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Integrated Reproductive Healthcare in School-Based Health Centers Improves Adolescents’
Access to Long-Acting Reversible Contraception

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1 **Abstract**

2 **Objective:** Long-acting reversible contraception (LARC) is the most effective reversible
3 method of contraception, yet there remain many barriers preventing adolescents in the United
4 States from using it. To mitigate these barriers, Heartland Health Center (HHC) changed the
5 workflow in their school based health centers (SBHCs), introducing a novel “integrated” model
6 of reproductive healthcare. This project aimed to assess changes in contraceptive provision
7 based on the new model of care.

8 **Methods:** The “integrated” model of care includes a certified nurse midwife (CNM) staffing the
9 SBHCs intermittently to provide longer counseling sessions and dedicated time for procedures.
10 Electronic medical records were utilized from before and after the implementation of this model
11 to assess change. Chi-square tests were used to test the significance of change and the
12 association between clinical and demographic data. A Poisson regression model was utilized to
13 estimate the incidence rate ratio (IRR) for the likelihood of receiving LARC.

14 **Results:** LARC prescriptions rose from just 0.6% in 2016 to 3.9% in 2018 ($p < 0.001$). Further,
15 data showed that students were 17.4 times more likely to get LARC prescriptions in 2018 than in
16 2016 ($p < 0.001$). The percentage of prescriptions for emergency contraception rose from 9.8% to
17 24.1% and the percentage of prescriptions for injections fell from 43.7% in 2016 to just 27.1% in
18 2018.

19 **Conclusions:** The present model of integrated reproductive healthcare not only has the potential
20 to improve access to methods of contraception that are challenging to receive, but it also
21 provides an opportunity for specialized providers to deliver culturally competent, trauma
22 informed sexual health education and medical care. This study also provides the foundation for a
23 future study investigating student experience and outcomes based on the new model.

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3 **Introduction**

4 Unintended adolescent pregnancy remains a significant burden in the United States (1).
5 In addition to inhibiting women's social, economic, and political freedom, unintended pregnancy
6 has significant consequences for maternal and child health outcomes (2). Unintended pregnancy
7 can largely be avoided with appropriate contraceptive use. However, in the United States, many
8 women still lack affordable access to effective contraception (3). More specifically, long-acting
9 reversible contraception (LARC), is difficult to access in the United States (4-5). One of the
10 most frequently cited barriers to LARC uptake is the lack of provider training or knowledge (6-
11 8). In order to address this barrier, Heartland Health Center (HHC) has begun utilizing a
12 reproductive health expert, or certified nurse midwife (CNM), for contraceptive counseling and
13 LARC insertions at their school-based health centers (SBHCs). The primary care provider at
14 each SBHC refers students who are interested in learning more about various contraceptive
15 methods to the CNM for counseling visits and insertion visits. This mode of service delivery
16 was modeled after integrated behavioral healthcare. Integrated behavioral healthcare (where
17 primary care physicians provide a warm handoff to on-site behavioral health specialists) has
18 been seen to improve patient's health outcomes, decrease utilization of emergency services, and
19 decrease medical spending (9-11). Therefore, the present study aims to determine if integrated
20 reproductive healthcare and contraceptive counseling alter service provision in SBHCs and
21 ultimately improve adolescent health outcomes. This will help improve future service delivery
22 in HHC's SBHCs and has the potential to inform future provision of adolescent reproductive
23 healthcare throughout the United States.

1 **Unintended Adolescent Pregnancy in the United States**

2 The incidence of unintended adolescent pregnancy in the United States is almost 7 times
3 greater than that of other developed countries (2,12). Data indicate that there are 57 pregnancies
4 per 1,000 female adolescents in the United States compared with 25 per 1,000 in France and 14
5 per 1,000 in the Netherlands (13). Further, 77% of adolescent pregnancies in the United States
6 are unintended (1). Unintended pregnancy not only inhibits young women’s social, economic
7 and political freedom but it can have significant consequences for maternal and child health
8 outcomes. Researchers have found a positive association between unintended pregnancies and
9 maternal risk behaviors (2). Unintended pregnancies have also been reported to result in an
10 increased risk of congenital anomalies, spontaneous abortion, premature delivery, and low birth
11 weight (2). Because of the potential consequences, it is necessary to improve access to
12 reproductive health services in order to limit unintended adolescent pregnancy rates.

13 One commonly cited reason for the high rate of unintended pregnancies in the United
14 States is lack of affordable access to effective contraception; 18% of adolescents (aged 15-19)
15 that are at risk of unintended pregnancy are not using any form of contraception (14). Further,
16 many women in the United States that use contraception, use short-acting reversible
17 contraceptives (SARCs) that have an annual failure rate of 9% (4). Long-acting reversible
18 contraceptives (LARCs) are significantly more effective, with less than a 1% annual failure rate,
19 but are not widely used (4). In the long term, LARC methods are shown to be 20 times more
20 effective than SARC (5). The American College of Obstetricians and Gynecologists asserts that
21 increasing access to all available methods of contraception, including LARC, will help reduce
22 rates of unintended adolescent pregnancy (5). Increasing access to and knowledge about
23 contraception will allow adolescents’ to make informed decisions about their healthcare.

