

OBSTETRICS

Obstetrician-gynecologists' beliefs about when pregnancy begins

Grace S. Chung; Ryan E. Lawrence, MD, MDiv; Kenneth A. Rasinski, PhD; John D. Yoon, MD; Farr A. Curlin, MD

OBJECTIVE: The purpose of this study was to assess obstetrician-gynecologists' regarding their beliefs about when pregnancy begins and to measure characteristics that are associated with believing that pregnancy begins at implantation rather than at conception.

STUDY DESIGN: We mailed a questionnaire to a stratified, random sample of 1800 practicing obstetrician-gynecologists in the United States. The outcome of interest was obstetrician-gynecologists' views of when pregnancy begins. Response options were (1) at conception, (2) at implantation of the embryo, and (3) not sure. Primary predictors were religious affiliation, the importance of religion, and a moral objection to abortion.

RESULTS: The response rate was 66% (1154/1760 physicians). One-half of US obstetrician-gynecologists (57%) believe pregnancy begins

at conception. Fewer (28%) believe it begins at implantation, and 16% are not sure. In multivariable analysis, the consideration that religion is the most important thing in one's life (odds ratio, 0.5; 95% confidence interval, 0.2–0.9) and an objection to abortion (odds ratio, 0.4; 95% confidence interval, 0.2–0.9) were associated independently and inversely with believing that pregnancy begins at implantation.

CONCLUSION: Obstetrician-gynecologists' beliefs about when pregnancy begins appear to be shaped significantly by whether they object to abortion and by the importance of religion in their lives.

Key words: fertilization, implantation, pregnancy, religion

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Two views on when pregnancy begins are prominent in the medical and lay literature. Since 1965, the American College of Obstetricians and Gynecologists (ACOG) has defined *pregnancy* as beginning with implantation of the embryo in the uterine wall.¹⁻³ This definition is used also by the Guttmacher Institute,⁴ Planned Parenthood,⁵ and some textbooks.⁶ Defining *pregnancy* as beginning with implantation fits with certain

★ EDITORS' CHOICE ★

facts: women who have regular periods generally do not consider themselves pregnant, regardless of whether ova were fertilized; human chorionic gonadotropin, which prevents menses and is the basis of the pregnancy test, is not produced before implantation^{7,8}; and in vitro fertilization allows for fertilization without pregnancy. However, other

books,⁹⁻¹² organizations,¹³ physicians,¹⁴ and politicians⁴ define *pregnancy* as beginning with fertilization of the ovum by the sperm (often called *conception*^{9-11,13,15,16}).

This question of whether pregnancy begins with fertilization or with implantation has often been raised in public debates about whether some contraceptive technologies should be considered abortifacients. Intrauterine devices act in part by preventing implantation^{17,18}; although hormonal contraceptives' primary mechanism of action is to prevent ovulation, there is still debate about whether and how often they act secondarily by preventing implantation.¹⁹⁻²¹ Even the potential of preventing implantation concerns those who oppose abortion and consider that action abortifacient.²² Some investigators have suggested that the beginning of pregnancy was redefined to make the intrauterine device more acceptable to patients who are concerned that it could act as an abortifacient.^{23,24} Other experts have countered that, even if a technology such as the postcoital contraceptive or the intrauterine device did prevent implantation, this would not make it an abortifacient because it acts before pregnancy (defined as beginning with implantation).^{6,25,26} These dis-

From the Sections of General Internal Medicine (Ms Chung and Drs Lawrence, Rasinski, and Curlin) and Hospital Medicine (Dr Yoon), Department of Medicine, and the MacLean Center for Clinical Medical Ethics (Drs Yoon and Curlin), The University of Chicago, Chicago, IL, and the Department of Psychiatry, Columbia University Medical Center, New York, NY (Dr Lawrence).

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Reprints: Grace S. Chung, Department of Medicine, University of Chicago, 5841 South Maryland Ave., MC 2009, Chicago, IL 60637. gchung@uchicago.edu.

