Understanding Consumer Behavior to Advance Reproductive Health in the United States

Results from Data Analysis in Louisiana and Mississippi, 2017-2018

May 2019

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SCHOOL OF PUBLIC HEALTH

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Acknowledgements

With funding from the David and Lucille Packard Foundation, this project was a collaboration faculty, staff and students at the Bixby and Wallace Centers at University of California, Berkeley.

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Additionally, the research project could not have been completed without the expert contributions of other faculty and staff at UC Berkeley including: Kim Harley (Wallace Center) for her contributions to the design of the study; Alan Hubbard for his statistical consulting; and Paul Gruenwald and Thomas Nephew (Prevention Research Center) for their contributions to mapping out and analyzing DMA data. We are also grateful to Lee Goldberg (Vector Media) and Rebecca Willett (Planned Parenthood) who were instrumental in our efforts to access and understand Planned Parenthood data related to searches on their website.

Finally, and most importantly, we would like to acknowledge the contributions of the reproductive health advocates, providers and experts working on the ground in Mississippi and Louisiana who played an essential role in advising our team throughout this research project.

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Introduction

Individuals should be able to use contraception or abortion resources; access should not be a barrier to these choices. Experts acknowledge that better-informed choices lead to better reproductive health outcomes (Dehlendorf, Krajewski, & Borrero, 2014). Contraceptives lower the risk of unintended pregnancy and associated adverse pregnancy outcomes. Women who use contraceptives incorrectly or inconsistently or who do not use contraception account for 95% of unintended pregnancies (Finer & Zolna, 2016).

Women have more contraceptive options today than they have ever had before. More choices mean that there is more information and more considerations, such as method efficacy, mode of action, frequency of use, accessibility and affordability, when making contraceptive decisions. In recent years, increased choice has been coupled with expansions in the number of women enrolled in Medicaid (Hasstedt, Sonfield, & Gold, 2017) and improved insurance coverage of contraception through the Affordable Care Act (ACA) (Sonfield, 2017b). The ACA requires that a range of contraceptives be covered without cost sharing, with research showing increased use of prescription contraceptives and long acting contraceptive (LARCs) since ACA was rolled out (Snyder, Weisman, Liu, Leslie, & Chuang, 2018; Sonfield, 2017b). Despite this, there are persistent disparities in women's access to contraceptive services in the US, with racial and ethnic minority women who do not desire more children less likely to use contraception than white women (Grady, Dehlendorf, Cohen, Schwarz, & Borrero, 2015), and women on Medicaid faced with incomplete coverage of family planning costs (Sonfield, 2017a). This is paralleled by disparities in abortion rates, with women of lower socioeconomic status and women of color in the US more likely to get an abortion than women of higher socioeconomic status and white women (Dehlendorf, Harris, & Weitz, 2013). Additionally, the current US administration has openly threatened sexual and reproductive health funding and rights, including the federal contraceptive coverage guarantee, Title X funding for family planning programs nationally (Hasstedt, 2017). These actions will likely undermine existing programs, create additional barriers, and potentially widen disparities in access to contraception and abortion in the US.

Restricted access to services, polarization of abortion, and shame and stigma of pregnancy termination can lead women to keep their intentions or actions regarding abortion secret. Such constraints in the current reproductive healthcare landscape prompt many women and men to go online to search for information. By allowing information seeking to be done privately or by connecting people to other resources, the internet gives individuals the chance to make informed, autonomous decisions and be better prepared to discuss their potential choices with their significant others and their health care providers. Evidence shows that clients want more information from their providers, and yet, insufficient time with providers, unaligned priorities and communication barriers often prompt them to turn to the internet (Kraschnewski et al., 2014; Lupton, 2016; Stephens-Davidowitz & Pinker).

Search engines are the first step for individuals looking for health information online; in the US, Google is the most widely used search engine (Fox & Duggan, 2013; Search Engine Watch,

2019). A 2012 American Community Survey report shows that 83% of search users identified Google as their main search engine, followed by Yahoo 16.6% (Purcell, Rainie, & Brenner, 2012). Google search data represent a novel source of data for understanding sexual and reproductive health needs. Google search data can capture what people actually "do, think or want" because people tell Google "some very personal things" (Stephens-Davidowitz & Pinker). What people type into a Google search box in the privacy of their own home often provides insight as to their true health-related questions that they are not comfortable sharing with their clinician or with a research survey.

Despite the wide-scale adoption of and heightened connectivity to the internet, not much is known about online health information seeking on family planning issues at the population level in the United States. As current reproductive health policies increasingly restrict access to birth control and abortion services and information, use of the web may become more important in decision making about these topics. In addition, search traffic information can also help us improve our capacity to conduct pro-active population surveillance that allows for "early cuing" and identification of patterns and trends. Our capacity to identify differences in Google search behaviors at the state and regional level and compare them to search behaviors at the national level allows us to gain insights into potential policy and programmatic implications. A deeper understanding of these search behaviors can help strengthen the capacity of key organizations and reproductive health leaders to deliver appropriate, acceptable, client-centered, quality reproductive information and services.

Rationale and Aim of this Project

This project examined Google online search traffic on birth control and abortion with the goal of generating evidence to inform reproductive health programs. We pursued three main aims:

1. Provide the landscape of internet searches for contraceptive technology and services, including abortion services, and identify the most popular sites for information seeking.
2. Compare online search traffic in MS and LA with the US as reference population.
3. Contrast insights into online search behaviors with clinic/program data in the selected Southern states to understand consumer needs and fill in information gaps in service delivery.

Study Setting

Two states were of particular interest for this study, Louisiana (LA) and Mississippi (MS), known for having some of the poorest reproductive health indicators and most restrictive policies on abortion (Guttmacher Institute, 2019a, 2019b; Jones & Jerman, 2017; Morrell & Davis, 2017).

According to America's Health Rankings 2018 report for women and children, MS ranks as the state with the most challenges for women, infants and children, followed by Arkansas (No 49) and LA (No 48) (United Health Foundation, 2017). For instance, consider the case of maternal

mortality, a closely linked indicator to reproductive health that is preventable. Although decreasing, maternal mortality in MS is still higher than the national average (22.8 vs. 20 per 100,000 live births). In LA, maternal mortality has actually increased by 28% since 2016 to 44/100,000 live births in 2018. Previous evidence has shown that unintended pregnancies – pregnancies that are either mistimed or unwanted – were much higher in MS (62%) and LA (60%) than in the US, where they make up 45% of all pregnancies (Finer & Zolna, 2016; Kost, 2015). This analysis also found that few women in both of these states were using highly effective, reversible contraceptive methods; only 6.6% of women in Louisiana and 11.6% of women in Mississippi were using an IUD or implant in 2017 compared to the state with the highest use, Maine, where 26.9% of women used a LARC (Douglas-Hall, Kost, & Kavanaugh, 2018).

Poverty and low or no insurance coverage are two known social risk factors of maternal health (Molina and Pace 2017) and both markers are relatively higher in the two study states. As the two poorest states in the continental US, 39% of Mississippi's population and 38% of Louisiana's were living below 200% of the federal poverty level in 2017 (Kaiser Family Foundation estimates based on the Census Bureau's American Community Survey, 2017). Rates of uninsured in 2017 at 12.3% (15% for women) and 11.1% (15% for women) in MS and LA respectively were over 4 times higher than in the top ranking state *(*Massachusetts at 2.7%). Through a Section 1115 family-planning waiver, MS covers family planning services with no out-of-pocket costs for women and men ages 13 to 44 with incomes at or below 194% of federal poverty level (FPL). LA provides free family planning services to individuals at or below 138% of FPL who have no other health insurance (Ranji, Bair, & Salganicoff, 2016). Neither MS nor LA have state laws that require coverage of prescription contraception or contraceptive coverage with no cost sharing for populations that fall outside these poverty levels. Both states allow individuals or entities to refuse to provide sexual and reproductive health services based on personal beliefs. In LA, this policy is restricted to abortion services but in MS, this also includes the provision of contraception (NARAL Pro-Choice America, 2018a, 2018b). To support these policies, in both Southern states no health care provider, health care institution or health care payer may be held liable for refusing to participate in a health care service for reasons of conscience (NARAL Pro-Choice America, 2018a, 2018b). These state policies create additional challenges for women in accessing contraception and may be particularly disadvantageous for low income and women who live in rural areas where fertility control stigma is high and access to providers and methods is low.

In addition to not supporting women's access to contraception, the states of LA and MS are among the most hostile to abortion, issuing highly restrictive regulations in recent years. This year MS introduced a heartbeat law that bans abortion after 6 weeks since the last menstrual period and in LA, discussions on a similar heartbeat law are taking place in the senate. Both states also have drafted "trigger laws" that would immediately ban abortion if *Roe v. Wade* were to be overturned (Nash, Gold, Mohammed, Ansari-Thomas, & Cappello, 2018). In addition, both states have imposed several other restrictions on abortion. Restrictions include mandatory counseling and waiting periods after counseling; parental involvement before a minor's abortion; ultrasound use prior to the abortion; banning Medicaid funding of abortion except in cases of life endangerment, rape or incest; restricting abortion coverage in private

health plans and in plans offered through a health insurance exchange; imposing medically inappropriate restrictions on medication abortion and requiring onerous regulations on abortion facilities. These restrictions may be linked to lower rates of abortion in MS and LA for women aged 15 to 44 years. In 2015 (latest available estimates) the rates were 7.8 per 1000 women in MS and 9 per 1000 in LA, compared to 11.8 nationally (Jatlaoui et al., 2018).

