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Signs of Growth and Healing: Health Care and Science

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Signs of Growth and Healing

Health Care and Science

Richard J. Fehring

* My essay on the history of Catholic Natural Family Planning (NFP) scientists (chapter 8 in this volume) ended with discussing scientists who were active during the papacy of John Paul II (1979–2005). This present essay continues with the time period from approximately 2000 to 2018 and, indeed, into the future. My purpose here, however, is to delineate signs of growth and healing in health care and science related to NFP and not to focus on individual NFP scientists. Given that purpose, recent trends in NFP science and historical factors that influence NFP science can provide us with signs of growth regarding NFP and its application to medicine and health care. Here, I will cover five areas to demonstrate that hope. Before doing so, however, a word should first be said about a handful of hopeful trends that have also occurred in this time period. They are: US federal government funding of NFP research, a resurgence of NFP interest among Catholic health-care professionals, and efforts to publish NFP science.

Growth in NFP Support and Research

NFP and Federal Funding

In the United States during the presidency of George W. Bush (2001–2009), several conservative Catholic leaders were appointed to important government institutions. Among the federal appointments, those to the Office of Population Affairs (OPA), would prove helpful to NFP education and use.

OPA oversees the administration of Title X in the Department of Health and Human Services (HHS). Title X, which was created in 1970 as part of the Public Health Service Act, is the “only federal program dedicated solely to the provision of family planning and related preventive health care.” In its general

1 Title X is “designed to provide contraceptive supplies and information to all who want and need them, with priority given to persons from low-income families.” In addition to providing voluntary family planning, Title X-funded centers provide family planning education and counseling, including information on the methods of Natural Family Planning; breast and cervical cancer screening; sexually transmitted disease (STD) and human immunodeficiency virus (HIV) testing, referral, and prevention education; and pregnancy diagnosis and counseling. By law, Title X funds cannot be used in programs where abortion is a method of family planning.” Title X Family Planning Annual Report, 2017 National Summary, 1, at https://www.hhs.gov/opa/sites/default/files/title-x-fpar-2017-national-summary.pdf.
requirements for grantee family planning programs, Title X includes NFP education and provision of services. In 2008, OPA issued a call for research proposals and programs that would help increase the use of NFP services in the Title X clinics and among other family planning providers. Research grants were awarded to Joseph Stanford, MD (University of Utah), Victoria Jennings, PhD (Georgetown University, Institute for Reproductive Health), and several other research organizations. One of the largest grants was provided to Marquette University’s Institute for NFP which helped fund an online provision of NFP services and the first randomized comparison study of NFP methods since the early 1980s.2

The US federal government has been helpful in monitoring use of NFP and Fertility Awareness-Based Methods (or FABMs) through one of their major studies, the National Survey of Family Growth (NSFG).3 The NSFG studies women from the age of 15–44 to determine family planning trends in the United States since 1977.4 The latest study on contraceptive trends in the NSFG showed an increase of 4% in “rhythm” and NFP use among the 20–29 age group from 2008 to 2014.5 This increase might reflect a rejection of hormonal steroids and a desire to use the newer fertility monitoring applications (apps), most of which are based on Rhythm. Information from this population-based data is useful for NFP researchers who often do not have access to large data sets.

Catholic Health-care Professionals

Interest in practicing medicine according to the Catholic faith has grown among Catholic health-care professionals over the last twenty years. This can be seen, for example, in the growth and interests of the members of the Catholic Medical Association (CMA). In the year 2000, for example, there were approximately three hundred CMA members. In 2018, the number rose to over 1,000.6 In the past (late twentieth century), it was difficult to schedule NFP science on the CMA’s annual meeting agenda. Today, NFP is often included as one of the plenary session presentations, preconference topics, and break-out sessions. The interest in supporting Church teaching, especially as it pertains to fertility and family planning, is now apparent in CMA leadership as well. For example, past

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3 The NSFG is a population-based survey produced by the National Center for Health Statistics, a division of the Center for Disease Control and Prevention (CDC).


5 The NSFG includes an item for “rhythm” and another for “temp/mucus.” The NSFG includes under the title “rhythm” calendar-based methods that are self-devised. The term “temp/mucus” is denoted for Natural Family Planning.

6 Catholic Medical Association Former President Dr. Peter Morrow, personal communication to the author (during the June 2018 CMA “boot camp”).
CMA Presidents Dr. Kathleen Raviele and Dr. Lester Ruppersberger provide clear witness of offering NFP-only obstetrics/gynecology practices as well as regularly promote NFP and Church teaching among Catholic physicians. This was not typical in the past.

