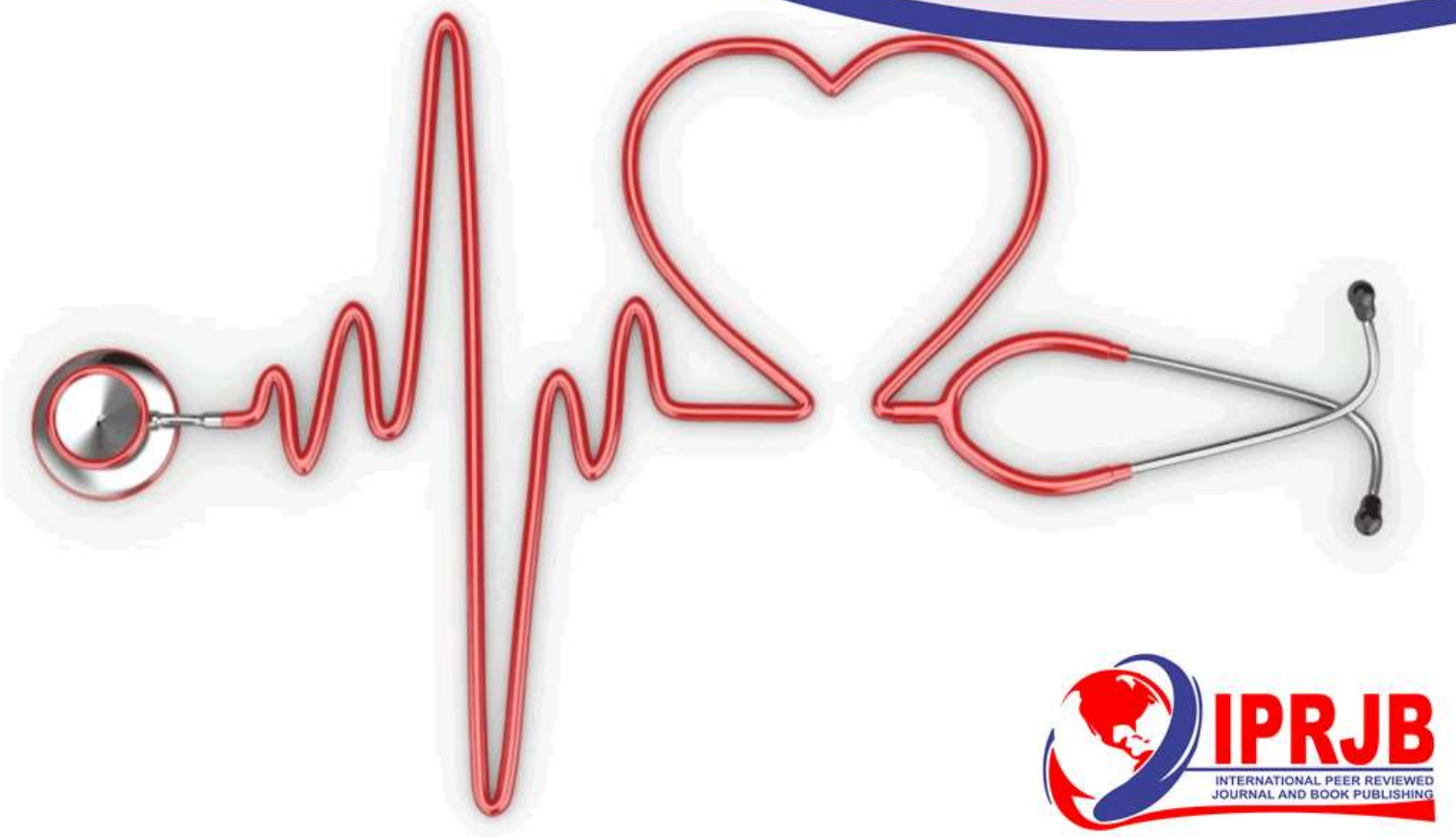
Journal of
Health, Medicine and Nursing
(JHMN)

Socio-demographic and Socio-economic Determinants of Consistent Iron and Folic Acid Supplementation Uptake among Pregnant Women Attending Antenatal Care at Archers Post Sub-County Hospital, Samburu County, Kenya

Lolkireri Saitiemu Haron, Dr. Dennis Gichobi Magu and Dr. Daniel Mokaya



IPRJB
INTERNATIONAL PEER REVIEWED
JOURNAL AND BOOK PUBLISHING

Journal of Health, Medicine and Nursing
ISSN 2520-4025 (Online)
Vol.12, Issue 4. No.4, pp 47 – 72, 2026

www.iprjb.org

Socio-demographic and Socio-economic Determinants of Consistent Iron and Folic Acid Supplementation Uptake among Pregnant Women Attending Antenatal Care at Archers Post Sub-County Hospital, Samburu County, Kenya

Lolkireri Saitiemu Haron[1*]
Jomo Kenyatta University of Agriculture and Technology
Dr. Dennis Gichobi Magu[2]
Jomo Kenyatta University of Agriculture and Technology
Dr. Daniel Mokaya[3]
Jomo Kenyatta University of Agriculture and Technology

Article History

Received 5th September 2026

Received in Revised Form 8th October 2026

Accepted 2nd November 2026

How to cite in APA format:

Lolkireri, H., Magu, D., & Mokaya, D. (2026). Socio-demographic and Socio-economic Determinants of Consistent Iron and Folic Acid Supplementation Uptake among Pregnant Women Attending Antenatal Care at Archers Post Sub-County Hospital, Samburu County, Kenya. *Journal of Health, Medicine and Nursing*, *12*(4), 47–72. https://doi.org/10.47604/jhmn.4028

Abstract

Purpose: Iron and folic acid supplementation (IFAS) is the principal intervention for preventing anaemia in pregnancy and is provided free of charge at antenatal care (ANC) contacts in Kenya, yet sustained consumption of the supplement remains uncommon. Evidence on the social and economic determinants of uptake among pastoralist populations is scarce, and most Kenyan studies have been conducted in urban and agrarian counties. This study determined the socio-demographic and socio-economic factors associated with consistent IFAS uptake among pregnant women attending ANC at Archers Post Sub-County Hospital, Samburu County, Kenya.

Methodology: An analytical cross-sectional study, guided by Andersen's Behavioral Model of Health Services Use, was conducted among pregnant women aged 18 to 49 years who were recruited consecutively at the antenatal clinic. Data were collected using an interviewer-administered questionnaire and abstraction of antenatal records. Consistent uptake was defined as consumption of an IFAS tablet on at least four of the seven days preceding the interview. Associations were assessed using Pearson chi-square tests and multivariable binary logistic regression, with statistical significance set at $p < 0.05$.

Findings: Of the 259 women approached, 210 were interviewed and analysed, representing a response rate of 81.1%. Overall, 58.1% (95% CI 51.3–64.6) of participants met the criterion for consistent uptake. After adjustment, consistent uptake was independently associated with attendance at four or more ANC visits (AOR = 6.56, 95% CI 2.30–18.74), tertiary education (AOR = 6.15, 95% CI 1.82–20.83), secondary education (AOR = 2.41, 95% CI 1.09–5.33), adequate knowledge of IFAS (AOR = 4.88, 95% CI 2.26–10.53), counselling by a health worker (AOR = 3.52, 95% CI 1.65–7.53), a monthly household income of KSh 20,000 or more (AOR = 3.36, 95% CI 1.46–7.76) and partner or family support (AOR = 2.50, 95% CI 1.12–5.58), while reported side effects were associated with lower odds of consistent uptake (AOR = 0.27, 95% CI 0.12–0.58). Marital status, employment status, gravidity and trimester were not associated with uptake, and rural residence and distance to the facility lost significance after adjustment. Consistent IFAS uptake in this pastoralist setting is shaped by education, household income and partner support, acting alongside antenatal contact and the quality of counselling.

Unique Contribution to Theory, Practice and Policy: Interventions should prioritise early and repeated ANC attendance, community-based resupply for dispersed households by community health promoters linked to level 1 community health units and the electronic Community Health Information System, engagement of partners, and counselling that prepares women to recognise and manage side effects, delivered alongside deworming and malaria prevention where these are indicated.

