

The impact of Ghana's R3M programme on the provision of safe abortions and postabortion care

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In 2006, in response to the high maternal mortality, driven largely by unsafe abortions, the government of Ghana, in partnership with other organizations, launched the reducing maternal mortality and morbidity (R3M) programme in seven districts in Greater Accra, Ashanti and Eastern, to improve comprehensive abortion care services. This article examines whether this intervention made a difference to the provision of safe abortion services and postabortion care (PAC). We also examine the role played by provider attitudes and knowledge of the abortion law, on providers with clinical training in service provision. Primary data on health care providers in Ghana, collected using a quasi-experimental design, were analysed using propensity score weighting. Apart from the treatment group, the sample included two controls: (1) Districts in Accra, Ashanti and Eastern, not exposed to the treatment; and (2) Districts from distant Brong Ahafo, also not exposed to the treatment. The findings show that providers in the treatment group are nearly 16 times as likely to provide safe abortions compared with their peers in Brong Ahafo, and ~2.5 times as likely compared with providers in the other control group. R3M providers were also different from their peers in providing PAC. Associations between provider attitudes and knowledge of the law on both outcomes were either non-significant or inconsistent including for providers with clinical knowledge of abortion provision. Provider confidence however is strongly associated with service provision. We conclude that the R3M programme is helping safe abortion provision, with the differences being greater with control groups that are geographically distant, perhaps owing to lower contamination from movement of providers between facilities. Increasing provider confidence is key to improving both safe abortion provision and PAC.

Keywords Abortion, Ghana, programme evaluation, propensity score analysis

KEY MESSAGES

- Ghana's R3M programme aimed at improving comprehensive abortion care, is helping to improve safe abortion provision.
- Expanding the programme to include more remote areas will potentially yield greater benefits in reducing abortion related mortality and morbidity.

Introduction

Despite Ghana's progressive abortion law,¹ one of the most liberal in sub-Saharan Africa, mortality caused by unsafe abortion remains a matter of concern. The country's maternal mortality ratio (MMR) in 2010 was an estimated 350 maternal deaths per 100 000 live births (World Health Organization *et al.* 2012), compared with an average MMR of 240 in the developing world. Among the biggest contributors to maternal mortality in the country are complications of unsafe abortions (Ghana Statistical Service *et al.* 2009). Estimates from the 2007 Ghana Maternal Health Survey suggest a national abortion rate of ~15 abortions per 1000 women of reproductive age (15–44).² Further, ~40% of abortions are performed by untrained providers; lack of training increases the risk of unsafe abortion and, therefore, of danger to a woman's life.

Evidence suggests that many health care providers are unaware of the abortion law (Lithur 2004; Ipas 2008). Studies show that substantial proportions of providers are either unaware of all allowable conditions or believe that it is illegal (Morhe *et al.* 2007; Aniteye and Mayhew 2013; Payne *et al.* 2013). Many feel that providing abortions conflicts with their religious values, and view women seeking an abortion with suspicion (Aboagye *et al.* 2007). Lack of knowledge of the law, coupled with social and religious stigma, drives the practice underground, resulting in clandestine procedures from untrained providers or attempts at self-inducing an abortion (Hill *et al.* 2008; Aniteye and Mayhew 2013) (Payne *et al.* 2013). Further, while Ghana allows doctors and various non-doctors³ to provide an abortion, many non-doctors have no clinical knowledge of how to provide one (Hessini *et al.* 2006; Aboagye *et al.* 2007).

In 2003, the Ghanaian government introduced changes in its reproductive health policy, and issued guidelines for the provision of comprehensive abortion care services (CAC), within the limits of the law (Ghana Health Service 2005).⁴ To ensure the full implementation of this policy, in 2006, the Ministry of Health, in partnership with a consortium of international health organizations, including Ipas, Engender Health, Marie Stopes International (MSI), the Population Council, and Willows Foundation, launched the programme 'Reducing Maternal Mortality and Morbidity' (R3M).⁵ The programme, aimed largely at health care providers, sought to increase access to CAC to reduce morbidity and mortality caused by unsafe abortion, and to widen access to family planning services to reduce the unwanted pregnancies that lead to abortions in the first place (Aboagye *et al.* 2007). The R3M programme was initiated in three regions—Accra, Ashanti, and Eastern—and within these regions, a total of seven districts were chosen (Table A1).

The timeframe for the programme's first phase was between 2006 and 2008, which was extended to 2009. Phase II was implemented between January 2010 and December 2011, and two additional districts in each R3M region were added during this time.⁶ Phase III in all districts in these regions is currently underway.

The consortium provides a mutually reinforcing basket of services to providers, communities and facilities, such as training in abortion techniques and contraceptive services, sensitizing the community and health care providers to client

needs, and providing equipment and products to facilities (Table A2 lists selected facility level interventions). Different organizations provide different types of services. For instance Ipas and the Ghana Ministry of Health have the task of training the providers in CAC in the public health facilities, while MSI focuses on the private health facilities. Engender Health provides training on contraceptive counselling and services, while the Willows Foundation and Population Council focus on educating the communities, and provide guidance to the programme.

In this article, we use a quasi-experimental approach to determine whether the R3M programme has made a difference in the provision of safe abortion services and postabortion care (PAC) in facilities. Since the study began in 2011, and the intervention was first implemented in 2006, it was impossible to conduct surveys directly before and after the programme was implemented. The quasi-experimental study design used in this article approximates this design by comparing provision of safe abortion services and PAC for the facilities exposed to the programme with those facilities that were not a part of the programme. Additionally, we examine the role that providers' knowledge of the law, and their attitudes play in influencing the two outcomes, specifically for those providers who have clinical knowledge of abortion provision.

