BMJ Global Health

The influence of gender on immunisation: using an ecological framework to examine intersecting inequities and pathways to change

Marta Feletto, Alyssa Sharkey

To cite: Feletto M, Sharkey A. The influence of gender on immunisation: using an ecological framework to examine intersecting inequities and pathways to change. *BMJ Global Health* 2019;**4**:e001711. doi:10.1136/bmjgh-2019-001711

Handling editor Stephanie M Topp

Received 11 May 2019
Revised 26 July 2019
Accepted 3 August 2019

Health Section, UNICEF, New York, New York, USA

Correspondence to
Dr Alyssa Sharkey;
asharkey@unicef.org

ABSTRACT

There is still a substantial knowledge gap on how gender mediates child health in general, and child immunisation outcomes in particular. Similarly, implementation of interventions to mitigate gender inequities that hinder children from being vaccinated requires additional perspectives and research. We adopt an intersectional approach to gender and delve into the social ecology of implementation, to show how gender inequities and their connection with immunisation are grounded in the interplay between individual, household, community and system factors. We show how an ecological model can be used as an overarching framework to support more precise identification of the mechanisms causing gender inequity and their structural complexity, to identify suitable change agents and interventions that target the underlying causes of marginalisation, and to ensure outcomes are relevant within specific population groups.

Summary box

- Effectively addressing gender inequities requires a clear understanding of the reinforcing mechanisms across dimensions of disparity.
- Gender can lead to different experiences—in relation to immunisation—within households, communities and local health systems and through these different entry points, can affect programme implementation and achievements.
- Action to address the underlying causes of gender inequity requires mutually reinforcing interventions at different levels.
- An ecological model provides a valuable framework for analysing, monitoring and addressing gender inequities in immunisation.
- Developing and funding targeted implementation research is critical to advance an equity agenda, notably by providing countries with guidance on how to address gender inequities as part of health systems strengthening.

INTRODUCTION

Analyses of gender inequity in childhood immunisation have tended to concentrate on sex differentials in coverage between boys and girls, and on how broader aspects of gender inequality—particularly mother's education—affect child immunisation for both sexes. These studies show that boys and girls have the same likelihood of being vaccinated in most low-income and middle-income countries (LMICs).[1 2] A few exceptions exist at subnational levels within socioeconomically and geographically marginalised populations, in that outcomes may favour boys in some contexts, and girls in others.[2 3]

Consistently across countries, studies also indicate that children of educated mothers are significantly more likely to be immunised. Part of the relationship between mother's education and childhood immunisation coverage is explained by socioeconomic status and contextual factors, since more educated mothers tend to live in more affluent households and in areas with better access to healthcare and services.[4 5] Empirical research also reveals reinforcing mechanisms across dimensions of disparities: children of younger mothers without education, for instance, have compounded disadvantage, which can be exacerbated if they belong to a poor household.[1]

This Analysis of immunisation research and practice suggests that consideration of the socioecological context in which immunisation programmes are implemented is key to elucidate the complex range of gender inequities that can undermine programmes' achievements, and to comprehensively address them as part of health system strengthening. The deliberate focus on implementation is meant to benefit decision makers and programme implementers who work towards scaling-up coverage in an equitable way, and help inform the design and implementation

of interventions that positively impact immunisation outcomes while advancing gender equity.

Two major considerations emerge from our observations. One is the need to acknowledge the diversity of women's experiences and realities in the formulation of strategies to achieve better equity.[6 7] Women are not a homogeneous population: whether in terms of access to and control of resources, or how they approach their health needs and use services, gender intersects with other dimensions and experiences of exclusion in multiple ways, requiring an intersectional approach to implementing programmes and policies.[6 8] The second is the relevance of using an ecological view of the intervention. Implementation of an immunisation programme is an inherently multilevel endeavour, which involves users' acceptance, providers' behaviour, healthcare organisations and policy.[9] Similarly, the effect of gender can be seen at these multiple and interacting levels, and therefore change must occur across these.

In this analysis, we illustrate how an ecological model can serve as a unifying framework to understand how gender-related barriers contribute to underimmunisation, and how to inform the design of health system responses to gender inequity. In particular, we suggest the ecological framework can be applied to: i) clarify the mechanisms and pathways through which gender can influence implementation efforts and outcomes, ii) identify intervention strategies that address the underlying causes of inequity and iii) frame implementation research questions that help inform those strategies.

Inputs to support this threefold exercise are drawn from the authors' analysis of the immunisation literature, and targeted consultations with gender and/or vaccine implementation experts. A literature review guided by a purposeful strategy was conducted to identify key issues underpinning the methodological development, research knowledge and practice around gender equity in immunisation. The review also included locating organisations and individuals relevant to the domain; 22 key informants were interviewed across various funding agencies, academia and global or in-country development partners. These consultations were exploratory in nature and attempted to explore the range and nature of intervention strategies that have been put forward across diverse global contexts in an effort to address gender-related barriers in programme implementation. Both activities were undertaken between May and October 2018.

