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The Association of Access to Resources in the Workplace During Menstruation on Individual Well-Being Among Adult, Working women in Nepal and Kenya

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2020

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Abstract

The Association of Access to Resources During Menstruation in the Workplace on Individual Well-Being Among Adult, Working women in Nepal and Kenya

By: Ivree Datcher

Context: Menstrual health has been identified as a key component of sexual and reproductive health and is integral in achieving many of the Sustainable Development Goals and addressing gender equality and human rights. Prior research shows that women spend many hours daily at the workplace, signifying the large impact the workplace can have on health. The increase in attention focused on menstruation and the menstrual needs of women, calls for researchers to further assess determinants that may be associated with outcomes like individual well-being that are related to menstrual experiences specific to the workplace.

Methodology: During the year 2021, 1220 females aged 18-53 were recruited in Nepal (n=479) and Kenya (n=741) to complete in-person surveys to assess various menstruation-related individual, workplace, and biological determinants and their association with individual, workplace, and biological outcomes. This secondary analysis includes 1033 of the primary research respondents (Kenya: 611; Nepal: 422) to assess if individual and workplace determinants are associated with individual wellbeing. Simple and multiple linear regression analyses were conducted using SAS 9.4.

Results: 34% (n=350) of respondents reported poor individual wellbeing overall. Poor individual well-being among women in Nepal was 20% (n=85) and 43% (n=265) among women in Kenya. The physical environment and individual well-being was significantly associated in the overall sample in Nepal, but the association was not significant in Kenya. Outcomes among working women in Nepal were overall better than outcomes among working women in Kenya.

Discussion: Findings suggest that having access to things like an optimal physical workplace environment, resources available at the workplace, and access to individual level resources improve individual wellbeing overall. Based on these findings, it is recommended to focus on increasing access to workplace menstrual materials, environmental improvements and individual menstrual materials to improve individual wellbeing among working menstruators in Nepal and Kenya.

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Chapter 1: Introduction

Introduction and Rationale

The mandating of women and minorities inclusion in all government-funded clinical studies (unless their exclusion could be justified) by the National Institute of Health (NIH) over twenty-five years ago has contributed to a rise in women's health research programs. While there is an expansion of research that seeks to address the experiences of health outcomes specific to women only, such as menstruation, there is a limited understanding of their experiences while working. The workplace menstruation challenges that have been identified by existing literature are comparable to challenges experienced by school-aged girls managing their menstruation at school, including inadequate facilities, water, and menstrual material access; stigmatizing social environments; and institutional policies (Hennegan et al., 2020; Abanyei et al., 2019). While measures have been developed to assess experiences of menstruation and sanitation in the household setting, and revalidated to be acceptable among women working in markets, schools, and healthcare work settings (Caruso et al., 2017; Caruso et al., 2020; Hennegan et al., 2021), research remains limited.

However, because existing research about menstruation mainly focuses on three workplace types (markets, schools, healthcare settings), there is a need for research that understands menstruation experiences among women at work in additional workplace settings to inform interventions that address barriers women face while managing menstruation at work. Additionally, there is limited research on individual and workplace determinants and individual level outcomes among women across workplace settings (USAID, 2021).

Problem Statement

Existing research suggests that menstruation does impact quality of work life and productivity among menstruators. A secondary analysis conducted in Burkina Faso, Niger, and Nigeria found that 19%, 11% and 17% of respondents reported missing work due to menstruation, respectively (Hennegan et al., 2021). Associations have also been found between use of disposable pads and reduced work absenteeism in Burkina Faso (Krenz et al., 2018) and Bangladesh (Czura et al., 2019). To improve outcomes like absenteeism/presenteeism, productivity, and individual well-being, we must understand what determinants impact these outcomes. The workplace physical environment, access to resources, and demographic factors have emerged as being influential in managing menstruation at work and impacts menstruation experiences (USAID, 2021).

Furthermore, access to resources like menstrual materials, pain relief, knowledge and social support have been identified as imperative to menstrual experiences in the workplace (USAID, 2021). There is a need to further understand how access to resources interacts with individual well-being.

Purpose Statement

The aims of this analysis are:

1. To describe the physical environment and access to resources related to menstruation where the women in Nepal and Kenya work;
2. To identify the proportion of women who work outside the home who report poor individual well-being;
3. To evaluate the association between the workplace physical environment, access to

workplace menstruation resources, and individual well-being;

4. To compare the outcome and differences in associations among working women in Nepal with working women in Kenya

We hypothesize that there will be an association between the physical environment, access to resources, and individual well-being.

Significance Statement

This study will provide insights about the experiences of menstruators while working outside the home in Nepal and Kenya. There is a lack of understanding the associations between the physical environment, access to workplace resources, and individual determinants like access to materials, pain management, social support, knowledge and individual well-being among adult working menstruators. Increasing research that understands the impact of individual and physical environment determinants on individual well-being could better shape future interventions to fully address the needs of adult working menstruators. Additionally, research that focuses on the relationship between workplace and individual determinants and individual well-being will add to existing literature that seeks to understand the experiences of adults working menstruators in Nepal and Kenya by creating a more holistic view of their experiences.

Definition of Terms

Adult, working women – Refers to women aged 18 or older and are working outside of the home.

ARISE – The Agency, Resources, and Institutional Structures for Sanitation-related Empowerment

Menstruation – Periodic discharge of blood and tissue from the uterus (National Cancer Institute def.)

MPNS – Menstrual Practice Needs Scale

NIH – National Institute of Health

USAID – United States Agency for International Development

WASH – Water, Sanitation, and Hygiene

WASHPaLS – Water, Sanitation, and Hygiene Partnerships and Learning for Sustainability

WHO – World Health Organization

Chapter 2: Comprehensive Review of Literature

Importance of Menstruation Research Among Adult Women

Since the mandating of women and minorities inclusion in all government-funded clinical studies [unless their exclusion could be justified] by the National Institutes of Health (NIH) over twenty-five years ago, there has been a rise in women's health research programs (National Institutes of Health, 1994). Nevertheless, women's health concerns continue to be underrepresented in research today. Many attribute this underrepresentation to the Food and Drug Administration who released a guidance that suggested the exclusion of females of "child-bearing age" in clinical trials from 1977 to 1993 (Meek, 2019). Though policies have been updated since, the lack of diversity in study subjects has ultimately impacted research topics investigated (or not investigated) to this day.

More specifically, menstruation is underrepresented in research because it is something experienced entirely by females. Menstruation can interrupt "education, employment, health, and contributes to restriction of behavior" but still receives a minimal amount of attention. This implies "that girls' and women's needs are unworthy of attention" (Caruso et al., 2019). Although studies regarding menstruation have been increasingly carried out, many are focused on the menstruation of school-aged and school going girls. A qualitative systemic review of women's and girl's experiences in low-income and middle-income countries found that only 12

of 76 studies focused on adult women (Hennegan, Shannon, Rubli, et al., 2019). And there is an even more limited understanding of women's experiences of menstruation in the workplace, particularly if working outside the home (Caruso, Clasen, Hadley et al., 2017; Caruso et al., 2020; Caruso et al., 2019; MacRae et al., 2019).

Given the barriers that are faced among school-aged and school-going girls, it is suggested that similar barriers may exist for women within the workplace. Existing literature has addressed "the critical gap of adequate measurements to improve quantitative menstrual health research and program evaluation" (Hennegan, Bukenya, et al., 2021). Stigma, behavioral expectations, and resource limitations have been identified as some of the barriers that affect the menstruation experience for women at work. There is a need for increased research that seeks to understand additional barriers that may influence menstruation experiences at work to "broaden the understanding of menstrual experiences, determinants, and outcomes" (USAID, 2021) and inform programming to ameliorate challenges.

Menstruation Challenges

This section of the literature review discusses existing literature on barriers women face while menstruating in their communities: stigma, behavioral expectations, and resource limitations. The additions that existing literature have contributed to public knowledge will also be discussed.

