Inequality in the Quality of Health Services: Wealth, Content of Care, and Price of Antenatal Consultations in the Democratic Republic of Congo

Günther Fink,[1] Eeshani Kandpal,[2] and Gil Shapira[3]

Abstract

Using unique direct observations of patient-provider interactions linked to patient exit interviews and detailed household surveys, this paper assesses the relationship between patient wealth and the quality and price of antenatal care in Democratic Republic of Congo. Overall, the analysis finds a significant wealth-quality gradient, with a standard deviation increase in wealth being associated with a four–percentage point increase in protocol compliance. This increase in compliance represents eight percent of the average quality of care received by women in the lowest wealth quintile. Over half of the wealth-quality gradient is driven by lower facility quality in poorer areas. However, the analysis also finds statistically significant within-village and even within-facility wealth-quality relationships. Within villages, wealth-quality gradients are primarily driven by wealthier women seeking care at higher-quality even if more distant facilities. Within the same facilities, poorer women tend to receive worse care, but on average they also pay less for the same quality of care compared with wealthier women. The price gap increases in the local ratio of wealthy to poor households, suggesting that providers do not charge different prices only for redistributive reasons.

[1] Swiss Tropical and Public Health Institute and University of Basel, guenther.fink@swisstph.ch.
[2] World Bank, ekandpal@worldbank.org.
[3] World Bank, gshapira@worldbank.org, corresponding author.

Acknowledgements: We thank Jishnu Das, Deon Filmer, Gyorgy Fritsche, Hadia Samaha, and Adam Wagstaff for their comments on this work. The data used in this study were collected as part of the impact evaluation of the DRC Performance-Based Financing project, funded by the Health Results Innovation Trust Fund. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors and do not necessarily represent the views of the World Bank, its Executive Directors, or the governments of the countries they represent.

1. Introduction

Despite rapid increases in access to health services over the past two decades, maternal and child mortality remain high in many settings. Improving health outcomes requires not only that the subpopulations that most urgently need care get it, but also adequate quality of care (Das and Hammer 2014; Kruk et al. 2018). The Democratic Republic of Congo (DRC) almost perfectly illustrates the often weak link between health service utilization and health outcomes: although more than 80 percent of women receive antenatal care and deliver in facilities (Demographic and Health Survey 2014), the country remains among the ten with the highest maternal and infant mortality rates globally.[4] Equally striking is the steep socioeconomic gradient in health outcomes: under-5 mortality in the bottom quintile is 54 percent higher than in the top quintile.[5]

Although gaps in utilization between the poor and rich exist, they are substantially smaller in magnitude relative to the gaps in health outcomes.[6] This suggests that the poor do not receive the same quality of services or these services do not correspond as well to their needs. This paper focuses on the first hypothesis. We use recently collected data on care seeking and treatment quality to assess the relationship between wealth and quality of health services in the context of antenatal care in the DRC.

There are several advantages to focusing on antenatal care in studying clinical quality. First, antenatal care reduces maternal and neonatal mortality (Adam et al. 2005; Hollowell et al. 2011). Second, the content and quality of antenatal care varies widely (Hodgins and D'Agostino 2014) and can be assessed objectively based on the essential procedures list outlined in the World Health Organization (WHO) guidelines and officially followed by all providers in the country. Most components of an antenatal care consultation are not dependent on the condition or medical history of the patient, facilitating the construction of a relatively large sample of comparable patient-provider interactions, something that tends to be difficult for more complex treatments or consultations. We focus on five main components of antenatal care: physical examinations, diagnostic testing, screening for danger signs, preventive treatment, and counseling. We measure quality as the proportion of these WHO-recommended

[4] Maternal mortality is 693 per 100,000 live births and infant mortality is 70 per 1,000 births

[5] Under-5 mortality was 117 per 1,000 in the bottom quintile and 76 per 1,000 in the top quintile. Gaps were even larger for undernutrition, with underweight (BMI < 18.5) rates of 18.2 percent in the lowest quintile and 7.4 percent in the top quintile.

[6] For example, coverage of antenatal care is 78 percent in the lowest wealth quintile compared with 96 percent in the highest quintile.

procedures completed by the providers. Direct observation data collected in the facilities also allow us to consider other proxies for the quality of care, such as the length of the consultation and whether the procedures were explained to the patients.

We first estimate the overall differences in access to antenatal care by comparing coverage and effective coverage among women of different wealth levels. We use concentration indexes to characterize inequality in antenatal care, following previous work by Wagstaff, Paci, and Van Doorslaer (1991). we show that inequality in effective coverage is more than three times as large as inequality in coverage alone. We then estimate a wealth-quality gradient and show that each standard deviation increase in household wealth is associated with a four-percentage-point increase in quality of antenatal care, as measured by protocol completeness, corresponding to eight percent of average quality in the lowest quintile. Similarly, the proportion of procedures received by women with secondary education is nine percentage points higher than that received by those without schooling.

Next, we decompose the observed wealth gradient into three main components. First, we expect health facilities in wealthier areas on average to be of higher quality, explaining at least part of the observed wealth-quality gradient. Indeed, controlling for village of residence reduces the wealth-quality gradient from 4 to 1.8 percentage points of completeness, suggesting that spatial differences explain about half of the overall gradient. The remaining wealth gap represents within-village variation in the quality of care. The within-village wealth gradient appears to operate mostly through facility choice: we show that wealthier women are more likely to visit a facility outside their catchment area or go to a hospital or other higher-level facility. Nevertheless, we also find a within-facility quality-wealth relationship, suggesting that even conditional on the specific facility chosen, wealthier women receive higher quality of care.

To understand within-facility differences in the quality of care, we use detailed exit interview data to analyze the specific services provided and prices charged to patients from various socioeconomic backgrounds. As expected, we find that the overall consultation price is positively correlated with the number of services provided, but also, conditional on quality, with the patient's socioeconomic status. The positive association between wealth and price could be interpreted as evidence of cross-subsidization or price discrimination for profit maximization. If facilities charge wealthier women higher prices to subsidize service provision to the poor, we would expect the difference in prices paid by women of different wealth levels to decrease in the ratio of wealthy-to-poor, because each wealthy woman would need to subsidize fewer poor women. But we observe the opposite: the price differences

are larger in wealthier areas than in poorer ones, suggesting that the price-wealth gradient does not only represent cross-subsidization.

A few other studies have documented positive relationships between patients' wealth and the quality of health services received in low- and middle-income countries. Sharma et al. (2017) show that in Kenya, health facilities located in more impoverished areas have worse infrastructure and provide lower quality antenatal and delivery care. In Mexico, Barber, Bertozzi, and Gertler (2007) find that poorer women reported having received fewer procedures in their antenatal consultations, and that indigenous women receive particularly low levels of care. Barber, Gertler, and Harimurti (2007) find that in Indonesia the poor and the wealthy have access to providers of similar knowledge levels, but that poorer women report receiving worse quality of prenatal care. The authors conclude that these results might suggest discrimination against the poor due to informal payments or social and educational differences between providers and patients. Das and Mohpal (2016) show that socioeconomic status is correlated with access to and use of more knowledgeable health care providers in the Indian state of Madhya Pradesh. However, this relationship was driven by differences across villages; within villages, better-off and worse-off households use the services of equally knowledgeable providers.

This paper contributes to the literature in several ways. First, to our knowledge, this is the first study that formally decomposes quality differentials into facility selection and within-facility discrimination mechanisms. Second, this is the first study to combine direct clinical observations of patient-provider interactions with maternal recall data. The combination of three data sources—clinical observations, patient exit interviews conducted immediately following the observations, and household-based interviews with women who recently gave birth—allows us not only to measure differential access, but also to measure objectively the quality of services received. Third, the exit interviews that were collected allow us to assess directly the out-of-pocket payments and their relationship to the quality of care received as well as patients' socioeconomic status. To the best of our knowledge, Sharma et al. (2017) is the only other study in this literature to use data from direct observations. Our data allow us to link direct observations to data on patients' socioeconomic background and the fees they paid. Finally, we add to the literature on health and health system challenges in the DRC, which remains responsible for a disproportionately large proportion of global maternal and neonatal deaths.

2. Background

The DRC is the second largest country in Sub-Saharan Africa, with an estimated population of about 80 million people. The estimated purchasing power parity–adjusted income per capita of $785 and Human Development Index score of 0.47 make the DRC one of the poorest and least developed countries in the world.

From a health system perspective, the DRC is organized into 26 provinces that are further divided into 516 health zones. Each health zone is further divided into catchment areas of about 10,000 inhabitants each. A catchment area typically has one health center providing a basic package of inpatient and outpatient services, including antenatal care and services for uncomplicated deliveries. Geographically large catchment areas have additional health posts that provide a more limited package of services. Some catchment areas are served by referral health centers, which have the capacity to provide a wider set of services. Most of the health zones have a single general referral hospital.

