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Student name: Jade Morkel

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Supervisors: Prof. Maria Florence and Prof. Shazly Savahl

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DECLARATION

I Jade Morkel hereby declare that *Stress and Nicotine Dependence during pregnancy among women in Low-SES communities in the Western Cape: The mediating effects of Social Support* is my own work. This work has not been submitted for any other degree or examination or professional qualification in any other university. All the sources I have used or quoted have been indicated and acknowledged by complete references.

Signature: _____J. Morkel_____

Date: _____

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ABSTRACT

Health behaviours during pregnancy are of great significance due to its associated health consequences for both the woman and the developing foetus. There is a large body of existing knowledge demonstrating the profound harmful effects of cigarette smoking on maternal and foetal health. Given the significant smoking rates and the related negative birth outcomes and health impact on infants, understanding who smokes during pregnancy and the factors influencing this behaviour is imperative for the creation of effective intervention programs. The overarching aim of the study was to determine the relation between stress and nicotine dependence among a sample of pregnant women residing in low socio-economic status communities in the Western Cape. The study further aimed to determine the extent to which social support mediates this relation. The study followed a cross-sectional design. Convenience sampling was employed to select participants ($N = 209$). Women were selected from various healthcare clinics in the Western Cape as well as the Change Agents South Africa organisation, who work specifically with women from marginalised communities. The average age of the participants was ($M = 26.61$; $SD = 5.865$). Socio-demographic information such as race, employment status, educational level and marital status along with baseline information about the extent of smoking and psychosocial well-being was collected from the sample of pregnant women. The Fagerström Test for Nicotine Dependence (FTND) was used to assess nicotine dependence and the Prenatal Psychosocial Profile Scale, which assesses stress and social support. The data was analysed using a multinomial logistic regression technique in SPSS version 28. Ethics clearance was obtained from the Biomedical Research Ethics Committee (BMREC – Ethics Reference Number: BM20/9/10). An online application was submitted to The Department of Health of the Western Cape Government and Department of Health Impact of Assessment Sub-directorate and City Health, to obtain ethics clearance and permission to conduct the study in the clinics. This study was informed by the Social Ecological Model

(SEM). Fragmentation of the South African healthcare system, coupled with racial and socio-economic issues, have proliferated negative health behaviours. Situating health behaviours during pregnancy against this backdrop allows us to understand how women's social world shapes health outcomes. It further shifts the focus of health behaviours as solely being the women's responsibility to societal organization and the myriad of institutions, structures, inequalities, and ideologies that underpin observed variation in health behaviours. In light of the research findings: (1) that stress is a significant predictor of nicotine dependence and (2) that social support does not act as a mediating factor between stress and nicotine dependence, future research and policy should be geared towards multi-level approaches that can be sustainable and effectively address the problem of maternal smoking. In effect this means that cessation interventions should be women-centred, context-specific, integrate inequality and socio-economic issues, and be mindful of the psychosocial needs of women. Such efforts may build confidence and increase motivation to quit smoking.

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CHAPTER 1
INTRODUCTION

1.1 Background

Health behaviours during pregnancy are of great significance due to its associated health consequences for both the women and the developing foetuses (Ma et al., 2020; Homish et al., 2012). Smoking during pregnancy is still a major public health concern (de Wolff et al., 2019; Scheffers-van Schayck et al., 2019). The negative effects of smoking on women's health have been reported on extensively (Page et al., 2012), and there is a large body of existing knowledge demonstrating the profound harmful effects of smoking on maternal and foetal health (Homish et al., 2012). For the babies these include pre-term birth, low birthweight, birth defects, risk of spontaneous abortion, still birth, neonatal infections, sudden infant death syndrome (SIDS) (de Wolff et al., 2019; Everet-Murphy, 2011; Tarasi et al., 2022); whilst the mother is exposed to the risks of placenta praevia, placental abruption and pre-eclampsia (Caleyachetty, 2014). According to Hauge et al. (2012), regardless of this readily available knowledge of the harmful effects of smoking, many women continue this habit even after becoming pregnant, increasing pregnancy complications and exposure of their unborn child to serious health hazards (Scheffers-van Schayck et al., 2019).

In 2018 the global prevalence of smoking during pregnancy was estimated to be 1.7% with wide variation between countries and regions. The highest prevalence of smoking during pregnancy was found in the European Region (8.1%), whilst the lowest appeared to be in the African region (0.8%). These estimates were generated through a meta-analysis of studies conducted by Lange et al., (2018) in selected samples. According to de Wolff et al. (2019) maternal smoking is influenced by social inequality, it is one of the most significant contributors of health inequality between the rich and the poor (Boucher & Konkle, 2016). Graham et al. (2010) states that women on disadvantaged trajectories are more likely to start

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their pregnancy as smokers. Seen from this perspective of socio-economic disadvantage, high rates of pregnant smokers are often found to be among women from low socio-economic communities (Madureira et al., 2020). They are characterised by having less social support (family/partner), fewer financial resources, less residential stability, lower-income levels, and lower educational attainment (Maxson et al., 2016). This suggests a greater likelihood that a woman will use smoking as a way of coping or as a perceived stress reducer (Boucher & Konkle, 2016; Maxson et al., 2016; Petersen, 2011).

Furthermore, several studies confirm that smoking is more prevalent among individuals experiencing high levels of stress (Boucher & Konkle, 2016; Crone et al., 2019; Hauge et al., 2012; Masho et al., 2014; Maxson et al., 2012). Hauge et al., (2012) state that nicotine from cigarette smoking may be the most easily and readily accessible means to relieve and control experiences of stress. Smoking is thus viewed as a potential buffer against negative life experiences and as a coping mechanism to manage psychosocial stressors (Crone et al., 2019). Masho et al. (2014) asserts that higher levels of stress are associated with smoking during pregnancy. However, further research is needed to confirm these relations and to further elucidate the complex context of pregnancy smoking (Grant et al., 2020). The lack of availability of such information could pose adverse drawbacks for the implementation of preventative practices.

Apart from individual level factors, social-environmental factors may be further predictors of the continuation of smoking during pregnancy, one such factor is the impact of social support (Homish et al., 2012). According to Kim et al. (2014), social support is seen as a voluntary act and can be provided by a family member, husband/partner, friend and others. It may be given in different forms: physical, emotional (e.g., empathy, caring, love), instrumental (e.g., financial) and appraisal (e.g., promoting self-evaluation). Several research studies (see Boucher & Konkle, 2015; Creswell et al., 2015; Kim et al., 2014; Masho et al.,

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2014; Willemse et al., 2022) have found that social support is protective with regards to smoking behaviours, by acting as a buffer against the impact that stress has on a mothers' well-being. According to Bedaso et al. (2021) the stress-buffering hypothesis suggests that the presence of social support can help individuals dealing with stress avoid smoking during pregnancy. This mediating effect may alter a person's perspective on negative events or challenging life circumstances, offering potential solutions by promoting adaptive responses and equipping individuals with the necessary skills required to buffer the effect of stress. As a result, the likelihood of experiencing harmful consequences is reduced.

However, it is also important to note that social support is not necessarily only positive as depicted in these studies. Oftentimes, social support may be counterintuitive and advance the problem behaviour. In these situations, it is likely that women's social circles (i.e., support networks) promote negative health behaviours. Therefore, partners, friends and family's smoking status and support for the pregnant woman's efforts to reduce or quit smoking may impact on women's smoking behaviour (Hemsing et al., 2015; Willemse et al., 2022). While there is consensus in the literature that social support impacts on smoking decisions during pregnancy, this association is not yet well understood based on the available literature.

1.2 Social Determinants of health in the South African Context

Reflecting on health behaviours in the South African context, it is important to note here that South Africa remains one of the most socially fractured and unequal contexts in the world (World Bank, 2017a). This dates back to the country's history, from colonial subjugation, apartheid dispossession, to the post-apartheid period (Giljam-Enright et al., 2020). Racial and gender discrimination, the destruction of family life, vast income inequalities, and extreme violence have all formed part of South Africa's troubled past. As a result, South Africa's health system and access to healthcare is strongly influenced by racial

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segregation and systemic fragmentation and there continue to exist wide inequalities in the distribution of health and health outcomes (Ataguba & McIntyre, 2015; Omotoso & Koch, 2018).

Bearing this history in mind, it is therefore important to highlight that an individual's health and health behaviours at any given time reflect physical endowments in combination with a cumulated set of experiences and circumstances that have unfolded over time, in distinct social and physical contexts (Short & Mollborn, 2016). This perspective, which considers social demographics, and social epidemiology, emphasizes the social milieu of health (Braveman & Gottlieb, 2014). Health disparities in South Africa are therefore rooted in complex, integrated and overlapping economic and social systems that are entrenched in society and are responsible for various inequalities (Giljam-Enright et al., 2020). These inequalities have significantly shaped individual characteristics, i.e., education, income, and health beliefs, as well as individual's social and physical contexts i.e., families, workplaces, neighbourhoods, and the larger political-economic organization of society that further enable or constrain health (Braveman & Gottlieb, 2014).

Multiple deficiencies and inadequacies caused by fragmentation of the South African healthcare system, coupled with racial and socio-economic issues, have thus led to further proliferation of negative health behaviours (Maphumulo & Bhengu, 2019). Situating health behaviours during pregnancy against this backdrop allows us to understand how women's social world shapes health outcomes, especially in the most affected populations in the South African context. It further shifts the focus of health behaviours as solely being the women's responsibility to societal organisation and the myriad of institutions, structures, inequalities, and ideologies that underpin observed variation in health behaviours (Short & Mollborn, 2015).

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1.2. Rationale

Pregnancy presents women a unique opportunity to improve health behaviours, as most women are motivated to ensure the health of their unborn baby (Maxson et al., 2012). However, prioritizing successful and enduring tobacco cessation during pregnancy is an ongoing public health concern (Boucher & Konkle, 2016). Boucher and Konkle (2016) asserts that health interventions over the last three decades have had poor success rates, partly as a result of the foetus-centric perspective it has adopted. Beyond this it could also be attributed to the fact that some women are unaware, or they downplay the real and substantial negative outcomes of continued smoking during pregnancy (Assari & Boyce, 2021; Smedburg, 2014). This may have served to limit the scope of interventions, by overlooking important factors that contribute to women's inability to quit smoking during pregnancy (Jackson et al., 2022). The literature confirms that increased stressful life experiences (Allen et al., 2019) and decreased social support and coping resources are positively associated with increased smoking (Bedaso et al., 2021). However, the influence of these factors in relation to maternal smoking are scarcely documented in the literature and currently existing literature lacks depth of understanding regarding these associations. Given the significant smoking rates and the associated negative birth outcomes and health impacts on mothers and infants, understanding who smokes during pregnancy and the factors influencing this behaviour is imperative to report on. This will contribute towards the larger goal of informing effective intervention programs (Maxson et al., 2012). The current study is thus able to make a significant contribution to existing literature globally, by providing a more comprehensive understanding regarding the association between stress and nicotine dependence and the influence of social support on this relation.

Moreover, given that these associations are understudied within the South African context, this study may be useful in broadening the existing scope of literature and offer

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meaningful contributions to advance South Africa's healthcare system for underprivileged women, a system which is fraught with widespread inequality as a result of South Africa's political history. The study therefore foregrounds marginalised South African women and provides insight into the ramifications of racial segregation and systemic fragmentation on health behaviours and access to healthcare. In doing so, the study endeavours to shift the onus as being solely on the woman and views health behaviours as embedded in a woman's social context. The study is therefore able to report on the need for improved access to smoking cessation programmes for pregnant women from underprivileged communities. More so, the study is able to highlight the need for public health practices to better support women, and to implement interventions that stretch beyond mere cessation. Considering influences such as that of stress and social support on smoking behaviours could potentially enhance the effectiveness of preventative practices, ultimately leading to an improvement in women's health behaviours and that of the public health domain.

1.3 Aim of the study:

The overarching aim of the study was to determine the relation between stress and nicotine dependence amongst a sample of pregnant women residing in low socio-economic status communities in the Western Cape. The study further aimed to determine the extent to which social support mediates this relation.

1.4 Objectives of the study:

i. To determine the levels of stress amongst a sample of pregnant women;

ii. To determine the level of nicotine dependence amongst a sample of pregnant women;

iii. To determine the relation between stress and nicotine dependence;

iv. To determine the extent to which social support mediates this relation

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1.5 Hypotheses

i. Stress significantly predicts Nicotine Dependence

ii. Social Support mediates the relation between Stress and Nicotine Dependence

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CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

The following chapter provides an overview of studies conducted that consider the relation between stress and nicotine dependence during pregnancy as well as the role of social support in this relation. Both national and international literature was consulted. In order to provide context about nicotine dependence during pregnancy and the factors that contribute to this behaviour, the literature review will be broadly divided into the following sub-sections: nicotine dependence during pregnancy, factors contributing to nicotine dependence as well as barriers to cessation. Furthermore, this chapter will discuss the theoretical framework that guided the study.

Despite social norms discouraging women from smoking during pregnancy, research findings show that smoking during pregnancy is still a prevalent behaviour in many countries, both nationally and internationally (Crone et al., 2019; Gaarskjaer, 2019; Lange et al., 2018; Whiteside, 2014). In a global systematic review by Lange et al., (2018) including 174 countries, the authors found that on average 75.2% of pregnant women who smoked were daily smokers and the proportion of women who continued to smoke daily during pregnancy was 52.9%.

These findings are concerning from a public health as well as a child development perspective (Diamanti et al., 2019). It is therefore imperative to understand and shed light on the factors inhibiting smoking cessation during pregnancy (Hauge et al., 2012).

2.2 Nicotine Dependence during pregnancy

According to Tsai et al. (2011) individuals who smoke on a regular basis and become addicted to nicotine are said to be nicotine dependent. Tobacco addiction is a chronic condition driven by an industry that is committed to researching the physiological, behavioural and psychological factors associated with tobacco use (Bernstein & Toll., 2019). The tobacco

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industry develops products and marketing approaches designed to increase the likelihood that people will try the products and become addicted (Cruz et al., 2019; Madureira et al., 2020). Nicotine as a drug, regardless of its delivery mechanism, drives repeated use and dependence by acting as a pharmacologic reinforcer of behaviour much like cocaine and heroin (Centers for Disease Control and Prevention, 2010).

The use of tobacco among females has taken a unique trajectory, with the adoption of cigarette smoking becoming widespread among women approximately 25 years later compared to men (Centers for Disease Control, 2017). In the year 1920, when women gained suffrage rights and started engaging in paid employment, the tobacco industry seized the opportunity to target a new group of potential smokers. They effectively promoted cigarettes to women, associating them with notions of glamour and independence (Scherman et al., 2018). Moreover, cigarettes were heavily marketed to women as a means of losing weight (Gonseth et al., 2012). Between 1924 and 1935, the prevalence of cigarette smoking among women more than tripled, rising from 6% to 20% (Centers for Disease Control, 2017). Women are thus an explicit target of tobacco marketing, and most individuals develop their addiction to nicotine early in the life course before becoming pregnant (Brown-Johnson et al., 2014).

When women become pregnant, they are generally more likely to stop smoking than at any other time in their lives (Itai et al., 2019). However, despite growing awareness of the harmful effects, studies have revealed that a substantial number of pregnant women continue to struggle with nicotine addiction (Lundquist et al., 2012; Smedburg et al., 2014). This dependence is often fuelled by various factors, including stress, social influences, and pre-existing smoking habits which is discussed in greater detail in the subsequent sections. Moreover, the rise of alternative nicotine delivery systems like e-cigarettes has introduced

new challenges in combating nicotine dependence among expectant mothers (Drope et al., 2017).