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putes have fresh relevance now that the Food and Drug Administration has approved the “5-day pill” (ulipristal acetate), which is a prescription-only contraceptive that is effective when taken within 120 hours of unprotected sexual intercourse.²⁷

Despite this controversy, little is known about what practicing obstetrician-gynecologist (Ob/Gyn) physicians believe about when pregnancy begins. The Guttmacher Institute has stated, “On the question of when a woman is considered pregnant, the medical and scientific communities have long been clear: Pregnancy is established only when a fertilized egg has been implanted in the wall of a woman’s uterus.”⁴ To our knowledge, no studies have examined whether this issue has been settled in the minds of obstetrician-gynecologists, who are the physicians for whom the issue is most relevant. Only 1 previous study surveyed Ob/Gyn physicians, and it was limited to members of the Louisville Ob/Gyn society ($n = 96$).²⁴ A more recent survey in 2 South Carolina family medicine clinics included patients ($n = 178$), but no physicians, and was geographically limited.²⁸ We surveyed a national representative sample of Ob/Gyn physicians to assess their beliefs about when pregnancy begins. Because previous studies have found that physicians who are more religious are more likely to oppose abortion,²⁹ we tested the hypothesis that believing pregnancy begins with implantation would be associated inversely with being religious and with objecting to abortion.

MATERIALS AND METHODS

Study population

The methods for this study have been reported previously.³⁰ Between October 2008 and January 2009, we mailed a confidential, self-administered, 12-page questionnaire to a national, stratified random sample of 1800 Ob/Gyn physicians who were ≤ 65 years old. The sample size was selected so that a 60% response would yield a margin of error of approximately 3%. The sample was drawn from the American Medical Association’s Physician Masterfile, a database intended to include all practicing US physicians. To increase minority representation (especially less-represented religions), we used validated

ethnic surname lists to create 4 strata.^{31–33} We sampled 180 physicians with typical South Asian surnames, 225 physicians with typical Arabic surnames, 180 physicians with typical Jewish surnames, and 1215 other physicians (from all those whose surnames were not on 1 of these ethnic lists). Physicians received up to 3 separate mailings of the questionnaire. The first included a \$20 bill, and the third offered an additional \$30 for participation. Physicians also received an advance letter and a postcard reminder after the first questionnaire mailing. All data were double-keyed, cross-compared, and corrected against the original questionnaires. This study was approved by the University of Chicago institutional review board.

Survey instrument

The primary criterion measure asked physicians, “Which of the following statements comes closest to your beliefs about when pregnancy begins?” Response options were (1) at conception, (2) at implantation of the embryo, and (3) not sure.

Primary predictors were 2 religious measures and a measure of objection to abortion. Religious affiliation was categorized as none/no affiliation, Hindu, Jewish, Muslim, Catholic (included Roman Catholic [$n = 237$] and Eastern Orthodox [$n = 25$]), Evangelical Protestant, non-Evangelical Protestant, and other religion. The importance of religion was assessed with the question, “How important would you say your religion is in your own life?” Response options were (1) not at all important, (2) fairly important, (3) very important, and (4) the most important part of my life. As an indicator of objection to abortion, we asked physicians whether they morally object to abortion for a 22-year-old single woman who was 6 weeks’ pregnant after failed hormonal contraception. Physicians’ demographic characteristics (sex, race/ethnicity, age, and geographic region) were included as controls.

We did post-hoc analyses to examine whether beliefs about pregnancy were associated with 3 additional areas of controversy. We asked physicians whether they have a moral/ethical objection to abortion for a 36-year-old woman in the

first trimester of pregnancy who needs radiation and chemotherapy for newly diagnosed breast cancer. We asked whether physicians have a moral/ethical objection to intrauterine devices. We asked physicians about their practices regarding emergency hormonal contraception and whether they offer it “to all women they believe are at risk for unplanned pregnancy” or do not offer it to all women (offer it only to women who say they have had unprotected intercourse, only to victims of sexual assault, or to nobody under any circumstances).