Government spending on health services is low, at an estimated total health expenditure of 4.3 percent of GDP (WHO 2014). Thus, public, private, and not-for-profit facilities rely on user fees for curative and preventive services. Many public sector health workers do not receive official salaries; they obtain remuneration based on user fees (Bertone, Lurton, and Mutombo 2016). These revenues are also used to cover other basic expenditure items, such as procurement of drugs and other supplies. At the time of the study, the health centers had significant autonomy in setting prices for various services. More recently, a flat-fee policy within a health zone was introduced to reduce some of the observed variation in pricing.

Considering the high poverty rate, cost of services, and physical accessibility challenges in many of the provinces, a remarkably high share of women receives antenatal care and delivers in health facilities in the DRC. According to the latest estimates, 88 percent of women received at least some antenatal care, and 80 percent delivered at health facilities. However, several challenges remain: only 17 percent of women started receiving antenatal care in the first trimester, and only 48 percent received the recommended number of at least four consultations (Demographic and Health Survey 2013/14).

3. Data

Our data were collected in 133 health zones in 14 provinces between June 2015 and March 2016. The sample and geographical scope were purposively chosen for the evaluation of two performance-based

financing pilots. Although the survey was not designed to be representative at the national or district level, it covered about 26 percent of the health zones in the country and is representative at that level.[7] In each health zone covered by the survey, five health centers were randomly chosen to be included in the sample, without distinguishing between health centers offering the minimal package of services and referral health centers offering a more complete package. In the catchment area of each of the chosen health centers, a village or urban quarter was randomly selected to be included as a sampling unit for the household survey. In addition to the health centers, health facility surveys were also conducted in general referral hospitals in most health zones. Appendix A provides further details on the sampling frame and overall study design.

Within the selected villages, 4,834 households with women who had live births in the 24 months prior to the survey were randomly selected for the household survey. The focus of the survey was the care received during the most recent pregnancy. Women who reported receiving at least one antenatal consultation were asked a series of recall questions about different components of the consultations, ranging from physical examinations and diagnostic tests to preventive treatments and counseling.

The facility assessments covered a wide range of aspects, ranging from staffing and management to infrastructure and availability of equipment and supplies. Observations of antenatal consultations were conducted in 316 facilities that were randomly selected for an in-depth assessment (see appendix A). Most of the health centers offer antenatal consultations only one day per week; on average, antenatal care services were offered 1.3 days per week. Exit interviews were conducted with the women who received antenatal care in these facilities. For 22 percent of the women for whom an exit interview was completed, an observation of the consultation was not conducted.[8]

A key advantage of using data collected through direct observations is the ability to overcome potentially large recall biases in maternal self-reports. Direct observation data are also more precise, as they are collected by trained enumerators with a medical background, and thus contain more detail on the procedures implemented. In addition, the information collected is more complete, as the direct observation tools measure not only which procedures were conducted during the consultations, but also

[7] The Performance-Based Financing programs are the Projet de Renforcement du Système de Santé pour Améliorer les Résultats de Santé Maternelle et Infantile and Projet d'Urgence relatif à la Violence Sexuelle Basée sur le Genre et la Santé des femmes dans la Région des Grands Lacs.

[8] Unfortunately, the data do not allow us to separate cases in which consent was not given for the observation (by the provider or user) from cases in which a member of the survey team was not available. A survey team spent a day in each facility and had to complete a set of interviews and observations.

other aspects related to the quality of care, including the duration of consultations, whether providers explained the different elements, and whether they encouraged the women to ask questions. However, the presence of observers during the consultations might lead to providers performing better than usual due to observer or Hawthorne effects (Leonard and Masatu 2010). Observer or Hawthorne effects could induce attenuation bias in the estimated socioeconomic gradients if increased provider efforts were more concentrated among poor women. If this was the case, the direct observation results would be a lower bound for the true wealth-quality gradient and its correlates.

To facilitate comparability, we restrict our analysis of the direct observation and exit interview data to women who were receiving the first consultation of their pregnancy. These consultations are more comparable to each other, because their content does not depend on previous consultations and include procedures that should be conducted regardless of women's medical and fertility histories. As poorer women attend fewer consultations during their pregnancies, there is also most variation in wealth among women attending a first consultation.

Table C.1, in appendix C, presents the basic sample characteristics. The first panel provides the characteristics of women in the household survey. We restricted the analysis to women who had a live birth in the two years preceding the survey. Because most of the analysis is of the information on content of care, the table is further restricted to the 82 percent of the women who attended at least one antenatal consultation during their recent pregnancy. The second panel presents the characteristics of the sample of pregnant women who completed exit interviews after receiving the first antenatal consultation of their pregnancy. The two samples are overall similar, although women in the household sample are slightly older on average and slightly less likely to have attended secondary school.

Following the methodology originally proposed by Filmer and Pritchett (2001), we use principal component analysis to create a wealth index, using a list of 32 household assets collected in the household survey and exit interviews. For the household sample, the index uses the first principal component of the entire sample of households regardless of whether the pregnancy was completed or the woman had attended any antenatal consultation. We normalize the index to mean zero and a standard deviation of one to facilitate the interpretation of the estimated coefficients. For the exit interview sample, the wealth index was constructed with the assets reported in the exit interviews applying the factor scores computed with the household data to ensure direct comparability of the scores. The average wealth in the exit interviews is higher by 0.75 standard deviation than the average wealth in the household data.

Table C.2, in appendix C, presents the quality indicators that are used in the analysis of the direct observation and household data. The direct observation indicators correspond only to the first antenatal care visits. The household self-reported indicators correspond to the entire sequence of consultations the women attended during their most recent pregnancy. The descriptive statistics show the variation in the content of antenatal care. Although some physical examinations, such as weighing the pregnant women and measuring their uterine height, are conducted relatively frequently, the rates of diagnostic testing, counseling, and preventive treatments are alarmingly low.

In addition, we create three indexes of quality of care, representing the proportion of actions performed among a set of actions recorded in the different data sources. The first index, computed from household data, summarizes the reported content of care recently pregnant women received during any antenatal care visit during the entirety of their pregnancy, among women who had a live birth in the past two years. The second quality index is based on the direct observation data. The third index is based on the procedures reported in the exit interviews. Although we prefer the more objective direct observation data, we have 177 exit interviews with women whose consultations were not observed.[9] In addition, during the exit interviews, we collected data on the prices paid for the consultations. Thus, this larger sample allows us to study the relationship between quality of care and price. As shown in table B.1, in appendix B, the indexes computed with the direct observation and exit interview data are strongly correlated, and the correlation between the two indexes is not significantly affected by wealth.

The indexes assign equal weights to the different components of antenatal care, although of course the clinical importance of the different actions might differ. For example, estimating a pregnant woman's due date might not be as important as prescribing iron supplements. However, any selection of weights for the different components in the DRC context will be somewhat arbitrary. The results are not dependent on the methodology used to create the indexes. First, we obtain similar results using a principal component analysis to create the quality indexes. Second, tables C.3, C.5, and C.6, in appendix C, present the results of regressions using the individual components of care as dependent variables.

Payments for consultations are paid in lump sum or by service provided. Eighty-six percent of the women reported paying a flat fee, while the rest reported having paid separately for different components of the consultation (such as laboratory testing and drugs). In the case of itemized

[9] There is no statistically significant difference in the quality of care reported in exit interviews by women with and without observed consultations. In addition, the two groups of women are not significantly different in wealth, education, marital status, or age.

payments, we summed the total payments made to get a comparable out-of-pocket expenditure measure. The median price paid was CDF 1,500, or approximately US$1.60, while the average price was CDF 2,373, or US$2.58.[10] Nine percent of the women received antenatal care without any out-of-pocket expenditure.

4. Wealth-Quality Gradient

We start our investigation of the inequality in antenatal care in the DRC by comparing inequality in coverage with inequality in effective coverage, using concentration indexes (Wagstaff, Paci, and Van Doorslaer 1991). Using the household survey data, we define antenatal care to be "effective" if essential services were provided. Specifically, we consider a visit to be complete if the following services were provided: (1) blood pressure was measured; (2) blood and urine samples were taken; (3) the woman was informed about pregnancy complications; and (4) the woman was given iron supplementation.[11] If any of these services was not recalled, the antenatal care is defined to be ineffective. Although 82 percent of the women reported receiving antenatal care during their most recent pregnancy, only 11 percent reported receiving effective care. We calculate the concentration indexes with the recently pregnant women ranked by household wealth.