The implementation focus of this paper means that we maintain a deliberate intent to approach gender within the realities of health planning and programme implementation. In this paper, *gender inequality* is used whenever we are indicating measurable differences in experiences and outcomes across gender,[10 11] while *gender (in)equity* evokes value-based concepts entailing judgements of what is unfair and unjust.[10–12] This paper focuses on childhood immunisation; elsewhere, the authors have explored the specific perspectives that adolescent vaccination—notably Human Papillomavirus vaccination—brings to understanding and advancing gender equity.[13]

RATIONALE FOR AN ECOLOGICAL FRAMEWORK

Evidence on the impact of gender on health system needs, experiences and outcomes is readily available, yet this knowledge does not always translate easily into the science and practice of implementation. One analysis of implementation science texts, implementation theories, models and frameworks, and Cochrane reviews on implementation strategies revealed that limited research has been carried out or reported to inform how sex and gender impact implementation research and practice.[8] Furthermore, although numerous gender analysis frameworks and approaches exist to help policy-makers and implementers assess the extent to which gender is considered and integrated within programmes, these are varied and inconsistent. Morgan *et al*, for example, found 15 gender frameworks that focused specifically on health, health systems and development, and each differed in its assumptions of what should be analysed and addressed.[14] In addition, as these frameworks tend to be an expression of a donor or an agency's policies and systems for gender mainstreaming, they tend to be structured around planning and review cycles (from country assessments to programme design and development to monitoring and evaluation) but do not give the actual process of implementation much attention.[15–19]

Innovative approaches are necessary to unravel the complexity of the different layers of influence of gender on immunisation outcomes, and to understand how the mechanisms of action associated with programme implementation may operate differently within and across gender and other stratifiers.

A first step involves considering the ways in which gender dynamically interacts with socioeconomic status, education, age and life-cycle, class/caste, ethno-religious identity and other social markers to shape disparity. These processes are intersecting in that they can alter the impact of any one dimension of inequality taken by itself.[20] It follows that unequal outcomes cannot be understood or mitigated by approaches that consider gender as a single subject of inquiry.[21] For the purpose of this paper, we focus within this perspective on the extent to which gender—with the intersection of other stratifiers—can affect implementation and the outcomes of immunisation programmes.

Second, and also germane, is the focus on individual-level factors which has led to recommendations or interventions that target behaviour change at the individual level (typically for the caregiver) without regard to the broader environmental context that influences those behaviours.[22] Reflecting an ecological view of the intervention means acknowledging the various levels at which gender inequities and their connection with immunisation are experienced. These levels range from the

caregiver (individual level) to interpersonal relationships within and between households that may influence or be the very locus of decision-making (household level), to societal networks embodying and sharing norms and values that households draw on when making health-related decisions (community level), to health services providing institutional capacity for individual participation in vaccination programmes and influencing normative values related to vaccine acceptance (institutional/system level) to a broad range of public policy factors including governance and financing that directly affect access to, delivery and sustainability of vaccination programmes (policy level).[23] It is important to recognise that these levels are intertwined and interdependent.[24] The resulting paradigm is known as the ecological framework and is commonly used in health programme planning.[25]

As an organising framework, the ecological model facilitates examination of potential barriers or enablers to the access, quality and impact of immunisation programmes, ranging from factors affecting the demand of services (eg, whether a caretaker takes her child for vaccination) to factors affecting health service delivery or supply (eg, how vaccination is made available and delivered), and shows how they are inter-related in shaping vaccination coverage.

The ecological model is also compatible with the perspective of intersectionality which, as noted above, postulates that multiple social identities and positions intersect at the micro level of individual experience to reflect multiple structural-level inequalities at the macro level of societal and health systems.[21 26] As an overarching framework, it has the potential to improve equity-driven research and practice in the complex and multidimensional ways that mirror the experiences of women from the individual through to the health system and policy level.

HOW GENDER INTERACTS WITH IMPLEMENTATION

This section illustrates how an ecological model is well suited to examine the many ways in which gender, in dynamic interaction with other stratifiers, plays out at multiple levels and through different pathways to influence implementation efforts and outcomes. Barriers to demand for, access to and uptake of immunisation services are well known and the objective is not to provide an exhaustive account of those. Our objective rather is to show how gender can affect programmes' achievements through patterns of individual and collective decision-making, access to and control over resources for service use, quality of healthcare delivery and biases in service provision (table 1).

Individual level

Women are disproportionately affected by weak health services as they require more services, particularly for reproductive, newborn and child health.[27] Furthermore, despite being assigned the role of primary caregivers in the family, women are often not empowered to fulfil this role. They are tied to a gendered division of labour that leaves them with little time or opportunity for health seeking, and their lower status in the household and community limits their capacity to influence and enact decisions about their own and their child's health (table 1). A large body of evidence demonstrates the strong link between maternal education and child health. Spillovers in the community have also been documented, with positive externalities on childhood immunisation produced by the education of other local women.[28 29] There is however much debate concerning the pathways of influence.[4 5] Health literacy has been shown to be an important mediator in the relationship between maternal education and child health outcomes. Women who are health literate—irrespective of their education levels—are more likely to vaccinate their children, in both rural and urban settings.[30] Where education levels and health systems are particularly weak—such as in rural settings, even moderate levels of health literacy lead to greater use of health services.[30] Other studies focusing on the impact of knowledge of immunisation and its benefits confirm a strong effect on vaccination outcomes, at each level of education.[2 5] It is also worth noting that, as opposed to formal education, health literacy and health knowledge are modifiable and can be gained informally.[5 30]

Household level

Women tend to have poorer access to household resources.[6] In addition, access to resources does not always imply that women are able to make decisions over their allocation.[31] In societies where health-related decision-making is negotiated within the primary household and extended family, mothers may be limited in their bargaining power vis-à-vis the male partner or head of household and vis-à-vis other relatives (eg, elderly women) (table 1).

