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Impact of the 5As brief counseling on smoking cessation among pregnant clients of Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) clinics in Ohio☆

Oluwatosin Olaiya[a,b,*], **Andrea J. Sharma**[a,c], **Van T. Tong**[a], **Deborah Dee**[a,c], **Celia Quinn**[b,d], **Israel T. Agaku**[b,e], **Elizabeth J. Conrey**[a,d], **Nicole M. Kuiper**[e], and **Glen A. Satten**[a]

[a]Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA, USA

[b]Epidemic Intelligence Service, Division of Applied Sciences, Scientific Education and Professional Development Program Office, Centers for Disease Control and Prevention, Atlanta, GA, USA

[c]U.S. Public Health Service Commissioned Corps, Atlanta, GA, USA

[d]Ohio Department of Health, Columbus, OH, USA

[e]Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA, USA

Abstract

Objectives—We assessed whether smoking cessation improved among pregnant smokers who attended Women, Infants and Children (WIC) Supplemental Nutrition Program clinics trained to implement a brief smoking cessation counseling intervention, the 5As: ask, advise, assess, assist, arrange.

Methods—In Ohio, staff in 38 WIC clinics were trained to deliver the 5As from 2006 through 2010. Using 2005–2011 Pregnancy Nutrition Surveillance System data, we performed conditional logistic regression, stratified on clinic, to estimate the relationship between women's exposure to the 5As and the odds of self-reported quitting during pregnancy. Reporting bias for quitting was assessed by examining whether differences in infants' birth weight by quit status differed by clinic training status.

Results—Of 71,526 pregnant smokers at WIC enrollment, 23% quit. Odds of quitting were higher among women who attended a clinic after versus before clinic staff was trained (adjusted odds ratio, 1.16; 95% confidence interval, 1.04–1.29). The adjusted mean infant birth weight was,

☆The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

*Corresponding author at: Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention (CDC), 4770 Buford Highway, MS F-74, Atlanta, GA 30341, USA. oolaiya@cdc.gov (O. Olaiya).

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Conflict of Interest Statement

The authors declare there is no conflict of interest.

on average, 96 g higher among women who reported quitting ($P < 0.0001$), regardless of clinic training status.

Conclusions—Training all Ohio WIC clinics to deliver the 5As may promote quitting among pregnant smokers, and thus is an important strategy to improve maternal and child health outcomes.

Keywords

Smoking cessation; Pregnancy; Counseling; WIC; Ohio

Introduction

The adverse effects of perinatal smoking are well documented and include placental abruption, preterm birth, low birth weight, and infant death (Anon., 2004; Alberg et al., 2014). Smoking prevention and cessation can prevent pregnancy-related adverse outcomes. Despite overall declines in perinatal smoking rates in the U.S. during 2000–2010 (Tong et al., 2013), perinatal smoking rates remain disproportionately higher among low-income women (Tong et al., 2013). Furthermore, almost half of the women who smoke prior to becoming pregnant will quit smoking before their first prenatal visit (Tong et al., 2008); thus, women who continue to smoke during prenatal care may be those who need extra help to stop smoking (Chamberlain et al., 2013).

Smoking cessation counseling is an effective public health intervention to help pregnant smokers quit (Chamberlain et al., 2013; Lumley et al., 2009; Anon., 2010). The U.S. Public Health Service (USPHS) recommends a five-step, evidence-based approach known as the 5As, whereby trained providers deliver brief counseling to help their clients quit smoking (Fiore et al., 2008). The steps include:

1. ASK every client whether they smoke; it is recommended that providers identify and document each client's tobacco use status at every visit.
2. ADVISE smokers to quit; providers should give advice to quit to each client in a clear, strong and personalized manner.
3. ASSESS smokers' willingness to quit; at each visit.
4. ASSIST smokers using evidence-based aids; if the client is willing to quit, the provider should offer or refer for counseling and/or provide medication unless otherwise contraindicated. If the client is not willing to consider quitting at the moment, providers should provide a brief intervention that promotes motivation to quit.
5. ARRANGE for follow-up; either by telephone or in person soon after the set quit date.