As shown in table 1, the indexes for coverage and effective coverage are significant at the 99 percent level. However, the concentration index of effective coverage, 0.179, is more than three times the concentration index in coverage, at 0.050, and significantly larger than the concentration index of 0.051 calculated for effective coverage of antenatal care in Kenya by Nguhiu, Barasa, and Chuma (2017).[12]

Restricting our analysis to the sample of women who received any antenatal care, we proceed by comparing in more detail the quality of care received by women of different socioeconomic backgrounds. Figure 1 shows the estimated wealth gradient for each component of antenatal care separately. Of the 13 items reported in the household survey, an average of 53 percent was performed. A one standard deviation increase in wealth is associated with a 4-percentage-point increase in the completeness of the antenatal care exam. On average, women in the lowest decile reported that 48 percent of the items were performed, compared with women in the highest quintile, who reported that

[10] At the time, the conversion rate was about CDF 920 per US$1.
[11] The selection of procedures is based on Nguhiu, Barasa, and Chuma (2017), although we do not have data on prescription of intestinal parasite drugs. Their definition of coverage is conditioned on a minimum of four consultations; we define coverage as any consultation.
[12] When we condition coverage on at least four consultations, as in Nguhiu, Barasa, and Chuma (2017), the concentration index is 0.187.

62 percent of the items were performed. There is a positive association between wealth and each individual procedure of antenatal care. All the coefficients are significant at least at the 95 percent level. A one standard deviation increase in wealth is associated with a seven percentage-point higher likelihood of having blood and urine samples taken for testing, a five-percentage-point increase in the likelihood of being offered an HIV test, and a five-percentage-point higher likelihood of receiving nutritional counseling.

Table 2 presents the results of regressions of the quality-of-care indexes on the wealth index. Columns 1 to 3 present the results from analysis of the household survey data, and columns 4 to 9 present the results from analysis of the direct observation data. Given that women in the household surveys report on antenatal care coverage over the entire pregnancy, positive wealth gradients could appear due to the difference in individual visits or because wealthier women attended more consultations. For the household survey data, we find that each standard deviation increase in wealth is associated with a 4-percentage-point increase in the completeness of antenatal care. When we focus on the first antenatal care consultation in directly observed visits (column 4), the gradient drops to 1.6 percentage points. In both cases, the coefficient representing the wealth-quality relationship remains statistically significant at the 99 percent level when controlling for women's education level, age, and marital status (columns 3 and 6). It is important to keep in mind that the items in the quality indexes are different. That is, although the estimated coefficients both represent percentage changes in protocol compliance, the clinical implications of observed changes might differ.

We use the rich data collected through direct observation of antenatal consultations to create an index of non-clinical quality of care, which primarily focuses on the interpersonal behavior of the providers. The index gives equal weight to the following six indicators: filling an antenatal care card, taking sufficient time for the consultation (at least 10 minutes), explaining procedures, encouraging questions, suggesting a third person attend the consultations, and using visual aids. On average, the providers score 0.57 on this index. We do not find a relationship between socioeconomic status and this measure of non-clinical quality, regardless of the regression specification (columns 7 to 9 in table 2).

Table C.3, in appendix C, presents the regression results when each component included in the direct observation quality indexes is regressed individually on wealth. The regressions include the same controls as those used in column 6 in table 2. For eight of the 21 items representing clinical quality, there is a positive relationship with the wealth index, with p-values below 0.10. The relationship is particularly strong for diagnostic testing, which often requires additional fees and out-of-pocket

expenditures for pregnant women. However, wealthier women are also significantly more likely to be counseled on family planning, prescribed iron, and asked about their blood type. Of the six non-clinical quality indicators, only one is statistically significant at the 95 percent level. A standard deviation increase in wealth is associated with a 2.6 percentage points increase in the likelihood of being encouraged to ask questions during the consultation.

Analysis of the household survey data reveals a strong relationship between education level and reported content of care during the sequence of consultations. Relative to women who never went to school, women with at least some primary or secondary education reported receiving an additional 3.3 and 9 percent of the content of antenatal care (table 2, column 2). As can be seen in table 2, column 3, holding wealth level fixed, women with higher education levels report receiving better care relative to less educated women. Conversely, holding schooling level fixed, wealthier women receive higher quality care. Interestingly, the education-quality relationship does not show in the direct observation data. It could be that the relationship presented in columns 2 and 3 is due to different recall by women of different education levels. Alternatively, it could be that this relationship is because, conditional on wealth, education is significantly correlated to the number of consultations. However, controlling for the number of consultations does not change the quality-education relationship.

The existence of a wealth-quality gradient could theoretically be driven by several mechanisms. First, wealthier women may simply live in the catchment areas of facilities with higher structural quality. Table C.4, in appendix C, shows that wealth is indeed positively correlated with the availability of equipment and consumables in the health centers.[13] Wealthier women are also more likely to live in the catchment areas of referral health centers that offer a wider package of services, including laboratory services, and have a doctor on staff. These correlations are significant at the 99 percent level. When controlling for province, these relationships weaken but remain positive and statistically significant at least at the 95 percent level, suggesting that there is residential sorting even within provinces.

To assess the extent to which residential sorting explains the wealth-quality relationship observed overall, table 3 presents village fixed effects results using the household survey data. Without any controls, the coefficient reduces from 0.041 (column 1 in table 2) to 0.018, but it remains statistically

[13] Indexes of equipment and consumables used in antenatal care were created with principal component analysis. The items included in the equipment index are scale, meter, fetal stethoscope, adult stethoscope, and blood pressure cuff. The items in the consumables index are diagnostic tests for HIV and syphilis, pregnancy test, capacity to do a urine test, tetanus vaccine, deworming pills, iron supplements, antimalarial pills, and treated mosquito nets.

significant at the 99 percent level. When we add additional controls for education, age, and marital status, the coefficient reduces to 0.015 (p-value < 0.01, table 3, column 3). This suggests that about 55 percent of the overall gradient is due to spatial sorting, and 45 percent is driven by local differences in the quality of care received.

Within communities, the two most likely mechanisms underlying the wealth gradient are self-selection into different facilities and within-facility wealth-quality gradients. Table 4 reports the relationship between wealth and the facilities where women reported receiving care. We find that a one standard deviation increase in wealth is associated with a four-percentage-point increase in the likelihood of receiving care at a referral health center or hospital ($p < 0.01$, column 1). The coefficient decreases to three percentage points when including village dummies ($p < 0.01$, column 2). Columns 3 and 4 consider the probability of receiving care in the health center officially serving the catchment area in which the village is located. The regression results presented in column 3 are for the full sample, while those in column 4 exclude villages where none of the women reported using the catchment's health center.[14] Overall, 73 percent of the women report receiving consultations in the catchment's health center. But the rates differ significantly by wealth: 79 percent among women from households in the lowest wealth quintile use the catchment's facility but only 64 percent of women in the top wealth quintile do so. A one standard deviation increase in wealth is associated with a 2.9 percentage point lower likelihood of using the assigned health center for the full sample and 3.4 percentage points for the restricted sample.

Data from the exit interviews conducted at the health facilities also contain some information on the rationales for the different choices made by women of different socioeconomic status. During the exit interviews, the women were asked the primary reason they chose the health facility where they received care. Proximity of the facility to their residence was the most frequent answer given by women on both sides of the wealth median. However, women above median wealth were four percentage points more likely to respond that the reason was the high quality of services and eight percentage points more likely to say they chose the facility because of the confidence they had in the staff. There is also a statistically significant relationship between wealth and using some mode of transportation to get to the consultation. Twelve percent of women above median wealth reported using transportation, while 5 percent of those below did so. This suggests that, at least to an extent, the choice of facilities by

[14] Some villages were closer to health a post or center in a neighboring catchment area.

women of different wealth levels is driven by financial constraints or willingness to pay, rather than by knowledge of which facilities are better.

Table 5 investigates the extent to which wealth gradients exist within facilities. Within-facility gradients could emerge due to discrimination if providers exert less effort when treating women with lower educational or socioeconomic status than theirs. Alternatively, within-facility gradients could be a result of the separate fees some facilities charge for consultations, consumables, laboratory tests, and drugs. Poorer women might choose a more limited package of care, or providers might not offer services for which they believe poorer women would not be able to pay.

Table 5, columns 1 and 2, restrict the sample to women who reported attending the health center serving their catchment area and include catchment area dummies in the regressions. As the content of care reported in the household data is from the entire sequence of consultations during the women's pregnancies, and wealthier women attend more consultations, we control for the number of consultations women reported attending. We observe a statistically significant within-facility relationship between wealth and content of antenatal care. A standard deviation increase in wealth is associated with a 1.6 percentage point increase in the proportion of actions taken. When controlling for women's characteristics, the coefficient only slightly changes to 1.4 percentage points (p-value < 0.01).