1 **Barriers to LARC**

2 In addition to commonly cited barriers to adolescent reproductive healthcare (such as
3 privacy, financial resources, transportation, and health literacy), there exist many specific
4 barriers to LARC uptake (15). These include: insufficient provider competency, provider
5 preference, limited access to LARC, and limited patient knowledge (7,16-18). Each of these
6 barriers will be examined further below.

7 **Provider competency.** The most commonly cited barrier to LARC implementation is
8 inadequate provider education and training. LARC counseling and insertion requires specialized
9 training that many primary care physicians lack. Data show that patient’s pathways to obtaining
10 LARC methods were dependent on the physician they saw within practices; providers’
11 individual comfort and perceived competence in contraceptive counseling also affected the
12 waiting time to receiving LARC (7,19). Further, a survey amongst members of the Society for
13 Adolescent Health and Medicine (SAHM) found that the strongest predictor of LARC provision
14 was residency training in obstetrics and gynecology (OB-GYN) (20). This has been supported
15 by other studies showing that OB-GYN providers were more likely to provide IUDs than family
16 practice physicians and pediatricians (18).

17 Despite OB-GYN providers being more likely to provide LARC to patients, OB-GYN
18 residents still face barriers to LARC training (17). LARC training is required for OB-GYN
19 residents yet 32% of all residents had only inserted 1-10 IUDs and 39.6% of residents had only
20 inserted 1-10 contraceptive implants. In total, 8% of chief residents had never inserted an
21 implant and 10% had only inserted 1-10 IUDs. Residents reported many barriers to their training
22 including financial barriers, institutional policy, lack of patient demand, and institutional

1 religious affiliation (17). Therefore, it is necessary to ensure providers are specifically trained in
2 LARC insertion and counseling methods in order to improve patients' contraceptive choice.

3 **Provider preference.** In addition to the lack of adequate education and training,
4 researchers have found that many providers have personal preferences that prevent them from
5 providing LARC as an option for adolescents (18,21). Primarily, data show that over half of
6 providers surveyed from the American College of Obstetricians and Gynecologists (ACOG)
7 disagreed with ACOG's statement that LARC can be used as effective contraception for
8 adolescents (18,21). The survey showed that while almost all obstetricians-gynecologists
9 (95.8%) reported providing IUDs, only 43.0% considered adolescents appropriate candidates
10 (21). Many providers were concerned about the safety of IUDs for adolescents. These concerns
11 varied by level of provider training on implantation of IUDs; the higher the level of training on
12 IUDs and LARC, the more likely providers were to support LARC being used for adolescents
13 (18). This once again demonstrates the need for adequate provider training on LARC counseling
14 and insertion in order to ensure adolescents have access to the contraceptive method of their
15 choice.

16 **Limited Opportunity.** Other reasons that adolescents lack access to LARC include
17 limited availability of LARC at their preferred healthcare center and long wait times for
18 insertion. Natavio et al. (2018) examined access to LARC for patients receiving contraception
19 free of cost under a Medicaid State Plan Amendment Program titled, "Family Planning, Access,
20 Care and Treatment" (Family PACT). Data showed that of the clinics that accepted Family
21 PACT, 61% said that they did not provide any LARC methods onsite, only 2% provided all
22 available LARC methods, and only 6% provided same-day placement of any LARC (6). Clinic
23 staff identify barriers to same-day insertion of LARC to be: insurance verification practices and

1 logistical challenges in ordering and stocking devices (7). Thus, patients may have insurance
2 coverage for LARC, yet the clinics they use do not have adequate resources to provide LARC
3 onsite. This demonstrates the need to improve clinics' resources so that adolescents may receive
4 their preferred contraceptive method.

5 In addition to not having adequate resources to provide LARC to patients, researchers
6 have found that community health center staff often provide contradictory descriptions of the
7 facilities' protocols and practices for LARC (7). This means that patients may be misled about
8 the availability of LARC in community health and primary care settings. Therefore, primary
9 care policies and procedures for LARC implementation need to be improved so that patients can
10 reasonably access their preferred method of contraception.