Systems and implementation strategies, such as documentation of the 5As steps at every clinic visit, are recommended by the USPHS to ensure that all smokers are identified and provided counseling and referral to smoking cessation resources (Fiore et al., 2008).

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) serves low-income pregnant and postpartum women and young children. WIC provides nutrition and breastfeeding education and counseling, food vouchers, and referrals to health care and other community resources. Whereas WIC programs do not provide direct prenatal care services, they do reach a large proportion of low-income women during the perinatal period; thus, WIC can serve as a venue for delivering the 5As to increase perinatal smoking cessation and improve maternal and infant health outcomes. In 2013, a Cochrane Review evaluated the effectiveness of smoking cessation counseling approaches, such as the 5As, and found modest improvements in perinatal smoking cessation (average risk ratio, 1.44; 95% confidence interval, 1.19–1.75) (Chamberlain et al., 2013). Results were consistent for women of all socioeconomic categories (Chamberlain et al., 2013).

Ohio's infant mortality rate (7.9 deaths per 1,000 live births) is one of the highest in the U.S., and exceeds the overall U.S. rate (6.1 deaths per 1,000 live births) (Deaths: Final Data for 2011). According to the Pregnancy Risk Assessment Monitoring System (PRAMS), over the past decade, nearly 20% of pregnant women in Ohio smoke during their third trimester (CDC's PRAMS On-line Data for Epidemiologic Research). Recognizing the need to improve perinatal smoking cessation, starting in 2006, the Ohio Department of Health (ODH) trained select WIC clinics to deliver the 5As to their clients and integrate delivery of the 5As into their clinic flow. The purpose of this study was to assess whether training the WIC clinics to implement the 5As improved smoking cessation.

Methods

Data sources

The primary data source was 2005–2011 data from the Centers for Disease Control and Prevention's (CDC) Pregnancy Nutrition Surveillance System (PNSS), a program-based surveillance system created to monitor the prevalence of nutritional and behavioral risk factors related to mortality and low birth weight among infants of low-income pregnant women (Pediatric and Pregnancy Nutrition Surveillance System). Data are collected on pregnant women receiving services at WIC clinics. Participating states aggregate all clinic-level data and then submit them to PNSS. The PNSS data include socio-demographic characteristics; self-reported behaviors before, during, and after pregnancy; and indicators of maternal and infant health.

At the time of the initial WIC visit, women report their current smoking behaviors, as well as their smoking behaviors during the 3 months prior to the pregnancy. Similarly, at the postpartum WIC visit, women report their current smoking behaviors as well as their smoking behaviors during the last 3 months of pregnancy. Therefore, the surveillance system allows for assessment of changes in smoking behavior (e.g., quitting) over time based on changes in documented self-reported smoking status. This study was determined to be exempt from review by the CDC's institutional review board.

Inclusion criteria and outcome variable

From 2005 to 2011, all women who enrolled in any Ohio WIC clinic during their first or second trimester and reported they were currently smoking at the time of WIC enrollment were eligible for analysis (n = 81,313). Our outcome variable was quitting smoking. Women who reported smoking no cigarettes during the last 3 months of pregnancy were categorized as having quit.

Exposure to 5As intervention

Data obtained from ODH on the year(s) of implementation of the 5As within clinics was used to determine a woman's exposure to the intervention. In 2006, ODH began a pilot project to train personnel at WIC clinics to implement the 5As. The training continued in phases and by 2011, personnel at 38 of approximately 200 WIC clinics had been trained. The pilot counties were selected by ODH because of their high rates of tobacco use, infant mortality, and racial disparities in birth outcomes. A more detailed description of the pilot training is described elsewhere (Ohio Partners for Smoke-Free Families Final Report, 2007). All women attending a clinic that had been trained by ODH to deliver the 5As, beginning with the same calendar year in which the clinic was trained, were categorized as exposed to a trained clinic. Women attending a clinic in any year prior to training (including women who attended a clinic that was never trained) were categorized as not exposed to a trained clinic.