Community level

As gender shapes identity, household economic and social status, ethnicity and religion also affect 'identity performance', for example, how women can occupy a public space, or the community roles for which they are eligible.[32] These intersecting hierarchies create and reproduce systemic differences in the positioning of different groups of people within a community,[33] and shape people's relationships to communities.[34] They can hinder full community participation in the delivery of primary care services,[35] and prevent women and marginalised groups from benefiting from the interventions seeking to help them.[32]

Health system level

As immunisation services typically target mothers as the primary caregivers of children, they are themselves gendered in the way they are presented, the kind of information they provide and how they are organised and

Table 1 Gendered dimensions of immunisation services access, quality and impact

Levels of the ecological framework	Drivers of inequality	Implications for immunisation services
INDIVIDUAL (main caregiver)	FINANCIAL BARRIERS AND PRIORITISATION ► Direct and indirect costs (eg, service fees or informal charges, and transportation); ► Missed opportunities for income generation	► In low-resourced settings, a mother needs to raise the necessary resources, or mobilise the necessary means of transport to take her child to vaccination.[49] Yet, women tend to have poorer access to, and control over resources within households and communities.[6 50] ► Economic barriers are particularly relevant for single mothers and those in low-income households. In the presence of conflicting needs or livelihood insecurity, subsistence and immediate problem-solving strategies take priority over long-term health needs in general, and preventive interventions like vaccination in particular.[49]
	HEALTH LITERACY	► Recognising that access to health literacy is—in many parts of the world—gendered, women lacking health literacy have a limited understanding of immunisation (such as knowing which diseases vaccines prevent, vaccine dosage and schedule), low motivation to vaccinate their child and less capacity to negotiate the health system.[2 30 31]
	PHYSICAL AND TIME BARRIERS ► Distance to services, poor infrastructure; ► Inconvenient times of services and long queues; ► Unpredictability of posts in areas with difficult access	► Women's responsibility for 'reproductive' work (ie, work required for the maintenance of the household—including cooking and cleaning, and fetching water and firewood—and the care of children and the sick) and diversified livelihood activities, pose heavy demands on their time and may constrain service use.[2 49] ► Physical and time barriers may be amplified in the context or setting in which women live. For instance, time costs owing to poor infrastructure are greatest in rural areas, while increasing participation in the workforce is a major time barrier in urban areas. ► Women may experience lack of mobility due either to gender norms that restrict female mobility in public, or lack of transportation.[49] Mobility may also be restricted by safety and security concerns.[51]
	ACCEPTABILITY OF HEALTH SERVICES ► Poor facilities and equipment; ► Unreliable vaccine supplies; ► Experience of healthcare quality	► Mother-provider interactions at the health facility are underpinned by socioeconomic and gendered differentials (eg, poor women have to interact with higher-status vaccinators—who may be men, and also higher-status mothers).[3] Lack of privacy and confidentiality in health facilities can result in mother-provider interactions being shared publicly, and expose disadvantaged women to public scrutiny or criticisms.[3 49] ► Women in more traditional areas may not seek care for themselves or even for their children unless they have access to a female provider. Availability of female health professionals is particularly important where sociocultural and/or religious norms and practices restrict social and physical contact between men and women.[38]
HOUSEHOLD (including extended family and lineage grouping)	-INTRA-HOUSEHOLD ACCESS TO RESOURCES	► Women tend to have less access to household income and assets, and income generating opportunities.[6]
	HEALTH-RELATED DECISION MAKING	► In many settings, women's success in negotiating decisions and resources that affect their children partly depends on their bargaining position in the gendered and generational hierarchies of the household.[5 49 52]

