

## Strengthen iron folate supplementation of pregnant women in Ntchisi District, Malawi

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## Abstract

While an estimated 45% of pregnant women in Malawi are anaemic, only 33% take iron tablets for a minimum of 90 days during pregnancy. The study explored the capacity of health facilities and communities to strengthen antenatal iron folate supplementation in Ntchisi, to support the achievement of Malawi's nutrition target on halving anaemia in women of reproductive age by 2025.

This qualitative study employed systematic random and purposeful sampling. Eight Focus Group Discussions with mothers of children 0-23 months, eight with Care Group volunteers and eight in-depth interviews with Village Health Workers (Health Surveillance Assistants) were conducted in each village falling within the catchment area of each of 8 health facilities. Health facilities had been sampled each from the 7 Traditional Authorities with the district hospital and direct observations had been conducted at each for antenatal care service delivery. 10 key informants from the health facilities and the District Health Office were interviewed. Thus a total of 16 FGDs, 8 HSA interviews, and 10 key informant interviews provided the data analysed in this paper. Data were analysed manually using thematic framework analysis.

Poor access to and follow up of antenatal care at the health facility has limited access to iron folate supplements, as the health facility is the main source of Iron folates. Recurrent depletion of stock of iron folate were reported by mothers at most health facilities. Consumer demand for the tablets was low due to side effects, poor acceptability, associated myths, forgetfulness and frustration from having to take a daily medication. There was limited training and education materials at the health facility and community with inadequate support given to women. The absence of clear policies and guidelines on iron folate supplementation resulted in inconsistencies in messaging. Uptake and adherence were not routinely monitored.

There is a need to improve the main building blocks of the iron folate programme, including the: delivery system, tablet supply, patient education, consumer demand, monitoring and evaluation and policy.

**Key words:** Iron Folate Supplementation, Adherence, Pregnancy, Programming, Health System

## Introduction

Anaemia (blood haemoglobin levels less than 11.0 g/dl and 12.0g/dl in pregnant and non-pregnant women respectively, at sea level) affects half a billion women of child bearing age (World Health Organization, 2014). Half of all anaemia cases are caused by iron deficiency (WHO, 2017a). An estimated 33% of women of reproductive age in Malawi are anaemic. Approximately 45% of them are pregnant women (National Statistics Office, 2016). Anaemia during pregnancy increases risk of still births, miscarriages, preterm delivery, low birth weight and neonatal deaths, and it is also responsible for a fifth of maternal deaths annually (Black et al., 2013; WHO, 2014; 2017b).

In 2012, the World Health Assembly established six specific nutrition targets to help ensure that hunger and malnutrition were prioritised and given increased political support globally. The United Nations Secretary General declared 2015-2025 the Decade of Nutrition. Anaemia was one of the nutrition problems given priority and a global nutrition target was set to reduce the prevalence of anaemia in women of child bearing age by 50% by the year 2025 (WHO, 2017c). The WHO developed a tracking tool for all women of reproductive age, and one specifically for pregnant women, to assist countries in monitoring their progress (WHO, 2017c).

The prevalence of anaemia in women of reproductive age in Malawi, went up from 29% in 2010 to 33% according to the Malawi Demographic Health Survey (MDHS) 2015-16 (National Statistics Office, 2016). An estimated 45% of pregnant women in Malawi are anaemic (NSO, 2016). Thus, Malawi is currently off track in meeting its 2025 anaemia target (WHO, 2017c).

As a key intervention for the prevention of iron deficiency and iron deficiency anaemia in pregnant women, the government of Malawi supplies free daily antenatal iron folate supplements through the public health facilities with the WHO-recommended daily dose of 60mg elemental iron and 0.4mg folic acid (WHO, 2013; 2018). Iron folate supplementation throughout pregnancy is estimated to result in a 12g/L increase in haemoglobin at term, a 73% risk reduction in anaemia, a 23% reduction in risk to maternal mortality (Bhutta et al., 2008).

Despite being efficacious, iron folate supplementation has not been an effective intervention in reducing anaemia during pregnancy in Malawi. A major impediment to its effectiveness, has been poor adherence, with only 37% of pregnant women taking iron folate tablet for a minimum of 90 days in 2010 and 33% in 2015-16 (Titilayo, Palamuleni and Omisakin, 2016; NSO, 2016).

Knowledge about anaemia, its causes, prevention and treatment were found to be good amongst Malawian women (Kalimbira et al., 2009). The main reported reason for non-compliance was nausea. Studies elsewhere have reported low compliance due to forgetfulness, disliking the taste of the supplements, fear of negative outcomes for mother or baby from taking the supplements and fear of having big babies (Lutsey et al., 2007; Seck and Jackson, 2007; Taye et al., 2015).

A study by Titilayo et al. (2016) positively associated compliance with younger age, urban residence, higher education, higher wealth status and early initiation of antenatal care. Though studies by Titilayo et al. (2016) and Kalimbira et al. (2009) described the characteristics of women who were non-compliant to iron folate supplements, they did not look into the environmental and community factors that were likely influencing uptake and adherence by the Malawian pregnant women.

Antenatal care (ANC) at the community health facility is the main delivery platform for the iron folate supplementation programme in Malawi. WHO recommends at least four ANC visits for low

risk pregnancies. It is at these visits that screening for anaemia and measures for prevention and treatment should be provided (Partnership for Maternal, New-born and Child Health, 2006). However, only about half (50.6%) of Malawian mothers managed four or more ANC visits (NSO, 2016).

Access to and frequency of ANC visits have been reported as major factors affecting adherence to iron supplementation (Onyeneho et al., 2016; Wendt et al., 2015). In a study by Roberts et al. (2016), cultural beliefs on when to access ANC, family and community influence, distance to the health facility and time spent waiting to be served influenced the achievement of four ANC visits in Malawi.

Despite frequency of attending ANC, service delivery has also been reported as not being comprehensive enough, with some interventions not being delivered (Pell et al., 2013). Iron supplementation for a minimum of 90 days has been shown to have a very low coverage with only an estimated 27% of women receiving the service during ANC in Malawi in 2010 (Hodgins and D'Agostino, 2014). Internationally, adequate iron supplement supply was found to be one of the barriers to accessing supplements in public facilities by Galloway et al. (2002) as cited by Nagata et al. (2012).