In addition to the above, CMA leaders integrate NFP information in their annual medical ethics “boot camp” for Catholic medical students. Finally, the CMA journal, *The Linacre Quarterly*, frequently offers peer-reviewed articles on NFP and related topics. And, it features the NFP science publication produced by the United States Conference of Catholic Bishops (USCCB) NFP Program, *Current Medical Research.* Of note is that in 2014, *The Linacre Quarterly* featured a special issue entirely devoted to NFP. And the November 2018 is devoted to the fiftieth anniversary of *Humanae vitae.*

**NFP Scientific Publications—Then and Now**

Efforts to publish research on NFP science and methodology have mostly been reliant on individuals and their specific research. As discussed in my chapter 8 on the history of NFP scientists in this volume, many have had success with their efforts. In addition to those publications, there are two efforts that are worthy of note. In 1977, the inaugural issue of the journal, the *International Review of Natural Family Planning* was published. The journal was initiated and published by Fr. Paul Marx, OSB, PhD, through the Human Life Center at Saint John’s University in Collegeville, Minnesota. On the advisory board for the journal were thirty-two individuals including many of the “who’s who” in NFP science at that time. The articles from the journal were linked to the National Library of Medicine Indexes affording the articles wide readership. More recently, under the efforts of Dr. Joseph Stanford, NFP research is featured in the new open access journal, *Frontiers in Medicine.*

The examples above are just some positive movements in NFP science and applications to health care. This essay presents the signs of growth and healing for the science and medical application of NFP in the following five areas: (1) the application of the internet and cell phone apps, (2) fertility monitoring technology and precision medicine, (3) the integration of NFP with women’s health, (4) globalization of science, and (5) the development of “big” data.

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9 For example, Drs. James Brown, Thomas Hilgers, Anna Flynn, Konald Prem, Rudolf Vollman, Claude Lanctot, and research and NFP pioneers Drs. Michelle and Francois Guy from France and a physician wife team that was on the 1960s papal birth control commission, Dr. Charles Rendu and his wife, Elizabeth.
The Internet and Mobile NFP Applications

In the twenty-first century, the widespread access to the internet and the development of mobile applications has made a significant contribution to NFP education. One of the first in the United States to use these formats is not a Catholic NFP leader but a secular fertility-awareness-based combined method leader, Toni Weschler.

Weschler popularized NFP at the turn of the twenty-first century through her book, *Taking Charge of Your Fertility*. Weschler’s online charting system, example charts, and fertility consultation were designed for clients as a subscription membership (the first to charge fees for this type of service). Weschler’s e-resources (including apps for iPhones and Androids), were among the very first electronic strategies in the fertility awareness and NFP community. Since then, there have been many other online systems of NFP, hundreds of new fertility-monitoring apps, and new social NFP/FABM networks for both achieving and avoiding pregnancy. Social networking is one of the main communication modes for modern young women. Social networking that focuses on young women’s health through the menstrual cycle can be a powerful tool to promote health and identify early symptoms that might indicate health problems. This tool can be especially useful when it is linked to health-care professionals, such as physicians and advanced practice professional nurses who specialize in understanding the menstrual cycle and the methods of NFP.

According to the National Center for Health Statistics, women of reproduc­tive age access health information on the internet (in blogs and social networks) more than men. The internet is the primary source of information on women’s health, the menstrual cycle (e.g., unusual uterine bleeding), and other related problems. According to the Pew Foundation, approximately 80% of US adults own a cell phone (the rate is about 87% among African Americans). Menstrual cycle tracking apps are the fourth most used health apps among adults and the most frequent among adolescents. There are, however, not many NFP

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10 Fertility-awareness-based combined method refers to the educator’s allowance of contraceptive barrier methods in the fertile time. Authentic NFP makes use of periodic sexual abstinence as the means to avoid pregnancy. With NFP, no barriers or chemicals are used to avoid pregnancy.


15 Kahlor and Mackert, “Perception of Infertility Information and Support Sources.”

16 Cohen and Stussman, “Health Information Technology Use.”
methods that have a web-based menstrual cycle monitoring system as well as a cell phone app that provides easy access to menstrual cycle monitoring, a social network, and professional support.

In 2008, a website program was launched (in English and Spanish) to teach couples the Marquette Model (MM) of NFP and provide online consultation (i.e., provide ease of access for couples across the United States). The website included information on NFP, user forums, a menstrual cycle charting system, protocols for special reproductive circumstances (e.g., monitoring fertility during the postpartum breastfeeding transition), and online support from professional nurses and physicians.

