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**Socioeconomic, demographic, and behavioural determinants of modern
contraceptive non- use among sexually active Chinese university students**

Gao, Shan

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**Socioeconomic, demographic, and behavioural determinants
of modern contraceptive non-use among sexually active
Chinese university students**

GAO, Shan

A thesis submitted for the degree of Doctor of Health (DHealth)

University of Bath

Department of Health

February 2023

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“Generatim discite cultus”

Abstract

Background

Sexual and Reproductive Health (SRH) is a key developmental issue for adolescents and youth globally, including in China. Research has demonstrated that young people in China lack SRH knowledge and services to enable them to make informed decisions on contraceptive use. Non-use of modern contraceptives (MC) during sexual intercourse increases the risk of unintended pregnancies, Sexually Transmitted Diseases (STDs), and other harmful health consequences. This study focuses on university and college students in China. The aim of the study was to find socioeconomic, demographic and behavioural factors associated with the non-use of MC among Chinese university students. The secondary aim was to find the socioeconomic, demographic and behavioural factors associated with SRH knowledge among Chinese university students.

Methods

This is a quantitative study investigating 11,223 sexually-active university students from the National University Students Survey on Sexual and Reproductive Health (NUSS-SRH), a national-level survey on SRH among university students across China. NUSS-SRH was conducted by Tsinghua University in 2019-2020. The questionnaire was administered electronically through an online platform. The basic characteristics of the participants were tabulated. The stratified tabulation of basic characteristics was conducted by MC use during the most recent sex (MRS). The univariable logistic regression was then performed on selected socioeconomic, demographic and behavioural factors against MC use during MRS. Thirty-two significant socioeconomic, demographic and behavioural factors identified from the univariable logistic regressions were broadly categorized into individual level factors, inter-personal level factors and environment level factors according to the Social Ecological Model (SEM). These factors were progressively adjusted in 14 models. Lastly, the gender stratified logistic adjustment multivariable of MC use during MRS and SRH knowledge against socioeconomic, demographic and behavioural factors were conducted respectively. All analyses were performed in StataMP (Version 17).

Results

The prevalence of MC non-use during MRS among surveyed sexually-active Chinese university students was 12.55%. The results show that at the individual level, being female, being younger in age, being a vocational school student, having smoking experience, having lower SRH knowledge, and not coming from a rich family were all associated with higher odds of MC non-use during MRS. At the inter-personal level, the findings show that being older at the first romantic relationship, being younger at the first sexual intercourse, not having a decision maker in MC use, and having experience of physical violence were all associated with higher odds of MC non-use during MRS. At the environment level, having difficulties accessing MC was found to be associated with MC non-use during MRS.

In the gender stratified analyses, being a vocational school student was associated with having lower SRH knowledge and higher odds of MC non-use among both male and female students. Having smoking experience was associated with having lower SRH knowledge among male students and higher odds of MC non-use behaviour among female students. Having no decision makers in the relationship for contraceptive use was associated with lower SRH knowledge among female students and higher odds of MC non-use behaviour among both male and female students. Increases in age were associated with greater SRH knowledge among both male and female students, but higher odds of MC non-use behaviour among male students. Being older at the first romantic relationship was associated with having greater SRH knowledge among female students while it was associated with higher odds of MC non-use among female students. Not coming from a rich family was associated with having more SRH knowledge among female students.

Conclusions

Benefitting from the large sample of data collected by the recent NUSS-SRH, the analyses in this study suggest that multiple determinants at various levels according to SEM are associated with MC use among Chinese university students. Gender disparities on the associations with MC use during MRS by these determinants were found. This study provides unique insights on developing programme interventions and relevant policies to promote MC use among university students, so that they could prevent unintended pregnancies and make informed decisions for their SRH.

Acronyms

CASP	Critical Appraisal Skills Programme
CFPA	China Family Planning Association
CI	Confidence Interval
CNKI	China National Knowledge Infrastructure
COVID-19	Corona Virus Disease
GDP	Gross Domestic Product
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
ICPD	International Conference on Population Development
KAP	Knowledge Attitude Practice
LARC	Long Acting Reversible Contraceptives
MC	Modern Contraceptive
MDG	Millennium Development Goal
MRS	Most Recent Sex
NUSS-SRH	National University Students Survey on Sexual and Reproductive Health
OR	Odds Ratio
PI	Primary Investigator
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RMB	Ren Min Bi
SD	Standard Deviation
SDG	Sustainable Development Goal
SEM	Social Ecology Model
SRH	Sexual and Reproductive Health
STD	Sexually Transmitted Disease
UN	United Nations
UNFPA	United Nations Population Fund
USD	United States Dollar
WHO	World Health Organisation

Chapter I: Background

1.1 Introduction

Sexual and reproductive health (SRH) is an important pillar of young people's health and wellbeing, and it is fundamental to social and economic development as healthier youth populations contribute more productively to society. (Starrs et al., 2018) Hence, promoting SRH for young people has already been included in numerous global and national development agendas. As such, advancing SRH for young people is a priority area of work in the International Conference on Population and Development (ICPD), an internally-recognized ground-breaking document developed in 1994 that guides the work on population development globally. (United Nations Population Fund, 2004) More recently, several indicators were designed to measure young people's SRH progress in the 2030 Agenda for Sustainable Development (SDGs), which was endorsed by heads of states from more than 190 countries in 2015. (Lozano et al., 2018)

Promoting the use of modern contraceptives (MC) and preventing unintended pregnancies are central issues in youth SRH. (Azzopardi et al., 2019) This doctoral thesis will investigate the key socioeconomic, demographic and behavioural determinants of using MC among university students in China which will contribute to advancing SRH for Chinese young people. This background chapter will be presented to set the stage, illustrate the rationale for this study and outline the aims and objectives of this study.

In the first section, key definitions related to the study theme are introduced, including the definitions for SRH in young people, the unmarried youth population, and the use of MC. These definitions will assist readers to understand the issues involved in this study.

In the second section, the global context of youth SRH is presented. This includes key statistics, such as the prevalence of unintended pregnancies, abortions, adolescent birth rates, and sexually transmitted diseases among young people. It also includes key topics commonly discussed for improving youth SRH in developing countries, such as youth-friendly health services, sex

education and skills, youth participation and building an empowering environment for youth policies. (Plesons et al., 2019)

Subsequently, in the third section, the Chinese context of youth SRH is presented. This includes introduction to the country's profile, the health system in China, and the family planning policies in China. Additional information is presented, including the demographics of the Chinese youth population, important statistics on Chinese young people's SRH status, and key issues for promoting youth SRH in China, including the provision of youth-friendly SRH health services and the provision of sex education in schools in China.

Followed by that, the fourth section consists of the literature review for the thesis, detailing the literature review search strategy and the search results. Articles shortlisted from the screening process are then described, critiqued and discussed. With contribution from the literature review, the remaining knowledge gaps on the study topic are evaluated. Analyses of the knowledge gaps provides the foundation on which this doctoral thesis is built.

The last section consists of the introduction of the aims and objectives for this doctoral thesis.

1.2 Key definitions

SRH is a state of complete physical, mental, and social wellbeing in relation to one's reproductive system. (Liang et al., 2019) As articulated in ICPD Programme of Action, the first international guiding document on SRH, good SRH generally refers to people being able to enjoy a safe sex life, being capable to reproduce and free to decide when, with whom, and how many children they want to have. (Obaid, 2009) SRH is closely connected with a broad range of issues, such as birth safety, health services quality and equity, HIV and sexually transmitted diseases, family planning and contraception, violence and abuse, and gender equality. (Starrs et al., 2018) In order to have good SRH, people need, and have the right to access, the correct knowledge, skills, essential services and an enabling environment to support them in making the right decisions. (Liang et al., 2019) Young people's SRH is a key component in the broader SRH discussions, as young people are more vulnerable and often have barriers to quality SRH services. (Obaid, 2009) Insufficient SRH

knowledge, skills and services can have detrimental outcomes, such as unintended pregnancies, for unmarried young people in developing countries, with such outcomes dramatically changing their life course. (Plesons et al., 2019)

In this thesis, the youth population refers to people aged between 15-24 years old, as per the United Nations' definition. (Hindin & Fatusi, 2009) University and college students, as a proportion of the youth population, generally refer to students in higher education institutes in China, which include higher vocational schools, private colleges, and universities. (Ma et al., 2008) Unmarried youths refer to young people who are not legally married, which may consist of young people who are single or in a relationship. (Liang et al., 2019) Sexually-active young people refers to young people who have already had voluntary sexual intercourse with a partner. (Huber & Ersek, 2009)

The scientific definition of an MC is a product or medical procedure that interferes with reproduction from acts of sexual intercourse. (Hubacher & Trussell, 2015) The most used MCs are listed in *Table 1*. MCs can be categorized by their features into three major groups, namely long-acting reversible contraceptives (LARC) such as Intrauterine devices (IUD) and implants, short-acting reversible contraceptives such as contraceptive pills and condoms, and other methods including sterilization and emergency contraceptives. MCs can also be categorized by how they function, namely barrier methods such as condoms, hormonal methods, such as contraceptive pills, and chemical methods such as spermicides. MCs are different from traditional contraceptive methods, which include the withdrawal method and the calendar method, that generally have a much lower effectiveness rate in pregnancy prevention. (Hubacher & Trussell, 2015; World Health Organization, 2007) Traditional contraceptive methods are not recommended by WHO and other health research organizations as effective contraceptive methods. (World Health Organization, 2018)

Modern contraceptives (selected)		
Methods	Description	Effectiveness to prevent pregnancy
Contraceptive pills	Contains two hormones (estrogen and progestogen)	>99% with correct and consistent use

Implants	Small, flexible rods or capsules placed under the skin of the upper arm; contains progestogen hormone only	>99%
Contraceptive injection	Injected into the muscle or under the skin every 2 or 3 months, depending on product	>99% with correct and consistent use
Contraceptive ring	A flexible plastic ring constantly releasing hormones that is placed in the vagina by the woman.	>99%
Contraceptive patch	A patch that sticks to the skin and releases hormones that are highly effective at stopping pregnancy.	>99%
IUD	Small flexible plastic device containing copper sleeves or wire that is inserted into the uterus	>99%
Male condoms	Sheaths or coverings that fit over a man's erect penis	98% with correct and consistent use
Female condoms	Sheaths, or linings, that fit loosely inside a woman's vagina, made of thin, transparent, soft plastic film	90% with correct and consistent use
Male sterilization (vasectomy)	Permanent contraception to block or cut the vas deferens tubes that carry sperm from the testicles	>99% after 3 months semen evaluation
Female sterilization (tubal ligation)	Permanent contraception to block or cut the fallopian tubes	>99%
Emergency contraception pills	Pills taken to prevent pregnancy up to 5 days after unprotected sex	>99%

Traditional methods

Calendar method or rhythm method	Women monitor their pattern of menstrual cycle over 6 months, subtracts 18 from shortest cycle length (estimated 1st fertile day) and subtracts 11 from longest cycle length (estimated last fertile day)	75% with common use
Withdrawal (coitus interruptus)	Man withdraws his penis from his partner's vagina, and ejaculates outside the vagina, keeping semen away from her external genitalia	73% as commonly used (Trussell, 2009)

Table 1 List of commonly used modern and traditional contraceptive methods (World Health Organization, 2022)

1.3 The global context of SRH among young people

1.3.1 Youth SRH in global development agendas

SRH for young people is a priority area in numerous high-level global development agendas. (Starrs et al., 2018) The first international consensus that created SRH language is the ICPD Programme of Action which was endorsed in Cairo in 1994 by more than 170 countries. (Cohen & Richards, 1994) It defined reproductive health service care as health services that include family planning counselling, maternal health care, safe abortion services, reproductive health knowledge education, prevention and treatment of sexually transmitted diseases, HIV and infertility. It also defined reproductive rights as part of human rights, which entails the right to decide freely and responsibly when to have children, with whom to have children, and how many children to have. (United Nations Population Fund, 2004)

Later, in 2000, the Millennium Development Goals (MDGs), a set of goals developed by the UN to eradicate poverty by 2015, removed SRH due to its cultural sensitivity. However, in 2007, SRH was added back in under the theme ‘reproductive health for all’, after rounds of global consultations. It was pointed out that countries should develop and implement policies to advance

the ICPD Programme of Actions. The monitoring indicator on the provision of youth friendly SRH services for unmarried young people was subsequently included. (Yamin & Boulanger, 2013)

The Agenda 2030, a set of 17 Sustainable Development Goals, was endorsed by more than 190 heads of states in 2015 to guide the social and economic development globally from 2015 to 2030. The provision of SRH services and education for young people are explicitly stated in its numerous monitoring indicators. (Barot et al., 2015) The indicator, SDG 5.6.1, emphasizes that the prevention of unintended pregnancies is a reflection of social and economic status. (United Nations Population Fund, 2022)

Several specialized UN organizations, such as the United Nations Population Fund, the United Nations Children's Fund, the World Health Organization, and many international organizations, such as Marie Stopes International and the International Planned Parenthood Federation have been placing youth SRH at the core of their business. They are working with national governments to design policies and intervention programmes to provide young people with quality SRH services and education. (Zuccala & Horton, 2018)

1.3.2 Global trends of youth SRH

There were 1.8 billion young people aged between 10-24 years old in the world in 2014, the largest youth population cohort the world has ever seen. (Gupta, 2014) Although between 2015 to 2030, the youth population is expected to decrease globally, as shown in *Figure 1*, young people aged between 15-24 years old still take up a large proportion in society, in particular in developing countries. (Starrs et al., 2018) In 2015, 20% of the population in lower-income countries were youth aged between 15-24 years old, 19% of the population in lower middle-income countries were youth, 14% of the population in higher middle-income countries were youth, and 12% of the population in high income countries were youth.