Continued

Table 1 Continued

Levels of the ecological framework	Drivers of inequality	Implications for immunisation services
COMMUNITY	PARTICIPATION AND REPRESENTATION	► Gender and other structural relationships—eg, family wealth, caste/ethnicity, etc—define membership and participation in formal and informal structures and processes through which people make decisions, establish leadership or organise social and economic activities in their community.[35 50 53] As a result, women's participatory voice and power in community programming—including many health initiatives—is often limited.[33]
	SOCIAL COHESION AND INTEGRATION	► In migrant families and in communities with more fluid, heterogenous and transient populations, women are more likely to lack the social support networks that could encourage health seeking, eg, with financial assistance or help with their chores.[49]
	ACCEPTABILITY OF IMMUNISATION SERVICES	► Local knowledge and expertise is important in determining acceptance of vaccination. Young mothers may trust and rely on elderly women as source of knowledge and information, more than health workers.[49] Similarly, key authority figures, religious institutions, teachers and local media outlets may formulate conflicting positions towards vaccination, which may gain currency in the respective settings.[2 49] ► Politically motivated resistance to vaccination is typically asked by men or leaders in the community. Whether or not they agree with the view of these authority figures, women in these settings may feel considerable pressure not to vaccinate their child.[2 49]
/**HEALTH SYSTEM**	HUMAN RESOURCES AND OVERALL MANAGEMENT OF THE SERVICE ► Service organisation; ► Availability of essential commodities and staff (male and female); ► Range of services available	► Gender (male vs female) and/or geographic (urban vs rural and/or remote facilities) imbalance in the distribution of human resources for health affect service provision and delivery.[54] Health providers face increased demands with declining resources for health services.[55] ► Female health workers—particularly those at the front line—themselves face gender biases and discrimination where they occupy lower status health occupations.[38 56] Similarly, female community health workers are under-recognised, underpaid and overworked, and often lack support from the wider health system.[57]
	PERFORMANCE AND QUALITY OF CARE ► Responsiveness of services; ► Provider attitudes and skills; ► Accountability for performance	► Interpersonal relationships between user and provider, which characterise service delivery, are an important marker of quality of care.[6] The social distance between user and provider—which Favin *et al*[55] refer to as the gaps with respect to gender, education, class, caste, ethnicity and other social stratifications—is important in shaping the interaction.[38] Discriminatory values, norms and practices and biases in the health system can deter women from attending services.[6]
POLICY	GOVERNANCE AND STAKEHOLDER ENGAGEMENT	► Women are less likely to be in senior, decision-making or policy-making roles than their male counterparts.[54] Their low levels of representation draw less attention to women's needs, both as users and providers.[27]
	HEALTH REFORM PROGRAMMES AND MECHANISMS	► Health sector reforms that have been implemented in many countries have rarely considered their implications for gender equity in general, and gender equity in healthcare in particular.[58]
	POLICIES, LAWS AND REGULATIONS THAT MAY AFFECT IMMUNISATION	► Policy and legislative frameworks and leadership are critical to build accountability for gender equity into health systems.[39] ► There is a number of challenges to integrating gender into medical curricula, including institutional resistance and limited expertise among faculty to teach gender and women's health issues.[18] Attempts at integrating gender in health provider training have largely remained at small scale.[18]

managed.[2] Health access and quality of care are typically considered to be separate, but these aspects are interconnected. It is critical to consider the importance of the process of care—ie, the content and nature of user-provider interactions—and the wide array of factors that influence those interactions (from the overall management of the service to staff attitudes and skills) as potential deterrents for women to accessing health services (table 1).

The healthcare system may undermine gender equity from the perspective of women as users, and as providers.[6] Women's role as health providers, both within the formal health system and as informal providers, and the gender imbalance of human resources for health—seeing more women in lower status health occupations—have not been meaningfully addressed in health research or policy.[36 37] Yet, the gendered dimensions of their work has come to be acknowledged as a crucial element in the gap between health policy and implementation.[38]

Policy level

Table 1 presents a few examples of how structural processes and policies may generate, amplify or temper gender inequities. This paper is focused on implementation and only touches on the policy level, but it is worth noting that an enabling policy environment ought to be promoted for interventions to produce social change.[39]

HEALTH SYSTEM RESPONSES TO GENDER INEQUITIES

An ecological approach also lends a framework for programmatic interventions, in relation to the levels of action (eg, individual, household, community or system), change agents and populations of interest, types of intervention and intended impact.

Table 2 presents potential pathways of change and intervention impact, aligning the types of interventions with the levels in which, or agents, channels and settings through which, they can have their effect. Green and Glasgow[24] would denote this as ecological alignment. This analysis does not aim to provide a full inventory of content, but rather to showcase the importance of multiple strategies and levels through which the programme may have its intended impacts, and acknowledge the behaviour of diverse, interconnected agents and processes from a system-wide perspective.

Table 2 includes collated evidence from the literature suggesting that different agents can play a fundamental role in driving change (left-hand column), and inputs from key informants on country implementation experience (right-hand column). Programmatic interventions that have a positive impact on immunisation uptake are widely documented; these range from interventions that stimulate demand for vaccines to those that target health service delivery or supply.[40–42] The scope of the interviews we conducted however focused on how interventions are or can be modelled to proactively address the mechanisms through which gender inequity hinders children from being vaccinated.

It emerged that interventions that have been or are being implemented to address gender-related determinants of access to, demand of or uptake of vaccination services are numerous, but there is a lack of research evaluating such efforts. These interventions vary in approach and implementation setting, but cluster around the strategies outlined in table 2.[43] They exemplify how implementation can take a gender-informed stance by targeting the gendered dimensions of immunisation services access, quality and impact. For instance, information, education and communication (IEC) interventions are an integral component of immunisation programmes. Yet, in consideration of the gender dynamics that may skew the uptake of information focused on women's health needs, such as maternal newborn and child health, they ought to reconsider both target and media to take into account the role of decision makers other than the main caregiver, and customise the content to reach low-literacy populations and ethnic or language minorities (table 2). Table 2 also exemplifies how action to address the underlying causes of gender inequity requires multilevel strategies, which promote change at the individual level and simultaneously shape supportive structures at the household, community and health system levels to encourage and support health-sustaining practices such as vaccination.

