

# Integrating Community-Based Family Planning Services with Local Marine Conservation Initiatives in Southwest Madagascar: Changes in Contraceptive Use and Fertility

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*This study assessed changes in contraceptive use and fertility between 2009 and 2013 in the Velondriake locally managed marine area of southwest Madagascar where marine conservation organization Blue Ventures began implementing an integrated health-environment program in 2007. The proportion of sexually active women aged 15 to 49 years using hormonal contraception and/or condoms during last intercourse increased more than twofold from 25 percent in 2009 to 59 percent in 2013. The number of births in the last 12 months per 1,000 women of reproductive age declined by 28 percent over the same period from 196 in 2009 to 141 in 2013. This program increased access to family planning for previously under-served communities, leading to uptake of modern contraceptives with an associated decline in fertility. These results suggest that this program has enabled couples to avoid unintended pregnancies, thereby bolstering local marine conservation initiatives.*

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Some 222 million women in developing countries report an unmet need for contraception (1). Programs integrating family planning services with environmental conservation in remote areas of high biodiversity can be a highly effective mechanism for reaching under-served communities (2–6). Many studies contend that expanding access to family planning services can also bolster local community-based natural resource management in areas where actual fertility is higher than desired fertility by enabling couples to avoid unintended pregnancies and achieve their desired family size (2–6). This article supports this assertion by reporting on the effects of an integrated health-environment program implemented by the marine conservation organization Blue Ventures in southwest Madagascar on modern contraceptive use and fertility over a four-year period. While changes in fertility were not a stated objective of this program, it was an observed outcome

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relating to the uptake of voluntary family planning services and the prevention of unintended pregnancies.

Madagascar regressed on progress made initially toward achieving Millennium Development Goal (MDG) 5, which included ensuring universal access to reproductive health (7). The national contraceptive prevalence rate (CPR), the proportion of women aged 15–49 years in union using a modern contraceptive method, was 29 percent in the 2008–9 Demographic and Health Survey (DHS) (8). If unmet family planning needs were addressed, national CPR is projected to rise to 59 percent, reflecting the total potential demand for spacing and limiting births (8). However, national CPR is thought to have stagnated since the 2008–9 DHS (UNFPA Madagascar, personal communication), and public health spending was cut by more than half during the country's political crisis in 2009–2013 (9).

Almost a quarter of women in the southwest coastal region of Atsimo-Andrefana, where the Blue Ventures health-environment program is located, reported an unmet need for family planning in the 2008–9 DHS; the regional CPR was only 20 percent at this time (8). Accessing reproductive health services is extremely difficult for these isolated communities, since public health centers, most of which are routinely under-staffed and under-stocked, are located up to 50 kilometers from some villages (3). Fertility rates are relatively high, with women in Atsimo-Andrefana giving birth to an average of 6.2 children compared to the national average of 4.8 (8). Combined with significant levels of migration from arid inland zones, this level of fertility results in the coastal population doubling every 10 to 15 years, placing increasing pressure on the region's marine ecosystems and the traditional fishing livelihoods that they support (10–13).

As a holistic response to the interconnected challenges of unmet reproductive health needs and environmental degradation in this region, Blue Ventures has developed a program combining the provision of voluntary family planning services with local marine resource management initiatives (2, 3, 13). This program upholds the reproductive rights of all individuals to choose freely the number and spacing of their births, while also upholding the management rights of coastal communities with regard to their marine resources. By reporting on changes in modern contraceptive use and fertility in the intervention zone over a four-year period, this article examines the results of this integrated approach.

## METHODS

### Design

Blue Ventures has supported the provision of voluntary family planning services to communities in and around the Velondriake locally managed marine area since 2007, through outreach clinics and a network of 30 local women trained as community-based distributors of contraceptives (13).

To assess modern contraceptive use and fertility trends, Blue Ventures conducted surveys in October 2009, January 2011, and May/June 2013. Data collection included household and individual surveys with reproductive-age women. Household surveys were analyzed for fertility trends, and individual surveys were analyzed for modern contraceptive use trends.

## Setting

The Velondriake locally managed marine area is located in the Morombe district of the Atsimo-Andrefana region in southwest Madagascar. Velondriake covers more than 750 km<sup>2</sup> and has a population of approximately 10,000 people living in 25 villages (13).