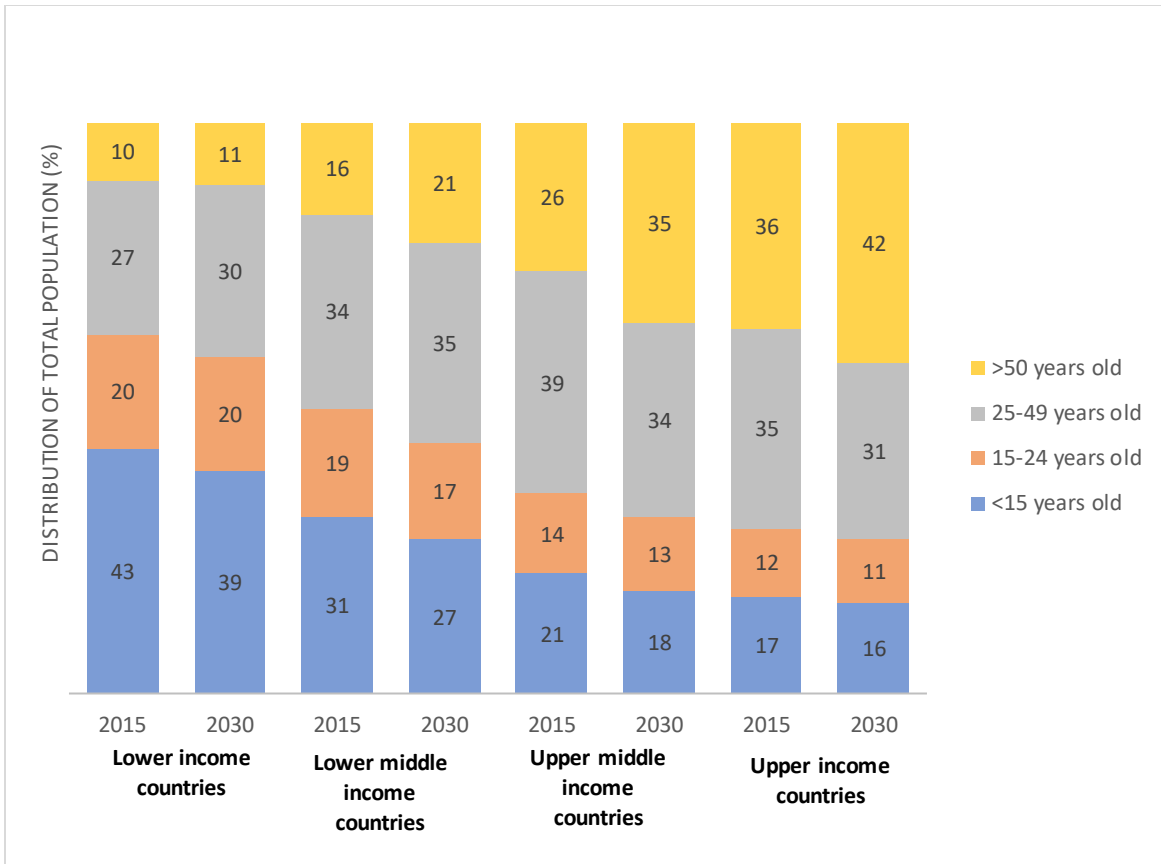


Figure 1 The Distribution of Total Population by Country Development Levels (Starrs et al., 2018)

After decades of endeavour, much progress has been made in promoting SRH across the world since the introduction of ICPD. (Starrs et al., 2018) However, the situation of SRH for young people, in particular among unmarried young people remains a concerning issue, particularly in developing countries. (Hindin et al., 2013) According to Neal and colleagues, each year an estimated 2.5 million births occur to girls under the age of 16 in low resource countries. (Neal et al., 2012) The same study also shows that in some countries (such as Chad, Guinea, Mali, Mozambique and Sierra Leone), more than 10% of girls aged under 16 gave birth. Early motherhood increases the challenges faced by young girls by harming their health, disrupting their education and limiting their life opportunities. (Santelli et al., 2017) While adolescent birth rates have declined globally, from 65 births per 1,000 adolescents during the period 1990-1995 to 44 births per 1,000 in 2012, they are still high as adolescents in most contexts are not ready to get married or give birth. (Patton et al., 2016)

About half of all pregnancies among girls and young women aged between 10 – 24 years old are unintended, and more than half of those pregnancies result in induced, and often unsafe, abortions. (Santelli et al., 2017) It is estimated that between 2015-2019, 121 million unintended pregnancies occurred among women of reproductive age annually, with 42 percent contributed by unmarried young women. (Bearak et al., 2018) The same study also shows that unintended pregnancies declined 16 percent from 1990–1994 to 2010–2014 in developing countries and 30 percent in developed countries. However, no decline has taken place among young women in resource limited communities in Latin America and Sub-Saharan Africa. (Sedgh et al., 2016) The largest declines were recorded in Asia and Europe. (Bearak et al., 2018) Despite the decline of overall unintended pregnancies in Asia, approximately 43 percent of pregnancies among girls remain unintended. (Liang et al., 2019)

Globally, abortion is in decline in recent years. (Ganatra et al., 2017) Between 1990-1994, there were 40 abortions happening annually for every 1,000 women of reproductive age, but by 2010-2014 that number decreased to 35 abortions annually for every 1,000 women of reproductive age. (X. Wang et al., 2019) The decrease in abortion rate was more pronounced in developed countries compared to developing countries. (Sedgh et al., 2016) Unsafe abortion, often caused by lack of services and a youth-friendly environment, is a major health burden for women as it may lead to haemorrhage, infertility and other severe health outcomes. (Wu et al., 2011) Between 2015-2019, there were approximately 73 million abortions annually worldwide, half of these were unsafe abortions, and 27% were contributed by unmarried young women. (Kantorová, 2020)

A study conducted in 2019 which collected data from 48 countries showed that 41 percent of sexually-active women were not using contraceptives regularly. (Moreira et al., 2019) A global systematic review which included 37 articles covering 29 countries from 1999 to 2016, showed that the contraceptive prevalence rate for unmarried young women was 57%, significantly lower than their married counterparts (69%). (Wang et al., 2019) This review also indicated that among sexually-active unmarried young women globally, 12.1% were predominantly relying on the calendar method and 12.7% were predominantly relying on the withdrawal method, which are traditional contraceptive methods that WHO advises are not effective. (Hubacher & Trussell, 2015)

It's also shown that for married women, including married young women, having a son preference is also associated with the choice of MCs. (Channon, 2017)

1.3.3 Trends of MC access and use by young people globally

In developed countries, young people tend to use a wide range of MCs based on their needs, however, in developing countries, they normally rely on a very limited number of contraceptive methods. (M. Y. Wang et al., 2020) For example, in the United States, young people in a stable relationship are much more likely to use hormonal contraceptive methods and dual protections (using two modern contraceptives at the same time to maximize the effect). (Kusunoki & Upchurch, 2011) The technical guidelines from the Canadian Paediatric Society pointed out that physicians should discuss with young people the MC options available and make recommendations based on the case, optimizing the adherence. (Di Meglio et al., 2018) Based on the guidelines, the first recommendation for young women, based on the effectiveness assessment, should be long-acting reversible contraceptives (LARCs), the second recommendation should be hormonal methods, such as contraceptive pills and injectables, and the third recommendation should be one-time methods, such as condoms.

In contrast, research from several countries in Southeast Asia shows that for sexually-active young people who regularly used contraceptives, the majority were using condoms (57%), followed by traditional contraceptive methods, such as the calendar method and the withdrawal method, and only 13% were using MCs other than condoms. (Hindin et al., 2013) Many young people have an incorrect understanding of MCs, fearing that hormonal contraceptives would harm their health. (Chalemphon, 2021)

Quality health services play a critical role in supporting young people's access to and use of MCs. (United Nations Population Fund, 2004) Unlike many family planning clinics in developing countries, the youth health clinics in developed countries offer services in a more youth-friendly manner. For example, Planned Parenthood clinics in the United States offer online education and consultations on the use of MCs to youth clients, and most youth health clinics engage in measures to protect young visitors' confidentiality. (Kusunoki & Upchurch, 2011) When seeing physicians,

LARCs were regularly discussed with young clients which resulted in an increase in LARC uptake among young people. (Kavanaugh et al., 2013) In the Netherlands, sexual health clinics are set up by social organizations and municipal governments, such as the Centre for Sexual Health and SoaAidsNI. (Hopman et al., 2014) These sexual health clinics offer a wide range of health services, including prevention of and testing for STDs, contraception, pregnancy tests, and support groups for people up to the age of 25 years old. All services are provided free of charge and are confidential and anonymous.

On the contrary, in developing countries, normally there are very few special clinics for young people. (Patton et al., 2016) When young people seek reproductive health services and contraceptives in clinics, health workers typically refuse such requests because they do not approve of premarital sex. (Tu et al., 2004) In cases where young people are provided with MCs, they are most likely provided with male condoms as health workers believe that other MCs are designed only for married couples. (World Health Organization, 2012)

In many countries, laws and policies restrict the provision of contraception to unmarried adolescents or those below a certain age. (Chandra-Mouli et al., 2014) As of 2014, 35 countries worldwide had at least one policy restricting access to contraceptive services, such as excluding provision to unmarried women or requiring parental consent for minors to access contraceptive services. (Chandra-Mouli et al., 2014)

From the demand side, women, in particular young women, have concerns about MC use according to the *State of World Population Report 2022*, released by the United Nations Population Fund. (United Nations Population Fund, 2022) The report elucidated that the reluctance to use MCs is contributed to by shared concerns on the side effects and safety of MCs, personal assessment of infrequent engagement in sex, resistance from partners, no access to MCs, and no knowledge of MCs. (United Nations Population Fund, 2022)

To summarize the global context of SRH among young people, the issue of SRH among youth has been placed high on global development agendas. (United Nations Population Fund, 2022) Currently, we are witnessing the largest youth generation in the world's history, and this

population are encountering various challenges in regard to their SRH, such as high levels of unintended pregnancies, unsafe abortions, and sexually transmitted diseases. (Starrs et al., 2018) These health consequences were caused primarily by the fact that young people, particularly young people from developing countries, have limited access to quality SRH education and services. (Hindin et al., 2013)

1.4 The context of youth SRH in China

1.4.1 Profile of China

With 1.4 billion people, China accounts for roughly 20% of the world's population. (UNFPA, 2020) As the life expectancy of the Chinese population increased from 69 years old in 1990 to 77 years old in 2018, the proportion of the population aged above 65 years old has increased substantially from 7% in 2000, to 12.6% in 2019, and may reach 26.1% by 2050. (UNFPA, 2020) Most of the Chinese population are Ethnic Han (91%), with the remaining 9% from 55 ethnic minority communities. The map of the People's Republic of China by East, Central and West regions is shown in *Figure 2*. Around 40% of the population lives in the Eastern part of China where commerce is more developed and the urbanization level is the highest; 33% of the population lives in the Central part of China where people are less affluent compared to the Eastern part of China, but there has been considerable economic progress in recent years; and 27% of the population lives in the Western part of China where the poverty level is much higher than the rest of China. (State Council, 2021) Sixty-three percent of the total population of China lives in urban and township areas, while 36% of the total population live in rural areas. (State Council, 2021)