Keywords: *Iron and Folic Acid Supplementation, Consistent Uptake, Socio-Economic Factors, Education, Household Income, Partner Support, Antenatal Care, Pastoralist Communities*

JEL Classification: *I12, I14, I18, O15*

©2026 by the Authors. This Article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0

Journal of Health, Medicine and Nursing
ISSN 2520-4025 (Online)
Vol.12, Issue 4. No.4, pp 47 – 72, 2026
www.iprjb.org

INTRODUCTION

Iron and folate belong to a small group of nutrients whose requirements rise so sharply in pregnancy that ordinary diets in poor communities rarely meet them. Deficiencies of vitamins and minerals affect more than two billion people worldwide and are concentrated in populations whose diets rest on a starchy staple with little meat, fruit, vegetables or fortified food (World Health Organization [WHO], 2016). Maternal plasma volume expands by roughly half over the course of gestation, red cell mass increases with it, and iron is transferred to the fetus and placenta and lost at delivery, so that a single pregnancy costs several hundred milligrams of iron. Intestinal absorption becomes more efficient in response, but only partially, and a woman who conceives with depleted stores has little prospect of closing the gap from her diet alone (Abbaspour et al., 2014). Folate requirements rise because of its role in DNA synthesis and cell division, and adequate folate status is indispensable to closure of the neural tube in the first weeks after conception (Viswanathan et al., 2023).

Where these requirements go unmet, anaemia is the most visible consequence. Under the updated WHO guideline on haemoglobin cut-offs, anaemia in pregnancy is defined as a haemoglobin concentration below 110 g/L in the first and third trimesters and below 105 g/L in the second (WHO, 2024a). The most recent WHO global estimates place the prevalence of anaemia among pregnant women aged 15 to 49 years at 35.5% in 2023, compared with 30.5% among non-pregnant women (WHO, 2025), and the Global Burden of Disease Study 2021 estimated that 1.92 billion people were living with anaemia in 2021, with dietary iron deficiency the leading cause of anaemia-related disability (GBD 2021 Anaemia Collaborators, 2023). Maternal anaemia narrows the physiological margin available to withstand blood loss at delivery and is associated with increased maternal morbidity and mortality, while in the fetus and newborn it is associated with growth restriction, low birth weight and preterm delivery. On this basis the WHO recommends daily oral supplementation with 30 to 60 mg of elemental iron and 400 µg of folic acid for every pregnant woman, begun as early as possible and continued throughout gestation, a recommendation that remains current in WHO guidance (WHO, 2016, 2024b). Cochrane evidence indicates that daily supplementation reduces maternal anaemia and iron deficiency at term (Peña-Rosas et al., 2015). The intervention is inexpensive and deliverable through the existing antenatal platform; its weakness has never been efficacy but the fact that a tablet dispensed and not swallowed confers no benefit.

Anaemia in pregnancy is not, however, synonymous with nutritional iron or folate deficiency. In arid and semi-arid lands (ASAL) such as Samburu, infectious co-morbidities contribute to low haemoglobin alongside diet. Hookworm and other soil-transmitted helminths cause chronic intestinal blood loss; malaria, which is transmitted seasonally in parts of Kenya's arid north, causes haemolysis and suppresses red cell production; and visceral leishmaniasis (kala-azar), endemic in neighbouring arid counties including Isiolo, Marsabit, Turkana and Wajir, causes anaemia through splenic sequestration and bone marrow involvement (Division of National Malaria Programme [DNMP] & ICF, 2021; GBD 2021 Anaemia Collaborators, 2023; Ouma & Mulambalah, 2021). IFAS corrects the nutritional component of anaemia but cannot offset continuing losses from infection. The WHO therefore recommends preventive anthelminthic treatment after the first trimester where the prevalence of hookworm or *Trichuris trichiura* infection is 20% or more and

anaemia affects 40% or more of pregnant women, together with malaria prevention in endemic areas (WHO, 2016, 2017). In ASAL settings, consistent IFAS uptake is thus a necessary but not sufficient condition for preventing anaemia in pregnancy, and supplementation needs to be delivered alongside deworming and vector control. The present study addresses the supplementation component of this package.

The gap between policy and practice is widest in sub-Saharan Africa, which carries the heaviest regional burden of anaemia in pregnancy, with a pooled prevalence of 35.6% among pregnant women (Fite et al., 2021). Coverage of supplementation is uneven and adherence is poorer still. Analysis of Demographic and Health Survey data from 22 African countries found that only 28.7% of pregnant women had taken iron supplements for the recommended 90 days or more (Ba et al., 2019), while the pooled compliance estimate from a regional meta-analysis was 39.2% (Fite et al., 2021). Country estimates range from about 22% in Tanzania (Lyoba et al., 2020) to 58.8% in Ghana (Wemakor et al., 2020), while Ethiopian studies span roughly 17% to 84%, a spread that reflects differences in definition and setting as much as genuine variation in behaviour (Desta et al., 2019; Sendeku et al., 2020). These estimates are not directly comparable. Survey-based figures count women who took 90 or more tablets over the whole pregnancy (Alemu et al., 2025; Ba et al., 2019), many facility studies classify a woman as adherent if she took the supplement on at least four days in the preceding week, others require five or more tablets in the past seven days (Kamau et al., 2020), and still others rely on self-reported missed doses or pill counts. Because each definition captures a different behaviour over a different period, cross-study comparisons across sub-Saharan Africa are hampered by heterogeneous definitions of "adherence" and "compliance", and differences between estimates should be read as indicative rather than exact. The present study used a seven-day, four-or-more-days criterion, which is directly comparable only with studies that applied the same definition. The explanations offered by these studies recur with notable regularity and include late booking, infrequent antenatal visits, limited counselling, stock-outs, gastrointestinal side effects and community beliefs about the tablets (Ba et al., 2019; Fite et al., 2021; Getachew et al., 2018).

Kenya conforms to the regional pattern. Anaemia among pregnant women has been reported nationally at 55.1%, well above the 40% threshold at which the WHO classifies anaemia as a severe public health problem (Ministry of Health [MoH], 2013), and more recent geospatial analysis of 2016–2019 data has shown wide variation in risk between counties (Odhiambo & Sartorius, 2020). Kenyan policy adopts the WHO recommendation in full and the supplement is issued free of charge through focused antenatal care in public facilities. Analysis of the 2022 Kenya Demographic and Health Survey reported adherence of 61.72% among women who attended antenatal care and began supplementation (Alemu et al., 2025; Kenya National Bureau of Statistics [KNBS] & ICF, 2023). Recent facility-level Kenyan studies have reported values ranging from 18.3% in a low-resource rural setting (Oiye et al., 2020) to 60.4% at Kakamega County Referral Hospital (Bahati et al., 2021), and between 63.8% and 74.3% among antenatal clients in Kiambu County when compliance was defined as five or more tablets in the preceding week (Kamau et al., 2020). Earlier facility studies reported lower values of 10.6% in Nyeri (Gathigi, 2011) and 32.7% in Kiambu County (Kamau et al., 2018). National averages therefore conceal wide variation between counties, and the determinants of uptake appear to be sufficiently local that evidence from one county cannot safely be transferred to another.

Among the socio-demographic determinants of uptake, maternal age is one of the more consistently reported. National analysis of the 2022 Kenyan survey found women aged 20 to 39 years between 1.3 and 1.7 times more likely to adhere than adolescents, with similar gradients reported across the region (Alemu et al., 2025; Ba et al., 2019). Education shows the most consistent association of any socio-demographic variable. Women with higher educational attainment were 1.6 times more likely to adhere in the Kenyan national data (Alemu et al., 2025), and comparable associations have been reported from Pakistan and across sub-Saharan Africa (Ba et al., 2019; Nisar et al., 2014). Interpretation of this association is less straightforward than its consistency suggests, because education is correlated with household wealth, urban residence, proximity to facilities and exposure to health information, and studies differ considerably in how thoroughly they adjust for these factors.

Other socio-demographic characteristics produce less consistent findings. The Kenyan national analysis found primigravid women 1.22 times more likely to adhere than multigravid women, consistent with earlier Kenyan work (Alemu et al., 2025; Kamau et al., 2018), whereas several Ethiopian studies have reported better adherence among multiparous women, attributing this to accumulated experience of the benefits of supplementation. Household size has received less attention, although women in households of ten or more members were 28% less likely to adhere in the Kenyan national data, a finding attributed to competing caregiving demands and dilution of household resources (Alemu et al., 2025). This is directly relevant in pastoralist settings, where households are typically large.

The influence of socio-economic status depends on how the supplement is financed. In an urban South Indian study, women of lower socio-economic status attending public facilities where tablets were free achieved higher compliance than women of higher status who purchased supplements from private providers (Mithra et al., 2014). Where supplements are free, as in the Kenyan public sector, the pathway from poverty to poor adherence is therefore unlikely to run through the price of the commodity, and more plausibly runs through the cost of reaching the facility and the opportunity cost of repeated journeys. Household decision-making is a related but less frequently measured dimension. The proposition that a woman's adherence depends partly on whether her partner understands and supports supplementation is frequently advanced, yet direct measurement of who decides on household health expenditure is uncommon, and the most recent national analysis in Kenya explicitly identified the absence of household and decision-making variables as a limitation (Alemu et al., 2025).