Stigma and Behavior Expectations

Prior research has highlighted many challenges that menstruators face in their respective cultural contexts, with stigma being one that is overarching (Hennegan, Shannon, Rubli, Schwab, Melendez-Torres, 2019). Across cultures, menstruation has been stigmatized as "dirty" which has had a permeating influence on menstruators (Hennegan, Shannon, Rubli, Schwab, Melendez-Torres, 2019). Because of the stigmatization, topics regarding menstruation are not openly discussed, which contributes to barriers to accessing accurate information or seeking support (Hennegan et al., 2019).

Additionally, the stigmatization associated with menstruation has contributed to self-imposed expectations to keep menstruation hidden (Hennegan et al., 2019). Stigma and social support are related as the community is essentially part of the social support group that menstruators normally have. Adequately understanding the impact of stigma can offer insight on practices that may be commonly used based on the expectations on the community, regardless of what is comfortable for the menstruator. Stigmatization is an overarching barrier that constantly impacts menstruators.

Literature suggests that menstrual experience is impacted by internal and external expectations (Hennega et al., 2019). These expectations could stem from cultural or religious expectations of menstruators and the implicit ideals of prioritizing cleanliness on menstruating bodies (Hennegan et al., 2019). For example, subpopulations in Nepal have practiced Chhaupadi,

a ritual that secludes menstruators from the community and home during menstruation (Amatya et al., 2018). Chhaupadi is also known as menstrual exile and the tradition supports notions of "untouchability." (Amatya et al., 2018). Girls and women are forbidden from touching other people and objects during menstruation, and therefore are required to live away from the community during menstruation (Amatya et al., 2018). A mixed-methods study collected data from 107 girls and found that 77% of participants practiced exile during their menstruation; of those 4% exiled to traditional *Chhau* sheds, 82% to livestock sheds, and 14% to courtyards outside of their homes (Amatya et al., 2018). The rest of the girls (23%) remained inside of their homes during menstruation, yet still practiced some sort of menstrual taboo like nutritional restrictions and inadequate hygiene practices (Amatya et al., 2018). In Zambia, an exploratory qualitative study conducted among 51 girls aged 13-20 years old showed that "girls suffer from poor menstrual hygiene" that originates from "lack of knowledge, cultural tradition, and socio-economic and environmental complaints" (Lahme et al., 2018). The implications of practices of exile and beliefs that menstruation is contaminating has contributed to social structures that perpetuate poor menstruation practices among menstruators through heightened barriers that stifle comfortable menstruation experiences. The beliefs that menstruation is associated with impurity has impacted women's and girls' interactions with the community because they are not allowed to cook or touch food and have restrictions on having sex and on contact with males,

livestock, crops, and farming (Crichton et al., 2013; Mohamed et al.; 2018; Garg et al., 2001; Caruso et al., 2017; Wall et al., 2018).

The behavioral expectations of menstruators are also related to the stigmatization of menstrual periods. As women and girls internalize the stigma, limitations associated with menstruation, and the expectation for their behaviors to shift accordingly to reflect menstrual restrictions, their confidence to interact with others during menstruation is impacted and adds to the shame women and girls experience during menstruation (Hennegan et al., 2019). For example, a qualitative study conducted in India found that some women "discussed throwing pads in ponds, rivers, and forested areas" (Caruso et al., 2017). These women were hiding their menstrual materials from anyone able to see them snd is a clear representation of the stigma and shame that surrounds menstruation.

Physical Environmental Resource Limitations

Menstruators are also faced with poor health outcomes like poor physical and mental health and the inability to menstruate comfortably, often related to access to safe and adequate water and sanitation. Menstruators require spaces to complete menstrual tasks like changing menstrual materials, washing and drying menstrual materials (if reusable), and cleaning their hands and bodies.

Perceptions of available environments have been an integral component of the menstruation experience. Two studies, one conducted in India and the other conducted in Za'atari refugee camp located in Jordan, suggested that latrines were too cold to be used during winter months in areas with colder climates (Nechitilo et al., 2016; Al-Shurbji, 2017), which also speaks to environmental considerations that impact the menstruation experience. A qualitative study that consisted of 69 Free-List Interviews and 8 focus group discussions among women in Odisha, India, found that weather conditions impacted the severity of women's sanitation-related concerns (Caruso et al., 2017). Study participants reported worries about the management of their menstruation during winter months and monsoon due to the wet or cold weather. Cleaning their menstrual cloths during "the rain was challenging, but drying was harder" (Caruso et al., 2017). Storms and rain would cause cloths to blow off of drying lines, posing the risk of becoming dirty again or not drying fully and being worn while damp, which can lead to chafed skin (Caruso et al., 2017).

Access to Resources

Access to resources such as materials, pain management, social support, knowledge, information sources are important to more comprehensively address menstrual needs.

Access to Materials

Limited access to menstrual materials is a common issue faced by women in low- and middle-income countries. Resources, like menstrual materials suitable to absorb (e.g., pads) or collect menses (e.g., cups), may not be available in some low-income and middle-income settings, and, if they are available, they may not adequately support menstruation needs (Hennegan et al., 2019). A study on working women in Burkina Faso, (Krenz and Strulik, 2019) found that participants commonly used old clothes or rags in place of menstrual hygiene products. Lack of access to adequate menstrual products raises health concerns, such as vaginal infections and harmful diseases (Critchley, Babayev, Bulun et al., 2020). To create research studies that consider the experiences that are a result of lack of access to adequate menstrual materials would provide a more holistic understanding of all components that impact menstruation experiences. A randomized control trial (RCT) conducted among Bangladeshi female garment workers found that women given free sanitary pads had 15% fewer absent days compared to women who did not have access to free sanitary pads (Caura et al., 2019). A systemic review (Hennegan et al., 2019), included two qualitative studies conducted with girls in Kenya and Ghana that reported girls engaged in transactional sex to generate funding for menstrual needs (Jewitt et al., 2013: Mason et al., 2013). These studies (Caura et al., 2019 and Hennegan et al., 2019) suggest that the costs of menstrual hygiene products have influence on the behaviors of girls navigating menstruation and absenteeism due to menstruation.

Access to materials during the menstrual period while outside of the home could contribute to positive experiences with menstruation at work. A quantitative study conducted in eight low- and middle-income countries (Democratic Republic of Congo, Ethiopia, Ghana, Kenya, India, Indonesia, Nigeria, and Uganda) that collected data from women and girls aged 15-49 who had experienced a menstrual period within the past three months, found that wealth,

education, rural-urban residence, and infrastructural limitations of the household contributed to inequalities in access to menstrual hygiene health materials and products (Rossouw, Ross, 2021). The studies that have been conducted in low- and middle-income countries emphasize that access to materials are just one component of a larger global health challenge regarding menstrual health.

Access to Pain Management

Poor pain management could negatively impact menstrual outcomes. There is limited research available that investigates access to pain medication and pain management strategies for menstruation (USAID, 2021). Nevertheless, access to pain management and knowledge of strategies to ameliorate pain could influence workplace experiences for women during menstruation (USAID, 2021). For example, a mixed-methods study conducted among women in rural India that assessed their menstruation-related concerns and negative experiences found that pain and discomfort were associated with self-reported difficulty working (Caruso, Portel, et al., 2020). A study conducted in Uganda found that not all women had access to pain management resources at work or found it appropriate to use them (Hennegan, Kibria et al., 2020). Prior research also suggests that these resources are used to cope with menstrual pain during work, possibly having an impact on the workplace experience during menstruation.

A qualitative study conducted on impoverished women in an inner city in NW England reported how women felt menstruation pain management resources and materials should be provided for women. Consisting of three focus group discussions (FGD) and 14 in-depth interviews (IDI), purposive sampling and convenience sampling were used for the FGD and IDI, respectively. Expressed both in the FGD and IDI, many participants elucidated their experiences

dealing with heavy menstruation without access to pain management resources. This study showed that many women perceived menstruation to be a burden with pain being one of the main aspects of it (Boyers et al., 2022). Many of these women were also unaware that there were local organizations available that offered free products (Boyers et al., 2022).