Crume (2019) asserts that pregnancy is a critical period at which successful smoking interventions could reap substantial public health benefits. However, smoking cessation interventions have traditionally emphasized the biomedical aspects of quitting smoking, often overlooking the crucial role of social factors (Stead & Lancaster, 2012). These interventions primarily revolve around pharmacotherapy, such as nicotine replacement therapy or prescription medications, which aim to alleviate nicotine withdrawal symptoms and reduce cravings (Claire et al., 2020; Wadgave & Nagesh, 2016). While these approaches can be effective in addressing the physiological addiction to nicotine, they often neglect the complex social dynamics that contribute to smoking behaviour. By failing to address the social aspects, such as peer pressure, social norms, and environmental triggers, these interventions may fall short in providing a comprehensive and sustainable solution to quitting smoking. Our contribution here, is thus to recognise the importance of the social context surrounding smoking, and the growing understanding that future interventions should adopt a more holistic approach, integrating biomedical strategies with social support systems and community engagement to increase the likelihood of long-term success in smoking cessation.

2.3 Factors contributing to Nicotine Dependence during pregnancy

2.3.1 Stress

Although pregnancy is considered to be a time of joyous anticipation for most women, it can be a time of increased stress associated with major life transitions. Considering the accompanying changes, such as changes in physical form, self-identity and often interpersonal relationships, it can become taxing to a woman's psychosocial and physical resources (Omidvar, 2018). The resulting stress may have adverse effects on maternal well-being. Understanding how women cope with stress during pregnancy is therefore critical (Dascal et al., 2019).

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According to Schaefer et al. (2019), maladaptive ways of coping are often associated with greater experiences of stress, one such maladaptive way of coping is through smoking. Many women report that continued smoking helps them cope with stress induced by the pregnancy, particularly in situations where the pregnancy was unintended, in situations of economic disadvantage, as well as in cases where they are unsupported during the pregnancy (Masho et al., 2014; Pereira et al., 2020).

There is strong evidence that links smoking during pregnancy to increased levels of stress (Pereira et al., 2020). The pharmacokinetic effects of nicotine on the nervous system are complex and include a biphasic pattern of initial alertness and arousal, which serve as a positive reinforcement, followed by a calming and reduction of stress, serving as a negative reinforcement (Benowitz, 2009). Women have been shown to be more likely than men to moderate symptoms of stress and depression with tobacco (Crume, 2019).

A cross-sectional study conducted in Romania by Dascal et al. (2019), with 130 pregnant smokers aimed to identify the factors associated with moderate to high nicotine dependence. First time pregnant women had increased odds of moderate to high nicotine dependence compared with women who had no previous pregnancies. Part of the explanation is that pregnancy is a new and stressful period accompanied by many changes and smoking may be a way of coping with pregnancy-related anxiety. Also, quitting smoking would be a stressor in itself because it implies effort and energy resources for managing immediate consequences of quitting smoking and maintaining smoking cessation at least for the period of pregnancy (van Dijk, 2021).

Similarly, a longitudinal study conducted by Brannigan et al., (2022) examined whether increased levels of self-reported stress is associated with increased smoking in pregnant women. The study included a subsample of 3633 pregnant women from the Helsinki

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Temperament Birth Cohort. The Cohort consist of expecting woman who returned at least one well-being questionnaire during their clinic visits. The results indicated that women reporting severe stress were more likely to smoke, compared to moderate stress and no stress groups.

Likewise, a prospective population-based cohort study by Hauge et al. (2012) which aimed to investigate associations between maternal stress and smoking amongst a sample of 71 757 pregnant women in the Norwegian Mother and Child Cohort Study, yielded similar risk factors. These factors include having low educational attainment, low income as well as a lack of partner support and/or having a smoking partner, which are all indicative of stressful life circumstances. In these instances, smoking is considered as an easily accessible means of relieving stressful experiences (Hauge et al., 2012).

In addition, Maxson et al. (2012) made use of data from a prospective cohort study of pregnant women in the United States in order to understand the psychosocial profiles of women who choose to smoke during pregnancy compared to those who do not smoke, or successfully quit smoking. The results indicated that higher levels of perceived stress were associated with higher odds of being a smoker than a non-smoker. Women who smoked during pregnancy experienced more negative psychosocial difficulties compared to those who did not smoke.

Similarly, a systematic review conducted by Gould et al. (2020), collating the latest evidence from systematic reviews about the maternal and child health outcomes of being exposed to tobacco and nicotine during pregnancy, highlights key barriers which contribute to continued smoking during pregnancy. These include, low socio-economic status, which is characterised by difficult life circumstances or persistent disadvantage. Preliminary evidence indicated that women who persistently smoked during pregnancy experienced elevated stress levels. There was thus a significant positive association between stress measures or the existence of stressors and the presence of continued smoking among pregnant women.

As is evidenced by the literature there is a confirmed association between stress and continued smoking during pregnancy. Pregnancy is a period of heightened emotional and physical changes, often accompanied by increased stress levels (McLeish & Redshaw, 2017). Among the concerns that pregnant women may face as elaborated on before are anxiety about their physical well-being, emotional concerns relating to motherhood and financial worries (Masho et al., 2014; Pereira et al., 2020; Weaver, 2008). Stress can elicit various psychological and physiological responses in pregnant women, which may lead to the perceived attractiveness of nicotine use and even dependency (van Dijk et al., 2021). Nicotine has been found to induce temporary feelings of relaxation and stress reduction due to its impact on neurotransmitters in the brain (Benowitz, 2009). Pregnant women experiencing stress may therefore turn to nicotine as a coping mechanism to relieve stressful experiences. This form of reinforcement may lead to a pattern of dependency. However, the influence of stressful events in relation to maternal smoking has been scarcely documented (Crone et al., 2019; Hauge et al., 2012). According to Maxson et al. (2012) it is important to note that there is a constellation of factors contributing to continued smoking during pregnancy, which work jointly in creating or perpetuating stressful life circumstances of pregnant women. This highlights the importance of taking into account the impact of these factors on smoking behaviours and understanding how it works to inhibit the success of smoking interventions.

2.3.2 Socio-economic factors

The research has shown marked differences between women who smoke during pregnancy and those who do not, consistently reflecting social disadvantage. Factors that have been strongly associated with nicotine dependence during pregnancy include, low socio-economic status, having an income below the poverty line, low level of education, unmarried and living with extended family, women of younger age, women with more children, living without a partner or a partner who smokes and attending public rather than private healthcare

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services, as well as attending antenatal care later and less regularly (Boucher & Konkle, 2016; Dascal, 2019; Masho et al., 2014; Madureira et al., 2020; Nur, 2017; Page et al., 2012; Petersen, 2011). Other factors include, poor coping skills, heavy smoking (more than 10 cigarettes a day), prenatal smoking, emotional or psychiatric problems (Pereira, 2020); unintended pregnancy and early or single motherhood (Barton et al., 2017; Nur & Nur, 2017; Širvinskienė et al., 2016).

A South African cross-sectional study conducted by Petersen (2011) with a sample of 800 participants, highlighted the distinction between women who continue to smoke during pregnancy and those who quit. Findings indicated marked socio-economic differences between these two groups. Women who successfully quit smoking during pregnancy were often those who had a positive social environment, they were either married or in a stable relationship with a partner. Whereas women who continued to smoke were more likely to be younger, poorer, unemployed, have lower levels of education, lower social support and living without a partner. The latter has been confirmed in a longitudinal study conducted by Page et al. (2012), in which the authors investigated factors associated with patterns of smoking during pregnancy in fragile families, amongst a sample of 3 552 women. They found that socio-economic status is a predictor of smoking and is characterised by factors such as living in households below the poverty line, having public or no health insurance and low education levels.

Similarly, a cross-sectional study conducted by Madureira et al., (2020) in Portugal, considers smoking prevalence, smoking cessation rate, environmental tobacco smoke exposure and the role of socioeconomic position. The study was conducted with a sample of 619 pregnant women who were receiving prenatal care at a facility which predominantly serves women from low socio-economic status. The findings demonstrated that smoking and exposure to environmental tobacco smoking still remains high and that this is driven by the significant socioeconomic inequalities that still exist in smoking. One of the key factors that was

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significantly associated with continued smoking during pregnancy was lower levels of education.

Likewise, Masho et al. (2014) examined the associations between domains of social support and smoking during pregnancy with a sample of 227 women in the United States. The women attended inner-city clinics, which predominantly serve low-income pregnant women. The results indicated that disadvantaged women, including those who live in poverty, have low income and report low educational attainment, were more likely to smoke during pregnancy. A recent study by de Wolff et al. (2019) shared similar sentiments, in which the authors postulate that smoking during pregnancy is a marker of social inequality, whereby higher rates of pregnant smokers are often observed among women from socially deprived areas, lower educational levels, and lower income. The findings indicated that predictors of smoking during pregnancy are evidently as a result of low socio-economic status, confirming this notion of social inequality in maternal smoking (de Wolff et al., 2019).

In addition, Whiteside (2014) reports on research conducted in the United Kingdom, amongst low socio-economic status pregnant women. The results show that pregnant women from low socio-economic status communities tend to smoke more than women from middle to high class communities, as a result of additional strains, due to financial difficulties and lack of social support. The author further elaborates on this and states that impoverished pregnant women who are addicted to tobacco are often from disadvantaged backgrounds. They lack access to proper medical care, experience financial deprivation, reside in inadequate housing, live in a hostile or non-supportive environment, they are victims of domestic violence, and are often living with a chemically dependent male. In such instances women often do not look favourably upon their pregnancies and are more likely to use tobacco products during pregnancy.

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Systematic attention should be paid to socioeconomic inequalities, in order to support women to quit smoking before or at an early stage of their pregnancies. As is evidenced by the literature several factors relating to socio-demographic conditions is closely connected with the likelihood of smoking behavior (Nur, 2017). The World Health Organization's report on Social Determinants of Health acknowledges that disadvantaged people are more likely to use substances in response to their circumstances, however, smoking cessation interventions fail to address barriers to participation amongst such high-risk groups. It is therefore imperative that health professions recognize the difficulties experienced by minority pregnant smokers when developing and implementing cessation strategies (Gould et al., 2013). In addition, anti-smoking interventions need to assume a positive as opposed to a punitive approach, respecting individual values, competencies and social circumstances in order to achieve compliance in women (Gould et al., 2013; Wen et al., 2012).

2.3.3 Social Support

Several studies confirm the notion that social support is protective with regards to smoking behaviours, by buffering the impact that life stress has on a mother's well-being (Boucher & Konkle, 2015; Creswell et al., 2015; Crone et al., 2019; Masho et al., 2014). Creswell et al. (2015) and Lemasters (2015) postulate that social support can provide both emotional and instrumental resources, minimising stressors experienced by pregnant women and improving the health outcomes of their pregnancy. In addition, social support is also considered to be an important determinant of successful smoking cessation. However, according to Everett-Murphy (2011) and Creswell et al. (2015) a lack of naturally occurring social support, such as the presence of existing support systems within the smoker's environment are associated with persistent smoking or even smoking relapse.

A cross-sectional study conducted by Meghea et al., (2012) assessing the prevalence, knowledge and attitudes of smoking during pregnancy in two urban clinics in Romania found

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that the percentage of women with no social support was higher among smokers (22%) than among quitters and non-smokers (11 and 10%). Findings showed that moderately heavy dependent smokers were more likely to have no social support (26%) compared to smokers with low nicotine dependence (19%). Consistent with other studies analysing pregnant women in industrialized countries, the authors found that, after controlling for other factors, continued smoking during pregnancy was associated with a lack of social support among pregnant women.

In a systematic review conducted by Boucher and Konkle (2016), the authors frame maternal smoking in terms of the bond between parents. Whether a woman smokes during pregnancy depends largely on the relationship she has with her partner. Marital status is viewed as an indicator of social support and is highly correlated with successful smoking cessation during pregnancy. Maternal smoking is thus lowest in married mothers, followed by cohabiting mothers, then single mothers. A noteworthy finding from this study is the increased risk of maternal smoking in cases where there is a lack of bonding between parents. Single mothers who do not have a relationship with the father are at higher risk of continued smoking, as opposed to those who are closely involved with the father during pregnancy (Boucher & Konkle, 2016).

Waldron et al. (2017) shares similar findings in The Missouri Adolescent Female Twin Study conducted with a sample of 370 pregnant women in Missouri, indicating that married women have much lower rates of smoking throughout their pregnancy, compared to single and cohabiting mothers. This is consistent with recent research findings by Bedaso et al., (2021) who found that women who smoke during pregnancy received less support from various intimate relationships and specifically perceived their partner interactions as less positive and more negative compared with women who were not smokers. According to Boucher and Konkle (2016), in conjunction with the presence of a partner, the amount of support received

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from a partner is indicative of the likelihood to quit smoking. Pregnant smokers are more likely to have challenging relationships, they may be subjected to physical abuse, for instance (Scherman et al., 2018). Therefore, suggesting that conflict within relationships may increase the need to smoke, hindering cessation attempts.

Furthermore, Boucher and Konkle (2016) also note that social support does not only promote healthy behaviour, in this case, encourage smoking cessation. Even among women that experience positive social relationships, living with a smoking partner or family member is one of the main barriers to smoking cessation in pregnancy. Due to the fact that the other smokers provide easy access to cigarettes. In a study conducted by Homish et al. (2012) results reveal that partner smoking has a significant impact on whether a woman continues to smoke. Likewise, Creswell et al. (2015) purports that having a smoking partner is particularly influential with women who continue to smoke. This was found to be especially true for women of low socio-economic status.

The literature generally focuses on the positive aspects of social support. However, there is also evidence of social support enabling negative health behaviours. Although, scarcely documented in the literature, this includes discouraging emotional expression, encouraging continued smoking, and a lack of assured help (Abdi et al., 2022). These forms of support can be harmful to a woman's health during pregnancy. A recent cross-sectional study conducted by Abdi et al, (2022), with 200 pregnant women recruited from two teaching hospitals in Iran aimed to study the association of social support with pregnancy related stress. The study found that the kind of social support women were receiving was related to increased stress during pregnancy. Similarly, Grant et al. (2020) conducted a qualitative study to gain an in-depth understanding of the health issues affecting 10 low-income pregnant women from deprived communities of South Wales in the UK. The study specifically focused on mother's accounts of smoking during pregnancy in order to understand the issue in more depth. Findings indicated

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that demonising and stigmatising women as a way of providing support for them to stop smoking negatively impacted on their self-identity and self-disclosure. The nature of this support was counterintuitive and in fact, led to continued smoking or smoking in private. In addition, a qualitative study conducted by Dokuzcan and Aydogdu (2021), exploring the characteristics of smoking behaviour among 12 pregnant women in a low-socio economic community in Turkey found that a smoking spouse negatively affected women's health behaviour by continued smoking. Some of the women reported that cigarettes were procured by their spouses which made it easy for them to continue smoking.

The literature suggests that social support can have both positive and negative influences on nicotine dependence. The positive factors include encouragement and motivation from friends or family who provide encouragement and motivation to pregnant women to quit smoking. This may boost self-confidence and increase the likelihood of successful smoking cessation. Emotional support includes showing understanding and empathy, which may help women cope with stress and emotional ups and downs. Whereas, negative influences include negative social pressure, for instance when a woman is surrounded by friends or family where smoking is prevalent or where smoking is normalised, which can undermine cessation attempts. Social support structures can also inadvertently enable nicotine dependence by creating an environment that makes it difficult to resist or by procuring cigarettes for the pregnant woman. In situations such as this identifying and treating women with dysfunctional support networks should be a primary goal of treatment (Bedaso et al., 2021).