We further characterized a woman's 5As exposure according to clinic documentation practices. As part of the 5As implementation, ODH required that documentation of the 5As steps be made on a Five As Intervention Record (FAIR) form, which was maintained in a woman's chart. ODH staff provided technical assistance to help clinics integrate the steps of the 5As into clinic procedures and conducted periodic chart reviews among clinics who reported using the form. Trained clinics that included FAIR forms in any charts were categorized as “trained, documenting” while trained clinics that reported not currently using the FAIR form were categorized as “trained, not documenting”. We categorized trained clinics by this documentation status because documentation was the only way we could objectively assess whether a trained clinic was implementing the 5As intervention. Clinics that were trained but were not documenting may or may not have been implementing the 5As. The periodic chart reviews allowed a clinic's documentation status to change over time. A typical example of how a clinic could be categorized over time is illustrated in Fig. 1. The clinic categories (i.e., untrained, trained/documenting 5As, trained/not documenting 5As) were used as proxies for a woman's exposure to the 5As intervention, as individual-level exposure to the 5As could not be determined in PNSS.

Covariates

Socio-demographic characteristics assessed included maternal age, in years (<15, 15–17, 18–19, 20–29, 30–39, or ≥40); race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, American Indian/Alaska Native, Hawaiian/Pacific Islander/Asian, or multiple race); education (<12, 12, or >12 years of schooling); and county type (metropolitan, suburban, Appalachian (Appalachian Regional Commission), rural non-Appalachian).

Women were categorized as heavy smokers if they reported smoking 10 or more cigarettes per day at the initial prenatal WIC visit.

Exclusion criteria

Of the 81,313 women eligible for the study, we excluded 12.0% for whom quitting status in the last 3 months of pregnancy could not be ascertained because they did not return for a postpartum visit. One woman was further excluded due to missing covariate data. The final analytic sample included 71,526 women. Women missing postpartum smoking data were included in a sensitivity analysis.

Statistical analysis

We used χ^2 statistics to compare the characteristics of women included in our analysis to those excluded due to missing data. We used (conditional logistic) regression to assess the association between exposure to the 5As and quitting. Because the characteristics of the trained and untrained clinics and their respective clients differed, and because some of these characteristics are unmeasured, we stratified by clinic to compare the odds of quitting smoking among women who attended a clinic before the clinic was trained in the 5As (reference period) to the odds of quitting smoking among women who attended the same clinic after the clinic was trained. We used conditional logistic regression to avoid estimating a separate intercept for each clinic. To further examine associations related to clinic documentation of the 5As, we compared the odds of quitting among women who attended a clinic before it was trained in the 5As (reference period) to women who attended during the “trained and documenting period” and to women who attended during the “trained but not documenting period” (as shown in Fig. 1). We controlled for maternal age, race/ethnicity, education, trimester of WIC enrollment, heavy smoking at first prenatal visit, and calendar year. We included the calendar year that the mother attended the clinic in our model to account for secular trends in smoking and quit rates. Women attending clinics that were never trained were included in the analysis to provide additional information on secular trends as well as the effect of potentially confounding covariates. Because heavy smokers may be less likely to quit (Freund et al., 1992) and demographics and smoking norms differ substantially among Ohio regions, we tested if the effect of clinic training was different among heavy smokers or different by county type by including multiplicative interaction terms between training status and heavy smoking and training status and county type in the model. To assess the impact of loss to follow-up, we conducted a sensitivity analysis where all women excluded due to missing data on smoking status during the last 3 months of pregnancy were assumed to have continued smoking. Smoking cessation is known to increase birth weight (Chamberlain et al., 2013), thus as a secondary analysis, we assessed the difference in mean birth weight, adjusted for covariates, between quitters and smokers. Additionally, because disclosure of smoking may differ among women receiving a smoking cessation intervention (Windsor et al., 1993), as a proxy assessment of reporting bias, we assessed whether the difference in mean birth weight between quitters and smokers differed by clinic training and documentation status. Analyses were performed using SAS 9.3 (SAS Institute Inc., Cary, North Carolina). We defined statistical significance at $P < 0.05$ for main effects and $P < 0.15$ for interactions.