Table C.5, in appendix C, presents the results of similar regressions with individual components of care as the dependent variables. We find a statistically significant association at least at the 90 percent level for six of the 13 elements of care reported by the women in the household survey. These elements include services that could require additional fees, such as HIV testing, iron supplementation, and antimalarial drugs. We also find a statistically significant relationship between wealth and receiving advice on nutrition during the pregnancy, having the due date estimated, and measurement of uterine height.

Table 5, columns 3 and 4, explores within-facility wealth gradients using the direct observation data. A one standard deviation increase in wealth is associated with a 0.6 percentage point increase in completeness of care (p-value < 0.05). The coefficient does not change when we add controls for women's characteristics. When we focus on the individual elements of the content of care in the direct clinical observations, as seen in table C.6, in appendix C, we find a statistically significant relationship for a much lower share of the items and at a lower level than when we consider the items reported in the household survey. These items include hemoglobin testing, prescription or provision of iron, as well as

asking about HIV status and whether the woman is taking any drugs. For the indicators representing non-clinical quality of care, we do not find any correlation with wealth.

5. Price

A wealth-quality gradient naturally gives rise to the question of a price-quality gradient, and to the question of whether quality gaps mostly exist because wealthier women can pay or are more willing to pay for higher quality of care (and additional services). This section analyzes the exit interview data to explore the correlations between the price women reported paying and the quality of their consultation and between the price and wealth of users.

Table 6, columns 1 to 3, presents the results of regressions of the total price paid for the consultation on the quality index created from the exit interview data. Overall, there is a strong relationship between quality and price: each percent of content of care is associated with a price increase of CDF 28. Alternatively, each additional item performed is associated with an average price increase of CDF 219 (15 percent of the median price of CDF 1,500). The coefficient is statistically significant at the 99 percent level. The relationship remains statistically significant at least at the 95 percent level even after accounting for health zone and facility fixed effects. The size of the effect reduces to CDF 23 when health zone dummies are included and to CDF 18 when facility dummies are included.

Consistent with the positive correlations of quality with wealth and price, there is a positive correlation between wealth and the price paid for a first consultation. The regression estimates show that a one standard deviation increase in wealth is associated with an increase of CDF 325 (about 22 percent of the median price) in the price paid for the consultation (table 6, column 4). This effect decreases to CDF 207 (about 14 percent of the median price) when health zone dummies are included in the regression, but it remains statistically significant at the 99 percent level (column 5).

Sixty-one percent of the health centers reported having a policy of exempting at least some fees for poor users. Health centers can also provide fee exemptions or reductions on a personal basis. We therefore proceed to test the within-facility wealth-price relationship. When facility dummies are included in the regression (table 6, column 6), a one standard deviation increase in wealth is associated with a price increase of CDF 122 (8 percent of the median price). The relationship between price and wealth remains similar in magnitude and statistically significant when controlling for the quality of the consultation. As presented in table 6, column 9, for a consultation of given quality, a one standard

deviation increase in wealth is associated with a price increase of CDF 123 over the price paid by poorer women in the same facility.

Why do facilities charge different prices for the same quality of consultation? One reason might be that health providers are pro-social and charge wealthier users higher fees to subsidize the provision of care to poorer users. Alternatively, this behavior might represent price discrimination for profit maximization. Given the autonomy in setting prices and the ability to distinguish women by their socioeconomic status, health providers can charge according to the willingness to pay by the distinct groups. One way to distinguish between the two options would be to compare the marginal cost of providing a consultation with the price charged to the poor. Under cross-subsidization, the price for the poor will be less than the marginal cost. Unfortunately, the data do not allow for reliably estimating the marginal cost. However, the household survey data provide the composition of wealth in the different health zones. If the goal of the providers is fully or partially covering the costs of serving the poor by charging higher prices to wealthier women, the additional amount needed to be charged from each wealthier woman will decrease as the ratio of wealthy to poor increases. As a result, the higher is the number of wealthier women per poor woman in the health zone, we would expect a flatter wealth-price gradient once controlling for the quality of consultations.

Table 7 presents the results of testing for heterogeneity in the price-wealth relationship by the ratio of wealthy (top quintile) to poor (bottom quintile) households. When restricting the sample to health zones in which the number of women in the bottom quintile is greater than the number of women in the top quintile, we do not find a statistically significant price-wealth relationship when we incorporate health zone dummies (column 1) or facility dummies (column 2). However, when the analysis is restricted to the sample of health zones where there are more women in the highest wealth quintile than in the bottom quintile, there is a larger and statistically significant relationship between price and wealth. When controlling for facility dummies, a one standard deviation increase in wealth is associated with a CDF 138 increase in price. The results are similar when we consider the number of women in the top two quintiles relative to the bottom two. The significance of the within-facility price-wealth relationship only when the ratio of wealthy to poor is above one suggests that the rationale for differential pricing is not purely pro-social.

To summarize, we find a strong correlation between the price of consultations and their quality. We also find that wealthier women pay significantly more for their consultations conditional on quality; thus, the average price paid per antenatal care visit is substantially higher for wealthy than for poor women.

These findings are consistent with the finding presented in the previous section on facility selection, which shows that wealthier women are willing to travel farther to reach high-level and high-quality facilities.

6. Discussion

A growing body of evidence highlights the critical importance of quality of care for improving health outcomes in low- and middle-income settings. Closing the gap between the health outcomes of the poor and wealthy will require not only increasing access for the poor, but also improving the clinical quality of the care they receive. In their analysis of data from 64 developing countries, Wagstaff, Bredenkamp, and Buisman (2014) find that progress on health service coverage has been considerably more pro-poor than progress on health status; they hypothesize that the quality of health care is worse for the poor. Our study corroborates this hypothesis, at least for the DRC. In this paper, we demonstrate that socioeconomic differences in the quality of care are indeed substantial. Our analysis employs data collected through household surveys, direct clinical observations, and exit interviews. Although each individual source of data has its limitations in objectively measuring the quality of care, the combination of these data sources provides robust evidence on the existence of a wealth-quality gradient.

The novel data that link health facilities to households in their catchment area as well as the content of care to price of consultations enables carefully disentangling the various mechanisms underlying the observed wealth-quality relationship. Although spatial correlation between household wealth and quality of care accounts for more than half of the overall gradient, a statistically significant positive association between wealth and the quality of antenatal care also emerges when we compare women from the same village. This gradient appears to a large extent to be driven by differential sorting or selection into facilities. Empirically, better-off women are more likely to leave their catchment area to seek care at more distant, higher-level, or better facilities, where they pay higher prices for the consultations. Both findings imply that equality in quality of health care will not be achieved only through allocating more resources to poorer areas.

When we zoom into specific facilities, we find a within-facility wealth-quality relationship. This relationship appears to be partially explained by the fees many facilities charge separately for laboratory tests and drugs. We find a statistically significant quality-price relationship even when including facility fixed effects in the regressions. It could be that poorer women choose to receive a more limited package of services, or that providers do not offer poor women services for which they would have to pay extra

fees. However, we also find significant differences in the provision of services, such as counseling and physical examinations, that should not affect the cost of the consultation. We cannot rule out that providers treat poorer women worse than they treat wealthier women. But it could also be that some of the differences are driven by the wealthier women being more proactive in demanding care, rather than the providers choosing to exert less effort. Unfortunately, the data provide limited insight into this question. The finding of within-facility variations in quality merits further research.

The pricing data analyzed in this paper suggest that, if anything, providers discriminate against wealthier women when it comes to out-of-pocket charges. Prices not only increase with quality, but also with the patient's wealth, suggesting that providers seem to assess ability or willingness to pay and charge patients accordingly. Comparing areas with higher and lower ratios of wealthy to poor women, we find greater within-facility price differentials in the former, suggesting that price discrimination is not only driven by pro-social cross-subsidization.

References

Adam, T., S. S. Lim, S. Mehta, Z. A. Bhutta, H. Fogstad, M. Mathai, ... and G. L. Darmstadt. 2005. "Cost Effectiveness Analysis of Strategies for Maternal and Neonatal Health in Developing Countries." *BMJ* 331 (7525): 1107.

Banuri, S., P. Keefer, and D. de Walque. 2018. *Love the Job… or the Patient? Task vs. Mission-Based Motivations in Health Care*. Washington, DC: World Bank. <this is not cited – delete?>

Barber, S. L., S. M. Bertozzi, and P. J. Gertler. 2007. "Variations in Prenatal Care Quality for the Rural Poor in Mexico." *Health Affairs* 26 (3): w310–w323.

Barber, S. L., P. J. Gertler, and P. Harimurti. 2007. "Differences in Access to High-Quality Outpatient Care in Indonesia." *Health Affairs* 26 (3): w352–w366.