2.4 Barriers to Cessation

Smoking is a complex phenomenon. Women are aware of the risks of smoking however, the many perceived barriers negate these. Flemming et al. (2015) therefore calls for recognition of the importance of understanding why women continue to smoke during pregnancy. The authors highlight that it is closely related to contextual factors – explaining

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why women smoke in the first place. Pregnancy is often thought to exacerbate the barriers that made it hard to quit before pregnancy, the now added complex circumstances reinforce women's dependence on smoking (Smedburg et al., 2014).

In a systematic review conducted by Flemming et al. (2015) the authors explored the barriers and facilitators to smoking cessation experienced by women during pregnancy. A key factor which was found to act as both an enabler and barrier to smoking cessation is women's psychosocial well-being. According to the authors women consider smoking as an integral part of their lives. Despite wanting to do what is best for their baby, smoking is protective of their psychosocial well-being, especially for women experiencing socio-economic disadvantage. Lower socio-economic status combined with the high addiction liability of nicotine, means that smoking can play an important role as a tool to cope with significant financial and interpersonal stressors. Smoking is thus used as a coping mechanism in the face of persistent disadvantage and difficult life circumstances (Flemming et al., 2015).

In addition, a more recent systematic review conducted by Barnett et al. (2019) aimed to identify what pregnant women perceive as barriers and enablers to smoking cessation during their pregnancy. The findings indicate that partner's smoking behaviours, such as smoking in pregnant women's presence, offering them cigarettes, or putting the entire onus of quitting smoking on the mother for the sake of the child's health acts as a major barrier to cessation. When efforts to cease smoking are made by women, they reported feeling resentful towards their partners, especially when a partner is not supportive of smoking cessation. This is especially evident in cases where a partner continues to smoke (Flemming et al., 2015).

Research has further shown that often pregnancy itself acts as a barrier to cessation because women smoke as a source of enjoyment while other activities, such as socializing and employment, are restricted due to their pregnancy (Barnett et al., 2019; Gould et al., 2020).

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These significant changes in physical capabilities, employment patterns, family relationships and often housing arrangements results in stress which makes it difficult to quit. Gould et al. (2020) asserts that smoking is essentially built into women's social and domestic lives. An enabler or barrier to smoking cessation for pregnant women is not a fixed entity but dependent on the context of an individual's life, further research is thus needed to optimise ways to address these barriers (Barnett et al., 2019).

2.5 Summary of the literature

Taken together, the literature supports the notion that stress represents an important risk factor during pregnancy, and its consequences may be markedly exacerbated by additional factors such as lack of social support and a disadvantaged trajectory. To date, only a limited number of studies have attempted to characterize this association with a majority of these studies being conducted internationally, within low-income countries. It is therefore imperative that future research demonstrate the pathways through which these factors function in order to better understand the associations between them, and to draw more accurate conclusions as to how they influence nicotine dependence during pregnancy.

Furthermore, it will help aid in the development of effective intervention strategies. The development of intervention strategies should be done in such a manner that the suitability thereof is ensured for women from all socio-economic contexts, specifically taking into account women from high-risk groups. This will address existing disparities in health provision for pregnant women and equally increase the chances of long-term cessation.

2.6 Summary of the South African literature

As seen in the review of the literature, there is a lack of representation of South African women in the existing literature. Majority of these studies were conducted in the Global North. Findings from three studies conducted in the South African context suggests links between

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socio-economic status and continued smoking during pregnancy (Petersen, 2011; Phaswana-Mafuya et al., 2019; Steyn et al., 1997). While only one (Petersen, 2011) explores social support, reporting that women who received more support from their social environment were more likely to quit smoking during pregnancy. None of these studies explicitly considered stress and its relationship with continued smoking during pregnancy. Based on these findings there is much to learn about the role of persistent socio-economic disadvantage in the South African context, and its impact on continued smoking during pregnancy, given that this was a prevalent factor across these three studies. However, there is still a notable gap in the current literature concerning smoking during pregnancy in the South African context, despite the recognized detrimental effects of maternal smoking on both maternal and foetal health. Furthermore, there is a lack of studies that have explored the associated factors contributing to smoking during pregnancy, as well as how this may be exacerbated by stressful life circumstances and the absence of social support. The lack of a thorough understanding of these influences and the absence of targeted interventions hinder the development of effective strategies to address this public health concern and safeguard the well-being of pregnant women and their babies. An exploration of the unique experiences of South African women is therefore imperative. These findings can inform future research and intervention development that are specific to the South African context.

2.7 Theoretical Framework: Social Ecological Model

The factors that influence smoking are a combination of biological, psychological, and socio-cultural factors. The relative importance of and inter-relationships between these factors differ across smoking and smoking cessation theories (Potter et al., 2021). One of the most frequently cited and applied models for predicting health and social behaviours is The Theory of Planned Behaviour (TPB) developed by Ajzen (1991). The central factor in the TPB is the individual's intention to perform a given behaviour. Intentions are assumed to

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capture the motivational factors that influence a behaviour and indicate how hard people are willing to try, or how much effort they plan to exert, in order to perform the behaviour. Intention is influenced by three main constructs: attitude towards the behaviour, subjective norm, and perceived behavioural control (Azjen, 1991). Another commonly discussed theory in the literature is the Problem behaviour theory (PBT), which is a social-psychological framework that helps to explain the development and nature of problem behaviours, for example, risky sex or alcohol use. Jessor (1987) described problem behaviour as any behaviour that deviates from both social and legal norms. The model comprises three systems of psychosocial influences: personality system (all social cognitions, personal values, expectations, beliefs, and values), perceived environmental system (family and peer expectations), and the behaviour system (problem and conventional behavioural structures that work in opposition to each other).

Considering these approaches, the health promotion field is often criticised for focusing on lifestyle change while failing to take into account contextual factors that influence health (Golden & Earp, 2012). Health behaviours are associated with a multitude of health and well-being outcomes at the individual and societal levels. In this study, we draw attention to the socio-ecological factors that influence health behaviours. Socio-ecological models recognize individuals as being part of larger social systems and describe the interactive nature between individual characteristics and their environments that underlie health outcomes (Sallis et al., 2008).

The current study was informed by the Social Ecological Model (SEM) developed by McLeroy et al. (1988). Building on the work of Brofenbrenner (1977), who had previously articulated a multilevel framework, the SEM views individual's behaviour as integrated in a dynamic network of intrapersonal characteristics, interpersonal processes, institutional factors, community features and public policy. The model assumes that the interactions

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between individuals' behaviours and their social environment are reciprocal. This essentially means that an individual is influenced by their environment and the environment is influenced by the individual. The environment is also considered as consisting of several overlapping levels (Salihu et al., 2015).

These include the intrapersonal characteristics which comprises factors that influence behaviour, such as knowledge, attitudes, beliefs, perceptions and skills. These factors are largely influenced by the individuals' physical and social environments (McLeroy et al., 1988; Salihu et al., 2015). The interpersonal level considers relationships with others and how these relationships impact on health-related behaviours of individuals, i.e., social support systems including the family, work group as well as friendship networks. Institutional factors, refer to how organizational characteristics can be used to support behaviour changes, the importance of organizational change as a target for health promotion activities, and the importance of organizational context in the diffusion of health promotion programs (McLeroy et al., 1988; Salihu et al., 2015). Community factors include availability and location of resources that promote health, social networks and social norms. Lastly, the public policy level includes state and federal policies, and laws that impact health. It also seeks to increase public awareness about specific health and policy issues (McLeroy, 1988; Salihu et al., 2015).

The SEM is successful in recognising the complex role played by context in the development of health problems as well as in the success or failure of attempts to address these problems (Centers for Disease and Prevention Control, 2018). The SEM was therefore utilised in this study as it puts forward a multidimensional approach. It demonstrates the interrelationships between smoking during pregnancy and various socio-ecological factors, including social, health, economic and political disparities, and how these factors predispose women to continued smoking during pregnancy (Lee & Park, 2021). This approach shifts the

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lens from individual attribution and responsibility for smoking during pregnancy to larger social and environmental determinants that may often be beyond the individual's control (Short & Mollborn, 2015). The focus of this theory is therefore on integrating approaches to change the physical and social environments rather than modifying only individual health behaviours. The SEM is not at odds with the incorporation of biological and psychological processes, rather, it recognizes the interplay between them in complex dynamic systems and situates the individual in context (Short & Mollborn, 2015).

Each of the levels as outlined by McLeroy et al. (1988) are discussed in greater detail in Chapter 5 and is presented in the context of the study findings. Here we demonstrate the impact of various levels of influence (intrapersonal, interpersonal, institutional, community and policy) in the women's environment on continued smoking during pregnancy. By mapping these levels of influence, we highlight the need for creating environmental conditions that support and promote effective and sustainable behaviour change (Kothari et al., 2007). In addition, it serves to foreground the importance of public health experts using multi-level, multi-sectoral interventions in preventing smoking during pregnancy.

CHAPTER 3
METHODOLOGY

3.1 Research Design

The study method was quantitative in nature, this methodology was employed in alignment with the project aim and objectives, which is focused on determining statistical relations between variables. A quantitative methodology was thus best suited as this allowed the researcher to determine these relations with the use of statistical analyses. The study utilised a cross-sectional design. Gad (2014) asserts that cross-sectional designs are predominantly used when wanting to assess the health requirements of a population and is therefore particularly useful in understanding the association between a risk factor and its health outcomes. Its results can often suggest a causative or risk factor associated with a particular behaviour (Gad, 2014). The key focus of the study was to understand the impact of stress on smoking behaviours during pregnancy, and how social support mediates this relation in a sample of women residing in low socio-economic status communities in the Western Cape.

3.2 Research Context

The study followed two recruitment strategies; these strategies were implemented in communities that are characterised as low socio-economic status communities. The American Psychological Association (2022) defines socio-economic status as the standing or class of an individual or group. It is often measured as a combination of education, income and occupation. Examinations of socio-economic status often reveal inequities in access to resources, and issues related to privilege, power and control. During the first phase of recruitment, which took place between 2018 and 2019 ($N = 172$) pregnant women were recruited from five urban Community Healthcare Clinics situated in the Cape Metropole. These communities were identified based on the presence of community-based healthcare clinics which had Midwife Obstetric Units (MOU's). They were also identified based on the fact that they predominantly serve large numbers of African and Coloured pregnant women, women who lack access to private

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healthcare. This showcases that racial differences still play a critical role in affording an individual access to healthcare, in South Africa. Before democracy there was unequal access to healthcare and many other services, which had been institutionalised by the apartheid government (Mhlanga, 2020), the ramifications which still has lasting effects on many African and Coloured people today. The result is that there are two healthcare systems in South Africa, one that is largely publicly funded that serves mostly African and Coloured South Africans and one that is privately funded to serve a small percentage of people who are able to afford it, mainly White South Africans (Kon & Lackan, 2008).

During the second phase, which took place during 2020 and 2021, what was also the height of the COVID-19 pandemic, six further Community Healthcare Clinics were included as recruitment sites situated in the Cape Metropole. These clinics were included in order to increase the existing data that was collected between 2018 and 2019 and were identified against the same criteria. However, the pandemic posed various challenges making it difficult to access the participants and conduct the surveys in person, resulting in low participant rates ($N = 22$). In order to mitigate these challenges, the researcher initiated a partnership with the Change Agents South Africa (CASA) organisation, with the assistance of the project supervisor to recruit more participants to increase the number of participants ($N = 15$). CASA is situated in the Langeberg District and offers a range of services to two neighbouring rural communities. The mission of the organisation is to facilitate sustainable people development by establishing and strengthening civil society organizations involved in poverty eradication, substance abuse related projects and protecting the rights of all South Africans with specific focus on women, children, youth and marginalized groups (Change Agents South Africa, 2021).

3.3 Sampling

The sampling frame of the study were pregnant women, who were between the ages of 16 and 40 years old, from low socio-economic status communities in the Western Cape.

Parental consent was obtained for those women who were under the age of 18 years old. Some women were recruited from Community Healthcare Clinics ($N = 194$), whilst others were recruited based on their membership to CASA ($N = 15$). The women were selected using a convenience sampling technique, which involves using respondents who are convenient to the researcher (i.e., those who presented at the clinics on the day were invited to participate). Power analysis for a multinomial logistic regression was conducted using G*Power 3.1.9.4 to determine a sufficient sample size (Faul et al., 2013), using an alpha of 0.05, a power of 0.80, a small effect size (odd ratio = .04) and a one-tailed test (see Appendix E). Based on the aforementioned assumptions, the desired sample size was 256 participants. The researcher therefore aimed to recruit $N = 250$ participants to ensure usable data for at least $N = 200$ participants. The final sample included ($N = 209$) women. The shortfall in the sample is attributed to COVID-19 related challenges which were experienced during phase two of data collection. Due to strict lockdown measures imposed by the government, in person data collection was restricted, which made accessing participants via the clinics difficult. As a result, telephonic data collection was employed, however this yielded low participant rates, this may have been due to lack of access to telephonic devices.

Table 1.

Participant demographics

		Frequency (N)	Percent (%)
Age Categories	16-20	31	14.8
	21-25	60	28.7
	26-30	45	21.5
	31-35	37	17.7
	36-40	14	6.7
Race	African	94	45.0
	Coloured	108	51.7
	White	1	1.0
	Other	2	98.1

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Employment Status	Employed	62	29.7
	Unemployed	130	62.2
	Self-employed	7	3.3
Education Level	Primary school only	28	13.4
	Matric	102	48.8
	Undergraduate	25	12.0
	Post-graduate	3	1.4
	Other	27	12.9
Marital Status	Single	137	65.6
	Married	53	25.4
	Separated/Divorced	3	1.4
	Widowed/Widower	2	1.0
	Living together	10	4.8
Grant Holder	No	105	50.2
	Yes	75	35.9

Table 1 presents the frequencies of the sample demographics. Majority of the women (28.7%) were between the ages of 21 and 25. The mean score and standard deviation for age was ($M = 26.61$; $SD = 5.865$). The study included 45% African women, 51.7% Coloured women, and 0.5% White women. Majority of the sample comprised of Coloured women. Most women in the sample were unemployed (62.2%), compared to those who were employed (33%). Majority of the women's highest qualification was matric (48.8%), followed by primary school only (13.4%), while 12% of women had an undergraduate degree and 1.4% had a post-graduate degree. In terms of marital status, 65.6% of women were single, 25.4% were married and 4.8% were living together with a partner. A total of 50.2% of women received child grants compared to 35.9% who did not receive grants.

Due to South Africa's political history and numerous ongoing governance concerns, seemingly immaterial differences have become translated into deeply embedded structural forms of marginalization (Friedman, 2020; Howell, 2019). South Africa's predilection with racial distinctions is one such example. Under the apartheid regime, racial characterisations

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were invented (African, White, Coloured, Indian) in order to justify the systematic division of society, the result of which is that long after the fall of apartheid these racial distinctions are still manifest in the economic and social patterns which structure society and in the physical spaces of its urban areas (Howell, 2019). The use of race in this study is considered against this backdrop and serves to represent the deeply entrenched disparities that exist in the social and economic experiences of racial groups in South Africa.

