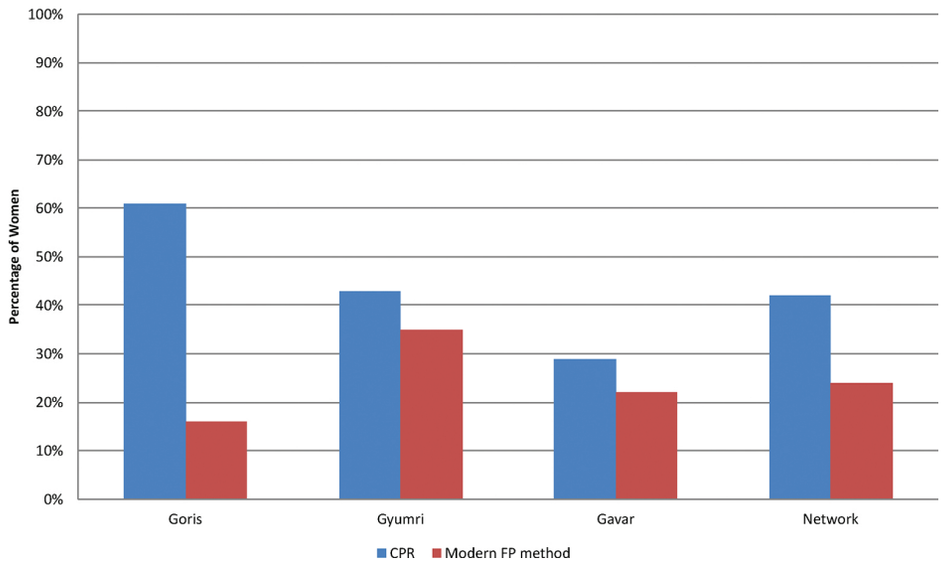

Figure 1. Contraceptive Prevalence Rate and Prevalence of Modern Family Planning Methods in the Three Sites of Armenia.

ADHS results show a slight decrease in the CPR (39% in 2000, 33% in 2005 and 34% in 2010) and variable use of modern contraceptives over a 10-year period (14% in 2000, 12% in 2005 and 17% in 2010) [35].

3.1.3. Post-abortion family planning

Further analysis of the survey results revealed that that only 37% of women who had had at least one induced abortion in their lifetime had been counselled regarding use of contraceptives after their abortion. A similar percentage (32%) was advised to use modern methods after the

[3] Contraceptive prevalence rate is the proportion of women of reproductive age who are using (or whose partner is using) a contraceptive method at a given point in time (WHO, 2006 http://www.who.int/whosis/whostat2006ContraceptivePrevalenceRate.pdf).

abortion, suggesting that those women who received any post-abortion counselling were likely to be informed about modern methods of family planning. One-third of women who had been exposed to post-abortion counselling reported using a modern method of contraception during the survey.

Postpartum experiences were also examined to determine whether mothers received family planning information. Only 21% of mothers reported being counselled about methods of contraception. While service providers play an influential role in the decision to use modern family planning methods in Armenia, some qualitative studies suggest that provider and client satisfaction with family planning counselling are critical factors [36, 37]. It remains unclear if service providers offer sufficient counsel to allay women's fears regarding modern contraceptives and to ensure that they feel empowered to make informed choices to use modern contraceptives.

According to these studies, the primary reasons for abortions were difficult socioeconomic conditions and a desire to postpone or stop childbearing. Among other factors affecting their decisions to abort, women cited insufficient effectiveness of contraceptives, lack of complete information about modern family planning methods, the side effects of the methods, difficulty of access, such as when women had to travel to the district centre to get contraceptives, and a lack of male motivation to use condoms. The views of service providers were also explored. The majority stressed the importance of providing adequate and comprehensive information and the need to discuss with women the variety of methods available. Some health care providers also emphasized the difference in health needs, level of education, preferences of women and respective importance of individual approach.

3.2. Safe motherhood

This section presents findings related to perinatal and newborn care. The respondents were women, men, or mothers, depending on the question. The questionnaire for mothers included both knowledge and behavioural questions, while the ones for women and men were knowledge questions. The outcomes thereof are summarized in **Tables 2** and **3**.