Bertone, M. P., G. Lurton, and P. B. Mutombo. 2016. "Investigating the Remuneration of Health Workers in the DR Congo: Implications for the Health Workforce and the Health System in a Fragile Setting." *Health Policy and Planning* 31 (9): 1143–51.

Das, J., and J. Hammer. 2014. "Quality of Primary Care in Low-Income Countries: Facts and Economics." *Annual Review of Economics* 6 (1): 525–53.

Das, J., and A. Mohpal. 2016. "Socioeconomic Status and Quality of Care in Rural India: New Evidence from Provider and Household Surveys." *Health Affairs* 35 (10): 1764–73.

Filmer, D., and L. H. Pritchett. 2001. "Estimating Wealth Effects without Expenditure Data—or Tears: An Application to Educational Enrollments in States of India." *Demography* 38 (1): 115–32.

Hodgins, S., and A. D'Agostino. 2014. "The Quality-Coverage Gap in Antenatal Care: Toward Better Measurement of Effective Coverage." *Global Health: Science and Practice* 2 (2): 173–81.

Hollowell, J., L. Oakley, J. J. Kurinczuk, P. Brocklehurst, and R. Gray. 2011. "The Effectiveness of Antenatal Care Programmes to Reduce Infant Mortality and Preterm Birth in Socially Disadvantaged and Vulnerable Women in High-Income Countries: A Systematic Review." *BMC Pregnancy and Childbirth* 11 (1): 13.

Kruk, M. E., A. D. Gage, N. T. Joseph, G. Danaei, S. García-Saisó, and J. A. Salomon. 2018. "Mortality Due to Low-Quality Health Systems in the Universal Health Coverage Era: A Systematic Analysis of Amenable Deaths in 137 Countries." *The Lancet*.

Leonard, Kenneth L., and Melkiory C. Masatu. 2010. "Using the Hawthorne Effect to Examine the Gap between a Doctor's Best Possible Practice and Actual Performance." *Journal of Development Economics* 93 (2): 226–34.

Ministère du Plan et Suivi de la Mise en oeuvre de la Révolution de la Modernité (MPSMRM), Ministère de la Santé Publique (MSP) et ICF International. 2014. *Enquête Démographique et de Santé en République Démocratique du Congo 2013-2014*. Rockville, MD: MPSMRM, MSP et ICF International.

Nguhiu, P. K., E. W. Barasa, and J. Chuma. 2017. "Determining the Effective Coverage of Maternal and Child Health Services in Kenya, Using Demographic and Health Survey Data Sets: Tracking Progress towards Universal Health Coverage." *Tropical Medicine & International Health* 22 (4): 442–53.

O'Donnell, O., S. O'Neill, T. Van Ourti, and B. Walsh. 2018. CONINDEX: Stata Module to Perform Estimation of Concentration Indices." *Statistical Software Components* S458111, revised September 2, 2018. Department of Economics, Boston College, Boston, MA.

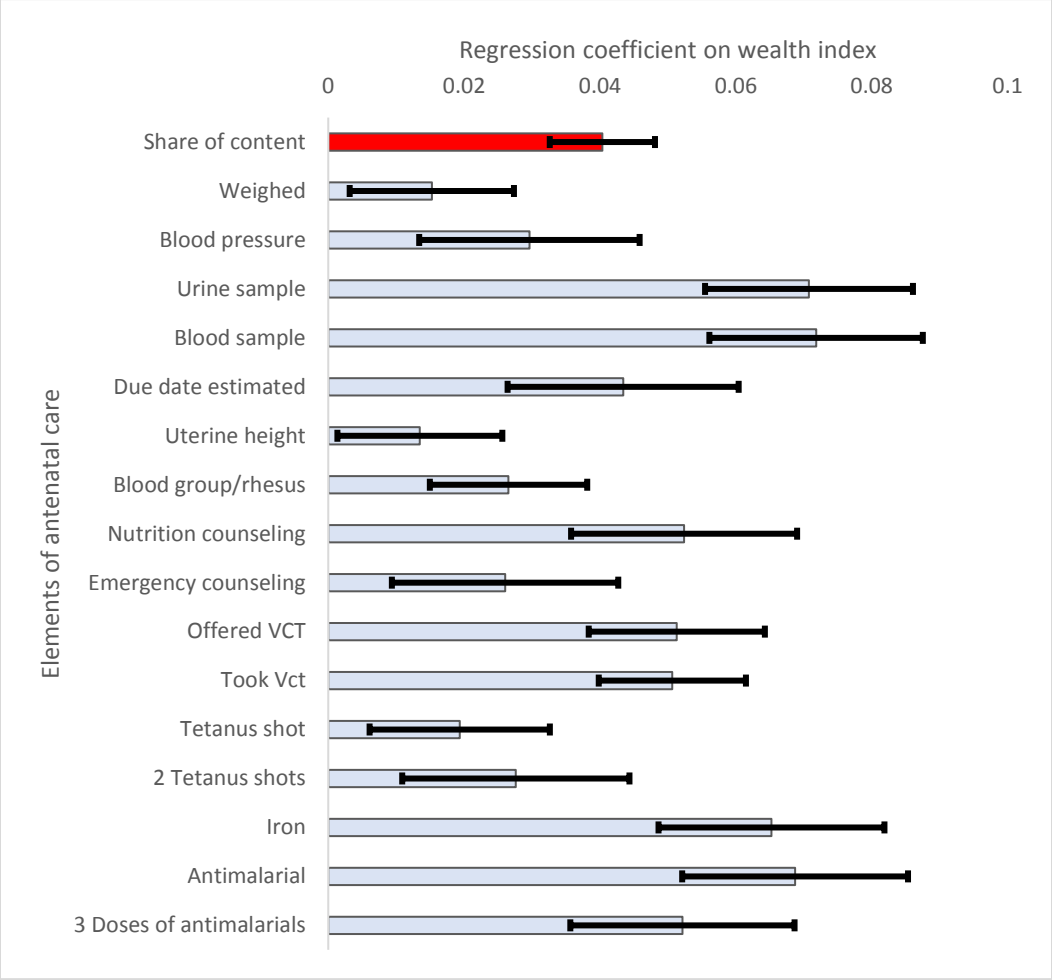
Sharma, J., H. H. Leslie, F. Kundu, and M. E. Kruk. 2017. “Poor Quality for Poor Women? Inequities in the Quality of Antenatal and Delivery Care in Kenya.” *PloS One* 12 (1): e0171236.

Wagstaff, A., C. Bredenkamp, and L. R. Buisman. 2014. “Progress on Global Health Goals: Are the Poor Being Left Behind?” *World Bank Research Observer* 29 (2): 137.

WAGSTAFF, Adam, PACI, Pierella, et VAN DOORSLAER, Eddy. On the measurement of inequalities in health. *Social science & medicine*, 1991, vol. 33, no 5, p. 545-557. WHO (World Health Organization). 2014. *WHO Country Profiles*. Geneva: WHO, https://www.who.int/countries/cod/en/.

Figure and Tables

Figure 1: Relationship between wealth and content of antenatal care (household survey data)



Note: The figure presents the regression coefficients of antenatal care procedures on the wealth index computed based on the first principal component of all household assets. The wealth index was normalized to have a zero mean and standard deviation of 1. The bars represent the 95% confidence interval. Regression coefficients represent changes in the observed probability of obtaining each service with a one SD increase in household wealth. All procedures are reported by women with a live birth in the two years preceding the survey. Women with multiple pregnancies in this period were instructed to report on their most recent pregnancy. The share of content is computed from the 13 elements reported to be conducted (excluding 3 doses of antimalarial treatment, 2 tetanus shots, and took VCT). VCT = voluntary counseling and testing.

Table 1: Concentration indexes for coverage and effective coverage of antenatal care

Indicator	Mean	Concentration index[a]	Standard error of concentration index	Number of observations
Any ANC[b]	0.817	0.050***	0.004	5186
Effective ANC[c]	0.113	0.179***	0.026	5138

Note: Data from the household survey. Sample of women with a live birth in the two years preceding the survey. ANC = antenatal care.

a. The concentration index is calculated using the CONINDEX Stata command (O'Donnell et al. 2018). Individuals are ranked according to household wealth based on the first principal component of 32 household assets.

b. Attended any consultation during the most recent pregnancy.

c. Attended any consultation during the most recent pregnancy and reported having all the following elements of ANC conducted: blood pressure measured, blood and urine samples taken, received information on pregnancy complications, and was given iron supplementation.