3.4 Instrumentation

A questionnaire including socio-demographic information, baseline questions about the extent of smoking, the Fagerstrom Test for Nicotine Dependence as well as the Prenatal Psychosocial Scale were administered to the participants (Appendix C).

3.4.1 Fagerström Test for Nicotine Dependence (FTND)

The Fagerström Test for Nicotine Dependence (FTND) is a validated standardized smoking instrument developed to assess nicotine dependence (Fagerström et al., 1996). It is a non-invasive self-report tool that conceptualizes dependence through physiological and behavioural symptoms (Perez-Rios, et al., 2009). The current version of the test includes six items with an overall score range of 0-10. These items and their response options are presented in Appendix C. The test yields a composite score which is an indication of the level of nicotine dependence. These are categorised as follows, 1–2= low dependence; 3–4= low to moderate dependence; 5–7= moderate dependence; 8 += high dependence (Perez-Rios et al., 2009).

The FTND has shown acceptable psychometric properties, with an internal consistency of 0.62 in a South African study conducted by Pahl et al. (2010). A study conducted by Tombor et al. (2010) with a sample of Hungarian women also reports alpha coefficients for internal consistency ranging from 0.60 to 0.74. Cronbach's alpha coefficients were calculated to assess the construct validity of the FTND amongst the current sample. The Cronbach's alpha coefficient was evaluated using the guidelines suggested by George and Mallery (2018) where

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> .9 excellent, > .8 good, > .7 acceptable, > .6 questionable, > .5 poor, and ≤ .5 unacceptable. The FTND scale had a Cronbach's alpha coefficient of 0.80, indicating good reliability.

3.4.2 Prenatal Psychosocial Profile Scale (PPP)

In order to measure the psychosocial well-being of participants the Prenatal Psychosocial Profile scale (PPP) was administered, which has been validated for use in low socio-economic status pregnant populations (Curry et al., 1994). The PPP emphasizes psychosocial behavioural constructs that directly and/or indirectly influence pregnancy health outcomes (Yu et al., 2011). The PPP was designed to yield a composite measure of four aspects of psychosocial well-being of women during pregnancy. The four subscales include: stress, support of a partner, support of others and self-esteem (Curry et al, 1994). Each sub-scale consists of 11 items that are measured on a Likert-type response scale. The stress scale ranges from no stress (1) to severe stress (4), with possible total scores ranging between 11 and 44 (Woods et al., 2010). While the three social support subscales range from very dissatisfied (1) to very satisfied (6), with possible total scores ranging between 11 and 66. For the purpose of the current study the subscales which assess stress, support of a partner and support from others were utilised. In order to align with the stress subscale, reverse scoring was applied to the partner support and other support subscales prior to conducting any analysis, to ensure consistency in interpretation across all items (Chyung, 2018). This means that higher scores on these items indicate lower levels of the construct being measured. These subscales when used independently in a sample of rural and urban pregnant women have shown acceptable internal consistency, for the support scales (0.70) and the stress scale (0.67 to 0.78) (Curry et al., 1998). Overall, the PPP has demonstrated reliability and validity with various samples of pregnant women.

The scale has proven to be reliable in terms of test-retest reliability and has shown internal consistency for all four subscales, with alpha coefficients exceeding 0.70 which is satisfactory

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for research purposes (Curry et al., 1994; Curry et al., 1998). The PPP has also demonstrated convergent validity among a sample of women from rural communities in Missouri (0.71) (Yu et al., 2011), as well as good construct and criterion validity amongst a sample of Brazilian women (Weissheimer & Mamede, 2015). Cronbach's alpha coefficients were calculated to assess the construct validity of the stress, partner support and other support scales, as these scales will be utilised in the study. The stress scale had a Cronbach's alpha of 0.86, indicating good reliability. The Partner Support scale had a Cronbach's alpha of 0.97 and the Other support scale had a Cronbach's alpha of 0.98, both of these scales indicating excellent reliability.

3.5 Procedures

Once permission was obtained from all the relevant authorities, data collection commenced. During the first phase of data collection the researcher contacted the respective clinic managers to inform them of the data collection procedures. Upon confirmation, trained fieldworkers went to the clinics where women were invited to participate in the study, granted that they were eligible. The women were approached while waiting for their consultation, and the data was collected in a manner that did not disrupt the operations at the clinics. The fieldworkers thoroughly explained the information sheet (Appendix A) and consent process (Appendix B) to the women, after which they completed the surveys with the assistance of the fieldworkers.

During the second phase of data collection, the researcher had to consider alternative data collection measures as a result of the COVID-19 pandemic. Data was collected telephonically to minimise contact and possible exposure for both participants and the researcher to the virus. After informing the clinic managers of the data collection procedures, posters were distributed to the respective clinics in order to gain access to the women (Appendix D), these were translated into English and Afrikaans and isiXhosa. The flyer

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described the purpose of the study, the criteria for those who are eligible to participate in the study as well as the contact details of the researcher. The flyer requested women who were interested in the study, and who fit the criteria of the study to contact the researcher via WhatsApp or *please call me*. The researcher then contacted the women who reached out to explain the study and to determine whether the participants were eligible to participate in the study. If the women still wished to participate after initial contact, a date and time was set up for the survey to be conducted. Particular SIM cards were set up from which the calls were made. The researcher recorded the participants' responses in an online google form. As for the rural sample, a partner from CASA provided the researcher with a list of eligible women for whom the same data collection procedures were followed.

3.6 Data Analysis

The data was analysed using IBM SPSS (version 28). To examine the research questions, descriptive statistics (means and standard deviations) were generated, and composite scores based on the FTND and PPP were computed in order to determine the levels of nicotine dependence, stress and social support experienced by the sample of pregnant women. To determine whether stress predicts nicotine dependence during pregnancy a multinomial logistic regression model was fitted. Multinomial logistic regression is an appropriate statistical analysis when the purpose of research is to predict categorical variables or the probability of category membership on a dependent variable based on multiple independent variables (Umaña-Hermosilla et al., 2020). As in binary logistic regression, multinomial logistic regression uses maximum likelihood estimation to evaluate the probability of categorical membership. Thus, this type of model allowed the researcher to characterize the probability of a respondent's decision for a particular multinomial discrete choice, conditional on the values of the explanatory variables. The distribution functions that characterize explanatory variables are often nonlinear. Thus, once the multinomial regression model is created, the parameters are

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used to make predictions about the probability of an event occurring compared with the reference category. In this particular case, we wanted to know how changes in stress affected nicotine dependence.

Multinomial logistic regressions, by design, overcome many of the restrictive assumptions of linear regression. For example, normality and homoscedasticity of the residuals are not assumed. Logistic regression does require that there should be no multicollinearity among the independent variables. Multicollinearity was assessed by calculating variance inflation factors (VIF). VIF values over 10 suggests the presence of multicollinearity (Menard, 2009). The overall model significance for the multinomial logistic regression was examined by the collective effect of the independent variables using the χ^2 omnibus test of model coefficients. McFadden's R^2 was used to estimate the variability accounted for by the independent predictor variable. Individual predictors will be assessed by the Wald coefficient. Predicted probabilities of an event occurring will be determined by Exp(B), the odds ratio. For significant predictors, an odds ratio greater than one indicates that for each one unit increase in the independent variable, the dependent variable will be X times more likely to be coded 1. Significant predictors with a odds ratio less than 1 will be evaluated by 1/Exp(B), meaning that a one unit increase in the independent variable will be X times more likely to be coded 0.

In order to test for mediation, to determine whether partner support and other support are underlying mechanisms of the relation between stress and nicotine dependence, the Hayes' PROCESS (v4.0) macro tool was utilised (Hayes, 2013). PROCESS is a freely available add-on for SPSS and SAS, it is used for statistical mediation, moderation, and conditional process analysis. As outlined by Hayes (2013), PROCESS uses an ordinary least squares or logistic regression-based path analytic framework for estimating direct and indirect effects in single and multiple mediator models. According to Hayes and Rockwood (2020), the most basic form

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of a mediational analysis known as simple mediation functions in the following way: Variable X's effect on a second variable Y is said to be mediated by a third variable M if X causally influences M and M in turn causally influences Y. So, X influences Y by inducing change in a mediator variable M, which then carries X's influence on to Y. A more complex model, known as parallel mediation, will be applied here. A parallel mediation can include more than one mediator (Hayes, 2013). That is, two or more variables (*M*1, *M*2, etc) are proposed to mediate the relationship between *X* and *Y*. These mediators are allowed to correlate with one another but are not allowed to influence one another in causality. In parallel mediation there are as many indirect effects as there are mediators. With two mediators there are the a1b1 and a2b2 pathways using M1 and M2 respectively. This model is useful since it allows for a more complex assessment of the process through which *X* effects *Y* (Hayes, 2013). A basic mediation process is represented conceptually in Figure 1. The arrows represent an effect from the variable sending the arrow on the variable receiving it. Assuming that M and Y are continuous variables, X is either dichotomous or continuous, and that the relationships between X, M, and Y are linear in form, ordinary least squares regression analysis is a widely used framework for mediation analysis (Hayes & Rockwell, 2020).
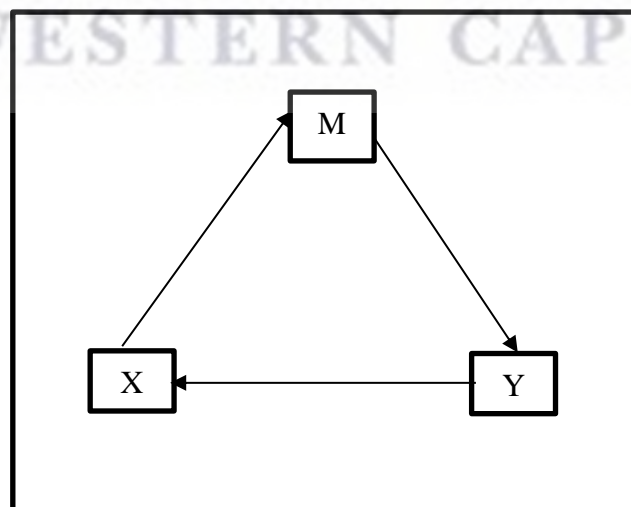

Figure 1.

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3.7 Ethics Considerations

Ethics clearance was obtained from the Biomedical Research Ethics Committee (BMREC – Ethics Reference Number: BM20/9/10) at the University of the Western Cape. An online application was submitted to The Department of Health of the Western Cape Government and Department of Health Impact of Assessment Sub-directorate and City Health to obtain ethics clearance and permission to conduct the study in the clinics. Once permission was obtained from the relevant authorities, the researcher contacted the clinic managers to set up an online meeting in order to obtain their permission and to discuss the arrangements for data collection (Appendix F). Before the commencement of data collection, the information sheet (Appendix A) and consent form (Appendix B) was issued to the participants in person during the first phase of data collection or via WhatsApp during the second phase of data collection. The information sheet included an explanation of the purpose of the study, the procedures for data collection, the potential risks and benefits for the participants. Importantly, it included the key ethics principles of informed consent, confidentiality, privacy, the voluntary nature of participation and participant's right to withdraw from the study without penalty. Similarly, participants under the age of 18 were provided with a consent form bearing the same key information, which was specifically developed for parents or legal guardians. These participants were only allowed to participate in the study based on their provision of signed parental consent. The consent forms, information sheets and the questionnaires were translated into Afrikaans and isiXhosa. During the second phase of data collection participants were requested to provide their consent via WhatsApp before data collection commenced, which acted as a basis to track consent. Participants were assured that anonymity and confidentiality would be maintained throughout the research process. To ensure anonymity a code was assigned to each participant for identification purposes. In terms of maintaining confidentiality,

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the data collected was stored electronically in password protected files and is only accessible to the principal investigators. The data will be destroyed and disposed of after five years.

Furthermore, in compliance with the Protection of Personal Information Act (POPIA) (Kandeh et al., 2018), the protection and confidentiality of participants personal information was prioritised throughout this research study. All personal information was treated with utmost care and handled securely. The information provided by participants was used solely for research purposes and anonymised to protect individuals' identities. Access to the data is restricted to authorised researchers involved in the study. By participating in this study participants acknowledged their informed consent and understanding of how their personal information is protected in accordance with the POPIA.

If participants experienced any discomfort, psychological or otherwise during the process of participation in the study, they were referred to the attending physician or psychological counsellor at the respective clinics for further assistance or intervention. This service was offered free of charge. Furthermore, if participants communicated that they wished to quit smoking, they were referred to the relevant organizations for treatment. These include quit lines such as the National Council Against Smoking (NCAS) (011 720 3145) and the CANSA eKick Butt Programme, an online cessation programme (021 689 5381), or non-governmental substance abuse centres in the Cape Town area, such as SANCA (011 892 3892/076 535 1701) and the Cape Town Drug Counselling Centre (021 447 8026). These protocols were followed with parental consent for those women who were under the age of 18 years old.

3.8 Significance

It is evident that smoking during pregnancy is still very widespread (Lange et al., 2018). Prevention strategies thus need to be implemented, especially in countries where prevalence of

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smoking during pregnancy remains high. However, this might be particularly challenging in low and middle-income countries, as a result of difficulties such as economic factors, low perception of risk in the public, lack of policies promoting cessation, poor health-care systems as well as lack of infrastructure. According to Crone et al. (2019), the re-occurrence of specific health, psychosocial and socio-economic conditions amongst certain groups thus highlights the need for preventative measures that simultaneously address these conditions. Essentially, preventative practices need to function through multiple mechanisms and not just be centred on single conditions. The present study can thus make a useful contribution in this regard, by providing insight into the life situations of women who smoke during pregnancy, specifically those living in disadvantaged circumstances. This will aid in gaining a better understanding regarding the impact of factors such as stress and social support on smoking behaviours, and in addition report on these findings. In doing so, it addresses the gap in currently existing literature regarding this association. More importantly, it points to the importance for interventions to take into account the multitude of interplaying factors that may contribute towards smoking during pregnancy. This could lead to better instituting intervention programmes that are accessible to women from all contexts to ensure the success of cessation. The study furthermore adds weight to the broader case for policy development to address inequalities across socioeconomic contexts regarding interventions.

4.1 Introduction

The following section presents the findings by means of tabular representations and narrative interpretation of the results. The first section presents the descriptive statistics in which the frequencies, means and standard deviations are interpreted. The second section presents the analyses of the constructs relevant to the study by using inferential statistics; specifically multinomial regression analysis, correlational analysis, and mediational analysis.

4.2 Descriptive Statistics

The descriptive statistics presented below provides a summary of the study's variables, demonstrating the frequency distributions, means and standard deviations of the variables.

Table. 2
Smoking Frequency

		Frequency (N)	Percent (%)
How many cigarettes have you smoked in your entire life?	1 to 15 cigarettes	29	13.9
	16 to 25 cigarettes	5	2.4
	26 to 99 cigarettes	8	3.8
	100 or more cigarettes	49	23.4
	I have never smoked cigarettes	118	56.5
During the past 30 days how many cigarettes have you smoked?	1 to 15 days	22	10.5
	6 to 19 days	11	5.3
	20 to 29 days	12	5.7
	All 30 days	31	14.8
	0 days	133	63.6

Table 2 illustrates women's cigarette smoking habits in their entire lifetime and over the past 30 days at the time of data collection. In their entire lifetime 13.9% of women had smoked at least one cigarette, 23.4% smoked more than 100 cigarettes and 56.5% have never smoked

cigarettes. During the past 30 days 10.5% of women smoked at least one day and 14.8% of women smoked all 30 days, while 63.6% did not smoke at all.