Research Questions, Methods, and Sources of Data

The project used a collaborative process comprised of four phases:
Formative phase: Working groups of Packard grantees and other important stakeholders convened separately in MS (March 2018) and LA (April 2018) to engage in discussions about research needs and prioritize the research questions that could help expand the evidence base for delivering consumer-driven family planning services in each state.

Research phase: We applied our research protocol to track research queries to priority questions. We did this by assessing the concerns and interests in family planning and abortion services among Google searchers, including specific birth control methods and their attributes.

Learning and Evaluation phase: We presented the results via zoom meetings in September – October 2018. Working groups in MS and LA had a chance to interpret and contextualize the findings.

Dissemination phase: With the help of working group members, we developed fact sheets on what people search for when they search for abortion and birth control at the state level and at the regional level in MS and LA (See Appendix 5). We additionally are preparing manuscripts for dissemination to a scientific audience.

Using a Collaborative Process to Identify Priority Research Questions

To ensure that we were asking research questions that were most relevant to key people working in reproductive health in MS and LA, we engaged a range of stakeholders as a first step in our project implementation. We initially reached out to Packard Foundation grantees in MS and LA through introductory calls, and through these calls we were connected to other key stakeholders. Next, we convened working groups of 9 and 10 participants in Jackson, MS and New Orleans, LA, respectively, to identify and prioritize the research questions. The working groups consisted of a diverse mix of stakeholders including those that provide reproductive health services, fund reproductive health services and advocate for better access and enabling legislation in each state. Additional stakeholders unable to attend in person were given the opportunity to provide feedback on the research questions and participate remotely in the prioritization activity.

The following **research questions** were identified as priority questions among stakeholders in both states with respect to abortion:

1. What are the top queries that people seeking abortion search on Google?

2. To what extent do people search for medical abortion, surgical abortion, natural/herbal abortifacients?
3. What websites do they go to the most?
4. Are the top sites likely to provide accurate information or misinformation?
5. What misconceptions do people have with respect to abortion? Stakeholders in MS were especially interested in misconceptions concerning abortion and cancer.

With respect to birth control, the following priority research questions were selected in both states:

1. What are the top queries that people seeking birth control search on Google? What birth control methods do they most often seek?
2. What method attributes are people most concerned about? (e.g. ease of use, efficacy/failure rate, pregnancy protection, dual protection, interference with sexual pleasure, cost).
3. What are the most popular websites that information seekers turn to for questions or concerns about birth control methods? Are these commercial, professional (clinical or informational), or governmental?
4. To what extent do the sites provide evidence-based information (or misinformation) on birth control methods?
5. Do health misconceptions appear among attributes of the highest concern?

LA stakeholders were also interested in information seekers who might be at risk of unprotected sex, asking:

1. To what extent do people search for emergency contraceptives, plan b, or morning after pill? Which EC's are searched for the most (pill or IUD's)?

Overall, lack of state-level survey data to address the key research questions render them particularly pressing in both states. Furthermore, questions on abortion received especially high priority given the systematic shift towards more restrictive abortion laws in both states. Stakeholders agreed to focus on the most recent time-period for which data were available and to map search data for MS and LA in reference to the United States.

Data and Methods

We relied on four main sources of data in order to complete our quantitative analysis: (i) Google search data, (ii) census demographic data, (iii) Google Consumer Survey results, and (iv) Planned Parenthood Federation of America (PPFA) website data. Stakeholders agreed to focus on the most recent time-period for which data were available at the time of the discussions (2017) supplemented by 2018 data when available; they also agreed to map search data for MS and LA in reference to the United States. Whenever possible, we present results by Designated Marketing Areas (DMAs) that exist for the states; this is the smallest geolocation for which Google search data are reported. We acquired Nielsen Corporation 2017 data and report on 7 DMAs for MS and 7 DMAs for LA for which we found Google data.

I. Google Search Data and Analytic Approach

We used four Google Application Program Interfaces (APIs) to access Google search data: the custom Google Trends API, the HealthTrends API, the Custom Search API, and the public Google Trends website. We were able to apply our methodology to use the data from these APIs to examine the research questions identified above (Fig 1). (For more details on our methodology, see Appendix Methodology).

The **custom Google Trends API** gave us data about the top search topics and top search queries in the United States, LA, MS, and the DMAs during a specified year (i.e. 2017, 2018) given an initial search term (e.g. birth control, abortion). The custom Google Trends API returns not only the top query requested, but also includes a value from 0-100 denoting the strength of the association between the initial search term and the query (with 100 denoting the strongest relationship and 0 denoting the weakest).

The **HealthTrends API** gave us the relative search volume of our list of top queries. The relative search volume refers to the frequency of a specific query as compared to the other queries in our list of top queries. We ran this analysis for the United States, LA, MS, and available DMAs during the specified year. Since Google has a privacy threshold, we do not report relative search values if the absolute search volume falls below what Google considers its "minimum threshold"; thus if the values fall below Google's unreported confidentiality threshold, we report the value as 0.

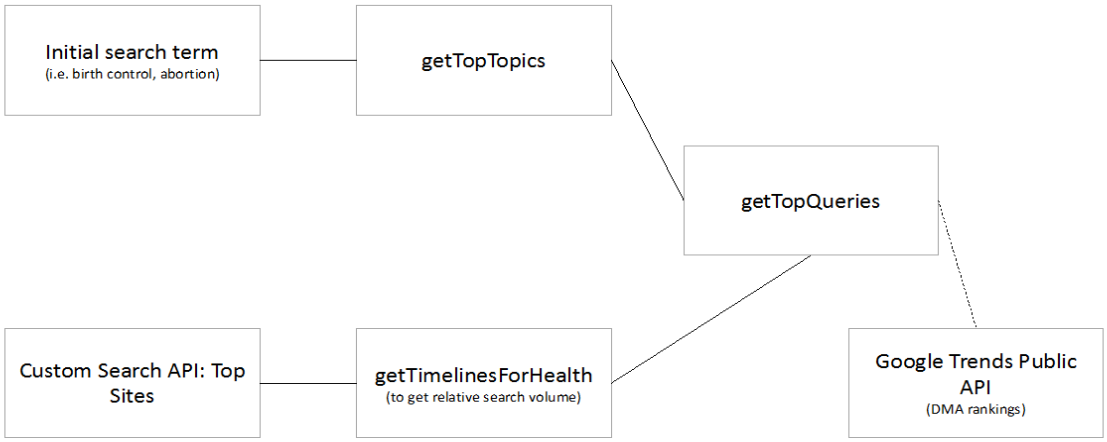
The **Custom Search API** gave us the list of top websites that people who search for a given initial search term (i.e. birth control, abortion) are shown when using the Google Search Engine. This list of top sites is not specific to a particular location, and the time-period defaults to the time when the API is run.

For the DMA analysis, we relied on the public Google Trends website to provide additional context where the HealthTrends API yielded limited information due to the confidentiality threshold. It gave us the relative rankings of search volume for a search query (e.g. birth control, abortion) for each DMA as compared to one another, when sufficient volume of searches were available in the DMA. This data allowed us to explore how search interest varies between different geographical areas in each of the two states.

In summary, we have five steps that we follow to obtain our top search queries for a specific initial term and their relative search volumes for each geolocation in the time period of interest (see Figure 1 below). We display the top queries as "bubble graphs" which map the initial search term to its top related queries in order of the strength of their association. We display the data on relative search volume in pie charts. We then use these relative search volumes in order to calculate estimated search volume. We present the estimated search volumes derived from the relative search volumes in the pie charts. The estimated search volume refers to our calculated estimate for the number of searches for a particular search query (i.e. "birth control pills", "birth control", "abortion pill") in a particular region during a particular year (i.e. 2017, 2018). For a more detailed description of our simulation, please reference Appendix

Methodology. To see the results of running the APIs, see Figures with the labels A1-15 and BC1-21.

Figure 1: Steps in Retrieving Data from Custom Google APIs



II. Census Demographic Data for Designated Marketing Areas (DMAs)

To examine how search interest may vary across populations within each state and to identify what demographic factors may affect this search behavior, we completed analysis at the DMA level using geographic information system (GIS) mapping methodology. We enlisted the help of the Prevention Research Center at UC Berkeley in aggregating Louisiana and Mississippi county statistics to their corresponding multi-county DMA level in each state. We obtained publicly available 2017 census data for each county in Louisiana and Mississippi for the following categories: median age of population, percent of population that is white, median household income and rate of high school graduation. We supplemented these data with the following data from the Robert Wood Johnson County Health Rankings and Roadmaps: income inequality (i.e. income ratio of the 80th to the 20th percentile), uninsured rate, number per 100,000 population of primary care providers, mental health providers, and of chlamydia cases (University of Wisconsin Population Health Institute, 2019). Data were collapsed to the DMA level to provide sum of counts (e.g. population by race, by education), medians (e.g. age) or percentiles and rates. We used quintile values to categorize each measure in the respective DMAs.