11 **Patient knowledge.** Finally, limited patient knowledge serves as a barrier to LARC.
12 Despite having awareness of LARC, sexually active adolescents cite LARC ineffectiveness,
13 device longevity, and LARC invasiveness as reasons for not using LARC (8). Patients need to
14 be counseled about the true effectiveness, future fertility, duration of use, and perceived
15 invasiveness in order to make informed decisions about LARC. This once again demonstrates
16 that there is a need for specialized providers to provide counseling in order to address barriers to
17 care (8). Further, a mobile app designed for adolescents to learn about contraception and sexual
18 health found that 52% of searches were for contraceptive methods other than condoms and oral
19 contraceptives (the most commonly used forms of contraceptives) (22). This indicates that
20 adolescents are interested in learning about and receiving alternate forms of contraception,
21 including LARC, that they currently have limited access to and information about.

22 **Need for Specialized Providers**

1 As demonstrated by the lack of provider competency in LARC insertion and limited
2 patient knowledge about LARC, specialized providers should be used to reduce adolescents'
3 barriers to LARC (7-8,17-20,22). Specialized reproductive health providers have been shown to
4 increase LARC uptake due to demonstrated competency. Additionally, specialized providers
5 increase patient satisfaction. Both of these benefits will be discussed further.

6 **Provider Competency.** Primarily, specialized providers are enabled by the knowledge
7 that adolescents are appropriate LARC candidates and by opportunity factors such as a
8 supportive clinic environment, LARC device availability, and the ability to insert LARC (or
9 access to someone who can) (16). Further, Zerfu, Ayele, and Bogale (2018) demonstrated that
10 trained community-based reproductive health nurses (CORN) within existing health centers
11 facilitated LARC uptake. CORN counseled women about contraception and the benefits and
12 effectiveness of LARC. Women in health centers that had CORN, were significantly more likely
13 to choose LARC than women in the control health centers (23). This demonstrates that
14 specialized reproductive health providers can facilitate access to LARC and adolescents'
15 preferred contraceptive methods.

16 **Patient Satisfaction.** In addition to decreasing barriers to LARC uptake, utilizing
17 specialized reproductive health providers has been shown to increase patient satisfaction. In a
18 study aimed at identifying reasons why women choose to use family planning clinics rather than
19 primary care providers for their reproductive health needs, 80% women reported that they chose
20 family planning clinics because of the respectful staff, confidential care, free or low-cost
21 services, and staff who were knowledgeable about women's health (24). Importantly, the
22 researchers also recognized that 67% of all specialized family planning clinics offer at least 10
23 different contraceptive methods on-site compared to only 41% of primary care clinics. Further,

1 primary care clinics are far less likely to provide LARCs than family planning clinics (57% vs.
2 75% respectively) (24). This again demonstrates the benefits of utilizing specialized
3 reproductive health providers to reduce barriers to LARC and improve patient satisfaction.

4 **Integrated Care**

5 Integrated behavioral healthcare is a model of service delivery that combines primary
6 healthcare and mental healthcare in a single setting. This is an important model of care because
7 behavioral health and physical health conditions are commonly comorbid (25). Addressing all of
8 the needs of someone's health (in this case behavioral health and physical health) is necessary
9 for positive, cost-effective care (25). Further, the ability of primary care providers to treat
10 mental disorders (particularly with medication) may not be adequate. Primary care providers are
11 often not adequately trained to provide high-quality mental health care and physical health care
12 in a consolidate visit (25). The same need for specialized providers has been demonstrated in
13 reproductive healthcare (16,23-24). The present study aims to assess a model of "integrated"
14 reproductive healthcare in SBHCs. Therefore, this section presents the benefits of integrated
15 healthcare in terms of quality of care, access to care, and cost of care.

16 **Quality of care.** Integrated behavioral care has been shown to improve health outcomes
17 (10-11). In a systematic meta-analysis of randomized clinical trials evaluating integrated
18 medical-behavioral healthcare for children and adolescents, data show a significant advantage for
19 integrated care interventions on behavioral health outcomes. These results demonstrate the
20 benefits of integrated medical-behavioral primary care for improving behavioral health outcomes
21 in adolescents (11). Additionally, Reiss-Brennan et al. (2016) report that patients receiving care
22 from integrated behavioral health clinics had lower rates of health care utilization (ER visits,
23 hospital admissions, and primary care physician encounters) (10). Therefore, integrated

1 behavioral health has been shown to improve the quality of care received and improve health
2 outcomes.

3 **Access to care.** In addition to improving health outcomes, integrated behavioral care
4 increases access to behavioral health services for patients. Data show that patients treated in
5 integrated healthcare practices had higher rates of depression screening, adherence to a diabetes
6 care bundle, and documentation of self-care plans (10). This is due to the fact that patients are
7 able to receive more comprehensive behavioral health services from a behavioral health
8 specialist while visiting their primary care provider (10). Researchers also hypothesize that
9 integrated behavioral health reduces barriers to treatment that occur during referral including
10 stigma and lack of adequately trained providers (9). Overall, integrated care improves patients
11 access to affordable, convenient care.