Access to Social Support

Access to social support has been more widely investigated, mainly in qualitative research studies among school-aged girls compared to older, working women (Hennegan et al., 2019). Social support sources are varied: friends, family, co-workers, and teachers; all serve a variety of purposes (Hennegan et al., 2019). Social support can serve as a barrier or facilitator on the impact of menstrual related interventions (Long et al., 2013; Caruso et al., 2013; Belliappa, 2018).

With the impact social support has on accessing menstrual resources, advice, and guidance, it is important to continue to assess this in the workplace because it influences what menstruaters must navigate. Restrictive gender norms that are particular to a given culture contribute to the social support context that shapes menstruators' experiences (Hennegan et al., 2019). Being unable to openly discuss menstruation makes it difficult to access materials or seek support because it impacts the perceptions and practices regarding menstruation and menstruation-related interventions (Hennegan et al., 2019). Moreover, Hennegan et al., 2019, found that social support strongly dictated menstrual experiences where social networks (parents, siblings, peers, partners, and teachers) served as sources of "information, resources, comfort, or assistance to accomplish menstrual tasks" (Hennegan et al., 2019). While in many cultures, mothers served as the primary information sources, this was sometimes considered inappropriate

(Hennegan et al., 2019). For example, a mixed-methods study conducted in Malawi among school-aged girls that attended urban and rural primary and secondary schools, reported that once a girl begins menstruation, she "tells a female relative", such as an aunt, though rarely her mother for fear that 'she will die'" (Pillitteri, 2011).

Access to Knowledge and Information Sources

Many women have sought practical knowledge regarding menstruation and their knowledge influences their practices during menstruation (Hennegan et al., 2019). Lack of knowledge regarding menstruation was found to cause confusion and distress among menstruators, and women and girls were unsure of what constituted normal and abnormal menstruation (Crawford et al., 2014; Naeem et al., 2015). Two qualitative studies were conducted among school-aged girls in South Asia and Pakistan to further understand girls' needs and preferences while addressing menstrual health management (Crawford et al., 2014 and Naeem et al., 2015) . The lack of knowledge that was highlighted in previously mentioned literature, emphasizes the need to increase research that captures the perceptions of experiences among menstruators at work (Alharbi et al., 2018). Additionally, having the knowledge to predict when the menstrual cycle will begin increases preparedness for menstruation management and could improve menstruation outcomes in the workplace (Alharbi et al., 2018). Failure to know when the menstruation period begins could have negative outcomes, such as staining clothes due to not using menstruation materials. Occurrences like stained clothes due to menstruation could cause embarrassment and negative associations with menstruation.

Workplace: Physical Environment

The physical environment of the workplace includes the availability of menstruation-related supplies and water and sanitation facilities and conditions (USAID, 2021). A case study conducted in the upper East region of Ghana among working women found that women wearing menstrual products for longer than recommended was due to a lack of sanitary facilities at the workplace (Abanyie et al., 2019). Twelve percent of respondents working in a formal sector job reported not having access to a restroom while at work and 60% of respondents working in an informal sector job reported not having access to a restroom while at work. The research also found that 68% of respondents kept used menstrual materials in their bags to later dispose of them at home (Abanyie et al., 2019). Furthermore, this study emphasized that providing WASH facilities that are menstruation friendly is critical and should be considered for further research and interventions. Specifically, Hennegan et al., 2019 reported that clean and safe WASH facilities with running water and soap help women manage their menstruation more comfortably.

Individual Well-Being

Menstrual health is defined as a state of complete physical, mental, and social well-being (Hennegan et al., 2021). Women's experiences of menstruation can influence these individual outcomes (USAID, 2021). It is important to also note that these health outcomes can interact. For example, someone experiencing physical assault may also experience social and mental health impacts (USAID, 2021).

Existing literature highlights the lack of structures that have been put into place to ensure hygienic menstrual maintenance and proper menstrual health management (MHM) in the workplace (Abanyie et al., 2019). A study conducted to investigate challenges faced by working women during menstruation suggested that there were no company policies regarding

menstruation and WASH facilities were inadequate (Abanyie et al., 2019). For example, 60% of respondents had no access to washrooms, 24% of respondents shared washrooms with male co-workers, and only 12% had access to gender segregated washrooms. Furthermore, this study found that women are deterred from using WASH facilities when the facilities are absent or in deplorable conditions, motivating them to use materials longer than the suggested duration of 4-8 hours which contributes to toxic shock syndrome (TSS) (Abanyie et al., 2019). This was reflected in the survey with 4% of respondents being diagnosed with TSS. Various quantitative studies also support that material type or location of changing materials has been associated with reproductive tract infections (Das et al., 2015; Das et al., 2021; Miiro et al., 2018; Torondel et al., 2018).

Research also suggests that women and girls' menstruation related experiences impact their mental health. A systematic review of 76 studies from Africa, Asia, Latin America and Europe found that women and girls' struggle with self-esteem, stress, anxiety, and depression when menstruating (Hennegan et al., 2019). A study conducted in rural India among 878 menstruating women found that women with higher scores of menstrual insecurity reported greater feelings of tension or difficulty working (Caruso et al., 2020).

The social well-being of menstruators has also been researched. Similar to practices adopted as a result of the stigmatization of menstruation, women and girls' reported that they alter their movement and participation outside the household during menstruation (Hennegan et al., 2019). Isolation is also a common descriptor of the experiences of menstruators. Qualitative studies conducted with school-going girls in Bolivia, Philippines, and Sierra Leone, found that girls reported being isolated from activities or self-isolating to circumvent menstruation-related bullying (Caruso et al., 2013; Ellis et al., 2016; Long et al., 2013).

Menstruation Among Working Menstruators

There is existing research regarding adult, working menstruators that seeks to fill the large gap in literature that quantitatively assesses menstruation experiences, especially among women in low-income and middle-income countries (Hennegan, Bukenya, et al., 2021; Hennegan et al., 2022). Past qualitative studies have focused more closely on menstruation experiences at home rather than at work (Hennegan, Kibira, Exum, Schwab et al., 2020). While these studies suggested barriers with accessing materials, it can be assumed that barriers may exist among menstruators at work. Comparably, prior research among school-aged girls suggests that managing menstruation was perceived to be more difficult at school rather than home (Hennegan, Sol, 2020). Understanding the menstruation experiences of adult women who work outside the home can inform interventions that cater to the experiences that shape perceptions of menstruation among women in the workplace. Lack of understanding regarding menstruation experiences in the workplace leaves little support or context in foundational findings of these experiences. It is imperative that adult working women's menstruation concerns remain appropriately assessed to ensure a holistic view of the menstruation period is assessed.

Understanding the Associations Between Individual and Workplace Determinants and Outcomes

The individual determinants (access to materials, pain management, social support, knowledge, and workplace physical environment) and outcomes (individual well-being) included in this research study were identified from a rapid review that was used to expound upon findings from a foundational literature review conducted by the Iris Group (USAID, 2021;

USAID, 2019). The impact of access to materials, pain management, social support, knowledge, and adequate workplace physical environment on individual well-being is not widely noted throughout related literature. Increasing research on the individual and workplace determinants will allow us to understand how access to materials, pain management, social support, and knowledge impact individual well-being on all levels for women at work due to menstruation. Further, understanding this relationship could better inform future research and interventions that are conducted to address women's menstrual needs in the workplace.