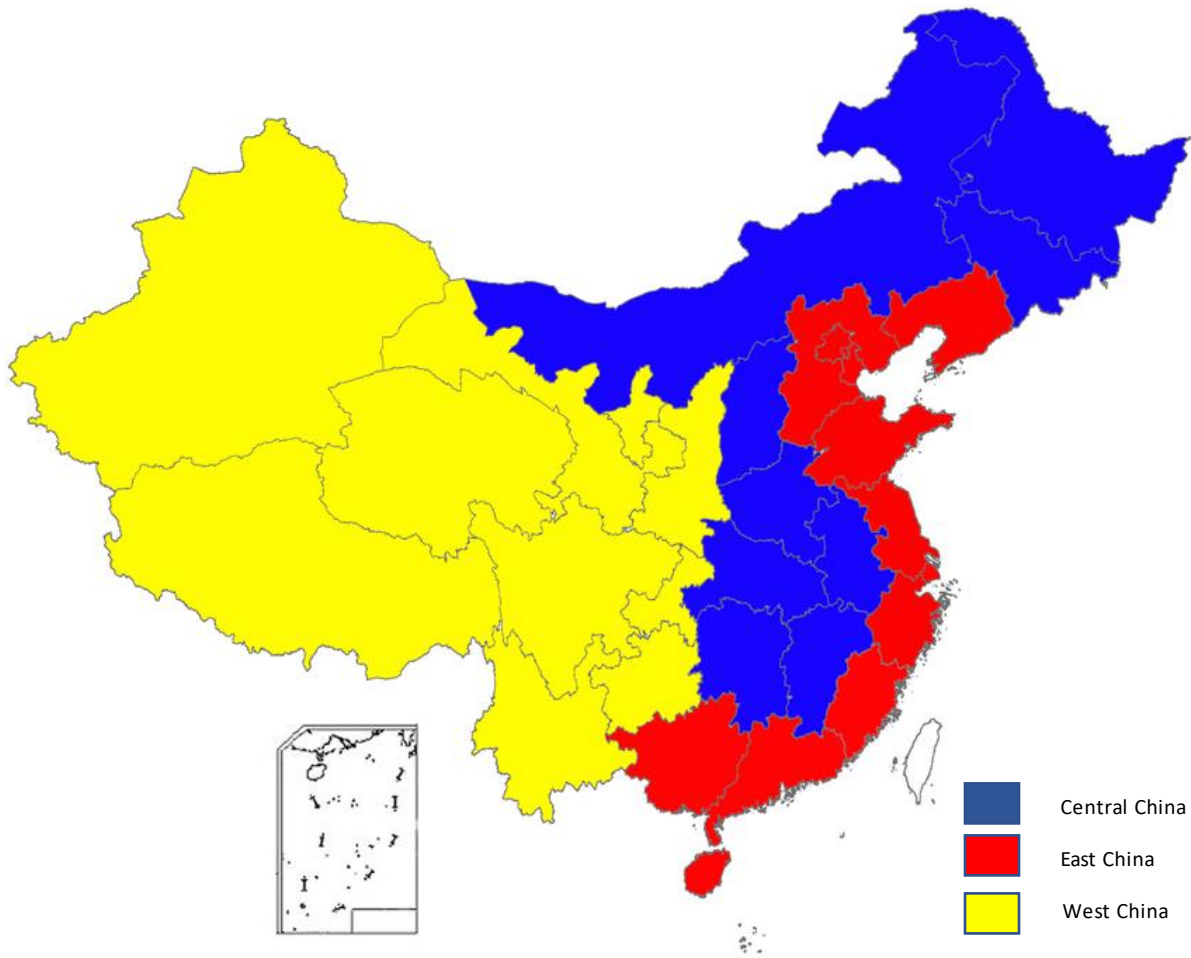


Figure 2 The Map of China by East, Central and West Parts (Du et al., 2015)

Over the past four decades since China's opening up to the world, it has made revolutionary social and economic progress. (Tan, 2018) Chinese people nowadays are living longer, receive better education, and are entitled to a much improved social security system, compared with 40 years ago. (Naughton, 2018) For example, it has lifted 800 million people out of poverty and lowered maternal mortality by 75% in the past four decades. (UNFPA, 2020) While China's total Gross Domestic Product (GDP) ranks second in the world, it is still a developing country with its Human Development Index (HDI) ranking eighty-fifth globally. (UNICEF, 2020) Most of China's social development needs arise from the aspect of promoting equity. The economic and social development gaps remain between rural and urban populations, and between people living in the Eastern part of China with those in the Western part of China. (Tan, 2018)

1.4.2 Health system in China

China's healthcare system is one of the largest healthcare systems in the world, in terms of its workforce, service capacity and healthcare expenditure. (Meng et al., 2019) In 2020, the total healthcare expenditure in China reached 7,230.6 billion Chinese RMB (880 billion GBP), of which 30.4% was from government funding, 41.8% was from Basic Medical Insurance (the social health insurance scheme for the general population), and 27.7% was from individual out-of-pocket expenses. (National Health Commission of China, 2020) The total healthcare expenditure accounted for 7.12% of the GDP. (National Health Commission of China, 2020) In 2020, there were 13.47 million health workers, of which 4.1 million were licensed physicians. (National Health Commission of China, 2020) The majority of health services (84%) were provided in public hospitals, while only a small portion (16%) of health services were provided in private institutions. (National Health Commission of China, 2020)

Over the last two decades, China has undergone several rounds of healthcare reform under the leadership of the State Council. (Li & Fu, 2017) The reforms have significantly increased the quality and accessibility of medical services at all levels, accelerated the innovative medicine approval, and increased the coverage of the Basic Medical Insurance scheme, which reached more than 95% of the Chinese population in 2011. (Fang et al., 2019; Meng et al., 2019) There are primarily three government agencies responsible for the three key pillars of China's healthcare system, namely the National Health Commission which is responsible for overall health strategy planning and health services provision, the National Health and Security Administration which is responsible for managing the Basic Medical Insurance fund, and the National Medical Product Administration which is responsible for drugs management. (Yip et al., 2019)

There are three levels in China's healthcare service provision: the tertiary level, the secondary level and the primary level. (Yip et al., 2019) The tertiary hospitals offer comprehensive medical services and are equipped with advanced diagnostic capacities. These are normally located in large cities such as Beijing, Shanghai and provincial capital cities. The secondary hospitals offer fewer medical services and are normally the general hospitals in small cities, as well as specialized hospitals, such as maternal and child health hospitals and Chinese traditional medicine hospitals.

The primary level medical institutes are normally the community clinics and town/village clinics which only offer limited and general medical services. They normally provide consultation, diagnosis and treatment on common chronic diseases, infectious diseases, family planning and reproductive health. (Huang et al., 2018)

The National Family Planning Commission, a ministry in China, had been overseeing the implementation of China's family planning policies since 1964. In 2013, the National Family Planning Commission merged with the Ministry of Health. The new ministry emerged as the National Health and Family Planning Commission (later renamed as the National Health Commission in 2018) which manages the family planning and reproductive health services for the general population, among many other portfolios. (Fang et al., 2020) After the merge, the National Health Commission has made efforts to integrate the family planning services with the maternal and child health services, through combining family planning clinics with maternal and child health clinics. (Song, 2020)

In China's healthcare system, the health expenditure for adolescents and youth was 87 billion RMB in 2014 (10.8 billion GBP), equating to 2.6% of China's total healthcare expenditure. (Zhang et al., 2020) However, the adolescent and youth population in China consist of 12.8% of the total population. (UNFPA, 2018b) Even though health expenditure for the adolescent and youth population is low (*Figure 3*), these expenditures are also primarily borne by household out-of-pocket funds, representing 57.9% of the total health expenditure for adolescents and youth. (Zhang et al., 2020)

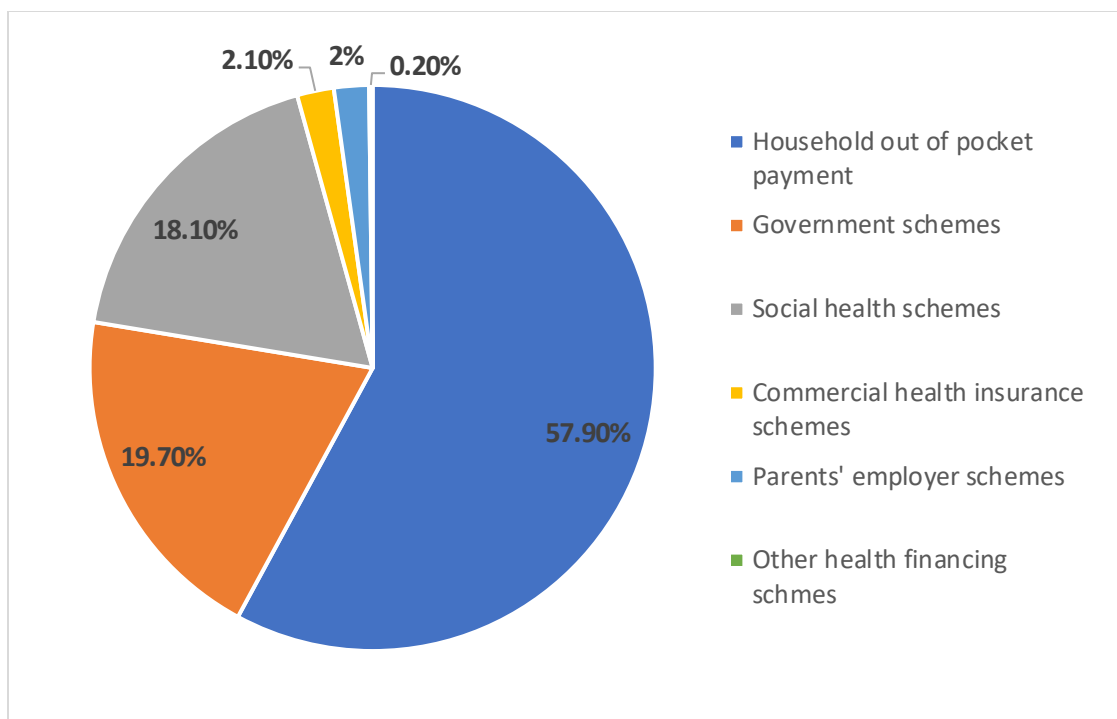


Figure 3 The composition of adolescent health expenditure financing by different sources (Zhang et al., 2020)

1.4.3 Relevant laws and policies in China on youth SRH

As mentioned previously, the ICPD Programme of Action is a global handbook for guiding the policies from various sectors at the national level to improve SRH for the whole population. According to Gu and colleagues, since the adoption of the ICPD Programme of Action, China has made remarkable progress on developing comprehensive policies and strategies in health, population, poverty alleviation, women's wellbeing, and youth wellbeing spaces to promote SRH for all, which are in line with the ICPD. (Gu et al., 2020) Key policies, strategies and laws on youth SRH will be discussed below.

'Healthy China 2030 Strategy' is the central mid-and long-term plan announced by the president Xi Jinping of China and approved by the State Council in 2016. It has set ambitious goals in 'all areas' of health development and chartered a new path for healthcare from 2016-2030. (Tan et al., 2019) For example, the Healthy China strategy includes proposals on improving hospital management, supply of essential medicines and advancing disease control and health literacy.

(Dong et al., 2020) The Healthy China 2030 Strategy emphasized health for vulnerable populations: namely adolescents, children, women and the elderly. (Qiao et al., 2021) It also mentioned the improvement of SRH for adolescents.

Provision of SRH and family planning services are included in the Healthy China 2030 Strategy *Chapter 7 on Improving Public Health Services Covering All People*. It has stated that the Government shall improve the management of family planning services; Reform the management of family planning services and establish the family related policies that focusing on maternity support; The government should also fully implement the policies to promote informed choices, and promote the knowledge on contraception, birth control, and reproductive health to married couples. The inclusion of family planning issues in the Healthy China 2030 Strategy indicated SRH and family planning are also key health issues. (Dong et al., 2020; State Council of China, 2016)

The Population and Family Planning Law of China is the guiding policy on China's Family Planning issues, including SRH services. The Law was developed and approved by the People's Congress in 1995. The Law states that the government shall decide to conduct public education on the importance of the population programme and family planning. Schools shall, in a manner suited to the characteristics of the receivers and in a planned way, conduct education in physiology and health, puberty or sexual health among students. (National People's Congress of China, 2021) The inclusion of such clauses in the Law indicated that Chinese people have the right to access SRH knowledge and information.