Health system factors interact with these household characteristics. Attendance at four or more antenatal visits produced the largest effect in the Kenyan national analysis (AOR = 3.96), exceeding that of any socio-demographic variable (Alemu et al., 2025), and comparable associations have been reported across the region (Ba et al., 2019). Because tablets are issued at antenatal visits, attendance governs both initial receipt and every subsequent resupply. Counselling, side effects and commodity availability also matter. Work in Eritrean refugee camps in northern Ethiopia, a marginalised setting with constraints comparable to pastoralist ones, identified counselling and knowledge as central to adherence (Getachew et al., 2018); gastrointestinal side effects have been shown to shorten the duration of supplementation in rural Kenya (Oiye et al., 2020), and inadequate programme coverage and low supply were the principal

reasons for non-use reported at a Kenyan provincial hospital (Gathigi, 2011), while more recent work in Kiambu County showed that weekly home delivery and counselling by community health volunteers reduced discontinuation because of side effects from 22.6% to 9.8% (Kamau et al., 2020). Examining socio-demographic and socio-economic factors without accounting for these service characteristics therefore risks attributing to one domain an effect that belongs to another.

Conceptual Framework

The study was guided by Andersen's Behavioral Model of Health Services Use, which explains the use of a health service as a function of predisposing characteristics, enabling resources and need (Andersen, 1995). Applied to IFAS, predisposing factors are characteristics that precede the pregnancy and shape a woman's propensity to use the supplement: her age, marital status, education, gravidity, and her knowledge and beliefs about IFAS. Enabling factors are the household and health-system resources that make sustained use possible or difficult: household income, employment, insurance cover, who decides on spending for her health, partner or family support, residence and distance to the facility, household food insecurity, the number of antenatal contacts, counselling and the availability of tablets. Need factors reflect the evaluated need for supplementation, indicated by gestational age at booking and trimester, and the perceived experience of the regimen, including side effects. In pastoralist communities these domains interact rather than act separately. Mobility, drought and long distances convert low income into missed resupply visits; gender norms that place spending decisions with the partner make household support an enabling resource in its own right; and limited schooling shapes both knowledge and the capacity to act on counselling (Figure 1). The model therefore anticipates that socio-economic factors influence uptake partly through access to antenatal contact, which is why antenatal service and knowledge variables were modelled jointly with the socio-demographic and socio-economic factors.

Journal of Health, Medicine and Nursing
ISSN 2520-4025 (Online)
Vol.12, Issue 4. No.4, pp 47 – 72, 2026
www.iprjb.org

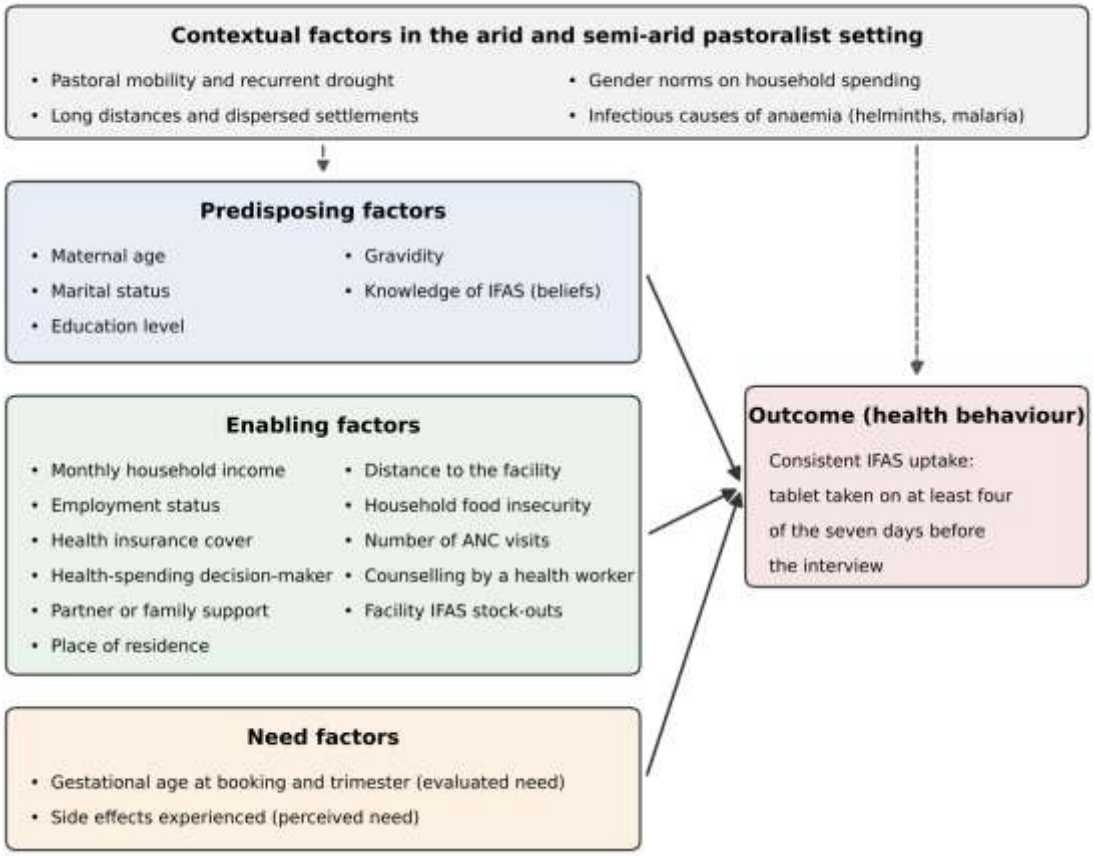


Figure 1: Conceptual Framework of Factors Influencing Consistent IFAS Uptake, Adapted from Andersen's Behavioral Model of Health Services Use (Andersen, 1995)

Statement of the Problem

Samburu County, in the arid and semi-arid north of Kenya, presents a context that differs markedly from the counties in which most Kenyan evidence has been generated. The county covers approximately 21,000 square kilometres and had a population of 310,327 at the 2019 census (KNBS, 2019). Livelihoods rest on pastoralism, households move seasonally in search of pasture and water, distances to health facilities are long, female literacy is low and women frequently have limited control over household spending. Mapping of maternal anaemia in Kenya has identified elevated risk in the pastoralist sub-counties of the north (Odhiambo & Sartorius, 2020). Each of these characteristics bears directly on whether a woman who is issued with tablets will take them consistently.

Despite this, the Kenyan facility-based literature on IFAS uptake has been built almost entirely in urban and agrarian counties such as Kiambu, Nyeri and Kakamega, whose settlement patterns, literacy levels and service geography bear little resemblance to those of Samburu. National survey analyses identify correlates of adherence at country level but omit variables that require primary data collection, including household decision-making, partner support and food insecurity (Alemu

et al., 2025). No published study has examined IFAS uptake or its determinants at Archers Post Sub-County Hospital or elsewhere in Samburu East Sub-County, so that counselling, commodity planning and adherence support are being designed without local evidence.

The problem addressed by this study is therefore threefold. First, a substantial share of pregnant women in pastoralist Samburu who are issued with free IFAS may not take it consistently, leaving them exposed to anaemia and its maternal and perinatal consequences in a setting where infectious causes of anaemia add to nutritional ones. Second, the socio-demographic and socio-economic drivers of inconsistent uptake in such settings are unknown, because Kenyan evidence comes largely from urban and agrarian counties and national surveys omit household decision-making, partner support and food insecurity. Third, without local evidence, counselling, commodity planning and community outreach cannot be directed to the women least likely to sustain supplementation. In filling these gaps, the study is intended to benefit pregnant women and their newborns in Samburu East Sub-County; the Samburu County Department of Health and the management of Archers Post Sub-County Hospital, in planning counselling, community resupply and commodity forecasting; community health promoters and community health units, in identifying women who need follow-up; the Ministry of Health, in adapting supplementation guidance for arid and semi-arid counties; and researchers, by providing a baseline for intervention studies in pastoralist populations.

The present study was therefore undertaken to determine the socio-demographic and socio-economic factors associated with consistent IFAS uptake among pregnant women attending the antenatal clinic at Archers Post Sub-County Hospital, Samburu County, Kenya. By examining these factors jointly with key antenatal service and knowledge characteristics, the study sought to establish their independent contribution to uptake and to generate evidence that can inform the design of supplementation support for pastoralist populations.