Data and methods

The data come from a primary survey administered in 2011–2012 in selected health facilities to providers of obstetric and gynaecologic services. The survey was designed to compare the attributes of providers who were exposed to the programme with those of providers who were not. The data were collected through face-to-face interviews using a structured questionnaire that sought information on a range of topics, including background information of the respondents and of the facility they practised in; and respondents' training, experience and attitudes on a range of issues.⁷ We collected data from 457 providers, who were legally eligible to provide abortions, in 166 facilities⁸ that had the capacity to provide some gynaecological services.⁹ Of them, 116 were doctors, while 341 were non-doctor health care providers, including midwives, nurses and medical assistants. While the sample seems skewed towards mid-level providers, in Ghana, the proportion of doctors to other providers is relatively small. We did attempt to oversample doctors; however, as an estimated 90% of Ghana's doctors live in Accra (in Greater Accra) and Kumasi (in Ashanti) (Brookman-Amisshah 2004), most of the providers from the other regions are perforce mid-level providers.

Since the study design was explicitly quasi-experimental, with treatment and control groups, our sample has three analysis groups: one treatment group and two control groups. The treatment group consists of 197 providers in the 64 health facilities located in the seven districts that participated in the first phase of the R3M programme.

The first control group of providers *not* exposed to the programme consists of a sample of 148 providers drawn from 58 facilities in 17 districts in the same three regions as the treatment group (Ashanti, Eastern and Greater Accra). Of these 17 districts, 13 were not included in the first phase of the R3M programme.

Although the remaining four districts were part of the first phase of R3M, we selected only facilities located in the 13 districts that did *not* participate in the first phase of the programme.

The second control group that was *not* exposed to the treatment consists of 112 providers¹⁰ from 44 facilities located in seven districts in the Brong Ahafo region, which was not part of the R3M programme. These 44 facilities were chosen because they are located outside of the three regions whose facilities participated in the R3M programme, and thus would have minimal exposure to it.

Thus, the rationale for having two control groups [both will be called non-R3M ($N=260$)] is that non-participating but nearby facilities may still indirectly benefit from geographic proximity. We assume that the second, more distant control group will be much less likely to benefit from the R3M programme than the first control group.

Although providers in all non-R3M facilities may also have been exposed to some CAC-related interventions through the programmes of the government and other organizations, these activities would not be as intense as those in the R3M districts. The main hypothesis this article thus tests is that providers in R3M districts are more likely than providers in non-R3M districts to provide safe abortion services and PAC. The second hypothesis we test is that providers who have clinical knowledge may still be reluctant to offer it because of unfavourable attitudes and lack of knowledge of the law.

We used propensity score analysis because of its effectiveness in simulating an experiment and measuring treatment impacts in non-experimental studies, especially post-test only studies such as this one (JSI Research and Training Institute 2007; Stuart 2010). The main feature of the technique is that it removes selection bias by balancing the sample on the characteristics that potentially influenced the selection of cases into the treatment group.

Compared with non-R3M districts, the districts chosen for the programme were more urbanized, and had more secondary and tertiary facilities, better qualified doctors, and more private facilities. Since this situation affected the selection of providers into the programme, we balanced our sample on the following provider-level variables: the type of facility they work in (primary, secondary or tertiary); whether the facility is in an urban or rural area; whether it is in the private or public sector; their total number of years of practice (<15 years or ≥ 15 years);¹¹ and by medical background (doctors or non-doctors). Balancing/adjusting for selection bias was done using a logit model, whose estimates were used to obtain the propensity scores (Dehejia and Wahba 2002) (Table 1).

Propensity scores are the predicted probabilities [$\hat{e}(x)$] that are generated from this model. These scores estimate the probability of each case receiving the treatment (i.e. being in the R3M programme). We then used propensity score weighting (PSW) to estimate the effect of the treatment on the two outcomes: provision of safe abortion services and of PAC (Imbens and Wooldridge 2009).

In the PSW model, the inverse of the propensity scores are used as weights in an analysis, to estimate the average treatment effect on providers who actually received the treatment, i.e. participated in the R3M programme (ATT i.e. the average treatment effect on the treated) (Guo and Fraser 2010;

DuGoff *et al.* 2014). We also estimate the potential average treatment effect (ATE) on *all* providers, including those in the control groups, had they *hypothetically* been exposed to the programme.

For ATT models, the weights are defined as:

$$\omega(W, x) = W + (1 - W) \frac{\hat{e}(x)}{1 - \hat{e}(x)}$$

For ATE models, the weights are defined as:

$$\omega(W, x) = \frac{W}{\hat{e}(x)} + \frac{1 - W}{1 - \hat{e}(x)}$$

where W is the indicator for the treatment, and is equal to 1 for those respondents who were exposed to the treatment, and is equal to 0 for those who were not.

Once the weights had been generated, we checked to see if the selection bias had been removed by performing bivariate tests against the treatment variable on all the variables used to remove selection. Since the treatment indicator was non-significant in all these models, we concluded that the selection bias had been successfully removed, and our subsequent models would be balanced (Dehejia and Wahba 2002). Except for the variable on type of provider (doctors or non-doctors) the variables included as controls in the multivariate model are different from the variables included in the selection model. This is by design, and is recommended as best practice for PSW models (Freedman and Berk 2008).

We used the propensity score weights in logistic regressions to analyse the effect of the treatment on the two outcome variables. Further, because we have nested data (providers nested within facilities), we used robust standard errors to estimate significance, by specifying the facilities as a cluster variable.

The outcome variables measure whether the respondent was providing safe abortion services or PAC at the time of the survey. The main explanatory variable is whether the provider was exposed to the R3M treatment in the first phase or not, and it captures the training and benefits given to facilities and providers in the first phase, including training in abortion techniques.