Data management and analysis

Case weights were incorporated into our statistical analyses to account for the oversampling strategy (the design weight) and to correct for differences in response rates among the surname categories and between US and foreign medical school graduates (the poststratification adjustment weight). Weights were the inverse probability of a person with the relevant characteristic being in the final dataset. The final weight for each case/respondent was the product of the design weight and the poststratification adjustment weight. This method of case weighting, which is used widely in population-based research,³⁴ enabled us to adjust for sample stratification and variable response rates to generate estimates for the population of US Ob/Gyn physicians. We used the chi-square test to examine associations between each background variable and physicians’ beliefs about when pregnancy begins. We then conducted multivariable logistic regression to examine the relationship between the belief that pregnancy begins at implantation (rather than at conception, after excluding 195 respondents who indicated they were “not sure”) and (model 1) religious affiliation, (model 2) the importance of religion, (model 3) objections to abortion, and (model 4) demographic characteristics. We estimated the 4 models beginning with model 1 as predictors and adding models 2, 3, and 4 in sequence, observing changes in coefficients across models. The sample size was kept at 900 for all of the models. This is the size of the sample for model 4, which was the model with the most variables and consequently with the most cases dropped because of missing val-

ues. All analyses were performed with the survey-design-adjusted commands of Stata SE statistical software (version 11.0; Stata Corporation, College Station, TX).

RESULTS

The response rate was 66% (1154/1760 questionnaires) after the exclusion of 40 potential respondents who were retired or who could not be located after 2 attempts to obtain a valid address. The response rate varied by stratum: 54% among those with Arabic surnames (120/221), 61% among those with South Asian surnames (107/175), 68% among those with Jewish surnames (120/176), and 68% in the primary sample (807/1188). Graduates of foreign medical schools were less likely to respond than graduates of US medical schools (58% compared with 68%; $P = .001$). The response rate did not differ significantly by age, sex, region, or board certification. Respondents' demographic characteristics are reported in Table 1. The sampling method increased the number of Muslim, Jewish, and Hindu respondents. However, the application of case weights to the analyses adjusted for this increase. Thus, our estimates of the percentages of US Ob/Gyn physicians in each racial category and in each religious affiliation were similar to our previous national survey that did not oversample by ethnic surname.³⁵

Just over one-half of Ob/Gyn physicians (57%) believe that pregnancy begins at conception. Fewer (28%) believe pregnancy begins at implantation of the embryo, and 16% are not sure which statement comes closest to their beliefs.

We found that religious doctors and those who objected to abortion were less likely to be "not sure" about which statement reflects their views on when pregnancy begins (data not shown). Among doctors who consider religion the most important part of their lives, 8% were "not sure" about when pregnancy begins, compared with 19% of those who consider religion not at all important ($P = .007$). The same was true for those who objected to abortion compared with those who did not (10% vs 20%; $P <$

TABLE 1

Demographic characteristics of obstetrics/gynecology physicians in the United States who responded to the survey