The website NFP system also facilitated studies to determine the effectiveness of special protocols for postpartum women, effectiveness to avoid pregnancy among women transitioning through perimenopause, and the effects of focused intercourse during the estimated fertile window with couples wishing to achieve pregnancy. In addition, the website facilitated the provision of women's health care beyond family planning in that the professional nurses managing the website and their physician consultants (through the user forums) answer many related health questions (e.g., assessing and managing polycystic ovarian syndrome (PCOS), and unusual uterine bleeding), with over 35,000 posts. In essence, these studies demonstrate that the online NFP website is a system of providing women's health care and the use of the menstrual cycle is a vital sign. There are many other websites and NFP learning systems that have some combination of online existence, consultation, charting systems, and fertility monitoring apps. Below are several examples.

Among the more significant changes for NFP education in the last five years or so are those having to do with the mobile fertility monitoring application systems—especially those that are either very simple to use or are linked to a


18 See Marquette University, “A Naturally Healthy Approach,” http://nfp.marquette.edu. As of April 2018, the MM online system had over 10,600 women/couples registered on the site.


22 As of February 2017.


24 For example, Dynamic Optimal Timing or DOT, developed by the staff of the IRH at Georgetown University, see https://www.dottheapp.com/news. This system is problematic for Catholics since it encourages barrier methods to be used during the fertile time.
Bluetooth for cell phones. Some are useful while others, unfortunately, are problematic for Catholics. Among the problematic ones are those that either include contraceptive barrier use as part of the FABM system or are connected to fertility clinics that provide IVF should the user have difficulty becoming pregnant.

Among the more helpful apps is Natural Cycles, which was developed by Swedish researchers. This app includes the ability to record the basal body temperature (BBT) and results from luteinizing hormone (LH) urine test kits. The Natural Cycles app has a built-in algorithm that calculates an estimated fertile window based on the first day of menses and the BBT recordings and provides indicators regarding the woman’s fertile window (a red color for potential fertile days and green color for estimated infertile days). Researchers and developers of this fertility monitoring application conducted a study to provide evidence for the accuracy of determining ovulation and the fertile window of the menstrual cycle with their fertility monitoring app. They were able to obtain 317 women participants (mean age 30.1) who generated 1,501 cycles of data. The results showed no pregnancies recorded with intercourse on the green days and one pregnancy reported with intercourse on a red fertile day among the participants using this system to avoid pregnancy. The researchers subsequently conducted and published a study to determine the effectiveness of the app in helping women avoid pregnancy.

The Natural Cycles app study was a retrospective analysis of data produced by 4,050 women aged 18 years or older who used the app for three months at a minimum and entered data for at least twenty days. The 4,050 women who purchased the app and agreed to the study produced 2,085 women-years of data. The participants had a total of 143 unintended pregnancies. These pregnancies and the 2,053 women-years of use yielded a perfect use Pearl Index of pregnancy rate of 0.5 and 7.0 (per 100 woman years) for typical use. Survival analysis produced a typical use pregnancy rate of 7.5. The authors concluded that their app improved the effectiveness of using a fertility awareness-based method of family

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25 As in DOT. In addition to the conflict with Catholic moral teachings prohibiting use of contraception, it should be noted that barriers used during the estimated fertile phase also confound the results of established effectiveness studies, in that it is not known if the effectiveness is due to using fertility awareness, or the barrier, or both together. It can also be said that failure rates for the contraceptive barriers may be estimated as higher than known when used during the fertile time since typical studies do not test use exclusively during the fertile window.

26 See, for example, Glow fertility monitoring app, https://itunes.apple.com/us/app/glow-ovulation-period-tracker/id638021335?mt=8. To read about Glow First, a premium membership fund linked to the app that provides support for assisted reproductive technology treatments, see https://abcnews.go.com/Technology/glow-fertility-app-pregnant-give-money/story?id=19901626.

27 See https://www.naturalcycles.com/en. According to the website, the company has sold over 700,000 units in 200 countries.


planning. They indicated that the app is especially effective in preventing unintended pregnancy when couples consistently use contraceptive barrier methods on the estimated (red) fertile days. These conclusions remove Natural Cycles from the category of authentic NFP methods. Clearly the researchers speak of a combined FABM. At the same time, it can be said that Catholic NFP users could obtain supportive information from this app since it monitors the BBT and the results from luteinizing hormone (LH) urine test kits. When seeking to avoid pregnancy, Natural Cycles can provide support to the typical NFP user without the introduction of barriers during the fertile time.

Another innovative fertility app-based program called “Cycle Technologies” is interesting since it is promoted as being useful to both plan and avoid pregnancies. Founded in 2002 by a private company that partnered with governments, nonprofits, and nongovernment organizations (NGOs), Cycle Technologies states that its mission is to prevent unintended pregnancies and help people have the families that they want when they are ready to have them. Its products are promoted as “free” and “safe” alternatives for women who are interested in effective, side-effect-free, family planning options. The company claims that its products have been used by six million people from sixty countries, helping to prevent 5.5 million pregnancies and to successfully plan 1.5 million pregnancies.