The multivariate analyses were conducted for three samples: R3M providers and all non-R3M providers (both control groups combined; Sample 1); R3M providers and non-R3M providers in the regions of Accra, Ashanti and Eastern (Sample 2); and R3M providers and non-R3M providers in the region of Brong Ahafo (Sample 3).¹²

Although these models test the association between the two outcomes and lack of knowledge of law and abortion attitudes; in order to gauge the extent to which these two variables act as barriers to service provision, we separately analysed both outcomes for a sub-sample of those who reported having clinical knowledge of abortion provision. That is, they knew at least one of dilation and curettage [D&C], manual or electric vacuum aspiration [MVA/EVA], or medication abortion protocols.^{13,14} Compared with the previous models that analyse all potential providers, the focus here is on respondents who are actually currently capable of providing service. This allows us to examine if despite knowing abortion techniques, respondents feel constrained from providing one. Due to small cell sizes, this

Table 1 Characteristics of R3M providers compared with non-R3M providers, by variables used in balancing the sample and obtaining propensity scores, Ghana 2011–2012

Variables	R3M facilities		Non-R3M facilities		
	N	% dist	N	% dist	
<i>Demographic distribution, by facility in which they work</i>					
Provider works in urban or rural setting					***
Urban	171	86.8	189	72.7	
Rural	26	13.2	71	27.3	
Total	197	100.0	260	100.0	
Ownership of facility in which provider works					***
Public	173	87.8	192	73.9	
Private	24	12.2	68	26.2	
Total	197	100.0	260	100.0	
Level of facility where provider works					*
Primary	74	37.6	128	49.2	
Secondary/tertiary	123	62.4	132	50.8	
Total	197	100.0	260	100.0	
<i>Demographic distribution, by provider's own characteristics</i>					
Professional experience					
Below 15 years	110	55.8	135	51.9	
15 years or more	87	44.2	125	48.1	
Total	197	100.0	260	100.0	
Provider type					†
Doctors (including Ob/Gyns)	59	30.0	57	21.9	
Non-doctors (including midwives)	138	70.1	203	78.1	
Total	197	100.0	260	100.0	

Notes: All data are unweighted. Components may not sum to totals due to rounding. Missing values were dropped using listwise deletion. Chi-square tests were used to assess significance. All estimates for this sample are from information that was current at the time of the survey. Total $N=457$.

*** $P < 0.001$, * $P < 0.05$, † $P < 0.1$.

analysis was restricted to the overall sample, and will be referred to as Sample 4.¹⁵

Various demographic characteristics were used as controls in all the models.¹⁶ The construction of the outcome and explanatory variables, and of the variables used to balance the sample, is described in Table A3.

Results¹⁷

Characteristics of R3M providers compared with non-R3M providers

Table 2 has the percentage distribution of the full sample along selected parameters,¹⁸ and it shows that more providers in the treatment (R3M) facilities have attributes favourable to safe abortion and PAC provision compared with non-R3M providers. Greater proportions of providers exposed to the programme provide safe abortion services (54 vs 13%) and PAC (66 vs 33%). Greater proportions of programme participants also have been trained in abortion techniques (84 vs 52%) and know more about the abortion law (80 vs 62%). Further, R3M providers have more confidence in their ability to provide safe abortions (77 vs 36%), and feel that their facility supports them, compared with non-R3M providers (82 vs 37%).

Determinants of safe abortion provision

Table 3 shows the results of the multivariate analyses that identify the impact of the R3M programme on safe abortion provision. The ATT model, which estimates the actual effect of the R3M programme, shows an association with safe abortion provision: in Sample 1 (R3M and all non-R3M providers), R3M participants have four times the odds of providing safe abortions as non-R3M providers. According to the ATE results, the hypothetical effect of all providers participating in the programme would increase the odds of abortion provision only slightly less, by about 2.5 times (Odds Ratio (OR)=3.5). Much of this is driven by Sample 3: while both ATT and ATE estimates for Sample 2 show that R3M providers have 2.5 times the odds of abortion provision, compared with non R3M providers, the ATT analysis for Sample 3 shows that R3M providers have over 15.5 times the odds. If all potential providers in Sample 3 had received the treatment, the odds of abortion provision would be over 12.5 times as much.

The programme also improves the odds of safe abortion provision for providers with clinical knowledge, with those exposed to the programme being nearly four times as likely to provide a safe abortion (ATT model), compared with trained providers not exposed to the programme. If all trained providers had hypothetically been exposed to the programme (ATE

Table 2 Characteristics of R3M and non-R3M facilities and providers, by selected parameters, Ghana 2011–2012

Variables	R3M facilities		Non-R3M facilities		
	N	% dist	N	% dist	
Facility variables					
Was facility R3M or non-R3M in phase 1?	64		102		
Did facility subsequently become R3M facility?					
Yes			78	76.5	
No			24	23.5	
Total			102	100.0	
Region where facility is located					***
Ashanti	13	20.3	23	22.5	
Brong-Ahafo	0	0.0	44	43.1	
Eastern	19	29.7	20	19.6	
Greater Accra	32	50.0	15	14.7	
Total	64	100.0	102	100.0	
Provider variables					
Number of providers in R3M/non-R3M facilities in phase 1	197		260		
<i>Distribution by abortion provision</i>					
Number of providers who provide safe abortions in average month					***
No abortions performed	87	45.8	198	86.8	
At least one of either MVA/EVA or D&C or medication abortion	103	54.2	30	13.2	
Total	190	100.0	241	100.0	
Number providers who provide PAC procedures in average month					***
No abortions performed	66	34.2	161	66.8	
At least one of either MVA/EVA or D&C or medication abortion	127	65.8	80	33.2	
Total	193	100.0	241	100.0	
<i>Distribution by knowledge and training</i>					
Ever trained in abortion methods such as MVA/EVA, D&C, medication abortion					***
Yes	165	83.8	134	51.5	
No	32	16.2	126	48.5	
Total	197	100.0	260	100.0	
How well does provider know the abortion law?					***
Answered six or more questions about law correctly	157	79.7	160	61.5	
Answered less than six questions about law correctly	40	20.3	100	38.5	
Total	197	100.0	260	100.0	
<i>Distribution by values, attitudes and perception</i>					
Provider attitude towards abortion provision					†
More favourable	154	79.0	185	71.4	
Less favourable	41	21.0	74	28.6	
Total	195	100.0	259	100.0	
Confidence in ability to provide abortion					***
Provider has confidence in own ability to provide abortion	151	77.4	93	35.8	
Provider has no confidence in own ability to provide abortion	44	22.6	167	64.2	
Total	195	100.0	260	100.0	
Provider's perception of facility support					***
Facility is supportive of abortion provision	159	81.1	95	36.7	
Facility is not supportive of abortion provision	37	18.9	164	63.3	
Total	196	100.0	259	100.0	