METHODOLOGY

Study Design

An analytical cross-sectional design was adopted. Data on the outcome and on all independent variables were collected from each participant at a single point in time during a scheduled antenatal visit and were supplemented by abstraction of clinical information from the participant's antenatal booklet and laboratory records. The design was appropriate because the objective required examination of associations between participant characteristics and a binary outcome, which an analytical cross-sectional design supports through bivariate testing and multivariable logistic regression with adjustment for confounding. It also allowed social, economic, service-related and knowledge-related exposures to be measured in the same women, which was necessary because the study sought the independent contribution of each domain rather than examining each in isolation.

Study Area

The study was conducted at Archers Post Sub-County Hospital in Samburu East Sub-County, Samburu County, Kenya. Samburu County lies in the arid and semi-arid north of the former Rift Valley Province, covers approximately 21,000 square kilometres and had a population of 310,327 at the 2019 census (KNBS, 2019). The population is predominantly Samburu, with Turkana and

other communities also present, and livelihoods rest largely on pastoralism based on cattle, sheep, goats and camels. Rainfall is low and erratic, drought is recurrent, poverty and food insecurity are widespread, and road infrastructure is limited. Archers Post lies on the Isiolo–Marsabit corridor near the Ewaso Ng'iro river at the southern edge of the county and functions as a service centre for the surrounding rangeland settlements and a mobile pastoralist population. Archers Post Sub-County Hospital is a Level 4 public facility providing outpatient and inpatient care, laboratory services, maternity services, nutrition counselling and a structured antenatal clinic through which iron and folic acid tablets are routinely issued free of charge. The facility was selected purposively because it is the principal provider of antenatal care to this population, its antenatal register allowed eligible women to be identified systematically, and no previous research on supplementation had been conducted there.

Study Population

The target population comprised pregnant women attending antenatal care services in Samburu East Sub-County. The accessible population comprised the 734 pregnant women aged 18 to 49 years who attended the antenatal clinic at Archers Post Sub-County Hospital during the data collection period. Defining the population by clinic attendance ensured that all participants had contact with the service through which supplements are provided and therefore had an opportunity to receive and use them. The lower age limit of 18 years was adopted so that all participants could provide informed consent in their own right, and the upper limit of 49 years corresponds to the conventional upper bound of the reproductive age range.

Inclusion and Exclusion Criteria

Women were eligible if they had a pregnancy confirmed and documented in the antenatal record, were aged 18 to 49 years, were attending the antenatal clinic during the data collection period, had resided within the facility catchment area for at least six months, were willing to give written informed consent in English, Kiswahili or Samburu, and agreed to abstraction of information from their antenatal records. Women were excluded if they declined consent, were acutely unwell or required urgent clinical attention, lacked capacity to consent at the time of the visit, had a documented condition that alters iron or folate metabolism or requires a therapeutic rather than preventive supplementation regimen (including known haemoglobinopathy, chronic kidney disease, malabsorption syndrome or recent transfusion), or had already been interviewed at an earlier visit.

Sample Size Determination

The sample size was determined using Yamane's simplified formula for a finite population:

$$n = N / [1 + N(e^2)]$$

Where n is the required sample size, N is the accessible population (734) and e is the acceptable margin of error (0.05). Substituting these values gave $n = 734 / [1 + 734(0.0025)] = 734 / 2.835 = 258.9$, which was rounded up to 259 participants. The adequacy of the achieved sample for multivariable modelling was assessed using the events-per-variable criterion, under which the number of degrees of freedom in the model was not permitted to exceed one tenth of the number of outcome events.

Sampling Procedure

Participants were enrolled by consecutive sampling. Every woman presenting at the antenatal clinic during the data collection period was screened against the eligibility criteria in the order in which she was registered, and every eligible woman who consented was enrolled until the required sample of 259 had been approached. Women who were ineligible, declined consent or did not complete the interview were not replaced out of sequence, and recruitment proceeded to the next eligible woman. A screening log recorded the outcome for each woman approached, including eligibility, consent, enrolment and the reason for non-enrolment where applicable, which enabled calculation of the response rate and documentation of exclusions.

Data Collection Methods and Instruments

Data were collected using a structured interviewer-administered questionnaire developed for the study. Interviewer administration was chosen because formal literacy in the study population is limited, and self-completion would have systematically excluded the least educated women. Items were adapted from instruments used in previously published studies of supplementation compliance in comparable settings. The questionnaire covered socio-demographic characteristics (age, residence, distance and travel time to the facility, marital status, education, gravidity and parity), socio-economic characteristics (occupation, household size, monthly household income, the person who decides on expenditure for the woman's health care, household food insecurity in the preceding 30 days and health insurance cover), antenatal service characteristics (gestational age at booking, number of antenatal visits, counselling by a health worker, experience of facility stock-outs and partner or family support), a twelve-item IFAS knowledge scale, and supplement use. The questionnaire was developed in English, translated into Kiswahili and Samburu by an independent translator and back-translated by a second translator, with discrepancies reconciled jointly.

The primary outcome, consistent IFAS uptake, was a binary variable. A participant was classified as a consistent user if she reported taking an iron and folic acid tablet on four or more of the seven days preceding the interview and confirmed that the supplement had been issued or prescribed during the index pregnancy; all other participants, including those never prescribed the supplement, were classified as non-consistent users. A seven-day window with day-by-day probing was preferred to the 90-day criterion used in national surveys because it reduces recall error and does not penalise women interviewed early in pregnancy or those who booked late. Knowledge was scored from twelve items, each scored one for a correct response and zero for an incorrect or "don't know" response, and a score of eight or more was classified as adequate knowledge. Where participants had their antenatal booklet and remaining tablets with them, reported consumption was cross-checked against the documented information.

Content validity was established through review of the instrument by three experts in public health, maternal nutrition and epidemiology until at least 80% agreement on item adequacy was reached. The questionnaire was pretested among 38 pregnant women at a comparable facility outside the study site, and those women were not included in the main study. The internal consistency of the knowledge scale in the study data was acceptable (Cronbach's alpha = 0.727). Research assistants with health-related backgrounds and fluency in Kiswahili and Samburu were trained for two days

on the study procedures, and interviews, lasting 30 to 40 minutes, were conducted in private after the participant's routine clinical consultation.

Data Management and Analysis

Completed questionnaires were checked for completeness and consistency before the participant left the facility and again by the researcher at the end of each clinic day. Data were double-entered by two clerks working independently, the files were compared electronically and discrepancies were resolved against the paper form. Analysis was conducted using SPSS version 25. Categorical variables were summarised as frequencies and percentages, and continuous variables as means with standard deviations and medians with interquartile ranges. Each socio-demographic, socio-economic and service variable was cross-tabulated against consistent uptake and tested using the Pearson chi-square test, with Fisher's exact test substituted where expected cell counts were small, and crude odds ratios (COR) with 95% confidence intervals (CI) were computed.

Variables associated with consistent uptake at $p < 0.25$ in the bivariate analysis were carried forward as candidates for multivariable binary logistic regression. This liberal screening threshold was adopted so that variables whose effects emerge only after adjustment were not excluded prematurely. Where the candidate set would have exceeded the events-per-variable criterion, multi-category variables were replaced by binary contrasts specified in the study codebook before the data were examined, and the candidates with the weakest bivariate associations were withdrawn in turn. Correlation among candidate variables, particularly education and income, and residence and distance, was considered when interpreting the model. Results are reported as adjusted odds ratios (AOR) with 95% CI alongside the corresponding crude estimates, so that the effect of adjustment on each estimate is visible. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics and Research Committee, and a research licence was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Written authorisation was obtained from the Samburu County Department of Health, the Samburu East Sub-County Health Management Team and the Medical Superintendent of Archers Post Sub-County Hospital. Written informed consent was obtained from every participant before any study procedure, and women unable to write provided a thumbprint witnessed by an independent person unconnected with the research team. Participation was voluntary, and participants were assured that declining or withdrawing would not affect the care they received. Recruitment and interviews were conducted by research assistants rather than clinical staff to reduce any perception that participation was expected. No direct identifiers were recorded on the questionnaire, interviews were conducted in a private area, and data were stored in locked cabinets and password-protected, encrypted files accessible only to the researcher. The study was conducted in accordance with the Declaration of Helsinki.

RESULTS

During the data collection period, 259 pregnant women were approached. Of these, 7 (2.7%) declined consent, 5 (1.9%) returned substantially incomplete questionnaires that were excluded during data cleaning, 2 (0.8%) did not meet the eligibility criteria and 35 (13.5%) did not complete

the interview. The final analytical sample therefore comprised 210 women, representing a response rate of 81.1%.