12 **Cost of care.** Finally, studies examining the effectiveness of embedding a behavioral
13 health clinician into a primary care practice have reported decreased health spending for
14 insurance companies, providers, and patients (9,26-27). Primarily, data show integrated
15 behavioral health services were associated with an \$860.16 per member per year savings (10.8%)
16 (27). Additionally, integrated health services have been seen to reduce healthcare costs for
17 providers receiving capitated payments through managed care plans without negative effects on
18 service utilization (26). Finally, patient health spending declined for families utilizing an
19 integrated behavioral health model (9). Thus, integrated health services not only have the
20 potential to improve health outcomes and improve access to behavioral health services, but they
21 also have the potential to reduce cost.

22 **School-Based Health Centers**

1 Finally, the history of reproductive healthcare in SBHCs will be discussed in order to
2 contextualize the setting of the present study. SBHCs were implemented in order to reduce
3 barriers to healthcare for children and adolescents (28). SBHCs have been shown to be effective
4 in having a positive and lasting impact on adolescents' health (29). Data show that SBHC users
5 were more likely to have made primary care visits, less likely to have used emergency care, and
6 more likely to have received a health maintenance visit (29). SBHCs are most commonly
7 utilized for mandatory vaccinations, physicals, and other primary healthcare needs (30). SBHCs
8 have been increasingly utilized to meet adolescents' reproductive healthcare needs, but not
9 without controversy (30). This section will discuss how reproductive healthcare in SBHCs has
10 been effective in improving access to reproductive healthcare, and the limitations that still exist
11 when providing reproductive healthcare in a SBHC.

12 **Reproductive healthcare in SBHCs.** SBHCs are uniquely situated to reduce barriers to
13 reproductive healthcare for adolescents. Barriers to reproductive healthcare for adolescents
14 include transportation and financial status. SBHCs provide care on site, regardless of a student's
15 ability to pay (30). Eliminating financial and transportation barriers is a significant success.
16 Further, SBHCs offer a one-stop-shop model; students can often access mental health services,
17 dental services, reproductive health services, and preventive services all at a SBHC (30).
18 Exemplifying improved access to reproductive healthcare, Sabharwal, Masinter, and Weaver
19 (2018) showed that the average time to STI treatment for students who received STI treatment
20 from a SBHC was found to be 17 days, whereas for students treated at a CDPH STI clinic was
21 found to be 28 days. Students treated elsewhere were found to have a median time to treatment
22 of 47.5 days (31). These findings support the literature citing the benefits of SBHCs for
23 adolescent reproductive health.

1 In addition to increasing access to reproductive healthcare, the presence of SBHCs have
2 been shown to improve reproductive health outcomes. For females, having access to a SBHC
3 increased odds of having received pregnancy or disease prevention care, use of hormonal
4 contraceptives at last sex, and rate of STI testing (32). Data also show that the presence of
5 SBHCs are associated with delayed initiation of sexual activity (33). This evidence supports the
6 use of SBHC to improve reproductive health outcomes of adolescents in the United States.

7 **Limitations of SBHCs.** Despite these successes, there are specific challenges facing
8 SBHCs and their ability to provide reproductive healthcare and contraception. Historically, the
9 provision of contraceptive services on-site has been singled out and restricted (30). In 2015,
10 only 37% of SBHCs dispensed contraceptives on-site and half of all SBHCs were restricted from
11 doing so. Most prohibitions on dispensing contraceptives were imposed at the local level, by the
12 school or school district (30). The percentage of SBHCs unable to provide contraception has
13 declined since the early 2000s, however, many SBHCs still do not provide contraceptives or
14 LARCs (30). Thus, while SBHCs are uniquely situated to meet students needs, they are not
15 always able to do so because of the controversial nature of adolescents and sexual activity.
16 Additionally, while SBHCs have been shown to improve access to reproductive health services
17 in some cases, many studies report that SBHCs do not reduce pregnancy rates (33). Mason-
18 Jones et al. (2012) also discuss the importance of well-trained staff who are able to communicate
19 effectively with adolescents and meet their healthcare needs (33). Therefore, SBHCs can be
20 useful in improving health outcomes, but there are specific challenges they must overcome.

21 **Public Health Relevance**

22 The goal of this intervention is to increase adolescents' access to their preferred method
23 of contraception and reduce barriers to LARC, which is consistent with the goals of the

1 American Public Health Association (APHA). APHA’s mission is to promote and protect the
2 health of people and communities. APHA asserts that evidence-based disease prevention and
3 wellness promotion programs are critical components of ensuring a healthy America (34). This
4 study is relevant to APHA’s mission as it provides preliminary evidence that supports future
5 evaluation of this integrated reproductive health intervention.