Linking the health facilities and the community in Malawi are the Health Surveillance Assistants (HSAs), who are the Government of Malawi's paid village health workers. Their role is to support health promotion and disease prevention, including basic treatment of childhood illnesses (Kok et al., 2016).

The World Food Programme implemented the Prevention of Stunting Project (PSP), in partnership with the Government of Malawi (GoM) and World Vision, in Ntchisi District, Malawi. The PSP used Care Group volunteers as its main mode for facilitating community behaviour change, in line with the National Nutrition Education and Community Strategy (NECS) 2011-2016, amongst which was the strengthening of the government's Iron supplementation programme (Government of Malawi, 2012; World Food Programme, 2014).

Care Groups are groups of 10-15 community-based volunteers that meet fortnightly for training and support. Each member is responsible for reinforcing positive behaviour change through peer to peer counselling of 8-10 households within a volunteer's own vicinity using picture flipcharts with key messages (Food Security and Nutrition Network Social and Behavioural Change Task Force, 2014). In relation to anaemia, iron folate supplementation and pregnancy, Care Group volunteers are supposed to be trained in, and make use of the maternal nutrition module/flip charts.

At the time of the study, the district had a 100% coverage of Care Groups, and these had been instrumental in creating increased demand for ANC services in communities. Though the district was estimated to have a 93% coverage of iron supplementation, only 34% of pregnant women in the district were estimated to adhere to iron folate supplementation (NSO, 2016).

This study, as part of WFP's program assessment, aimed to identify the factors influencing iron supplementation uptake and adherence during pregnancy in women and explore the health system's and the Care Groups' ability to strengthen and support the iron folate supplementation programme. These objectives were essential to ensure effective programming and support from the Stunting Reduction Programme in Iron Folate Supplementation.

## Methodology

A qualitative research design using three qualitative data collection methods was used: in-depth interviews, focus group discussions (FGDs) and direct observations. The FGDs explored the experiences of women during antenatal care, with emphasis on iron supplementation. They also explored the support and health messages given by the volunteers to pregnant women. Interviews with key informants and HSAs examined their roles and their perceptions regarding ANC, the iron supplementation programme, and uptake and adherence of pregnant women to the supplement. Direct observations considered the interaction of health staff with pregnant women during ANC and also validated information given during both group and individual interviews.

### *Sampling and Data Collection*

The study was conducted in Ntchisi, a district in the central region of Malawi. Sampling was done for all seven traditional authorities (TA) in the District. Eight health facilities, a health facility from each TA with the greatest ANC coverage as advised by the District Health Office (DHO), and the referral hospital, were purposefully sampled for the direct observations. Using WHO's STEPS sampling instrument Excel workbook (WHO, 2017d), systematic random sampling of eight villages falling under each of the sampled health facilities was done for the community FGDs (one for women and one for volunteers in each village) and the HSA interviews (one HSA for each village). Purposeful sampling of 10 key informants, one from each health facility and an additional two from the DHO, relevant to ANC and the iron supplementation programme was also done. Thus a total of 16 FGDs, 8 HSA interviews, and 10 key informant interviews provide the data analysed in this paper.

The study was carried out in the months of June and July 2017. All tools for the FGDs and interviews, including consent forms, had been developed and agreed on by all authors, were translated into the local language and pretested prior data collection.

Guided by a direct observation checklist, the investigator captured data on interactions between the nurses and women in the maternity ward and key messages on supplementation on a routine ANC day. Additional notes were taken for observations that were of interest. Key informant interviews of health staff in the maternity department and from the DHO were done on the same day of the direct observations or on a different day using a Key Informant interview guide.

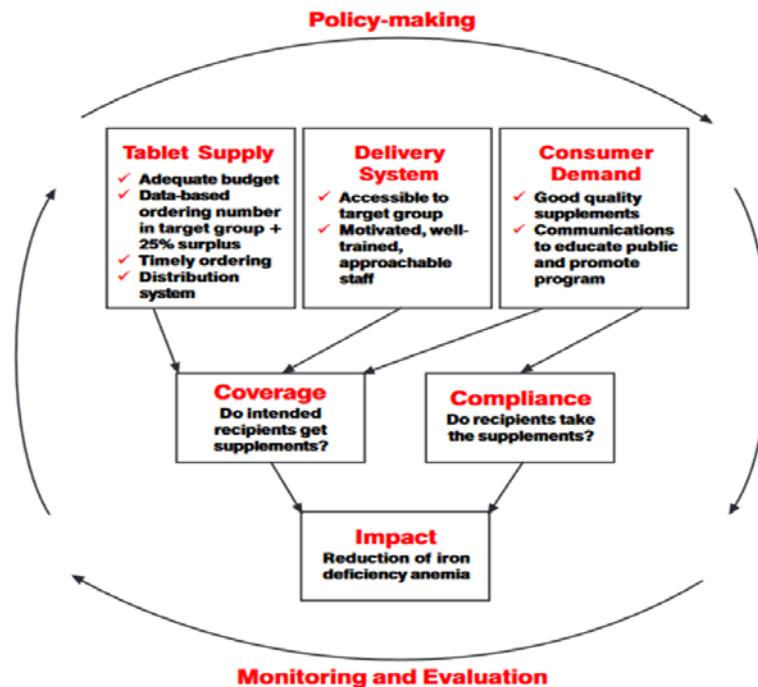
With the use of focus group guide questions, 34 Care Group volunteers who were currently active at the time of data collection in the sampled villages participated in the FGDs. 62 women with children under the age of two (mothers) participated in the women FGDs. Nulliparous and pregnant women, or mothers of children over 24 months of age were excluded from the study. Sampling of women with children under the age of two was purposive, taking into consideration the fact that these women were able to report on experiences throughout pregnancy and could still recall these experiences given the short time frame from child birth. In-depth interview guides were used for HSA interviews. Data was audio recorded and notes were taken for those participants who had not consented to audio recordings.