(continued)

Table 2 Continued

Variables	R3M facilities		Non-R3M facilities	
	N	% dist	N	% dist
<i>Demographic distribution, by facility in which they work</i>				
Size of the facility where provider works (measured by number of beds)				***
0–8 beds	33	16.8	70	27.2
9–50 beds	70	35.5	108	42.0
51+ beds	94	47.7	79	30.7
Total	197	100.0	257	100.0
<i>Demographic distribution, by provider's own characteristics</i>				
Age of provider				
Below 40	42	21.4	71	27.3
40 and above	154	78.6	189	72.7
Total	196	100.0	260	100.0
Religion of provider				
Catholic	39	19.8	63	24.2
All other religions and sects	158	80.2	197	75.8
Total	197	100.0	260	100.0

Notes: All data are unweighted. Components may not sum to totals due to rounding. Missing values were dropped using listwise deletion. *** $P < 0.001$, † $P < 0.1$. Chi-square tests were used to assess significance. Not applicable. All estimates for this sample are from information that was current at the time of the survey. Total $N = 457$.

model), they would have been nearly 3.5 times as likely to provide safe abortion, compared with whether they had not received the treatment.

According to the ATT model, better knowledge of the abortion law is only marginally associated with safe abortion provision in Sample 1 ($P = 0.06$), although if all potential providers had been exposed to the treatment, they would have had over 3.5 times the odds of abortion provision. The variable is however significant for Sample 2 ($P = 0.03$)—i.e. net of the effect of the other variables, it raises the odds of safe abortion provision by 2.7 times (ATT OR = 3.7). However, the ATT analysis found no independent association between being better informed about the law and actually providing safe abortions in Sample 3, which includes the Brong Ahafo group.

Holding favourable attitudes toward abortion is not associated with safe abortion provision, although being Catholic (compared with other religions) lowers the odds of providing safe abortions by about 57% (ATT estimates) in Sample 2. However, providers' confidence in their ability to provide safe abortions is important in all samples, and in Sample 1, the ATT estimates show that *ceteris paribus*, more confident providers have over 7.5 times the odds of providing safe abortions than less confident ones. The association between the outcome and facility support is only marginal ($P = 0.09$), though the ATE estimates for Samples 1 and 2 show that there would be an effect if all providers had been exposed to the programme.

For the sub-sample of providers with clinical knowledge of abortion provision (Sample 4), better knowledge of the abortion law is only marginally associated ($P = 0.07$) with the outcome, though hypothetically, trained providers would have about 3.5 times the odds of abortion provision if they knew the law, compared with their peers. Even among trained providers though, being Catholic reduces odds of abortion provision by 57%, compared with other religions (ATT estimates).

Provider confidence continues to be associated with abortion provision, with confident providers having nearly four times the odds of providing abortions compared with less confident ones. The effect size is however smaller than for Sample 1.

Determinants of delivery of PAC

Exposure to the R3M programme is associated with PAC provision only in Sample 1 (ATT OR = 1.97), though there is a hypothetical effect of the programme in both Samples 1 and 2. However, as with safe abortion provision, providers with clinical knowledge of abortion provision, who were exposed to the R3M programme, had over twice the odds of PAC provision (ATT model), compared with those who had not received the treatment. This remains true under the hypothetical scenario (ATE model) where all potential providers are exposed to the treatment (Table 4).

Neither knowing the abortion law nor religion nor attitudes toward abortion is associated with the odds of providing PAC, though abortion attitudes is weakly associated ($P = 0.09$) with PAC for Sample 3. However, as with the outcome of safe abortion provision, providers' confidence in their ability to provide abortion does predict PAC provision, with the actual odds being between six times as much (in Sample 3) and about four times as much (in Sample 2) for confident providers compared with less confident ones.

Unlike the models predicting the provision of safe abortion, being a non-doctor does affect their likelihood of providing PAC. Not being a doctor lowers the odds of providing PAC in all samples, with only the ATT estimates in Sample 2 being marginal ($P = 0.07$). The ATT estimates range from 63% lower odds for PAC provision for non-doctors in Sample 1 to 83% lower odds in Sample 3.

Knowledge of law, provider attitudes, and religion are not associated with PAC provision for Sample 4. A provider's

Table 3 Maximum likelihood logit estimates of the odds of a provider providing safe abortion services, by whether they were part of the R3M programme or not, and other characteristics, Ghana 2011–2012