We ranked each DMA based on the percentiles of each demographic characteristic and with respect to the relative search volume for abortion and birth control. Rankings on relative search volume for abortion and birth control were obtained through the **public Google Trends**

website. After obtaining these values, we computed Spearman's Rho statistical values for the relationships between DMA demographic rankings and relative search volume rankings for abortion and birth control, respectively.

III. Google Consumer Survey Data and Analytic Approach

Google Consumer Surveys (GCS) allow for online, customized market research; we were able to use GCS in order to ask internet users questions regarding birth control. More information regarding how GCS works is available in the GCS documentation (Google Surveys Help, 2019). We ran separate GCS in LA and MS between August 21 and April 2019 targeting adult English-speaking women aged 18 to 44 years. The goal of the surveys was to gain insight on the main birth control methods that people search for, the contraceptive attributes that women search for, the main side effects that they search for and the top sites they visit to find information on such methods (see Appendix GCS). Google did not allow us to ask questions related to abortion or birth control use, therefore we were limited in the questions we were able to ask via these surveys. Sample size for each survey was 663 respondents with a confidence level of 99%. GCS ensures that the responses it collects form a representative sample of the location in which the survey is run. This means that the responses are representative of the inferred age demographics of the state and the locations of the respondents are spread across the state. Please reference Appendix GCS to view the questions asked in the survey. Survey results are reported in the Key Findings on Birth Control section.

Survey reports include weighted percentages of each variable of interest presented in a graphic form. Weights upweight underrepresented groups and downweight overrepresented groups. The Google Consumer Survey results not only provided a means of corroborating the data we received from the Google APIs, but also yield concrete numbers of information seekers of particular contraceptive methods and attributes.

IV. Planned Parenthood Search Traffic Data

We worked with the Planned Parenthood Federation of America (PPFA) in order to obtain data on the number of searches to their website, as this is the most popular website for reproductive health information that people access in the US. PPFA works with Vector Media to collect analytics on the number of visitors to their site. We worked directly with Lee Goldberg, co-founder of Vector Media, to obtain the number of Google searches for birth control and abortion to the Planned Parenthood (PP) website in the 2017 calendar year in the United States, MS, and LA.

A search is defined as a user typing in a query in a search engine, and then being directed to the search engine's results. All of the data on searches that we obtained are thus the result of a user entering in a query regarding a particular initial search term in the Google search engine, which them leads them to the PP website (Google Analytics Help, 2019). We use the search data obtained from PPFA in order to compute our estimated search volume predictions.

Unfortunately, Google does not provide search volumes. To overcome this limitation we used actual volume data on searches from PP as the baseline for calculating estimated total search

volume corresponding to the relative search volume for the top search queries that we obtained from the HealthTrends API. We had to use two different methods of computing estimated search volume for the initial search terms of interest ("abortion" and "birth control") as the query "planned parenthood" only appeared as a top query for the initial search term "abortion". See Appendix Search Volume for more details on calculating estimated total search volume.

Top Sites and Assessment of the Quality of Sites

Google's Custom Search API was used to identify the top websites for a given search query such as "abortion", or "birth control". On the Google search engine itself, Google's first page lists approximately ten websites determined by their search engine optimization algorithm; the Custom Search API returns these top ten sites when given a query. To ensure the relevancy and legitimacy of the website's content, pages that are linked by other reputable websites are ranked higher by the algorithm; sites with better "user experience" are presented higher as well.

Our analysis was restricted to the top 5 webpages providing information on most searched for methods of abortion ("abortion pill," 5 sites total) and birth control ("birth control pill," "birth control shot," "birth control implant," "birth control patch," and "birth control IUD," 25 sites total) in the US. A previous study has shown that 75% of search traffic is directed to the top 5 sites (Chitika, 2013). Top site links on platforms such as YouTube or news articles were excluded as we were interested in pages providing textual informational content on currently approved methods and wished to remove popular culture news coverage or political coverage of these methods.

To assess the quality of websites accessed by people searching for information on abortion and birth control methods in the US, we developed a comprehensive Website Quality Assessment Tool. Tool development consisted of the following steps:

1. <u>Literature review on assessment of quality of websites and health information:</u> We carried out a systematic review of the literature on quality assessments of health information online and user experience of websites published since 2000 (with a few exceptions for foundational publications), reviewing 28 scholarly articles on these topics pulled from PubMed and Google Scholar. We extracted these key messages:
    a. Certain website characteristics such as clearly stated site objectives, easy to use top navigation, and the presence of an internal search engine on the site, lends sites to be more "user-friendly" and more effectively communicate content (Fitzpatrick, 2000; Hasan & Abuelrub, 2011; Moustakis, Litos, Dalivigas, & Tsironis, 2004).
    b. While assessments have been done on the quality of online information for specific contraceptive methods (IUD, oral contraceptives)(Madden, Cortez, Kuzemchak, Kaphingst, & Politi, 2016; Neumark, Flum, Lopez-Quintero, & Shtarkshall, 2012), no comprehensive

tool existed to assess information across methods of contraception and abortion, and no tool existed to assess websites providing information on the abortion pill specifically.

2. Review and synthesis of clinical and factual information on methods: We conducted an additional literature review to gather the content needed to assess the quality of the clinical and factual information presented by websites on the methods of contraception and abortion of interest for this analysis. We reviewed a variety of resources providing guidance for health care providers and consumers on methods of contraception and abortion. Resources included documents from the American College of Obstetrics and Gynecology (ACOG) and the Association of Reproductive Health Professionals. For eligibility criteria on contraceptive use, we turned to the Morbidity and Mortality Weekly Report(Curtis et al., 2016). The information pulled from these resources was synthesized into a list of assessment criteria for each method considered necessary to provide comprehensive information on that method to a consumer.

3. Initial quality assessment tool development: Informed by the findings from the reviews, we constructed an initial draft of the assessment tool with 129 criteria to assess the sites relevance, objectivity, timeliness, attractiveness, usability, and accuracy. While past research has been done assessing the quality of health information materials, as with the SAM, DISCERN, and EQUIP tools (Charnock, 1998; Charnock, Shepperd, Needham, & Gann, 1999; Doak, Doak, & Root, 1985; Practice Development Inc., 2008), these criteria were compiled to assess the relevance, objectivity, timeliness, attractiveness, usability, and accuracy of websites as resources for health information.

4. Narrowing assessment criteria: The initial tool was paired down based on relevance and utility to this analysis, eliminating criteria that did not yield meaningful or valid information for our assessment. Criteria were eliminated for the following reasons: i) all sites appeared to meet the criterion (e.g. few spelling or grammatical errors; ii) a criterion was not a meaningful measure of quality for sites designed for lay users (e.g. presence of references on a page, or statement of page purpose and scope); iii) the criterion could not be applied objectively based on pretesting by the research team.

5. Tool piloting: The criteria of the Website Quality Assessment Tool were piloted with a small subsample of websites to assess relevance, clarity, and objectivity of assessment criteria based on application by the study team. Wording of criteria was refined based on this piloting.

6. Expert feedback: We then sought input from 5 experts in marketing, health communications, and informatics to further calibrate and refine the tool which was trimmed to 116 assessment criteria with clear and objective definitions. For

each method of contraception and abortion, only certain parameters were applicable to assess the method-specific content provided by the website.

7. Final tool and application: The final product was a Website Quality Assessment Tool with two sections, Quality of Information (QI) on the website and the second, the User Experience (UE) of the website. The complete Website Quality Assessment Tool is described in Appendix WQA.

User experience was designed to assess site credibility, design and functionality, and readability and comprehensibility of information. As show in Table 2, this section encompassed 11 criteria, including whether the site included reading guidelines suggesting that health materials be written at the 6-7 grade reading level to be understandable to the general public (Hutchinson, Baird, & Garg, 2016). Reading level was determined based upon a readability consensus score for excerpted text run through a readability checker that uses 8 readability formulas to score the text (http://www.readabilityformulas.com/free-readability-formula-tests.php). Knowing that many of these sites would have to use some medical terminology or jargon language, we assessed if they provided clarification or further information on complex or medical terminology that users might not be familiar with.

Scoring the Tool: for each assessment criteria in the Quality of Information section, the information had to be present and accurate on the webpage to be scored as a "Yes" (1), and if it was absent or inaccurate it was scored as "No" (0). For UE criteria, sites were scored as a "Yes" if the site had the functionality or met the criteria in the parameter, or as "No" if it did not.

The complete Website Quality Assessment tool was programmed into SuveryGizmo to facilitate easy data entry over a large number of websites. The tool was scored for each site, assessing whether each parameter was met. Two of the five sites were randomly selected to be scored by an additional rater. Early in tool application, differences were also used as a check for the wording and objectivity of assessment questions, and some changes were made based on these crosschecks. These crosschecks also helped establish consistency in the application of the tool across all sites, ensuring that there was discussion of how criteria were applied and any biases in application were checked throughout the assessment process. All differences were noted and reconciled with input from both raters. Over all assessments, raters differed by less than two responses (6.26%).