The characteristics of the participants are presented in Table 1. The study population was young, with a mean age of 31.9 years (SD = 8.0), and two thirds of the women (67.7%) were younger than 36 years. Most participants (78.1%) were married or cohabiting. Educational attainment was low, with 41.9% having no formal education or primary education only and 14.3% having reached tertiary level. Nearly two thirds (62.9%) lived in rural settlements outside the trading centre and 37.1% lived more than 10 km from the facility, the mean distance being 9.1 km (median 7.6 km, maximum 39.3 km). Seven in ten households (70.5%) reported a monthly income below KSh 20,000, 45.7% had experienced food insecurity in the preceding 30 days and 72.4% of participants had no health insurance. In only about one household in five (21.9%) did the woman herself decide how money was spent on her health care. Antenatal attendance was limited: fewer than one third of participants (29.5%) had attended four or more visits, and 61.4% had booked at or after 14 weeks of gestation, the mean gestational age at booking being 15.7 weeks (SD = 5.1).

Journal of Health, Medicine and Nursing
ISSN 2520-4025 (Online)
Vol.12, Issue 4. No.4, pp 47 – 72, 2026
www.iprjb.org

Table 1: Socio-demographic, Socio-economic and Antenatal Characteristics of the Participants (n = 210)

Characteristic	Category	n	%
Age (years)	18–30	86	41.0
	31–35	56	26.7
	36–40	42	20.0
	41–49	26	12.4
Marital status	Married or cohabiting	164	78.1
	Single, divorced or widowed	46	21.9
Education level	None or primary	88	41.9
	Secondary	92	43.8
	Tertiary	30	14.3
Employment status	Unemployed	74	35.2
	Self-employed or casual	72	34.3
	Employed	64	30.5
Place of residence	Town or trading centre	78	37.1
	Rural settlement	132	62.9
Distance to the facility	5 km or less	77	36.7
	6–10 km	55	26.2
	More than 10 km	78	37.1
Monthly household income (KSh)	Below 10,000	82	39.0
	10,000–19,999	66	31.4
	20,000–29,999	38	18.1
	30,000 or more	24	11.4
Household food insecurity (past 30 days)	Yes	96	45.7
	No	114	54.3
Health insurance cover	Yes	58	27.6
	No	152	72.4
Decides on health care spending	Jointly with partner	78	37.1
	Partner alone	74	35.2
	Woman herself	46	21.9
	Other relative	12	5.7
Gravidity	Primigravida	84	40.0
	Multigravida	126	60.0
Number of ANC visits	1	52	24.8
	2–3	96	45.7
	4 or more	62	29.5
Trimester at interview	First	38	18.1
	Second	97	46.2
	Third	75	35.7
Gestational age at booking	Before 14 weeks	81	38.6
	14 weeks or later	129	61.4

ANC = antenatal care; KSh = Kenya shillings.

Of the 210 participants, 156 (74.3%, 95% CI 68.0–79.7) were consuming IFAS at the time of the interview and 122 (58.1%, 95% CI 51.3–64.6) met the criterion for consistent uptake. Only 56 (26.7%) had taken a tablet on six or seven of the preceding seven days, and 6 (2.9%) had accumulated 90 or more tablets. Counselling on IFAS by a health worker had been received by 124 participants (59.0%), 42 (20.0%) had encountered a facility stock-out, and 76 (36.2%) reported at least one side effect.

The distribution of consistent uptake across the socio-demographic, obstetric and antenatal characteristics is presented in Table 2. Significant associations were observed for education level, number of antenatal visits and age. Education showed the clearest gradient, consistent uptake rising from 43.2% among participants with no education or primary education only to 64.1% among those with secondary education and 83.3% among those with tertiary education ($\chi^2 = 17.27$, df = 2, $p < 0.001$). Uptake also rose with the number of antenatal visits, from 42.3% among women attending for the first time to 56.2% among those with two or three visits and 74.2% among those with four or more ($\chi^2 = 12.06$, df = 2, $p = 0.002$). Age was significantly associated with uptake ($\chi^2 = 10.51$, df = 3, $p = 0.015$), although the pattern was not linear: uptake ranged from 57.1% to 69.0% across the three younger age groups before falling to 30.8% among women aged 41 to 49 years, an estimate based on only 26 women. The study was not powered for age-stratified subgroup comparisons, so this pattern is vulnerable to both chance findings and type II error; it is reported descriptively and was not examined further by post-hoc testing. Place of residence approached significance, with consistent uptake reported by 66.7% of women living in the town or trading centre compared with 53.0% of those in rural settlements ($\chi^2 = 3.74$, df = 1, $p = 0.053$). No significant associations were observed for marital status, employment status, gravidity or trimester of pregnancy.

Table 2: Consistent IFAS Uptake by Socio-demographic, Obstetric and Antenatal Characteristics

Characteristic	Category	n	Consistent uptake n (%)	χ^2 (df)	p-value
Age (years)	18–30	86	53 (61.6)	10.51 (3)	0.015
	31–35	56	32 (57.1)		
	36–40	42	29 (69.0)		
	41–49	26	8 (30.8)		
Marital status	Married or cohabiting	164	99 (60.4)	1.59 (1)	0.208
	Single, divorced or widowed	46	23 (50.0)		
Education level	None or primary	88	38 (43.2)	17.27 (2)	<0.001
	Secondary	92	59 (64.1)		
	Tertiary	30	25 (83.3)		
Employment status	Unemployed	74	39 (52.7)	1.82 (2)	0.402
	Self-employed or casual	72	42 (58.3)		
	Employed	64	41 (64.1)		
Place of residence	Town or trading centre	78	52 (66.7)	3.74 (1)	0.053
	Rural settlement	132	70 (53.0)		
Gravidity	Primigravida	84	48 (57.1)	0.05 (1)	0.819
	Multigravida	126	74 (58.7)		
Number of ANC visits	1	52	22 (42.3)	12.06 (2)	0.002
	2–3	96	54 (56.2)		
	4 or more	62	46 (74.2)		
Trimester of pregnancy	First	38	25 (65.8)	1.84 (2)	0.399
	Second	97	52 (53.6)		
	Third	75	45 (60.0)		
Total		**210**	**122 (58.1)**		

χ^2 = Pearson chi-square statistic; df = degrees of freedom; ANC = antenatal care.

Eleven variables met the screening threshold of $p < 0.25$. Marital status, the weakest of these, was withdrawn to satisfy the events-per-variable criterion, leaving ten variables occupying twelve degrees of freedom against 122 outcome events. The results of the multivariable model are presented in Table 3. Seven of the ten variables retained an independent association with consistent uptake.

Among the socio-demographic and socio-economic factors, education retained a strong and graded association with consistent uptake after adjustment. Relative to women with no education or primary education only, the odds of consistent uptake were more than twice as high among those with secondary education (AOR = 2.41, 95% CI 1.09–5.33, p = 0.029) and six times as high among those with tertiary education (AOR = 6.15, 95% CI 1.82–20.83, p = 0.004). A monthly household income of KSh 20,000 or more was associated with more than threefold higher odds of consistent uptake (AOR = 3.36, 95% CI 1.46–7.76, p = 0.004), an effect that strengthened slightly on adjustment from a crude value of 2.72. Women who reported that their partner or family supported

them in taking the supplements had two and a half times the odds of consistent uptake of those who did not (AOR = 2.50, 95% CI 1.12–5.58, p = 0.026).

The antenatal service and knowledge variables entered as covariates also showed strong independent associations. Attending four or more antenatal visits carried the largest adjusted odds ratio in the model (AOR = 6.56, 95% CI 2.30–18.74, p < 0.001) relative to a single visit, and attending two or three visits carried an AOR of 3.11 (95% CI 1.26–7.64, p = 0.014). Adequate knowledge of IFAS (AOR = 4.88, 95% CI 2.26–10.53, p < 0.001) and counselling by a health worker (AOR = 3.52, 95% CI 1.65–7.53, p = 0.001) were each independently associated with higher odds of consistent uptake, whereas reporting any side effect reduced the odds by 73% (AOR = 0.27, 95% CI 0.12–0.58, p < 0.001).