Chapter 3: Methods and Results

Methods

Study Population

This research study included women working outside of the home in Kathmandu, Nepal and Nairobi, Kenya. To identify potentially eligible research participants, sub-counties and districts were purposively selected in coordination with local partners, and houses were randomly selected within each neighborhood. Surveys were conducted in four sub-counties in Nairobi: Embakasi, Kasarani, Njiru, and Lang'ata. The sub-counties exhibited variability in job types, sectors of work, and socioeconomic status with Embakasi, Kasarani, and Njiru offering access to more industrialized workplaces with factories and offices, while Lang'ata was more varied in sectors of work. Surveys were conducted in two districts in Kathmandu Valley: Kathmandu district and Lalitpur district. Both districts' variability was most evident in occupation, sectors of work, and socioeconomic status. Additionally, the variety of work settings had a concentration of urban customer-service related workplaces like banks and hospitals and informal workplaces, mainly in the form of markets.

Data Collection

Data were collected in Nepal and Kenya among adult women. Women were eligible if they had experienced a menstrual period while working outside of their homes in the past three (Kenya) or six (Nepal) months, free of COVID-19 symptoms or exposures, and could verbally communicate in English, Swahili (Kenya) or Nepali (Nepal). Cognitive interviews were completed with working women in Nairobi and Kathmandu in July 2021 to assess acceptability and comprehensibility. Primary data included in this secondary analysis were collected in Kenya

from September 2, 2021 – September 15, 2021. Surveys took place in Nepal from September 19, 2021 – October 8, 2021. Data were collected using Android tablets equipped with Open Data Kit (ODK). Enumerator teams participated in one-week trainings prior to data collection in each country on topics such as research objectives, research ethics, informed consent, recruitment procedures, use of tablets, and an overview of all survey modules. Enumerators conducted mock interviews at the end of classroom training using the full survey tool.

To identify potentially eligible research participants, each randomly selected household was approached to determine if an eligible woman was available and willing to participate. Once participants were screened and determined eligible, they were provided with consents forms to keep, and enumerators read the forms aloud to ensure comprehension and obtain verbal consent. Participants were informed of the voluntary nature of the survey, risks, and participants' right to withdraw at any point. The survey took approximately 45 minutes to 1 hour and 30 minutes to complete.

Measures

The survey questions included in the primary study were developed in English and translated to Swahili (Kenya) and Nepali (Nepal). The survey questions were designed to capture workplace-specific experiences, conditions, and impacts (USAID, 2021). Survey topics of the study included demographic information, social environment, institutional policies, physical environment (WASH), individual-level determinants, work-menstruation experiences, individual well-being, and job satisfaction. The survey topics used for these secondary analyses included individual well-being, the physical environment (WASH), workplace resources, and individual-level resources (knowledge, materials, pain management, and social support).

Individual well-being. The primary outcome in this study is individual well-being. Individual well-being was measured using the World Health Organization Well-Being Index (WHO-5) (Bech et al., 2003; Topp et al., 2015). The WHO-5 Well-Being Index is comprised of five items that ask about the frequency of a variety of feelings over the previous two weeks (Topp et al., 2015). The questions included in the WHO-5 WellBeing Index assessed how frequently respondents were in good spirits, felt calm and relaxed, felt active and rigorous, woke up feeling fresh and rested, and if their daily lives were filled with things that interested them. Each item has the following potential responses: at no time, some of the time, less than half the time, more than half of the time, most of the time, and all the time, scored from 0 to 5, respectively. Response options were summed across these items per respondent with the highest score possible being 25. Scores below 13 indicate poor well-being (Topp et al., 2015).

Physical environment. The physical environment is the primary exposure of this research study. An Index to assess the Physical Workplace Environment was developed. The purpose of the Physical Workplace Environment Index is to assess if respondents have access to adequate workplace WASH resources. This index measured if respondents had access to bathroom facilities at work with toilets that are clean, private, safe and have water and soap available. For each topic, one question was included to assess whether women had access to these resources. Table 1includes the questions that were used to assess each topic and how they were recoded for the physical environment index. Each variable was recoded based on USAID recommendations (USAID, 2021).

Table 1: Variable recoding for the Physical Environment Index

Variable	Original coding	New coding
The Physical Environment		
Facilities		
Does your workplace have any designated?	Never	No=0
	Sometimes	No=0
	Often	No=0
	Always	Yes=1
Cleanliness		
Is the place you most often use to change your menstrual materials while you are working clean?	Never	No=0
	Sometimes	No=0
	Often	No=0
	Always	Yes=0
Safety		
How often did you feel safe in the place where you went to change your menstrual materials/manage your menstruation?	Never	No=0
	Sometimes	No=0
	Often	No=0
	Always	Yes=1
Privacy		
Does the place where you work have any private facilities for women to bathe/wash themselves or wash reusable materials (such as a tap and basin inside a lockable toilet stall)?	Never	No=0
	Sometimes	No=0
	Often	No=0
	Always	Yes=1
Water and soap available		
Is there soap and water available?	Never	No=0
	Sometimes	No=0
	Often	No=0
	Always	Yes=1
Resource Availability in the Workplace		
Materials		
Are menstrual materials available where you work?	No=1	No=0
	Yes=2	Yes=1
Employer Provided Goods		
Does your employer provide any goods to assist menstruating women for free or at a subsidized rate?	No=1	No=0
	Yes=2	Yes=1

A yes response indicated respondents always had access to an enabling workplace environment conducive to managing menstruation. A no response indicated that respondents never, sometimes, or often had access to an enabling workplace environment conducive to managing menstruation. A total variable was developed that summed all five components. A score of 5 is the highest possible score and indicated an optimal physical WASH environment that was conducive to managing menstruation. The questions included for each topic were sourced and adapted from Emory/Athena, ARISE, Iris Group, MPNS, and Mohammed (UNESCO, 2012; Sihnaroy et al., 2021). The key questions about cleanliness, safety, and water and soap availability had missing values because participants answered "no" to the key question about facilities, which resulted from a skip pattern during primary data collection. All missing values due to this skip pattern were recoded as "no" for the key questions for cleanliness, safety, and water and soap availability.

Resource availability. Resource availability in the workplace was the secondary exposure for this study. A Workplace Resource Availability Index was created that focused on assessing access to materials among working women that were provided by their employers for free or at a subsidized rate. Table 1 includes the questions that were asked to measure resource availability in the workplace. The question that assesses if materials are available specifically meant if they are available from any source at the workplace, like a store. The question about if goods are employer provided goes beyond to better understand if employers are supporting access. "Goods" may include medical care, menstrual materials, or other goods.

Responses were dichotomized to a yes (1) or no (0) response for both questions. A sum of both questions was used as an index to measure resource availability for menstruating women in the workplace. The highest score possible was 2 for workplace resource availability index. Each question was adapted from MPNS, Iris Group, and Hennegan (Sihnaroy et al., 2021; Calaf et al., 2023).

Individual level determinants. Additional exposures included individual level determinants that assessed access to resources such as materials for managing menstruation, pain relief, knowledge, and social support. Table 2 includes all recoding done for each variable.

Table 2. Variable recoding for Individual Level Resource Availability

Variable	Original coding	New coding
Individual level resources		
Access to resources		
Did you have enough menstrual materials to change to change them as often as you wanted?	Never	No=0
	Less than half the time	No=0
	More than half of the time	No=0
	Always	Yes=1
Access to pain management		
During your last menstrual period, were you able to get menstrual pain remedies you needed?	Never/Not applicable	No=0
	Less than half the time	No=0
	More than half of the time	No=0
	Always	Yes=1
Access to social support		
If you had a concern about your menstrual period, would you feel comfortable seeking help from a health care provider?	No=2	No=0
	Yes=1	Yes=1
Access to knowledge and information sources		
Can you usually predict when your menstrual period will start?	No, I don't know when it will start	No=0
	Yes, I keep a calendar/track	Yes=1
	Yes, my body tells me	Yes=1
	Yes, I am on oral contraceptives	Yes=1
	Yes, other	Yes=1

Access to resources. Access to resources at the individual level specifically looked to see if respondents were able to bring menstrual materials from home. This variable was recoded based on USAID recommendation (USAID, 2021). This question was adapted from the MPNS (Sihnaroy et al., 2021).

Access to pain management. Access to pain management was measured at the individual level. This variable was recoded based on USAID recommendation (USAID, 2021). This question was adapted by the Iris Group (Sihnaroy et al., 2021).