On marriage, in China, according to the Marriage Law, the minimum marriage age for women is 20 years old and the minimum marriage age for men is 22 years old. (X. Zhang, 2002) Furthermore, as part of the Family Planning Strategy, the Chinese Government encourages young people to marry late and give birth late. Namely, it is encouraged that men should get married after 26 years old, and women after 22 years old. The delay of getting married and giving birth will slow down the population growth as well as ensuring that couples are having children at a life stage when they could afford childrearing. (Wang, 2012) Employers, especially government employers and state-owned business employers often provide special stipends for young people who get married late

in accordance with the government recommendations.(Ogletree Jr & De Silva-de Alwis, 2003) Research shows that the current Family Planning policies and the Marriage Law aiming at controlling population growth requires substantial revisions as the number of new-borns already dropped from 24.27 million in 1990 to 9.56 million in 2022. (He, 2023; Qin et al., 2018)

The China Women's Development Plan (2021-2030) is a 10-year cross-ministerial strategy with a sharp focus on women's issues in various aspects, ranging from education to health. The plan set development goals and indicators for women's issues across the country. It has also incorporated health policies into the plan. It states that the government shall ensure women's access to high-quality family planning services; widely disseminate reproductive health knowledge; improve women's ability to choose scientific and fitful contraceptive methods in order to prevent unintended pregnancies. (State Council of China, 2020) This indicated that government agencies working in women's affairs should also place SRH high on its working agenda.

SRH services have already been included in state-level health policy documents, which demonstrates the importance that the government attaches to this issue. (Guo, Pang, Ding, et al., 2019) However, SRH for young people were not emphasized, highlighting the difficulties in responding to the evolving needs of Chinese youth. (Dong et al., 2020) For example, family planning and contraceptive services are only provided free of charge to married couples, to the exclusion of unmarried young people who have already become sexually active, according to China's Family Planning Law. (Song, 2020)

1.4.4 The youth population in China

The youth population of China reached 175 million in 2015, accounting for 12.8% of China's total population, according to the 'mini census' conducted by the National Bureau of Statistics of China. (UNFPA, 2018b) The 'mini census' also indicated that the youth population in China has fluctuated over the past decades, with an increase from 1950 to 1990, followed by a decrease from 1990 to 2000, another growth from 2000 to 2005, and now a decline since 2005 (*Figure 4*). According to the 'mini census', China has a skewed sex ratio. Among the current youth population,

the sex ratio was 112 in 2015, meaning that for every 100 females born in 2010, there were 112 males born.

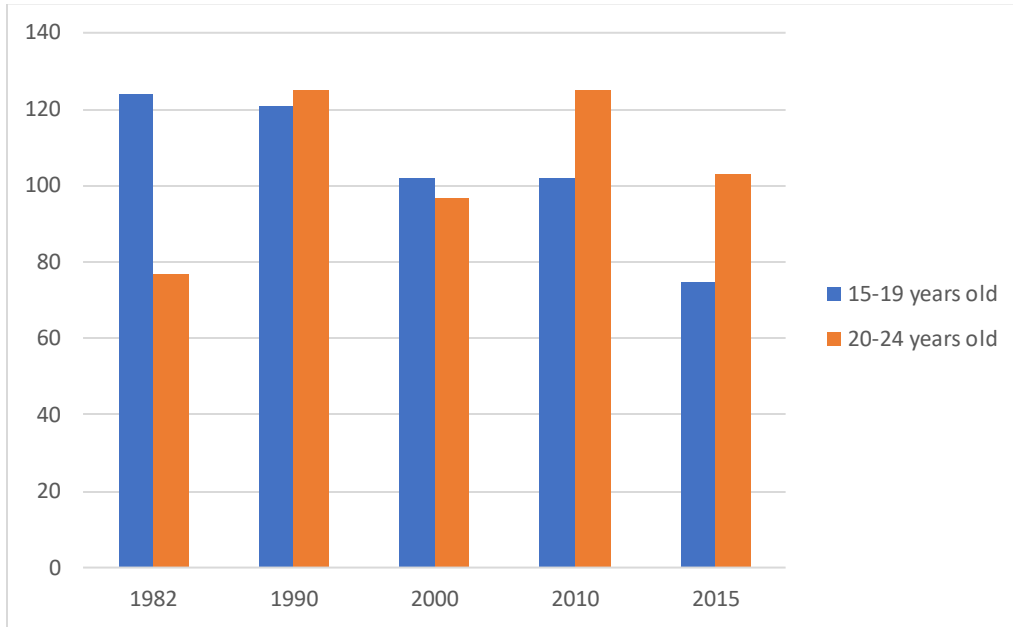


Figure 4 The size of the youth population in China from 1982-2015, Million (UNFPA, 2018b)

There is a disparity on where the youth population lives across the country. (Naughton, 2018) Proportionally, more of the youth population lives in the Eastern part of China (68.82 million), which accounts for 39.3% of the total youth population in China. There were 54.4 million (31.1%) and 52.6 million (29.7%) youths living in the Central and Western parts of China, respectively. (UNFPA, 2018b) The same report revealed that more of the youth population live in urban regions, whereby 42% of the youth population reside in rural areas and 58% reside in urban and suburban areas. In Zhejiang Province (East China), which ranks in the top three for economy size in China, 71% of young people live in urban areas, while in Tibet Autonomous Region (West China), which ranks in the lowest three for economy size, 18.9% of the youth population live in urban areas. It is important to understand the interplay of school location and rural/urban context in terms of the distribution of youth population, and this will be accounted for in my study.

The education status of the youth population in China has increased dramatically. The illiteracy rate (people who never received any formal education) has decreased from 1.2% in 2000 to 0.4% in 2015. (UNFPA, 2018b) The male urban youth population has the lowest illiteracy rate (0.17%), while the female rural youth population has the highest illiteracy rate (0.77%) (Table 2). (UNFPA, 2018b) In 2000, 5.1% of the youth population had higher education qualifications while in 2015, this figure had increased to 30.1%. (UNFPA, 2018b) In 2015, 55.5 million young people had a higher education attainment, accounting for 31% of the total Chinese youth population. Specifically, 27.11 million (48.8%) male youth and 28.39 million (51.2%) female youth had higher education qualifications, however, among all youth who had higher education qualifications only one fifth were from rural areas. (UNFPA, 2018b) Therefore, there is a clear association between rural/urban division and education in China, and this is something that needs to be considered in future studies (i.e., sampling or control factor considerations).

Education attainment	Urban		Rural		Total	
	Male	Female	Male	Female	Male	Female
Never been to school	12.0	7.6	25.8	30.2	37.8	37.8
Primary education	66.6	55.1	162.9	168.1	229.5	223.1
Junior secondary education	1189.5	899.3	1846.8	1545.2	3036.3	2444.5
Senior secondary education	1373.6	1130.8	1057.1	923.9	2430.7	2054.7
Secondary vocational education	537.3	444.5	250.0	254.6	787.3	699.1
Higher education	2174.1	2327.2	537.6	511.9	2711.7	2839.1
- Vocational college	910.4	968.6	343.1	322.1	1253.5	1290.7
- Undergraduate	1196.5	1292.1	190.2	186.7	1386.6	1478.8
- Graduate	67.2	66.5	4.3	3.1	71.5	69.6
Total	5353.2	4864.6	3880.1	3433.8	9233.3	8298.4

Table 2 Youth Population by Education Attainment, 2015, 10,000 persons (UNFPA, 2018b)

The number of migrant youth in China has increased from 43.9 million in 2000 to 63.4 million in 2015 as shown in Figure 5. (UNFPA, 2018b) There are multiple reasons for this youth migration, such as searching for employment, education, marriage, and reunion with family members.

(Naughton, 2018) In the Eastern part of China, 41% of the youth population were migrants, while in the Central part of China, only 27.1% of the youth population were migrants. (Naughton, 2018) Among all the migrant youth in China, 89% were living in urban areas and 11% were living in rural areas. (UNFPA, 2018b)

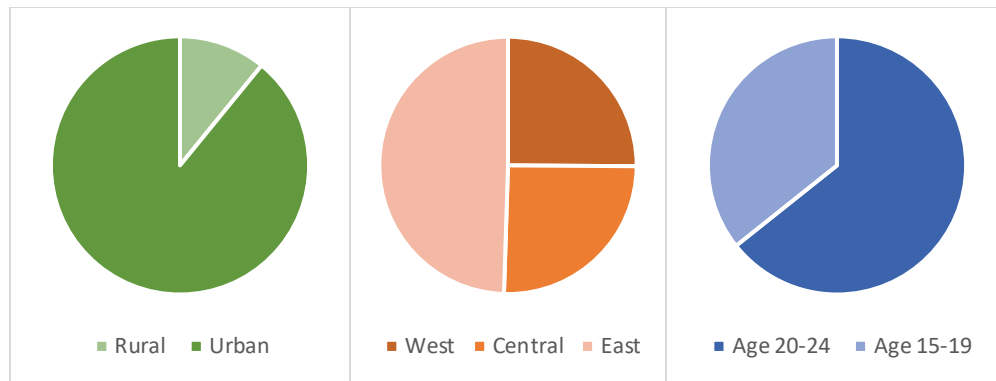


Figure 5 Percentage of migrant youth by age group, urban/ rural and by regions (UNFPA, 2018b)

1.4.5 The situation of SRH among Chinese young people in China

As with other countries, SRH plays a major role in young people's healthy development in China. Although rapid social and economic growth has improved people's way of life in the past four decades in the country, there are still major challenges facing Chinese young people's SRH and wellbeing. (Qiao et al., 2021) A large number of unmarried Chinese young people are vulnerable to unprotected sex as they are having sexual initiation earlier but getting married later in life. (Qiao et al., 2021) More than 70% of unmarried young people aged between 15-24 years old are accepting of premarital sex. (Zhang et al., 2013) According to a national survey in China in 2010, 22.4% of unmarried young people aged between 15-24 years old had engaged in premarital sex, and less than half of those who had premarital sex used contraceptives during their first sexual intercourse. (Zheng et al., 2010)

The level of contraceptive use among unmarried young people is concerning. (Zhou et al., 2013) Although the contraceptive prevalence rate, an indicator measuring the percentage of women who were using or whose partners were using at least one method of contraception among women of reproductive age, was the highest in the world (89%) among married women, the contraceptive

prevalence rate among sexually active unmarried young people in China was low, increasing over time between 17% in 1988 to 70% in 2010. (M.-y. Wang et al., 2019) Additionally, around 25% of sexually-active unmarried young people who and whose partners were using contraceptives, were relying on less effective traditional contraceptive methods, such as the rhythm and withdrawal methods (Li et al., 2013). Among university students, only 28.3% reported that they always adopted contraceptives during sexual intercourse, and for those who always used contraceptives, less than 20% used MC other than condoms. (H. Wang et al., 2015a)

The majority of MC non-use among Chinese university students is due to unmet needs for family planning, since very few university students are getting married and giving birth during their university studies, although the exact prevalence is unknown. (Coulson et al., 2023) It is very rare for university students to get married during their university time as the current environment, laws, regulations, and culture in China strongly discourage them from doing so. (H. Wang et al., 2015b) As mentioned previously regarding China's Family Planning strategies and the Marriage Law, most university students, especially college students who are normally aged between 18-22 years old, are not in the age range that could marry. (Ogletree Jr & De Silva-de Alwis, 2003; UNFPA, 2018b) Besides that, China started to legally recognise birth outside of marital ties only as recently as 2016. However, it may take more time for local culture and community beliefs to accept the change. (Song & Ji, 2020; Yu & Xie, 2021) All these factors have resulted in very few cases of intended birth by university students.