Table 3: Multivariable Logistic Regression of Factors Associated with Consistent IFAS Uptake (n = 210)

Variable	Category	COR (95% CI)	AOR (95% CI)	p-value
Education level	None or primary	1.00 (reference)	1.00 (reference)	
	Secondary	2.35 (1.29–4.28)	2.41 (1.09–5.33)	0.029
	Tertiary	6.58 (2.31–18.78)	6.15 (1.82–20.83)	0.004
Monthly household income	Below KSh 20,000	1.00 (reference)	1.00 (reference)	
	KSh 20,000 or more	2.72 (1.42–5.24)	3.36 (1.46–7.76)	0.004
Partner or family support	Not supportive	1.00 (reference)	1.00 (reference)	
	Supportive	2.01 (1.09–3.70)	2.50 (1.12–5.58)	0.026
Place of residence	Town or trading centre	1.00 (reference)	1.00 (reference)	
	Rural settlement	0.56 (0.32–1.01)	0.59 (0.23–1.49)	0.264
Distance to the facility	10 km or less	1.00 (reference)	1.00 (reference)	
	More than 10 km	0.54 (0.31–0.96)	0.64 (0.26–1.60)	0.341
Number of ANC visits	1	1.00 (reference)	1.00 (reference)	
	2–3	1.75 (0.89–3.47)	3.11 (1.26–7.64)	0.014
	4 or more	3.92 (1.78–8.65)	6.56 (2.30–18.74)	<0.001
Knowledge level	Inadequate	1.00 (reference)	1.00 (reference)	
	Adequate	5.17 (2.84–9.39)	4.88 (2.26–10.53)	<0.001
Counselled by a health worker	No	1.00 (reference)	1.00 (reference)	
	Yes	2.44 (1.39–4.30)	3.52 (1.65–7.53)	0.001
Any side effect reported	No	1.00 (reference)	1.00 (reference)	
	Yes	0.33 (0.18–0.58)	0.27 (0.12–0.58)	<0.001
Facility stock-out reported	No	1.00 (reference)	1.00 (reference)	
	Yes	0.52 (0.26–1.03)	0.47 (0.19–1.16)	0.101

COR = crude odds ratio; AOR = adjusted odds ratio; CI = confidence interval; ANC = antenatal care; KSh = Kenya shillings. All ten variables were entered simultaneously.

The comparison of crude and adjusted estimates was informative. The two antenatal service variables strengthened on adjustment: the crude odds ratio for two or three visits (1.75) was not significant, whereas the adjusted value (3.11) was, and the estimate for counselling rose from 2.44 to 3.52. This pattern indicates negative confounding by socio-economic position, since women with less education and lower income attended less frequently and were counselled less often. The education estimates changed little after knowledge and service contact were controlled, indicating that education was associated with consistent uptake through pathways beyond the factual knowledge captured by the knowledge scale. Rural residence and a distance of more than 10 km, both significant or near-significant in isolation, lost significance after adjustment (AOR = 0.59 and 0.64 respectively), with wide confidence intervals. The two variables measure the same underlying constraint of geographical access, compete with one another in the model and are correlated with education and income, so that their separate contributions could not be distinguished at this sample size. Facility stock-out retained its direction and much of its magnitude without reaching significance (AOR = 0.47, 95% CI 0.19–1.16).

Discussion

This study examined the socio-demographic and socio-economic factors associated with consistent IFAS uptake among pregnant women attending antenatal care in a pastoralist setting in northern Kenya. A little over half of the participants (58.1%) were taking the supplement on at least four days a week. After simultaneous adjustment for antenatal service and knowledge characteristics, education, household income and partner or family support were independently associated with consistent uptake, together with antenatal attendance, knowledge, counselling and the experience of side effects. Marital status, employment status, gravidity and trimester were not associated with uptake, and the associations of rural residence and distance did not persist after adjustment. Interpreted through Andersen's model, uptake was shaped by predisposing factors (education and knowledge), enabling resources at household level (income and partner support) and within the health system (antenatal contact and counselling), and a perceived-need factor (side effects). The findings describe a population in which what a woman brings to the antenatal encounter, what the health system provides during it and what the tablets do to her afterwards each independently influence whether supplementation is sustained.

Education and Consistent IFAS Uptake

Education showed the steepest gradient of any socio-demographic characteristic, with consistent uptake rising from 43.2% among women with no education or primary education only to 83.3% among those with tertiary education, and adjusted odds ratios of 2.41 and 6.15 for secondary and tertiary education respectively. The direction of this association agrees with the published literature, while its magnitude exceeds most previous estimates. Alemu et al. (2025) reported an adjusted odds ratio of 1.6 for higher education in the Kenyan national data, and the multi-country analysis by Ba et al. (2019) and the Pakistani household survey by Nisar et al. (2014) similarly reported lower supplement use among less educated women. However, adjusted odds ratios from models with different reference categories, covariate sets and outcome definitions are not directly comparable, so this contrast establishes a consistent direction of association rather than a difference in magnitude.

The larger estimate observed in the present study probably reflects the composition of the sample. Because 41.9% of participants had no education or primary education only, the contrast between the lowest and highest categories was wide, and where the educational range in a sample is compressed the estimated effect is correspondingly smaller. Differences between studies are therefore likely to reflect differences in the populations studied as much as differences in the underlying relationship. Importantly, education retained its association after adjustment for knowledge, income and antenatal contact, and its estimate changed little in the process. This suggests that schooling confers something beyond the factual understanding measured by the knowledge scale, most plausibly the confidence, health literacy and organisational capacity required to sustain a daily regimen, interpret instructions and navigate an appointment-based service. In a population where formal education is limited, this finding identifies the least educated women as a group requiring more intensive and more practical adherence support.

Household Income, Residence and Distance

A monthly household income of KSh 20,000 or more was associated with more than threefold higher odds of consistent uptake. Because iron and folic acid tablets are dispensed without charge at public facilities in Kenya, this association cannot be explained by the price of the commodity. This interpretation is consistent with the finding of Mithra et al. (2014) that, where supplements are free, the relationship between socio-economic status and compliance differs from that observed where they must be purchased. In the present setting, the income effect is more plausibly explained by the indirect costs of repeated clinic attendance, including transport fares, time away from livestock and household work, and the opportunity cost of long journeys. Two further observations support this interpretation. Rural residence and distance of more than 10 km were both associated with lower uptake in isolation, and cost of the tablets was cited by only a small minority of non-users in the wider study. In a free service, what household income buys is not the tablets themselves but the journeys required to obtain them.

The loss of significance of residence and distance after adjustment should not be interpreted as evidence that physical access is unimportant. Both variables measure the same underlying constraint, compete with one another for explanatory space in the model and are correlated with income and education, which are themselves strong predictors. The model therefore indicates that geographical access adds little once socio-economic position and antenatal contact are accounted for, not that it has no bearing on uptake. Indeed, a difference of approximately 14 percentage points in consistent uptake between town and rural residents is of practical consequence in a population where most women live in dispersed rural settlements. Kenyan evidence from Nyeri similarly identified inadequate programme coverage and supply as barriers to supplementation (Gathigi, 2011), and the need to travel repeatedly to a fixed facility is likely to be a greater constraint for mobile pastoralist households than for the urban and agrarian populations in which most Kenyan studies have been conducted (Kamau et al., 2018; Bahati et al., 2021), and community-based delivery of IFAS has been shown to be feasible in Kenya (Kamau et al., 2020).

Partner Support and Household Decision-Making

Partner or family support was independently associated with two and a half times higher odds of consistent uptake. This finding is particularly relevant in light of the distribution of household

decision-making in the study population, in which only about one woman in five controlled the money spent on her own health care and more than a third reported that the partner alone decided. The proposition that a woman's adherence depends partly on whether her partner understands and endorses supplementation has frequently been advanced in the literature but rarely measured directly, and the most recent national analysis in Kenya identified the absence of household and decision-making variables as an important limitation (Alemu et al., 2025). The present study provides direct evidence from a pastoralist population that support from the household is associated with sustained consumption, independently of the woman's own education and income.

Several mechanisms may explain this association. A supportive partner may provide money for transport to antenatal visits, remind the woman to take her tablets, reinforce the advice given at the clinic and counter beliefs within the household that the tablets are harmful or unnecessary. Conversely, where household members are indifferent or opposed, a woman with limited control over resources may find it difficult to attend for resupply or to continue taking tablets that cause discomfort. Because beliefs about pregnancy and medicines are often acquired from family and community rather than from health workers (Getachew et al., 2018), counselling directed at the pregnant woman alone may never reach the people whose views shape her behaviour. Involving partners and other influential household members in antenatal counselling therefore represents a practical and low-cost strategy for improving uptake in this setting.

Antenatal Contact, Counselling and Side Effects

Although the focus of this analysis was on socio-demographic and socio-economic factors, their effects cannot be interpreted without reference to the antenatal service variables with which they were modelled. Attendance at four or more antenatal visits carried the largest adjusted odds ratio (6.56), whereas Alemu et al. (2025) reported an adjusted odds ratio of 3.96 for Kenya nationally. Because the national model used a different reference category, covariate set and outcome definition (90 or more tablets), the two adjusted odds ratios cannot be compared in magnitude; what is consistent is the direction of the association. Expressed in crude terms within the present sample, consistent uptake was 74.2% among women with four or more visits compared with 42.3% among those attending for the first time, an absolute difference of about 32 percentage points. Comparable associations between antenatal attendance and adherence have been reported in multi-country regional data (Ba et al., 2019). The consistency of this finding is unsurprising, since antenatal visits are the mechanism through which tablets are delivered and resupplied. Yet fewer than one third of participants had attended four or more times and only 59.0% had been counselled, indicating that the programme's most effective delivery mechanism reaches only a minority of the women who need it.