### *Data Analysis*

Using audio recordings and notes taken during data collection, data were translated into English and transcribed. The investigator assigned descriptive codes to phrases and sentences in the transcriptions manually, using Microsoft Word. The codes were manually sorted and grouped to

come up with merging themes. Using the model by Stoltzfus and Dreyfuss (1998), themes and sub-themes were arranged under each of the building blocks for *A Successful Iron Supplementation Programme*: tablet supply, delivery system, consumer demand, policy and monitoring & evaluation (Figure 1).

**Figure 1: Elements of successful iron supplementation programs**



Stoltzfus and Dreyfuss (1998), p18.

## Ethics

Ethical clearance was granted by the University of Westminster. District permission was sought from the DHO and an introductory letter issued for use in health facilities. Written authorisation was also sought from each health facility for the direct observations. Informed oral and written consent was provided by participants to the study and participants were advised that they could opt out at any time.

## Results

### Delivery system

The health facility was the only delivery system of the iron folate tablets and failure to access meant failure to get iron folate supplements. Access to and follow-up of ANC was therefore an emerging theme which was limited by distance, traditional beliefs and practices and reinforcement of male involvement at health facilities.

#### Access and follow-up of ANC

Distance to health facilities was a barrier to accessing ANC and thus the iron folate supplements. This resulted in women coming in small numbers for ANC and missing some of their scheduled ANC follow up visits. A village health worker stated

*“Women from the village [name withheld] attend ANC in small numbers due to the distance. The ANC clinic is far. 12 kilometres from [name withheld] to the village.”*

Traditional practices and cultural beliefs also affected when one started ANC, with some women being secretive about their pregnancy until it started to show. This negatively affected the number of ANC follow up visits and consequently adherence to iron folate supplementation. A health surveillance assistant had this to say,

*“Pregnant women who do not manage the recommended number of visits... got used to making use of traditional medicines and regard them more superior to ANC. The other cultural practice is that of delaying pregnancy presentation at ANC...Because they fear that if people knew they were pregnant in the first trimester, they might bewitch them and remove the unborn baby.”*

Male involvement in maternal health received both government and community leadership support, with bi-laws in place in support of it. Women were expected to attend ANC with their partners to receive essential messages in an effort to improve spousal support during pregnancy, whilst those coming alone were turned back.

*“I failed to manage (four recommended ANC visits) because of the program where the man and the woman go together for ANC. ...I went there alone. So they sent me back because I had not gone with my husband,”* one mother had explained.

## Tablet Supply

### Receipt of Iron folate Supplements

The usual supply for iron folate supplements was 30 tablets per month, as confirmed by the direct observation. However, some women reported receiving less than a month's supply of 30 tablets. One mother had said,

*“Yes, I finished all of them because sometimes they were giving me a few tablets, they were saying that there are a few tablets left. So they would give us 12 tablets and I would finish those since they were not much.”*

Some women had received the iron tablets for a fraction of the four ANC visits. Hence supply of the tablets also affected iron folate supplementation adherence for a minimum of 90 days.

*“I only received them (iron folate supplements) twice but I had 4 visits. So I asked them to say ‘what about the tablets that you gave me last time, you have given those ones but you haven't given me’. “They told me that they were finished and that when attending the next visit they would give me. But, I was out of time as time for me to deliver was close,”* another mother had said.

### Health Facility Iron Folate tablet stocks

Iron Folate stock at health facilities was brought up as one of the weaknesses of the iron folate supplementation programme by the key informants. One nurse stated



*“Well, we sometimes have challenges, for instance some time back we had (iron folate) stock outs for almost three months. However, that was a district problem because the DHO did not have iron supplements”*

Though at the time of the study seven of the sampled health facilities had iron folate supplements in stock, one health facility was totally out of stock and had not been distributing iron folate supplements to women attending ANC throughout the duration of data collection.

The reason given for the stock out at the health facility had been the misplacement of the health facility's order book at the DHO. On follow up with the DHO's office, the office had been unaware of the issue, stating that an emergency order could have been placed using an alternative requisition form that the health facility was in possession of.

The procurement process had also been faulted for the health facility stock outs. Orders from health facilities were placed through the DHO to the Central Medical Stores. Drugs were thus procured by the Central Medical Stores and thereafter distributed to the district and respective health facilities. However, this process was reported to sometimes take a long time, resulting in delivery delays at health centres.

## *Consumer Demand*

The iron folate supplements that were being supplied in health facilities were sweet coated red tablets with 65mg elemental iron and 0.25mg folic acid. Consumer demand was greatly influenced by side effects and acceptability of the tablets, myths associated with the supplements, knowledge on benefits of the tablets, fatigue from taking the tablets on a daily basis and forgetting. Though the health facility, HSAs and volunteers were key in improving demand, efforts were hampered by limited Behaviour Change Communication (BCC) material, minimum training of the cadres and not taking full opportunity of group meetings and individual consultations to counsel and support pregnant women on the importance of adhering to the iron folate supplementation to reduce anaemia.

### Side effects and acceptability of Iron Folate Supplements

Women reported experiencing nausea, vomiting and heart palpitations, resulting in some stopping the supplements entirely. One mother said,

*“I finished the whole packet the first time, even though the heart was doing that (heart palpitations) .... When I received the next tablets I just kept them.”*

However, some, attributed some of these side effects, nausea and vomiting in particular, to the unfavourable properties of the supplements such as smell and metallic after taste. As a means to improve acceptability of the iron folate supplements, women often took their supplements with the local staple food.

*“...when I took the tablets, the smell was really not good so I made another plan. I would take the pills and put it inside my ball of nsima (local staple) and take it together. So that is how I was taking the tablet, until I finish all of them,”* explained one mother.



### Myths on iron folate supplements

Quite a number of myths were associated with the iron folate supplements. Myths about children being stubborn, disobedient or deformed as a result of mothers taking iron folate supplements during pregnancy were mentioned. The most common and wide spread myths were about the iron supplements causing blisters or a rash in the new born baby.