High-risk sexual activities among unmarried young people has been a key topic of discussion. (Guo, Pang, Wen, et al., 2019) The current youth generation are more independent and socially connected after adolescence compared to previous generations. However, without the correct knowledge, they are more likely to get involved in high-risk sex, such as unprotected sex, sex after substance abuse and sex with multiple partners. (Yan et al., 2010) Research shows that more than half of surveyed university students have engaged in high-risk sex. (Mou et al., 2020) Around 20% of surveyed university students in Sichuan Province reported that their most recent sex was with a casual partner. (Long et al., 2019)

Abortions among unmarried young people can result in harmful impacts on their mental and physical wellbeing, in particular when abortions are unsafe. (Kantorová, 2020) Although safe abortion has minimized medical risks, as with other medical treatments the procedure may go wrong, leading to complications. (Kapp & Lohr, 2020) Abortion, regardless of its medical safety, may have an impact on women's mental health. (Major et al., 2009) In China, the official abortion rate, measured as the percentage of women who had abortions among women of reproductive age, increased steadily from 2005 (20.2%) to 2016 (28.1%). (Fang et al., 2020) Other research showed around half of unintended pregnancies were contributed by unmarried young people in 2015. (Fang et al., 2020) Several national and regional level studies have revealed that between 10-20% of sexually-active unmarried young people have experienced unintended pregnancies and more than 90% of the unintended pregnancies resulted in abortion (He & Blum, 2013; Li et al., 2013; Ma et al., 2008; H. Wang et al., 2015a). The research conducted by Liu and colleagues shows that for surveyed adolescents under the age of 20 who had undergone abortion, 39% of them experienced repetitive abortions and the primary cause for their unintended pregnancies was not using contraceptives. (Liu et al., 2019)

Besides abortion, sexually transmitted diseases (STDs) are another serious health outcome of unprotected sex. Unmarried young people's knowledge on preventing STDs was low. (He & Blum, 2013) An internet-based survey among university students showed that although university students were aware of 'famous' STDs, such as HIV (79%) and gonorrhoea (82.8%), only 20% of students knew that STDs could be asymptomatic or present with flu-like symptoms. (Zhang et al., 2013) The same study also showed that around 3% of sexually active university students reported that they have had STDs and 8% suspected they had an STD but had not checked with a doctor.

1.4.6 SRH services for young people in China

As articulated in China's Family Planning Law, the family planning and SRH services in China are primarily targeted toward married couples, including SRH counselling and the provision of contraceptive tools. This has left unmarried sexually-active young people behind. (Liu et al., 2019) Research demonstrated that only 64% of surveyed unmarried youth knew that they could receive health and medical support from hospitals when they have questions on SRH and contraceptive

use, and only 11% had visited hospitals for SRH and contraceptive related issues. (Zheng et al., 2010) Another study showed a noticeable disparity in number of visits to hospitals for SRH and contraceptive-related services by unmarried youth from rural and urban regions. Only 2% of surveyed rural youth have visited hospitals for SRH and contraceptive-related issues compared to 14% of surveyed urban youth. (Zheng & Chen, 2011)

SRH services in hospitals in China are generally not youth friendly. (UNFPA, 2018a) Research shows that young people are not comfortable seeking SRH and contraceptive-related services from hospitals. (Zou et al., 2022b) The reasons, according to this research, include that they felt they might be judged by health workers for having premarital sex, they have concerns that their personal information might be shared with their parents and schools, and they are concerned about the affordability of such services in hospitals. In the meantime, research also shows that health workers are not willing to provide family planning and contraceptive services to unmarried young people. Only one quarter of surveyed health workers were willing to offer family planning counselling to young people above 18 years old. (Tu et al., 2004) When unmarried young people need to use contraceptives, they would normally buy condoms from hospitals. (Mou et al., 2020)

1.4.7 Sex education in China

The comprehensive sex education, which was introduced by the international community including the United Nations agencies in 2018, is an effective tool to promote modern contraceptive use and prevent unintended pregnancies. It covers eight thematic areas, which are 1) relationships, 2) value, rights, culture and sexuality, 3) understanding gender, 4) violence and staying safe, 5) skills for health and well-being, 6) the human body and development 7) sexuality and sexual behaviour, and 8) SRH, all of which are directly and indirectly connected to SRH. (Herat et al., 2018)

Although government officials, parents and stakeholders are concerned about STDs, unintended pregnancies and HIV/AIDS among young people, sex education is not systematically provided in schools. In some places where sex education is available on a small scale, it is abstinence oriented.

(Fang et al., 2020) There is no evidence that abstinence-oriented sex education is effective to improve young people's health outcomes. (Herat et al., 2018)

Some small-scale research shows that among surveyed university students, around 60% indicated they have received some sort of sex education in school. (Chen et al., 2008; Dongxian Zhang et al., 2010) But most (86%) of the school-based sex education was offered as a one-time lecture, which is far from sufficient. (Liu & Liu, 2019) The *National Youth Reproductive Health Survey* shows that the primary source that young people receive SRH-related information from is the internet, followed by books and magazines, peers, teachers and parents. (Zheng & Chen, 2011) However, in the current context where information is flowing unlimitedly online, young people also receive misleading and wrong SRH information from unvalidated sources which would harm their well-being. A report shows that 70% of university students mentioned that they 'gained knowledge' through watching pornographies. (UNFPA, 2018a)

The quality of the implementation of sex education is another issue. A national survey on the implementation of sex education in middle schools showed that only 38.5% of students reported that they have learned SRH and HIV knowledge in the sex education they have attended. (UNFPA et al., 2018) Of those who learned knowledge on SRH and HIV, less than one third of students reported that contraception and abortion topics were discussed, ranking at the bottom of 12 SRH and HIV key topics listed in the survey. When contraception and abortion were discussed, more than 60% of the students reported feeling some level of discomfort. In the same study, 57.6% of the teachers who taught sex education in schools reported that they never received any training, and 84.3% teachers felt they do not have sufficient knowledge to teach sex education in schools. (UNFPA et al., 2018)

To summarize, China has one of the largest youth populations globally, and its social and economic development in the past four decades has brought significant improvement to the health, education and social welfare of the youth generation. The large and tiered health system in China offers quality health services to the general population; however, disparities of the health services remain between rural and urban regions, and between age groups. Family planning policies and laws are high on the government agenda, but the provision of SRH services and education to unmarried

young people are not included in those policies, leaving behind a large youth population. Research shows that the Chinese youth population lacks quality SRH services, including contraceptive counselling and school-based sex education to provide them with SRH knowledge. Consequently, they are still vulnerable to SRH risks, such as STDs, unintended pregnancies, and unsafe abortions.

1.5 Literature review on the use of MCs among young people in China

This chapter presents a comprehensive literature review on the status of contraceptive use and its social and economic determinants in China. The literature review section in the background chapter is composed of four sections. The first section introduces the methodology used in the literature review process, including eligibility criteria, key words used, the database used, data collection results, the evaluation of the articles and the description of the selection process. The second section presents the search results and general information from the selected articles. The third section presents key findings from literature on the socioeconomic, demographic and behavioural factors that influence the use of MCs in China. Based on previous sections, the last section discusses the remaining gaps in the knowledge based on the analyses of the results and proposes novel areas to deepen the understanding on socioeconomic, demographic and behavioural factors associated with the use of MCs in China. This chapter provides a knowledge base for the study.

1.5.1 Introduction of the search strategy

Procedure overview. The literature review was informed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. (Moher et al., 2009) Briefly, this review was comprised of five stages: 1) identifying the research question: what are the factors influencing the use of MCs among university students in China? 2) identifying suitable studies; 3) study selection; 4) consolidating the data; 5) summarizing and reporting the results.

Search strategy. Searches were conducted in PubMed. The search terms encompass two key terms: 1) use of MCs. 2) China. I further searched manuscripts published in Chinese in the China National Knowledge Infrastructure (CNKI) database using the two key terms (use of MCs and China) (in

Chinese). The search was also conducted on certain institutes' websites, such as the website of the National Health Commission of China, the Peking University Health Science Center, the World Health Organizations, and the United Nations Population Fund China Office. The search was individually designed and adapted for each database. Our search strategy was informed by a previous review on similar topic. (Paulen et al., 2010)

The search term in PubMed for contraceptive use was:

("contracept*" [All Fields] OR ("levonorgestrel" [MeSH Terms] OR "levonorgestrel" [All Fields] OR "mirena" [All Fields]) OR ("Norpregnanes" [MeSH Terms] OR ("Contraceptive Agents" [MeSH Terms] OR "Contraceptive Agents" [Pharmacological Action]) OR "Contraceptive Devices" [MeSH Terms] OR "Contraception" [MeSH Terms]) OR (("progest*" [All Fields] OR ("Progestins" [MeSH Terms] OR "Progesterone Congeners" [MeSH Terms] OR "Progesterone" [MeSH Terms])) AND ("contracept*" [All Fields] OR ("Norpregnanes" [MeSH Terms] OR ("Contraceptive Agents" [MeSH Terms] OR "Contraceptive Agents" [Pharmacological Action]) OR "Contraceptive Devices" [MeSH Terms] OR "Contraception" [MeSH Terms]))) OR (("n n dimethyl 4 anisidine" [Supplementary Concept] OR "n n dimethyl 4 anisidine" [All Fields] OR "dmpa" [All Fields] OR ("medroxyprogesterone acetate" [MeSH Terms] OR ("medroxyprogesterone" [All Fields] AND "acetate" [All Fields]) OR "medroxyprogesterone acetate" [All Fields] OR "depoprovera" [All Fields]) OR ("norethindrone enanthate" [Supplementary Concept] OR "norethindrone enanthate" [All Fields] OR "norethisterone enanthate" [All Fields]) OR "Medroxyprogesterone 17-Acetate" [All Fields]) AND ("contracept*" [All Fields] OR ("Norpregnanes" [MeSH Terms] OR ("Contraceptive Agents" [MeSH Terms] OR "Contraceptive Agents" [Pharmacological Action]) OR "Contraceptive Devices" [MeSH Terms] OR "Contraception" [MeSH Terms]))) OR ("iud" [All Fields] OR "Intrauterine Devices" [MeSH Terms]) OR ("contraception, postcoital" [MeSH Terms] OR ("Contraception" [All Fields] AND "postcoital" [All Fields]) OR "postcoital contraception" [All Fields] OR ("emergency" [All Fields] AND "Contraception" [All Fields]) OR "emergency contraception" [All Fields] OR ("contraception, postcoital" [MeSH Terms] OR "Contraceptive Agents" [MeSH Terms])) OR ("nuvaring" [Supplementary Concept] OR "nuvaring" [All Fields] OR "nuvaring" [All Fields] OR "estradiol" [MeSH Terms] OR "estradiol" [All Fields] OR "estradiols" [All Fields] OR "estradiol s" [All Fields] OR "estradiole" [All Fields] OR "ethinyl

oestradiol"[All Fields] OR "ethinyl estradiol"[MeSH Terms] OR ("ethinyl"[All Fields] AND "estradiol"[All Fields]) OR "ethinyl estradiol"[All Fields] OR "etonogestrel"[Supplementary Concept] OR "etonogestrel"[All Fields] OR "oestradiol"[All Fields] OR "oestradiols"[All Fields] OR ("Desogestrel"[MeSH Terms] OR "contraceptive agents, female"[MeSH Terms] OR "contraceptive devices, female"[MeSH Terms])) OR (((("hormon"[All Fields] OR "hormonal"[All Fields] OR "hormonally"[All Fields] OR "hormonals"[All Fields] OR "hormone s"[All Fields] OR "hormones"[Pharmacological Action] OR "hormones"[MeSH Terms] OR "hormones"[All Fields] OR "hormone"[All Fields] OR "hormons"[All Fields]) AND ("patch"[All Fields] OR "patch s"[All Fields] OR "patche"[All Fields] OR "patches"[All Fields] OR "patching"[All Fields] OR "patches"[All Fields])) OR ("ortho evra"[Supplementary Concept] OR "ortho evra"[All Fields] OR "ortho evra"[All Fields]) OR ("Norgestrel"[MeSH Terms] OR "contraceptive devices, female"[MeSH Terms] OR "contraceptive agents, female"[MeSH Terms]))))

The search term was then linked with "China"[MeSH Terms] as well as “adult, young [MeSH Terms]” by AND, and limited the search to English or Chinese language, with year range from 2005 to 2022.

Study selection. Inclusion criteria were: (1) peer-reviewed academic publications and reports from credible sources including from the national government and registered international organizations; (2) published in English or Chinese; (3) broadly on the topic of factors influencing use of MCs in China among youth; (4) quantitative, qualitative, or mixed methods studies were also be included. As SRH is a culturally sensitive issue, and in view that China has undergone significant social and economic changes in the past four decades, in order to keep relevance, the search only focused on publications after January 2005. (Zhou et al., 2021) (5) The study population is university/college students in China.

Exclusion criteria were: (1) studies that were published as conference abstracts, webpages, systematic reviews, or any other media except those mentioned in the inclusion criteria; (2) studies not in English or Chinese; (3) studies that did not study the use of MCs; (4) study region did not include China; (5) studies investigating populations other than university/college students; and (6) studies published prior to 2005.

The selection of articles was conducted in two steps. First, titles and abstracts were screened for topic relevance and study design. Those articles with titles or abstracts that did not fit into the inclusion criteria were excluded. Second, full texts of the remaining studies were screened to check for eligibility. The study selection process was conducted in *Endnote 20*.