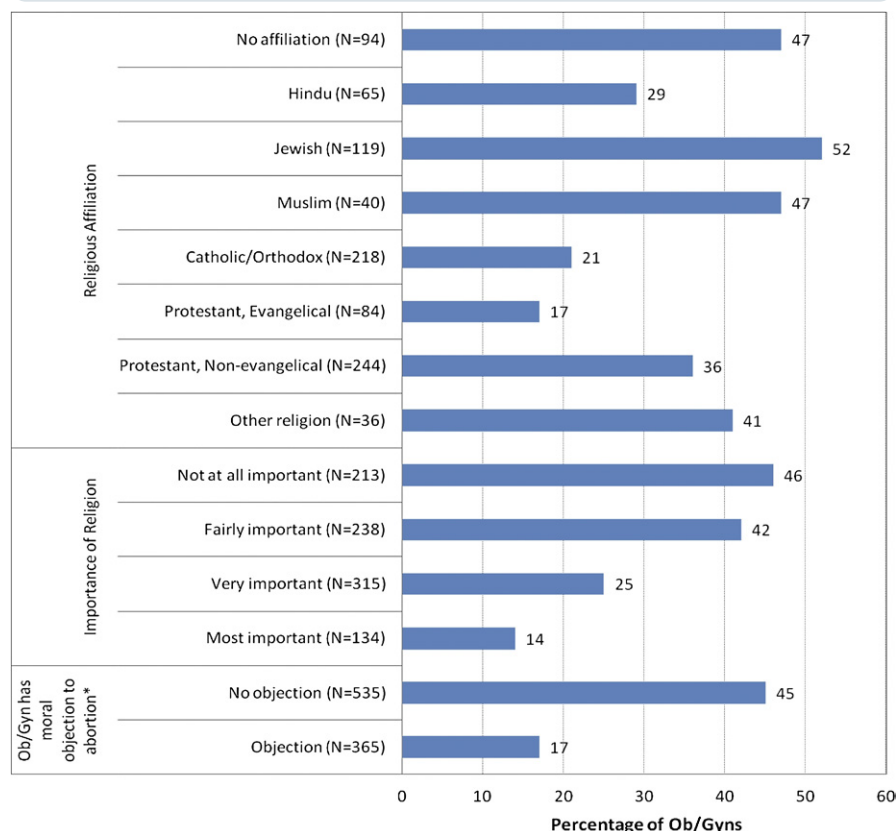
Variable	n	Percentage
Sex		
Female	537	47
Male	617	53
Region		
South	373	32
Midwest	249	22
Northeast	288	25
West	242	21
Race		
White	774	69
Black	67	6
Asian	202	18
Hispanic/Latino	64	6
Other	22	2
Age, y^a		
25–40	291	25
41–47	305	26
48–55	281	24
56–65	277	24
Immigration history		
US born	817	72
Immigrated	323	28
Clinical characteristics		
Board certified	963	83
American College of Obstetricians and Gynecologists member	1052	92
Religious affiliation		
No affiliation	119	11
Hindu	91	8
Jewish	160	14
Muslim	54	5
Catholic	262	23
Evangelical Protestant	91	8
Non-Evangelical Protestant	300	27
Other religion	48	4
Attendance at services		
Never	123	11
Once a month or less	547	48
Twice a month or more	466	41
Importance of religion		
Not at all important	272	24
Fairly important	385	34
Very important	385	34
Most important part of life	157	14

Results reflect the actual percentages in our sample and are not adjusted for survey-design.

^a Mean age, 47.8 ± 9.2 years; range, 26–65 years.

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FIGURE

Obstetricians/gynecologists who believe pregnancy begins with implantation

Excludes respondents who were “not sure” ($n = 195$) and respondents with missing values (total missing, 73: region, 2; race, 25; affiliation, 29; importance of religion, 19; or abortion belief, 22). Percentages are survey-design adjusted and reflect estimates of the population of all US obstetrics/gynecology physicians. The asterisk indicates a 22-year-old single woman who was 6 weeks’ pregnant after failed hormonal contraception.

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.001). Religious affiliation was not associated with being “not sure” about when pregnancy begins ($P = .09$).

As seen in the Figure, believing that pregnancy begins at implantation rather than conception (excluding those who were “not sure”) was associated with religious affiliation, the importance of religion, and objections to abortion. Table 2 displays these relationships in more detail with the use of results from a series of 4 multivariable logistic regression models. Model 1 shows that, compared with those physicians with no religious affiliation, Hindu (odds ratio [OR], 0.5; 95% confidence interval [CI], 0.2–1.0), Catholic (OR, 0.3; 95% CI, 0.2–0.5), and Evangelical Protestant (OR, 0.2; 95% CI,

0.1–0.5) physicians are less likely to believe that pregnancy begins at implantation. Model 2 shows that, when importance of religion is taken into account, physicians who say that religion is very (OR, 0.5; 95% CI, 0.3–0.8) or most (OR, 0.3; 95% CI, 0.1–0.5) important were less likely than those who say religion is not important to believe pregnancy begins with implantation. Coefficients for Hindu and Evangelical Protestant became nonsignificant, and the coefficient for Catholic was attenuated, which suggests that the association between religious affiliation and beliefs about when pregnancy begins is mediated by the importance of religion in the physician’s life. Model 3 shows that, when objection

to abortion is added to the model, those who object to abortion are less likely to believe pregnancy begins with implantation. The coefficient for Catholic affiliation becomes nonsignificant ($P = .054$), and the coefficients for the importance of religion are attenuated, which suggests that the associations between religious characteristics and beliefs about when pregnancy begins are mediated partially by objection to abortion. As seen in Model 4, the addition of demographic characteristics to the model does not appreciably change the coefficients that were found in Model 3. The belief that religion is most important and objection to abortion remain associated significantly and inversely with believing that pregnancy begins at implantation. Demographic characteristics (age, sex, race/ethnicity, and geographic region) had no significant effect.