Access to social support. Access to social support was evaluated at the individual level. This question was adapted by Hennegan et al in a cross sectional survey administered in Uganda (Hennegan et al., 2021). *Access to knowledge and information sources.* Access to knowledge and information sources were evaluated at the individual level. The question used to measure access to knowledge and information sources was adapted by Mohammed et al in a multi-method survey administered to schoolgirls and schoolboys in Ghana (Mohammed et al., 2020).

Demographic characteristics. Demographic questions gathered included data on respondents' age, marital status, level of education, religious affiliation, and job type. The demographic questions included in the primary study were adapted from ARISE, ICSED, Nepal DHS, Kenya DHS, and Hennegan (Sihnaroy et al., 2021; Hennegan et al., 2020; Hennegan et al., 2021; UNESCO, 2012).

Analysis

Data cleaning and analyses were conducted using SAS 9.4. The analytic sample was created by excluding all missing variables for any exposure and outcome variables.

The first study aim of this research project was describe the physical environment and access to resources related to menstruation where the women in Nepal and Kenya work.

The proportion of individuals with poor individual wellbeing is reported to address aim two. Individual wellbeing scores were determined for each individual and the proportion for those under the 13 threshold were designated as individuals with poor individual wellbeing.

To address the third aim of this secondary analysis, we used multiple linear regression to assess the associations between the physical environment, access to workplace individual resources, access to individual resources, and individual wellbeing. The primary outcome of these analyses was the WHO-5 Individual wellbeing scale. The primary exposure used in the unadjusted model was the Index of Enabling Workplace Physical Environment. Three additional adjusted models were strategically built on each other. Resource availability was assessed with the Index of Enabling Workplace Physical Environment to assess associations with the primary outcome at the workplace level only. Additional adjusted models included individual level determinants such as access to resources, access to materials, access to knowledge, and access to pain management to assess the outcome with individual level exposures included. We also developed a model that adjusted for demographic factors like age and education to further assess the association between the physical environment, access to resources, and individual wellbeing.

To address the fourth aim of comparing differences in associations among women working in Nepal versus women working in Kenya, we developed the same unadjusted and adjusted models, but restricted the data to only those in Kenya and separate models restricting only to those in Nepal.

Ethical approvals

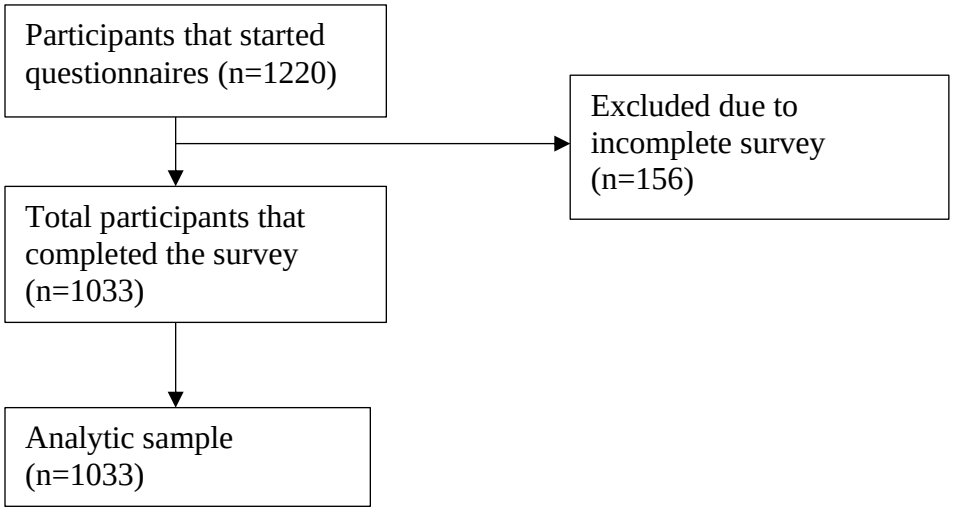
The Emory University Institutional Review Board in Atlanta, Georgia, USA (00002617), the United States International University – Africa in Nairobi, Kenya (USIU-A/IRB/19402921), and the Nepal Health Research Council in Kathmandu, Nepal (344/2021 P) approved study protocols for WASHPaLS data collection. In Kenya, the National Commission for Science, Technology, and Innovation granted a license to conduct research (NACOSTI/P/21/1161).

Results

Respondents

The total number sampled in the primary study was 1,220 respondents. This secondary analysis included 1,033 women survey respondents; 59% (n=611) of respondents lived in Kenya and 41% (n=422) of respondents lived in Nepal. Women who completed the survey and did not have missing values for exposure and outcome variables were included in the analyses. Figure I include a breakdown of the analytic sample.

Figure I: Flow chart for analytic sample of analysis



The mean age for overall respondents in the analytic sample was 29.3. On average, participants were younger in Kenya with the mean age being 32.2 in Nepal and 30.5 in Kenya. Table 3 includes the percentage distribution of demographic characteristics of the analytic sample. The job types included in this analysis varied greatly with fields like farming/agriculture, teaching/education, factory, customer service in a marketplace, health care worker, civil servant/government employee, professional work, and more being represented.

Professional/office work held the highest percentage of job types within the overall sample. This held true for both Nepal and Kenya country-level samples.

Table 3: Percentage distribution of participants by sample characteristics

	Kenya (n=611)		Nepal (n=422)		Full sample (n=1033)	
	n	%	*n*	%	*n*	%
Age						
Mean/Range	29.3	18-53	32.2	18-52	30.5	18-53
Gender						
Marital status						
Single, never married	237	38.8	156	37.0	393	38.0
Married	275	45.0	246	57.8	519	50.2
Unmarried, living with partner	48	7.9	0	0	48	4.7
Divorced/separated	38	6.2	9	2.1	47	4.6
Widowed	13	2.1	11	2.6	24	2.3
Highest educational level						
Never attended school	1	0.2	9	2.1	10	1.0
Less than primary education	3	0.5	21	5.0	24	2.3
Primary education	24	3.9	23	5.4	47	4.6
Lower secondary education	34	5.6	54	12.8	88	8.5
Upper secondary education	132	21.6	94	22.3	226	21.9
Short-cycle tertiary education	184	30.1	14	3.3	198	19.2
Bachelor's or equivalent level	194	31.8	126	29.9	320	31.0
Master's or equivalent level	34	5.6	77	18.3	111	10.8
Doctoral or equivalent level	3	0.5	2	0.5	5	0.5
Not elsewhere classified	0	0	1	0.2	1	0.1
Religion						
Christian (Catholic)	183	30.0	40	9.5	223	21.6
Christian (Protestant)	356	58.3	6	1.4	362	35.0
Muslim	10	1.6	323	76.5	333	32.2
Hindu	0	0	48	11.4	48	4.7
Jewish	0	0	3	0.7	3	0.3
None	20	3.3	2	0.5	22	2.1
Other	36	5.9	0	0	36	3.5
Job type						
Farming/agriculture/forestry/fishing	4	0.7	16	3.8	20	1.9
Teaching/education/tutoring	50	8.2	43	10.2	93	9.0
Factory/manufacturing/textiles	31	5.1	27	6.4	58	5.6
Selling goods in a marketplace, street, or other informal setting	87	14.2	18	4.3	105	10.1
Working in a shop or store (retail)	96	15.7	77	18.3	173	16.8
Day labor/casual or informal labor	44	7.2	10	2.4	54	5.2
Food or lodging (e.g., restaurants, hotels)	54	8.8	44	10.4	98	9.5
Domestic work (e.g., cleaning homes)	32	5.2	26	6.2	58	5.6
Health care worker	55	9.0	29	6.9	84	8.1
Civil servant/government employee	35	5.7	26	6.2	61	5.9
Professional/office work (e.g., financial services, IT, research)	111	18.2	96	22.8	207	20.0
Other	11	1.8	10	2.4	21	2.0

Note. Participants were on average 30.5 years old (*SD* = 7.0) overall. There was 1 observation from Nepal and 2 observations from Kenya that chose not to answer their highest level of education, 6 observations from Kenya that chose not to answer their religion, 1 observation from Kenya that chose not to answer their job type, and 2 observations from Nepal that chose not to answer their marital status.