## Participants

The voluntary family planning services provided by Blue Ventures and its health partners are available to all reproductive-age women and their partners in Velondriake. Survey participants were heads of households for the household survey and reproductive-age women for the individual survey, all of whom gave verbal informed consent to participate. A local research ethics committee approved the survey design and confidentiality protocols. No personally identifying information was collected. All paper forms were stored securely in the field office of Blue Ventures, and the electronic database was saved on password-protected laptops.

## Intervention

Blue Ventures began offering family planning services in the central Velondriake village of Andavadoaka in August 2007, with a weekly clinic run by an expatriate medical officer and a local translator. In response to demand from other Velondriake communities, fortnightly outreach clinics were established in two other villages (Tampolove in the south and Belavenoke in the north) from April 2009, expanding to another five sites in March 2010 (visited on a six-weekly / quarterly basis) and operating across a total of 11 sites by May 2013 (mostly on a six-weekly basis). These services were offered by a full-time Malagasy medical professional, employed by Blue Ventures from April 2009.

Population Services International (PSI) trained a first group of community-based distributors in June 2010, a second group in July 2011, and a third in March 2012. These local women offer counseling and contraceptive methods (condoms, combined oral contraceptive pills, and Depo-Provera injections) to clients in their villages. The contraceptives are supplied by Blue Ventures at cost price from PSI, which the distributors then sell in their villages at subsidized retail prices fixed by PSI. The community-based distributors receive quarterly training from Blue Ventures and integrate their work as closely as possible with the Madagascar Ministry of Public Health. Long-acting reversible contraceptives (Implanon implants and copper intrauterine devices) have been offered in the Velondriake area on a quarterly basis since September 2009, in collaboration with mobile outreach teams from Marie Stopes Madagascar.

Blue Ventures links health promotion and family planning information with environmental topics, facilitated through peer-led community outreach and behavior change communication activities such as cultural and sporting events, interactive village presentations, radio shows, women's group meetings, and young people's clubs (3, 13). These initiatives engage men, women, and youth in health and environmental discussions, particularly by linking concerns related to food security and fish stocks to reproductive rights and family planning.

## Sample size

The surveys employed stratified cluster sampling that included ten villages: Andavadoaka plus nine additional villages out of the 25 villages in Velondriake. The same ten villages were sampled annually (except in 2013 when one village was no longer inhabited and therefore not included).

Predetermined minimum household quotas per village using the 2006 census (14) with a 3 percent annual population growth rate assumption for the district (INFOSTAT Toliara, unpublished data) guided the sampling in each survey: 140 households in Andavadoaka (half of the estimated households) and 140 households distributed proportionally between the other nine villages for a total of 280 households in 2009; 220 total households (110 in Andavadoaka and 110 distributed across the other nine villages at ten households per village plus five additional households in medium-sized villages and ten in larger villages) in 2011; and 30 households per village (in villages with 30 or fewer households, all were to be surveyed) in 2013. Using these household quotas, the survey team (local data collectors trained and supervised by expatriate program coordinators from Blue Ventures) systematically sampled each section of a village using a list of randomly generated numbers. Actual numbers of households surveyed (279 in 2009, 226 in 2011, and 186 in 2013) differed from the quotas because of difficulties coordinating with data collectors in the field (2009, 2011 and 2013), and because there were insufficient households in some villages to meet the quotas (2013). Implementation of the 2013 survey was delayed by cyclone Haruna and associated emergency response efforts, so it came after a period of seasonal emigration, which also contributed to household quotas not being met in some villages.

In 2009, the individual survey was conducted separately from the household survey using a sampling fraction for each village (the number of individuals in each village by their relative proportion as a percent of the region's total population). A sample size of 600 reproductive-age women (300 in Andavadoaka and 300 distributed proportionately across the other nine villages) was calculated using the 2006 census and the 3 percent annual population growth rate assumption mentioned above, a 5 percent increase in contraceptive use, and 50 percent variability in the sample. Data collectors systematically went through the village speaking with every  $n$ th person based on that village's sampling frame. Actual numbers of reproductive-age women surveyed (575 in 2009) differed from the quota owing to difficulties coordinating with data collectors in the field.