*“I was told that if I take the tablets, the unborn child will have blisters. So I only took the tablets for 2 months and for the other months I did not take them,”* one mother said.

### Forgetfulness and loss of interest

Some women would forget to take their iron supplements. Whilst some found taking the pills on a daily basis exhausting. One mother said,

*“My last ANC visit, I did not finish the tablets they gave me.... and there was no reason, I was just lazy... and my throat got bored.”*

*“...I still had some left when I went to my next appointments at the clinic but it was because I forgot to take some days,”* said another mother.

### Knowledge on increased need of iron in Pregnancy

Knowledge of anaemia and the benefits associated with taking iron folate supplements had a positive influence on women’s ability to adhere to the supplements. Hence the fear of the risk that anaemia posed and the knowledge that the supplements could reduce these risks resulted in some women adhering to the supplements. One mother had said,

*“Like in my case, I was motivated to take in order to increase my blood levels. I did not want to be told that I had low blood volume during delivery, no, and because I took all of them I delivered without any complications concerning my blood levels.”*

### Empowering and engaging individuals and families

Only one health facility had a poster on its walls in the Chichewa language on iron supplementation during pregnancy. The rest of the health centres did not have any messages on walls and neither did they issue pamphlets to women as reminders.

Nurses described their role in ANC in relation to the iron folate programme as that of educating on anaemia and iron folate supplementation, encouraging the women to adhere to the supplements, supporting them through their side effects and informing them about the benefits of the iron folate supplements. Women had also mentioned the health facility as their primary source of information on anaemia and iron folate supplementation.

Only two health facilities had conducted group health education talks during the Direct Observations. Information on anaemia and iron supplementation in both the group health education and the individual consultations, was limited to description of the iron folate supplements and dosage, with statements such as,

*“These are tablets for the blood, they improve blood levels. You should take one each day before going to bed at night.”*

An enquiry into women's adherence had been noted in only one health facility during the individual consultation.

### Empowering and engaging communities

In the community, the HSAs stated that their role was to promote ANC attendance and encourage women to adhere to iron folate supplementation as advised by nurses at the health facilities. Supplements were not administered in the community; therefore, distribution of the supplements was a role only for the nurses at health facilities, and HSAs relied on the health facility as the source of most of the information on the iron folates.

The role of Care Group volunteers was similar to that of HSAs, encouraging women to stick to advice given at the health facility regarding their iron folate supplements. The majority of Care Groups reported that they had not been trained or given the maternal nutrition module. In Care Groups that had received the modules, some volunteers confessed to knowing little due to no training. For the volunteers who were knowledgeable about anaemia and the importance of iron folate, they had mentioned that they supported and reinforced iron folate supplementation adherence through their household visits.

Spousal support had also been mentioned as a motivation to adhere to the iron folate supplements. One mother had said,

*“...my husband was telling me to take the tablets so that my blood should not decrease. So I was trying my best to take the tablets.”*

### Policy

From all enquiries through the direct observation and key informant interviews, there was no known/clear anaemia policy or iron folate supplementation guidelines. Knowledge of health facility staff and HSAs had been gained through their professional training curriculums in college.

In two health facilities, women had been advised during ANC to start taking their iron folate a week after the ANC visit. On enquiry by the investigator, the nurses explained that iron was ineffective in combination with Sulfadoxine Pyrimethane (SP) treatment for malaria, which was taken as a direct observation prophylaxis at the health facility, and therefore the week was to allow for the drug to clear out of the body's system.

### Monitoring and Evaluation

At health facility level, service given to the pregnant woman was captured in her health passport, as observed during the direct observations. There was no register to record data on iron supplementation and related counselling for each woman, neither was such data captured in the community.

WFP's through its quarterly Post Distribution Monitoring exercises monitored coverage of the programme in the district through household electronic questionnaires, with questions on receipt and previous day's consumption of iron folates. However, there seemed to be no monitoring for

iron folate adherence except through the MDHS which is done every five years. Though some Care Group volunteers had mentioned monitoring adherence through pill count during the household visits, this was at their own discretion and not documented in the volunteer registers.

## Discussion

The use of a qualitative methodology encompassing individual interviews, focus group discussions and direct observations, made it possible to explore experiences of pregnant women, health facility staff, village health workers and volunteers with the iron folate supplementation programme. By making use of the different data collection methods, the investigator was able to triangulate data and hence validate data across the different sources. Some factors in the delivery system, consumer demand, tablet supply, policy and monitoring and evaluation, were found to influence iron folate adherence in pregnant women in Ntchisi district.

Access to and follow up of ANC was identified as a factor influencing iron folate adherence especially due to ANC being a source of the supplements. Distance to ANC limited access to 4+ ANC visits and this is supported by studies elsewhere (Wendt et al.2015; Wiradnyani et al., 2016). The assessment also identified cultural beliefs and practices on when to disclose pregnancy as influencing time to initiate ANC in the Malawian community, this too is supported by a study by Roberts et al. (2016).

Distances to health facilities, could be shortened through an increase in the number of health facilities serving the district and the employment of more frequent mobile clinics taking the service to the people. A less costly and immediate solution to improving access of pregnant women to iron folate supplementation would be to shift the task of preventive supplementation to the community, more specifically the HSAs as is the case in India and Bangladesh where village health workers are the source of iron tablets (Alam et al., 2015; Dutta et al., 2014). Through accessing iron folate supplements within the vicinity of their households, pregnant women would also have their need for secrecy in the early months of pregnancy accommodated.

Quite interesting in this study, the requirement for male involvement as a prerequisite for ANC, was also acting as a barrier to accessing ANC services in the district. Refusing care to women who had presented without their spouses has the potential of shunning women who were not in relationships from ANC services and follow up. Thus, instead of turning the women away, invitations can be sent to their partners with community tracing by volunteers, of those partners who never respond to the invitation, a strategy that was employed in a study by Rosenberg and group (2015) with great success.