Description of the Physical Environment and Access Workplace and Individual Resources

Women in Nepal and Kenya had varying distributions of access to the physical environment. While there were similarities between both countries for the proportion of women with access to sanitation facilities at work (Nepal 77%, n=327; Kenya 78%, n=476), there were stark differences in other areas of the physical environment. Among women in Nepal, only 21%

(n=88) always had access to clean facilities while working. Fortunately, 68% (n=288) reported that they always felt safe in the facilities that were used to manage menstruation, 58% (n=245) reported that they always had access to private facilities to manage menstruation at work, and 57% (n=241) had access to water and soap. Among women in Kenya, 83% (n=510) had access to clean facilities while working and 59% (n=362) always felt safe in the facilities that were used to manage menstruation. Only 36% (n=220) reported that they had access to private facilities to manage menstruation while at work and 36% (n=219) reported that they always had access to water. Table 4 displays the percentage distribution of all exposure variables.

Table 4: Percentage distribution of the physical environment, resource availability in the workplace, access to individual resources in Nepal and Kenya

	Full sample (n=1033)		Kenya (n=611)		Nepal (n-422)	
	n	%	n	%	n	%
Independent variables						
Physical environment index						
Proportion of women with access to sanitation facilities at work	803	77	476	78	327	77
Proportion of women with access to clean facilities to manage menstruation	844	82	510	83	88	21
Proportion of women who always felt safe where they typically change their menstrual materials	650	63	362	59	288	68
Proportion of women who had access to private facilities at work to wash menstrual materials	465	45	220	36	245	58
Proportion of women who had access to water and soap	573	55	219	36	241	57
Proportion with score of 0	88	9	56	9	34	8
Proportion with score of 1	100	10	58	10	22	10
Proportion with score of 2	183	18	125	21	58	14
Proportion with score of 3	350	34	227	37	123	29
Proportion with score of 4	312	30	145	24	167	40
Proportion with score of 5	0	0	0	0	0	0
Overall index score (m, sd)	2.7	1.2	2.6	1.2	2.8	1.3
Resource availability in the workplace index						
Proportion of women with access to menstrual materials in the workplace	2	1	1	1	1	1
Proportion of women with access to menstrual materials at a free or subsidized rate	121	12	30	5	91	22
Proportion with a score of 0	910	88	580	95	330	78
Proportion with a score of 1	123	12	31	5	92	22
Proportion with a score of 2	0	0	0	0	0	0
Overall index score (m, sd)	0.1	0.3	0.05	0.2	0.2	0.4
Access to individual resources						
Proportion of women with access to individual menstrual materials	726	70	396	65	330	78
Proportion of women with access to knowledge and information sources	134	13	104	17	30	7
Proportion of women with access to pain management resources	366	35	199	33	167	40
Proportion of women with access to social support	913	88	539	88	374	89

No individual in either country received a score of five (highest possible score) for the physical environment index. Majority of respondents in Nepal (40%, n=167) received a score of 4 with the average score being 2.8. Most respondents in Kenya (37%, n=227) received a score of 3 with the average score being 2.6. The overall average physical environment index score was 2.7, much like the scores at the country level.

Resource availability in the workplace was negligible. Overall, 88% (n=910) of respondents did not have access to resources at the workplace, nor were they available at a free or subsidized rate. Among women in Nepal, the proportion of women with access to menstrual materials in the workplace was 1% (n=1) and only 22% (n=91) reported that they had access to menstrual materials at a free or subsidized rate. None of the respondents in Nepal received a score of two (highest possible score), with most respondents receiving a score of zero (78%, n=330). Similar results were found among women in Kenya with only 1% (n=1) reporting access to menstrual materials in the workplace and 5% (n=22) reporting access to menstrual materials at a free or subsidized rate. Additionally, there were no respondents in Kenya that received a score of two, with respondents overwhelmingly receiving a score of zero (95%, n=580).

The individual resources among respondents were slightly better in comparison to workplace resources. Overall, 70% (n=726) of participants had access to individual resources and 88% (n=913) had access to social support. Most respondents in Nepal had access to individual materials (78%, n=330) and social support (89%, n=374). Similar results were found among women in Kenya with 65% (n=396) having access to individual materials and 88% (n=539) having access to social support.

Well-Being Among Women Who Work Outside the Home

An overwhelming proportion of respondents that had poor individual wellbeing; 34% (n=350) of the overall sample reported poor individual wellbeing. Poor individual wellbeing among women in Nepal was 20% (n=85) reporting below the threshold; among women in Kenya, 43% (n=265) reported poor individual wellbeing. Table five provides the distribution of respondents with poor individual wellbeing.

Table 5: Percentage distribution of individual wellbeing (WHO-5) and poor individual wellbeing

	Full sample (n=1033)		Kenya (n=611)		Nepal (n=422)	
	n	%	n	%	n	%
Dependent variable						
WHO-5 index						
WHO-1: Over the last two weeks, I have felt cheerful and in good spirits.						
At no time	16	2	9	2	7	2
Some of the time	257	25	200	33	57	14
Less than half of the time	93	9	64	10	29	7
More than half of the time	197	19	104	17	93	22
Most of the time	363	35	181	29	182	43
All of the time	107	10	53	9	54	13
WHO-2: Over the last two weeks, I have felt calm and relaxed.						
At no time	13	1	5	1	8	2
Some of the time	226	22	177	29	49	12
Less than half of the time	89	9	63	10	26	6
More than half of the time	211	20	121	20	90	21
Most of the time	393	38	192	31	201	48
All of the time	101	10	53	9	48	11
WHO-3: Over the last two weeks, I have felt active and vigorous.						
At no time	13	1	5	1	8	2
Some of the time	215	21	171	28	44	10
Less than half of the time	82	8	58	9	24	6
More than half of the time	213	21	139	23	74	18
Most of the time	392	38	194	32	198	47
All of the time	118	11	44	7	74	18
WHO-4: Over the last two weeks, I woke up feeling fresh and rested.						
At no time	13	1	6	1	7	2
Some of the time	245	24	185	30	60	14
Less than half of the time	63	6	47	8	16	4
More than half of the time	223	22	133	22	90	21
Most of the time	362	35	179	29	183	43
All of the time	127	12	61	10	66	16
WHO-5: Over the last two weeks, my daily life has been filled with things that interest me.						
At no time	31	3	18	3	13	3
Some of the time	307	30	227	37	80	19
Less than half of the time	92	9	66	11	26	6
More than half of the time	180	17	88	14	92	22
Most of the time	343	33	178	29	165	39
All of the time	80	8	34	6	46	11
Overall score (m, sd)	3.7	1.5	3.4	1.4	4.1	1.4
Poor individual wellbeing	350	34	265	43	85	20

The Physical Environment, Access to Workplace and Individual Resources and Individual WellBeing

Overall

The findings within the overall sample were similar to those in Nepal, but slightly different compared to Kenya. Refer to Table 6 for all associations found in the overall sample. In the unadjusted model, the physical environment was associated with a 0.71 ($p<0.05$) point increase in individual wellbeing scores. This finding was also significant in Nepal, but it was not significant in Kenya. Positive associations were also found when accounting for additional exposures like the workplace resource availability where we found the physical environment was associated with a 0.64 ($p<0.05$) point increase in individual wellbeing. Those with access to resources in the workplace had on average 2.36 ($p<0.05$) points higher in individual wellbeing scores compared to those without access to workplace resources.