3.2.1. Antenatal care

Mothers with children 0–11 months were questioned about their pregnancy for their infant. Eighty percent of all mothers in the pilot sites said they had visited a clinically trained provider (gynaecologist, doctor, nurse, or midwife) at least once for antenatal care during that pregnancy. The ADHS 2000 found a slightly higher percentage (92%) for this indicator [38]. This variation is likely due to the Network study being confined to three locations, whereas the ADHS is nationally representative.

There was a variation among the sites. Gyumri had a lower percentage (67%) than Gavar (77%) and much lower than Goris (95%). Only 34% of all mothers interviewed had their first antenatal visit during the first trimester. The variation across the three sites for this indicator was similarly substantial (Goris: 45%; Gyumri: 26%; Gavar: 32%).

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Indicator	Pilot areas			Aggregate coverage
	Goris	Gyumri	Gavar	
Antenatal care				
Percentage of mothers who visited a clinically trained provider at least once for antenatal care	95% (±5%)	67% (±11%)	77% (±9%)	80% (±5%)
Percentage of mothers who had the first antenatal visit during their first trimester of pregnancy	45% (±10%)	26% (±10%)	32% (±10%)	34% (±6%)
Percentage of mothers receiving iron supplements during pregnancy	6% (±5%)	17% (±9%)	12% (±7%)	12% (±4%)
Knowledge of danger signs				
Percentage of women knowing 2 or more danger signs during pregnancy	64% (±10%)	44% (±11%)	72% (±9%)	63% (±6%)
Percentage of men knowing 2 or more danger signs during pregnancy	33% (±10%)	30% (±11%)	55% (±10%)	42% (±6%)
Percentage of women knowing 2 or more danger signs during labour/delivery	47% (±10%)	43% (±11%)	74% (±9%)	58% (±6%)
Percentage of men knowing 2 or more danger signs during labour/delivery	29% (±9%)	33% (±11%)	44% (±10%)	37% (±6%)
Percentage of women knowing 2 or more postpartum danger signs	69% (±9%)	46% (±11%)	79% (±8%)	68% (±6%)
Percentage of men knowing 2 or more postpartum danger signs	37% (±10%)	41% (±11%)	49% (±%)	44% (±6%)
Percentage of women knowing 2 or more danger signs in each stage	37% (±10%)	31% (±11%)	58% (±10%)	45% (±6%)
Percentage of men knowing 2 or more danger signs in each stage	14% (±7%)	16% (±8%)	33% (±10%)	23% (±5%)

Table 2. Safe Motherhood: maternal care indicators and knowledge of maternal complications with 95%-confidence intervals in the three sites of Armenia.

Overall, a very low proportion of mothers (12%) reported receiving iron supplementation during their recent pregnancy, with Goris (6%) being significantly behind Gyumri and Gavar (17 and 12%, respectively). These results may cause concerns about maternal nutritional status. However, the ADHS 2000 found that only 12% of women in Armenia actually suffer from mild, moderate, or severe anemia [38].

Indicator	Pilot areas			Aggregate coverage
	Goris	Gyumri	Gavar	
Percentage of women knowing 2 or more danger signs in newborns within first 7 days of birth	72% (±9%)	52% (±11%)	78% (±8%)	70% (±6%)
Percentage of men knowing two or more danger signs in newborn with first 7 days of birth	55% (±10%)	42% (±11%)	52% (±10)	50% (±6)

Table 3. Indicators of newborn danger signs awareness with 95%-confidence intervals in the three sites of Armenia.

3.2.2. Knowledge of danger signs

Questions about danger signs during pregnancy, labour/delivery and postpartum were asked of both women and men. Men appeared to be substantially less knowledgeable than women about danger signs at any perinatal stage. Only 63% of women and 42% of men knew two or more danger signs during pregnancy. Gyumri and Goris reported the least knowledge for both men and women (women: 44 and 64%, respectively; men: 30 and 33%, respectively). Fifty-eight percent of women knew at least two danger signs during delivery. Again, Gyumri (43%) and Goris (47%) had lower levels of knowledge than Gavar (74%). Only 37% of men knew at least two danger signs during delivery, with the variation among pilot sites quite similar to the variation among women (**Table 2**).

Knowledge of two or more postpartum danger signs was demonstrated by 68% of women; consistent with other knowledge indicators, Gavar had the highest percentage of knowledgeable women (79%) followed by Goris (69%) and Gyumri (46%). Only 44% of men exhibited knowledge of postpartum danger signs, with similar results across the sites.