Iron supply and hospital stocks of the iron folates were a predictor of adherence. Women who had received less than the month's supply, or who had not received any supplements, were thus unlikely to take the tablets for 90 days. This corresponds with findings by Lacerte et al. (2011) and Getachew et al. (2018). Furthermore, the findings suggest that this was because of an unreliable procurement process, that delayed distribution of supplements at health facility level and poor communication in the procurement process.

The health facility that had completely run out of stock, had done so possibly out of lack of knowledge on alternative ordering when missing an order book, or because of not taking the iron folate supplementation programme seriously. There is need to train health facility staff on the

procurement and ordering process and to monitor iron folate stocks at health facility level. It might therefore, be worth exploring tasking responsible nurses with reporting monthly on health facility iron folate stocks with regular replenishment through the district pharmacy to meet health facility demands. In an almost similar push and pull mechanism, Omotayo et al. (2017) found that iron folate supplements became available at ninety-eight percent of spot checks at study health facilities in Kenya.

Side effects and the acceptability of iron folate supplements were found to decrease the demand of iron folate tablets among pregnant women. Findings were consistent with findings by Kalimbira et al. (2009). There is need to train nurses, HSAs and volunteers on iron folate supplementation and ways to alleviate side effects, to help support the women, such as taking the iron supplements after a meal to prevent the heart palpitations or taking them just before sleeping. Although the local practice of taking the supplements with the main staple improve acceptability and adherence, there is risk of decreasing iron absorption by an estimated 40% with meals (WHO, 2001).

Forgetfulness and frustration from taking iron folate supplements was another mentioned challenge in adhering to iron folate supplements and this too is supported by other studies (Dutta et al., 2014; Getachew et al., 2018). Whilst posters, take home pamphlets may be used for recall, only one health facility had a poster on its walls. It might therefore, be worthwhile distributing take home pamphlets with illustration on taking supplementation, key recall messages on benefits and ways to manage common side effects. In addition, calendars with an additional section to tick daily as aid in tracking consumption of iron folates by pregnant women could be distributed as used in other studies (Omotayo et al., 2017a; 2017b).

Knowledge of the increased needs of iron during pregnancy acquired through health education talks and counselling at the health facility, positively influenced iron supplementation adherence. This finding is supported by studies elsewhere (Dutta et al. 2014; Taye et al. 2015). However, these services were not adequately given at the health facility. It is therefore important to ensure that at least every woman attending ANC gets at least one comprehensive health education session on anaemia and the iron folate supplementation programme especially on the initial visit to ANC. Engaging communities through social behaviour change communication and campaigns on iron folate supplementation and anaemia, could improve attitudes towards daily iron folate supplementation.

Though the HSAs and the Care Group volunteers have the potential to inform women on both anaemia and supplementation, the findings suggest that their knowledge is also limited because of lack of training in anaemia, iron supplementation and particularly the maternal nutrition module for the Care Group volunteers. Training and distribution of the maternal nutrition module is necessary to improve their confidence in adequately supporting the iron supplementation programme. Quarterly inventories on trained volunteers and BCC material availability in the community could also assist in ensuring that 'filling the gap' trainings are done and materials redistributed as needed.

The absence of a clear policy or guidelines, was observed to result in inconsistent advice being given on the taking of iron folate after an intermittent dose of SP. Interrupting iron folate supplementation can potentially affect iron folate adherence by resulting in women forgetting to continue the supplements. The reason given for the interrupted iron folate supplementation by health facility staff had been on iron efficacy, which is incorrect and proved poor knowledge amongst health staff.

Supplementation with iron folate or folate alone has been proven to reduce the efficacy of SP on malaria prevention and treatment (Oama et al., 2006). However, this effect is dose dependent with folate doses of 0.4mg and less having no effect on SP efficacy and being recommended for daily supplementation with iron by WHO (Nzila et al., 2013; WHO, 2018). Iron folate supplements that were being distributed in health facilities in Ntchisi had 0.25mg of folate, which is less than the recommended daily folate supplementation dose and thus has no effect on SP efficacy. Hence, no need for interrupting iron folate supplementation in pregnant women in Ntchisi health facilities.

There is need for clear guidelines for the iron folate supplementation programme within health facilities. A clear policy on anaemia and iron folate supplementation would also assist in prioritisation of the programme within antenatal care services. Hence this would positively affect iron folate hospital stocks. In the meantime, there is need for health facility staff training on current WHO recommendations and guidelines.