The strengthening of the antenatal attendance and counselling estimates after adjustment has direct relevance to the socio-economic findings. Women with less education and lower income attended less frequently and were counselled less often, so that the crude estimates understated the benefit of the service contact itself. The practical implication is that additional antenatal contact and counselling yield the greatest benefit in precisely the group least likely to receive them. Socio-economic disadvantage therefore operates on uptake both directly and through reduced access to the service contacts that sustain supplementation.

Reporting any side effect reduced the odds of consistent uptake by 73%, the largest negative effect in the model. This agrees with Kenyan evidence that side effects shorten the duration of supplementation in low-resource rural settings (Oiye et al., 2020) and with studies in Tanzania and Ethiopia in which side effects and forgetfulness recur as the leading reasons for non-adherence (Lyoba et al., 2020; Yismaw et al., 2022). A woman who has not been told in advance that nausea, constipation and dark stools are expected, usually temporary and not harmful has no framework within which to interpret them, and discontinuation is an understandable response to an unexplained symptom in pregnancy. Adequate knowledge, which was strongly associated with uptake independently of education, is likely to act partly by changing how side effects are interpreted and managed rather than whether they occur.

Characteristics Not Associated with Uptake

Several characteristics that might have been expected to influence uptake did not. Employment status showed no association despite an even distribution across three categories, so the null result cannot be attributed to lack of contrast. Marital status was not associated with uptake at the bivariate level and was the weakest candidate for the multivariable model, suggesting that the presence of a partner matters less than whether that partner is supportive. Gravidity was also unrelated to uptake, a finding that differs from both the Kenyan national ancalysis, which favoured primigravidae (Alemu et al., 2025; Kamau et al., 2018), and several Ethiopian studies, which have favoured multigravidae. The absence of any association in the present study argues against the intuition that women learn adherence across successive pregnancies and suggests that each pregnancy presents the service with a new task. The apparent decline in uptake among women aged 41 to 49 years was based on only 26 women and should be interpreted with caution; age was not retained as an independent determinant in the adjusted model. Because the sample size was calculated for the overall estimate rather than for age-stratified comparisons, the study was underpowered for subgroup analysis by age, and neither the presence nor the absence of age differences should be over-interpreted.

Implications of the Findings

The findings indicate that consistent IFAS uptake in this pastoralist setting is socially patterned. Women with little education, low household income and limited household support are least likely to sustain supplementation, and they are also the women least likely to attend antenatal care frequently or to be counselled. Interventions that treat all antenatal clients identically are therefore likely to widen rather than narrow these differences. Programmes should instead direct more intensive counselling, follow-up and practical support to less educated and poorer women, reduce the indirect costs of resupply through community-based distribution by community health promoters, and engage partners and family members as allies in supplementation. Because the income and access effects operate through the cost of reaching the facility rather than the cost of the tablets, bringing supplements closer to households is likely to be more effective than further reductions in commodity cost, which is already zero.

Journal of Health, Medicine and Nursing
ISSN 2520-4025 (Online)
Vol.12, Issue 4. No.4, pp 47 – 72, 2026
www.iprjb.org

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study examined the socio-demographic and socio-economic factors associated with consistent IFAS uptake among pregnant women attending antenatal care at Archers Post Sub-County Hospital in Samburu County, Kenya. A little over half of the women were taking the supplement at the recommended frequency, indicating that a substantial proportion of those in contact with antenatal services were not receiving its full protective benefit.

Education, household income and partner or family support were independently associated with consistent uptake after adjustment for antenatal attendance, counselling, knowledge and side effects. The strong gradient by education, which persisted after knowledge was controlled, indicates that schooling contributes to adherence through pathways beyond factual knowledge. Because supplements are issued free of charge, the income effect is best explained by the indirect cost of repeated attendance, an interpretation supported by the crude associations of rural residence and distance. Partner support emerged as a measurable and modifiable determinant in a population where most women do not control household spending on their own health.

Marital status, employment status, gravidity and trimester of pregnancy were not associated with consistent uptake, and the effects of residence and distance were absorbed by socio-economic position and antenatal contact. Overall, the study concludes that improving consistent IFAS uptake in pastoralist settings requires strategies that address social and economic disadvantage directly, by reducing the cost of access, engaging households and tailoring counselling to women with limited education, alongside efforts to increase antenatal attendance and improve the management of side effects.

Recommendations

The Samburu County Department of Health and facilities serving dispersed rural populations should extend IFAS distribution beyond the fixed clinic. Community-based distribution through community health promoters, carrying a supply sufficient to bridge the interval between antenatal visits, would address the constraints of physical access and resupply together and would reach women whose attendance is limited by the indirect cost of travel rather than by unwillingness. Early booking and completion of the recommended antenatal contacts should be promoted actively at community level, since antenatal attendance was the strongest determinant of uptake and its benefit was greatest among less educated and poorer women.

Facilities should engage partners and other household members directly in IFAS counselling, for example by inviting partners to antenatal visits or providing simple take-home information, since partner or family support independently increased the odds of consistent uptake and most women did not control household expenditure on their health. Counselling should be adapted for women with little or no formal education through the use of pictorial materials, practical demonstrations and the local languages, and should prepare every woman at the booking visit to recognise and manage common side effects, including advice to take the tablet with food or at bedtime and to continue while informing a health worker if symptoms persist.

Community health promoters should be integrated into the existing level 1 community health units linked to Archers Post Sub-County Hospital and formally assigned to IFAS follow-up of pregnant women in their households. Each community health promoter should be equipped with a standardised IFAS resupply log, recording the tablets issued, the date of the next resupply and any side effects reported, maintained within the electronic Community Health Information System (eCHIS) so that community resupply is linked to the woman's antenatal record and missed resupply visits or stock-outs are detected and followed up by the facility (Exemplars in Global Health, n.d.; Kamau et al., 2020).

Strengths and Limitations of the Study

A major strength of this study was the direct measurement of household decision-making, partner support, food insecurity and physical access, variables that are commonly omitted from survey-based analyses, and their joint modelling with antenatal service and knowledge characteristics. The use of a seven-day recall window with day-by-day probing and cross-checking against antenatal records where available reduced recall error, and the translated and back-translated instrument limited measurement error arising from ad hoc translation. However, several limitations should be considered. The cross-sectional design establishes association but not temporal sequence. Adherence was self-reported and may have been overestimated because of social desirability bias. The study was conducted at a single facility among women already attending antenatal care, so the findings cannot be extended to women who never attend, who are likely to have lower uptake. Finally, the events-per-variable criterion required the candidate set to be reduced, so that some variables of substantive interest, such as household food insecurity and decision-making autonomy, could not be examined in the adjusted model. The sample size was calculated for the overall estimate, so the study was underpowered for subgroup analyses such as comparisons across age groups. Haemoglobin concentration and infections such as helminths and malaria were not measured, so the contribution of non-nutritional causes of anaemia in this setting could not be assessed.

Implications for Policy and Practice

The findings have implications for the delivery of IFAS in Kenya's arid and semi-arid counties. National guidance on antenatal supplementation assumes regular facility attendance, which is difficult for mobile pastoralist households with limited income and long travel distances. Policy should therefore recognise community-based resupply as a legitimate complement to facility-based distribution in such settings. Because anaemia in arid and semi-arid settings is multifactorial, IFAS should be delivered as part of an integrated antenatal package that includes deworming after the first trimester where indicated and malaria prevention in endemic zones (WHO, 2016, 2017). The strong socio-economic gradient in uptake indicates that routine monitoring of tablets issued conceals inequalities in consumption, and programme monitoring should include simple measures of consumption disaggregated by education and residence. The influence of partner support further suggests that maternal nutrition programmes should incorporate male involvement strategies rather than directing information exclusively at pregnant women.

Areas for Future Research

Future studies should employ prospective cohort designs, following women from booking to delivery, to establish the temporal relationship between socio-economic factors, antenatal attendance and sustained supplementation, and to verify cumulative consumption against clinic records. Qualitative research with women of differing educational backgrounds and with their partners would help to identify the mechanisms through which education and household support influence adherence, and whether these can be replicated among women who have not been to school. Multi-facility studies across pastoralist counties such as Turkana, Marsabit, Isiolo and West Pokot, and intervention studies evaluating community-based distribution and partner-inclusive counselling, would strengthen the evidence base for supplementation policy in arid and semi-arid regions.