In the third round, the full articles were reviewed and appraised critically for their quality using the adopted Critical Appraisal Skills Programme (CASP). The articles were reviewed in nine aspects as shown in *Table 3*. Every rating of ‘good’ transmitted to a score of 4 points and every rating of ‘very poor’ transmitted to a score of 1 point. In total, articles are scored out of 36 points in the CASP, with articles that are rated under 18 points deemed to be unqualified articles. (Hawker et al., 2002)

Adopted Critical Appraisal Skills Programme			
Areas of assessments	Deception and key questions	Ratings	
1	Abstract and title	Did they provide a clear description of the study?	Good Fair Poor Very poor
2	Introduction and aim	Was there a good background and clear statement of the aim of the research?	Good Fair Poor Very poor
3	Methodology	Is the research design scientific and clearly described?	Good Fair Poor Very poor
4	Sampling strategy	Is the sampling strategy scientific and clearly described?	Good Fair Poor

			Very poor
5	Analyses	Is the data analyses sufficient, scientific and clear?	Good Fair Poor Very poor
6	Ethics and limitations	Are ethical issues discussed thoroughly? Is the ethical approval granted to the study? Are limitations discussed thoroughly?	Good Fair Poor Very poor
7	Results	Are the findings clearly stated? Are the findings based on the analyses in the study?	Good Fair Poor Very poor
8	Generalizability	Are the findings from this study generalizable to the wider population?	Good Fair Poor Very poor
9	Novel contribution	Is this study contributing from a new and unique perspective?	Good Fair Poor Very poor

Table 3 Adopted Critical Appraisal Skills Programme (Hawker et al., 2002)

1.5.2 Search results

As shown in the following PRISMA flowchart (*Figure 6*), using the search strategy, at the first step 428 articles were found from PubMed and 167 articles were found from CNIK. Additionally, there were 18 reports found from websites. Among all 667 articles found in the first step, there were 13 duplications.

In the second step, titles and abstracts were reviewed for 654 articles and 573 of them were excluded according to the exclusion criteria mentioned above.

In the third step, full articles were reviewed for the remaining 81 articles and 62 of them were excluded. The reasons for excluding those studies include: 1) The study populations were not university and college students – for example, they were workplace-based young workers and young people out of the university student age range, 2) studies that primarily investigated SRH outcomes other than contraceptive use, such as HIV, abortion and other topics, 3) studies that did not research the determinants of MC use, 4) studies that were conducted before 2005, 5) studies that were published as conference abstracts, webpages, systematic reviews, or any other media.

In the last step, 19 articles were critically appraised using the adopted CASP tool.

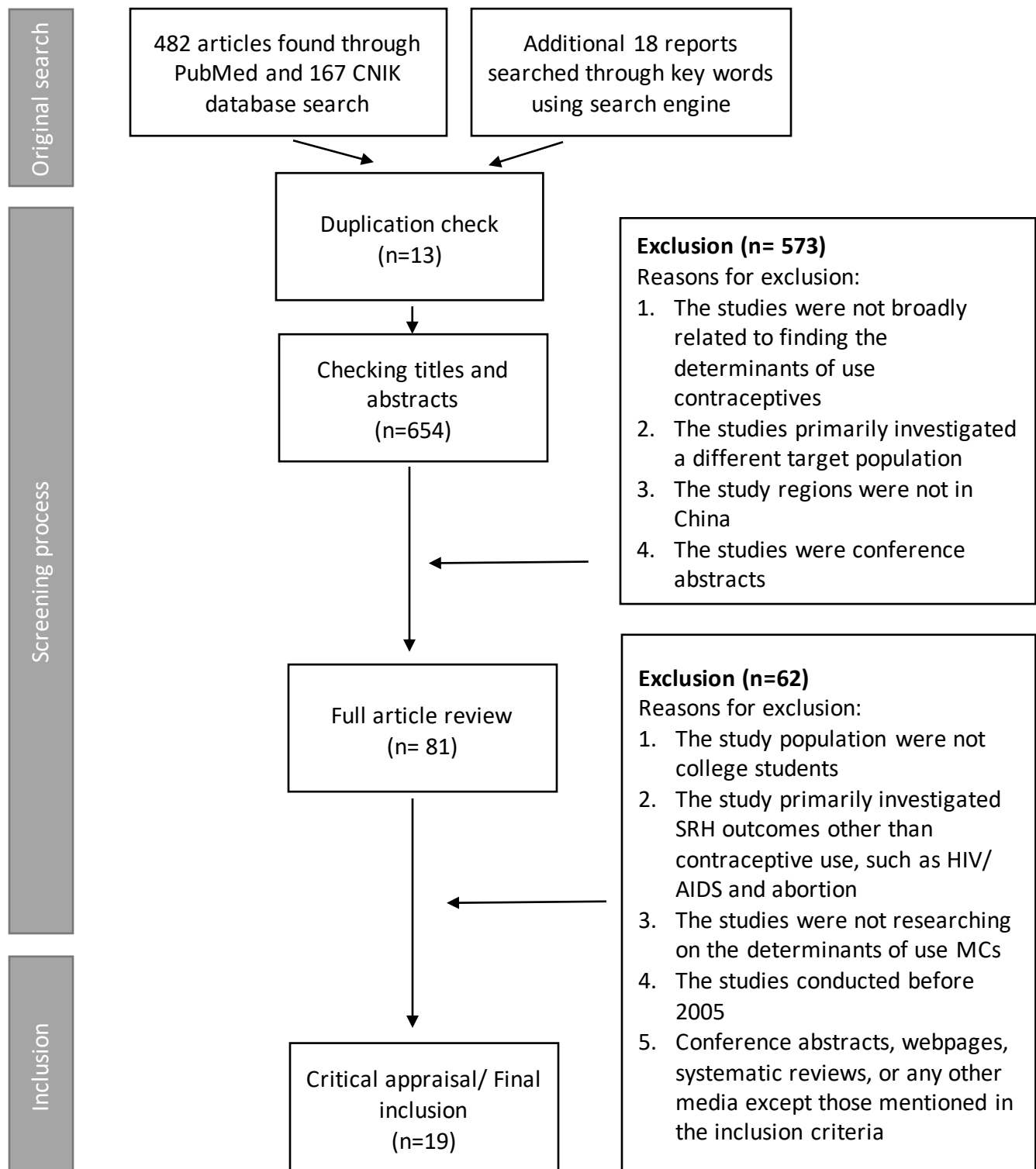


Figure 6 Flow chart of the comprehensive literature review process

The nineteen articles on the determinants of MC use among university students were finally included and reviewed. The study population, its aims and objectives, the study outcomes variable and the study key findings are listed in Table 4.

1.5.3 Findings from the literature review

References	Sample population	Aim	Outcome variable	Key findings
(Zou et al., 2013)	4,769 unmarried undergraduate students in Wuhan	To compare the risky sexual health indicators, such as unintended pregnancies and sexually transmitted disease, of fine art undergraduate students with students from other disciplines	Whether or not they used condoms in the first sex; The frequency of using condoms	- Fine art students were more likely to not use a condom during their first sex, compared to general undergraduate students - Fine art students who had more sexual partners had a higher likelihood of not using contraceptives regularly
(Zhou et al., 2013)	13,544 university student participants from 327 classes of 49 universities across 7 cities in East, West, North, South and Central China.	To assess the incidence of unintended pregnancy and identify the determinants associated with unintended pregnancy among unmarried graduate students in China	The incidence of having unintended pregnancies	- The risk factors for unintended pregnancies among graduate school students were: having unstable sexual partners, younger age at first sexual intercourse, lacking knowledge of contraceptive use, and lacking understanding of the harm from abortions.

(Zeng et al., 2015)	158 undergraduate students majoring in medicine and nursing	To investigate the association between sexuality behaviour, and contraceptive practices among medical school students in China	The frequency of contraceptive use in the past 12 months; Contraceptive use in MRS	<ul style="list-style-type: none"> - Lacking knowledge on preventing unintended pregnancies was associated with contraceptive non-use - Holding a permissive attitude towards sex, compared to holding a conservative attitude, was associated with higher frequency of contraceptive use among Chinese medical and nursing students
(Xiao et al., 2010)	490 sexually-active university students in Hunan Province, China	To understand the determinants of condom use among Chinese university students, using the multiple domain model (MDM)	Whether students used a condom during the last sexual occasion; the frequency of using a condom in the last 12 months	<ul style="list-style-type: none"> - Students who had prepared to use condoms, including having bought condoms and had communicated the plan of using condoms, were more likely to use condoms in sexual intercourse - Students in a longer dating relationship were less likely to use condoms during sexual intercourse - Students who frequently drunk alcohol were less likely to use condoms during sexual intercourse - Having a positive attitude towards sex is associated with higher odds of using condoms during sexual intercourse
(Wong et al., 2021)	781 female university students in Hong Kong, China	To evaluate the impact of an interactive web-based sexual health literacy programme on consistent	Self-reported consistency of condom use in the 3 months and 6	<ul style="list-style-type: none"> - As compared to a single webpage programme on safe sex, an interactive web-based sexual health literacy programme did not increase the odds of consistent

			use of condoms, via a multicentred randomized controlled trial	months' timeframe respectively		condom use among female university students in Hong Kong, China.
(Wang et al., 2020)	17,517 university students across China		To find the social, economic and behavioural determinants of contraceptive use among university students	The use of contraceptives in MRS	-	<p>Among male participants, high monthly expenditure, light alcohol consumption and good sexual knowledge were associated with higher likelihood of contraceptive use</p> <p>Among both male and female participants, tobacco use was associated with lower likelihood of contraceptive use</p> <p>Among female participants, coming from suburban areas, having higher parental education levels, moderate alcohol consumption and good sexual knowledge were associated with higher likelihood of contraceptive use</p>
(Wang et al., 2015)	35,383 sexually-active female university students across China in 49 universities in 7 cities		To study the status of contraceptive knowledge and attitudes, and explore the linkages between contraceptive practice and unintended pregnancies	The frequency of contraceptive use; the use of contraceptives in MRS	-	<p>The primary reason for contraceptive non-use was the lack of preparations for contraceptives</p> <p>Correct contraceptive knowledge was associated with the use of contraceptives</p> <p>Having experienced unintended pregnancy is associated with contraceptive non-use</p>

			among female university students in China			
(Tang et al., 2013)	4,769 unmarried undergraduate students in Wuhan City of Hubei Province	To understand the prevalence of using condoms and its determinants among female undergraduate students in Wuhan, China	The consistency of using contraceptives in the past 12 months; the use of contraceptives in the first sexual intercourse	-	Female who used condoms in the first sexual intercourse were four times more likely to use condoms consistently in future sexual intercourse	-
						-
						-
						-
(Sun et al., 2013)	19,123 college students across China	To assess the sexual behaviour of college students in China and explore the determinants	Condom use and intention behaviour	-	According to Path analyses, exposure to pornographic information, level of living expenditure, and experience of sexuality education were factors associated with condom use	

			associated with risky sex behaviours	measured by a 5 point Likert scale	<ul style="list-style-type: none"> - Condom use was more common among college students who had better HIV knowledge, self-efficacy and attitude toward using condoms. - Having an intention to use condoms is the key predictor for using condoms during sexual intercourse.
(Sudhinaraset et al., 2012)	959 youth aged 15-24 years old in both rural and urban Shanghai	To explore the association between migration and condom use among youth population in Shanghai	Condom use during first sex; consistent condom use	<ul style="list-style-type: none"> - Rural to urban migrant youth were less likely to use condoms during first sexual intercourse and consistently use condoms with their first sexual partner compared with non-migrant urban youth - Non-migrant female rural youth were less likely to use condoms in their first sexual intercourse and consistently use condoms with their first sexual partner compared to migrant female youth and non-migrant urban female youth 	
(F. Ruan et al., 2019)	2,054 sexually-experienced undergraduate students across China	To assess the factors associated with consistent condom use among undergraduate students in China	The consistent use of condoms	<ul style="list-style-type: none"> - Having higher self-efficacy, having more knowledge on HIV, having later initiation of sexual activities, and having a stable sexual partner are associated with higher likelihood of consistent condom use 	
(Mou et al., 2020)	1,247 female college students across China	To assess the informational, motivational, behavioural	Regular condom use in the past 12 months	<ul style="list-style-type: none"> - Close adherence to the stereotypical female gender role was associated with lower likelihood of condom use among female college students 	

		and cultural factors associated with safe sex among female college students in China		
(Long et al., 2012)	870 sexually active male college students in 7 colleges in Wuhan City of China	To identify factors associated with consistent condom use among male college students in China	The use of condoms in MRS	<ul style="list-style-type: none"> - Male students with a steady partner, who had positive contraceptive responsibility and who had received SRH knowledge online, by radio and/or TV were more likely to use condoms during MRS - Offering free condoms and reproductive counselling services at the college health centre was associated with higher odds of condom use during MRS by male college students
(Long et al., 2019)	826 college students in 3 colleges in Sichuan Province, China	To explore college students' perception on the responsibility of condom use in China	Use of condoms in MRS	<ul style="list-style-type: none"> - Both female and male college students who believed that contraception is a shared responsibility were more likely to use condoms during MRS.
(Long et al., 2016)	915 female college students in 5 colleges in Wuhan City of China	To explore the association between college health services and contraceptive use among female students in China	Frequency of contraceptive use in the past 6 months; consistency of contraceptive use	<ul style="list-style-type: none"> - Contraceptive non-use was associated with younger age - Female students who had searched SRH knowledge online and who attended family planning and reproductive health counselling at the health centre in school were more likely to use contraceptives.