Explanatory variable	Safe abortion					
	Sample 1: all providers surveyed (N=412)			Sample 2: R3M providers and non-R3M providers in Accra, Ashanti, Eastern (N=303)		
	PSW (ATT) logit β estimate	Odds ratio	Robust std. error	PSW (ATT) logit β estimate	Odds ratio	Robust std. error
Intercept	-4.705***		0.921	-4.434***		0.925
Treatment						
R3M ('No' omitted)	1.397***	4.044	0.400	0.924*	2.519	0.405
Knowledge						
Knowledge of law ('Answered fewer than six questions correctly' omitted)						
Answered six or more questions correctly	1.072†	2.920	0.558	1.300*	3.670	0.560
Values, attitudes and perception						
Attitude toward abortion provision ('Less favourable' omitted)						
More favourable	0.405	1.499	0.382	0.329	1.390	0.388
Confidence in own ability to provide abortion ('Low confidence' omitted)						
Have confidence	2.046***	7.735	0.470	1.993***	7.340	0.449
Facility support ('Low support for abortion' omitted)						
Facility supports abortion provision	0.795†	2.214	0.471	0.875*	2.398	0.444
Religion ('Other religion/sects' omitted)						
Catholic	-0.681†	0.506	0.387	-0.681†	0.506	0.372
Facility in which they work						
Number of beds in facility they practice ('0–8 beds' omitted)						
9–50 beds	-0.104	0.902	0.363	-0.292	0.747	0.381
51+ beds	-0.303	0.739	0.439	-0.328	0.720	0.445
Provider characteristics						
Provider type ('Doctors' omitted)						
Non-doctors	-0.425	0.654	0.386	-0.485	0.615	0.369
Age ('Below 40' omitted)						
40 and above	0.740	2.096	0.458	0.715	2.045	0.441
Likelihood ratio chi-square	69.910***			68.620***		
N	412			412		303

(continued)

Table 3 Continued

Explanatory variable	Safe abortion						Sample 4: All providers that reported training in at least one method of abortion (N = 280)					
	Sample 3: R3M providers and non-R3M providers in Brong Ahafo (N = 297)			Sample 4: All providers that reported training in at least one method of abortion (N = 280)			Sample 3: R3M providers and non-R3M providers in Brong Ahafo (N = 297)			Sample 4: All providers that reported training in at least one method of abortion (N = 280)		
	PSW (ATT) logit β estimate	Odds ratio	Robust std. error	PSW (ATE) logit β estimate	Odds ratio	Robust std. error	PSW (ATT) logit β estimate	Odds ratio	Robust std. error	PSW (ATE) logit β estimate	Odds ratio	Robust std. error
Intercept	-5.528**		1.252	-5.409**		1.184	-3.851**		0.955		0.920	
Treatment												
R3M ('No' omitted)	2.751***	15.660	0.696	2.534***	12.606	0.599	1.329**	3.776	0.467	1.234**	3.436	0.441
Knowledge												
Knowledge of law ('Answered fewer than six questions correctly' omitted)												
Answered six or more questions correctly	0.735	2.086	0.674	0.976	2.653	0.655	1.010†	2.745	0.556	1.252*	3.498	0.570
Values, attitudes and perception												
Attitude toward abortion provision ('Less favourable' omitted)												
More favourable	0.527	1.694	0.416	0.558	1.747	0.415	0.544	1.724	0.390	0.451	1.569	0.408
Confidence in own ability to provide abortion ('Low confidence' omitted)												
Have confidence	1.885***	6.589	0.513	1.812***	6.120	0.515	1.365*	3.915	0.577	1.294*	3.646	0.549
Facility support ('Low support for abortion' omitted)												
Facility supports abortion provision	0.461	1.586	0.566	0.554	1.740	0.548	0.647	1.909	0.540	0.695	2.004	0.535
Religion ('Other religion/sects' omitted)												
Catholic	-0.317	0.728	0.464	-0.333	0.717	0.442	-0.846*	0.429	0.395	-0.796*	0.451	0.384
Facility in which they work												
Number of beds in facility they practice ('0-8 beds' omitted)												
9-50 beds	-0.316	0.729	0.459	-0.522	0.594	0.491	-0.253	0.777	0.426	-0.452	0.636	0.455
51+ beds	-0.461	0.631	0.515	-0.581	0.559	0.523	-0.514	0.598	0.489	-0.517	0.596	0.505
Provider characteristics												
Provider type ('Doctors' omitted)												
Non-doctors	-0.285	0.752	0.404	-0.426	0.653	0.385	-0.137	0.872	0.406	-0.209	0.812	0.377
Age ('Below 40' omitted)												
40 and above	0.804	2.235	0.617	0.855	2.351	0.577	0.920†	2.508	0.482	0.918†	2.505	0.470
Likelihood ratio chi-square	61.650***			58.660***			41.140***			42.870***		
N	297			297			280			280		

Notes: Components may not sum to totals due to rounding. Missing values were dropped using listwise deletion. All estimates for this sample are from information that was current at the time of the survey. Total N = 457. Observations with missing values on the dependent variable were dropped as were those cases that had a missing or a negative propensity score. *P < 0.05, **P < 0.001, ***P < 0.0001, †P < 0.1.

Table 4 Maximum likelihood logit estimates of the odds of a provider providing post abortion care services, by whether they were part of the R3M programme or not, and other characteristics, Ghana 2011–2012

Explanatory variable	Postabortion care					
	Sample 1: all providers surveyed (N = 428)			Sample 2: R3M providers and non-R3M providers in Accra, Ashanti, Eastern (N = 320)		
	PSW (ATT) logit β estimate	Robust std. error	Odds ratio	PSW (ATE) logit β estimate	Robust std. error	Odds ratio
Intercept	-1.088***	0.627	-0.652	-1.216†	0.694	-1.065
Treatment						
R3M ('No' omitted)	0.679*	0.323	0.723*	0.564	0.378	0.717*
Knowledge						
Knowledge of law ('Answered fewer than six questions correctly' omitted)	0.128	0.310	0.251	0.101	0.363	0.283
Answered six or more questions correctly						
Values, attitudes and perception						
Attitude toward abortion provision ('Less favourable' omitted)	-0.228	0.342	-0.346	-0.116	0.436	-0.244
More favourable						
Confidence in own ability to provide abortion ('Low confidence' omitted)	1.591***	0.327	1.520***	1.460***	0.371	1.411***
Have confidence						
Facility support ('Low support for abortion' omitted)	0.414	0.351	0.512	0.320	0.383	0.398
Facility supports abortion provision						
Religion ('Other religion/sects' omitted)	-0.177	0.289	-0.349	-0.414	0.351	-0.544
Catholic						
Facility in which they work						
Number of beds in facility they practice ('0–8 beds' omitted)	-0.069	0.286	-0.339	-0.082	0.313	-0.234
9–50 beds						
51+ beds	0.244	0.429	-0.006	0.420	0.536	0.280
Provider characteristics						
Provider type ('Doctors' omitted)	-1.171*	0.310	-1.390**	-0.837†	0.433	-0.975*
Non-doctors						
Age ('Below 40' omitted)	0.554†	0.327	0.521	0.645†	0.354	0.558
40 and above						
Likelihood ratio chi-square	77.110***		79.080***	53.010***		56.680***
N	428		428	320		320