Results

Among the study sample, about half (52.8%) enrolled in WIC during the first trimester of pregnancy compared to the second trimester, 42.7% were heavy smokers at their initial WIC visit, and 5.4% and 6.5% of women attended trained/documenting and trained/not documenting clinics, respectively. Overall, 23.0% of women quit smoking by the last 3 months of pregnancy. In comparisons of the characteristics of women who were included versus excluded from analysis, a greater proportion of excluded women had <12 years of education, enrolled in WIC in the first trimester, and were of a racial/ethnic group other than non-Hispanic white (Table 1)

The odds of quitting smoking were significantly higher among women who visited a clinic after it had received 5As training compared with women who visited the same clinic prior to training (adjusted odds ratio [aOR], 1.16; 95% confidence interval [CI], 1.04–1.29) (Table 2). Associations were similar for women who attended a clinic when it was documenting the 5As (aOR, 1.18; 95% CI, 1.03–1.35) or when it was not documenting the 5As (aOR, 1.14; 95% CI, 0.98–1.32) compared with women who attended prior to training. However, the latter association was not statistically significant ($p = 0.08$) (Table 2).

The association between attending a trained clinic and quitting smoking did not differ between heavy or light smokers (p-value for interaction, $p = 0.64$), but may differ by county type (p-value for interaction, $p = 0.10$). In rural, non-Appalachian counties and Appalachian counties, the odds of quitting smoking were higher among women attending a clinic after it was trained compared with women who visited the same clinic prior to training aOR (1.31; 95% CI, 1.07–1.60) and aOR (1.25; 95% CI, 1.01–1.54), respectively. There was no difference in the odds of quitting smoking by clinic training status among women attending clinics in metropolitan (aOR, 1.00; 95% CI, 0.83–1.20) or suburban (aOR, 0.96; 95% CI, 073–1.27) counties. Associations were nearly identical with the sensitivity analysis, where women with missing postpartum smoking information ($n = 9,787$) were considered not to have quit (Supplemental Table 1).

For the secondary analysis, 66,811 women (93.4% of the study sample) had data on infant birth weight. Women missing birth weight data tended to be older, non-white, less educated, enrolled in WIC during the first trimester, and to have attended a non-trained clinic, but there was no difference in the proportion who reported quitting smoking (data not shown). The adjusted mean birth weight was an average of 96 g higher among women who reported quitting smoking; there was no significant effect modification by clinic training or documentation status (test for interaction, $P = 0.40$) (Table 3).

Discussion

The odds of reported smoking cessation by the last 3months of pregnancy among pregnant women attending Ohio WIC clinics were higher after the clinics received 5As training. Our study adds to the body of evidence supporting the effectiveness of a brief smoking cessation counseling intervention, particularly the 5As, for pregnant women. The intervention was delivered as part of routine WIC program services by trained WIC personnel, most of whom

were not physicians, thus further supporting evidence that the 5As delivered in a non-clinical context can be effective in increasing smoking quit rates (Fiore et al., 2008).

Although we were unable to measure or document how much time was devoted to the 5As within each clinic, the 5As typically takes 5–15 min at each visit (Fiore et al., 2008). The magnitude of associations obtained from this study compare closely with the odds of smoking cessation from counseling as reported in the USPHS practice guideline: for minimal <3 min (OR, 1.3; 95% CI, 1.01–1.6), or low-intensity 3–10 min (OR, 1.6; 95% CI, 1.2–2.0) counseling by a physician, and for non-physician clinicians' counseling (time unspecified) (OR, 1.7; 95% CI, 1.3–2.1) (Fiore et al., 2008).