6 Moreover, the literature exemplifies the need for specialized providers in order to provide
7 effective contraceptive counseling and to reduce unintended pregnancy rates in the United States.
8 Unintended pregnancy is largely preventable with appropriate contraceptive use. Based on the
9 literature, it is hypothesized that the use of a specialized reproductive health provider, or CNM,
10 will enhance the ability of adolescents to make informed decisions and access their preferred
11 contraceptive method.

12 **Methods**

13 **Integrated Reproductive Healthcare**

14 Heartland Alliance’s mission is to transform healthcare for vulnerable populations,
15 improve health for all, and enhance the well being of the Chicagoland community (35). In order
16 to meet this mission, Heartland Alliance partnered with Chicago Public Schools to create SBHCs
17 throughout the city. Prior to 2017, Heartland Alliance SBHCs provided reproductive healthcare
18 through a midlevel primary care provider (i.e. a nurse practitioner or physician assistant). In
19 order to increase LARC uptake, the midlevel primary care providers attended a brief training
20 seminar on LARC counseling and insertion. Despite the brief training, the providers reported
21 being too busy and not feeling adequately trained to perform LARC insertions. In response, a
22 novel integrated reproductive health model (modeled after integrated behavioral health) was

1 implemented in 2017 at three of the Heartland Alliance SBHCs (Nicholas Senn High School,
2 Theodore Roosevelt High School, and Roger C Sullivan High School).

3 The integrated reproductive health model allows the primary care provider at these three
4 SBHCs to refer students to a CNM on staff. The CNM has significant training in contraception
5 counseling and LARC insertion. Additionally, the CNM is able to spend more time with
6 students to provide them with appropriate care. The primary care provider is only able to see
7 students for 15 minutes, which is not adequate time to discuss all available methods of
8 contraception in addition to what else must be done during these visits. The CNM utilized at
9 these SBHCs is able to provide 20 minute contraceptive counseling appointments and 30 minute
10 LARC insertion appointments. The CNM visits each school 1-2 times per month. While same-
11 day LARC insertion is not always possible, the SBHCs have a "captive audience," or rather
12 students can be pulled from class for their health center appointments and have easy access to the
13 clinic. In addition to a referral from the primary care provider, students often refer one another
14 to the CNM.

15 **Data**

16 De-identified data were extracted by staff at Alliance using an electronic medical query
17 for HHC clinical encounters where a birth control prescription was written. This study was not
18 considered human subjects research and was granted exemption from the Northwestern
19 University IRB. All data was provided to the student investigator via a de-identified dataset for
20 the purposes of analysis for the student's Culminating Experience project.

21 Study inclusion criteria were: (1) contraceptive prescriptions for adolescents at a
22 Heartland Alliance SBHC in 2016 (prior to the integration of the CNM), and (2) contraceptive
23 prescriptions for adolescents at a Heartland Alliance SBHC in 2018 (after integration of the

1 CNM). The analysis is at the level of individual prescriptions rather than unique students. The
2 average number of prescriptions per student was approximately two, and approximately 20% of
3 students received three or more prescriptions. Therefore, some students seen in 2016 may also
4 have been seen in 2018, and some prescriptions, such as injections involved multiple visits
5 within a year.

6 Prescriptions for adolescents that were not able to be matched with a patient ID or record
7 were excluded from analysis (4.6% of prescription data). Patient data collected included
8 demographic data (e.g. age, sex, and language) and healthcare visit-related data (e.g. visit type,
9 location of visit, and contraceptive medications).

10 **Data Analysis**

11 Prescription types included: emergency contraception, implant, intrauterine device (IUD),
12 injections, oral contraception, patch, and ring. Age was coded as a categorical variable with
13 three categories: 12-14, 15-17, and 18-20. Location of visit was coded as Nicholas Senn High
14 School, Theodore Roosevelt High School, Roger C Sullivan High School, or “other.” “Other”
15 refers to the three other SBHCs with smaller patient populations (Uplift Community High
16 School, Kilmer Elementary School, Hibbard Elementary School). Language was either English
17 or Spanish. Finally, encounter year is used as a proxy to represent the mode of health care
18 delivery (2016 represents contraception provision by a primary care provider and 2018
19 represents contraception provision by the CNM). It should be noted that this analysis does not
20 confirm the effect of this provider intervention as opposed to what could have been a simple
21 secular trend in types of contraception requested and provided.

22 Chi-square tests were used to test the significance of the association between clinical and
23 demographic data (prescription type, age group, location of visit, and Spanish language) and

1 encounter year (2016 versus 2018). A multivariate Poisson regression model was utilized to
2 estimate the incidence rate ratio (IRR) for the likelihood of receiving LARC, testing the
3 significance of year controlled for patient characteristics (language, age, SBHC).

4 **Results**

5 There were 510 contraceptive prescriptions in 2016 and 698 in 2018 for 607 unique
6 patients. Only two prescriptions were for males. Figure 1 shows the distribution in each year of
7 types of contraceptive prescriptions.