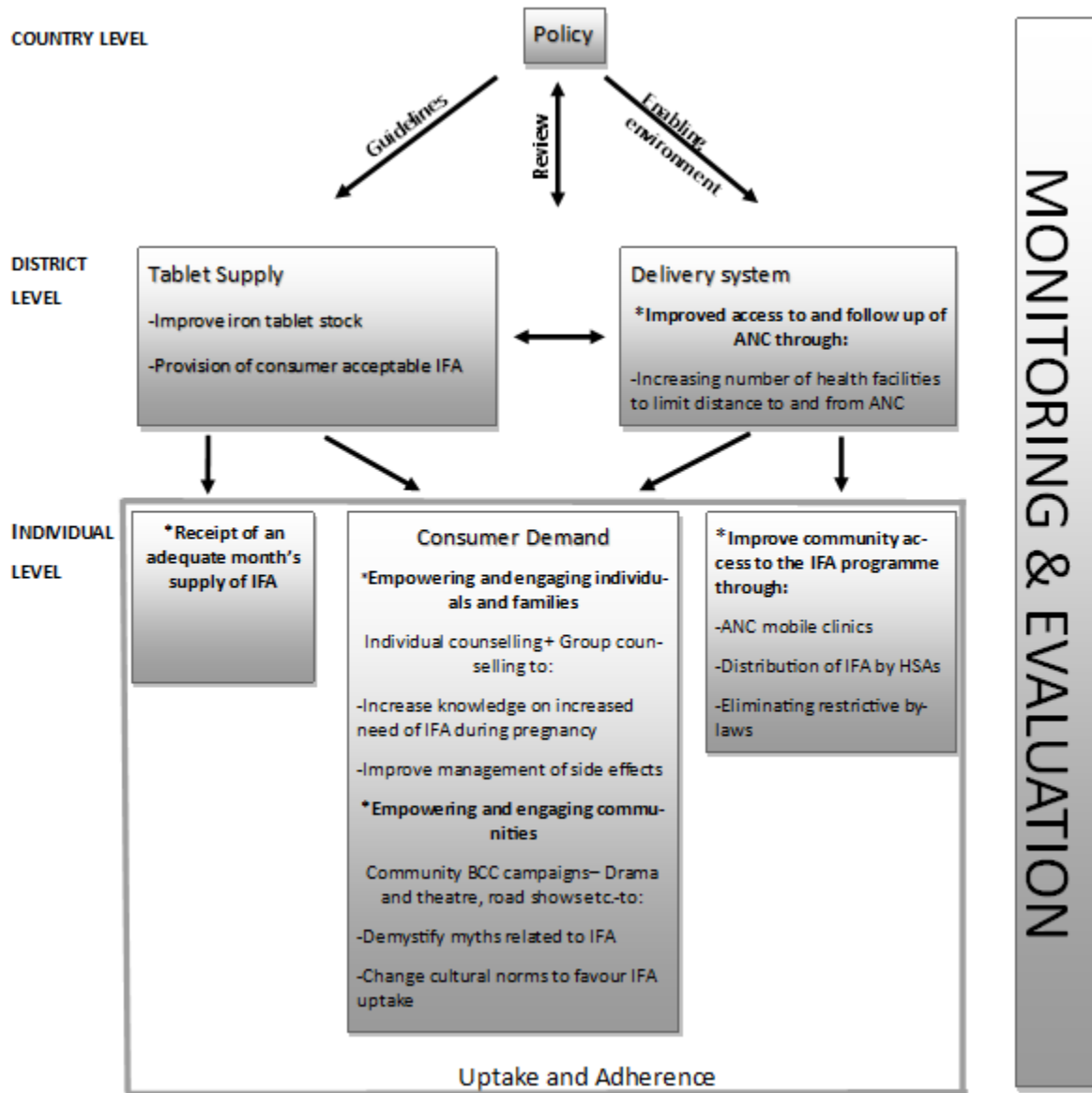
While coverage of the iron folate programme was routinely monitored, the number of iron folate tablets supplied or received and consumed were however not recorded as per WHO recommendation (WHO, 2018). Hence, there is a need to set up monitoring systems for receipt, uptake and adherence of iron folate supplements in both health facilities and communities. As a starting point, registers could be introduced at health facilities that capture such information with the data fed into the Health Management Information System (HMIS) for timely programme evaluation and feedback by the Ministry of Health.

The framework (Figure 2 below) is an illustration of some of the above-mentioned recommendations and how they can contribute to the iron supplementation programme and ultimately to adherence in Ntchisi. All programmatic inputs on policy, consumer demand, tablet supply and the delivery system, whether at national or district level eventually contributed to iron folate supplementation uptake and adherence. It is therefore, important to ensure that a policy is in place as the backbone to guidelines and an enabling environment for the programme. At national level, continued review of the policy would ensure it is in line with the latest evidence and recommendations.

At community level, consumer demand could be strengthened through empowering and engaging individuals and families during message delivery and counselling. An accessible delivery system is important for the programme to ensure pregnant women are assisted in an environment that they are comfortable in whilst ensuring that iron folate tablets are in-stock at all times. Including the voices of the women in the planning and implementation of the iron folate policy and programme could help identify and address the majority of barriers. It is important to constantly engage with communities to understand their concerns and relevantly address them.

Most importantly, all stages need to be monitored and evaluated to ensure programme objectives and goals in the iron folate programming framework are being met.

**Figure 2: Iron Folate Supplementation Programme and Adherence**



*Limitations*

Whilst women mentioned that their spouses supported them in taking the iron supplements, there was need for follow up enquiries with husbands as a positive influencing group and to identify how they could contribute to positive programming outcomes. Issues regarding the district's or Ministry of Health's budget on the iron supplementation programme were also not explored, which could have answered some of the questions on the procurement process and iron folate stock outs in health facilities. There is therefore need for future research in the Ministry of Health's drug budget and how this affects iron folate procurement at district level.

## Conclusions

This qualitative study identified weaknesses in five of the building blocks of the iron supplementation programme, which are: delivery system, tablet supply, consumer demand, monitoring and evaluation and policy. To strengthen the programme and supporting adherence to iron folates by pregnant women, efforts should be made to address the weaknesses identified here in these building blocks at national, district and community level.

There is however need for future research in identifying the root causes of anaemia in pregnant women in Ntchisi and exploring ways to tackle these.

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## References

Alam, A. Rasheed, S., Khan, N. U., Sharmin, T., Huda, T. M., Arifeen, S. E. and Dibley, M. J. (2015). How can formative research inform the design of an iron-folic acid supplementation intervention starting in first trimester of pregnancy in Bangladesh. *BMC Public Health*, (2015), 15,374. Available from <http://dx.doi.org/10.1186/s12889-015-1697-2>

Bhutta, Z. A., Ahmed, T., Black, R. E., Cousens, S., Dewey, K., Giugliani, E., Haider, B. A., Kirkwood, B., Morris, S.S., Sachdev, H.P.S. and Shekar, M. (2008). What works? Interventions for maternal and child undernutrition and survival. *Lancet*. 371, 417 – 440. Available from [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(07\)61693-6/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(07)61693-6/fulltext)

Black, R.E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., de Onis, M., Ezzati, M., Grantham-McGhregor, S., Katz, J., Martorell, R., Uauy, R. and the Maternal and Child Nutrition Study Group. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*; Available from [https://www.unicef.org/ethiopia/1\\_Maternal\\_and\\_child\\_undernutrition\\_and\\_overweight\\_in.pdf](https://www.unicef.org/ethiopia/1_Maternal_and_child_undernutrition_and_overweight_in.pdf)

Dutta, A. J., Patel, P., and Bansal, R.K. (2014). Compliance to Iron Supplementation among Pregnant Women: A Cross Sectional Study in Urban Slum. *National Journal of Community Medicine*, 5 (4), 457 – 462. Available on <http://www.njcmindia.org/home/article/4/5/2014/Oct - Dec/21>