Though the associations in this study and other studies related to smoking cessation counseling interventions are modest, prenatal smoking is one of the few modifiable risk factors for which we have effective interventions to prevent several adverse pregnancy outcomes, such as preterm delivery. In fact, in the U.S., 5%–8% of preterm deliveries and preterm-related deaths, 13%–19% of term low birth weight deliveries, and 23%–34% of infant deaths related to sudden infant death syndrome (SIDS) are attributable to perinatal smoking (Dietz et al., 2010). Thus, decreasing the number of pregnant women who smoke can reduce many adverse outcomes and have significant public health impacts. Among women attending Ohio WIC clinics in 2011, 20.5% (n = 56,581) smoked throughout pregnancy; smoking prevalence was higher in rural, non-Appalachian and Appalachian counties [25.6% (n = 17,282] (Pediatric and Pregnancy Nutrition Surveillance System, 2011). Assuming our observed associations are casual, our data suggest that implementing the 5As in all WIC clinics statewide may help an additional 2,100 pregnant woman quit smoking annually (Northridge, 1995). Based on an Ohio expenditure per maternal smoker of $221 (using 2004 dollars), this may result in an annual savings of $464,100 in neonatal healthcare costs (Perinatal Cigarette Smoking, 2012). If associations are limited to rural, non-Appalachian and Appalachian counties, implementation of the 5As in WIC clinics for only the areas may help an additional 1,300 pregnant women quit smoking annually, resulting in savings of $417,300 annually (Adams et al., Aug. 2011).

The WIC program is a uniquely advantageous setting to deliver the 5As because of the large number of low-income pregnant women it reaches—a population with high rates of both perinatal smoking and pregnancy-related complications (Perinatal Cigarette Smoking, 2012; Ohio's Commitment to Prevent Infant Mortality, 2013). For example, the WIC program in Ohio has the potential to reach about 48% of the pregnant population (Ohio Partners for Smoke-Free Families Final Report, 2007), and pregnant women on WIC are about three times more likely to smoke than those not on WIC (Perinatal Cigarette Smoking, 2012). Though some pregnant women spontaneously and successfully quit smoking when they discover they are pregnant, others are unable to do so and may benefit from intervention (Melvin et al., 2000; Colman and Joyce, 2003). Studies show that women who receive smoking cessation support expect and appreciate receiving that support and have greater satisfaction with their care compared with those who do not receive support (Chamberlain et al., 2013; Fiore et al., 2008). Intensified efforts to offer smoking cessation counseling to pregnant smokers at different levels of health care delivery, both at the community level (e.g., in WIC clinics) as well as in specialized clinic settings (e.g., obstetricians) may help to

reinforce such counseling and motivate quitting (Anon., 2010). Furthermore, cessation strategies, such as the 5As, delivered as part of a comprehensive and sustained tobacco strategy that includes smoke-free policies and higher tobacco prices/taxes are effective in reducing smoking prevalence (WHO Report on the Global Tobacco Epidemic, 2008; Kim et al., 2009).

Systems and implementation strategies, such as documentation of the 5As for every client at every clinic visit, is recommended by the USPHS to ensure that all smokers are systematically identified, provided counseling, and referred to smoking cessation resources. Documentation ensures that data are available to monitor clients' progress. For example, at follow-up visits, responses elicited at previous visits, issues discussed, and action points are readily available to the health care provider and could have been used to help reinforce steps taken toward quitting. Finally, documentation with the FAIR form may have served as prompts or reminders for WIC staff to initiate the 5As and systematically move through the steps of the counseling intervention. The use of reminder systems such as chart stickers or electronic medical records prompts have been observed to increase the rates at which providers implemented the 5As in clinics (Fiore et al., 2008; Levine et al., 2013).

The strengths of this study include the availability of a census of all low-income women in Ohio who received services from WIC during their pregnancy from2005 to 2011. This allowed us to compare quitting before and after clinics were trained and account for changes in participant characteristics over time.