OPPORTUNITIES FOR IMPLEMENTATION RESEARCH

A commitment to address gendered dimensions of immunisation requires tackling the social context of individual health behaviour and community level dynamics, empowering individuals and communities for positive change and fostering transformation of gender inequities within the larger immunisation programme. A strategic approach to implementation research is critical to take the equity agenda forward, and provide clear guidance to countries on how to address gender inequity within the realities of health planning and programme implementation. The approaches outlined in table 2 prompt a number of questions for implementation research, and salient themes worth investigating arise in each of the levels. For instance, interventions to improve health literacy, which have typically been limited in scale, need to be designed with attention to scale-up and sustainability. Other interventions need to be piloted to assess conditions such as feasibility and acceptability. For instance, that communities provide an ideal setting for women's participation and action is well documented,[44 45] but whether community strategies have potential for effectiveness in urban areas or settings with high levels of heterogeneity and transience needs investigating, as does what in these settings may foster a 'social space' where women, and men, can gather and be receptive to intervention's messages and objectives. Finally, interventions need to incorporate monitoring and process evaluation data to understand the conditions and contexts under

Table 2 Change agents and illustrative programmatic entry points to promote gender equity in immunisation

Levels of the ecological framework	Agents of change: How they can make a difference, and why they should be engaged	Entry points for programming: Clusters of intervention strategies
INDIVIDUAL	WOMEN'S GROUPS ► *FOR CAPACITATION* – Improved maternal health literacy is a contributing factor to the beneficial effects of women's participation in groups to improve maternal and neonatal health in LMICs.[44] Furthermore, benefits are not limited to women with high reported levels of intervention exposure, and spillovers in the community have been documented.[59] ► *FOR HEALTH ACCESS* – A space for women's dialogue builds women's confidence and improves access to information related to health needs, which positively impact utilisation.[60]	EMPOWERING WOMEN WITH KNOWLEDGE, MOTIVATION AND SELF-EFFICACY ► Strengthen women's health literacy, particularly in areas with weak health systems and low educational levels. ► Initiate or leverage women's groups as a platform for counselling and behaviour promotion focusing on health literacy, and mentoring to access government services and entitlements.
HOUSEHOLD	WOMEN'S GROUPS ► *FOR SOCIAL COHESION OR INTEGRATION* – Some aspects of women's time poverty may be mitigated when mothers can share the burden of child care or can rely on assistance from family or the community.[31] MEN ► *AS HUSBANDS OR A PARENT* – Men's financial contribution to the household remains one of the most significant factors in determining the healthcare that children receive.[48] Their involvement in decision-making around child care can increase the likelihood that positive decisions are made to seek immunisation services.[31] ► *AS CLIENTS* – Men may also have support needs requiring referral to external social support mechanisms, especially in challenging settings. Engaging them in questions about their children's immunisation might encourage them to participate in conversations about health.[61] ELDERLY WOMEN ► *AS AUTHORITIES IN HOUSEHOLDS* – Elderly women with authority in the household can play an important role in helping (or hindering) younger women's negotiations over decisions and resources that affect their children.[31 52]	ENCOURAGE FATHERS' GREATER INPUT INTO CHILD CARE, AND INTEGRATING THE ROLE OF OTHER HOUSEHOLD MEMBERS AND THEIR INVOLVEMENT IN CHILD CARE ► Create communication platforms and related delivery strategies to engage on positive behaviours related to childhood development focusing on delivering the same messaging (eg, on child immunisation) to both mothers and fathers as well as other decision makers in the household. ► Complement women's group interventions with programmes to involve fathers, including facilitating regular sessions with women and men to foster collaborative parenting and decision-making.
COMMUNITY	MEN ► *AS INFLUENCERS* – Men can have considerable influence in shaping normative values related to vaccine acceptance within the broader societal network (eg, as community facilitators, cultural leaders, religious or political leaders).[2 49] ► *AS ALLIES IN WOMEN'S EMPOWERMENT AGENDA* – Programmes with the potential to shift gender roles by empowering women through improvement in knowledge, decision-making and economic gains, need to consider the roles and interests of men as potential partners in empowerment efforts.[45 47] ELDERLY WOMEN ► *AS GATEKEEPERS OF SOCIAL NORMS* – In communities where older women are seen as respected elders, they can have a strong influence on vaccine acceptance and support for participation in immunisation programmes.[49]	ESTABLISHING A DIALOGUE WITH LOCAL KNOWLEDGE AND EXPERTISE, AND PROMOTING A SHARED SENSE OF PURPOSE AND ACCOUNTABILITY ► Engage fathers and other decision makers and influencers in the household and community—including elderly women, on awareness and the importance of vaccination, providing them with information on basic health, and routine immunisation status of their communities.