Key Findings

This report is organized around the leading research questions identified in Section IV(1). We present the key findings from our analysis related to the topic of abortion, followed by the key findings of our analysis on questions pertaining to birth control. We present data for a complete year -- 2017-- but report data from 2018 to highlight key issues. In addition, we provide

evidence on the most popular sites by topic and the quality of information consumers get from the top five sites. For the abortion section, we present results from Google search data, Planned Parenthood data and our qualitative analysis of most popular websites. For the birth control section, we additionally provide supplementary data on birth control searches for women in MS and LA obtained from GCS. When appropriate, we discuss and contextualize findings using available evidence. Results are shown in annexed tables and graphs in Figures A1-15 and BC1-21).

Abortion Findings

I. Tracking Search Queries on Abortion

Top Queries

In 2017, "abortion" as the initial term searched for in the US (our reference population) was most closely linked to the pill (and its cost), followed by abortion clinics/clinic and Planned Parenthood. Abortion facts, abortion statistics and partial birth abortion followed in order of importance (Figure A-1). Top queries in MS in 2017 were far narrower. They were restricted to the abortion pill and its cost -- which is high -- (Figure A-2) whereas in LA, the top queries included the abortion pill and its cost, as well as abortion clinics/clinic (Figure A-3). While there is only one clinic providing abortions in MS, LA still has 3 abortion clinics, thereby providing more options for surgical and medication abortions. As shown in the top queries, most searches are for medication abortion and far fewer are for surgical abortion. Searches for natural abortifacients are not a top concern. The strong interest in abortion pills is consistent with evidence showing that 9 out of 10 abortions in the US occur in the first 12 weeks. Abortion pills can be used to terminate a pregnancy within the first 10 weeks of gestation (Jatlaoui et al., 2018).

The percentage of all abortions by medication rose by 110% in the US between 2004 and 2013 (Jatlaoui et al., 2018). In 2014, about 45% of all early US abortions (<9 weeks gestation) were with abortion pills (Jerman, Jones, & Onda, 2016). Aspiration abortion (also referred to as surgical abortion) is the most common method used in the United States, regardless of gestation, accounting for almost 68% of abortions in 2013 (Bocskor, Hunyadi, & Vince, 2017). Both medication and aspiration procedures are offered in MS and LA's abortion facilities.

Relative Search Volumes

Figures A-4, A-5, and A-6 present relative search values for the top queries on abortion for MS, LA and the US. Even though certain top queries in the United States did not appear as top search queries in LA and MS, using the custom HealthTrends API, we can obtain relative estimates for these queries in each state and then compare these results to the relative search volumes in the United States. Very low search volume will appear as 0. The relative search volume is the label in parentheses on the pie charts.

State level results show that there were significantly more searches for the abortion pill in the two Southern states. Searches for the abortion pill were 1.7 times higher in MS and 1.4 times higher in LA compared with the United States (reference population).

Searches for clinics/clinic other than Planned Parenthood in which to get an abortion were 3.2 times higher in MS and 2.6 times higher in LA respectively compared to the US (Figure A-4, A-5, A-6). Higher searches for clinic/s in the two Southern states may be related to the low number of available abortion clinics. In MS, there is a single abortion clinic. Notably in MS there are approximately 30 Crisis Pregnancy Centers that actively discourage abortion (Figure A-7). In LA, there are 3 functioning abortion clinics and about 40 Crisis Pregnancy Centers (Figure A-8).

Although there were much fewer searches overall, searches for partial birth abortion were relatively higher in the two Southern states than in the US (4.5 and 3.1 times higher in MS and LA respectively; Figures A-4, A-5, A-6). A partial birth abortion is referred to medically as "dilation and extraction", which involves dilating a pregnant woman's cervix and then removing the fetus by pulling the body through the birth canal. Portraying partial birth abortions as a "common" surgical procedure -- when in fact only 1.3% of all abortions are performed at over 20 weeks gestation (Jatlaoui et al., 2018) and, according to year 2000 data, about 0.2% used D and E extraction mostly to save the life of the mother —has been the focus of anti-abortion campaigns and politicians. These campaigns aim to discourage abortions and instill moral judgements that view all abortions as morally wrong (Pollitt, 2014). Searches for partial birth abortion may be a response to aggressive political messaging rather than a response to an actual intention to seek late abortion. MS and LA ban these procedures unless they are necessary to prevent serious health risk of the pregnant woman. In LA, the Center for Reproductive Rights has challenged the ban and the case is pending. In the meantime, the state has agreed to delay enforcement of the ban (Shea, 2018).

In the US, searches for abortion were closely linked to searches for Planned Parenthood, the largest provider of reproductive health services in the US. Planned Parenthood offers STI testing and treatment, contraception, pregnancy tests, prenatal care, cancer screening and prevention and abortion services to women and men. Searches for Planned Parenthood were 2.1 times higher in the US than in MS and 1.5 times higher than in LA, indicating strong brand recognition nationwide. Searches for Planned Parenthood were lowest in MS – a state where there is only one Planned Parenthood clinic and the clinic does not provide abortion services (Figure A-4, A-5, A-6).

Total Estimated Search Volume for "abortion"

We estimate that the total number of searches for abortion in 2017 fell within the following ranges for the US, LA and MS respectively:

United States: 16,431,075 – 18,895,736 searches
Louisiana: 532,609 – 612,500 searches
Mississippi: 505,004 – 580,755 searches

Concerns about the Cost of the Abortion Pill

The cost of the abortion pill appears as a top concern for searchers in the U.S (Figure A-1). This concern is understandable given that in the US, the majority (53%) of women who have an abortion pay for it out of pocket, with Medicaid being the second most-common method of payment, and used by 24% of women (Jerman, Jones and Onda, 2016). However, Medicaid coverage is limited to those states that cover abortion. MS and LA do not cover abortion for Medicaid patients except for pregnancies resulting from rape, incest or life endangerment (Bocskor et al., 2017). Consequently, estimates indicate that 75% of women in Southern states such as MS and LA pay for abortions out of pocket (Jerman, 2016). Only 1.5% of abortions are covered by Medicaid under very limited circumstances, usually through federal Medicaid funds; a whopping 22% rely on financial assistance for abortion (Jerman 2016). Barriers to cost reflect the online searches on cost of the abortion pill (Figures A-2 and A-3).

People who search for "abortion pill cost" go predominantly to the Planned Parenthood website in the US (Figure A-9) (Jerman et al., 2016). The Planned Parenthood website shows that the abortion pill can cost up to $1000 but that the cost depends on where you get it and the type of health insurance coverage that a woman has. In MS, women can get the pill only at the Jackson Women's Health Clinic in Jackson. It costs about $600 in MS and about $500 in LA. Concerns about "abortion pill cost" in 2018 were similar to those observed in 2017 in the US (Figure A-10). In the US and in the two low-resource states, cost of the abortion pill was weighted against the plan b pill and the morning after pill (Figures A-9, A-10).

Abortion Pill and the Emergency Contraception Pill

Overall, more people in MS and LA and the US search for EC (including plan b and morning after pill) than the abortion pill (Figure A-11). The search pattern does suggest that searchers weigh the cost of the abortion pill vs the cost of the EC pills. Searchers might do so for the following reasons: (a) searchers do not know the difference between the two kinds of pills; (b) searchers are weighing the options of taking one vs the other; or (c) searchers may be worried that if the EC pill malfunctions or they cannot access it on time, they may have to resort to an abortion pill. Evidence suggests that crisis pregnancy centers present inaccurate information on emergency contraceptives describing them as abortifacients (Swartzendruber et al., 2018). Claims that pregnancy begins at conception rather than at implantation as medically defined, and the push towards personification of the fetus at increasingly earlier weeks of gestation may add confusion on how these interventions work, increasing online searches on this issue (Pollitt, 2014).

Variations across States

Search volume for abortion varies widely among US states. Compared to other states in the country, the relative search volume for abortion in 2017 was highest in MS and third highest in

LA (after Alabama). By 2018, as shown in the abortion fact sheets, searches in MS remained at the top of the ranking while LA fell to number seven (see Appendix fact sheets).

States with more abortion restrictions ranked higher on relative search volume for abortion than states with fewer restrictions (Spearman's Rho=0.30; p-value <=0.04) (Figure A-12). In 2017, LA had 22 restrictions and MS had 20. Only Alabama with 23 restrictions exceeded the restrictions imposed in LA. Previous studies have shown that abortion search volumes are directly associated with legislative and policy restrictions on abortion and inversely correlated with abortion rates (Cartwright, Karunaratne, Barr-Walker, Johns, & Upadhyay, 2018; Reis & Brownstein, 2010). Using Google 2004 search data, Reis and Brownstein showed that abortion search volume was markedly higher in states requiring mandatory waiting periods, mandatory counseling, mandatory parental consent and notification in the case of minors.