Table 2: Relationship between quality of antenatal care and socioeconomic status

	Household data[a]			Direct observations[b]					
Dependent variable	ANC quality index			ANC clinical quality index			Non-clinical quality index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Wealth index[c]	0.041***		0.033***	0.016***		0.015***	0.009		0.007
	(0.004)		(0.004)	(0.005)		(0.005)	(0.006)		(0.007)
Primary		0.033***	0.033***		-0.024	-0.029		0.007	0.007
		(0.009)	(0.009)		(0.023)	(0.024)		(0.033)	(0.034)
Secondary		0.090***	0.078***		0.031	0.015		0.030	0.028
		(0.009)	(0.009)		(0.021)	(0.022)		(0.030)	(0.031)
Constant	0.514***	0.472***	0.459***	0.464***	0.473***	0.508***	0.555***	0.556***	0.564***
	(0.004)	(0.006)	(0.015)	(0.010)	(0.017)	(0.044)	(0.014)	(0.024)	(0.063)
Controlling for age and marital status	No	No	Yes	No	No	Yes	No	No	Yes
Number of observations	4,137	4,134	4,132	441	481	440	452	494	451

Note: The items used for the computation of the quality indexes are presented in appendix B. ANC = antenatal care.

a Data from the household survey. The quality index is the share of 13 procedures performed, reported by women who had a live birth in the two years preceding the survey and received any ANC during that pregnancy.

b. Data from direct observations of antenatal consultation. The quality index is computed from 21 indicators recorded by an enumerator observing the first consultation women received during their pregnancies.

c. The wealth index is based on the first principal component of 32 household assets. The index was created with household survey data and the same weights were used to compute the wealth index for the sample of pregnant women whose antenatal consultations were observed. The wealth index was normalized to have a zero mean and standard deviation of 1.

Table 3: Within-village relationship between quality of antenatal care and socioeconomic status

Dependent variable	Antenatal care quality index		
	(1)	(2)	(3)
Wealth index[a]	0.018***		0.015***
	(0.004)		(0.004)
Primary		0.022***	0.023***
		(0.008)	(0.008)
Secondary		0.049***	0.048***
		(0.009)	(0.009)
Constant	0.514***	0.490***	0.500***
	(0.003)	(0.006)	(0.014)
Controlling for age and marital status	No	No	Yes
Catchment dummies	Yes	Yes	Yes
Number of observations	4,137	4,134	4,132

Note: Data from the household survey. The quality index is computed from 13 procedures performed, reported by women with a live birth in the two years preceding the survey about their most recent pregnancy. The procedures are listed in appendix B.
a. The wealth index is based on the first principal component of 32 household assets. It has a zero mean and standard deviation of 1.

Table 4: Health facility selected for antenatal care (household survey data)

Dependent variable	Higher-level facility[a]	Higher-level facility[a]	Health center of the catchment area[b]	Health center of the catchment area[c]
	(1)	(2)	(3)	(4)
Wealth index[d]	0.041***	0.032***	-0.029***	-0.034***
	(0.004)	(0.004)	(0.008)	(0.007)
Constant	0.062***	0.062***	0.726***	0.807***
	(0.004)	(0.003)	(0.007)	(0.006)
Village dummies	No	Yes	No	No
Number of observations	4,238	4,238	4,258	3,889

a. Antenatal care received at a reference health center or hospital.
b. Antenatal care received at the health center serving the catchment area of residence.
c. Antenatal care received at the health center serving the catchment area of residence, excluding villages where none of the women reported receiving care in the local health center.
d. The wealth index is based on the first principal component of 32 household assets. It has a zero mean and standard deviation of 1.

Table 5: Within-facility relationship between quality of antenatal consultations and wealth

	Household data[a]		Direct observations[b]	
Dependent variable	Antenatal care quality index		Antenatal care quality index	
	(1)	(2)	(3)	(4)
Wealth index[c]	0.016***	0.014***	0.006**	0.006**
	(0.005)	(0.005)	(0.003)	(0.003)
Primary		0.028***		0.021
		(0.009)		(0.013)
Secondary		0.042***		0.011
		(0.010)		(0.013)
Constant	0.494***	0.477***	0.472***	0.492***
	(0.008)	(0.017)	(0.004)	(0.024)
Controlling for age and marital status	No	Yes	No	Yes
Controlling for number of consultations	Yes	Yes	No	No
Facility fixed effects	Yes	Yes	Yes	Yes
Number of observations	2,976	2,972	441	440

a. Data from the household survey. The quality index is the share of 13 procedures performed, reported by women with a live birth in the two years preceding the survey about their most recent pregnancy. The procedures are listed in appendix B.
b. Data from direct observations of antenatal consultations. The quality index is computed from procedures observed by an enumerator observing the first consultation women received during their pregnancies.
c. The wealth index is based on the first principal component of 32 household assets and is normalized to have a zero mean and standard deviation of 1.

Table 6: Relationship between price of first antenatal care consultation, quality, and wealth (exit interview data)

Dependent variable	Price of antenatal care			Price of antenatal care			Price of antenatal care		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No additional controls	**Health zone dummies**	**Facility dummies**	**No additional controls**	**Health zone dummies**	**Facility dummies**	**No additional controls**	**Health zone dummies**	**Facility dummies**
Quality Index[a]	2,819.199***	2,342.726***	1,789.720**				2,439.118***	2,257.813***	1,546.273**
	(477.292)	(423.374)	(710.502)				(488.898)	(458.599)	(781.855)
Wealth index[b]				324.846***	207.008***	121.956***	290.445***	173.076***	123.355***
				(50.153)	(47.257)	(45.913)	(49.809)	(46.747)	(45.982)
Constant	1,040.955***	1,266.522***	1,528.320***	2,068.786***	2,164.586***	2,233.731***	948.249***	1,129.278***	1,505.477***
	(243.678)	(208.916)	(339.297)	(102.184)	(74.566)	(60.112)	(246.326)	(223.130)	(374.247)
Observations	635	635	635	584	584	584	581	581	581

a. Data from the exit interviews. The quality index is the share of the 13 procedures performed, reported by pregnant women after receiving an antenatal consultation. The items used for the computation of the index are presented in appendix B.

b. The wealth index is based on the first principal component of 32 household assets and is normalized to have a zero mean and standard deviation of 1.

Table 7: Price differentiation by health zone wealth distribution (exit interview data)

Dependent variable	Price of antenatal care		Dependent variable	
	Zones with more women in the lowest wealth quintile than the highest one[a]		Zones with more women in the highest wealth quintile than the lowest one[a]	
	(1)	(2)	(3)	(4)
	Health zone dummies	**Facility dummies**	**Health zone dummies**	**Facility dummies**
Quality index[b]	1,715.680***	211.319	2,766.344***	1,977.845*
	(403.443)	(624.624)	(754.522)	(1,120.208)
Wealth index[c]	78.691	30.521	185.555***	137.807**
	(68.274)	(46.413)	(62.116)	(61.553)
Constant	995.197***	1,713.100***	1,204.876***	1,635.138***
	(195.750)	(293.572)	(368.678)	(546.022)
Observations	231	231	340	340

a. The classification of health zones by wealth distribution is based on the wealth indexes calculated using the household survey data.

b. Data from the exit interviews. The quality index is the share of 13 procedures performed, reported by pregnant women after receiving an antenatal consultation. The items used for the computation of the index are presented in appendix B.

c. The wealth index is based on the first principal component of 32 household assets and is normalized to have a zero mean and standard deviation of 1.

Appendix A: Sampling

The baseline survey for the Performance-Based Financing program in the Democratic Republic of Congo took place between June 2015 and March 2016 in 133 health zones in 14 provinces, prior to the launch of the program. For the sample selection, the health teams in each province provided the research team with lists of catchment areas in each health zone, the health facilities in each catchment area, as well as the villages or urban quarters served by the different facilities.

Health Facility Assessments

Five catchment areas in each health zone where randomly selected for inclusion in the sample. All catchment areas within a health zone had the same probability of being selected. In cases where more than one health center served the catchment area, one center was randomly selected. The selection did not distinguish between health centers offering the minimum package of services and reference health centers that offer a more complete package of services.

The five selected health centers within each health zone were randomly divided into two categories: two health centers that would go through extensive assessment and three health centers that would go through a lighter, abridged assessment. Direct observations of antenatal consultations and exit interviews of the pregnant women were conducted only in the health centers where the extensive evaluation was conducted. Five consultations were to be observed in each facility where antenatal care services were provided on the day of the survey. The women who were observed were to be asked to participate in the exit interview. If consent was not provided for direct observation, the women were still invited for the exit interview.

Household Survey

Within each selected catchment area, a single village or urban quarter was randomly selected. In each village, 10 households with female members ages 15-49 who were pregnant in the two years prior to the survey were randomly selected, after listing all the households in the village. General information on the household was collected through interviewing the household head or most knowledgeable member present at the time of the survey. Individual interviews were conducted with all available female household members who were pregnant in the two years preceding the survey.