The following section presents the items of the Fagerstrom Test for Nicotine Dependence which was used to determine whether women smoked during their pregnancy and if they did, to what extent they were nicotine dependent.

Table. 3
Fagerstrom Test for Nicotine Dependence (FTND)

		Frequency (N)	Percent (%)
How soon after waking up do you smoke your first cigarette?	Not applicable	133	63.3
	After 60 minutes	20	9.6
	After 31-60 mins	13	6.2
	60-30 minutes	8	3.8
	Within 5 minutes	35	16.7
How many cigarettes a day do you smoke?	Not applicable	126	60.3
	0-10 or less	59	28.2
	11-20	18	8.6
	21-30	3	1.4
	32 or more	3	1.4
Did you find it difficult to refrain from smoking in places where it is forbidden (e.g., in the hospital)?	No	172	82.3
	Yes	37	17.7
Which cigarette would you hate to give up?	Not applicable	130	62.6
	All the others	36	17.2
	The first one in the morning	43	20.6
Do you smoke more frequently in the morning?	No	169	80.9
	Yes	40	19.1
Do you smoke even if you are sick in bed most of the day?	No	182	87.1
	Yes	27	12.9

Table 3 presents the frequencies for the items in the FTND. These items determine women's smoking habits. Item 1 presents how soon after waking up women smoke their first cigarette, 9.6% of women smoke their first cigarette after 60 minutes, 6.2% of women smoke their first

cigarette after 31-60 minutes, while 16.7% of women smoke their first cigarette in the first 5 minutes. Likewise, item 2 asked women how many cigarettes they smoked in a day, 28.2% smoked 0-10 or less, 8.6% of women smoked between 11-20 cigarettes a day, while only 1.4% of women smoked 32 or more cigarettes a day. When asked whether they find it difficult to refrain from smoking in places where it is forbidden, 82.3% of women responded no, compared to 17.7% who responded yes. Item 3 asked women which cigarette they would most hate to give up, 20.6% of women responded the first one in the morning compared to 17.2% who indicated all the others. Lastly, items 4 and 5 looked at whether women smoke more frequently in the morning and whether they smoke even though they are sick in bed, for both items more women responded no (80% - 87%) as compared to the number of women that said yes (12% - 19%). It is evident, given these frequencies, that more women in the sample were not smoking at the time of pregnancy compared to those who were smoking.

Table 4.
Nicotine Dependence

		Frequency (N)	Percent (%)	Valid Percent	Cumulative Percent
Valid	No dependence	114	54.5	55.1	55.1
	Dependence	93	44.5	44.9	100.0
	Total	207	99.0	100.0	
Missing	System	2	1.0		
Total		209	100.0		

Table 4 illustrates the total number of women in the sample who were nicotine dependent during their pregnancy compared to those who were not. Based on the FTND 44.5% of women were nicotine dependent during pregnancy while 54.5% were not nicotine dependent.

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Table 5.
Nicotine Dependence Levels

	Frequency (N)	Percent (%)
Low dependence	15	7.2
Low to moderate dependence	15	7.2
Moderate dependence	38	18.2
High dependence	25	12.0

Table 5 demonstrates the extent to which women were nicotine dependent based on the FTND.

A total of 12.0% of women showed high nicotine dependence (scored 8+ on the FTND), 18.2%

showed moderate dependence (scored between 5–7 on the FTND), and 7.2% showed low

nicotine dependence (scored between 1–2 on the FTND). This indicates that of the women in

the sample who were nicotine dependent, the majority of them demonstrated moderate levels

of nicotine dependence during pregnancy.

> *The following section presents descriptive statistics for the Prenatal Psychosocial Profile scales determining levels of stress, partner support and other support.*

Table 6.
Prenatal Psychosocial Profile: Stress descriptive statistics

	N	Mean	Std. Deviation
Financial worries (e.g., food shelter healthcare, transportation)	209	2.10	1.205
Other financial worries (e.g., bills etc)	209	1.96	1.155
Problems related to family (e.g., partner, children etc)	209	1.93	1.081
Having to move either recently or in the future	209	1.76	1.186
Recent loss of loved one (e.g., death, divorce, long distance)	209	1.70	1.185
Current pregnancy	209	1.62	1.040
Current abuse (e.g., sexual, emotional, or physical)	209	1.20	.789

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	N	Mean	Std. Deviation
Problems with alcohol and/or drugs	209	1.26	.925
Work problems (e.g., being laid off etc)	209	1.63	1.106
Problems related to friends	209	1.31	.851
Feeling generally overloaded	209	1.96	1.196

Table 6 presents the item mean scores for the stress scale in the Prenatal Psychosocial Profile. The item with the highest mean score was "financial worries" ($M = 2.10$; $SD = 1.205$), and the item with the lowest mean score was "current abuse" ($M = 1.20$; $SD = .789$). This indicates that women experienced more stress relating to financial worries and experienced the least stress relating to current abuse.

Table. 7
Prenatal Psychosocial Profile: Partner Support descriptive statistics

	N	Mean	Std. Deviation
Shares similar experiences with me	209	3.68	1.978
Helps keep up my morale	209	3.85	1.925
Helps me out when I'm in a pinch	209	3.99	1.938
Shows interests in my daily activities and problems	209	3.94	1.975
Goes out of the way to do special or thoughtful things	209	3.75	1.995
Allows me to talk about things that are very personal and private	209	4.08	1.990
Let's me know I am appreciated for the things I do for him/her	209	4.01	1.996
Tolerates my up and downs and unusual behaviours	209	3.95	1.948
Takes seriously when I have concerns	209	4.18	1.953
Says things that make my situation clear and easier to understand	209	3.94	1.997

	N	Mean	Std. Deviation
Let's me know that he/she will be around if I need assistance	209	4.22	2.072

Table 7 presents the item mean scores for the partner support scale in the Prenatal Psychosocial Profile. The mean score was highest for "lets me know that he/she will be around if I need assistance" (*M* = 4.22; *SD* = 2.072), which indicates that women felt supported by their partners. The item with the lowest mean score was "shares similar experiences with me" (*M* = 3.68; *SD* = 1.978). This indicates that most women felt that their partners could not relate to their experiences during pregnancy.

Table. 8
Prenatal Psychosocial Profile: Other Support descriptive statistics

	N	Mean	Std. Deviation
Shares similar experiences with me	209	3.81	2.005
Helps keep up my morale	209	3.94	1.954
Helps me out when I'm in a pinch	209	3.81	2.064
Shows interest in my daily activities and problems	209	3.78	1.988
Goes out of way to do special or thoughtful things	209	3.76	1.993
Allows me to talk about things that are very personal and private	209	3.79	2.022
Let's me know I am appreciated for the things I do for him her	209	3.75	2.035
Tolerates my ups and downs unusual behaviours	209	3.81	1.986
Takes me seriously when I have concerns	209	3.93	2.011
Says things that make my situation clear and easier understand	209	3.99	1.938
Let's me know that he/she will be around if I need assistance	209	4.00	2.017

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Table 8 presents the item mean scores for the other support scale in the Prenatal Psychosocial Profile. The item with the highest mean score was "Lets me know that he/she will be around if I need assistance" ($M = 4.00$; $SD = 2.017$), this indicates that women felt supported by others (i.e., friends and family) during their pregnancy. The item with the lowest mean score was "Lets me know I am appreciated for the things I do for him/her" ($M = 3.75$; $SD = 2.035$). This indicates that most women did not feel appreciated by others during their pregnancy.

4.3 Inferential Statistics

Three statistical techniques were used to test the hypotheses of this study. Multinomial logistic regression was used to determine whether stress predicts nicotine dependence. To cross validate the findings of the regression analysis, Spearman's Rho Correlation and Pearson's Correlational analyses were used to determine whether there are significant relationships between stress, social support and nicotine dependence. Lastly, a mediational analysis was conducted to determine whether social support mediates the relation between stress and nicotine dependence.

Hypothesis 1: Stress significantly predicts Nicotine Dependence

Multinomial regression was utilised to test the above hypothesis. This technique allows for predicting nicotine dependence based on the predictor variable stress.

Table. 9
Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	232.464			
Final	221.866	10.599	4	.031

Table 9 demonstrates the model fit information, the final model indicates a significant improvement in fit over the intercept-only model [$\chi^2 (4) = 221.866$, $p = .031$]. This suggests

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that stress had a significant effect on the odds of observing at least one category of nicotine

dependence.

Table. 10
Goodness-of-Fit

	Chi-Square	Df	Sig.
Pearson	114.432	116	.524
Deviance	113.876	116	.538

Table 10 demonstrates the goodness of fit. Pearson's chi-square test indicates that the model

fits the data well [χ^2 (116) = 114.432, p = .524], the p value is greater than 0.05.

Table. 11
Pseudo R-Square

Cox and Snell	.050
Nagelkerke	.054
McFadden	.020

The Pseudo R-Square measures are Cox and Snell (.050), Nagelkerke (.054) and McFadden

(.020). Based on Nagelkerke the model improvement accounts for 5% of the variance and

represents a relatively decent sized effect. Furthermore, .050 falls between 0 and 1 indicating

good model fit.

Table 12.
Likelihood Ratio Tests

	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of			
Effect	Reduced Model	Chi-Square	df	Sig.
Intercept	258.512	36.646	4	<,001
Stress	232.464	10.599	4	.031

Table 12 demonstrates that stress (p< 0.05) is a significant predictor of nicotine dependence.

Therefore, stress significantly improves the model's ability to predict the outcome variable, nicotine

dependence.

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Table 13.
Parameter Estimates

Nicotine Dependence[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Low dependence	Intercept	-3.263	.800	16.651	1	<,001			
	Stress	.063	.036	3.088	1	.079	1.065	.993	1.143
Low to moderate dependence	Intercept	-1.049	.622	2.846	1	.092			
	Stress	-.061	.037	2.649	1	.104	.941	.875	1.012
Moderate dependence	Intercept	-1.300	.500	6.758	1	.009			
	Stress	.011	.025	.192	1	.661	1.011	.962	1.063
High dependence	Intercept	-2.697	.643	17.587	1	<,001			
	Stress	.061	.029	4.238	1	.040	1.062	1.003	1.126

a. The reference category is: No dependence.

Table 13 presents the parameter estimates otherwise known as the coefficients of the model. Each dependence category is compared against the reference category No dependence. The first set of coefficients allows one to determine which of the predictor variables significantly predict whether a person will fall into the Low dependence category (i.e., the comparison group) versus the No dependence category (i.e., the reference category). The regression coefficient for stress in response category Low dependence was not significant, (B = .063, s.e. = .036, Wald = 3.088, p = .079), suggesting that stress did not have a significant effect on the odds of observing the Low dependence category relative to the No dependence category. The second set of coefficients represents the comparison of the Low to Moderate dependence category to the No dependence category. The regression coefficient for stress in response category Low to moderate dependence was not significant, (B = -.061, s.e. = .037, Wald = 2.649, p = .104), suggesting that stress did not have a significant effect on the odds of observing the Low to moderate dependence category relative to the

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No dependence category. The third set of coefficients represents the comparison of the Moderate dependence category to the No dependence category. Moderate dependence was not significant, (B = .011, s.e. = 0.25, Wald = .192, p = .661), suggesting that stress did not have a significant effect on the odds of observing the Moderate dependence category of relative to the No dependence category. The only coefficient that is statistically significant is for the fourth set of coefficients, which is High dependence. In this portion of the outcome stress is a significant positive predictor (B =.061, s.e. = .029, Wald = 4.238, p = .040) in the model, respondents in this category were more likely to show High dependence. For each one-unit increase in stress, the odds ratio of a case falling into the "High dependence" category (relative to the No dependence category) is predicted to change by a factor of 1.062. Results suggest that individuals who experience more stress are more likely to fall within the High dependence category compared to the No dependence category.

In addition to the above analyses a Correlational analysis was conducted to cross validate the results of the regression analysis. Correlation was used to determine whether stress, social support and nicotine dependence correlates with one another.

Table 14.
Correlations

			Nicotine Dependence	Stress	Partner Support	Other Support
Spearman's rho	Nicotine Dependence	Correlation Coefficient	1.000	.131	.016	-.006
		Sig. (2-tailed)	.	.059	.821	.930
		N	207	207	207	207
	Stress	Correlation Coefficient	.131	1.000	.025	-.036
		Sig. (2-tailed)	.059	.	.715	.608
		N	207	209	209	209
	Partner Support	Correlation Coefficient	.016	.025	1.000	.595[**]
		Sig. (2-tailed)	.821	.715	.	<,001
		N	207	209	209	209
	Other Support	Correlation Coefficient	-.006	-.036	.595[**]	1.000

| | | Sig. (2-tailed) | .930 | .608 | <,001 | . |
| | | N | 207 | 209 | 209 | 209 |

Table 14 presents the results of the correlations between nicotine dependence, stress, partner support and other support. A Spearman's rho correlation was computed. A significant positive correlation was observed between partner support and other support (0.60, $p < .001$) indicating a large effect size. This suggests that as partner support increases, other support tends to increase. No other significant correlations were found.

Table 15.
Correlations

		Stress	Partner Support	Other Support
Stress	Pearson Correlation	1	.167[*]	.154[*]
	Sig. (2-tailed)		.015	.026
	N	209	209	209
Partner Support	Pearson Correlation	.167[*]	1	.574[**]
	Sig. (2-tailed)	.015		<,001
	N	209	209	209
Other Support	Pearson Correlation	.154[*]	.574[**]	1
	Sig. (2-tailed)	.026	<,001	
	N	209	209	209

Table 15 presents the results of the correlations between stress, partner support and other support. A Pearson's correlation was computed. A significant positive correlation was observed between stress and partner support (0.17, $p < 0.05$) indicating a small effect size. This suggests that as stress increases partner support tends to increase. A significant positive correlation was observed between stress and other support (0.15, $p < 0.05$) indicating a small effect size. This suggests that as stress increases, other support tends to increase. Likewise, a significant positive correlation was observed between partner support and other support (.57, $p < 0.01$) indicating a large effect size. This suggests that as partner support increases, other support tends to increase.