We additionally found that the number of abortion facilities available in a state was inversely correlated with state rankings on relative abortion searches (Spearman's Rho=0.24; p<0.10) (Figure A-13). A recent study demonstrated that closures of abortion facilities and barriers to access increase abortion online searches (Cartwright et al, 2018). Women may respond to these closures by taking pro-active measures. Stephens-Davidowitz found that MS was the state with the highest searches for self-induced abortions (Stephens-Davidowitz, 2016).

Abortion searches were positively correlated with birth control searches (p=<0.001) (Figure A-14) suggesting that people who are concerned about preventing a pregnancy, simultaneously search for ways to terminate the pregnancy should a birth control method fail, be unavailable or unsuitable. The fact sheets show the correlations for these two variables using 2018 data (see Appendix Fact Sheets).

Trends over Time

The Trends graph (Figure A-15) shows that in the US, compared with 2014 which was our baseline year, relative searches for Planned Parenthood increased in subsequent years (2015, 2016, and 2017). This may be explained by improvements to optimize the Planned Parenthood website and attention to abortion issues brought about after Trump's election. In contrast, searches for the abortion pill remained fairly stable. Relative to the other locations, MS also saw an increase in searches for Planned Parenthood compared to 2014 baseline data but a decrease in search for other clinic/clinics over time as abortion became more restrictive and less available. However, concerns for abortion pill remained fairly steady (Figure A-15). Similar patterns were observed in LA (Figure A-15).

II. Traffic to Planned Parenthood Website in 2017

The vast majority of people who search for abortion visit the Planned Parenthood website. In the US, the number of searches for "abortion" and for "birth control" directed to the Planned Parenthood website from Google engine were estimated at 16,431,075 and 22,060,440 respectively (Table 3). We see that in LA, the number of searches for "abortion" and for "birth

control" directed to the Planned Parenthood website from the Google engine were estimated at 296,520 and 532,609, respectively. In MS, the number of searches for "abortion" and for "birth control" directed to the Planned Parenthood website from the Google engine were estimated at 203,400 and 505,004, respectively. From these initial volumes, we are able to extrapolate the ranges for estimated search volume.

III. DMA Analysis

DMA level analysis suggests big variations in search traffic across geolocation. In 2017, searches for abortion in MS were highest in the Greenwood-Greenville area and lowest in the Memphis area (Table 4). As shown in Table 14, Greenwood-Greenville was the DMA in MS that had the lowest percent white population, lowest mean age, highest percent of population without a high school graduation, highest income disparity, highest percent uninsured, highest rates of chlamydia and lowest rate of mental health providers.

Searches for the abortion pill in MS were highest in the Jackson area, followed by the Columbus-Tupelo-West Point area and the Memphis area (Table 5). Searches for abortion clinic/s were highest in Jackson, the city where the sole abortion clinic is located (Table 6). The highest number of searches for Planned Parenthood was in the Hattiesburg-Laurel area, which is also the location of the sole Planned Parenthood clinic in the state (Table 7). Partial birth abortion was mostly searched for in Jackson, area where the seat of state government is located (Table 8).

In 2017, searches for abortion in LA were highest in New Orleans, and were lower in Shreveport (Table 9). Shreveport had the lowest percent white population, and highest rate of primary care and mental health providers (Table 15). Chlamydia rates were amongst the highest. Searches for the abortion pill in LA were highest in the Lafayette area, followed by the Baton Rouge area, the New Orleans area, and the Shreveport area (Table 10). Searches for abortion clinic/s were highest in the Baton Rouge area, the New Orleans area, the Lafayette area, and the Shreveport area; available clinics are located in Shreveport, Baton Rouge, and New Orleans (Table 11). As in MS, searches for Planned Parenthood were linked with the location of Planned Parenthood clinics. In LA, the searches for Planned Parenthood were highest in New Orleans and Baton Rouge, areas that correspond to the location of the Planned Parenthood clinics (Table 12). Partial birth abortion was predominately searched for in Baton Rouge, area where the seat of LA government is located (Table 13).

We ran a regression analysis to examine which demographic and health characteristics were associated with higher rankings on search volume in the DMAs. We found that in MS, higher income inequality was correlated with more searches for abortion. No specific characteristics predicted searches for abortion in LA's DMAs.

A map of the DMAs in each state as well as differences in search traffic across DMAs in 2018, are shown in the fact sheets located in Appendix Fact Sheets.

IV. Most Frequent Sites Accessed for Abortion Searches

We determined the top 5 sites that information seekers in the US visited to find information about the abortion pill, the most searched for method of abortion. These sites are shown in Table 16. The *plannedparenthood.com* page on the abortion pill was the top site, followed by a w*ikipedia.com* page on medical abortion, and then three sites that can be categorized as anti-abortion sites. The anti-abortion sites included an *americanpregnancy.org* page on the abortion pill, *abortionpillreversal.com,*a site providing information on abortion pill reversal, and *abortionprocedures.com,* a page on the abortion pill procedure from a pro-life perspective. No government sites (.gov) were among the top most popular sites.

Our analysis suggests that people in MS and LA also turned to the Planned Parenthood website to search for information on abortion, and specifically for the abortion pill and its cost, although search traffic was lower compared with traffic to Planned Parenthood in the US. We were not able to collect data on the top websites popular in LA and MS because the Custom API does not divulge specific geolocations. However, the high exposure to anti-abortion values and practices likely directs individuals in the two Southern states to visit anti-abortion sites such as those popular nationally.

V. Quality of Top Abortion Pill Websites

Using the Website Quality Assessment Tool, we assessed the quality of the top 5 websites accessed by people searching "abortion pill" in the US. As shown in Table 17 of the top 5 sites, two were health services sites (focused on directing patients to service providers associated with the site in addition to providing health information), two were health education sites (providing health information only) and one was a *wikipedia.com* page, which is a non-profit open source site with information on all topics. The *plannedparenthood.com* site on the abortion pill (site 1) scored notably better than all other sites overall (81%), with higher scores for the User Experience (UE) and Quality of Information (QI) dimensions. The last three of the 5 sites can all be categorized as pro-life sites, discouraging users seeking abortion from accessing services via a variety of tactics. These three sites all had notably lower scores for QI, with two of these three sites presenting no correct clinical or factual information at all. These sites also scored poorly for user experience, with scores ranging from 27 to 55%.

The last three of the 5 sites presented information at higher reading levels on average compared to the first two (10^{th} grade vs. college level, see Appendix WQA for full scoring results). These pro-life sites did not explain or define vocabulary while the first two did, generally through links to other resources on their website. So, in addition to presenting information that was harder to read, they also did not provide any avenue for users to get clarification or definition, creating an additional challenge for users to understand and effectively act upon the information presented.

Cost and Access

In quantitative analysis we found that when searching for the abortion pill many people were concerned with the cost of the pill. Accordingly, we included an assessment of the information presented on these sites about cost. Only the top 3 sites provided accurate information on the cost of the abortion pill. We also included a parameter assessing if sites inform users that some states have laws that restrict and regulate abortion. Only the *plannedparenthood.com* site and the third site, American Pregnancy, did this. While users likely have questions around cost and legal issues they might face in accessing the abortion pill, sites are not consistently providing this information.

VI. Misinformation about Abortion

Misinformation from Top Sites

Beyond not providing accurate information about the abortion pill to users, the pro-life sites assessed presented misinformation related to the effects and use of the abortion pill. As shown in Table 18, these sites stated that the abortion pill leads to increased risk of mortality (site 3, *americanpregnancy.org*), may have effects on future fertility (site 3), is not appropriate for women with mental health problems (site 3) or that it can lead to mental health problems later (site 3 and site 4, *abortionpillreversal.com*), and that the abortion pill is reversible (site 4 and site 5, *abortionprocedures.com*). The figure shown below gives a snapshot of the misleading message that the abortion pill can be reversed.

Abortion Pill Reversal Messaging, https://www.abortionpillreversal.com

The misinformation on these pages is inaccurate based on current clinical evidence (Bocskor et al., 2017). It is part of a larger, well-funded misinformation campaign around abortion in the US. As part of this campaign, anti-abortion groups, including crisis pregnancy centers (CPCs), local and national religious organizations, and even state governments, present inaccurate information seemingly designed to discourage abortion by making it appear unsafe and

psychologically risky, and often under the guise of factual and evidence-based counselling (Ahmed, 2015; Bryant-Comstock, Bryant, Narasimhan, & Levi, 2016). Past research on the information provided by CPC websites has highlighted the range of misinformation on their websites. Abortion has been linked to breast cancer, mental health issues, future infertility, and preterm birth. This misinformation often comes with offers of free services (usually pregnancy tests, ultrasounds and STI testing) (Bryant-Comstock et al., 2016; Bryant, Narasimhan, Bryant-Comstock, & Levi, 2014; Swartzendruber et al., 2018; Waxman, 2006).

In MS, providers are required to counsel patients on the possible link between abortion and cancer and in LA they are required to counsel that abortion has long-term mental health consequences despite both of these assertions being in contradictions to current medical evidence. Both MS and LA also require that CPCs be included on the list of resources healthcare providers given to patients who are seeking services for an unintended or undesired pregnancy, ensuring that CPCs are included with abortion providers as options in the decision-making process and widening the reach of their misinformation (NARAL Pro-Choice America, 2018c). This system of disseminating and validating medically inaccurate information has become prominent over the internet and threatens the quality of reproductive care, posing real challenges for individuals attempting to make informed reproductive health choices.