The associations found after accounting for additional exposures like individual resources were also significant in the overall sample. Individual wellbeing scores were associated with a increase of 0.49 ($p<0.05$) points in score for each increasing score of the physical environment within this model. Those with available resources in the workplace had individual wellbeing scores on average 2.19 points higher than those without available resources in the workplace, and this finding was significant ($p<0.05$). Having access to menstrual materials showed positive associations with those participants having individual wellbeing scores associated with an 1.99 ($p<0.05$) increase in points compared to those without access to these materials. Negative associations were found between access to knowledge, access to pain management, and access to social support. Only the associations between access to pain management were significant ($p<0.05$)

The fully adjusted model held a similar trend of a decrease in some associations. Individual wellbeing was associated with a 0.48 point increase in score for each score of the physical environment, and this finding was still significant ($p<0.05$). The associations of those with available resources in the workplace were similar to previous models of the overall sample with individual wellbeing scores on average being on 2.06 ($p<0.05$) points higher than those without available resources. Those with access to materials at the individual level had individual wellbeing scores associated with an increased average of 1.94 ($p<0.05$) points higher than those without access to materials. Like the model adjusted for individual resources, negative associations were found among access to individual level determinants like access to knowledge and information sources, and access to pain management. Similarly, the association between access to pain management was the only one that was significant ($p<0.05$) When accounting for age, there was only a 0.05-point increase associated with individual wellbeing but this finding was not significant. For each education level there was only a 0.07-point increase in individual wellbeing scores, but this finding was also not significant.

Table 6: Association between the physical environment, workplace resource availability, individual level access to resources, and individual wellbeing in Nepal and Kenya (Overall Sample=1033)

	Parameter estimate, standard error, confidence interval, p-value															
	Model 1: Unadjusted				**Model 2: Adjusted for resource availability in the workplace**				**Model 3: Adjusted for resource availability in the workplace, access to individual resources**				**Model 4: Adjusted for resource availability in the workplace, access to individual resources, and demographic factors**			
Independent variable																
Physical environment index	0.71	0.11	(0.49, 0.94)	<0.001*	0.64	0.11	(0.42, 0.87)	<0.001*	0.49	0.12	(0.26, 0.72)	<0.001*	0.48	0.12	(0.24, 0.71)	<0.001*
Resource availability index					2.36	0.57	(1.25, 3.48)	<0.001*	2.19	0.56	(1.09, 3.29)	0.000*	2.06	0.56	(0.96, 3.17)	0.000*
Access to individual resources																
Access to materials									1.99	0.40	(1.20, 2.79)	<0.001*	1.94	0.40	(1.15, 2.74)	<0.001*
Access to knowledge									-0.78	0.54	(-1.84, 0.27)	0.144	-0.77	0.54	(-1.82, 0.28)	0.148
Access to Pain management									-0.91	0.38	(-1.67, -0.17)	0.017*	-0.89	0.38	(-1.64, -0.14)	0.020*
Access to social support									-0.20	0.57	(-1.32, 0.92)	0.720	-0.17	0.57	(-1.29, 0.95)	0.767
Demographic factors																
Age													0.05	0.02	(0.00, 0.10)	0.047
Education													0.07	0.05	(-0.03, 0.17)	0.179

*Significant at $p<0.05$.

Nepal

There were significant associations found among working women in Nepal throughout each unadjusted and adjusted model (Table 7). Participant's individual wellbeing increased 0.72 points for each increasing score of the physical environment at the workplace. This association was significant. When accounting for workplace resource availability, individual wellbeing is associated with an increase of 0.67 in score for each increasing score of the physical environment and those with available resources in the workplace had individual wellbeing scores on average 1.72 points higher compared to those without available resources. Both the physical environment and workplace resource availability were significant predictors of individual wellbeing.

While the physical environment and resource availability at the workplace still was still associated with an increase in individual wellbeing, after accounting for individual level determinants, the score increase was not as drastic. Individual wellbeing increased only 0.48 points in score for each increasing score of the physical environment within this model. Those with available resources in the workplace had individual wellbeing scores on average only 1.43 points higher than those without available resources in the workplace. Having access to menstrual materials at the individual level showed stark associations with those participants having individual wellbeing scores on average 2.43 points higher than those without access to these materials. Negative associations were found between access to knowledge, access to pain management, and access to social support, though none of these associations were significant.

After accounting for the primary exposure, additional exposures, and demographic factors, there was a similar trend of a decrease in associations. For example, individual wellbeing increased only 0.37 in score for each score of the physical environment,

but this finding was still significant (p<0.05). Those with available resources in the workplace had drastic differences compared to previous models with individual wellbeing scores on average being on 1.22 points higher than those without available resources. Furthermore, this finding was not significant (p=0.065) whereas the same association was significant when demographic factors were not accounted for. Those with access to materials at the individual level had significant associations with individual wellbeing scores. Negative associations were found when accounting for age, but this finding was not significant. For each education level there was only a 0.19 point increase in individual wellbeing scores, and this finding was significant (p<0.05).

Table 7: Association between the physical environment, workplace resource availability, individual level access to resources, and individual wellbeing in Nepal (Nepal=422)

	Parameter estimate, standard error, confidence interval, p-value															
	Model 1: Unadjusted				**Model 2: Adjusted for resource availability in the workplace**				**Model 3: Adjusted for resource availability in the workplace, access to individual resources**				**Model 4: Adjusted for resource availability in the workplace, access to individual resources, and demographic factors**			
Independent variable																
Physical environment index	0.72	0.17	(0.40, 1.05)	<0.001*	0.67	0.17	(0.35, 0.99)	<0.001*	0.48	0.17	(0.14,0.82)	0.006*	0.37	0.17	(0.02, 0.73)	0.036*
Resource availability index					1.72	0.65	(0.44, 3.00)	0.009*	1.43	0.65	(0.15,2.72)	0.028*	1.22	0.66	(-0.08, 2.51)	0.065
Access to individual resources																
Access to materials									2.43	0.66	(1.12, 3.73)	0.000*	2.32	0.66	(1.02, 3.62)	0.000*
Access to knowledge									-0.59	1.05	(-2.65, 1.46)	0.572	-0.64	1.04	(-2.68, 1.41)	0.540
Access to Pain management									-0.26	0.56	(-1.36, 0.83)	0.636	-0.10	0.56	(-1.20, 1.00)	0.856
Access to social support									-1.57	0.86	(-3.26, 0.13)	0.070	-1.53	0.86	(-3.21, 0.16)	0.076
Demographic factors																
Age													-0.01	0.03	(-0.08, 0.06)	0.737
Education													0.19	0.08	(0.03, 0.34)	0.019*

*Significant at p<0.05.

Kenya

While there were not significant findings in the unadjusted models in Kenya, there were significant findings in all subsequent models (Table 8). When adjusted for resource availability in the workplace, individual wellbeing is associated with an increase of 0.47 ($p<0.05$) points in score for each increasing score of the physical environment and those with available resources in the workplace had individual wellbeing scores on average 0.61 points higher compared to those without available resources. The association between resource availability, though, was not significant.

While the physical environment and resource availability at the workplace in Kenya was still associated with an increase in individual wellbeing, after accounting for individual level determinants, the score increase was smaller. Individual wellbeing increased only 0.41 ($p<0.05$) points in score for each increasing score of the physical environment within this model. Those with available resources in the workplace had individual wellbeing scores on average only 0.40 points higher than those without available resources in the workplace, but this finding was not significant. Having access to menstrual materials at the individual level showed an increase in associations with those participants having individual wellbeing scores associated with an average 1.39 ($p<0.05$) points higher than those without access to these materials. Negative associations were found between access to knowledge, access to pain management, and these associations were significant ($p<0.05$). Additionally, positive associations were found in when accounting for access to social support with this component being associated with a 0.43 point increase individual wellbeing score, though this finding was also not significant.