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Hypothesis 2: Social Support mediates the relation between Stress and Nicotine Dependence

Mediational analysis was utilised in order to determine whether social support is an underlying mechanism of the relation between stress and nicotine dependence. A parallel mediation model (PROCESS model 4) is presented in Tables 16 to 19 below, demonstrating the relationship between stress and nicotine dependence through two mediators: partner support and other support. Figure 2 below illustrates these findings diagrammatically. The findings are discussed in more detail in the analysis which follows.
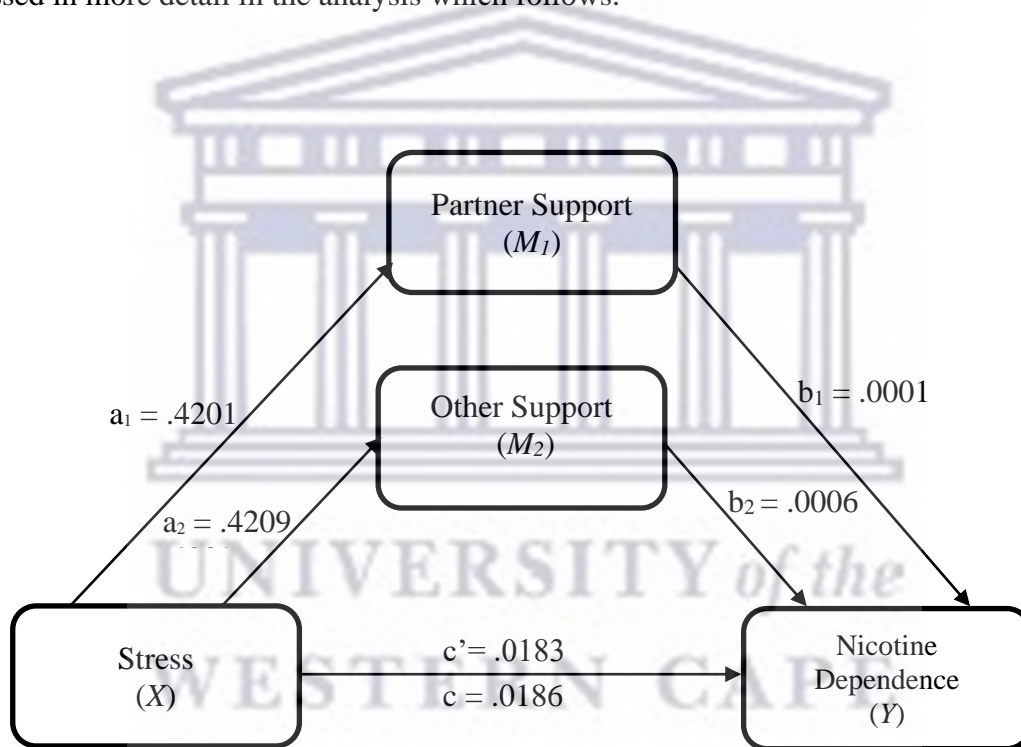

Figure 2. Parallel mediation model showing the mediating effects of stress on nicotine dependence through partner support and other support. Notes: a_n is the effect of stress on partner support and other support; b_n is the effect of partner support and other support on nicotine dependence; c' is the direct effect of stress on nicotine dependence; c is the total effect of stress on nicotine dependence.

Table. 16

Mediation Analysis

Bootstrap Results for Regression Model

Variable	Coeff	BootMean	BootSE	BootLLCI	BootULCI
Model 1					
Partner Support					
Constant	35.8235	35.8775	4.3456	27.6252	44.7143
Stress	.4201	.4190	.2048	.0097	.8104
Model 2					
Other Support					
Constant	34.8821	34.9485	4.3544	26.6269	43.8789
Stress	.4029	.3995	.1996	-.0061	.7797
Model 3					
Nicotine Dep					
Constant	.8861	.8826	.3089	.2914	1.5131
Stress	.0183	.0184	.0141	-.0080	.0477
Partner Support	.0001	.0002	.0072	-.0135	.0148
Other Support	.0006	.0005	.0068	-.0128	.0136

Table. 17

Total effect of X on Y

Effect	*SE*	95.00% CI	*t*	*p*
.0186	.0140	[-.0090, .0462]	1.3285	.1855

Table. 18

Direct effect of X on Y

Effect	*SE*	95.00% CI	*t*	*p*
.0183	.0143	[-.0099, .0465]	1.2810	.2016

Table. 19

Indirect effect of X on Y

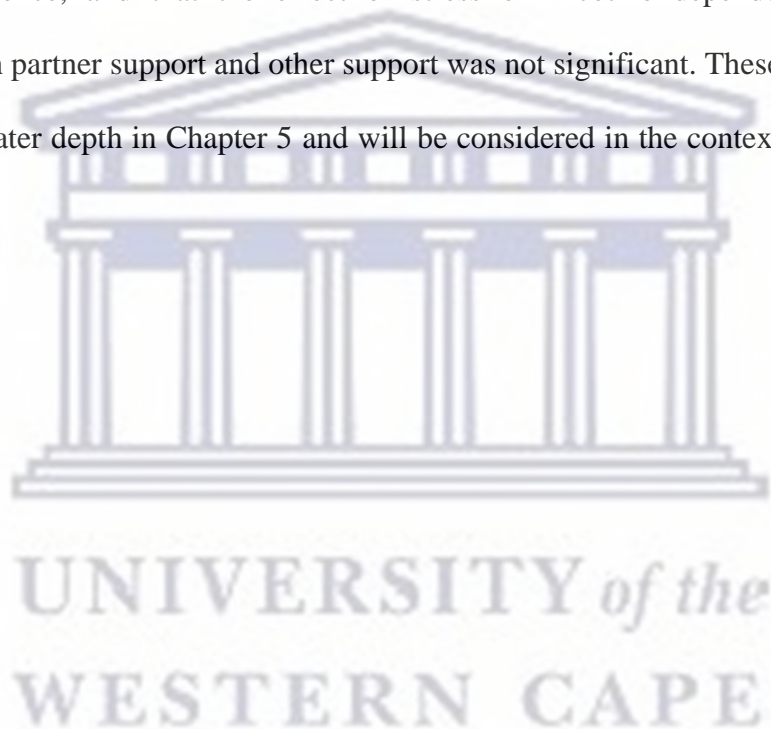|	*Effect*	*BootSE*	*BootLLCI*	*BootULCI*
Total	.0003	.0029	-.0054	.0065
Partner Support	.0000	.0034	-.0064	.0078
Other Support	.0003	.0030	-.0060	.0067

Model 1 (Table 16) presents the results for partner support predicted from stress, stress

significantly predicts partner support, *B*= .4201, 95% bootstrapped CI [.0097 - to .8104]. The

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$R^2 = .03$ value indicates that the model explains 3% of the variance in partner support. As stress increases partner support also increases. Model 2 (Table 16) presents the results of other support predicted from stress, stress does not significantly predict other support, *B*= .4029, 95% the bootstrapped CI [- 0061 to .7797] is not entirely above zero. The $R^2 = .03$ indicates that the model explains 3% of the variance in other support. As stress increases, support from others also increases. Model 3 (Table 16) presents the results of nicotine dependence predicted from stress, partner support and other support. Stress does not significantly predict nicotine dependence *B*= .8861, 95% bootstrapped CI [-.0080 to .0477]. Likewise partner support *B*= .0001, 95% bootstrapped CI [-.0135 to - .0148] and other support *B* = .0006, 95% bootstrapped CI [-.0128 to .0136] does not significantly predict nicotine dependence. The $R^2 = .01$ indicates that the model explains 1% of the variance in nicotine dependence. The positive b values for stress, partner support and other support indicates that as stress, partner support and other support increases nicotine dependence also increases.

Table 18 shows the effect, p value and 95% confidence interval of the direct effect of stress on nicotine dependence (*B* = .0183, p = .2016). A 95% bootstrapped confidence interval based on 5000 bootstrap samples indicated that the direct effect was not entirely above zero CI [-.0099 to .0465]. This indicates that stress did not significantly predict nicotine dependence. Likewise, a 95% bootstrapped confidence interval based on 5000 bootstrap samples indicated that the indirect effects (Table 19) of stress on nicotine dependence through partner support (*B*= .0000) and other support (*B*= .0003) were not entirely above zero CI [-.0064 to .0078 and -.0060 to .0067]. This indicates that the average indirect effect for stress on nicotine dependence through its relationship with partner support and other support was not significant. The fact that the confidence intervals are not entirely above zero supports the idea that partner support and other support does not mediate the relationship between stress and nicotine dependence.

In summary, this section presented the descriptive statistics including findings from the FTND, these findings demonstrated women's levels of nicotine dependence as well as findings from the PPP which demonstrated women's levels of stress, partner support and other support. Subsequently, inferential statistics were presented, in order to test the hypotheses of the study. Findings from a multinomial logistic regression indicated that women who experience more stress during pregnancy are more likely to show high levels of nicotine dependence. While findings from the parallel mediational analysis show that stress does not significantly predict nicotine dependence, and that the effect of stress on nicotine dependence through its relationship with partner support and other support was not significant. These findings will be discussed in greater depth in Chapter 5 and will be considered in the context of the available literature.

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CHAPTER 5
DISCUSSION

The overall aim of the study was to determine whether there is a relation between stress and nicotine dependence amongst a sample of pregnant women residing in low socio-economic status communities in the Western Cape. The study further sought to determine the extent to which social support mediates this relation. The current chapter presents an integrated discussion of the research findings that were presented in the preceding chapter. The chapter will discuss the findings in relation to the research aims and objectives and the study hypotheses. The chapter will also discuss the findings in the context of relevant literature and the SEM framework that guided the study.

The first hypothesis determined whether stress is a significant predictor of nicotine dependence. Congruent with previous studies (Crume, 2019; Dascal et al., 2019; Gould et al., 2020), the current study found a significant relation between stress and nicotine dependence. Amongst this sample stress was found to be a significant positive predictor of nicotine dependence, women who experienced stress during their pregnancy were more likely to fall within the high dependence category. These findings are consistent with empirical research that found positive relations between high stress environments and continued smoking during pregnancy and high levels of nicotine dependence (see Crume, 2019; Mabetha et al., 2022). The findings could be attributed to a multitude of factors as discussed in the literature. These include amongst others, low maternal socio-economic status which is characterised by a lack of income, living in poverty-stricken circumstances and low educational attainment (Dascal, 2019; Hauge et al., 2012) lack of social support (Bedaso et al., 2021; Page et al., 2012); stressful intimate relationships and pregnancy-related anxiety (van Dijk, 2021). This confirms findings by Maxson et al. (2012) and Selebano and Ataguba, (2021) that women who are subjected to more psychosocial difficulties before and during pregnancy are more likely to continue

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smoking during their pregnancy. Under such circumstances, coupled with the absence of resources to mitigate these stressors, continued smoking is considered as an easily accessible way to relieve stressful life circumstances.

In addition, a correlational analysis was conducted to cross validate the findings of the regression analysis and to determine whether stress, social support (partner support, other support) and nicotine dependence correlates with one another. There was a significant positive relationship between stress and partner support as well as between stress and other support, the strength of these relationships was quite small and according to Cohen (1988) could be characterised as having a small effect size. Therefore, although a positive relationship suggests that as stress increases both partner and other support increases, social support in the current study only partially contributes to the variance in stress. Only 3% of the variance in women's experience of stress is predicted by partner support and other support respectively. This means that 97% of the variance in women's experience of stress is unexplained by the model. Based on these findings it can be derived that social support may or may not mitigate stressful experiences during pregnancy, however social support is not the only predictor of stress and by extension nicotine dependence during pregnancy.

The second hypothesis sought to determine whether social support mediates the relation between stress and nicotine dependence. The findings demonstrate that the indirect effect of stress on nicotine dependence through its relationship with partner support and other support was not significant. Given that the indirect effect was not significant, it can be concluded that partner support and other support does not mediate the relationship between stress and nicotine dependence. Contrary to prior research findings, the current study found that the presence of social support during pregnancy from a partner, family or friend was not an underlying mechanism of the relation between stress and nicotine dependence. Conventionally, social support is considered to act as a buffer by providing access to additional resources to enhance

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suitable coping mechanisms for pregnant women to deal with stressful life events (Bedaso et al., 2021; Guo et al., 2022). Similarly, Li et al. (2021) asserts that social support works as a protective factor, whereby higher levels of social support are found to reduce the impact of stress on pregnant women, which in turn, decreases the risk of continued smoking during pregnancy. There is thus increasing evidence in the literature that social support has positive outcomes on both physical and psychological well-being of pregnant women (Ilska, 2017).

However, despite the fact that this notion of social support is prevalent throughout the literature, it may not hold true or be experienced in the same way by women across contexts, since much of these findings are from studies conducted in the Global North. The South African context on the other hand is characterised by persistent inequality and socio-economic disadvantage, as a result a large percentage of the population lives in severe poverty (Cheteni et al., 2019; World Bank, 2018). This has resulted in great disparities in terms of socio-economic status, employment, educational attainment, and healthcare amongst others (Selebano & Ataguba, 2022; Wabiri et al., 2016). These circumstances are exacerbated for women (Bittar, 2020; Obse & Ataguba, 2021), more so pregnant women who are vulnerable and living in already marginalised circumstances. These disparities are prime examples of other underlying factors that trumps social support and that could act as mediating factors of the relation between stress and nicotine dependence. Living under such circumstances where women are confronted with marked socio-economic disadvantages in their daily lives inhibits social support efforts from partners, family and friends (Mabetha et al., 2022). Therefore, social support may be potentially compromised by other contextual factors and is thus not enough to reduce stress and eventually lead to smoking cessation during pregnancy (Rashid & Mohd, 2017).

These findings also raise concerns about the nature of social support women from disadvantaged contexts are receiving and their perceptions thereof. Women may be receiving

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support but not necessarily the kind of support that encourages them to stop smoking or support that fosters health enabling behaviours, it could be that often partners, and family members reinforce smoking behaviours because they are also smokers or smoking in the pregnant women's environment. Which further hinders cessation attempts. The influence of partner and familial relationships can thus both positively and negatively shape health behaviours. Mabetha et al. (2022) thus asserts that it is imperative to consider the significance of each source of support as pregnant women are not a homogenous group. They have varying demographic and familial characteristics, different relations with their families and partners and their experiences and the contexts in which they live differ (Bedaso et al., 2021). Since women's experiences of pregnancy are so connected to their social and contextual realities, the kinds of social support women are provided with needs to be relevant to their everyday realities. This also suggests that the wider context within which the mother is embedded needs to be educated by policymakers and healthcare providers about the importance of partner, family and peer support in order to minimize risks that may affect maternal pregnancy care and wellbeing (Abdi et al. ,2022; Mabetha et al., 2022).

Furthermore, the findings of this study provide support for and increased confidence in the SEM, as the model recognize individuals as embedded within larger social systems and describe the interactive characteristics of individuals and environments that underlie health outcomes (Sallis et al., 2008; Stokols, 1992). The physical and socio-economic aspects of an environment have a cumulative effect on health and may influence health outcomes differently (Golden & Earp, 2012). Building on the work of Brofenbrenner (1977), who had previously articulated a multilevel framework, McLeroy et al. (1988) offered five levels of influence specific to health behavior: intrapersonal factors, interpersonal processes, institutional factors, community factors, and public policy.

Intrapersonal factors include factors that influence individual behaviour such as knowledge, attitudes, beliefs and perceptions (McLeroy et al., 1988). Intrapersonal factors that contributed towards the likelihood of continued smoking during pregnancy in the current study include age, race, socio-economic status, unemployment, educational level, and a history of smoking. All the women in the study were 16 years and older, indicating increased independence and mobility and therefore greater exposure to tobacco marketing. In addition, these women are from low-income communities characterised by social inequality and economic disadvantage which effects access to healthcare and cessation programmes. This lack of access coupled with low educational attainment affects individuals' understanding of the harms of smoking during pregnancy, the seriousness thereof and the threat it could pose to their health and that of their babies. Furthermore, high levels of stress caused by situational circumstances and projected fears about being able to care for the offspring, their lack of knowledge on how to manage these stressors, and the persistence of their circumstances drive women to smoke, as a method to cope with stress (Mund et al., 2013; Pereira et al., 2020; van Dijk et al., 2021). These characteristics taken together have the capacity to influence continued smoking during pregnancy and women's beliefs and perceptions that are associated with continued smoking during pregnancy.