Food Security and Nutrition Network Social and Behavioural Change Task Force. (2014). *Care Groups: A Training Manual for Program Design and Implementation*. Washington, DC: Technical and Operational Performance Support Program. Available from <http://www.fsnnetwork.org/care-groups-training-manual-program-design-and-implementation>

Gebremedhin, S. Aregash, S. Girma, M. and Tibebu, M. (2014). Coverage, compliance and factors associated with utilization of iron supplementation during pregnancy in eight rural districts of Ethiopia: a cross-sectional study. *BMC Public Health*, 14, 607 Available from <http://bmcpublikealth.biomedcentral.com/articles/10.1186/1471-2458-14-607>

Getachew, M., Abay, M., Zelalem, H., Gebremedhin, T., Grum, T. and Bayray, A. (2018). Magnitude and factors associated with adherence to Iron-folic acid supplementation among pregnant women in the Eritrean refugee camps, northern Ethiopia. *BioMed Central Pregnancy and Childbirth*, 18:83.

Hodgins, S. and D'Agostino, A. (2014). The quality–coverage gap in antenatal care: toward better measurement of effective coverage. *Global Health: Science and Practice*, 2014, (2)2. Available from [www.ghspjournal.org](http://www.ghspjournal.org)

Kalimbira, A. A., Mtimuni, B. M. and Chilima, D. M. (2009). Maternal Knowledge and Practices Related to Anaemia and Iron Supplementation in Rural Malawi: A Cross-sectional

Study. *African Journal of Food Agriculture Nutrition and Development*, 9(1), 550-564. Available from <http://www.bioline.org.br/request?nd09006>

Kok, M.C., Namakhoma, I., Nyirenda, L., Chikaphupha, K., Broerse, J. E. W., Dieleman, M., Taegtmeier, M. and Theobald, S. (2016). Health surveillance assistants as intermediates between the community and health sector in Malawi: exploring how relationships influence performance. *BMC Health Services Research*, 16, 164. Available from <http://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-016-1402-x>

Lacerte, P., Pradipasen, M., Temcharoen, P., Imaee, N., and Vorapongsathorn, T. (2011). Determinants of Adherence to Iron/Folate Supplementation during Pregnancy in Two Provinces in Cambodia. *Asia-Pacific Journal of Public Health*, 23(3), 315 –323. Available from <http://dx.doi.org/10.1177/1010539511403133>

Lutsey, P. L., Dawe, D., Villate, E., Valencia, S. and Lopez, O. (2007). Iron supplementation compliance among pregnant women in Bicol, Philippines. *Public Health Nutrition*, 11(1), 76–82. Available from <http://dx.doi.org/10.1017/S1368980007000237>

Malawi National Statistics Office. (2016). The 2015-16 Malawi Demographic and Health Survey (MDHS): Key Indicator Report. *National Statistics Office*. Available from [http://www.nsomalawi.mw/images/stories/data\\_on\\_line/demography/mdhs2015\\_16/Malawi%20DHS%202015-16%20KIR.pdf](http://www.nsomalawi.mw/images/stories/data_on_line/demography/mdhs2015_16/Malawi%20DHS%202015-16%20KIR.pdf)

Nagata, J. M., Gatti, L. R. and Barg, F. K. (2012). Social determinants of iron supplementation among women of reproductive age: a systematic review of qualitative data. *Maternal & Child Nutrition*, 8, 1–18. Available from <http://dx.doi.org/10.1111/j.1740-8709.2011.00338.x>

Nzila, A., Okombo, J. and Molloy, A. M. (2014). Impact of folate supplementation on the efficacy of sulfadoxine/pyrimethamine in preventing malaria in pregnancy: the potential of 5-methyl-tetrahydrofolate. *Journal Antimicrobial Chemotherapy*, 69, 323–330. Available from <http://dx.doi.org/10.1093/jac/dkt394>

Ouma, P., Parise, M. E., Hamel, M. J., ter Kuile, F. O., Otieno, K., Ayisi, J. G., Kager, P. A., Steketee, R. W., Slutsker, L. and van Eijk A. M. (2006). A Randomized Controlled Trial of Folate Supplementation When Treating Malaria in Pregnancy with Sulfadoxine-Pyrimethamine. *PLoS Clinical Trials*, 1(6), e28. Available from <http://dx.doi.org/10.1371/journal.pctr.0010028>

Omotayo, M. O., Dickin, K. L., Pelletier, D. L., Martin, S. L., Kung'u, J. K., and Stoltzfus, R. J. (2017a). Feasibility of Integrating Calcium and Iron-Folate Supplementation to Prevent Preeclampsia and Anemia in Pregnancy in Primary Healthcare Facilities in Kenya. *Maternal and Child Nutrition*, 2018. 14(S1), e12437. Available from <http://dx.doi.org/10.1111/mcn.12437>

Omotayo, M. O., Martin, S. L., Stoltzfus, R. J., Ortolano, S. E., Mwanga, E. and Dickin, K. L. (2017b). With Adaptation, the WHO Guidelines on Calcium Supplementation for Prevention of Preeclampsia are adopted by pregnant women. *Maternal and Child Nutrition*, 2018.14, e12521. Available from <http://dx.doi.org/10.1111/mcn.12521>

Onyeneho, N.G., I' Aronu, N., Chukwa, N., Agbawodikeizu, U.P., Chalupowski, M. and Subramanian, S.V. (2016). Factors associated with compliance to recommended micronutrients uptake for prevention of anaemia during pregnancy in urban, peri-urban, and rural communities in Southeast Nigeria. *Journal of Health, Population and Nutrition*, 35(35), 1-17. Available from <http://dx.doi.org/10.1186/s41043-016-0068-7>

Partnership for Maternal, New-born and Child Health. 2006. Opportunities for Africa's new-borns: Practical data, policy and programmatic support for new-born care in Africa. The Partnership for Maternal, New-born and Child Health. Available from [http://www.who.int/pmnch/media/publications/aonsectionIII\\_2.pdf](http://www.who.int/pmnch/media/publications/aonsectionIII_2.pdf)