In 2011 and 2013, participants in the individual survey were sampled from the household surveys. When a household survey was complete, data collectors asked members of the household to participate in an individual survey. Reproductive-age women within households were sampled using a probability proportional to the size of the age/sex group of each village based on the 2006 census and the 3 percent annual population growth rate assumption until a predetermined quota was met. In 2011, individual survey quotas for men and women within the household were based on the village household quotas (villages with ten household surveys had a quota of 30 individual surveys, villages with 15 household surveys had a quota of 40 individual surveys, and villages with 20 household surveys had a quota of 55 individual surveys). In 2013, there was a quota of 30 individual surveys for men and women per village. Actual numbers of reproductive-age women surveyed (355 in 2011, 118 in 2013)

differed from the overall quotas because these included men as well as women, and because of difficulties coordinating with data collectors in the field.

## Statistical analysis

Analysis of fertility trends was based on reproductive-age women and births in the last 12 months collected in the household surveys. Trends in modern contraceptive use were analyzed from data in the individual surveys where women were asked what, if any, contraceptive method they used at last intercourse: none, condom, hormonal, or both condom and hormonal. Contraceptive prevalence was calculated only among sexually active women; women who did not report their age at first intercourse were excluded from the analysis, as they were assumed to be sexually inactive.

Weights were created separately for household and individual survey data to adjust for the unequal probabilities of a household or an individual being sampled by: 1) calculating the selection probability separately for each survey (2009, 2011, 2013) in each village (estimated population of that village based on the 2006 census plus the 3 percent annual population growth rate assumption divided by the total estimated population of the Velondriake area); 2) calculating the actual probability of being selected for inclusion separately for each survey (2009, 2011, 2013) in each village (number of respondents in each village divided by the total population of each village based on the 2006 census plus the 3 percent annual population growth rate assumption); and 3) creating weights as the inverse probability of a household or an individual being sampled in each village in each survey year in order to standardize the probability of being sampled across villages and across survey years (selection probability divided by actual probability). Data analysis, which included descriptive and trend analysis of modern contraceptive use and fertility, was conducted in Stata/SE 10 using the survey function (StataCorp 2007).

## RESULTS

A total of 691 household surveys and 1,048 individual surveys with reproductive-age women were collected across the three survey years (Table 1). Forty individual surveys with reproductive-age women were excluded because those respondents did not report their age at first intercourse.

Mean age varied significantly across the survey years: 29.2 in 2009, 25.3 in 2011, and 25.6 in 2013 (Table 2). Mean age at first intercourse was 15.8 in all survey years. Almost two thirds of women were married (as opposed to being single, in a relationship, divorced, or widowed).

The proportion of reproductive-age women using hormonal contraception and/or condoms at last intercourse more than doubled over the four years, increasing from 25 percent

**TABLE 1** Survey respondents by year

	2009	2011	2013	Total
Household surveys	279	226	186	691
Individual surveys – all	575	355	118	1,048
Individual surveys included in analysis: reproductive-age women reporting age at first intercourse	558	344	106	1,008

**TABLE 2 Mean age, mean age at first intercourse, and marital status, weighted**

	2009 (n=558)	2011 (n=344)	2013 (n=106)	p-value
Age (mean)	29.2	25.3	25.6	< 0.001
Age at first intercourse (mean)	15.8	15.8	15.8	0.9456
Married (percent)	60.0	59.8	64.2	0.6455

**TABLE 3 Modern contraceptive use at last intercourse, weighted**

	2009	2011	2013	% change (2013 – 2009)	p-value
Used contraception the last time they had sexual intercourse (%)	24.9	34.4	58.9	34.0	<0.001
<b>Modern contraceptive use at last intercourse, by type (%)</b>					
Condom	3.4	1.8	5.9	2.5	0.4773
Hormonal	20.7	28.9	43.5	22.8	0.0004
Both condom and hormonal	0.8	3.8	9.5	8.7	0.0330
None	75.1	65.6	41.1	–34.0	<0.001

**TABLE 4 General fertility rate (GFR), weighted**

	2009	2011	2013	% change (2013 – 2009)	p-value
Births in the last 12 months per 1,000 reproductive-age women	178.1	191.0	142.9	–19.8	0.5671

NOTE: The unweighted analysis showed a clearer trend, although still not statistically significant: 196 in 2009, 173 in 2011, and 157 in 2013 (p=0.4409).