In post-hoc analyses, physicians who object to abortion for a 37-year-old woman with newly diagnosed breast cancer were less likely to believe pregnancy begins with implantation (9% of objectors vs 39% of nonobjectors; unadjusted $n = 17/169$ vs $302/768$; bivariate $P < .001$). Physicians with a moral/ethical objection to intrauterine devices were less likely to believe pregnancy begins with implantation (9% of objectors vs 34% of nonobjectors; unadjusted $n = 4/41$ vs $315/903$; bivariate $P = .002$). Compared with physicians who offer emergency contraception to all women whom they believe are at risk for unplanned pregnancy, those who do not offer it “to all women” were less likely to believe pregnancy begins with implantation (25% vs 40%; unadjusted $n = 120/451$ vs $195/482$; bivariate $P < .001$).

COMMENT

In this national survey, we found that one-half of Ob/Gyn physicians (57%) believe pregnancy begins with conception, that 28% believe pregnancy begins with implantation, and that 16% are not sure. High religious commitment and opposition to abortion (in the case of a 22-year-old woman after contraceptive failure) are associated independently

TABLE 2

Multivariable logistic regression of the belief that pregnancy begins with implantation, according to religious affiliation, importance of religion, objection to abortion, and demographic characteristics

Variable	Model 1		Model 2		Model 3		Model 4 ^a	
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Religious group affiliation								
No affiliation	Referent		Referent		Referent		Referent	
Hindu	0.45	0.2–1.0 ^b	0.65	0.3–1.5	0.52	0.2–1.2	0.57	0.2–1.5
Muslim	1.22	0.7–2.2	1.55	0.8–3.0	1.38	0.7–2.7	1.50	0.8–3.0
Jewish	0.98	0.4–2.3	1.76	0.7–4.4	1.86	0.7–4.8	2.00	0.8–5.3
Catholic	0.29	0.2–0.5 ^b	0.46	0.2–0.8 ^b	0.54	0.3–1.0	0.54	0.3–1.0
Evangelical Protestant	0.22	0.1–0.5 ^b	0.57	0.2–1.3	0.76	0.3–1.8	0.76	0.3–1.8
Non-Evangelical Protestant	0.61	0.4–1.0	0.92	0.5–1.7	1.00	0.6–1.8	1.01	0.6–1.8
Other	0.77	0.3–1.8	1.32	0.5–3.4	1.23	0.5–3.1	1.23	0.5–3.1
Importance of religion								
Not important in my life			Referent		Referent		Referent	
Fairly important in my life			0.96	0.6–1.5	1.05	0.7–1.7	1.04	0.7–1.7
Very important in my life			0.48	0.3–0.8 ^b	0.66	0.4–1.1	0.68	0.4–1.1
The most important part			0.25	0.1–0.5 ^b	0.44	0.2–0.9 ^b	0.46	0.2–0.9 ^b
Objection to abortion								
No					Referent			
Yes					0.38	0.2–0.6 ^b	0.37	0.2–0.6 ^b

Includes a sequence of multivariable logistic regression analyses that indicate the odds ratios (and 95% CIs) for believing that pregnancy begins with implantation. Respondents who were “not sure” about when pregnancy begins were excluded ($n = 195$); excludes respondents with missing values (total, 73: region, 2; race, 25; affiliation, 29; importance of religion, 19; object to abortion, 22) so that the total was 900 respondents for all models.

CI, confidence interval.

^a Model 4 includes variables in Model 3, plus age, sex, race/ethnicity, and region (no demographic coefficient was statistically significant; data not shown); ^b $P < .05$.

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with being less likely to believe pregnancy begins with implantation.