Overall knowledge of perinatal complications (knowing two or more danger signs during each of three stages: pregnancy, delivery and postpartum period) was low among both women (45%) and men (23%). Gavar exhibited relatively higher level of knowledge than the other two sites: 58% of the women knew two more danger signs during each of the three stages. Nevertheless, the WHO data show a slow but stable decrease in the maternal mortality ratio in Armenia, from 40 in 2000 and 2005 to 33 in 2010 and 25 in 2015 [39]. This may be due to emergency care in Armenia being accessible or to the increasing awareness of men and women to perinatal danger signs. However, the ADHS 2010 did not include this information and we cannot substantiate our view regarding the declining MMR.

3.2.3. Newborn care

Women and men were asked about newborn danger signs within the first 7 days of birth. Seventy percent of women knew two or more danger signs of a newborn. As with maternal care, the level of knowledge in Gyumri was lower (52%), than in Goris (72%) and Gavar (78%) (**Table 3**).

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Among men, 50% knew two or more danger signs in a newborn in the first 7 days of birth. The pattern of variation is similar to that for women, with Gyumri having a lower level of knowledge (42%) than Gavar and Goris (52 and 55%, respectively).

3.3. Breastfeeding and complementary feeding

The questionnaire for mothers of children 0–11 months included questions about initiating breastfeeding, exclusive breastfeeding and introduction of complementary foods (**Table 4**). For some indicators, the data were analysed for subgroups rather than the whole sample. For example, the assessment of *exclusive breastfeeding* included mothers of children ages 0–5 months, while the assessment of *complementary feeding* practices included mothers of children ages 6–9 months. Other indicators included the full sample of women with children 0–11 months.

Indicator	Pilot areas			Aggregate coverage
	Goris	Gyumri	Gavar	
Percentage of mothers of children 0–11 months whose newborns were breastfed within the first hour of delivery	3% (±4%)	31% (±11%)	41% (±10%)	28% (±5%)
Percentage of mothers of children 0–11 months whose newborns were placed with the mother immediately after cutting the umbilical cord	18% (±8%)	42% (±11%)	31% (±10%)	30% (±6%)
Percentage of children 0–5 months exclusively breastfed in the 24 h preceding the survey	22%	24%	22%	23% (±7%)[a]

[a] CIs for separate sites are not indicated because of small sample sizes.

Table 4. Breastfeeding indicators with 95%-confidence intervals among mothers of children 0-11 months in the three sites of Armenia.

Twenty-eight percent of mothers began breastfeeding newborns within 1 h of the birth; values ranged from 3% in Goris to 41% in Gavar. Gyumri, at 31%, was about average. The low percentage of newborns breastfeeding within the first hour of life could be attributed to the practice of separating newborns from their mothers immediately after delivery. Less than one-third of mothers (30%) reported that their babies were given to them right after the cutting of the umbilical cord. Overall, less than a quarter of mothers with children aged 0–5 months (23%) reported exclusive breastfeeding at the time of the survey. In a smaller sub-sample of mothers with children aged 0–3 months, the proportion of mothers who exclusively breastfed was 34%. This result indicated that mothers commenced giving liquids or complementary feeding earlier than recommended.

A trend analysis of exclusive breastfeeding indicates a rapid decline in the practice by the second month of life, and it continues to decline steeply until 4 months of age (**Figure 2**). While two-thirds of mothers (66%) reported they were exclusively breastfeeding their 0–1-month-old babies, the prevalence of exclusive breastfeeding decreased with a child's age, with only 43, 22 and 8% of mothers breastfeeding their babies exclusively in the second, third and fourth months, respectively. By the fifth month, no mothers reported they were exclusively breastfeeding their babies.