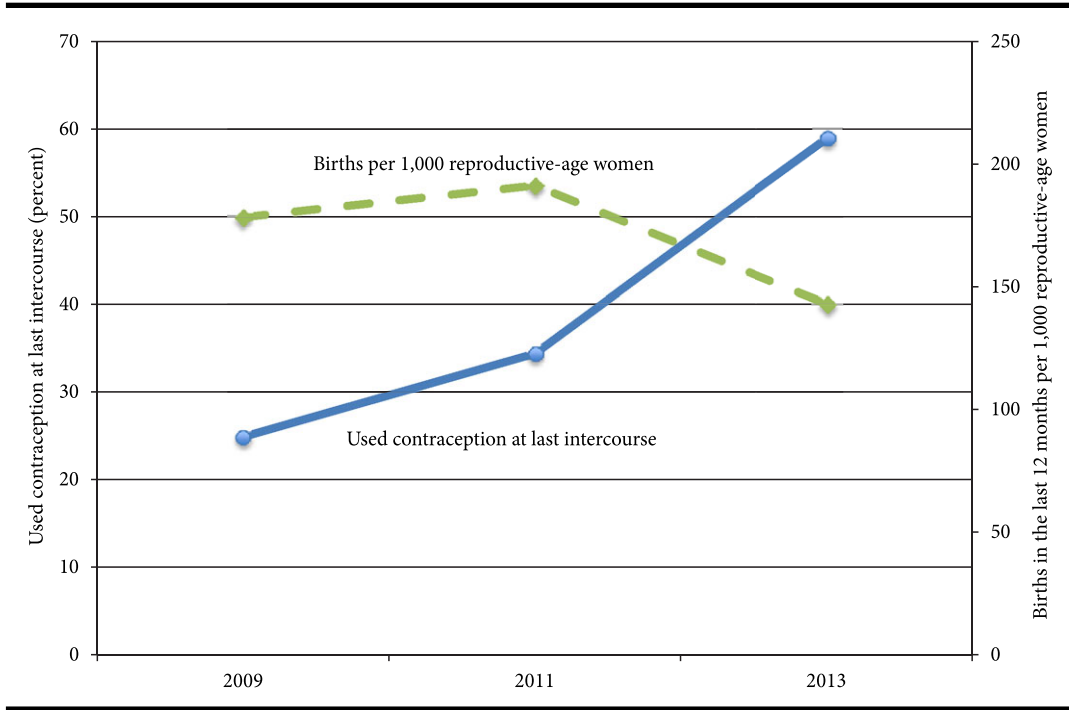
in 2009 to 59 percent in 2013 (Table 3). Most of this increase was due to the uptake of hormonal contraception, which increased by 23 percent over the four years. The proportion of reproductive-age women who did not use a modern method of contraception at last intercourse decreased by 34 percent over the four years.

The general fertility rate (GFR), the number of births in the last 12 months per 1,000 women of reproductive age, declined by 20 percent between 2009 and 2013, from 178 in 2009 to 143 in 2013 (Table 4). While changes in the GFR were not statistically significant, Figure 1 shows a trend of declining fertility in conjunction with contraceptive uptake. This is a relatively short time frame in which to observe changes in fertility; given that the largest increase in modern contraceptive use occurred between 2011 and 2013, a significant decrease in GFR may be seen in subsequent years.

## DISCUSSION

The results of this study are in line with other research which suggests that integrating the provision of family planning services with environmental conservation initiatives can be effective in reaching under-served populations living in remote areas of high biodiversity, where health agencies typically find it difficult to operate as a result of infrastructural obstacles (2–6, 13).