Appendix B: Quality Indexes

Household Survey

Women who reported receiving any antenatal consultation during their most recent pregnancy were asked whether various procedures were conducted during any of the consultations. The quality index is the share of the following items that were performed:

1. The woman was weighed.
2. Blood pressure was measured.
3. A urine sample was taken.
4. A blood sample was taken.
5. Uterine height was measured.
6. The due date was estimated.
7. The health provider asked about blood group/rhesus.
8. The woman received advice on nutrition during pregnancy.
9. The woman received counseling on what to do in case of emergency.
10. The woman was offered an HIV test.
11. The woman received an antitetanus shot.
12. The woman received iron supplements.
13. The woman received antimalarial drugs.

Direct Observations

The direct observation quality index was constructed using data from observations of first antenatal consultations. A content-of-care index was constructed by calculating the share of the following items that were performed in each consultation:

1. The woman was asked about her HIV status.
2. The woman was asked about her blood group/rhesus.
3. The woman was asked whether she is taking any drugs.
4. The woman was asked about previous antitetanus shots.
5. The woman was asked about symptoms experienced during the current pregnancy. The binary indicator is equal to one if the woman was asked about at least one of the following: vaginal bleeding, abdominal pain, respiratory problems, convulsions, blurry vision or headache, swelling, and other health problems.
6. The woman was weighed.
7. Blood pressure was measured.
8. Uterine height was measured.
9. Auscultation was performed.
10. The health provider listened to the heartbeat of the fetus.
11. A urine sample was taken for diagnostic testing.
12. An HIV test was offered.
13. A syphilis test was conducted or prescribed.
14. A hemoglobin test was conducted.
15. The woman was given or prescribed an antitetanus shot.
16. Iron supplements were given or prescribed.

17. Intermittent preventive treatment for malaria was given or prescribed.
18. The woman received a treated mosquito net.
19. Counseling on nutrition was provided.
20. Counseling on family planning was provided.
21. The woman was informed of signs of pregnancy complication. The binary indicator equals one if at least one of the following was discussed: vaginal bleeding, extreme fatigue, swelling, fever, blurry vision, or headache.

An index of non-clinical quality of care was created by calculating the share of the following indicators:

1. Antenatal care card was filled.
2. Duration of consultation was above median (11 minutes).
3. Provider explained procedures.
4. Provider encouraged questions.
5. Provider suggested a third person attend the consultation.
6. Provider used visual aids.

Exit Interviews

In their exit interview, women were asked about the content of their first antenatal consultation. The quality index is the share of the following items that were performed:

1. The woman was weighed.
2. Blood pressure was measured.
3. A urine sample was taken.
4. A blood sample was taken.
5. Due date was estimated.
6. Uterine height was measured.
7. The woman was asked about her blood group/rhesus.
8. Advice on nutrition was given.
9. Danger signs were discussed.
10. The woman was asked about previous tetanus shots.
11. The woman was given or prescribed iron.
12. The woman was given or prescribed antimalarial drugs.
13. Family planning was discussed.

Table B.1: Relationship between the direct observation and exit interview quality indexes

	(1)	(2)
Direct observation quality index	0.660***	0.673***
	(0.036)	(0.041)
Wealth index[a]		0.005
		(0.010)
Direct observation quality index x wealth index		-0.010
		(0.017)
Constant	0.155***	0.149***
	(0.019)	(0.020)
R-squared	0.24	0.436
Number of observations	482	441

Note: The table presents regressions of the quality index computed from the exit interview reports of content of care on the quality index computed from the direct observation data. The sample is of women for whom we have both observations and exit interviews. The items used for the computation of the quality indexes are presented in appendix B.

a. The wealth index was created with principal component analysis of 32 types of household assets reported by the women in the exit interviews.

Appendix C: Appendix Tables

Table C.1: Sample characteristics

	Mean	Standard deviation	Minimum	Maximum	Observations
i. Sample of recently pregnant women (household survey)					
Age	26.99	6.76	15	49	4,136
In union	0.90	0.30	0	1	4,136
Schooling level					
None	0.28	0.45	0	1	4,134
Primary	0.34	0.47	0	1	4,134
Secondary	0.38	0.49	0	1	4,134
Wealth index	0.06	1.02	-0.46	19.22	4,137
ii. Sample of pregnant women receiving first antenatal consultation (exit interview)					
Age	25.69	6.72	13	45	639
In union	0.90	0.30	0	1	642
Schooling level					
None	0.27	0.44	0	1	642
Primary	0.29	0.46	0	1	642
Secondary	0.44	0.50	0	1	642
Wealth index	0.81	1	-0.45	15.97	588

Table C.2: Antenatal care quality indicators

	Direct observations[a]		Household data[a]	
	Mean	**N**	**Mean**	**N**
Asked about HIV status	0.27	503		
Asked about her blood group/rhesus	0.07	505	0.14	4,137
Asked whether she is taking any drugs	0.48	504		
Asked about symptoms[b]	0.76	498		
The woman was weighed	0.83	506	0.85	4,137
Blood pressure was measured	0.80	505	0.66	4,137
Uterine height was measured	0.97	506	0.88	4,137
Auscultation was performed	0.93	505		
The health provider listened to the fetal heartbeat	0.27	504		
A urine sample was taken	0.20	502	0.34	4,137
HIV test was offered	0.26	501	0.20	4,137
Syphilis test was conducted or prescribed	0.24	503		
Hemoglobin test	0.24	504		
Antitetanus shot given or prescribed	0.48	506	0.81	4,137
Iron given or prescribed	0.43	506		
Intermittent preventive treatment for malaria was given or prescribed	0.60	506		
Received treated mosquito net	0.45	503		
Counseling on nutrition	0.34	506	0.54	4,137
Counseling on family planning	0.17	505		
Counseling on danger signs and emergency[c]	0.52	501	0.54	4,137
Antenatal care card was filled	0.93	503		
Provider explained procedures	0.63	506		
Provider encouraged questions	0.61	506		
Provider suggested a third person attend the consultation	0.38	506		
Provider used visual aids	0.42	504		
A blood sample was taken			0.35	4,137
Provider estimated due date			0.55	4,137
Took iron			0.51	4,137
Took intermittent preventive treatment for malaria			0.52	4,137

a. The direct observations data are for first antenatal care visits. The household data indicators are self-reported by recently pregnant women on the sequence of antenatal care during their most recent pregnancy.

b. Asked about at least one of the following: vaginal bleeding, abdominal pain, respiratory problems, convulsions, blurry vision and headache, swelling, or other health problems.

c. At least one of the following danger signs was discussed: vaginal bleeding, extreme fatigue, fever, blurry vision and severe headache, or swelling.

Table C.3: Relationship between observed content of first antenatal consultations and wealth

	Wealth index[a]		Constant		N
Asked about HIV status	0.043***	(0.011)	0.307***	(0.102)	460
Asked about her blood group/rhesus	0.020***	(0.006)	-0.030	(0.060)	462
Asked whether she is taking any drugs	0.011	(0.012)	0.814***	(0.113)	461
Asked about previous antitetanus shots	-0.004	(0.011)	0.651***	(0.102)	461
Asked about symptoms during current pregnancy[b]	0.005	(0.009)	-0.000	(0.003)	463
The woman was weighed	0.005	(0.009)	0.856***	(0.086)	463
Blood pressure was measured	0.011	(0.010)	0.778***	(0.095)	462
Uterine height was measured	-0.002	(0.004)	0.998***	(0.041)	463
Auscultation was performed	-0.002	(0.006)	0.918***	(0.060)	462
The health provider listened to the fetal heartbeat	-0.001	(0.011)	0.423***	(0.102)	462
A urine sample was taken for diagnostic testing	0.049***	(0.010)	0.195**	(0.092)	459
HIV test was offered	0.053***	(0.011)	0.240**	(0.100)	459
Syphilis test was conducted or prescribed	0.053***	(0.010)	0.268***	(0.097)	461
Hemoglobin test	0.028***	(0.010)	0.170*	(0.098)	461
The woman was given or prescribed an antitetanus shot	-0.018	(0.012)	0.624***	(0.116)	463
Iron supplements were given or prescribed	0.020*	(0.012)	0.475***	(0.116)	463
Intermittent preventive treatment for malaria was given or prescribed	0.005	(0.012)	0.541***	(0.115)	463
The woman received a treated mosquito net	0.005	(0.012)	0.674***	(0.116)	462
Counseling on nutrition was provided	-0.001	(0.012)	0.439***	(0.111)	463
Counseling on family planning was provided	0.016*	(0.009)	0.101	(0.087)	462
Counseling on danger signs and emergency[c]	0.005	(0.012)	-0.000	(0.004)	459
Antenatal care card was filled	0.009	(0.006)	0.922***	(0.059)	461
Duration above median (11 minutes)	-0.008	(0.012)	0.286**	(0.114)	454
Provider explained procedures	0.017	(0.012)	0.644***	(0.113)	463
Provider encouraged questions	0.026**	(0.012)	0.685***	(0.114)	463
Provider suggested a third person attend the consultation	0.008	(0.012)	0.364***	(0.113)	463
Provider used visual aids	-0.005	(0.012)	0.507***	(0.115)	461

Note: Data from direct observations of antenatal consultations. The quality index is computed from 21 indicators recorded by an enumerator observing the first consultation women received during their pregnancies. The items used for the computation of the quality indexes are presented in appendix B. All regressions include controls for age, schooling level, and marital status of the pregnant women.

a. Wealth indexes are based on the first principal component of 32 household assets. Separate indexes were created for the sample of recently pregnant women interviewed as part of the household survey and the sample of pregnant women whose antenatal consultations were observed.

b. Asked about at least one of the following: vaginal bleeding, abdominal pain, respiratory problems, convulsions, blurry vision and headache, swelling, or other health problems.

c. At least one of the following danger signs was discussed: vaginal bleeding, extreme fatigue, fever, blurry vision and severe headache, or swelling.