This age of fertility indicators, mobile apps for smartphones, and internet access also is thought to have been responsible for the increase in use of the Rhythm Method and NFP among younger women (i.e., age 20–24) in the United States as indicated in recent NSFG studies. According to German researchers, knowledge of fertility indicators and symptoms in a woman’s cycle has increased dramatically in recent decades. If a woman wants to use this knowledge, it is all too understandable in the age of the personal computer and smartphone that she will use resources that make her daily work easier, especially regarding the daily charting of fertility symptoms. This new technology help make life as favorable and natural as possible for women.

The large numbers of apps that have been downloaded with the Cycle Technology and Natural Cycle systems demonstrate the interest and need for such easy and accessible menstrual cycle charting systems for using NFP. Now that access to these apps can be made through satellite cell towers and do not need additional infrastructure, anyone with a cell phone or other mobile device can take advantage of useful resources. This access was demonstrated in an article in National Geographic showing Samburu women in Nairobi, Africa, with handheld tablets connected to the internet by satellite and uploaded with educational programs. Certainly, NFP education should be part of such global e-education.

Fertility Monitoring and Precision Medicine

Since all classic NFP methods make use of careful monitoring of the woman’s menstrual cycle through charting, the development of technologies to facilitate the process has contributed substantially to the practice of NFP. In addition, a more recent conceptualization in health care called “precision medicine and health” has significance for NFP use. Precision medicine means targeting medical interventions on an individual’s genes, environment, and lifestyle for treatments. Precision health involves predicting and preventing health problems based on not just genes, the environment, and lifestyles but also population-based data to drive those decisions for personal and targeted health care. Applied to NFP, that would mean the following benefits: helping women be more precise in predicting the fertile phase of the menstrual cycle, targeting the best method of NFP for the individual and couple during particular phases of their reproductive life, assessing patterns of the woman’s menstrual cycle parameters for potential health problems, and using parameters of the menstrual cycle for assessing medical treatments for women. Below, we will consider the contributions of electronic monitoring of fertility. Having more precision in estimating the fertile phase of the menstrual cycle and the levels of hormone will allow health professionals and scientists to better study the associations of lifestyle, (e.g., diet and exercise) on the menstrual cycle and general health.

Electronic Devices and Fertility Information

In the 1980s and 1990s, inexpensive microelectronics made available fast digital thermometers as an aid to using BBT methods. During that same time period, electronic BBT monitors were developed with small computers that were designed to track the menstrual cycle and to estimate the fertile time of the menstrual cycle.34 The Bioself monitor is an example of such a monitor that has a built-in computer which tracks cycle length and temperature. The Bioself is based on BBT and calendar algorithms and provides the user with a red light for fertility and a green light for infertility.

The Baby-Comp (for achieving pregnancy) and the Lady-Comp (for avoiding pregnancy) are similar devices developed by Valley Electronics GmbH, a company based in Germany. In an effort to better serve the American market, Valley Electronics LLC was born in 2010. Another device, the l'Sophia, was developed and marketed in Japan. This Japanese fertility monitor has been miniaturized and

called the *Sophia* women's thermometer or the *Petite Sophia*. They are available through major online shopping sites.

Another computerized BBT device called the Cyclotest 2 (which is available and advertised on the internet) has been updated as microelectronics have developed. A group of researchers from the Academic Teaching Hospital of the University of Dusseldorf, Germany, tested the efficacy of the Cyclotest 2 Plus by comparing the fertile time in a woman's cycle as detected by the Cyclotest 2 Plus with the fertile time determined by the Sympto-Thermal Method (STM) of NFP.\textsuperscript{35} Newer temperature measuring devices have recently been developed that offer continuous temperature measurement and are thought to be more accurate than a single temperature upon rising in the morning. One such device called the DuoFertility measures continuous temperature and movement by having the woman wear a sensor as an axillary patch. Researchers recently conducted a study to determine the accuracy of the device by comparing the continuous measure of body temperature with serial ultrasound of the developing follicle, that is, the gold standard of detecting the day of ovulation, and in comparison to luteinizing hormone.\textsuperscript{36}

A number of fertility devices have been tested to see if salivary or vaginal electrical resistance can provide the user with information to determine the beginning and end of the fertile window. One such device, called the OvaCue fertility monitor, is sold and marketed in the United States\textsuperscript{37} as a device to achieve pregnancy only and for use with NFP.\textsuperscript{38} The OvaCue monitor provides a predictive marker (a peak in salivary resistance readings) about 5–7 days before ovulation and a vaginal electrical resistance nadir followed by a rise in vaginal electrical resistance readings as a confirmation of ovulation. Because the OvaCue both predicts and confirms ovulation, it can potentially be used as a method to avoid or achieve pregnancy, that is, as a means of or an assistive device for NFP. Consumers like the device since it is a one-time purchase and does not require test strips. However, the salivary and vaginal electrical resistance is an inaccurate estimator of fertility and has never been tested for use in avoiding pregnancy.