The observed increase in contraceptive use—the majority of which was due to the uptake of hormonal, female-controlled methods—coincided with the introduction and expansion

**FIGURE 1** Modern contraceptive use and general fertility rate over four years, weighted

of voluntary family planning services offered by Blue Ventures and its health partners, in a region where and at a time when practically no other family planning services were available to local communities, and against a backdrop of stagnating national CPR (UNFPA Madagascar, personal communication). This result demonstrates that environmental conservation organizations such as Blue Ventures, in partnership with health agencies like PSI and Marie Stopes Madagascar, can effectively increase access to and support uptake of family planning services through community-based distribution and mobile outreach clinics, complemented by community outreach linking health and environmental topics (3, 13, 15). However, it is not clear what proportion of the contraceptive uptake was related to the environmental component of the program and what proportion was simply a consequence of improved access to community-based family planning services. It is also not possible to compare these results with regional and national CPR, as the latter are reported for reproductive-age women in union while these results are reported for all sexually active reproductive-age women. A reproductive rights-based approach is recommended as a matter of principle for all organizations seeking to increase access to family planning services through similar health-environment partnerships.

The observed decline in GFR was not statistically significant, but this is a relatively short time frame in which to see changes in fertility. The observed trend suggests that the provision of voluntary family planning services can bolster local community-based natural resource management by enabling couples to space their births and prevent unintended pregnancies, thereby reducing demands on the natural resources and ecosystems upon which their livelihoods depend. Nevertheless, further research is needed to generate more robust evidence on

the links between family planning use and environmental sustainability (16). A major limitation of this study was the lack of data collected regarding unmet family planning needs; such data would have illuminated factors contributing to the observed changes in fertility (for example, demand met for spacing or limiting births) and overall progress toward preventing unintended pregnancies within a reproductive rights framework. Since addressing unmet family planning needs (rather than observing any changes in fertility) is a stated objective of integrated health-environment programs, Blue Ventures recommends that other organizations implementing health-environment programs prioritize monitoring changes in unmet family planning needs. Blue Ventures started to monitor unmet family planning needs in the Velondriake area in 2016.

This study had several limitations in its methodology and analysis. Sampling strategies varied across survey years and used quotas instead of populations proportionate to size or a census. Therefore, weighting had to be used to adjust for sampling bias for each survey year, separately for the household survey and the individual survey. We constructed these weights per village to make them as accurate as possible; however, we had to rely on population size calculated using census data from 2006 and an estimated annual population growth rate (INFOSTAT Toliara, unpublished data), which could be inaccurate.

Furthermore, in 2011 and 2013 sampling of reproductive-age women was done within households. We were unable to construct weights for this second set of sampling because of insufficient data, so our analysis is not fully adjusted for unequal probabilities of sampling individuals within the household, and this could bias our contraceptive use results.

Surveys were conducted at different times of the year. Given seasonal migration patterns along this coastline, the time of year can have a significant effect on population and births, as many men (sometimes with their partners and children) migrate north of the Velondriake area to take advantage of better fishing grounds between March and December. Since the populations of these villages and our sample sizes were relatively low, the different timings of the surveys could affect our estimates of GFR and their significance level.

Survey questions focused on the use of condoms and hormonal contraception, so intrauterine devices and permanent methods were not included; however, the use of these methods is known to be relatively low in the Velondriake area (3, 13). We did not examine certain determinants of contraceptive use—for example, those related to number of children, desired fertility, service access, and service quality—since these were not collected in all survey years. Analyzing the effect of service access and fertility preferences would expand our understanding of the relationship between contraceptive use, GFR, and integrated health-environment programs.

Despite these limitations, this analysis demonstrates the effectiveness of integrating family planning services into local community-based natural resource management, particularly with regard to contraceptive uptake. Further research is needed to elucidate other hypothesized pathways through which this integrated approach generates shared benefits for human and ecosystem health; for example, to examine whether enabling women to space or limit their births may increase their involvement in natural resource management, and whether discussing the links between food security and reproductive rights may build support for family planning among men (3, 13, 16).



## CONCLUSION

We offer three key results.

- Voluntary family planning services offered through a marine conservation organization in Madagascar resulted in a significant increase in modern contraceptive use and decline in fertility.
- Environmental conservation organizations can effectively address unmet family planning needs and uphold reproductive rights by partnering with health agencies for service delivery.
- Fertility changes arising from increased access to family planning services and the prevention of unintended pregnancies may slow growing pressure on natural resources and thereby bolster local environmental management efforts.

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