				in the past 6 months	- Female students from schools where reproductive health counselling was available were more likely to use contraceptives
(Z. Liu et al., 2021)	12,280 sexually active university students across China	To identify key determinants of contraceptive use among sexually active university students in China	The frequency of contraceptive use in the past 12 months		<ul style="list-style-type: none"> - Negotiation on contraceptive use and having free access to contraceptives were associated with decreased frequency of contraceptive use between couples - Convenient access to contraceptives and having higher SRH knowledge were associated with increased frequency of contraceptive use - Female students who did not plan to get married but plan to live with their partner for a long time tended to have lower frequency of contraceptive use - Single children tended to have higher frequencies of contraceptive use compared with students born in families with multiple children
(J. Li et al., 2015)	863 sexually active female university students in Wuhan, China	To assess the association between early sex initiation and unsafe sexual activities	Use of condoms in first sexual intercourse; consistency of using condoms in the past 12 months		<ul style="list-style-type: none"> - Having early sexual initiation was associated with higher likelihood of not using condoms in first sexual intercourse, not using condoms consistently in the past year, and not using condoms correctly

(Li et al., 2017)	17,966 university students, among them 3,639 sexually experienced for sub-analyses on contraceptive use across China	To identify the association between school-based sexuality education, SRH knowledge and sexual behaviour among university students in China	Use of contraceptives during MRS	-	Increased SRH knowledge was associated with lower odds of not using contraceptives during MRS among male university students. No such significant association was observed among female university students.
(Guo et al., 2014)	402 college students in 3 colleges in Zhengzhou City, Chengdu City and Jinan City of China	To identify the predictors for the intention of using condoms among college students in China, using the Theory of Planned Behaviour	The consistency of condom use; the use of condoms in first sexual intercourse; having the intention to use condoms in the past 12 months	-	<p>The attitudes towards condom use were a predictive factor for the intention of using condoms. Namely, students who hold positive attitudes toward condoms were more likely to use condoms.</p> <p>Subjective norms were a predictive factor for the intention of using condoms. Namely, students who thought their partner wanted them to use condoms were more likely to use condoms.</p> <p>Perceived behaviour control was a predictive factor for the intention of using condoms. Namely, students who thought condoms were easy to use were more likely to use condoms.</p>

Table 4 Summary of the literature review

1.5.4 Discussion

Outline of the literature

Nineteen articles were finally included in the literature review. All of them investigated the determinants of contraceptive use among college and university students in China. Among them, fifteen articles were published between the years 2010-2020, and four articles were published after the year 2020. Nine articles covered a study population of less than 1,000 college and university students (number of participants range: 159-959), and ten articles covered a study population of more than 1,000 college and university students (number of participants range: 1,247- 35,383). Ten studies only focused on universities in one region/ city (Hong Kong, Wuhan, Shanghai and Sichuan), while the other nine studies focused on universities and colleges in multiple localities across the country. The largest study population was 35,383 in the article published by Wang and colleagues. (Wang et al., 2015) However, none of the studies claimed national representativeness. Eight studies only investigated sub-populations of university and college students, such as art students, unmarried university students, sexually active university students, or male/female students individually. (Long et al., 2012; Mou et al., 2020; Fang Ruan et al., 2019; Tang et al., 2013; Wang et al., 2015; Wong et al., 2021; Yan et al., 2010; Zou et al., 2013) The most commonly investigated outcome variables were the consistency of contraceptive use (N=8), followed by whether contraceptives were used in the most recent sex (N=7), the frequency of contraceptive use in the past 12 months (N=7), and the use of contraceptives in the first sex (N=5). Some studies also measured participants' intention to use contraceptives (N=3).

Key determinants of contraceptive use among Chinese university students

The studies provided insightful knowledge on potential determinants for the use of contraceptives among university and college students in China. The key determinants for contraceptive use from the literature review, based on *Table 4*, are illustrated below.

Demographic factors: In a large sample study of 17,517 university students from across China, the gender stratified analyses showed that among male university students, high monthly

expenditure was positively associated with contraceptive use, while for female university students, suburban residency and higher parental education level were positively associated with contraceptive use. (Wang et al., 2020) The study highlighted that higher monthly living expenditure may mean the purchasing of contraceptives was more affordable, and higher parental education may be associated with more sufficient communication between children and parents on SRH-related discussions. The study also called for future research to explain why suburban residency was associated with higher contraceptive use. Sudhinaraset and colleagues brought migration into the picture, analysing the correlation between migration and condom use. (Sudhinaraset et al., 2012) They found that male rural-to-urban migrants had the lowest odds of consistent condom use, compared with male youth in China with or without migration experience, while female rural youth with no migration experience had the lowest odds of consistent condom use, compared with female youth in China with or without migration experience. It is important to note that this study, however, included youth aged 15-24 years old generally regardless of their education and employment status. The author's team did not disclose the proportion of youth in-school versus out-of-school hence the findings may not be directly translatable to my study.

Concerns over the effectiveness and safety of the contraceptives: In a large national survey of 35,383 female students from 49 universities conducted in 2007-2008, Wang and colleagues found that prior considerations about contraceptives in relation to their safety and effectiveness were associated with use of contraceptives. (Wang et al., 2015) For example, the study showed that around 62% of the participants had the misbelief that oral contraceptive pills may cause infertility, thus they rejected using them, even if recommended by doctors.

Lack of preparations for contraceptives before sex: A national study conducted by Wang and colleagues found that the most common reason for contraceptive non-use reported by female university students was lack of preparation of contraceptives before sex. (Wang et al., 2015) Research with 490 sexually-active university students in Hunan Province also showed that preparatory behaviour is a strong predictor of condom use. (Xiao et al., 2010) This study revealed that students who bought condoms before sex and communicated the contraception plan with their sexual partner were more likely to use condoms during sexual intercourse. This study also showed that students who reported difficulties accessing condoms were more likely to not use condoms. The association between greater perceived difficulty in accessing condoms and lower odds of contraceptive use was confirmed by Guo and colleagues. (Guo et al., 2014)

Lack of correct SRH knowledge: Another commonly identified reason for contraceptive non-use by female university students in China was the lack of correct SRH knowledge. (Wang et al., 2015) In this study, Wang and colleagues surveyed female university students, finding that those who had incorrect SRH knowledge (believing that occasional sex would not lead to pregnancy) tended not to use contraceptives during MRS. The findings that insufficient SRH knowledge is a predictor for contraceptive non-use, and increased SRH knowledge is associated with higher likelihood of contraceptive use were also reinforced by other studies. (Z. Liu et al., 2021; Wang et al., 2020; Wang et al., 2015)

In the literature review, I found that SRH knowledge is the determinant for MC use behaviour most commonly reported by studies (N=7), and there was a positive correlation between SRH knowledge increase and higher odds of MC use. (Z. Liu et al., 2021; Mou et al., 2020; Sun et al., 2013; Wang et al., 2020; Wang et al., 2015; Zeng et al., 2015; Zhou et al., 2013) Furthermore, several global level literature reviews have put SRH knowledge high on the list of individual level determinants for MC use among young people. (Bamufleh et al., 2017; Mekonnen et al., 2022; Yakubu & Salisu, 2018) The Knowledge, Awareness and Practice (KAP) Theory also indicated a positive correlation between knowledge and practice. (Ude-Akpeh & Ezeoke, 2017) The KAP Theory suggests that a change in knowledge leads to increased levels of awareness and further to behavioural change.

In my literature review, some studies have further explored effective approaches to increase young people's SRH knowledge to promote MC use behaviour. Sun and colleagues found that receiving SRH misinformation (e.g., via pornography) was associated with having lower correct SRH knowledge and thus a lower likelihood of condom use. (Sun et al., 2013) Therefore, it is important to ensure the correctness of SRH information that young people are receiving. Zou and colleagues have found that college students who majored in fine arts in China tend to have lower levels of SRH knowledge. (Zou et al., 2013) Therefore, it is recommended to allocate more SRH information resources to students who major in fine arts in China and improve their SRH knowledge. While confirming the positive association between SRH knowledge and contraceptive use, Li and colleagues have also found that receiving sex education in school was associated with higher SRH knowledge, suggesting school-based sex education is an effective tool to increase students' SRH knowledge. (Li et al., 2017)

Lack of SRH and health services: According to a study covering 870 sexually active male college students, only 15% of students reported that SRH services and counselling are available in their student health clinics. (Long et al., 2012) However, the research team found that students who had accessed convenient SRH services in universities, including reproductive health counselling at the student health clinics, were more likely to use condoms. (Long et al., 2012) A further study of female university students in four colleges in Wuhan City of China found supportive evidence to this effect. (Long et al., 2016) It showed that female university students who were in universities where reproductive health services and counselling are available had higher odds of condom use. One possible explanation is that services and counselling provided in university clinics are more likely to be tailored to the issues concerning students, such as sexually transmitted diseases and unintended pregnancy, with university-based health services also tending to be more available within student timetables. Therefore, university based SRH services may actively contribute to university students' contraceptive uptake. Using the ensembled machine learning method, Liu and colleagues have further investigated the impact of SRH and health services on university students' contraceptive use. (Z. Liu et al., 2021) They found that although convenient access to contraceptives was associated with higher frequency of contraceptive use, receiving free contraceptives provided by the family planning department was negatively associated with the frequency of contraceptive use. They suggested that accessing contraceptives in a safe and private environment is critical for contraceptive uptake, while the free distribution of contraceptives by the family planning department in China are mostly in a semi-public space.

Interfering sexual pleasure: The study by Wang and colleagues also indicated that interference with sexual pleasure, especially by condoms, was one of the top three most common reasons, reported by 28% of surveyed female university students, for contraceptive non-use. (Wang et al., 2015)

Relationship related factors: A study conducted in a major university in Hunan Province with 490 sexually active university students indicated that students who were in a steady and long-term relationship were less likely to use condoms frequently. (Xiao et al., 2010) One possible explanation was that long time sexual partners may have less concerns over the transmission of STDs, and hence are less careful with the consistent use of condoms during sexual intercourse. They might also plan to get married soon, hence are not using contraceptives as a means of starting a family. However, findings from a large national study (N=11,936)

contradicts the finding from Xiao and colleagues. (Zhou et al., 2013) This study showed that having no steady sexual partner was a risk factor for contraceptive non-use, which is also supported by the findings from other studies covering male university students, female university students and fine arts students. (Long et al., 2012; Tang et al., 2013; Zou et al., 2013) They reinforced that an increased number of sexual partners is a risk factor for having unprotected sex. Another study further argued that there was a gender difference in this association: male students who were with a steady sexual partner were more likely to use condoms, than male students with casual sexual partners; in contrast, female students who were with a steady sexual partner were less likely to use condoms, than female university students with casual sexual partners. (Long et al., 2019) However, Long and colleagues did not give sufficient explanations on the gender disparity of the contraceptive use in casual vs. steady sexual relationships.

First sexual experience related factors: In relation to the first sexual intercourse, Zhou et al found that younger age at first sexual intercourse was a risk factor for contraceptive non-use. (Zhou et al., 2013) Tang and colleagues found that the use of condoms in the first sexual intercourse is a strong predictor for consistent condom use in the past 12 months. (Tang et al., 2013) Another study covering 4,769 university students in Wuhan, China focused on the impact of early sexual initiation on subsequent sexual behaviours. (J. Li et al., 2015) It revealed that early initiation of first sex was a strong predictor of high-risk sexual behaviours in their subsequent sexual intercourse (e.g., contraceptive non-use, using contraceptives less frequently, and having multiple and concurrent sexual partners) as well as having harmful consequences (e.g., unintended pregnancies and sexually transmitted diseases). Li and colleagues suggested the main reasons were that the first sexual behaviour normally set the pattern for their subsequent sexual behaviours, and that young people who had sex early normally have similar psychological traits, such as being rebellious, impulsive, excited and adventurous which may also influence their lifelong sexual behaviours. These studies suggested that in order to promote contraceptive use among young people, it is important to intervene at an earlier age, such as providing SRH education among senior students in primary school.