Our results resemble the 1998 survey of Spinnato²⁴ of Ob/Gyn physicians in Louisville, KY ($n = 96$). In that survey, 50% of the physicians indicated pregnancy began at fertilization, and 48% of them said that pregnancy begins with implantation (few respondents chose “I don’t know” or “other”). Our findings also resemble a 2008 report by Campbell et al²⁸ ($n = 178$ respondents), in which 47% of patients at family medicine clinics said that pregnancy begins when the sperm and egg join, 44% believed that pregnancy begins when implantation occurs, 8% believed that pregnancy begins when the heart starts beating, and 1% were unsure. Both studies report a higher percentage of persons who believe pregnancy begins with implantation than we found in our survey.

It is not surprising that physicians’ beliefs about pregnancy were associated with religious characteristics, because religion plays a role in many debates about sexuality and reproduction. Elsewhere, we have reported associations between religious characteristics and Ob/Gyn physicians’ views on contraception,³⁶ emergency contraception,³⁷ and assisted reproductive technologies.³⁰ In the present case, it appears that the effects of religious characteristics on ideas about pregnancy are largely mediated by the way religion shapes ideas about abortion and other morally contested interventions. These data cannot confirm that religion shapes ideas about abortion rather than vice-versa, although this seems likely.

In our data, a significant percentage of Ob/Gyn physicians (16%) marked “not sure” when asked to indicate when preg-

nancy begins. This group may include some physicians who consider conception and implantation of the embryo to be synonymous, as we mentioned earlier. Some might believe pregnancy begins at some other point (eg, first heartbeat).²⁸ Alternatively, it is possible that a significant minority of physicians have not made up their minds or that they believe that their views could not be reduced to either of the 2 options that were offered.

Our data suggest the obstetrics and gynecology community is divided regarding when pregnancy begins. In this sense, the Guttmacher Institute was incorrect in stating that the medical community has long been clear on the question of when pregnancy begins.⁴ Indeed, our study suggests that only a minority of Ob/Gyn physicians believes pregnancy begins with implantation. However, others also oversimplify

history when they criticize ACOG for redefining pregnancy. For instance, Richard Sosnowski,²³ in his 1984 presidential address to the South Atlantic Association of Obstetricians and Gynecologists, charged that “with no scientific evidence to validate the change, the definition of conception was redefined as the implantation of a fertilized ovum.” In truth, there is a long history of ambiguity in the language that has been used to describe pregnancy’s beginning. In his 1852 obstetrics textbook, C.D. Meigs,³⁸ a professor of midwifery at Jefferson Medical College, explained that “Fecundation [fertilization] is not conception [pregnancy]. . . A fecundated ovulum entering into the womb through the Fallopian tube, and falling without delay into the vagina, may be destroyed or lost before conception can take place. . . Conception is the fixation of a fecundated ovum upon the living surface of the mother; it is the formation of an attachment to or union with the womb, the tube etc, of the mother.”

However, a different definition of pregnancy is found in the 1892 obstetrics manual of C.W. Hayt³⁹: “Conception, impregnation or fecundation, is the act by which the semen or fluid furnished by the male organs of generation unites with the ovule from the female ovary, so that a new being results.”

Our findings provide one example of the way in which the interpretation of science can be contested, in this case through contested definitions of pregnancy. Language conveys meaning; when the moral significance of a condition (whether of conception or implantation) is disputed, it is not surprising that the language that is used to refer to that condition is also disputed and along similar lines. As such, it is not surprising to find that disagreements about how to define pregnancy track with differences of religion and disagreements about abortion. Speaking during a 1964 conference on intrauterine contraception, Christopher Tietze predicted, “If a medical consensus develops and is maintained that pregnancy, and therefore life, begins at implantation, eventually our brethren from the [philosophy and theology] faculties will listen.”⁴⁰ These data make clear that the consensus that Tietze anticipated has not come to pass, perhaps because no new

data have emerged that fundamentally change scientific understanding of how human life begins. Unless and until the science changes, physicians will probably continue to disagree about how to interpret (Is it pregnancy? Does it matter?) a biologic process that has long been established scientifically.