Abortion and Cancer

Based on past research claiming that abortion can lead to cancer and the knowledge that providers in some states are required to counsel patients that having an abortion could increase breast cancer risk (Bryant et al., 2014; Swartzendruber et al., 2018; Waxman, 2006), we identified the top sites for the joint search for "abortion and cancer". We chose to include all 10 of the top sites in this section of the analysis because we wanted to gauge the variety of sites users might be accessing, rather than solely focusing on those most accessed (Table 19). These sites are a mix of informational resources, news articles, and research publications. Overall, these sites largely focused on the link between abortion and increased risk of breast cancer. We reviewed the content of these sites to determine whether they argue that abortion is associated with breast cancer, or that it is not. Of the top 10 sites, 6 argued that abortion is not linked to increased risk of breast cancer based on current medical evidence, while 4 argued the opposite. The sites that link abortion to increased risk of breast cancer provide a scientifically discredited claim that abortion interrupts transformation of breast tissue, making tissue more unstable and more vulnerable to the development of cancer cells (National Academy of Sciences, 2018).

These contradictory results are likely to confuse online seekers of abortion information that visit multiple sites and mislead those seekers who land on sites that offer discredited information.

Birth Control Findings

I. Tracking Search Queries on Birth Control

Top Queries

In the United States (our reference population group) in 2017, searches for "*birth control*" topic were most strongly associated with the birth control pill (Figure BC-1). This finding is not surprising given that the pill is the most popular method of birth control in the nation and has remained most popular since 1982. Between 2008-2014, approximately 60% of all 15 to 44 year-old women in the US were using a contraceptive method and of those women, 25.3% used the pill (Kavanaugh & Jerman, 2018). More recent data shows that among women at risk of unintended pregnancy the proportion using a contraceptive method has remained the same at 89% in the last decade, with birth control pills being the most used primary method of contraception ranging from 11% in Alaska to 24% in Maine(Douglas-Hall et al., 2018). Following the birth control pills, searches for birth control in the US were also associated with birth control shot (the DMPA injectable contraceptive) and the implant. (Figure BC-1). Other top queries were male birth control referred to vasectomy only and IUD birth control referred to copper IUD.

In 2017, LA followed a similar pattern of the reference population except that the IUD was not a popular search topic associated with birth control (Figure BC-2). State level estimates of contraceptive use in 2017 show that IUD use in LA is among the lowest in the country at 5% among women at risk of unintended pregnancy (Douglas-Hall et al., 2018). The birth control patch was among the top queries associated with birth control in LA (Figure BC-2) but not found in the reference population. In contrast to the US and LA, in MS the range of searches was mostly circumscribed to birth control pills (Figure BC-3).

In 2017, contraceptive use among women aged 18-44 at risk of unintended pregnancy in LA and MS was among the lowest in the country ranging from 65%-69% versus a national average of 89% (Douglas-Hall el all, 2018). In 2018, the top queries for birth control remained the same in LA and MS (Figure BC-5 and BC-6). However, in the US IUD was among the top queries in 2017 but no longer in 2018 (Figure BC-4). Although surprising, this finding can perhaps be explained by the wide variation in IUD use in the US in 2017. IUD use tends to be higher in high contraceptive use states, i.e. West and Northeast regions of the US (80-84%) and the highest use of IUD is estimated to be in Maine (24%) (Douglas-Hall et al., 2018).

Relative Search Volume

In the US birth control pills accounted for slightly more than half of the total searches for birth control in 2017 (Fig BC-7), while slightly less than half in LA (Fig BC-8) and MS (Fig BC-9). In LA and MS birth control shot appears as the second most searched query, while in the US birth control implants and birth control shots were not significantly different from each other as the second most searched queries. In the US, LA and MS, searches for birth control pills were

significantly higher than any other queries related to birth control, supporting Guttmacher Institute findings on contraceptive use in the US in 2017 where birth control pills are one of the most commonly used primary methods of contraception among women at risk of unintended pregnancy (Douglas-Hall et al., 2018). Birth control pill searches were 1.2 times higher in the US than LA and MS, while the shot and patch were relatively much higher in the two southern states than in the country as a whole. LA searches for the shot was 1.9 times higher and for the patch 1.7 times higher than in the US. In MS, searches for the shot were 1.6 times higher and for the patch 2.3 times higher. Implants were the third most searched method in LA and MS while in the US it was the IUD. It is important to note that IUD use is less common in the southern states and more common in the West and Norther states (Douglas-Hall et al., 2018). The fourth most searched method is the patch, but with significantly higher search volume in LA and MS than in the US as a whole. Although specific reasons for this relative difference are not clear to us it is important to note that in 2005 the USFDA required an updated label for the patch to include a warning on increased levels of estrogen. The FDA strengthened the warning in 2008, concluding that the patch might be more likely to lead to blood cloths compared to women on the pill (Krennhrubec K, Zuckerman D, & Ahlbrand S, 2019). This warning might have had an impact on use of this method in the US and therefore relatively fewer searches.

Total estimated search volume for "birth control"

We estimate that the total number of searches for birth control in 2017 fell within the following ranges for the US, LA and MS:

United States: 17,171,784 – 19,747,552 searches
Louisiana: 753,832 – 866,907 searches
Mississippi: 743,152 – 854,625 searches

II. Results from Google Consumer Surveys (GCS)

Overall findings from GCS on the most searched contraceptive methods align with our findings using Google search traffic. In both Mississippi and Louisiana, birth control pills stood out as the method that survey respondents searched for the most on Google (48.6% and 49.9%) respectively). IUD was the second most searched method in LA and MS (26.1% and 25.5% respectively). Contrary to our findings with Google traffic data (which is not restricted to females or to individuals of a certain age), GCS results (which are restricted to 18-44 year- old women) underscore the importance of triangulating information to arrive at meaningful insights given data source limitations (more in limitations section of the report). Implants and Depo shots followed the IUD searches in both states (Figures BC-10, BC-11).

Contraceptive attributes and side effects women are most concerned with, something we could not yield meaningful results with Google API data, were assessed in GCS.(Figures BC-12, BC-13, BC-14, BC-15). For any of the birth control searched online women in both LA and MS were most concerned with how well the method prevents pregnancy (37.8% and 39.6% respectively), followed by changes to menstruation (32.5% and 31.1% respectively) and cost of the method (24.7% and 25.0% respectively), (Figures BC-12, BC-13). Regarding side effects, in both LA and

MS, weight gain emerged as the side effect from birth control methods women are most concerned with (51.7% and 53.3% respectively), (Figures BC-14, BC-15).

In regards to top sites, respondents in both states indicated that they seek information on *WomensHealth* followed by Planned Parenthood. More on the quality and accuracy of the site information in the next section.

III. Trends over Time

Figure BC-16 shows trends in relative search volume for the birth control top queries since 2014. In general, within each geolocation, the queries have remained similar 2014-2017 with relative changes observable in 2017. However, a more detailed comparison by year, geolocation and search query is shown in Figures BC-17.

In the US, LA and MS, birth control pills remain the most searched query for the studied period although with a slight but significant drop in search volume in both the US and MS in 2017. In contrast, searches for birth control shot, the second most searched query in the 3 geolocations appears to have slightly increased in LA in 2017, decreased in MS in 2017 while registering no significant differences in search volume in the US for the entire period (Figure BC-17).

It is possible that changes in contraceptive care laws may also affect online search behaviors. The Affordable Care Act (ACA) regulations require that insurers and group health plans and employers cover women's preventive services, including contraceptives, without cost sharing. The federal contraceptive coverage guarantee requires coverage for 18 methods of contraception used by women (including female sterilization) along with related counseling and services, and it requires this coverage to be provided without any out-of- pocket- costs to the patient, such as copayment or deductibles (Guttmacher Institute, July 2018). The rules exempt religious organizations that object to contraceptive coverage for religious reasons. The current administration has tried to relax these regulations even further, by allowing individuals with a moral or religious objection to contraceptive coverage to purchase health insurance coverage that does not cover contraceptives, even if an insurer or employer offers it to them. So far these regulations have been blocked by the courts. However, some states have recently amended or expanded their own requirements. Currently, 30 states require insurance plans to cover contraceptives with a wide range of coverage and cost sharing requirements and exemptions among these mandates (Kaiser Family Foundation, 2019). According to KFF (www.kff.org/state indicators) neither MS nor LA requires coverage of prescription contraception, or no-cost contraception coverage.

IV. Traffic to Planned Parenthood Website in 2017

The vast majority of people who search for abortion visit the Planned Parenthood website (Table 3). In the US, the number of searches for "abortion" and for "birth control" directed to the Planned Parenthood website from Google engine were estimated at 16,431,075 and 22,060,440 respectively. We see that in LA, the number of searches for "abortion" and for

"birth control" directed to the Planned Parenthood website from the Google engine were estimated at 296,520 and 532,609, respectively. In MS, the number of searches for "abortion" and for "birth control" directed to the Planned Parenthood website from the Google engine were estimated at 203,400 and 505,004, respectively. From these initial volumes, we are able to extrapolate the ranges for estimated search volume.