8 Table 1 presents analyses of differences between years (2016 versus 2018) in prescription
9 type, age, SBHC, and Spanish language. The results revealed significant differences in
10 prescription types between 2016 and 2018. The percentage of LARC prescriptions (implants and
11 IUDs) rose from 0.6% to 3.9% ($p<0.001$). Implants and IUDs each individually made up a
12 significantly greater percentage of total contraceptive prescriptions in 2018 compared to 2016
13 ($p<0.01$ and $p<0.02$ respectively). The percentage of prescriptions for emergency contraception
14 rose from 9.8% to 24.1% and oral contraception rose from 14.5% to 30.2% ($p<0.001$). Finally,
15 the percentage of prescriptions made up by the patch rose from 2% to 7.2% ($p<0.001$). These
16 increases were met by a significant decrease in injections, falling from 43.7% of prescriptions in
17 2016 to just 27.1% in 2018 ($p<0.001$). The small percentage of prescriptions for contraceptive
18 rings did not change significantly from 2016 to 2018 ($p>0.05$).

19 Data also showed that the age of students getting prescriptions was significantly different
20 in 2018 compared to 2016 ($p<0.001$). In 2016, 0.8% of prescriptions were written to patients 12-
21 14, 52.9% to patients 15-17, and 46.30% to patients 18-20. In 2018, 23.2% of prescriptions were
22 written to patients 12-14, 74.5% to patients 15-17, and 2.3% to patients 18-20. The percentage

1 of prescriptions provided at each SBHC and the number of Spanish speakers also differed
2 between 2016 and 2018 ($p < 0.001$).

3 A multivariate Poisson model of the likelihood of a LARC prescription was used to test
4 the significance of year (e.g. 2016 or 2018) and was controlled for age, language, and SBHC
5 (table 2). The IRR for this model was 17.4, indicating that students were 17.4 times more likely
6 to get LARC in 2018 than 2016 ($p < 0.001$). Additionally, students aged 18-20 were 3.8 times
7 more likely to get LARC than students aged 12-14 ($p = 0.06$).

8 **Discussion**

9 Data indicate that the percentage of LARC prescriptions significantly increased in 2018
10 from 2016 after the implementation of an integrated reproductive healthcare model at Heartland
11 Alliance SBHCs. LARC prescriptions rose from just 0.6% to 3.9% ($p < 0.001$). This increase
12 was met by a significant decrease in some SARC prescriptions, including injections. Further,
13 data showed that students were 17.4 times more likely to get LARC prescriptions in 2018 than in
14 2016 ($p < 0.001$). These data provide preliminary evidence that integrated reproductive healthcare
15 may decrease barriers to LARC and increase patients' choice in contraceptive method. Data
16 have been distributed to HHC; ultimately, this study sets the stage for a larger study to examine
17 the effect of this intervention on patient satisfaction and patient access to their preferred method
18 of contraception.

19 Improving access to reproductive healthcare and reducing rates of unintended teenage
20 pregnancy have been seen as such important human rights issues that the United Nations
21 established reproductive health as one of its 8 Millennium Development Goals (36). By 2015,
22 the United Nations hoped to improve maternal health and achieve universal access to
23 reproductive healthcare throughout the world (37). As such, many resources have been devoted

1 to reproductive healthcare and improving maternal and child health outcomes. In the United
2 States, the unintended pregnancy rate amongst adolescents (15-19 years old) reached its lowest
3 point in at least 80 years in 2013 (38). The adolescent pregnancy rate dropped 36% from 2008 to
4 2013 and abortion rates also fell by more than one-third (38).

5 Researchers have several hypotheses on the source of this decline. One hypothesis is that
6 a part of the decline is linked to a decrease in sexual activity amongst adolescents. Studies report
7 that national trends indicate that fewer adolescents are sexually active in the twenty-first century
8 (39). Another, more prominent, hypothesis is that increased use of effective contraception is the
9 primary driver of reduced unintended adolescent pregnancy (38,40-42). From 2007 to 2014
10 increased contraceptive use was found to be the primary driver of reduced adolescent pregnancy
11 rates. During these years, there were significant increases in the use of one or more
12 contraceptive methods at last sex and use of LARC methods. Additionally, these data show that
13 the level of sexual activity did not change (40-41). Further, another study showed that
14 improvements in contraceptive use were responsible for 86% of the decline in adolescent
15 pregnancy risk (42). Therefore, increased access to contraception has continued to reduce the
16 rate of unintended pregnancy and improve adolescent health outcomes.

17 While the present study does not show that contraception is directly linked to a decrease
18 in adolescent pregnancy, it does show that access to more effective contraception has increased.
19 Thus, the integrated reproductive healthcare model used in this study has the potential to lead to
20 increased access to effective contraception which has been seen to improve adolescent health
21 outcomes (38,40-42). This is vital to the economic, political, and social freedom of women as
22 described by the United States Supreme Court and the United Nations (36,43).