**Progesterone (and Estrogen) Tests**

A recent study showed that the serum threshold of 5–7 µg/mL of progesterone past the LH surge or cervical mucus peak, confirms ovulation in close to 100%


\textsuperscript{37} The device is marketed and developed by Zetek Corp. in Aurora, Colorado.

\textsuperscript{38} R. Fehring and N. Gaska, "A Comparison of the Ovulation Method with the CUE Ovulation Predictor."
of ovulatory menstrual cycles.\textsuperscript{39} Based on the results of this study, a simple home urine progesterone (P) dip test was developed by Amy Beckley, PhD, that is designed to confirm ovulation when a threshold level of progesterone has been reached post a peak day of mucus or a positive LH test.\textsuperscript{40} Currently, the only way to self-confirm ovulation is to take daily first morning body temperatures and track a significant rise in the body temperature from baseline. This temperature method is time-consuming and often inaccurate. Women who wish to confirm ovulation with a progesterone test currently need to have a physician order a serum test and have a laboratory measure the progesterone level (which is expensive and time-consuming). The P tests are now commercially available through MFB Fertility, and many women are already using the P tests for various reasons.

There are a number of independent ongoing studies to confirm the accuracy of the P test. The P test could be useful for women who: suffer from PCOS; are in the postpartum breastfeeding transition; have serious reasons to avoid pregnancy; or in the event that the usual indicators for the end of the fertile phase are not conclusive. This urine P test recently received US Food and Drug Administration (FDA) approval. The urine P test has not yet been validated with independently published studies that compare the urine results with serum progesterone levels. Ideally, a study that compared the urine P test with ultrasound-detected day of ovulation would provide the best evidence.

In addition to the P test, two professors of biochemistry at the University of Wisconsin, Madison, Drs. Katie Brenner and Doug Weibel, co-founded, along with Jodi Schroll, MBA, bluDiagnostics to develop a quick, saliva-based method for measuring not only progesterone but also estrogen.\textsuperscript{41} They indicated that variations and ratios in estrogen and progesterone levels are closely related to ovulation and could be very helpful for timing of conception. The co-founders of bluDiagnostics aim to obtain FDA approval and reach the market in the near future.

The approach of bluDiagnostics is to utilize a wet paper saliva test that connects to a cell phone app system through Bluetooth technology and provide the user with daily probabilities of fertility. The co-founders are also thinking beyond fertility and considering how they can provide data that will contribute to women’s overall health.

Seamless systems that integrate fitness indicators, health indicators, and information from the menstrual cycle are the directions for the future to assist in NFP education and method use.


\textsuperscript{40} Brian Fraga, “At-home Ovulation Test a ‘Breakthrough’ for NFP: Company Hopes to Release Progesterone Test This Summer That Will Help Couples Pinpoint Ovulation,” Our Sunday Visitor Newsweekly (May 22, 2016): 4.

\textsuperscript{41} See https://www.bludiagnostics.com.
NFP educators are well aware of the usefulness of the practice of charting a couple's fertility—especially as it pertains to the woman. Since the early part of the twenty-first century, a number of developments occurred that support NFP use and education. They are: monitoring the menstrual cycle as a vital sign, the importance of fertility literacy, and integrating women’s health with NFP.

**Monitoring the Menstrual Cycle as a Vital Sign**

The subcommittees of both the American Academy of Pediatrics and American College of Obstetricians and Gynecologists (and other health-care professionals) have recommended monitoring the menstrual cycle as vital signs for female adolescents and young adults. This is due to the reality that significant health problems are manifested as changes in the parameters of a woman’s menstrual cycle and/or lack of ovulation.

Others have recommended that women of all reproductive ages monitor their menstrual cycle for potential health problems. The National Institute of Child Health and Human Development and the Office of Women’s Health (an Office of the National Institutes of Health, or NIH, and the Institute of Child Health and Human Development) have sponsored conferences on the menstrual cycle and synchronizing women’s health. The conferences promote empowerment of women through ensuring a healthy menstrual cycle. They also include the study of PCOS, infertility, anorexia, and premature ovarian failure. The evidence from presentations at these conferences demonstrate the usefulness of women (of all reproductive ages) charting their menstrual cycles. The presentations were based on research but the presentations were not published.