(continued)

Table 4 Continued

Explanatory variable	Postabortion care					
	Sample 3: R3M providers and non-R3M providers in Brong Ahafo (N = 299)			Sample 4: All providers that reported training in at least one method of abortion (N = 288)		
	PSW (ATT) logit β estimate	Odds ratio	Robust std. error	PSW (ATE) logit β estimate	Odds ratio	Robust std. error
Intercept	-0.412		0.858	-0.118		0.796
Treatment						
R3M ('No' omitted)	0.656	1.927	0.461	0.600	1.821	0.455
Knowledge						
Knowledge of law ('Answered fewer than six questions correctly' omitted)						
Answered six or more questions correctly	0.110	1.116	0.389	0.116	1.123	0.366
Values, attitudes and perception						
Attitude toward abortion provision ('Less favourable' omitted)						
More favourable	-0.620†	0.538	0.368	-0.576	0.562	0.360
Confidence in own ability to provide abortion ('Low confidence' omitted)						
Have confidence	1.809***	6.104	0.424	1.755***	5.781	0.400
Facility support ('Low support for abortion' omitted)						
Facility supports abortion provision	0.643	1.902	0.449	0.686	1.986	0.447
Religion ('Other religion/sects' omitted)						
Catholic	-0.013	0.987	0.370	-0.133	0.875	0.357
Facility in which they work						
Number of beds in facility they practice ('0-8 beds' omitted)						
9-50 beds	-0.068	0.935	0.399	-0.243	0.784	0.392
51+ beds	-0.030	0.971	0.503	-0.218	0.804	0.483
Provider characteristics						
Provider type ('Doctors' omitted)						
Non-doctors	-1.782**	0.168	0.686	-1.898**	0.150	0.637
Age ('Below 40' omitted)						
40 and above	0.436	1.547	0.413	0.464	1.590	0.383
Likelihood ratio chi-square	84.310***			87.700***		
N	299			299		288

Notes: Components may not sum to totals due to rounding. Missing values were dropped using listwise deletion. All estimates for this sample are from information that was current at the time of the survey. Total N = 457. Observations with missing values on the dependent variable were dropped as were those cases that had a missing or a negative propensity score. *P < 0.05, **P < 0.001, ***P < 0.0001, †P < 0.1.

confidence in his or her own abilities, however, continues to be significantly associated ($P=0.01$) with PAC provision, with confident trained providers being about thrice as likely to provide PAC compared with less confident trained providers (ATT estimates), though the effect size is smaller than for Sample 1 (OR=4.9).

The PSA is a more conservative technique compared with a standard regression, which often provides spurious associations between variables. However, as with any multivariate technique, we cannot account for confounding unobserved characteristics. Propensity score weights are also dependent on the functional form of the model that is used to estimate them. We tried various functional forms and used the one that gave us the best balance.

Discussion

The pilot phase of the Ghanaian government's R3M programme in 2006 created a natural experiment to compare facilities selected to participate in the programme with those that were not. We collected data on providers and their provision of safe abortion and PAC services to see how they differed according to exposure—and geographic proximity to exposure—to the R3M programme.

Our findings show that, net of all potentially confounding variables, participation in the R3M programme does have a substantial association with the provision of safe abortion services in all groups, including among those who have clinical knowledge of abortion provision. However, the differences are much stronger between R3M and non-R3M providers in Brong Ahafo, than between the R3M and non-R3M providers in the R3M regions. The stronger association for the former is likely because of geographical distance, which reduces contamination of samples due for instance, to the transfer of providers between facilities.

While the R3M programme is associated with PAC provision in Samples 1 and 4, there is no association for either Samples 2 or 3. While the results for Sample 1 show that the programme made a difference in the provision of PAC overall, the lack of association for the sub-samples is hardly surprising, since PAC is not nearly as controversial as safe abortion and has long been part of essential emergency obstetric care in Ghana (Government of Kenya 1997; Republic of Ghana Ministry of Health 1997; Billings *et al.* 1999).

Further, while *ceteris paribus*, we expect doctors to be more likely to provide PAC, it is important to involve the mid-level providers in PAC provision owing to the paucity of doctors in Ghana, especially outside the two biggest cities Accra and Kumasi (Brookman-Amisshah 2004; Hessini *et al.* 2006). Inability to receive life-saving PAC, due to lack of trained providers, only exacerbates the problem of maternal mortality.

Earlier studies have suggested that negative provider attitudes and ignorance of the law may hinder abortion provision (Aboagye *et al.* 2007; Aniteye and Mayhew 2013). Our analyses, however, found no such uniform association with the provision of safe abortion services. In the analyses for all providers (Samples 1–3), we found no association for abortion attitudes for any sample; though being Catholic was negatively associated with the outcome for Sample 2. While abortion law

knowledge was significantly and positively associated with Sample 2, the actual (ATT) association was only marginal in Sample 1; and it had no association in Sample 3. These variables had no independent association with PAC provision.

To get a clearer picture of the association of these variables with service provision, we separately analysed a sample of only those who were trained in clinical provision of abortion services, since only these providers can potentially provide a safe abortion or PAC. As with the other analyses, the analysis for Sample 4, showed no association of abortion attitudes towards provision of safe abortion or PAC, though being Catholic was negatively associated with safe abortion provision. The actual association of abortion law knowledge with safe abortion provision was also only marginal, although it does have the potential to improve service provision in the hypothetical scenario where all providers are exposed to the treatment. The variable had no association with PAC provision under any scenario.