Our study had limitations. First, quitting was determined based on women's self-report of smoking in the last 3 months of pregnancy ascertained at the postpartum visit, thus is subject to misclassification. While non-disclosure of smoking among pregnant women has been shown to be as high as 22% (Dietz et al., 2011), other studies, including one conducted with WIC participants, suggest that non-disclosure may be as low as 5% (Ross et al., 2002; Klebanoff et al., 1998; Kvalvik et al., 2012). We assessed the difference in mean birth weight between quitters and smokers as a proxy for non-disclosure since smoking cessation is known to increase birth weight (Chamberlain et al., 2013). Although we observed an increase of 96 g in the adjusted mean birth weight among women who reported quitting, this increase was modest compared with studies with cotinine-confirmed quitting (250–300 g increase) (Li et al., 1993; Benjamin-Garner and Stotts, 2013). Thus, it is likely that some women who reported quitting reported inaccurately or only reduced their smoking intensity. The increase in mean birth weight, however, was not affected by intervention participation, suggesting that women attending a trained clinic were not more likely to misreport smoking cessation than women in non-trained clinics. Second, we were unable to examine the effect of varying degrees of fidelity to the 5As implementation. We used any documentation of the 5As steps on the FAIR form as a proxy for full implementation and therefore may have underestimated the true effect of the intervention had it been implemented with full compliance with USPHS framework or guidelines for smoking cessation. Third, we categorized training and documentation status by calendar year as we did not have detailed data on the precise month the 5As implementation and/or documentation began or terminated. Thus, it is likely that exposure status for some women had been misclassified,

biasing our results towards the null. Finally, clinics that received the 5As training were not randomly selected; thus, our results may not be generalizable to all Ohio WIC clinics.

In conclusion, our study demonstrates that training WIC clinics to implement the 5As and integrate the steps into their clinic flow may improve smoking cessation among low-income pregnant women. Given that a number of trained clinics were not documenting use of the 5As, there is a need to understand barriers to and support for proper documentation of the 5As to improve effectiveness. Furthermore, it is important to examine how variation in fidelity to implementation of the 5As affects smoking cessation. Pregnancy is a time when women may make positive behavior changes, one of which is smoking cessation; however, many pregnant women need support to quit smoking. Training WIC clinics to deliver the 5As intervention presents an important opportunity to help low-income, high-risk pregnant women successfully quit smoking.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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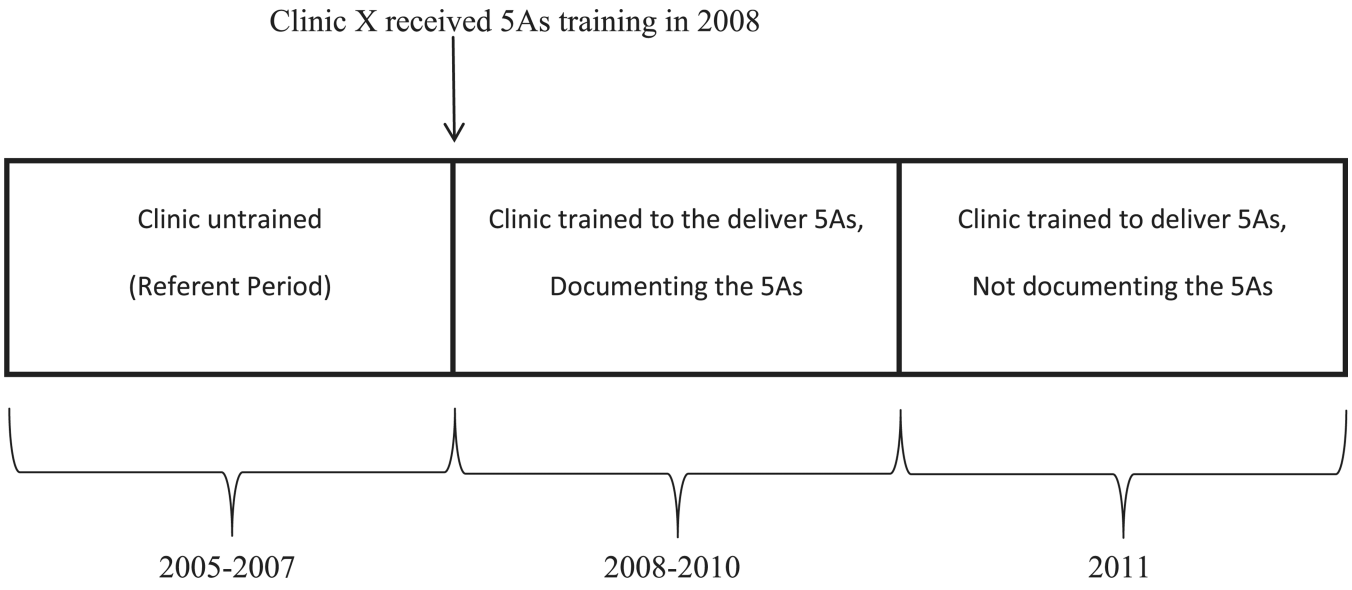

Fig. 1.