V. DMA Analysis

DMA level analysis shows variations in search traffic for birth control across each state. In LA, searches for birth control pills were relatively higher in Lafayette and Monroe El Dorado (Figure BC-18). These two DMAs have some of the highest proportion of people categorized as white; also high percentage of people without a high school degree, and a high-income disparity ratio $80^{th}/20^{th}$ percentile (Table 15). Regarding searches on birth control shot, the second most common query, Shreveport emerges as the DMA with the relative highest volume followed by Baton Rouge (Fig BC-18). These two DMAs can be characterized as middle range relative to other DMAs in the state regarding indicators presented in Table 15.

In MS, the searches for the pill were much higher in Biloxi-Gulfport and Columbus (Figure BC-19). In contrast, Jackson and Memphis as DMAs had relatively higher search volumes for birth control shot. Regarding searches for IUDs, Memphis represented the majority of searches in the state for this method. As a DMA Memphis has relatively lower rates on uninsured in the state, the lowest percent of the population without a high school degree and a relatively low income ration percentile (Table 14).

Results from a regression analysis examining the characteristics of each state (Tables 14 and 15) association with higher rankings on search volume for birth control revealed that in LA only the clamydia incidence was statistically significantly associated with birth control searches; higher clamydia incidence was associated with more searches on birth control. In MS, we found that higher income inequality was correlated with statistically significant more searches for birth control.

VI. Most Frequent Sites Accessed for Birth Control Searches

For birth control queries, the top 5 sites in the US visited to find information about key methods of birth control were assessed. Table 20 presents results for the 5 top sites for birth control pills, Table 21 for the birth control shot (Depo Provera or the injection), Table 22 for the birth control implant (Implanon or Nexplanon), Table 23 for birth control patch, and Table 24 for the birth control IUD (intrauterine contraceptive device, most commonly Mirena or Skyla).

For all search terms, a *plannedparenthood.com* page was the top site, with variation across methods for subsequent sites. Pages on *birthcontrol.com* were frequently accessed sites for all methods as well, though generally lower on the list of top sites. Others were accessed frequently across methods, including *healthline.com* (3 methods: pill, shot, implant), *bedsider.com* (2 methods: implant and patch), *webmd.com* (pill and IUD), *kidshealth.org* (shot and patch), and *hhs.gov* (shot and patch). Users also accessed pharmaceutical sites for the birth

control implant and IUD, potentially related to these methods still being unavailable in any generic form in the US and therefore strongly linked to pharmaceutical company branding. All sites provide information specific to the searched method (e.g. birth control pills), and some sites also focused on comparisons between methods (e.g. pill vs. shot) or certain aspects of a method (e.g. side effects or benefits).

VII. Quality of Top Birth Control Websites

Using the Website Quality Assessment Tool, we assessed the quality of the top 5 websites accessed by people searching for "birth control pills," "birth control shot," "birth control implant," and "birth control IUD" in the US. Tables 25, 26, 27, 28, and 29 present the summary results of the Top Birth Control Website Quality Assessment.

The majority of the websites accessed were health education sites, followed by a slightly smaller number of health services sites. Across all methods, *plannedparenthood.com* pages scored highest in the Quality of Information (QI, site scores ranging 75-88.9%) and User Experience (UE, site scores ranging 72.7-90.9%) dimensions of the quality assessment tool. This means that across birth control methods, *plannedparenthood.com* had the highest QI (clinical and factual) and the best UE scores. *Birthcontrol.com* (ranging 53.6-74.1%) provided quality information for most methods but did not do as well on user experience, as their pages did not include visual element to engage users and did not provide in-person resources to users via a help or chat functions as *plannedparenthood.com* sites did. *Bedsider.com* (ranging 62.1-70.4%) did well on UE, providing extensive visual resources for users and very easy navigation of pages and text, but did not provide comprehensive clinical and factual information at the level required by this tool. *Healthline.com* did consistently poorly, scoring highest overall at around 60% for their birth control pills page and lowest at 44.4% for their birth control shot page; these pages provided limited clinical information on a site with poor user experience. The *HHS.gov* (US Health and Human Services) site also did poorly on both UE and QI, with scores ranging from 44.4 to 58.6% overall.

Reading Level and Comprehension

Only 5 out of the 25 webpages provided information meeting the NIH suggestion for 6-7 grade reading level. Two of these were *plannedparenthood.com* pages, one *bedsider.com* page, one *HHS.gov* page, and one *webmd.com* page. Overall, the average reading level for all pages not meeting the requirement was 9.7 grade-level, ranging from 8th to 20th grade levels. This made it clear that reading level is not consistently checked and regulated on these websites, thereby posing a potential barrier for users with lower reading comprehension to accessing information. While many sites did not meet the reading level requirement, they often facilitated user understanding by providing links for difficult or jargon words or technical/scientific concepts. In fact, 18 out of 20 sites that did not meet the grade level requirement provided opportunities for users to access further explanation of difficult language or medical terminology.

Quality of Information

Most sites provided correct information on method efficacy and use, but not for method contraindications, side effects, or risks. *Plannedparenthood.com*, *bedsider.com* and *birthcontrol.com* consistently provided information on method cost and how to access it across methods, while other sites often did not discuss method cost. Many of these sites seemed to be trying to balance providing sufficient information to inform users about the method while not overwhelming them with material. This meant that many had very limited information on the method, and scoring poorly on this assessment. Providing quality of information is particularly important for users who are not able to supplement the information they gain online with quality in-person counselling from a health care provider, as is conceivable in low resource settings such as MS and LA. In low-resource settings counseling time and resources are limited by a variety of factors such as the availability of public funding for use by providers delivering contraceptive services, limited numbers of women's health care providers often with many patients to serve, and limited training available to providers on the provision of modern contraceptive methods such as IUDs and the implant.

Overall, the information provided by sites on birth control methods was evidence-based, if not complete; but there were some instances where sites provided incorrect information about a method, e.g. the "*contraceptive implant reduces sexual desire or pleasure*". This misinformation may contribute to common misconceptions about methods and potentially influence method uptake, particularly for people facing challenges in access mentioned above.

Because we could not get information on top sites for LA and MS from the Custom Search API, we collected this information in the GCS. The top site reported by women in both LA and MS was women's health followed by Planned Parenthood and Wikipedia. Since we have assessed the Planned Parenthood site and Wikipedia already, we proceed to evaluate the quality of information in women's health website using the same methodology. We found that *women'shealth.gov* is a health education site and scored a total of 67.9% in our total score, rated higher in user experience and relatively lower compared to *plannedparenthood.com* related to accuracy of information, clinical information and facts.

Fertility Awareness Based Methods

We wanted to be certain we were not missing alternative ways in which people search for birth control, so we tested various terms. *"Family planning*" emerged as a search term that people used but with a different intention as the one we have been reporting. In the US, people who searched for "family planning" instead of "birth control" were searching for traditional or "natural family planning" methods based on fertility awareness (Figure BC-20). Louisiana was the state where these searches were most pronounced compared to the US (or even compared to MS) in 2017 and 2018 (Figure BC-21). This is not surprising, given that in the US reporting of fertility awareness methods is very low. In 2014, only 2.2% of women used fertility awareness based methods (Kavanaugh & Jerman, 2018).

Study Strengths and Limitations

This study has several strengths. It presents novel analysis of Google search traffic data for abortion and birth control, using local stakeholder input to prioritize research questions and to interpret key findings. The study design uses two comparison groups (neighboring states) to draw important conclusions about search traffic at the state level, and the US as a whole. We rely on timely 2017 and 2018 data from which we obtained volume of searches relative to other queries associated with a key topic and were able to estimate the total volume of searches for a given geolocation based on data that we ascertained from Planned Parenthood. Despite these strengths, the interpretation of the study results needs to account for the following limitations related to the data and the methodology.

Related to Google API data, we do not know the reasons that prompt individuals to search for reproductive health information, nor the characteristics of the individuals searching for the topics assessed in this analysis, although previous studies have shown that people identified as female tend to search more often for topics related to health (Fox & Duggan, 2013). In addition, we cannot be certain that searching for a topic online reflects intention to act. The custom Google Trends API used for identifying top queries only shows the queries highly associated with the topic searched. This results in queries that have weaker associations with the topic not reported. The HealthTrends API also does not report relative search volume below a certain threshold, which is unknown to us. The Google Consumer Survey gave us more precise results on search patterns for women of reproductive age. Nonetheless, GCS presented various challenges. Completion of the survey took a very long time thus in this report we are using 79% of the sample for LA and 98% of the sample for MS. In addition, we were limited to questions of birth control searches. Questions on actual use of contraceptives or on the topic of abortion were disallowed.

Our methodology, although robust for identifying the most popular search queries at a given time and place is affected by the limitations of the data. We were able to estimate a range for the estimated total number of searches. In the future, a methodology needs to be developed to extrapolate estimated total *number of people* searching on Google from estimated total number of searches.