A key driver of abortion and PAC provision seems to be a provider's confidence in their ability to provide such care. This variable is significantly associated with both outcomes in all samples, though much larger for Sample 1 compared with Sample 4, indicating that training in clinical provision of abortion services is key to building confidence.

While facility support was marginally significant at best in the ATT models, the ATE results from Samples 1 and 2 show that it has the potential to make a difference if all providers and their facilities were exposed to the treatment.

In sum, our results show that any intervention to improve comprehensive abortion care in Ghana should focus on providing training in abortion techniques and on building provider confidence in service provision, in particular for mid-level providers in all regions, due to a greater availability of such providers coupled with a paucity of doctors, who mostly live in the big cities (Brookman-Amisshah 2004; Hessini *et al.* 2006).

Further, although we found no consistent association between better knowledge of legal criteria and abortion provision, this does not mean that providers should remain ignorant of the law. It may matter less for the average provider, but individual providers may refuse to provide abortions simply because they are unaware when women legally qualify for them (Morhe *et al.* 2007; Ghana Statistical Service, Ghana Health Service & Macro International Inc. 2009). Similarly, interventions that focus on transforming individual providers' attitudes, should continue, since it can only help strengthen service provision (Hessini *et al.* 2006).

The R3M intervention provides potential for various types of assessments. For instance a broader assessment of the programme could include women—the clients who avail of CAC services. It could also examine the impact of the programme on facilities, such as changes in facility infrastructure, or changes in the number of abortion procedures performed in a facility. Both facility and women level outcomes were however outside the scope of this study since our survey focused strictly and narrowly on providers. While studies exist on women's abortion experiences (Sundaram *et al.* 2012), more research is needed on the impact of the programme on the women who are the intended beneficiaries of such an intervention, and on the impact of the programme on the facilities.

Future research could also include analyses that simultaneously examine the association between the provider outcomes and facility characteristics, such differences in number of available providers in the facility and quality of infrastructure, using multilevel modelling techniques. This would also help shed greater light on the impact of the R3M programme. However, such an analysis was also outside the scope of our study owing to lack of facility level data.

We hope however that our findings help Ghanaian policy makers better assess the success of the current R3M intervention and related policies, and also aid them in finding solutions to problems of implementation. Our findings should also hopefully encourage the expansion of the R3M programme to cover the entire country, especially the more remote areas, in order that barriers that currently prevent women from accessing safe abortion services and quality PAC are removed. Removing such barriers would contribute to substantial reductions in the unconscionably high levels of maternal morbidity and mortality that currently prevail in the country (Hu *et al.* 2010).

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Endnotes

- ¹ The 1985 law states that an abortion performed by a qualified medical practitioner is legal if the pregnancy is the result of rape, incest or 'defilement of a female idiot'; if continuation of the pregnancy would risk the life of the woman or threaten her physical or mental health; or if there is a substantial risk the child would suffer from a serious physical abnormality or disease (Morhee and Morhee 2006).
- ² This is an underestimate given that it is obtained from a face-to-face questionnaire; however, the level of untrained providers used by women gives a degree of the severity of abortion complications.
- ³ This group includes midwives, nurses and medical assistants.
- ⁴ This was done in response to the African Union adopting the Protocol on the Rights of Women in Africa, which recognizes the right of women to safe, elective abortion for a range of indications (Hessini *et al.* 2006).
- ⁵ In the acronym R3M, the R stands for 'reducing', while 3M stands for the three words beginning with the letter M: 'maternal mortality and morbidity.'
- ⁶ Personal communication with R3M consortium members in 2010.

- ⁷ Since Ghana is an English speaking country and this is a survey of professionals, the questionnaire was administered only in English.
- ⁸ One hundred and twelve facilities were primary, 47 secondary and 7 tertiary. Further, 116 of these facilities were public and 50 were private.
- ⁹ We interviewed on average about five providers in each of the selected tertiary and secondary facilities, and about two providers from each of the primary facilities.
- ¹⁰ Out of the total 457 providers, 197 were from the R3M treatment facilities, and 260 were from the facilities in the two control groups.
- ¹¹ Although providers' professional experience was not significantly different when comparing R3M with non R3M providers, it was nevertheless an important variable in balancing our sample. Without its inclusion in the logit model for computing propensity scores, the balance was not as good as it was when the variable was included.
- ¹² The ATT and ATE weights were estimated separately for each sample.
- ¹³ As mentioned earlier, not all providers eligible for providing abortion services are actually trained in abortion techniques, thereby rendering them a wasted resource, who could otherwise have been used for service provision. (World Health Organization 2012; Clark *et al.* 2013).
- ¹⁴ Although the programme also provides training in abortion law, we measured the providers' knowledge with a separate set of questions that specifically tested their knowledge of the different conditions of the law. The correlation coefficient between the treatment variable and the variable measuring knowledge of law is 0.19, which is very low.
- ¹⁵ Only 55 providers in the first control group and 79 providers in the second control group were trained in abortion provision techniques. We therefore analysed the combined sample, where 134 respondents in the two controls were trained, compared with 165 providers in the treatment group.
- ¹⁶ Education was not included in any of the models, due to high correlation with the indicator for provider type (doctors or non-doctors). The correlation coefficient for the two variables was -0.76 .
- ¹⁷ Unless otherwise mentioned, all associations between the dependent and explanatory variables listed in the text were significant at 95% or higher level of confidence.
- ¹⁸ The sample distribution is not weighted by propensity score weights, since the intent was to capture the characteristics of the sample.