Schema representing how a woman's exposure to the 5As was determined using a hypothetical Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) clinic (clinic X). In this example, clinic X's staff received 5As training in 2008. Ohio Department of Health chart reviews indicated that the clinic documented the implementation of the 5As using the Five As Intervention Record (FAIR) form through 2010, but did not document with the FAIR form in 2011.Hence, women who attended clinic X from2005–2007were considered not exposed to the 5As, women who attended from 2008–2010 were considered exposed to the 5As and the clinic was documenting the 5As steps, those who visited in 2011 were considered exposed to the 5As but the clinic was not documenting the 5As steps. In the analysis, all clinics include 2005 – 2011 data, but the actual year each clinic was trained to deliver the 5As varies. After training, some trained clinics continuously documented the 5As steps, others ceased documentation and some never adopted documentation into clinic records.

Table 1

Characteristics of pregnant smokers attending Ohio WIC clinics who were included and excluded from the analysis due to missing data (Pregnancy Nutrition Surveillance System, 2005–2011).

	Included		Excluded*		
Characteristics	***N***	**(%)**	***N***	**(%)**	***P*-value**
Maternal age (years)	71,526		9,787		<0.001
<15	154	(0.2)	11	(0.1)	
15–17	3,666	(5.1)	488	(5.0)	
18–19	11,643	(16.3)	1,568	(16.0)	
20–29	45,646	(63.8)	6,105	(62.4)	
30–39	9,800	(13.7)	1,474	(15.1)	
40+	617	(0.9)	141	(1.4)	
Maternal race/ethnicity	71,526		9,753		<0.001
Non-Hispanic white	60,857	(85.1)	7,814	(80.1)	
Non-Hispanic black	8,128	(11.4)	1,556	(16.0)	
Hispanic	1,340	(1.9)	215	(2.2)	
American Indian/Alaska Native	253	(0.4)	38	(0.4)	
Hawaiian/Pacific Islander/Asian	252	(0.4)	40	(0.4)	
Multiple races	696	(1.0)	90	(0.9)	
Maternal education (years completed)	71,526		9,787		<0.001
<12	24,544	(34.3)	3,907	(39.9)	
12	38,492	(53.8)	4,771	(48.8)	
13–30	8,490	(11.9)	1,107	(11.3)	
Missing			2	(0.0)	
Trimester enrolled in WIC	71,526		9,787		<0.001
1st	37,756	(52.8)	5,814	(59.4)	
2nd	33,770	(47.2)	3,973	(40.6)	
County type	71,526		9,787		<0.001
Metropolitan	30,259	(42.3)	4,893	(50.0)	
Suburban	8,646	(12.1)	1,097	(11.2)	
Rural, non-Appalachian	11,852	(16.6)	1,371	(14.0)	
Appalachian	20,769	(29.0)	2,426	(24.8)	
Smoking intensity at WIC enrollment	71,526		9,787		0.04
Light (<10 cigarettes/day)	40,977	(57.3)	5,477	(56.0)	
Heavy (≥10 cigarettes/day)	30,549	(42.7)	4,310	(44.0)	
Quit smoking in last 3 months of pregnancy	71,526		466		0.36
No	55,043	(77.0)	367	(78.8)	
Yes	16,483	(23.0)	99	(21.2)	
Type of clinic attended	71,526		9,787		<0.001
Untrained in the 5As	63,005	(88.1)	8,758	(89.5)	
Documenting the 5As	3,849	(5.4)	504	(5.2)	

	Included		Excluded*		
Characteristics	***N***	**(%)**	***N***	**(%)**	***P*-value**
Not documenting the 5As	4,672	(6.5)	525	(5.4)	

* Excluded due to missing data required for analysis.