Continued

Table 2 Continued

Levels of the ecological framework	Agents of change: How they can make a difference, and why they should be engaged	Entry points for programming: Clusters of intervention strategies
HEALTH SYSTEM	FEMALE PROVIDERS ► *AS FACILITATORS FOR HEALTHCARE ACCESS* – In areas where female seclusion and/or gender segregation are prevalent, women are critical for accessing women. Female frontline workers communicate directly with female caregivers and indirectly with other women in the community, thus enabling a larger capacity for trust.[61] MOTHERS/WOMEN'S GROUPS ► *AS STEWARDS TO PROMOTE RESPONSIVE SERVICES* – Mothers' voices in service planning and programmes, and their direct feedback and guidance can help ensure that services are acceptable and accessible to the most disadvantaged.[53]	ENGAGING AND ADEQUATELY SUPPORTING FEMALE FRONTLINE WORKERS BY ENSURING LINKAGES WITH THE WIDER HEALTH SYSTEM ► Recruit women from inside the community—especially where vaccination is religiously or politically controversial—to improve mobilisation, and support efforts to reach marginalised women and children. ► Ensure mobile health teams have a balanced female/male ration where needed, particularly when home visits are conducted. ► Consider capacity building/mentoring to improve technical capacity of health personnel, including on providing confidential care to beneficiaries, and interpersonal communication skills to sensibly relate with vulnerable groups. MAKING ADJUSTMENTS TO SERVICE PROVISION BASED ON COMMUNITY PERSPECTIVES OF QUALITY OF CARE ► Tailor location of outreach services to meet the needs of caregivers and ensure acceptability of services among both mothers and fathers. This may include ensuring the schedule is agreed on with the beneficiaries and enable equal access and opportunity to mothers and fathers, and timely communicating schedule and location to the community. ► Provide immunisation services at more appropriate and flexible times for women and their families. Approaches may encompass establishing a fast line for mothers and caregivers who come only for vaccination services, designating a space specifically for vaccination to ensure an efficient flow of patients, or changing or extending vaccination session hours.

LMICs, low-income and middle-income countries.

which they can be successfully implemented. For instance, adjustments to service provision are considered critical in facilitating access but while some can be implemented at low or no cost, others may require a compensation system or deployment of additional staff or revival of competencies. Tested strategies are required for effectively redistributing or capacitating limited human resources for health in underserved areas.

To conclude, implementation research that helps inform the design of health system responses to gender inequity ought to consider not only the impact of these interventions on behavioural outcomes. It should also seek to understand whether these interventions do improve broader outcomes for women. There is mixed evidence for instance on the impact on women's status and on the relationship between the sexes, of interventions that engage both men and women. Notably, the supportive effect of a man's involvement in his wife's use of services or health behaviours has shown to be stronger among fathers with higher levels of education who may be more open to messages concerning shared domestic and child care responsibilities.[46] Yet, approaches that hold the potential to shift gender roles by empowering women through improvements in knowledge, decision-making and economic gains have shown in some contexts to exacerbate household dynamics by reinforcing existing power differentials.[47] Understanding the structural complexity of gender relations in any given context is critical to reduce gender-related disadvantages in access to health services, quality of services and health outcomes, and to prevent potential unintended consequences and ensure implemented interventions promote rather than hinder gender equity. There is scope to access learning from gender equity initiatives in areas of adult and adolescent health where there are more demonstrated results and to build linkages to these initiatives,[48] to elucidate on the challenges of implementing and evaluating interventions that address gendered dimensions of immunisation on one hand, and to create synergistic benefits for children's health on the other.

CONCLUSION

As this Analysis has shown, an ecological framework is central to consider immunisation programmes within the broader context that influences implementation and change, including the role that gender inequities may play, and to acknowledge the structural complexity in which interventions are implemented. If immunisation programmes are to effectively scale up coverage and reduce gender inequities, it is critical to understand the different ways in which the intervention is affected when households, communities and health systems interact with it. Furthermore, how gender intersects with various forms of exclusion and the reinforcing mechanisms across dimensions of disparity need to be understood, to more effectively target pockets of marginalisation that may be missed by wide-reach interventions.

An ecological framework has much to offer in supporting more precise identification of inequities, in developing interventions that target the underlying causes of marginalisation and ensuring outcomes are relevant within specific population groups. Addressing gendered structural determinants and associated gendered vulnerabilities is a necessary investment, and impact is dependent on multilevel approaches, that is, mutually reinforcing interventions within an enabling policy environment.

Acknowledgements The authors would like to thank Lauren Pandolfelli, Sagri Singh and Shreyasi Jha for their valuable inputs while an earlier version of this framework was under development. The authors would like to thank many stakeholders who gave their time to participate in interviews to discuss country experience of interventions targeting gender-related barriers. The authors would also like to thank Molly Abbruzzese, Feyrouz Kurji and Richard Duncan of the Secretariat for the Equity Reference Group on Immunisation (ERG), who reviewed part of this work that shaped a subsequent discussion paper for the ERG.

Contributors MF and AS conceived the analysis. MF developed the paper and AS commented on drafts. Both authors agree with the manuscript's results and conclusions.

Funding This article is based on work funded through a grant from Gavi, The Vaccine Alliance to UNICEF.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No additional data are available.