Interpersonal factors encompass relationships with others and how these relationships impact on individual health behaviours. Smoking during pregnancy is thus not only the behavior of a mother, but also how this behaviour is influenced by social support networks in the mother's environment. Continued smoking in the current study could be attributed to the quality of social support women received during their pregnancy from a partner, family member or friend. Having a supportive partner is particularly important, as it can significantly increase the ability of a pregnant smoker to quit successfully. However, a lack of naturally occurring social support within the mother's environment is predictive of continued smoking

during pregnancy (Creswell et al., 2015). Furthermore, as alluded to in the study findings the support women receive during pregnancy could also be compromised by other factors which trumps social support efforts, especially under severe socio-economic disadvantage. In addition, previous research has shown that pregnant women with partners who are active smokers find it harder to quit and are more likely to relapse, especially during the pre-natal period (Diamanti et al., 2019). As Yang (2019) asserts that continued smoking in the home by a partner or family members is closely associated with persistent pre-natal smoking. This further emphasizes the need for prenatal care and cessation efforts to recognize pregnant women as endowed with self-will, but notwithstanding restrictions in the expression of their decisions due to their membership in a familial setting that may also face the habit of smoking. This means that methods for quitting smoking should take into account the values and customs of the family as a whole rather than just one individual's actions.

Institutional factors refer to services that an organization/institution provides that can promote behavioural changes related to prenatal smoking, specifically prenatal care services and smoking cessation interventions (Yang, 2019). Socio-economically disadvantaged pregnant smokers are more likely to receive little to no prenatal care (Weiland et al., 2022). In instances where they do receive prenatal care from a state hospital or clinic, cessation interventions/programmes tend to be non-existent (Madureira et al., 2020); highly individualised and not tailored to the specific needs of women (Hemsing et al., 2015); the physician to women ratios are quite low which impacts on the care that women receive (Weiland et al., 2022) and a punitive approach to anti-smoking interventions or cessation programs is assumed, disregarding individual competencies and social circumstances (Boucher & Konkle, 2016; Miyazaki et al., 2015). The kind of support that women receive from these institutions are often in the form of discussions, advice to quit, videos or information booklets. The current findings, which indicates that to an extent women are still nicotine dependent,

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suggests that the existing maternity care practices that are in place in institutions that cater to the needs of disadvantaged women are inadequate and requires further development that targets women's specific needs while still taking into account contextual influences.

Community factors explore the community level of influence and help identify characteristics of the community that are associated with perpetuating smoking behaviours, Community level factors include environmental and social norms related to smoking behaviours. Communal level influences include factors such as access to and the availability of basic needs and resources, provision of communal support, and communal attitudes about smoking. Research has shown strong evidence for how social norms within social networks can influence smoking behaviours, especially among smokers who are increasingly marginalised socially. For example, the marketing of tobacco products is actively present in low socio-economic communities where retailers are more likely to advertise and sell cigarettes, compared to high income communities where tobacco products are not as visible or marketed in the same way. Pregnant women from low socio-economic communities are subsequently more exposed to pro-tobacco messages and underexposed to anti-tobacco messages, further encouraging them to smoke (Stevens et al., 2021). The findings of the current study thus indicate that collective, community level interventions may be more effective than individual interventions and underscores the importance of understanding the motivating factors behind continued smoking at the community level of influence.

Public Policy level includes local government and national laws and policies that impact health. These policies can shape smoking behaviours by either encouraging or inhibiting such behaviours. Policies related to access to healthcare services and laws restricting the use and purchase of cigarettes are part of this domain. Societal factors like social norms and values also play an important role in the behavioural choices' individuals make. Positive influences on social norms and values can occur through effective health promotion and marketing

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strategies, and conversely, negative influences like social stigma and targeted marketing can be detrimental at the societal level. Policy regulations thus need to take into account vulnerable women from contexts where high exposure of marketing tactics is present (Scroggs, 2021). It requires cessation interventions that counteract such marketing techniques. Regulations such as prohibiting advertising, price reductions or banning point-of-sale advertising, could greatly impact marketing technique's ability to persuade women from low soscio-economic community to use tobacco products (Patten et al., 2019). While exposure to signage prohibiting smoking contributes to the discouragement of use in the social context, it is not enough. This is evidenced by the findings in the current study which indicates that smoking cessation efforts in low soicio-economic contexts has not been implemented effectively given the disparities that still exist. Government and public health professionals should therefore aim to reach audiences with comprehensive messaging about the risks of smoking, women should be informed of the importance of cessation during pregnancy while at the same time giving them the tools to do so (e.g., quitline information). In addition, these efforts should be part of well-funded and sustained public health campaigns that target all sectors of the community, particularly low socio-economic communities.

In summary, smoking behaviours exist within a complex socio-ecological system. The SEM helps us understand the multi-layered nature of the individual, relationship, community and policy levels of influence. As women are embedded in these larger social and economic structures, the environmental context may influence the health of individual women differently, depending on their life trajectory. An enabler or barrier to smoking cessation for pregnant women is therefore not a fixed entity but is dependent on the context of an individual's life (Barnett et al., 2019). Creating sustainable health improvements is thus most effective when all of these factors are targeted simultaneously. Taken together, it is evident that social support,

which is generally considered to be a mediator between stress and nicotine dependence, is compromised by both internal and external social and environmental factors.

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CHAPTER 6
CONCLUSION

6.1 Conclusion and recommendations

The study aimed to determine the relation between stress and nicotine dependence amongst a sample of pregnant women residing in low socio-economic status communities in the Western Cape. The study further sought to determine the extent to which social support mediates this relation. Congruent with existing empirical research, the current study findings indicated that stress is a significant predictor of nicotine dependence. Nicotine dependence and stress are intertwined for various reasons. First, the majority of nicotine dependent women are of lower socio-economic status, which is associated with higher levels of perceived stress. Second, nicotine dependent women often continue smoking because they feel stressed, this is further exacerbated by the added stressors brought on by pregnancy. Stress is therefore an evident barrier to smoking cessation during pregnancy. Targeted interventions such as stress-coping skills are needed to support women with smoking cessation, this will not only help women quit smoking during pregnancy but can also help women stay abstinent after the birth of their baby.

Contrary to previous research findings (see Boucher & Konkle, 2015; Creswell et al., 2015; Crone et al., 2019) the current study found that social support does not act as a mediating factor between stress and nicotine dependence. This is concerning given that social support is often thought to be a protective factor that provides important psychosocial resources during pregnancy, ultimately improving health outcomes. A lack of strong social support networks in a pregnant women's environment is thus detrimental to her well-being and may be further exacerbated by the effects of severe economic disadvantage. It is therefore imperative that interventions are also focused on treating dysfunctional support networks so that individuals who make up these support networks are educated by healthcare providers and policymakers

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about the importance of partner, family and peer support in order to minimize risks that may affect maternal pregnancy care and well-being. Focusing attention on pregnant women to identify those who experience poor levels of social support along with the provision of community-based support services in collaboration with partners and families, may help foster positive behavioural outcomes among pregnant women (Mabetha, 2022).

As highlighted in the current study, women who continue to smoke during pregnancy may be confronted with various psychosocial problems, for example lower socio-economic status, living in poverty, a lack of social support and higher stress. It is therefore imperative to understand smoking mothers' social situations and psychosocial characteristics. More so, this should be done from a socio-ecological perspective in order to gain greater insight into the interactive characteristics between women and their environments, and how these underlie health behaviours (Scroggs, 2021; Yang et al., 2019). If women enter prenatal care while smoking, this is an important opportunity for healthcare providers to assess women's smoking status, to educate them on the harms of smoking during pregnancy, to provide them with self-help materials, to provide them with counselling to quit smoking, and to provide referrals for cessation services (Weiland et al., 2022). Previous research has shown evidence of the effectiveness of using psychosocial approaches on pregnant women who wish to quit smoking (Chamberlain et al., 2017; Miyazaki et al., 2015); future studies should seek new or improved approaches that are tailored to women's specific psychosocial needs. This will ensure the sustainability of such interventions and increase the chances of long-term cessation. In addition, given the scarcity of literature that exists within the South African context, there is growing need for research to explore smoking during pregnancy as it relates to stress and social support, in order to develop a richer and more nuanced understanding of these associations. In effect, this will better inform existing cessation interventions and ensure that future interventions are developed in response to the specific needs of women.

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6.2 Limitations

The current study is not without limitations; however, these limitations point towards fertile ground that future research on the relation between nicotine dependence and stress can cover. Firstly, it is important to note and caution that the results produced in this study indicate that of the 44.5% of women in the sample who were nicotine dependent, almost half of them (18.2%) showed moderate dependence. This may however be a conservative estimate given that the study comprised only a representative of pregnant women from the larger population. This means that in reality, there may be untapped cohorts of women from various other low socio-economic communities in the Western Cape, not considered here, who may also show some degree or a higher degree of nicotine dependence. It is therefore suggested that future research studies are conducted at a larger scale and that it is inclusive of pregnant women from various low socio-economic communities, in order to better understand the prevalence and degree of nicotine dependence during pregnancy. Secondly, given the use of the FTND which is a self-report instrument, nicotine dependence may be under reported in this sample due to the stigma associated with smoking during pregnancy that exists in antenatal care facilities. Women therefore may have concealed their true smoking status. Establishing a trusting and non-judgmental relationship with pregnant women is therefore crucial to create an open and non-threatening atmosphere where women feel comfortable disclosing their smoking status. This is an important consideration at both the levels of research and healthcare, as the main goal is to support the health of both the mother and the baby.
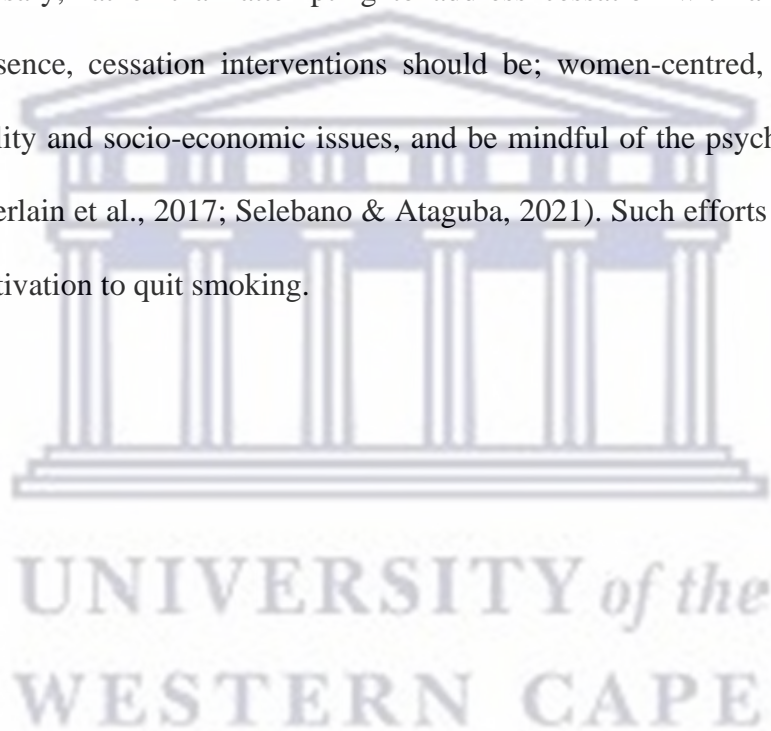
Thirdly, the Prenatal Psychosocial Profile Scale (PPP) has only been reported in one other South African study (Florence et al., 2023 in press) the scale therefore requires further investigation in the South African context to examine its suitability as well as the validity and reliability of the scale among pregnant women from low socio-economic communities in the Western Cape. Further validation should also be considered across different cultures and

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language groups. Fourthly, the second phase of data collection was conducted during the height of the COVID-19 pandemic during which strict bans and restrictions were set in place by the government of the country. In person data collection was restricted, which made accessing participants via the clinics difficult. As a result, telephonic data collection was employed, however this yielded low participant rates and shortfall in the overall sample size. Under the circumstances this was the most appropriate alternative method, ensuring the safeguarding of both the participants and researcher. However, future research should also consider alternative data collection methods (i.e., online surveys) with considerations of the appropriateness of those methods for the specific needs of the participants. Fifthly, due to the fact that the study is quantitative in nature the study was unable to explore subjective experiences of participants, it is recommended that future studies utilise a mixed method approach to gain a more in depth understanding of the relation between stress and nicotine dependence and how social support mediates this relation. Sixthly, the study employed a convenience sampling technique, future research could consider alternative sampling techniques, such as quota sampling to ensure that the sample is as representative as possible of the population being studied. This allows for case control, i.e., only including smokers in the sample. Lastly, due to the cross-sectional nature of the current study which is a once off measurement of exposure and outcome, this design cannot be used to analyse the relation between stress and smoking behaviour over a long period of time. Future research could use a longitudinal design to explore whether changes in this relation do occur overtime.

6.3 Implications for research and practice

The findings of this research suggest important directions for future research that can help research and policy move forward toward multi-level approaches that will be sustainable and effectively address the problem of maternal smoking. At the forefront is the need for the development of interventions for socio-economically disadvantaged women who are at an

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increased risk for prenatal smoking. Targeting research and intervention efforts at women who are at greater risk may result in the most meaningful improvement in maternal smoking rates and are integral to understanding trajectories of risk (Gould et al., 2020). Interventions and policy development should also take into consideration that women are embedded in larger social structures and that smoking during pregnancy exists within a complex socio-ecological system with various levels of influence (Siqueira et al., 2016). The integration of a multi-level smoking cessation intervention that is comprehensive and informed by the specific needs of women is necessary, rather than attempting to address cessation with a one size fits all approach. In essence, cessation interventions should be; women-centred, context-specific, integrate inequality and socio-economic issues, and be mindful of the psychosocial needs of women (Chamberlain et al., 2017; Selebano & Ataguba, 2021). Such efforts build confidence and increase motivation to quit smoking.

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UNIVERSITY *of the* WESTERN CAPE

DEPARTMENT OF PSYCHOLOGY

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2825 Fax: 27 21-959 3515

E-mail: 3628311@myuwc.ac.za

INFORMATION SHEET

Project Title: Stress and Nicotine Dependence during pregnancy among women in Low-SES communities in the Western Cape: the mediating effects of Social Support

What is this study about?

This is a research project being conducted by Jade Morkel at the University of the Western Cape. You are invited to participate in this research project because you are receiving antenatal care at this facility. We are interested in whether you have made use of any substances during any stage of your pregnancy, specifically nicotine. The purpose of the research project is to understand the impact of stress on nicotine dependence amongst women residing in low socio-economic communities. The researcher also wishes to understand how social support impacts on this relation.

What will I be asked to do if I agree to participate?

You will be asked to complete a survey, telephonically for 10 to 15 minutes, at a time that is convenient for you. It is required that you try to answer the questions as truthfully as possible. You will be asked to answer questions related to any drug use during your pregnancy as well as some background information about yourself that will be explored to see whether these are putting you at a higher risk for drug use. Lastly, you will be asked to answer questions about the amount of stress you experience as well as questions about your level of satisfaction with the support you receive.

Would my participation in this study be kept confidential?

The researchers undertake to protect your identity and the nature of your contribution. To ensure your anonymity the surveys are anonymous and will not contain information that may personally identify you. **(1)** Your name will not be included on the survey; **(2)** a code will be placed on the survey; **(3)** through the use of an identification key, the researcher will be able to link your survey to your identity in order to follow-up once your child is born; and **(4)** only the researcher will have access to the identification key. To ensure your confidentiality all data will be filed in locked cabinets using identification codes only on data forms and using only password-protected computer files. If we write a report or article about this research project, your identity will be protected. In accordance with legal requirements and/or professional standards, we will disclose to the appropriate individuals and/or authorities' information that comes to our attention concerning child abuse or neglect or potential harm to you or others. In this event, we will inform you that we have to break confidentiality to fulfil our legal responsibility to report to the designated authorities. If the unborn child is exposed to possible harm as a result of the mother's abuse of substances a referral will be made to the attending social worker at the respective clinics to provide further assistance or intervention.