Our results must be interpreted with caution. To begin, we anticipated that physicians would understand “conception” to mean fertilization, which is arguably the predominant definition in medical literature.^{9–11,13,15,16} Yet, there are some investigators (ACOG for instance) who define conception as implantation.² We expected that respondents understood the survey question, because conception and implantation were offered side by side as alternate responses and because our results are similar to other surveys (as described earlier), but this nevertheless represents a potential limitation of our data. In addition, the survey focused specifically on when pregnancy begins; although the results are pertinent to questions about embryonic research, contraception, abortion, and when life begins, the study does not address these questions (eg, Campbell et al²⁸ reported that one-half of patients believe pregnancy begins with fertilization, but only 30% believe life begins at that point). We surveyed only Ob/Gyn physicians; physicians in other fields may have different views. The response rate was strong, but it is possible that nonrespondents differed from respondents in ways that biased the findings.

In this national survey, Ob/Gyn physicians showed diverging views about when pregnancy begins. The disagreement is longstanding and appears to be related to religious differences and disagreements about abortion. These observations suggest that the profession of medicine is far from consensus regarding when pregnancy begins. ■

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REFERENCES

1. American College of Obstetricians and Gynecologists. Terminology bulletin no. 1: terms used in reference to the fetus. Chicago: The College; 1965.
2. Hughes EC, ed. Obstetric-gynecologic terminology with section on neonatology and glossary of congenital anomalies. Philadelphia: F.A. Davis; 1972: 299, 327.
3. American College of Obstetricians and Gynecologists. Statement on contraceptive methods. Washington, DC: The College; 1998.
4. Guttmacher Institute. Antiabortion activists in their own words: contraception is abortion, 2008. Available at: <http://www.guttmacher.org/media/nr/AntiabortionActivistsInTheirOwnWords.pdf>. Accessed Nov. 3, 2010.
5. Planned Parenthood. Info for teens: how long does it take to get pregnant after having sex? Available at: <http://www.plannedparenthood.org/info-for-teens/pregnancy/am-pregnant-33831.htm>. Accessed Nov. 5, 2010.
6. Beckmann CRB, Ling FW, Smith RP, Barzansky BM, Herbert WNP, Laube DW. Obstetrics and gynecology, 5th ed. Philadelphia: Lippincott Williams & Wilkins; 2006:68.
7. Costanzo LS. Physiology, 3rd ed. Philadelphia: Elsevier; 2006:458.
8. Wilcox AJ, Baird DD, Weinberg CR. Time of implantation of the conceptus and loss of pregnancy. *N Engl J Med* 1999;340:1796-9.
9. Anderson DM, ed. Dorland’s illustrated medical dictionary, 29th ed. Philadelphia: W.B. Saunders; 2000:1451.
10. Dox IG, Melloni JL, Sheld HH. Melloni’s illustrated dictionary of obstetrics and gynecology. New York: Parthenon; 2000: 87, 284.
11. Gennaro AR, Nora AH, Nora JJ, Stander RW, Weiss L, eds. Blakiston’s Gould medical dictionary, 4th ed. New York: McGraw-Hill; 1979:305, 1092.
12. Tindall VR, ed. Jeffcoate’s principles of gynaecology, 5th ed. London: Butterworths; 1987:103.
13. Christian Medical and Dental Association. CMA healthwise: morning-after pill, 1997. Available at: http://www.cmda.org/wcm/CMDA/Issues2/Beginning_of_Life1/Abortion1/Resources_and_Downloads2/Morning_After_Pill_F.aspx. Accessed Nov. 5, 2010.
14. Larimore WL, Stanford JB, Kahlenborn C. In response: does pregnancy begin at fertilization? *Fam Med* 2004;36:690-1.
15. Christian Medical and Dental Association. The beginning of human life. Available at: http://www.cmda.org/wcm/CMDA/Issues2/Beginning_of_Life1/Reproductive_Technology_and_Health1/Ethics_Statements/The_Beginning_of_Hum.aspx. Accessed Nov. 5, 2010.
16. Leikin JB, Lipsky MS, editors. American Medical Association complete medical encyclopedia. New York: Random House Reference; 2003: 1011.