Table 2

Conditional logistic regression analysis estimating odds of smoking cessation in the last 3 months of pregnancy among pregnant smokers attending a WIC clinic before or after the clinic was trained to deliver the 5As, overall and by documentation status (Ohio, 2005–2011).

	By Training Status		By Training and Documentation Status	
5As exposure status**	**Crude OR (95% CI)**	**Adjusted OR (95% CI)†**	**Crude OR (95% CI)**	**Adjusted OR (95% CI) †**
Clinic untrained	**1.00**	**1.00**	**1.00**	**1.00**
Clinic trained	**1.19 (1.09–1.32)**	**1.16 (1.04–1.29)**	**–**	**–**
Documenting 5As	**–**	**–**	**1.20 (1.06–1.37)**	**1.18 (1.03–1.35)**
Not documenting 5As	**–**	**–**	**1.18 (1.03–1.36)**	**1.14 (0.98–1.32)**
Covariates				
Maternal age (years)				
≤15	–	2.36 (1.68–3.32)	–	2.36 (1.68–3.32)
15–17	–	1.52 (1.40–1.64)	–	1.52 (1.40–1.64)
18–19	–	1.30 (1.24–1.36)	–	1.30 (1.24–1.36)
20–29	–	1.00	–	1.00
30–39	–	0.81 (0.77–0.86)	–	0.81 (0.77–0.86)
40+	–	0.79 (0.64–0.98)	–	0.79 (0.64–0.98)
Maternal race/ethnicity				
Non-Hispanic white	–	1.00	–	1.00
Non-Hispanic Black	–	1.75 (1.64–1.86)	–	1.75 (1.64–1.86)
Hispanic	–	1.74 (1.54–1.96)	–	1.74 (1.54–1.96)
American Indian/Alaska Native	–	1.18 (0.88–1.60)	–	1.18 (0.88–1.60)
Hawaiian/Pacific Islander/Asian	–	0.77 (0.56–1.07)	–	0.77 (0.56–1.07)
Multiple races	–	1.04 (0.87–1.24)	–	1.04 (0.87–1.24)
Maternal education (years)	–	1.08 (1.06–1.09)	–	1.08 (1.06–1.09)
Trimester enrolled in WIC				
1st	–	1.31 (1.27–1.36)	–	1.31 (1.27–1.36)
2nd	–	1.00	–	1.00
Smoking intensity at WIC enrollment				
Light (<10 cigarettes/day)	–	2.71 (2.60–2.82)	–	2.71 (2.60–2.82)
Heavy (≥10 cigarettes/day)	–	1.00	–	1.00
Calendar year	–	1.01 (1.00–1.02)	–	1.01 (1.00–1.02)

OR, odds ratio; CI, confidence interval.

† Covariates include trimester enrolled in WIC; heavy smoking (≥10 cigarettes/day); year of clinic attendance; maternal age, race, education.

** Women's exposure status is based on whether or not the clinic had been trained to deliver the 5As and whether or not the clinic was documenting its delivery of the 5As.

Table 3

Mean birth weight (grams) among smokers and quitters by clinic training and documentation status (Ohio, 2005–2011).

	Smoked Throughout Pregnancy		Quit By Last 3 Months of Pregnancy	
	n	**Adjusted Mean Birth Weight, g (SE)†**	***n***	**Adjusted Mean Birth Weight, g (SE)†**
Overall**	51,425	3,022.1 (12.9)	15,386	3,118.0 (13.3)
Women's 5As exposure status‡				
Untrained	45,224	3,022.3 (13.0)	13,504	3,119.6 (13.4)
Trained, documenting the 5As	2,859	3,022.9 (16.4)	777	3,129.2 (23.4)
Trained, not documenting the 5As	3,342	3,015.9 (15.9)	1,105	3,088.4 (20.8)

SE, standard error.

† Covariates include: trimester enrolled in WIC; year of clinic attendance; maternal age, race, education.

** A total of 4,715 (6.6% of study sample) women were missing data on infant birth weight.

‡ Women's exposure status is based on whether or not the clinic had been trained to deliver the 5As and whether or not the clinic was documenting its delivery of the 5As.