What are the risks of this research?

All human interactions and talking about self or others carry some amount of risks. We will nevertheless minimise such risks and act promptly to assist you if you experience any discomfort, psychological or otherwise during the process of your participation in this study. In the event that you do experience any discomfort psychological or otherwise, you will be referred to the attending physician or psychological counseller at the respective clinic for further assistance or intervention. This service will be offered free of charge. Furthermore, if you communicate that you wish to quit smoking, you will be referred to the relevant organizations for treatment. These include quit lines such as the National Council Against Smoking (NCAS) (011 720 3145) and the CANSA eKick Butt Programme, an online cessation programme (021 689 5381), or non-governmental substance abuse centres in the Cape Town area, such as SANCA (011 892 3892/076 535 1701) and the Cape Town Drug Counselling Centre (021 447 8026).

What are the benefits of this research?

This research is not designed to help you personally, but the results may help the investigator have a more complete understanding of the relation between stress and nicotine dependence.

We hope that, in the future, other people might benefit from this study through improved understanding of the impact of stress on nicotine dependence. If you indicate that you wish to stop using substances, you will be referred to relevant organisations for treatment.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to partake at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or stop participating at any time, you will not be penalized.

What if I have questions?

This research is being conducted by Jade Morkel at the University of the Western Cape. If you have any questions about the research study itself, please contact Maria Florence at: The Department of Psychology, University of the Western Cape, Private Bag X17, Bellville 7535, Telephone: (021) 959-2283/2453, email address: mflorence@uwc.ac.za.

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Jade Morkel
Department: Psychology
University of the Western Cape
Private Bag X17
Bellville 7535
3628311@myuwc.ac.za

Prof. Anita Padmanabhanunni
Head of Department: Psychology
University of the Western Cape
Private Bag X17
Bellville 7535
apadmana@uwc.ac.za

Prof Anthea Rhoda
Dean of the Faculty of Community and Health Sciences

University of the Western Cape

Private Bag X17

Bellville 7535

chs-deansoffice@uwc.ac.za

Patricia Josias

Research Ethics Committee Officer

University of the Western Cape
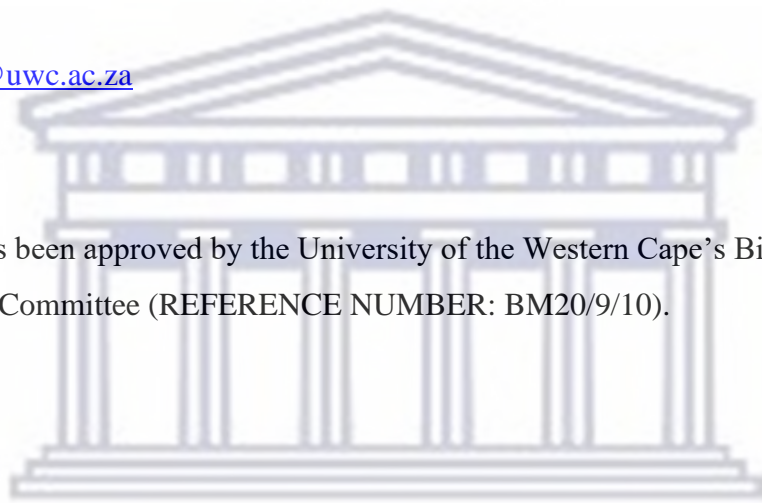
Private Bag X17

Bellville 7535

research-ethics@uwc.ac.za

021 959 4111

This research has been approved by the University of the Western Cape's Biomedical
Research Ethics Committee (REFERENCE NUMBER: BM20/9/10).

APPENDIX B: CONSENT FORM

UNIVERSITY *of the* WESTERN CAPE

DEPARTMENT OF PSYCHOLOGY

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2825 Fax: 27 21-959 3515

E-mail: 3628311@myuwc.ac.za

CONSENT FORM

Title of Research Project: Stress and Nicotine Dependence during pregnancy among women in Low-SES communities in the Western Cape: the mediating effects of Social Support

The study has been explained to me in language that I understand. My questions about the study have been answered. I understand what my participation will involve, and I agree to participate of my own choice and free will. I understand that my identity will not be disclosed to anyone. I understand that I may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.

Participant's name………………………..

Participant's signature……………………………….

Date………………………

APPENDIX C: QUESTIONNAIRE

Demographic information

1	Age in years					
2	Race/Ethnicity	African	Coloured	Indian	White	Other *Specify:*
3	Education level	Primary school only	Matric	Undergraduate	Postgraduate	Other *Specify:*
4	Number of people in your household					
5	Employment status	Currently Employed		Currently Unemployed		
6	Marital status	Single	Married	Separated/Divorced		Widowed
7	General health status	1 Poor	2	3	4	5 Excellent
8	Number of pregnancies					
9	Number of biological children					
10	Grant holder	No		Yes		
11	How far along is this pregnancy					
12	How many antenatal visits have you had during this pregnancy					

Baseline questions: Assessing women's smoking habits

1. About how many cigarettes have you smoked in your entire life?	
a)	I have never smoked cigarettes
b)	1 to 15 cigarettes
c)	16 to 25 cigarettes

http://etd.uwc.ac.za/

d)	26 to 99 cigarettes	
e)	100 or more cigarettes	

2. How old were you when you first tried cigarette smoking, even one or two puffs?

	Years old

3. During the past 30 days, on how many days did you smoke cigarettes?

a)	0 days
b)	1 to 5 days
c)	6 to 19 days
d)	20 to 29 days
e)	All 30 days

4. . About how many times have you used a hookah or water pipe in your entire life?

a)	I have never used a hookah or water pipe
b)	1 to 15 times
c)	16 to 25 times
d)	26 to 99 times
e)	100 more times

5. How old were you when you first tried a hookah or water pipe?

	Years old

6. During the past 30 days, on how many days did you use a hookah or water pipe?

a)	0 day
b)	1 to 5 days
c)	6 to 19 days
d)	20 to 29 days
e)	All 30 days

Fagerström Test for Nicotine Dependence

		0	1		
1	Do you find it difficult to refrain from smoking in places where it is forbidden? (e.g. in the library)	No	Yes		
2	Which cigarette would you hate to give up?	All the others	The first one in the morning		
3	Do you smoke more frequently in the morning?	No	Yes		
4	Do you smoke even if you are sick in bed most of the day?	No	Yes		
		0	1	2	3

5	How soon after waking do you smoke your first cigarette?	After 60 minutes	31-60 minutes	6-30 minutes	Within 5 minutes
6	How many cigarettes a day do you smoke?	0-10 or less	11-20	21-30	32 or more

The Prenatal Psychosocial Profile Scale

PPP – Stress

Rate the amount of stress you experience on the response scale provided in relation to the following 11 items

		No Stress	Little Stress	Much Stress	Severe stress
1	Financial worries (e.g., food, shelter health care, transportation)	1	2	3	4
2	Other money worries (e.g., bills, etc.)	1	2	3	4
3	Problems related to family (e.g., partner, children, etc.)	1	2	3	4
4	Having to move, either recently or in the future	1	2	3	4
5	Recent loss of loved one (e.g., death, divorce, long distance)	1	2	3	4
6	Current pregnancy	1	2	3	4
7	Current abuse (e.g., sexual, emotional, or physical)	1	2	3	4
8	Problems with alcohol and/or drugs	1	2	3	4
9	Work problems (e.g., being laid off, etc.)	1	2	3	4
10	Problems related to friends	1	2	3	4
11	Feeling generally 'overloaded'	1	2	3	4

PPP – Support from partner

Rate you level of satisfaction on the response scale provided with the support you receive from your partner in relation to the following 11 items

		Very dissatisfied	Dissatisfied	Somewhat dissatisfied	Somewhat satisfied	Satisfied	Very Satisfied
1	Shares similar experiences with me	1	2	3	4	5	6
2	Helps keep up my morale	1	2	3	4	5	6
3	Helps me out when I'm in a pinch	1	2	3	4	5	6
4	Shows interest in my daily activities and problems	1	2	3	4	5	6

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5	Goes out of the way to do special or thoughtful things	1	2	3	4	5	6
6	Allows me to talk about things that are very personal and private	1	2	3	4	5	6
7	Let's me know I am appreciated for the things I do for him/her	1	2	3	4	5	6
8	Tolerates my ups and downs and unusual behaviour	1	2	3	4	5	6
9	Takes me seriously when I have concerns	1	2	3	4	5	6
10	Says things that make my situation clear and easier to understand	1	2	3	4	5	6
11	Let's me know that he/she will be around if I need assistance	1	2	3	4	5	6

PPP – Support from others

Rate you level of satisfaction on the response scale provided with the support you receive from other close friends and/or family in relation to the following 11 items

		Very dissatisfied	Dissatisfied	Somewhat dissatisfied	Somewhat satisfied	Satisfied	Very Satisfied
1	Shares similar experiences with me	1	2	3	4	5	6
2	Helps keep up my morale	1	2	3	4	5	6
3	Helps me out when I'm in a pinch	1	2	3	4	5	6
4	Shows interest in my daily activities and problems	1	2	3	4	5	6
5	Goes out of the way to do special or thoughtful things	1	2	3	4	5	6
6	Allows me to talk about things that are very personal and private	1	2	3	4	5	6
7	Let's me know I am appreciated for the things I do for him/her	1	2	3	4	5	6
8	Tolerates my ups and downs and unusual behaviour	1	2	3	4	5	6
9	Takes me seriously when I have concerns	1	2	3	4	5	6
10	Says things that make my situation clear and easier to understand	1	2	3	4	5	6
11	Let's me know that he/she will be around if I need assistance	1	2	3	4	5	6

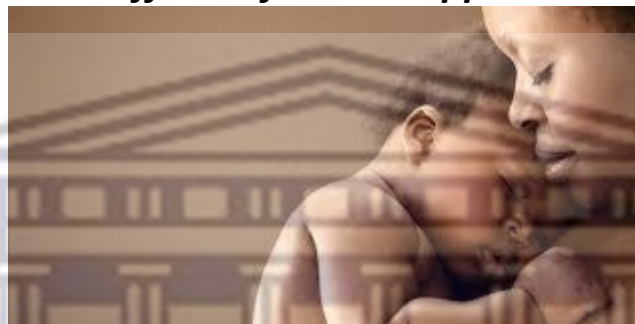UNIVERSITY *of the* WESTERN CAPE

Department of Institutional Advancement
University of the Western Cape
Robert Sobukwe Road
Bellville 7535
Republic of South Africa

FACULTY OF COMMUNITY
AND HEALTH SCIENCES

DEPARTMENT OF PSYCHOLOGY
Private Bag X 17, Bellville 7535, South Africa, Telephone: (021) 959-2454, email:
mflorence@uwc.ac.za

Stress and Nicotine Dependence During Pregnancy among Women in Low-SES Communities in the Western Cape: The Mediating Effects of Social Support

You are invited to participate in this research project because you are receiving antenatal care at this facility and we are interested in whether you have used any drugs at any stage during your pregnancy. The purpose of this research project is to get a better sense of how many women struggle with drug use during pregnancy and what care needs to be put in place to ensure the safe delivery and healthy development of your baby.

Please **send us a WhatsApp or SMS to 000 00 00 000**
if you are **18 years or older and currently pregnant**. We are especially interested in those women who have struggled with drugs, alcohol or smoking during their pregnancy, but are also interested in hearing from those who have not.

Please contact Dr Maria Florence on 082 48 98 072 if you have any questions.
Should you need assistance with managing a drug, alcohol or smoking addiction we can assist you to access help with this problem.

As a token of our appreciation for your participation, **we are offering airtime vouchers** to the value of **R50.00** (Vodacom, Telkom, Cell C or MTN).
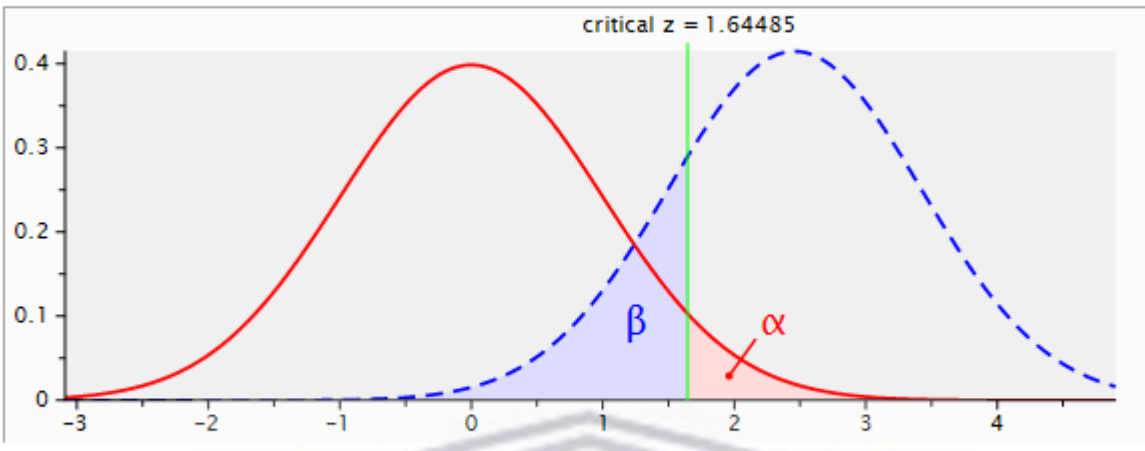THANK YOU!!!

Faculty of Community and Health Sciences:
Bellville campus:
14 Blanckenberg Street
Bellville CBD
Tel: 021 959 2852
Email: chsdesk@uwc.ac.za

CHS Main campus:
Social Sciences Building
Room 1.206, Ground Floor
Tel: 021 959 1794
Email: chshelpdesk@uwc.ac.za

FROM HOPE TO ACTION THROUGH KNOWLEDGE.

APPENDIX E: POWER ANALYSIS (G*Power 3.1.9.4)

File   Edit   View   Tests   Calculator   Help

Central and noncentral distributions | Protocol of power analyses

Test family

z tests

Statistical test

Logistic regression

Type of power analysis

A priori: Compute required sample size – given α, power, and effect size

Input Parameters

Tail(s)	One	
Determine => Pr(Y=1|X=1) H1		0.25
Pr(Y=1|X=1) H0		0.18
α err prob		0.05
Power (1−β err prob)		0.80
R² other X		0.04
X distribution	Normal	
X parm μ		0
X parm σ		1

Output Parameters

Critical z	1.6448536
Total sample size	256
Actual power	0.8013811

Options | X–Y plot for a range of values | Calculate

The Facility Manager

Crossroads CDC

To whom it may concern /2020

Request for permission to collect data

I am from the Department of Psychology at the University of the Western Cape. We are conducting research on substance use during pregnancy. I would like to meet with you to discuss the possibility of including the women who access your clinic in this study. This project is registered at the University of the Western Cape – see ethics clearance certificate attached. Also find attached a permission letter from the Health Research Directorate of the Western Cape Department of Health.

The idea is to access the women through the distribution of flyers to your clinic which will explain the nature of the study. The women can then contact the researchers provided that they are interested and eligible to participate in the study. The data collection will be done telephonically, thus not interfering with the daily procedures of the clinic. We will ensure that participation in the study is voluntary and that the information shared by patients is kept confidential and handled sensitively.

Please let me know when you will be available to meet to discuss our request further.

Sincerely,

Maria Florence

Principal Investigator

Prenatal methamphetamine exposure in the Western Cape, South Africa

Department of Psychology University of the Western Cape