REFERENCES

Abbaspour, N., Hurrell, R., & Kelishadi, R. (2014). Review on iron and its importance for human health. *Journal of Research in Medical Sciences*, *19*(2), 164–174.

Alemu, G. G., Adugna, D. G., Mesfin, A., Agimas, M. C., Baffa, L. D., Abuhay, H. W., Aweke, M. N., Alemu, T. G., & Baykemagn, N. D. (2025). Adherence to iron-folic acid supplementation and its associated factors among pregnant women in Kenya: A multilevel data analysis of the 2022 Kenyan Demographic and Health Survey. *PLOS ONE*, *20*(8), e0329458.

Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: Does it matter? *Journal of Health and Social Behavior*, *36*(1), 1–10. https://doi.org/10.2307/2137284

Ba, D. M., Ssentongo, P., Kjerulff, K. H., Na, M., Liu, G., Gao, X., & Du, P. (2019). Adherence to iron supplementation in 22 sub-Saharan African countries and associated factors among pregnant women: A large population-based study. *Current Developments in Nutrition*, *3*(12), nzz120.

Bahati, F., Kairu-Wanyoike, S., & Nzioki, J. M. (2021). Adherence to iron and folic acid supplementation during pregnancy among postnatal mothers seeking maternal and child healthcare at Kakamega Level 5 Hospital in Kenya: A cross-sectional study. *Wellcome Open Research*, *6*, 80.

Desta, M., Kassie, B., Chanie, H., Mulugeta, H., Yirga, T., Temesgen, H., Leshargie, C. T., & Merkeb, Y. (2019). Adherence of iron and folic acid supplementation and determinants among pregnant women in Ethiopia: A systematic review and meta-analysis. *Reproductive Health*, *16*(1), 182.

Division of National Malaria Programme [Kenya], & ICF. (2021). *Kenya Malaria Indicator Survey 2020: Summary report*. DNMP and ICF.

Exemplars in Global Health. (n.d.). *Kenya's eCHIS: Revolutionizing community health with digital innovation*. https://www.exemplars.health/stories/kenyas-echis

Fite, M. B., Roba, K. T., Oljira, L., Tura, A. K., & Yadeta, T. A. (2021). Compliance with iron and folic acid supplementation (IFAS) and associated factors among pregnant women in sub-Saharan Africa: A systematic review and meta-analysis. *PLOS ONE*, *16*(4), e0249789.

Gathigi, L. N. (2011). *Factors influencing utilization of iron and folic acid supplementation services among women attending antenatal clinic at Nyeri Provincial Hospital, Kenya* [Unpublished master's thesis]. Jomo Kenyatta University of Agriculture and Technology.

GBD 2021 Anaemia Collaborators. (2023). Prevalence, years lived with disability, and trends in anaemia burden by severity and cause, 1990–2021: Findings from the Global Burden of Disease Study 2021. *The Lancet Haematology*, *10*(9), e713–e734. https://doi.org/10.1016/S2352-3026(23)00160-6

Getachew, M., Abay, M., Zelalem, H., Gebremedhin, T., Grum, T., & Bayray, A. (2018). Magnitude and factors associated with adherence to iron-folic acid supplementation among pregnant women in Eritrean refugee camps, northern Ethiopia. *BMC Pregnancy and Childbirth*, *18*(1), 83.

Kamau, M. W., Mirie, W., & Kimani, S. (2018). Compliance with iron and folic acid supplementation (IFAS) and associated factors among pregnant women: Results from a cross-sectional study in Kiambu County, Kenya. *BMC Public Health*, *18*, 1–10.

Kamau, M. W., Kimani, S. T., Mirie, W., & Mugoya, I. K. (2020). Effect of a community-based approach of iron and folic acid supplementation on compliance by pregnant women in Kiambu County, Kenya: A quasi-experimental study. *PLOS ONE*, *15*(1), e0227351. https://doi.org/10.1371/journal.pone.0227351

Kenya National Bureau of Statistics. (2019). *2019 Kenya population and housing census, Volume I: Population by county and sub-county*. KNBS.

Kenya National Bureau of Statistics, & ICF. (2023). *Kenya Demographic and Health Survey 2022: Key indicators report*. KNBS and ICF.

Lyoba, W. B., Mwakatoga, J. D., Festo, C., Mrema, J., & Elisaria, E. (2020). Adherence to iron-folic acid supplementation and associated factors among pregnant women in Kasulu communities in north-western Tanzania. *International Journal of Reproductive Medicine*, *2020*, 3127245.

Ministry of Health, Republic of Kenya. (2013). *National iron and folic acid supplementation communication strategy 2013–2017*. Division of Nutrition, Government of Kenya.

Mithra, P., Unnikrishnan, B., Rekha, T., Nithin, K., Mohan, K., Kulkarni, V., Holla, R., & Agarwal, D. (2014). Compliance with iron-folic acid (IFA) therapy among pregnant women in an urban area of south India. *African Health Sciences*, *14*(1), 255–260.

Nisar, Y. B., Dibley, M. J., & Mir, A. M. (2014). Factors associated with non-use of antenatal iron and folic acid supplements among Pakistani women: A cross-sectional household survey. *BMC Pregnancy and Childbirth*, *14*, 305.

Odhiambo, J. N., & Sartorius, B. (2020). Mapping of anaemia prevalence among pregnant women in Kenya (2016–2019). *BMC Pregnancy and Childbirth*, *20*, 712.

Oiye, S., Juma, M., Konyole, S., & Adan, F. (2020). The influence of antenatal oral iron and folic acid side effects on supplementation duration in low-resource rural Kenya: A cross-sectional study. *Journal of Pregnancy*, *2020*, 9621831.

Ouma, F. F., & Mulambalah, C. S. (2021). Persistence and changing distribution of leishmaniases in Kenya require a paradigm shift. *Journal of Parasitology Research*, *2021*, 9989581. https://doi.org/10.1155/2021/9989581

Peña-Rosas, J. P., De-Regil, L. M., Garcia-Casal, M. N., & Dowswell, T. (2015). Daily oral iron supplementation during pregnancy. *Cochrane Database of Systematic Reviews*, *2015*(7), CD004736.

Sendeku, F. W., Azeze, G. G., & Fenta, S. L. (2020). Adherence to iron-folic acid supplementation among pregnant women in Ethiopia: A systematic review and meta-analysis. *BMC Pregnancy and Childbirth*, *20*(1), 138.

Viswanathan, M., Urrutia, R. P., Hudson, K. N., Middleton, J. C., & Kahwati, L. C. (2023). Folic acid supplementation to prevent neural tube defects: Updated evidence report and systematic review for the US Preventive Services Task Force. *JAMA*, *330*(5), 460–466.

Wemakor, A., Garti, H., Akai, M. M., Napari, A. A., & Dankyi-Frimpomaa, J. (2020). Prevalence and factors associated with compliance to iron and folic acid supplementation in pregnancy in Tamale Metropolis, Ghana. *Nutrire*, *45*, 1–10.

World Health Organization. (2016). *WHO recommendations on antenatal care for a positive pregnancy experience*. World Health Organization.

World Health Organization. (2017). *Guideline: Preventive chemotherapy to control soil-transmitted helminth infections in at-risk population groups*. World Health Organization.

World Health Organization. (2024a). *Guideline on haemoglobin cutoffs to define anaemia in individuals and populations*. World Health Organization.

World Health Organization. (2024b). *Daily iron and folic acid supplementation during pregnancy*. e-Library of Evidence for Nutrition Actions (eLENA). World Health Organization.

World Health Organization. (2025). *WHO global anaemia estimates: Key findings, 2025*. World Health Organization.

Yismaw, A. E., Tulu, H. B., Kassie, F. Y., & Araya, B. M. (2022). Iron-folic acid adherence and associated factors among pregnant women attending antenatal care at Metema District, Northwest Ethiopia. *Frontiers in Public Health*, *10*, 978084.

Declarations

Ethical Approval and Consent to Participate

Ethical approval for the study was obtained from the Institutional Ethics and Research Committee (P451/05/2024), and a research licence was obtained from the National Commission for Science, Technology and Innovation [NACOSTI/P/24/40710]. Written informed consent was obtained from all participants before participation in the study.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets used and analysed during the current study are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare that they have no competing interests.

Funding

The study did not receive any external funding.

Authors' Contributions

LSH conceptualised the study, collected the data, conducted the analysis and drafted the manuscript. DGM provided technical guidance, reviewed the manuscript and contributed to interpretation of the findings. All authors reviewed and approved the final manuscript.

Acknowledgements

The authors acknowledge the management and antenatal clinic staff of Archers Post Sub-County Hospital, the Samburu County Department of Health, the study participants, the research assistants, and Jomo Kenyatta University of Agriculture and Technology for their support during the study.