In sum, our methodology for assessing online searches succeeded in addressing the key research questions of this study. We were able to identify specific patterns and compare and contrast them between geolocations and across different time periods. A better understanding of the concerns, interests and preferences underlying search traffic can help identify the knowledge, skills and attitudes that providers and more generally programs will need to address the current demand for information and services.

Implications of Study Results

As people continue to add the internet to their personal toolbox to search for health information and make informed health decisions, we aimed to examine Google search traffic on abortion and birth control in MS and LA compared with the US. Below we highlight the main implications of our findings for service and advocacy and then underscore the main implications for research.

Abortion

Interest in abortion is very high with over half million searches occurring in 2017 in each of the two southern states, reflecting unmet need for reproductive health information and services. In MS and LA search traffic on "abortion" was strongly linked to the abortion pill and its cost and with clinics that provide abortion. Access to the abortion pill is highly regulated in MS and LA and highly restricted in private health plans and in plans offered through the health insurance exchange while Medicaid does not cover abortions except in cases of life endangerment, rape or incest. Medical abortions cost about $600 in MS and $500 in LA, an amount that is relatively expensive for less affluent women who are more likely to experience unplanned pregnancies. Individuals who do not know where to go for care may use the internet to find clinic information. We found that lack of facilities is associated with an increased volume of abortion pill searches. Recent closure of abortion facilities, persistent threats to the only remaining abortion facility available in MS, heightened competition from Crisis Pregnancy Centers which denigrate and discourage abortion and restrictions to Planned Parenthood reproductive services in the two Southern states, require individuals to actively search for clinic information and for many women to travel out of state to get an abortion. In fact, we found that relative searches for the abortion pill and its cost and for abortion clinics were higher in the two Southern states compared to the US overall. This pattern reflects higher unmet need for abortion information and abortion services in LA and MS.

Abortion restrictions at the state level do not seem to inhibit online searches for abortion. On the contrary, multiple changing restrictions appear to stimulate search traffic, perhaps because as legal expert Carol Sanger (Sanger, 2017) explains, "increased regulation of abortion makes abortion feel too personal, too risky and too stigmatizing" prompting people to search for information online rather than through face-to-face providers. Evidence shows that the

higher the unmet need for information, the more likely individuals spend on the internet (Lee & Hawkins, 2010). In MS and LA abortions can only be done up to 15 weeks- and this restriction is changing, becoming even more stringent as the states move to adopt heartbeat laws. Mandatory counseling and waiting periods after counseling, ultrasound use prior to the abortion and parental involvement before a minor's abortion coupled with onerous demands of providers, compound the access barriers.

Higher interest in abortion searches is also associated with unmet contraceptive needs that manifest in a higher volume of searches.
As our findings indicate, we found a robust positive association between search volume for birth control and search volume for abortion, and both were highest in the two southern states. Specifically, in 2017 relative search volume for abortion and for birth control in MS and LA ranked as the top highest and third highest respectively among states in the US.

Search volume for abortion varies widely across DMA's in both states.
Of the demographic variables that we examined, the one that most significantly accounts for variations in search traffic across regions in MS is income inequality: the higher the income inequality in a region, the higher the volume of searches for abortion. In LA on the other hand, none of the demographic variables examined predicted search traffic across DMAs. These results call for more data collection efforts across regions in both states to improve our understanding of local search behaviors.

Removing online informational barriers to abortion is of high priority given unmet reproductive health care needs in both states. Planned Parenthood is the most popular and most trusted website for abortion pill queries in the US and according to some stakeholders should have a more prominent role in educating and informing the public in LA and MS.
In the US in 2017, the number of searches for "abortion directed to the national Planned Parenthood website from Google engine were estimated at 16,431,075 while searches directed to the Planned Parenthood website in LA and in MS were estimated to be proportionally much lower taking population size into account. The public could benefit from having the national Planned Parenthood website refer searchers to more localized information in the two states and help them locate resources. State-level websites could help improve the public's understanding of sexual and reproductive health.

The internet can be a valuable resource for information on birth control and abortion, but it can also be a source of misinformation.
The presence of anti-abortion websites among the top most popular websites in the US is concerning because these sites provide misleading, discredited information and jeopardize the quality of reproductive health care. Providers in LA and MS are mandated by law to refer abortion patients to CPCs. This increases the probability that many MS and LA residents consult anti-abortion sites. The low knowledge-levels about the health and legal aspects of abortion among individuals of reproductive age makes residents in both states more gullible to consume misinformation and confuse fiction from facts (Bessett, Gerdts, Littman, Kavanaugh, & Norris, 2015). Sub-optimal quality websites on abortion must be monitored closely and should be

discouraged whenever possible. Training counselors, providers and consumers how to discern websites that provide quality information is an important action step in both states.

Birth Control

The high volume of searches- more than 700,000 searches for birth control in both LA and MS- might indicate a high level of unmet need for information about contraceptives and potentially services. Our findings indicate that searches on birth control are highly associated with searches on abortion, with MS and LA being the states with the highest search volume in the country on both – birth control and abortion. These two states have some of the lowest contraceptive use in the country and the highest number of abortion restrictions. Google search data tells us that the most commonly searched birth control method is the birth control pill in both LA and MS as well as in the US, a method that is also the most commonly used among women at risk of unintended pregnancy in the country. While GCS data from a representative sample of women 18-44 years old who use the internet in LA and MS, confirms birth control pills are the most searched method, the survey results show Long Acting Reversible contraceptive methods IUD and Implants (in this order) follow birth control pills. This order differs from that found in Google search traffic, perhaps because the latter includes men and women of a broader age range. IUDs and Implants are relative to other contraceptive methods less used in LA and MS but seemed to be highly searched on Google by women in those states. Changes in contraceptive access (e.g., cut backs in contraceptive funding, insurance coverage for services, and restrictions in contraceptive choices) are likely to increase the volume of searches for some if not all birth control methods if restrictions affect certain methods differently.

Similar to the abortion pill, most of the online searches on birth control have been in the Planned Parenthood website; **the number one website that provides high degree of accuracy of information per detailed assessment of content and user information conducted**. Planned Parenthood is also a website that in addition to information about contraceptive methods and abortion provides information on services, thus, increasing consumer knowledge related to access. However, other visited sites, mostly education sites, where potentially thousands of women access information do not present a high degree of contraceptive accuracy. The public must be directed to places with accurate information. Planned Parenthood should be encouraged to be a resource for information and education on contraceptives.

There is a high level of interest among LA and MS women of reproductive age to search for birth control attributes and side effects. In both LA and MS, women of reproductive age are mostly concerned with contraceptive attributes related to how well it prevents pregnancy, changes in menstrual period and cost, in this order of importance. Though discussion on these issues can happen during contraceptive counselling before adoption of a method, during or after adoption in clinic settings, GCS results indicate that women of reproductive age use the internet to gather information on these important topics. Weight gain and mood changes together represent more than 80% of the side effects the women of reproductive age are most concerned with in both LA and MS. Though side effects can also be discussed in clinic settings, women of reproductive age in both LA and MS, seem to rely on the internet to find answers to concerns related to birth control side effects. To better support clients, provider training could include knowledge about the most searched contraceptive methods, most important contraceptive attribute and side effects that concern women.

Search volume on birth control varies within geolocations. The distribution of relative search volume for birth control methods varies widely across Designated Marketing Ares in both LA and MS. However, in LA only high incidence of chlamydia is associated with DMA search volume on birth control while in MS only income inequality significantly predicts high search volume for birth control. These

results indicate that more local data collection efforts are needed to identify factors that are driving the differences in birth control search behaviors.

Trends in birth control searches have not changed much from 2014-2018 in the US and LA and MS. Birth control pills continue to be the most searched method, although increase in searches for Long Acting Reversible methods are noticeable in the last couple of years. This could be a result of more programmatic efforts to make LARC available, but those efforts will need to be coupled with more accessible and accurate information.

Abortion and birth control information seeking expressed by the volume of searches on the internet, indicate a need for improvement in provider-client communication. Providers should be mindful of what clients are searching for and be trained on how to address the interest and knowledge clients have that could reflect accurate or inaccurate information. In addition, given the level of interest reflected in the volume of searches online, there is room for improvement in websites that provide accurate information, especially state-level sites. It is important that providers make every opportunity to tell clients where to go on the web, particularly regarding information on abortion as it becomes more stigmatized and more restrictive.

Implications for future research. There is a need to continue to understand internet searches in today's rapidly changing legal and health care context where personal decisions about birth control methods and managing pregnancy are increasingly under state control. Analysis of Google searches offers reproductive health advocates in MS and LA the opportunity to address deep concerns with almost real-time data. Because the environment is changing rapidly providers and decision makers need to know the unexpressed concerns that are voiced on the internet. In the current environment people will feel more inhibited to express to providers, thus examination of online searches will beoame more important to gage the unmet need of the client population. At the policy level, understanding the drivers of searches for abortion and birth control methods, specifically LARCs, is important so predictions of search patterns can be done based on state-level policy changes. In addition, immigrants may be among the most vulnerable populations to fall prey to contentious reproductive health policies. Thus, understanding searches among non-English speakers in the US and the two southern states and compare their search patterns with those of English speakers would provide insights valuable for program planners and advocates of reproductive choice.

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