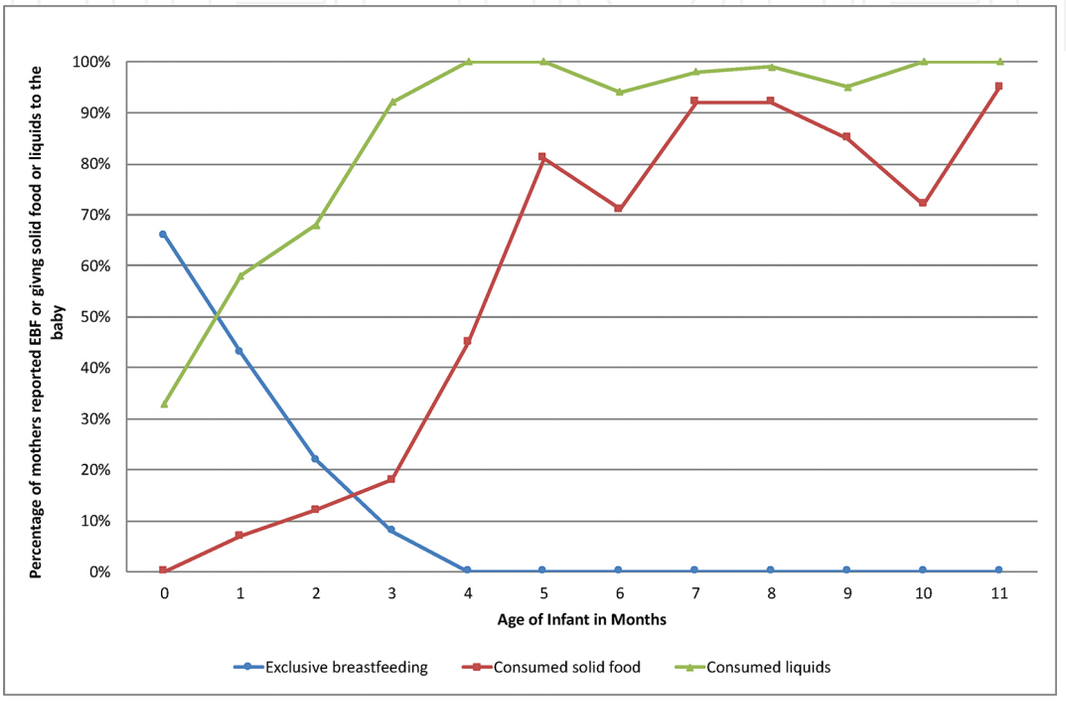

Figure 2. Infant feeding in a cohort of infants aged 0–11 months.

The majority (85%) of mothers of children ages 6–9 months reported that they were giving complementary foods to their babies. More than 90% of mothers in Goris and Gavar fed their 6–9-month-old babies complementary foods, but in Gyumri, only 74% of mothers reported giving complementary foods. Consistently, a high proportion of mothers were giving complementary food to their 6–9-month-old children for each month of age. A trend analysis for complementary feeding showed that 74% of the mothers were practicing complementary feeding at 6 months and 84% by 9 months. When the 'food' category was disaggregated into liquids and solids and all mothers with children ages 0–11 months were included, the earliest premature introduction of solids occurred at 1 month and was 18% by the third month, while 34% of mothers began giving their infants liquids during the first month of life. In ADHS 2010, 23% of mothers of children 2–3 months gave their babies non-milk liquids in addition to breastfeeding, and 14% gave other milk in addition to breastfeeding; 35% of mothers gave complementary foods to their babies of 4–5 months. The tendency to introduce both liquids and solids at an early age, by as early as 1 month, and the consequent rapid decline in exclusive breastfeeding is an area for program action at the present time.

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4. Current research priorities in areas of reproductive health in Armenia

In accordance with the statement of the International Conference on Population and Development Program of Action, "reproductive health… implies that people are able to have a responsible, satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so…The aim of interventions is to enhance reproductive health and promote reproductive rights rather than population policies and fertility control" [40].

The results of ADHS 2010 showed that 21% of married women of reproductive age had an unmet need for contraceptives, while the World Bank's data indicated a lower prevalence of 13.5% for the same year [41]. Another source reported this indicator as 19% [42]. In either case, this result indicates that access to modern birth spacing methods and complete information on contraceptives might be still an issue, although there are also other priorities for reproductive health research and policy in Armenia. Infertility and termination of pregnancies due to socio-economic difficulties is now evident and needs further investigation. Fifteen percent of women in ADHS 2010 reported termination of pregnancy due to socio-economic difficulties. Eight percent of women of reproductive age declared being infecund in 2010 as compared to four percent of women in 2005 [43].

Types and causes of infertility need investigation, and prevention and treatment programs should be designed, implemented and evaluated. A law to support families with more than one child should be introduced, its implementation should be tracked, and its effectiveness should be assessed. The low status of women and various socioeconomic barriers contribute to the high level of sex-selective abortions, indicating that programs to empower women and to support families wanting more children need to be implemented and monitored. In all community assessments, the LQAS methodology can be used. Using the modification of LQAS developed for large countries makes it possible to generate statistically rigorous results on both national and regional levels and at an even lower relative low cost as compared to conventional cluster sampling [44].