REFERENCES

1. World Health Organization. *Explorations of inequality: childhood immunization*. Geneva: WHO, 2018.
2. Hilber AM, Bosch-Capblanch X, Schindler C, *et al*. *Gender and immunisation. Summary report for SAGE*. Basel: Swiss Centre for International Health, Swiss Tropical and Public Health Institute, 2010.
3. Jones N, Walsh C, Buse K. *Gender and immunisation. Abridged report. A knowledge stocktaking exercise and an independent assessment of the GAVI Alliance. A report commissioned by the Gavi Alliance Secretariat*. London: Overseas Development Institute, 2008.
4. Balogun SA, Yusuff HA, Yusuf KQ, *et al*. Maternal education and child immunization: the mediating roles of maternal literacy and socioeconomic status. *Pan Afr Med J* 2017;26.
5. Vikram K, Vanneman R, Desai S. Linkages between maternal education and childhood immunization in India. *Soc Sci Med* 2012;75:331–9.
6. Sen G, Östlin P. Gender inequity in health: why it exists and how we can change it. *Glob Public Health* 2008;3:1–12.
7. Hankivsky O, Grace D, Hunting G, *et al*. An intersectionality-based policy analysis framework: critical reflections on a methodology for advancing equity. *Int J Equity Health* 2014;13:119.
8. Tannenbaum C, Greaves L, Graham ID. Why sex and gender matter in implementation research. *BMC Med Res Methodol* 2016;16:145.
9. Proctor EK, Landsverk J, Aarons G, *et al*. Implementation research in mental health services: an emerging science with conceptual, methodological, and training challenges. *Adm Policy Ment Health* 2009;36:24–34.
10. Tugwell P, Petticrew M, Kristjansson E, *et al*. Assessing equity in systematic reviews: realising the recommendations of the Commission on social determinants of health. *BMJ* 2010;341:c4739.
11. Whitehead M. The concepts and principles of equity and health. *Health Promot Int* 1991;6:217–28.