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Appendix

Table A1 R3M implementing districts

Region	Original districts	New districts (as of 2010)
Greater Accra	Accra Metro	Ledzekuku Krowor
		Accra Metro
	Tema Municipal	Ashiaman Muni Tema Metro
Ashanti	Kumasi Metro	Kumasi Metro
	Adansi North	Adansi North
Eastern	Birim South	Birim Central Birim South
		New Juaben
	Akwapim North	Akwapim North

Table A2 Selected topics of training provided to facility staff under the R3M programme

Training topics
When an abortion can be performed legally
Guidelines for provision of comprehensive abortion care
MVA/EVA abortion procedure
Medication abortion procedure
Emergency obstetric care/Medical abortion emergency
Management of abortion complications
Postabortion contraceptive counselling and services
Counselling patients on danger of unsafe abortion
Infection prevention
Pain management
Guidelines for provision of family planning
Family planning services and counselling
Intrauterine device (IUD) insertion and removal
Implant insertion and removal
Female sterilization (example: minilaparotomy)
Ultrasound use
Medical management of people with Sexually Transmitted Infections (STIs) or HIV/AIDS
Quality Supervision
Values Clarification and Attitude Transformation (VCAT)

Table A3 Description of the variables used in logistic regression analyses
Sample: All respondents ($N=457$)

Name of variable	How constructed?	Recode values
Outcome variables		
Safe abortion provision	Has respondent reported current provision of safe abortion services? Variable constructed based on composite variable indicating whether respondent reported currently providing any of the following safe abortion procedures: dilation and curettage (D&C), manual vacuum aspiration (MVA), electric vacuum aspiration (EVA) or medication abortion	Currently provides safe abortion = 1 Does not currently provide safe abortion = 0
Postabortion care provision	Has respondent reported current provision of post abortion care? Variable constructed based on composite variable indicating whether respondent reported currently providing any of the following post abortion procedures: dilation and curettage (D&C), manual vacuum aspiration (MVA), electric vacuum aspiration (EVA) or medically induced evacuations	Currently provides post abortion care = 1 Does not currently provide post abortion care = 0
Explanatory variables		
R3M	Is respondent part of the R3M programme? Four samples: (a) Treatment: R3M providers in Accra, Ashanti, Eastern. Control: The control groups in (b) and (c) were combined into one. (b) Treatment: R3M providers in Accra, Ashanti, Eastern. Control: Brong Ahafo (c) Treatment: R3M providers in Accra, Ashanti, Eastern. Control: Non R3M providers in same regions (d) Treatment: R3M providers with clinical knowledge of abortion provision in Accra, Ashanti and Eastern Control: non-R3M providers with clinical knowledge of abortion provision from both control groups	Yes (Part of the R3M programme) = 1 No (Not part of the R3M programme) = 0
Knowledge of abortion law	Composite based on variable that asked whether the respondent knew the correct answers to the following questions: (1) Abortion is allowed in the case of rape (true), (2) In the case of incest (true), (3) When there is fetal impairment (true), (4) To save a woman's life (true), (5) When the woman is mentally impaired (true), (6) When the woman is severely psychologically stressed (true), (7) On socioeconomic grounds (false), (8) Elective abortion (false)	Knew six or more answers = 1 Knew fewer than six answers = 0
Attitude towards providing abortion	Composite based on variable that asked whether respondent agreed with statement 'I think safe abortion is contrary to the health worker's oath to do no harm.' Original variable measured on a scale of 1–5, from 'Strongly Agree (1) to Strongly Disagree (5)', with scores above three corresponding to more favourable attitudes	Score above 3 (more favourable attitude) = 1 Score equal to or below 3 (less favourable attitude) = 0
Confidence in ability to provide abortion	Composite created by summing scores for the following variables, each measured on a scale of 1–5: (a) I am uncertain about the circumstances under which I can legally provide abortion. (b) I am uncertain on how to perform a safe abortion (c) I am concerned about my ability to provide safe abortion because I perform them infrequently or never have performed them (d) I have received adequate training on safe abortion procedures (e) I have received adequate training on postabortion care procedures	Score above average (more confident) = 1 Score below or equal to average (less confident) = 0

(continued)

Table A3 Continued

Name of variable	How constructed?	Recode values
Belief in facility support for abortion provision	<p>Scores ranged from 5 to 25, with a mean of 16.86. Score above the mean corresponded to greater confidence in ability to provide abortion</p> <p>Composite created by summing scores for the following variables, each measured on a scale of 1–5:</p> <ul style="list-style-type: none"> (a) I/My colleagues don't have the support of the administration of my health facility to provide safe abortions (b) I feel that the people who provide Comprehensive Abortion Care counselling give it in a judgmental way at my health facility (c) My facility has adequate training for Postabortion Care (d) In my facility some professionals treat women badly for seeking an abortion (e) In my facility, women seeking an abortion who are seen by a conscientious objection provider are never referred to another doctor (f) I think my facility does a good job in providing contraceptive methods to abortion patients. 	<p>Score above average (belief in more support) = 1</p> <p>Score below or equal to average (belief in less support) = 0</p>
Religion	<p>Religion of respondent</p> <p>Original variable codes:</p> <ul style="list-style-type: none"> Catholic = 1 Protestant = 2 Pentecostal/Charismatic = 3 Other religion = 4 	<p>Catholic = 1</p> <p>All other religions and sects = 0</p>
Provider type	<p>Position of respondent</p> <p>Original variable codes:</p> <ul style="list-style-type: none"> Ob/Gyn = 1 Physician = 2 Midwife = 3 Other healthcare provider = 4 	<p>Non-doctors = 1</p> <p>Doctors = 0</p>
Age	<p>Age of respondent</p> <p>Original variable codes:</p> <ul style="list-style-type: none"> Below 40 = 1 40–49 = 2 Over 50 = 3 	<p>Below 40 = 0</p> <p>40 and above = 1</p>
Number of beds at facility (Proxy for facility size)	Number of beds available at facility	<p>0–8 beds = 1</p> <p>9–50 beds = 2</p> <p>51 + beds = 3</p>