Among the findings, it is clear that charting can help to identify early hints of menstrual cycle pathologies and could be useful as an aid to early warning signs for a number of health problems. Menstrual cycle charting systems

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that include information on menses, ovulation, phases of the cycle, and unusual uterine bleeding are useful in the detection, prediction, diagnoses, and treatment of women’s health problems. In addition, women who effectively monitor their menstrual cycles and related symptoms are able to identify problematic lifestyle characteristics and health issues in their early phases which may predispose them to serious pathologies in the future. The more information gathered about normal and abnormal parameters of a woman’s menstrual cycle and related symptoms, the better health professionals can use this information to inform women about potential and actual health problems. Although studies have described normal parameters of the menstrual cycle, few of them have provided information on patterns of menstrual parameters especially among young women and the association of these parameters with lifestyle and other signs of health problems. There is need for more research in this area.

**Fertility Literacy**

Fertility health knowledge, or “literacy,” is a sub-concept of health knowledge. It includes education about information related to men and women’s fertility throughout their lives. Fertility knowledge has been increasingly recognized as a critical component that may impact people’s sexual and reproductive behavior and outcomes. However, multiple studies have shown that fertility knowledge is lacking among diverse populations from different countries. The following example demonstrates this problem.

Primary care physicians from Australia conducted a study among women seeking pregnancy with artificial reproductive technologies. They found that after twelve months of treatments, only 12.7% had fertility awareness knowledge.

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This was up from 2.1% at the beginning of treatment. These same physicians were interested in the fertility knowledge among women that were of reproductive age, who attended a general medical practice, and were not seeking infertility services. The researchers found that only 4.3% of the respondents were using fertility awareness-based methods for family planning, 9.8% were seeking pregnancy, 37.1% actively sought to improve their knowledge of fertility, and 76.6% strongly agreed or agreed that having intercourse during the fertile time of the menstrual cycle would aid couples in achieving a pregnancy. However, only 2.1% of the participants were able to correctly identify the fertile phase of the menstrual cycle. They concluded that most women who attend general medical clinics express interest in fertility awareness education. They also mentioned that those women who indicate that they use FABMs be assessed as to their actual knowledge of these methods. The authors mentioned that there is a need for further research as to how best to provide information to women on fertility awareness-based methods and fertility knowledge. The authors did not express familiarity with newer methods of NFP that used hormonal monitoring nor the use of fertility monitoring apps. That said, their work supports the need for the type of education which most NFP methods provide.

Some researchers are investigating strategies to promote fertility literacy. For example, researchers Mary Lee Barron, PhD, APRN and Qiyan Mu, PhD, RN are currently developing fertility knowledge and fertility risk assessment tools to be used by health-care professionals. These fertility knowledge survey tools can also be used to assess interventions designed to increase fertility knowledge among men and women.

**Integrating Women's Health with NFP**

Since the mid-1990s, there has been an increase of private medical practices and clinics that offer women's health care without providing contraception. Many also offer one or more methods of NFP. This is due to the realization among some health-care professionals (mostly Catholics) that: (1) there is a lack of fertility knowledge among women and men, (2) the menstrual cycle is a vital sign of women's health, (3) use of hormonal contraception for women can mask


important health symptoms in a woman, and (4) use of hormonal contraceptives to manage female health problems by suppressing the menstrual cycle rather than treating the root causes is bad medicine. Examples of these efforts include what is commonly referred to as “NFP-only” medical practices that individual physicians offer.\textsuperscript{52} Other national and international efforts have also been established. Among those, the FertilityCare\textsuperscript{TM} Centers of America, which offer NaPro-TECHNOLOGY\textsuperscript{TM} and Creighton Model FertilityCare to patients, is noteworthy. Founded in Omaha, Nebraska, by Dr. Thomas Hilgers, this network is the first of its kind established in the United States and with international reach.\textsuperscript{53}

A second relatively new development of a national FABM system is that of Fertility Education and Medical Management (FEMM) clinics and health-care providers.\textsuperscript{54} FEMM is a comprehensive women’s health program that involves teaching women to understand their bodies, to recognize vital signs of health (including their signs of fertility), and to provide evidence-based and ethical medical protocols. FEMM offers a training program for health-care professionals and others so that they can teach the FEMM menstrual cycle tracking system. Training for health-care professionals in the FEMM medical protocols is also provided.