After accounting for the primary exposure, additional exposures, and demographic factors, there was a similar trend of a decrease in some associations. Individual wellbeing was associated with a 0.49 increase in score for each score of the physical

environment, and this finding was still significant ($p<0.05$). The associations of those with available resources in the workplace were similar to previous models with individual wellbeing scores on average being on 0.30 points higher than those without available resources. Furthermore, this finding was not significant ($p=0.777$), similar to the previous model. Those with access to materials at the individual level had individual wellbeing scores on average 1.34 ($p<0.05$) points higher than those without access to materials. Like the model adjusted for individual resources, negative associations were found among access to individual level determinants like access to knowledge and information sources, and access to pain management. When accounting for age, there was only a 0.06-point increase associated with individual wellbeing but this finding was not significant. For each education level there was only a 0.02-point increase in individual wellbeing scores, but this finding was also not significant.

Table 8: Association between the physical environment, workplace resource availability, individual level access to resources, and individual wellbeing in Kenya (Kenya=611)

	Parameter estimate, standard error, confidence interval, p-value															
	Unadjusted				**Adjusted for resource availability in the workplace**				**Adjusted for resource availability in the workplace, access to individual resources**				**Adjusted for resource availability in the workplace, access to individual resources, and demographic factors**			
Independent variable	**Model 1**				**Model 2**				**Model 3**				**Model 4**			
Physical environment index	0.48	0.15	(0.19, 0.78)	0.781	0.47	0.15	(0.17, 0.77)	0.002*	0.41	0.16	(0.11, 0.72)	0.008*	0.49	0.16	(0.09, 0.71)	0.011*
Resource availability index					0.61	1.08	(-1.53, 2.74)	0.577	0.30	1.07	(-1.81, 2.41)	0.782	0.30	1.07	(-1.80, 2.41)	0.777
Access to individual resources																
Access to materials									1.39	0.50	(0.40, 2.37)	0.006*	1.34	0.50	(0.36, 2.33)	0.008*
Access to knowledge									-1.55	0.62	(-2.78, -0.32)	0.013*	-1.52	0.62	(-2.74, -0.29)	0.016*
Access to Pain management									-1.24	0.51	(-2.23, -0.24)	0.015*	-1.21	0.62	(-2.74, -0.29)	0.016*
Access to social support									0.43	0.74	(-1.04, 1.90)	0.565	0.44	0.75	(-1.03, 1.90)	0.561
Demographic factors																
Age													0.06	0.04	(-0.02, 0.13)	0.143
Education													0.02	0.06	(-0.10, 0.15)	0.709

*Significant at $p<0.05$.

Differences in Associations between Nepal and Kenya

To assess the differences in associations of each model among women in Nepal versus women in Kenya, each developed linear regression model was assessed by restricting the outcomes to only those in Nepal and only those in Kenya. Refer to previously mentioned tables (7, 8) for each country. A significant linear regression equation was found for the primary exposure and outcome in both Nepal and Kenya ($p < .0001$). It was also found that participant's individual wellbeing among women only in Kenya increased 0.48 for each score of the physical environment, whereas individual wellbeing among women only in Nepal increased 0.72 for each increasing score of the physical environment. Adjusted models at the workplace level for resource availability only found significant results for Nepal but did not find significant results for women in Kenya. The workplace physical environment, though, was significant for Kenya. Significant changes to the estimates were found when accounting for resources at the individual level like access to materials and demographic information like education in Nepal. Though, there were not significant associations in any model after accounting for access to knowledge and information sources, and pain management. Furthermore, accounting for access to resources at the individual level and demographic factors did not result in significant changes to the estimates in Kenya. Significant changes were found in Kenya when accounting for individual level determinants such as access to materials, knowledge and information sources, and pain management.

Chapter 4: Discussion, Conclusion and Recommendations

Discussion

Our study aimed to (1) describe the physical environment and access to resources related to menstruation where the women in Nepal and Kenya work, (2) identify the proportion of women who work outside the home who report poor individual well-being, (3) evaluate the association between the workplace physical environment, access to workplace menstruation resources, and individual well-being, and (4) compare the differences in associations among working women in Nepal with working women in Kenya. Findings suggest that having access to an optimal physical workplace environment, resources available at the workplace, and access to individual level resources improve individual wellbeing overall.

We found a large proportion of respondents that reported poor individual wellbeing in the full sample. When assessed at the country level, Kenya had overall more individuals with poor wellbeing compared to Nepal. We also found that individuals with access to resource availability in the workplace had individual wellbeing scores on average 1.72 points higher compared to individuals without access to resource availability in the workplace in Nepal. Among participants in Kenya, we found that participants with access to materials at the individual level had individual wellbeing scores on average 1.39 points higher compared to individuals without access to materials. Respondents in Nepal with access to materials at the individual level had individual wellbeing scores on average 2.43 points higher compared to respondents that did not have access to materials at the individual level.

With the high percentage of individuals in the overall sample with poor individual wellbeing indicates a need to address the determinants that are associated with individual

wellbeing. Furthermore, nearly half of study participants in Kenya (43%) reported poor individual wellbeing, whereas 20% of participants in Nepal reported poor individual wellbeing.

Analysis suggests that not having access to menstruation-related determinants like individual materials and resource availability in the workplace can contribute to poorer wellbeing. Existing research supports that having access to materials is a core requirement to achieving menstrual health (Hennegan et al., 2021) The findings of this secondary analysis align with existing literature as we found that individual wellbeing scores increase when participants have access to materials at the individual level. Moreover, a positive association was found between access to resource availability in the workplace and individual wellbeing, further highlighting the importance of menstruating women having access to necessary materials to manage their menstruation. While literature already suggests that young adult females in low- and middle-income countries lack "adequate access to materials to manage their menstruation" which can lead to worse psychosocial outcomes, these data align with this as those without access to menstrual materials had poorer individual wellbeing (Rupe et al., 2022).

No respondents within our sample received the optimal score for resource availability pr workplace environment in the workplace. Our data suggests there is a need to improve the access to workplace menstrual related resources and environments to support menstruating employees. As mentioned, individuals in Nepal increased individual wellbeing points when they had access to these workplace resources, and these findings were significant. Because those with access to materials at the workplace level had better individual wellbeing scores, we can infer that improving the support by workplace's management of employee menstruation will improve individual wellbeing for the employed menstruator in Nepal. Significant associations were found between the physical environment, resource availability, and access to resources at the overall

level but differences did exist at each country level. For example, there were significant associations when individuals in Nepal had access to materials in the workplace, but individuals in Kenya had significant associations when they had access at the individual level. These findings echo previous studies that have shown having unmet menstrual practice needs are associated with poorer wellbeing at the individual level (Hennegan et al., 2022). Moreover, because many women spend most of their day in the workplace, these study findings emphasize the need to address menstrual practices in the workplace and advance the evidence of associations that exist between the physical environment, workplace determinants, individual determinants, and individual wellbeing.

Strengths and Limitations

One of the core strengths of this secondary analysis was that data were already collected, therefore it was extremely cost efficient to complete these analyses. This analysis allows for a deeper understanding of the primary data and existing data in the field. Additionally, the primary data collected information on women with at least twelve different job types, increasing the variability of responses based on the work industry. Secondary researchers commonly have the barrier of accessing data and information necessary to conduct analyses. Because I was advised by one of the leaders of the primary data collection, I was able to access all necessary information to complete this analysis.

Like any secondary analysis, there was no control over the data collection process, therefore there was no input on questions and revisions. Moreover, the data had a high rate of missingness that existed within the primary data for key measures that were used within the secondary analysis. Due to this, reconstruction of various indexes that were developed and recommended by the primary research team was required to be able to assess those key

measures. Moreover, these findings are from cross-sectional data, preventing inference of causality or directionality from these results. Despite these limitations, this study contributes new information on workplace and individual determinants to better understand how they associate with individual wellbeing.

In conclusion, the physical environment, workplace resource availability, and individual level resources can improve the individual wellbeing of menstruating employees. Future policies could provide guidelines so that the physical environment at work is adequate to ensure menstruators have access to clean, safe, and private facilities with proper resources. Furthermore, addressing these areas could improve the menstrual practices of employees, which would improve their mental and overall health.

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