23 **Limitations**

1 While this study showed that LARC prescriptions increased and students were more
2 likely to be prescribed LARC in 2018 than in 2016, it is necessary to note that this change cannot
3 be directly attributed to the change in service delivery. In order to demonstrate that the change in
4 contraceptive service provision was directly attributable to the change in service delivery, the data
5 would have needed to be extracted more precisely around the start date of the CNM. This would
6 have allowed data to be analyzed as an interrupted time series and would have shown more
7 precise effects of this intervention.

8 Additionally, it would also have been beneficial to utilize a control group in order to
9 demonstrate that the change in LARC was due to the mode of service delivery rather than
10 national trends in LARC use. Nationally, data show that LARC use has increased, specifically
11 amongst young women aged 18-24, in the last decade (44-45). Utilizing a control group would
12 have allowed researchers to eliminate the possibility that the increase in LARC was due to
13 national trends rather than the mode of service provision.

14 However, it is also important to note that this national trend is less clear for adolescents
15 under the age of 18 at risk of unintended pregnancy. Data show LARC use did not significantly
16 increase between 2008 and 2013 in adolescents (44). Additionally, data from the present study
17 show that students aged 18-20 were 3.8 times more likely to get LARC than students 12-14.
18 Therefore, while it is possible that the present results are reflective of a national increase in
19 LARC use, this trend is not clearly established in adolescents, which were the primary
20 population used in our analysis.

21 The analysis in this study is also limited because data may be slightly skewed. Data were
22 analyzed at the prescription level rather than the individual patient level. Thus, the percentage of
23 prescriptions that were for injections may have been multiplied to the extent that individual

1 patients received multiple injections (every three months). Each patient had between 1-10
2 prescriptions, with an average of 2 prescriptions. While analyzing the data by individual patient
3 may have avoided this error, it would also have introduced bias, as the researchers would have
4 had to select which prescription to utilize for each patient.

5 Finally, it is important to recognize that increased uptake of LARC was not the primary
6 goal of the intervention. Rather, the goal was for students at the SBHCs to be able to access their
7 preferred method of contraception utilizing a reproductive justice framework. The data collected
8 is only able to assess the change in contraceptive provision, not access to the preferred method of
9 contraception. Thus, this study was unable to determine if the CNM was effective in decreasing
10 barriers to care for adolescents at the SBHCs. Future research should aim to better understand
11 the change in service provision as a function of adolescents' preferred contraceptive method.
12 Further, it is hypothesized that a specialized provider would improve overall patient satisfaction
13 in the SBHCs. Women have previously reported that they are more confident and comfortable
14 with specialized women's health providers (24). Therefore, future research can utilize a mixed
15 methods design in order to better understand patient satisfaction within an integrated
16 reproductive care model.

17 **Public Health Implications**

18 While some have deemed the recent decline in adolescent pregnancy a public health
19 success, there still exist significant health disparities in adolescent reproductive health outcomes
20 in the United States that need to be addressed. Hispanic, African American, and American
21 Indian adolescents continue to have the highest adolescent birth rates in the country (12,38).
22 Other vulnerable populations (runaway and homeless adolescents, adolescents in foster care, and
23 adolescents living in rural areas) also continue to show higher than average adolescent pregnancy

1 rates. It is hypothesized that these rates result from the lack of culturally competent and trauma-
2 informed sexual health education and medical care (46). The present model of integrated
3 reproductive healthcare not only has the potential to improve access to adolescents' preferred
4 method of contraception, but it also provides an opportunity for specialized providers to deliver
5 culturally competent, trauma informed sexual health education and medical care utilizing a
6 reproductive justice framework. This study provides a novel model for health care delivery that
7 can increase adolescents' access to their preferred method of contraception, improve adolescent
8 reproductive health outcomes, and reduce health disparities. Therefore, after further research,
9 this model may be implemented in SBHCs throughout the country.