Supporting the above and with a view to target the lack of FABM knowledge among health-care professionals is Fertility Appreciation Collaborative to Teach the Science (FACTS). This organization is comprised of physicians, health-care professionals, and educators who work to provide information about NFP and FABMs for the medical community.\textsuperscript{55} Their mission is to share the best evidence available for health-care colleagues and students so they can: “educate women and men about their fertility, empower them to make more informed choices about family planning, and enable women to collaborate with medical professionals to better monitor and manage their reproductive health.”\textsuperscript{56} FACTS leaders accomplish this by holding webinars, making presentations at conferences for health-care professionals, conducting research, and promoting NFP and FABM among health-care professionals.

**Globalization of NFP Science**

As noted in chapter 8 of this volume, since the 1930s, NFP scientists and physicians were able to network with each other to promote and develop NFP science and methodology. Since 1968, the year *Humanae vitae* was promulgated, the international NFP scientific community was able to network more easily in international conferences sponsored, in part, by funds from the World

\textsuperscript{52} For example, Dr. Kathy Raviele, whose essay is chapter 10 of this volume, has an NFP-only Ob/GYN practice in Georgia.

\textsuperscript{53} This network has approximately 150 physicians and advanced practice nurses listed as providing these services. See FertilityCare\textsuperscript{TM} Centers of America at https://fertilitycare.org.

\textsuperscript{54} See the FEMM website at https://femmhealth.org.

\textsuperscript{55} See www.factsaboutfertility.org.

\textsuperscript{56} https://www.factsaboutfertility.org/about.
Health Organization (WHO), the United States Aid to International Development (USAID), and other organizations. This series of meetings spanned the 1970s-2000s. The leading organizations in the 1970s–1980s were the International Federation for Family Life Promotion (IFFLP), the Human Life Foundation (later “Human Life and NFP Foundation”), and the Human Life Center. These national and international organizations were notable for the development and promotion of NFP science and methodology.

The IFFLP, in particular, was an important global organization. It was incorporated in 1974 and dissolved in 1997 (due to lack of financial support). The IFFLP was formally incorporated for the purpose of providing leadership, guidance, and education in the fields of family life education and NFP. The IFFLP grew into an international organization comprised of more than one hundred organizational members from seventy-two countries. The IFFLP provided consultation and technical assistance and guidance in training areas for members, international scientific congresses, and workshops. Programs included NFP demonstration and development, family life education, breastfeeding promotion, and technical assistance in the Third World.

Another NFP organization with international outreach is the Institute for Reproductive Health (IRH). The IRH was founded in 1985 as part of Georgetown University’s School of Medicine with funding from USAID. As mentioned earlier, the IRH was primarily established to conduct NFP research and effective programming in developing countries to identify “gaps” in family planning. The work of the institute included research on the development, implementation, and testing of new, easy-to-use FABM and provide leadership in international collaboration and with international programs. IRH has made significant contributions to furthering FABM science and viability globally to health-care providers, especially those in public health.

The use of the internet to promote international cooperation in research by means of voice and video communications online has progressed both informally (i.e., small research groups that work on specific projects) and formally with defined organizations. The International Institute for Restorative Reproductive Medicine (IIRRM), is one such formal group.

IIRRM was formed in the early 2000s as an online network to unite NFP providers and researchers who promote evidence-based reproductive health-care services that cooperate with and restore reproductive function. The IIRRM focuses investigations and treatments on identifying and correcting

57 Information on the International Federation for Family Life Promotion (IFFLP) can still be found online at https://uia.org/s/or/en/1100047235. It should be noted that some former members of IFFLP formed their own organizations and continue to meet annually in Europe to share information and promote research. See for example, http://www.ieef.eu.


59 Such as the Standard Days Method (SDM) and the Two-Day Method discussed in my essay on the history of NFP scientists, chapter 8 of this volume.

abnormalities and restoring or optimizing normal reproductive function. The IIRRM sponsors and endorses research that cooperates with and restores normal reproductive function or anatomy. Some of the IIRRM features online are Grand Rounds, Research Update Webinar series, Journal Club, and an annual in-person meeting. 61

Development of Big Data

The term “big data” has a wide range of definitions depending on the area of science that is involved; for example, environmental and meteorology science uses extremely high-volume data sets to predict future weather occurrences. For health research “big data” encompasses “high volume, high diversity biological, clinical, environmental, and lifestyle information collected from single individuals to large cohorts, in relation to their health and wellness status, at one or several time points.” 62 Big data involves a strong governance model and best practices of new technologies that are compliant with community-based quality standards, shared data storage, data integration, and advanced analytics. The US government mandated health-care data and health-care data-based systems are examples of systems that develop big data.