17. American College of Obstetricians and Gynecologists. The intrauterine device: ACOG technical bulletin no. 164. *Int J Gynaecol Obstet* 1993;41:189-93.
18. Spinnato JA. Mechanism of action of intrauterine contraceptive devices and its relation to informed consent. *Am J Obstet Gynecol* 1997;176:503-6.
19. Rivera R, Yacobson I, Grimes D. The mechanism of action of hormonal contraceptives and intrauterine contraceptive devices. *Am J Obstet Gynecol* 1999;181:1263-9.
20. American College of Obstetricians and Gynecologists. Emergency oral contraception: ACOG practice patterns no. 3. Washington, DC: The College; 1996.
21. Croxatto HB, Devoto L, Durand M, et al. Mechanism of action of hormonal preparations used for emergency contraception: a review of the literature. *Contraception* 2001;63:111-21.
22. Sulmasy DP. Emergency contraception for women who have been raped: must Catholics test for ovulation, or is testing for pregnancy morally sufficient? *Kennedy Inst Ethics J* 2006;16:305-31.
23. Sosnowski JR. "The pursuit of excellence": have we apprehended and comprehended it? *Am J Obstet Gynecol* 1984;150:115-9.
24. Spinnato JA. Informed consent and the redefining of conception: a decision ill conceived? *J Matern-Fetal Med* 1998;7:264-8.
25. Jones DA, Stammers T. Why emergency contraception remains controversial. *South Med J* 2009;102:5-7.
26. Grimes DA. Switching emergency contraception to over-the-counter status. *N Engl J Med* 2002;347:346-9.
27. Moyer CS. 5-day pill moves emergency contraception back to doctor's office: American Medical News, 2010. Available at: <http://www.ama-assn.org/amednews/2010/08/30/pr10830.htm>. Accessed Nov. 9, 2010.
28. Campbell JW, Busby SC, Steyer TE. Attitudes and beliefs about emergency contraception among patients at academic family medicine clinics. *Ann Fam Med* 2008;6(suppl):s23-7.
29. Abdel-Aziz E, Arch BN, Al-Taher H. The influence of religious beliefs on general practitioners' attitudes towards termination of pregnancy: a pilot study. *J Obstet Gynaecol* 2004;24:557-61.
30. Lawrence RE, Rasinski KA, Yoon JD, Curlin FA. Obstetrician-gynecologists' beliefs about assisted reproductive technologies. *Obstet Gynecol* 2010;116:127-35.
31. Lauderdale DS. Birth outcomes for Arabic-named women in California before and after September 11. *Demography* 2006;43:185-201.
32. Lauderdale DS, Kestenbaum B. Asian American ethnic identification by surname. *Popul Res Policy Rev* 2000;19:283-300.
33. Sheskin IM. A methodology for examining the changing size and spatial distribution of a Jewish population: a Miami case study. *Shofar* 1998;17:97-114.
34. Groves RM, Fowler FJ, Couper MP, Lepkowski JM, Singer E, Tourangeau R. Stratification and stratified sampling, chapter 4.5. In: *Survey methodology*, 2nd ed. Hoboken, NJ: John Wiley & Sons; 2009: 113-20.
35. Curlin FA, Lawrence RE, Chin MH, Lantos JD. Religion, conscience, and controversial clinical practices. *N Engl J Med* 2007;356:593-600.
36. Lawrence RE, Rasinski KA, Yoon JD, Curlin FA. Obstetrician-gynecologist physicians' views on contraception and natural family planning: a national survey. *Am J Obstet Gynecol* 2011;204:124.e1-7.
37. Lawrence RE, Rasinski KA, Yoon JD, Curlin FA. Obstetrician-gynecologist physicians' beliefs about emergency contraception: a national survey. *Contraception* 2010;82:324-30.
38. Meigs CD. *Obstetrics: the science and the art*, 2nd ed, revised. Philadelphia: Blanchard and Lee; 1852:175-6.
39. Hayt CW. *Obstetrics: a manual for students and practitioners*. Philadelphia: Lea Brothers; 1892:26.
40. Segal SJ, Southam AL, Shafer KD, eds. *Intra-uterine contraception: proceedings of the second international conference October 2-3, 1964*, New York City. New York: Excerpta Medica Foundation; 1965.