Table C.4: Relationship between socioeconomic status and characteristics of health center serving the local catchment area

	Equipment index	Consumables index	Reference health center	Equipment index	Consumables index	Reference health center
Wealth index	0.097***	0.191***	0.036***	0.027	-0.018	0.020***
	(0.022)	(0.037)	(0.006)	(0.018)	(0.027)	(0.005)
Constant	0.088***	0.147***	0.139***	0.087***	0.152***	0.139***
	(0.019)	(0.030)	(0.005)	(0.014)	(0.019)	(0.004)
District dummies	No	No	No	Yes	Yes	Yes
Number of observations	4,521	2,959	5,119	4,521	2,959	5,119

Table C.5: Within-facility relationship between reported content of antenatal care and wealth (household data)

	Wealth index[a]		Primary		Secondary		Constant		N
Woman was weighed	0.010	(0.008)	-0.004	(0.015)	0.024	(0.017)	0.980***	(0.031)	3,029
Blood pressure measured	-0.009	(0.012)	0.028	(0.022)	0.054**	(0.025)	0.579***	(0.045)	3,018
Urine sample was taken	0.013	(0.012)	0.075***	(0.021)	0.059**	(0.024)	0.273***	(0.042)	3,032
Blood sample was taken	0.018	(0.012)	0.050**	(0.021)	0.054**	(0.024)	0.385***	(0.043)	3,022
Uterine height was measured	0.026*	(0.014)	0.062***	(0.024)	0.068**	(0.027)	0.447***	(0.048)	3,008
Due date was estimated	0.016*	(0.009)	-0.014	(0.017)	-0.036*	(0.019)	0.842***	(0.033)	3,027
Health provider asked about blood group/rhesus	0.004	(0.009)	0.014	(0.017)	-0.038**	(0.019)	0.140***	(0.034)	3,027
Received advice on nutrition during pregnancy	0.048***	(0.013)	0.044*	(0.023)	0.032	(0.026)	0.499***	(0.046)	3,028
Received counseling on what to do in case of emergency	0.016	(0.013)	0.029	(0.023)	0.033	(0.026)	0.460***	(0.045)	3,022
Offered an HIV test	0.020**	(0.009)	0.039**	(0.017)	0.016	(0.019)	0.107***	(0.034)	3,031
Received an antitetanus shot	-0.003	(0.011)	0.008	(0.020)	0.060***	(0.022)	0.698***	(0.040)	3,032
Received iron supplements	0.045***	(0.013)	0.047**	(0.023)	0.049*	(0.026)	0.460***	(0.045)	3,030
Received antimalarial drugs	0.034***	(0.013)	-0.018	(0.024)	0.117***	(0.027)	0.380***	(0.048)	3,031

Note: Data from the household survey. Women who received any antenatal care and had a live birth in the two years preceding the survey described the care they received during their most recent pregnancy. All regressions include controls for age and marital status of the women, the number of antenatal consultations received during the pregnancy, and village fixed effects.
a. Wealth indexes are based on the first principal component of 32 household assets. Separate indexes were created for the sample of recently pregnant women interviewed as part of the household survey and the sample of pregnant women whose antenatal consultations were observed.

Table C.6: Within-facility relationship between observed content of first antenatal care consultation and wealth

	Wealth index[a]		Primary		Secondary		Constant		N
Asked about HIV status	0.01*	(0.01)	0.05	(0.04)	0.03	(0.03)	0.29***	(0.07)	460
Asked about her blood group/rhesus	0.01	(0.01)	0.04	(0.03)	0.02	(0.03)	-0.02	(0.06)	462
Asked whether she is taking any drugs	0.04***	(0.01)	-0.03	(0.06)	-0.03	(0.05)	0.57***	(0.11)	461
Asked about previous antitetanus shots	0.01	(0.01)	-0.02	(0.06)	0.00	(0.06)	0.76***	(0.12)	461
Asked about symptoms during current pregnancy[b]	-0.00	(0.01)	0.00	(0.00)	-0.01	(0.05)	0.78***	(0.10)	455
The woman was weighed	0.01	(0.01)	0.04	(0.03)	0.02	(0.03)	0.79***	(0.06)	463
Blood pressure was measured	0.01**	(0.01)	-0.00	(0.03)	-0.04	(0.03)	0.88***	(0.06)	462
Uterine height was measured	0.01	(0.01)	-0.01	(0.03)	-0.01	(0.03)	1.07***	(0.06)	463
Auscultation was performed	-0.01	(0.01)	0.00	(0.04)	0.03	(0.04)	0.91***	(0.07)	462
The health provider listened to the fetal heartbeat	-0.01	(0.01)	-0.05	(0.03)	-0.02	(0.03)	0.28***	(0.06)	462
A urine sample was taken	-0.01	(0.01)	0.04	(0.04)	-0.02	(0.04)	0.20***	(0.07)	459
HIV test was offered	0.01	(0.01)	0.04	(0.03)	0.00	(0.03)	0.27***	(0.06)	459
Syphilis test was conducted or prescribed	0.01	(0.01)	0.04	(0.03)	0.01	(0.03)	0.26***	(0.06)	461
Hemoglobin test	0.02*	(0.01)	0.17***	(0.05)	0.02	(0.04)	0.07	(0.08)	461
Antitetanus shot given or prescribed	-0.01	(0.01)	0.01	(0.06)	0.09	(0.06)	0.74***	(0.11)	463
Iron given or prescribed	0.02*	(0.01)	0.08	(0.05)	0.03	(0.04)	0.49***	(0.09)	463
Intermittent preventive treatment for malaria was given or prescribed	0.02	(0.01)	-0.01	(0.06)	-0.01	(0.06)	0.64***	(0.11)	463
Received a treated mosquito net	-0.01	(0.01)	0.05	(0.04)	0.06	(0.04)	0.48***	(0.08)	462
Counseling on nutrition	0.01	(0.01)	0.01	(0.05)	-0.03	(0.05)	0.41***	(0.10)	463
Counseling on family planning was provided	0.01	(0.01)	0.00	(0.04)	0.05	(0.03)	-0.04	(0.07)	462
Counseling on danger signs and emergency[c]	-0.01	(0.01)	0.00	(0.00)	-0.01	(0.05)	0.00	(0.04)	459
Antenatal care card was filled	0.00	(0.01)	0.01	(0.02)	0.01	(0.02)	0.99***	(0.05)	461
Duration above median (11 minutes)	-0.01	(0.01)	-0.13*	(0.06)	-0.06	(0.06)	0.40***	(0.12)	454
Provider explained procedures	0.00	(0.01)	0.06	(0.04)	0.02	(0.04)	0.59***	(0.08)	463
Provider encouraged questions	-0.01	(0.01)	0.03	(0.04)	0.00	(0.04)	0.57***	(0.07)	463
Provider suggested a third person attend the consultation	0.01	(0.01)	-0.02	(0.04)	-0.02	(0.04)	0.43***	(0.08)	463
Provider used visual aids	-0.01	(0.01)	-0.02	(0.05)	-0.03	(0.04)	0.41***	(0.08)	461

Note: Data from direct observations of first antenatal consultation. All regressions include controls for age, marital status, and facility fixed effects.

a. Wealth indexes are based on the first principal component of 32 household assets. Separate indexes were created for the sample of recently pregnant women interviewed as part of the household survey and the sample of pregnant women whose antenatal consultations were observed.

b. Asked about at least one of the following: vaginal bleeding, abdominal pain, respiratory problems, convulsions, blurry vision and headache, swelling, or other health problems.

c. At least one of the following danger signs was discussed: vaginal bleeding, extreme fatigue, fever, blurry vision and severe headache, or swelling.