Another example of “big data” as gathered through a strong government model is the data that was collected from the mandated governmental health records in Denmark. These government-mandated health records that represent the people of Denmark as a population, showed that there was a significant 20% risk of breast cancer among women using hormonal contraception and a risk of 38% among those who were using hormonal contraception for ten years or more. 63 Another study in Denmark using government-regulated health registries showed an association between the use of progesterone-type birth control methods and depression. 64 Large data sets like these are considered population based and thus findings can represent what is happening to members of that population.

Regarding NFP and women’s health, the use of mobile fertility monitoring apps that reflect the menstrual cycle and the parameters of the menstrual cycle have the potential to produce large data sets of menstrual cycles (i.e., millions).

61 Of note was a by-invitation-only meeting held in September 2016 which brought together key NFP scientists in Cranbrook, Canada. The scientists were from Australia, Canada, Chile, England, France, Germany, Italy, New Zealand, and the United States.


Examples of this can be seen in the data from Cycle Technologies and Natural Cycles that have sold millions of fertility monitoring apps. The best scenario would be to have these fertility monitoring apps synced to an online site that health professionals can access and contribute to. This would allow health-care professionals to see patterns of the menstrual cycle for women with regular cycles but also those with special circumstances (e.g., postpartum transition to fertility). Such menstrual cycle charting systems could be sold and used by multiple health-care professionals and health systems that are linked to one another and thus result in the ability to generate large data sets. The usefulness of this can be demonstrated by the Marquette Model’s recent research.

The Marquette Model’s online charting system yielded multiple studies from the data that was collected from the MM online charting system, user registration, and online forums. The recent extended use-effectiveness studies included women/couples from all fifty states and five foreign countries. The data set of the MM online system provides more generalizable evidence that applies to middle-class educated Catholic women and couples. The online forums also provided further information into the marital dynamics and the struggles of couples using the MM system. Furthermore, the online charting system provides researchers with thousands of fertility monitoring charts and cycles that provide information and patterns of use. Menstrual cycle charting from women going through fertility transitions, such as from postpartum amenorrhea to regular menstrual cycles, the transition from regular cycles through peri-menopause and into menopause, and the transition off hormonal contraception to regular menstrual cycles, would provide important information on the menstrual cycle and menstrual cycle patterns. Knowledge of these patterns could be used to develop better NFP protocols for women and couples in these transitions. Furthermore, this information could be provided to these couples so that they can have a better understanding of their special situation.

Useful research can also be done using existing data sets such as the NSFG that continue to be developed though US federal funds. These data sets also provide population-based data. NFP researchers need to take more advantage of the rich information in these data sets related to contraception, NFP, and women’s health. Recent studies using the NSFG have not only shown an increase in use of NFP but also the differences in divorce rates among NFP users and users of contraception, and the association of contraceptive use with abortion and sexually transmitted diseases. Researchers also need to be active in helping to shape

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these data sets and the questions used in these data sets so that they yield a better picture of use of NFP methods.

Despite the advantages, there are also unique disadvantages with big data and the internet systems that produce the sets. The problem concerns data security and access to the data systems that generate the data. The maintenance of internet security is a daily problem that includes the use of secure virtual servers, the obtaining and maintaining of security certification, constant updating of software, the utilizing of software and software developers who are knowledgeable with online security, the hiring of online security specialists, and the need for funds to cover the cost for these expensive systems and necessary security. A positive of this need for security is the constant updating of websites, charting systems, and mobile apps. In today’s internet-connected world, websites and mobile apps can become old very quickly. It was different in the 1970s–1990s when systems of NFP could be developed and the graphics and literature for it lasted for years. That no longer can happen in order to remain relevant, attractive, and cyber-secure for new users.

Conclusion

The growth and development of internet, mobile apps, and social networks have changed society and, as a result, have had a profound effect on NFP science and NFP education. There is a revolution in online charting systems, more refined biological indicators, NFP social networking groups, and integrative health care that includes NFP. The globalization of health care, research, and the ability to gather large data sets have provided evidence that confirms the predictions and truths exposed in *Humanae vitae*. The evidence shows more interest in use of NFP and FABMs for avoiding and achieving pregnancy and the integration into women’s health care.

On April 4, 2018, NFP scientists from Europe, South America, the United States, and Canada gathered to discuss the current evidence for NFP methods, newer fertility monitoring technology, and NFP and marital dynamics, and to make recommendations for future research in NFP. These scientists consisted of those who are near the end of their scientific career, mid-career scientists, and scientists who have just completed their doctoral programs. Although a relatively small group, the energy, knowledge, and creativity that these scientists generated provide hope and a sense of a continuation of the research that Popes Paul VI, Pius XII, and John Paul II requested in this important sector of human life.

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