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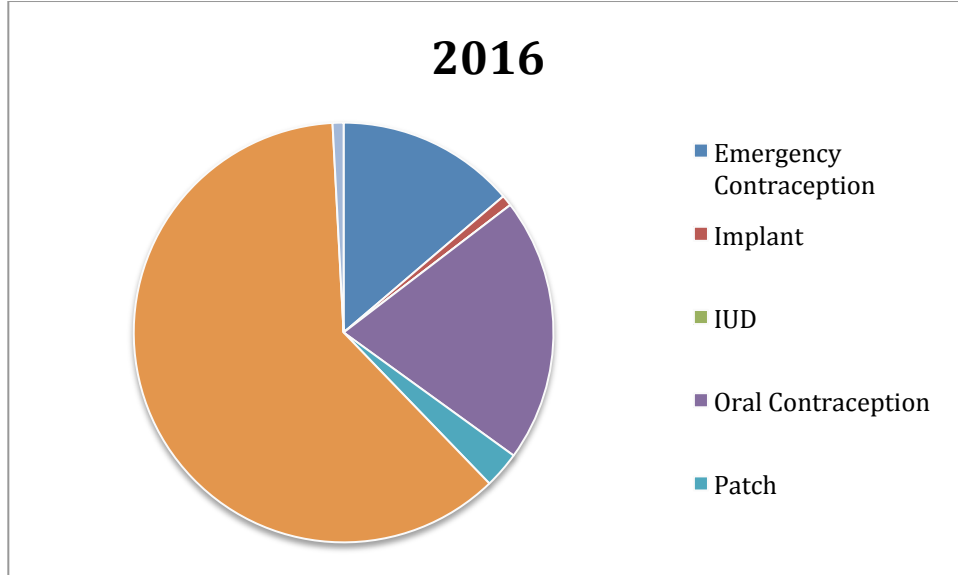
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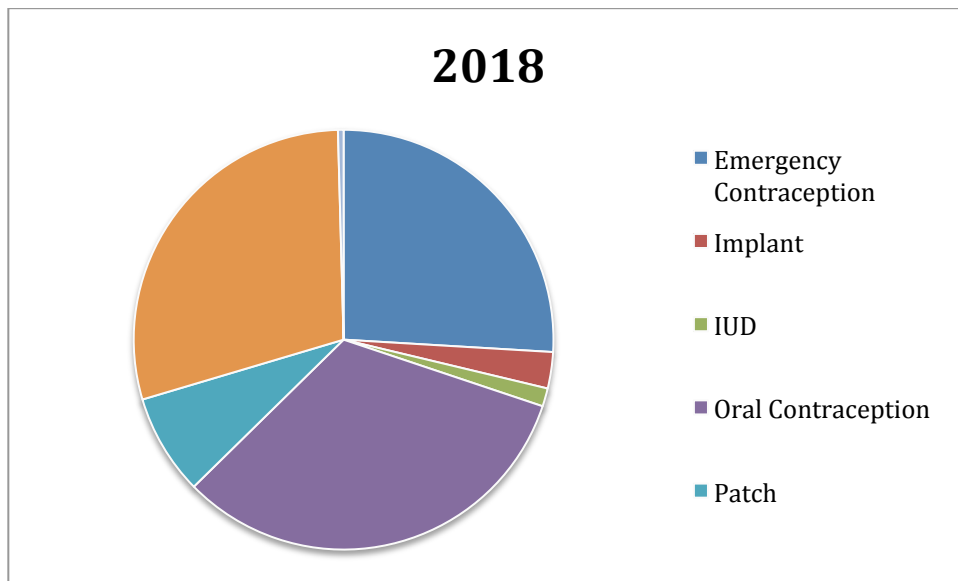
Figure 1

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Contraceptive Prescriptions by Year 2016-2018



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Table 1
Comparison of Contraceptive Prescriptions for Students Age 12-20 at Six Chicago School
Based Health Centers 2016-2018

	Percent 2016 N=510	Percent 2018 N=698	Significance
LARC	0.60	3.90%	P<0.001
Emergency Contraception	9.80%	24.10%	P<0.001
Implant	0.60%	2.60%	P<0.01
IUD	0.00%	1.30%	P<0.02
Oral Contraception	14.50%	30.20%	P<0.001
Patch	2.00%	7.20%	P<0.001
Injection	43.70%	27.10%	P<0.001
Ring	0.60%	0.40%	P=0.70
Age Group			P<0.001
12 to 14	0.80%	23.20%	
15 to 17	52.90%	74.50%	
18 to 20	46.30%	2.30%	
School Based Health Centers			P<0.001
Senn	39%	40.30%	
Roosevelt	47.80%	34.80%	
Sullivan	2.40%	19.50%	
Other Health Centers	10.8%	5.4%	
Language			P<0.001
Spanish Speakers	17.5%	8.3%	

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Table 2

2

Testing the Significance of Year Using Incidence Rate Ratio (IRR) for the Likelihood of

3

Receiving LARC

LARC	IRR (95% CI)	P Value
Spanish	1.76 (0.66-4.68)	P=0.26
Age Group		
12-14	Reference	
15-17	0.99 (0.40-2.49)	P=0.99
18-20	3.85 (0.97-15.26)	P=0.06
Clinic Location		
Other SBHC	Reference	
Roosevelt	0.60 (0.17-2.15)	P=0.43
Senn	0.67 (0.18-2.35)	P=0.53
Sullivan	0.44 (0.10-2.00)	P=0.29
Year 2018	17.45 (4.10-74.34)	P<0.001

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