Pell, C., Men'aca, A., Were, F., Afrah, N.A., Chatio, S., Manda Taylor, L., Hamel, M.J., Hodgson, A., Tagbor, H., Kalilani, L., Ouma, P. and Pool, R. (2013). Factors Affecting Antenatal Care Attendance: Results from Qualitative Studies in Ghana, Kenya and Malawi. *PLoS ONE*, (8)1, e53747. Available from <http://dx.doi.org/10.1371/journal.pone.0053747>

Roberts, J., Marshak, H. H., Sealy, D., Manda-Taylor, L., Mataya, R. and Gleason, P. (2016). The Role of Cultural Beliefs in Accessing Antenatal care in Malawi: A Qualitative Study. *Public Health Nursing*, 34 (1), 42–49. Available from <http://dx.doi.org/10.1111/phn.12242>

Rosenberg, N.E. Mtande, T.K., Saidi, F., Stanley, C., Jere, E., Paile, L., Kumwenda, K., Mofolo, I., Ng'ambi, W., Miller, W.C., Hoff man, I. and Hosseinipour, M. (2015). Recruiting male partners for couple HIV testing and counselling in Malawi's option B+ programme: an unblinded randomised controlled trial. *Lancet HIV* 2015. Available from [http://dx.doi.org/10.1016/S2352-3018\(15\)00182-4](http://dx.doi.org/10.1016/S2352-3018(15)00182-4)

Seck, B. C. and Jackson, R. T. (2007). Determinants of compliance with iron supplementation among pregnant women in Senegal. *Public Health Nutrition*, 11(6), 596–605. Available from <http://dx.doi.org/10.1017/S1368980007000924>

Sambili, B., Kimambo, R., Peng, Y., Ishunga, E., Matasha, E., Matumu, G., Noronha, R. and Ngilangwa, D. P. (2016). Factors Influencing Anti-Malarial Prophylaxis and Iron Supplementation Non-Compliance among Pregnant Women in Simiyu Region, Tanzania. *International Journal of Environmental Research and Public Health*, 13, 626; Available from <http://dx.doi.org/10.3390/ijerph13070626>

Stoltzfus, R.J and Dreyfuss, M.L. (1998) Guidelines for the Use of Iron Supplements to Prevent and Treat Iron Deficiency Anemia. *World Health Organisation*. Available from

[http://www.who.int/nutrition/publications/micronutrients/guidelines\\_for\\_Iron\\_supplementation.pdf](http://www.who.int/nutrition/publications/micronutrients/guidelines_for_Iron_supplementation.pdf)

Taye, B., Abeje, G. and Mekonen, A. (2015). Factors associated with compliance of prenatal iron folate supplementation among women in Mecha district, Western Amhara: a cross-sectional study. *The Pan African Medical Journal*, 20, 43. Available from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4449983/>

Titilayo, A., Palamuleni, M. E. and Omisakin, O. (2016). Sociodemographic factors influencing adherence to antenatal iron supplementation recommendations among pregnant women in Malawi: Analysis of data from the 2010 Malawi Demographic and Health Survey. *Malawi Medical Journal*, 28(1), 1-5. Available from <http://www.bioline.org.br/pdf?mm16001>

Wendt, A., Stephenson, R., Young, M., Webb-Girard, M., Hogue, C., Ramakrishnan, U. and Martorell, R. (2015) Individual and Facility-Level Determinants of Iron and Folic Acid Receipt and Adequate Consumption among Pregnant Women in Rural Bihar, India. *PLoS ONE*. Available from <http://dx.doi.org/10.1371/journal.pone.0120404>

Wiradnyani, L.A.A., Khusun, H., Achadi, E. L., Ocviyanti, D. and Shankar, A. H. (2016). Role of family support and women's knowledge on pregnancy-related risks in adherence to maternal iron-folic acid supplementation in Indonesia. *Public Health Nutrition*, 19(15), 2818–2828. Available from <http://dx.doi.org/10.1017/S1368980016001002>

World Health Organization. (2001). Iron Deficiency Anaemia: Assessment, Prevention, and Control-A guide for programme managers. *World Health Organization*. Available from [http://apps.who.int/iris/bitstream/10665/66914/1/WHO\\_NHD\\_01.3.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/66914/1/WHO_NHD_01.3.pdf?ua=1)

World Health Organization. (2013). Essential Nutrition Actions: improving maternal, new-born, infant and young child health and nutrition. *World Health Organization*. Available from [http://apps.who.int/iris/bitstream/10665/148556/1/WHO\\_NMH\\_NHD\\_14.4\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/148556/1/WHO_NMH_NHD_14.4_eng.pdf?ua=1)

World Health Organization. (2014). Global Nutrition Targets 2025 Anemia Policy Brief. *World Health Organization: Nutrition*.

World Health Organization. (2017a). Global Nutrition Targets 2025: Anemia policy brief. *World Health Organization: Nutrition*. Available from [http://www.who.int/nutrition/publications/globaltargets2025\\_policybrief\\_anaemia/en/](http://www.who.int/nutrition/publications/globaltargets2025_policybrief_anaemia/en/)

World Health Organization. (2017b). Nutrition: Micronutrient Deficiency. *World Health Organization*. Available from <http://www.who.int/nutrition/topics/ida/en/>

World Health Organization. (2017c). STEPS Sample Size Calculator and Sampling Spreadsheet. *World Health Organization: Chronic diseases and health promotion*. Available from <http://www.who.int/chp/steps/resources/sampling/en/>

World Health Organization. (2017d). Global Target Indicators. *World Health Organization: Nutrition*. Available from [http://who.int/nutrition/globaltargets\\_indicators/en/](http://who.int/nutrition/globaltargets_indicators/en/)

World Health Organization. (2018). Developing and Validating an Iron and Folic Acid Supplementation Indicator for Tracking Progress Towards Global Nutrition Monitoring Framework Targets. *Geneva: World Health Organization ;2018*. Available from <https://www.who.int/nutrition/publication/iron-folic-indicator-GNMF/en/>