12. World Health Organisation. *Handbook of health inequality monitoring: with a special focus on low- and middle-income countries*. Geneva: WHO, 2013.
13. Feletto M, Sharkey AB. Broadening the perspective on gender equity in immunization: the unique contributions of Human Papillomavirus vaccination. *Vaccine* 2019;37:5920–2.
14. Morgan R, George A, Ssali S, *et al*. How to do (or not to do)… gender analysis in health systems research. *Health Policy Plan* 2016;31:1069–78.
15. March C, Smyth I, Mukhopadhyay M. *A guide to Gender-Analysis frameworks*. London: OXFAM, 1999.
16. Gender and Health Group, Liverpool School of Tropical Medicine. *Guidelines for the analysis of gender and health*. Liverpool School of Tropical Medicine and Department for International Development: Liverpool, 1999.
17. World Health Organisation. *Gender analysis in health: a review of selected tools*. Geneva: WHO, 2002.
18. Ravindran TKS, Kelkar-Khambete A. Gender mainstreaming in health: looking back, looking forward. *Glob Public Health* 2008;3:121–42.
19. World Health Organisation. *The Innov8a approach for reviewing National health programmes to leave no one behind*. Geneva: WHO, 2016.
20. Iyer A, Sen G, Östlin P. The intersections of gender and class in health status and health care. *Glob Public Health* 2008;3:13–24.
21. Bowleg L. The Problem With the Phrase *Women and Minorities:* Intersectionality—an Important Theoretical Framework for Public Health. *Am J Public Health* 2012;102:1267–73.
22. Bauer GR. Incorporating intersectionality theory into population health research methodology: challenges and the potential to advance health equity. *Soc Sci Med* 2014;110:10–17.
23. Bingham A, Janmohamed A, Bartolini R, *et al*. An approach to formative research in HPV vaccine introduction planning in low-resource settings. *Open Vaccine J* 2009;2:1–16.
24. Green LW, Glasgow RE. Evaluating the relevance, generalisation, and applicability of research: issues in external validation and translation methodology. *Eval Health Prof* 2006;29:126–53.
25. Green LW, Kreuter MW. *Health program planning: an educational and ecological approach*. New York: McGraw-Hill, 2005.
26. Krieger N. Methods for the scientific study of discrimination and health: an ecosocial approach. *Am J Public Health* 2012;102:936–44.
27. Ostlin P, Eckermann E, Mishra US, *et al*. Gender and health promotion: a multisectoral policy approach. *Health Promot Int* 2006;21:25–35.
28. Kravdal Øystein, Kravdal O. Child mortality in India: the community-level effect of education. *Popul Stud* 2004;58:177–92.
29. Parashar S. Moving beyond the mother-child dyad: women's education, child immunization, and the importance of context in rural India. *Soc Sci Med* 2005;61:989–1000.
30. Johri M, Subramanian SV, Sylvestre M-P, *et al*. Association between maternal health literacy and child vaccination in India: a cross-sectional study. *J Epidemiol Community Health* 2015;69:849–57.
31. Liverpool School of Tropical Medicine. *Gender influences on child survival, health and nutrition. A narrative review to UNICEF*. New York: UNICEF, 2011.
32. Scott K, George AS, Harvey SA, *et al*. Negotiating power relations, gender equality, and collective agency: are village health committees transformative social spaces in northern India? *Int J Equity Health* 2017;16:84.
33. Campbell C, Jovchelovitch S. Health, community and development: towards a social psychology of participation. *J Community Appl Soc Psychol* 2000;10:255–70.
34. Agarwal B. Environmental action, gender equity and women's participation. *Dev Change* 1997;28:1–44.
35. McCoy DC, Hall JA, Ridge M. A systematic review of the literature for evidence on health facility committees in low- and middle-income countries. *Health Policy Plan* 2012;27:449–66.
36. Gupta N, Diallo K, Zurn P, *et al*. Assessing human resources for health: what can be learned from labour force surveys? *Hum Resour Health* 2003;1:5.
37. Nurses GA. Community health workers, and home carers: gendered human resources compensating for skewed health systems. *Glob Public Health* 2008;3:75–89.
38. Govender V, Penn-Kekana L. Gender biases and discrimination: a review of health care interpersonal interactions. *Glob Public Health* 2008;3:90–103.
39. Unterhalter E. Mobilization, meanings and measures: reflections on girls' education. *Development* 2005;48:110–4.
40. Johri M, Pérez MC, Arsenault C, *et al*. Strategies to increase the demand for childhood vaccination in low- and middle-income countries: a systematic review and meta-analysis. *Bull World Health Organ* 2015;93:339–46.
41. Phillips DE, Dieleman JL, Lim SS, *et al*. Determinants of effective vaccine coverage in low and middle-income countries: a systematic review and interpretive synthesis. *BMC Health Serv Res* 2017;17:681.
42. LaFond A, Kanagat N, Steinglass R, *et al*. Drivers of routine immunization coverage improvement in Africa: findings from district-level case studies. *Health Policy Plan* 2015;30:298–308.
43. Feletto M, Sharkey A, Rowley E, *et al*. *A gender lens to advance equity in immunisation*. New York: Equity Reference Group for Immunisation, 2018.
44. Prost A, Colbourn T, Seward N, *et al*. Women's groups practising participatory learning and action to improve maternal and newborn health in low-resource settings: a systematic review and meta-analysis. *The Lancet* 2013;381:1736–46.
45. Muralidharan A, Fehringer J, Pappa S, *et al*. *Transforming gender norms, roles, and power dynamics for better health: evidence from a systematic review of Gender-Integrated health programmes in low- and middle-income countries*. Washington DC: Futures Group, Health Policy Project, 2015.
46. Kraft JM, Wilkins KG, Morales GJ, *et al*. An evidence review of gender-integrated interventions in reproductive and maternal-child health. *J Health Commun* 2014;19:122–41.
47. Jennings L, Gagliardi L. Influence of mHealth interventions on gender relations in developing countries: a systematic literature review. *Int J Equity Health* 2013;12:85.
48. Richards E, Theobald S, George A, *et al*. Going beyond the surface: gendered intra-household bargaining as a social determinant of child health and nutrition in low and middle income countries. *Soc Sci Med* 2013;95:24–33.
49. Merten S, Martin Hilber A, Biaggi C, *et al*. Gender determinants of vaccination status in children: evidence from a meta-ethnographic systematic review. *PLoS One* 2015;10:e0135222.
50. Taukobong HFG, Kincaid MM, Levy JK, *et al*. Does addressing gender inequalities and empowering women and girls improve health and development programme outcomes? *Health Policy Plan* 2016;31:1492–514.
51. Langer A, Meleis A, Knaul FM, *et al*. Women and health: the key for sustainable development. *The Lancet* 2015;386:1165–210.
52. Sanneving L, Trygg N, Saxena D, *et al*. Inequity in India: the case of maternal and reproductive health. *Glob Health Action* 2013;6:19145.
53. Meinzen-Dick R, Zwarteveen M. Gendered participation in water management: issues and illustrations from water users' associations in South Asia. *Agric Human Values* 1998;15:337–45.
54. Exavery A, Lutambi AM, Wilson N, *et al*. Gender-based distributional skewness of the United Republic of Tanzania's health workforce cadres: a cross-sectional health facility survey. *Hum Resour Health* 2013;11:28.
55. Favin M, Steinglass R, Fields R, *et al*. Why children are not vaccinated: a review of the grey literature. *Int Health* 2012;4:229–38.
56. Vlassoff C, Garcia Moreno C. Placing gender at the centre of health programming: challenges and limitations. *Soc Sci Med* 2002;54:1713–23.
57. Pfaffmann Zambruni J, Rasanathan K, Hipgrave D, *et al*. Community health systems: allowing community health workers to emerge from the shadows. *Lancet Glob Health* 2017;5:e866–7.
58. Pan American Health Organisation. *Evaluating the impact of health reforms on gender equity. A PAHO guide*. Washington, DC: Pan American Health Organisation, 2001. As reported in Sen & Ostlin.
59. Abramsky T, Devries K, Kiss L, *et al*. Findings from the Sasa! study: a cluster randomized controlled trial to assess the impact of a community mobilization intervention to prevent violence against women and reduce HIV risk in Kampala, Uganda. *BMC Med* 2014;12:122.
60. CARE Global VSLA Reach. *An overview of the global reach of CARE's Village Savings and Loans Association Programing*. London: CARE, 2017.
61. Global Polio Eradication Initiative. *Technical brief: gender*. Geneva: World Health Organization, 2018.