This observation is not intended to denigrate DHS and MICS, but we believe it is appropriate and preferable to use rapid and affordable methods for recurrent local-level monitoring that supports sound program management. LQAS can be applied not only to survey the community but also to assess health facilities (HFA). Using the LQAS for HFA allows detecting the gaps in quality of health care provision and identifying priorities for resource allocation and systematic monitoring [45–47].

During 2000 when this survey was undertaken, abortion was already an outmoded means of family planning. Today, 15 years later, this is even more true and yet the current TAR in Armenia signals the need for ongoing local level assessments of its prevalence and cause. The results of this study and the methodology used may support the development of sound health policies for Armenia's and other nations.

Appendices

LQAS Table: Decision rules for sample sizes of 12–30 and coverage targets/average of 10–95%

Sample size*	Average coverage (baselines)/annual coverage target (monitoring & evaluation)																	
	10%	**15%**	**20%**	**25%**	**30%**	**35%**	**40%**	**45%**	**50%**	**55%**	**60%**	**65%**	**70%**	**75%**	**80%**	**85%**	**90%**	**95%**
12	N/A	N/A	1	1	2	2	3	4	5	5	6	7	7	8	8	9	10	11
13	N/A	N/A	1	1	2	3	3	4	5	6	6	7	8	8	9	10	11	11
14	N/A	N/A	1	1	2	3	4	4	5	6	7	8	8	9	10	11	11	12
15	N/A	N/A	1	2	2	3	4	5	6	6	7	8	9	10	10	11	12	13
16	N/A	N/A	1	2	2	3	4	5	6	7	8	9	9	10	11	12	13	14
17	N/A	N/A	1	2	2	3	4	5	6	7	8	9	10	11	12	13	14	15
18	N/A	N/A	1	2	2	3	5	6	7	8	9	10	11	11	12	13	14	16
19	N/A	N/A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
20	N/A	N/A	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17
21	N/A	N/A	1	2	3	4	5	6	8	9	10	11	12	13	14	16	17	18
22	N/A	N/A	1	2	3	4	5	7	8	9	10	12	13	14	15	16	18	19
23	N/A	N/A	1	2	3	4	6	7	8	10	11	12	13	14	16	17	18	20
24	N/A	N/A	1	2	3	4	6	7	9	10	11	13	14	15	16	18	19	21
25	N/A	1	2	2	4	5	6	8	9	10	12	13	14	16	17	18	20	21
26	N/A	1	2	3	4	5	6	8	9	11	12	14	15	16	18	19	21	22
27	N/A	1	2	3	4	5	7	8	10	11	13	14	15	17	18	20	21	23
28	N/A	1	2	3	4	5	7	8	10	12	13	15	16	18	19	21	22	24
29	N/A	1	2	3	4	5	7	9	10	12	13	15	17	18	20	21	23	25
30	N/A	1	2	3	4	5	7	9	11	12	14	16	17	19	20	22	24	26

N/A: *not applicable*, meaning LQAS cannot be used in this assessment because the coverage is either too.

unshaded cells indicate where alpha or beta are < 10%
shaded cells indicate where *alpha* or *beta* errors are ≥ 10%.
hashed cells indicate where *alpha* or *beta* errors are > 15%.

Appendix 1: Composite LQAS Table.

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Summary Results: Baseline Survey, December 2000												
Indicator	**Number of correct responses in each SA**				**Total number of correct responses**	**Sample size in each SA**				**Total sample size**	**Average coverage**
	Decision rule										
	1	**2**	**3**	**4**		**1**	**2**	**3**	**4**		
Section 3A: Prenatal care											
Percentage of mothers at least once visited a clinically trained provider for antenatal care	13	10	13	16	52	19	19	19	19	76	68%
	11	11	11	11							
Section 3B: Delivery and newborn care											
Percentage of mothers of children 0–11 months whose newborns were placed with mother immediately after cutting umbilical cord	15	5	5	12	37	19	19	19	19	76	49%
	7	7	7	7							
Section 4: Family planning											
Percentage of mothers whose most recent birth was planned	17	18	12	16	63	19	19	19	19	76	83%
	14	14	14	14							

Appendix 2. A sample of hand tabulated data—summary results for mothers with children 0–11 months—baseline survey.

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