Contraceptive responsibility related factors: In a study covering 826 sexually-active college students in Sichuan Province of China, researchers measured contraceptive responsibility by asking ‘who was responsible for taking care of contraception during the most recent sexual intercourse? (male/ female/ both)’. (Long et al., 2019) Results showed that contraceptive use

behaviour was positively associated with a shared sense of responsibility for contraception use (i.e., those who answered ‘both’) as compared to an individual responsibility of contraceptive use. However, authors from the study mentioned the limitation of using only one question to define contraceptive responsibility and asked future studies to improve the measurement of contraceptive responsibilities.

Substance use: In a study with 490 sexually-active university students, Xiao and colleagues found that alcohol abuse (alcohol consumption three times or more per week) is associated with lower odds of condom use. (Xiao et al., 2010) The explanation was that alcohol abuse may lead to reckless behaviours, including high-risk sexual behaviours. However, in a large sample research covering 17,517 university students from around 130 colleges across China found that, in contrary, light consumption of alcohol was associated positively with contraceptive use. The possible explanation was that light alcohol consumption may not have an impact on an individual’s ability to make prudent decisions, including their sexual behaviour decisions. (Wang et al., 2020) Future investigations are required to analyse the association between alcohol consumption and contraceptive use. In addition to alcohol use, in the same study, tobacco use was also found to be associated with lower frequency of contraceptive use, for both male and female students.

Attitude towards sex: A study covering 154 university students in Guilin Medical University of Guangxi Province in South China found that students who held positive attitudes toward sex, such as viewing premarital sex as acceptable, were more likely to be sexually active and use contraceptives more frequently. (Zeng et al., 2015) This finding is supported by Long and colleagues, who found that sexually-active male university students who have positive attitudes toward sex had higher odds of using condoms in their most recent sexual intercourse. (Long et al., 2012) Applying the Theory of the Planned Behaviour, Guo and colleagues confirmed the association between a positive attitude towards sex and the intention to use condoms. (Guo et al., 2014) They also found an association between positive subject norms (perception of the sexual partner’s desire to use condoms) and the intention to use condoms.

To summarize, the literature has found the following determinants for contraceptive use among Chinese university students: monthly expenditure, rural residency, migration history, concerns over contraceptive effectiveness and safety, preparations for contraceptives before sex, SRH knowledge, availability of university based SRH services, interference of sexual pleasure by

contraceptives, early initiation of sex, contraceptive use in the first sex, sense of contraceptive responsibility, tobacco use and attitudes towards sex. However, literature has also suggested conflicting associations for certain determinants of contraceptive use among Chinese university students. These determinants are alcohol consumption and relationship situation (i.e., having a steady sexual partner vs. having casual sexual partners).

Limitations of the literature

Though determinants for the use of contraceptives among college and university students have been identified in previous literature, many articles only investigated a limited number of determinants. For example, the study conducted by Long and colleagues in 2019 only focused on an individual's perception of contraceptive responsibility for contraceptive use, (Long et al., 2019) while the study conducted by Long and colleagues in 2016 only focused on the determinants of health services for contraceptive use, (Long et al., 2016) and the study conducted by Li and colleagues only focused on sex education as a determinant of contraceptive use. (Li et al., 2017) These studies mentioned above only adjusted for simple demographic variables, such as age and gender in the regression analyses, hence, it is likely that key confounding variables, such as relationship status and substance use were not controlled for. Also, with many of the studies focusing on a subgroup of the population, it makes it difficult to compare different studies and collate the research, because what may be true for female students may be completely different for males and vice versa.

For the outcome variables, all of the included articles either focused on one modern contraceptive method or contraceptives in general, which included traditional contraceptive methods that are proven to be less effective compared to MCs. (Hubacher & Trussell, 2015) There are, in total, nine articles that focused on condom use, while there was no study that focused on the use of MCs more broadly. Additionally, many researchers used 'the frequency of using contraceptives in the past six months' as the outcome variable. It may be challenging for university students to estimate the frequency of contraceptive use in a long time frame given that their sex life may not be as regular as with married couples. (Zheng et al., 2010) Overall, the studies were mostly conducted more than five years ago, and many have focused on sub-populations of Chinese university students, such as female students, students who majored in arts and students from a certain geographic location. All these limitations pose a question about their relevance to current issues and in a broader scale in China.

Conclusions

Though limitations still exist, the literature review has provided a solid ground on which my study could build on. The abovementioned literature findings are considered when conducting my study on ‘investigating socioeconomic, demographic and behavioural factors for the non-use of MCs among sexually active university students in China’.

Based on the literature review, my study will further investigate if the determinants identified in the literature review would have similar influence on Chinese university students’ MC use. It is important to reemphasize that most of the literature focused on general contraceptive use, broader than my research focus on MC use. Using data from 2020 National University Students Survey on Sexual and Reproductive Health (NUSS-SRH), a national large-scale database focused on SRH wellbeing of Chinese university students across the country, I will further verify the association between alcohol consumption and relationship status with MC use among university students. These two factors were found in different studies to have conflicting associations with contraceptive use among Chinese university students. Besides that, my study will also generate novel results by investigating new determinants from NUSS-SRH, such as violence experience and education status, in addition to the determinants found in the literature review.

In addition, as informed by the literature review that increased SRH knowledge is the most identified factor for MC use among university students in China, my study will take a step forward to investigate the possible factors associated with higher levels of SRH knowledge, in order to improve SRH knowledge among Chinese university students.

1.6 Aims and Objectives

Building on the context, the literature review and the gaps of the knowledge, the aims and objectives of the study were developed.

Research question: what are the social, economic, demographic and behavioural determinants of modern contraceptive non-use among Chinese university students?

Aim: to find social, economic, demographic and behavioural determinants of not using modern contraceptives in the most recent sexual intercourse among Chinese university students.

Research objectives:

- To present the characteristics of the sexually-active university students who participated in the NUSS-SRH (NUSS- SRH will be introduced in *section 2.1*).
- To demonstrate the characteristics of study participants who used and did not use modern contraceptives during the most recent sexual intercourse.
- To explore the crude associations between demographic, social, behavioural and economic factors with not using modern contraceptives during the most recent sex.
- To study the adjusted associations between demographic, social, behavioural and economic factors with not using modern contraceptives during the most recent sex.
- To investigate the associations between demographic, social, behavioural and economic factors with not using modern contraceptives during the most recent sex, after stratification by gender.
- To explore the differential effects of demographic, social, behavioural and economic factors on SRH knowledge.

Chapter II: Research methods

2.1 Background

This chapter outlines the methods for the study to find socioeconomic, demographic and behavioural determinants for not using modern contraceptives among Chinese university students.

In this quantitative research, I have investigated possible determinants of not using MC during MRS. The study used the dataset from the NUSS- SRH which was conducted by Tsinghua University with the support of the China Family Planning Association. NUSS-SRH included 100 questions from various aspects broadly related to SRH. The survey is composed of cross-sectional data from 54,580 university student respondents from across China, and this study focuses on the 11,223 respondents who were sexually active.

I was the Programme Officer at the United Nations Population Fund China Office, a specialized SRH agency, when this survey was designed and implemented. In the meantime, I was also the co-lead of an eight-person technical committee for NUSS-SRH and heavily participated in the design of the research instruments and the sampling strategy, guiding the data collection processes and conducting quality assurance activities. The primary investigator of the NUSS-SRH, Professor Tang Kun from Tsinghua University, was my work-based supervisor.

Several articles have been published using the NUSS-SRH dataset (Jin et al., 2021; Z. Liu et al., 2021; Ren et al., 2022; Zou et al., 2022a). However, this study answers unique research questions. I have independently conceptualized and designed the study as well as the analyses, under the guidance from my supervisors.

To answer the research question and identify the potential socioeconomic, demographic and behavioural determinants of not using MC during MRS, extensive data analyses have been conducted, with several logistic regression models, including progressive logistic regression models and stratified logistic regression models.

In this chapter, I will introduce the theoretical frameworks, the research paradigm and the research setting. I will elaborate on the process of designing and implementing the study and conducting the data analyses. I will discuss the sampling methods and the overview of the samples. I will also describe the key variables, including the outcome variables and independent variables in the analyses. Following that, I will present the analytical methods, including descriptive statistics, hypothesis tests, regression models, and sensitivity analyses. Lastly, in this chapter, I will discuss the relevant ethical issues.

2.2 Research Paradigm

2.2.1 Positivist Paradigm

This study involves quantitative research which employed a positivist paradigm. Traditionally, there are two paradigms in research, which are the positivist and the constructionist. (Clark, 1998; Dzurec, 1989) Qualitative research is based on constructivism, focusing on how people interpret reality in different contexts (relativist ontology). Constructivism believes that reality is based on people's perceptions on the research objects and there is more than one methodology to generate knowledge (subjectivist epistemology). (Mackenzie, 2011) Quantitative research is, however, based on the positivist paradigm focusing on collecting evidence and making observations to defend the scientific findings. Positivism believes that there is only one methodology to generate knowledge, which is through objective findings (objectivist epistemology). (Clark, 1998)

The positivism philosophy can be dated back to the Enlightenment period of the 17th and 18th Century, conceptualized by Descartes and Locke. (Park et al., 2020) Positivism depends on the hypothetic-deductive methodology to verify an established hypothesis, where a relationship can be found between independent variables and dependent variables. (Park et al., 2020) Positivists believe that the truth can be revealed and discovered through analysing the quantitative data available. The scientific methods in the positivist paradigm provide answers that are technical, neutral and can be generalised in different contexts. (Clark, 1998)

One advantage of the positivist approach is that you can cover a wide range of topics in a short time period and among a large population. (Mackenzie, 2011) However, positivism has various

disadvantages. For example, positivists believe that the truth can be found as long as the researcher is observing objectively. However, it is always difficult to disregard observers' emotions and be completely objective. (Laudan, 1996). Some scholars believe that positivism, since it is based on measurement and calculation, lacks flexibility. (Park et al., 2020) Hence, factors that are not measured, or not being able to be measured are normally disregarded in the analyses and interpretation. This study employed the positivist approach because with the quantitative analysis of the large dataset from Chinese university students across the country, the study findings will be more objective and generalisable, which could effectively support government's policy making.

2.2.2 *Social Ecological Model*

Several frameworks were used in the study to support the identification of the determinants and their associations with not using MC during MRS among university students in China. One of the models is the Social Ecological Model (SEM), which was developed in 1970s to understand the dynamic relationships among various personal and environmental factors. (Bronfenbrenner, 1992) Using SEM, the independent variables could be categorized into several levels, namely the individual level, the inter-personal level, the community level, the organizational level, and the policy level. (Bronfenbrenner, 1992; Christensen, 2016; McLeroy et al., 1988)

SEM for human development, initially conceptualized by Urie Bronfenbrenner in the 1980s, recognizes that behaviour affects and is affected by multiple levels of influence as well as the interactions of factors at the individual, social and environmental levels. SEM theorises that individual behaviour shapes and is shaped by the social environment, and that all health issues are complex and interlinked. Hence, addressing health problems requires systematic and multi-level approaches. (Bronfenbrenner, 1992; Christensen, 2016; Grzywacz & Fuqua, 2000)

As shown in *Figure 7*, the first level of the SEM includes the individual level factors. Some of these factors are demographic indicators, like age, education level, location, and ethnicity. It also includes factors related to an individual's health situation, disease history and their knowledge, attitudes and behaviour. (Bronfenbrenner, 1992; Wold & Mittelmark, 2018) It is important to note that among the individual level factors, some are modifiable factors such as

education-related variables and health-related variables, while some are not modifiable factors, such as age and ethnicity. (Grandner, 2019) In order to develop corresponding intervention strategies, the Knowledge, Attitude and Practice (KAP) Theory was used to identify key individual level modifiable factors that determine the non- use of MCs among university students. (Ude-Akpeh & Ezeoke, 2017)

The inter-personal level factors are also known as relationship level factors. This level concerns the individual's interaction with their close social circles, including with peers, friends, family members and their partners. Some of these factors include bonding with families, peer influence and communication with partners. (Bronfenbrenner, 1992)

At the community level, it investigates the impact of a certain setting, such as schools, workplaces, and neighbourhoods on an individual's health and wellbeing. Some of the factors include whether certain services are provided in the community, whether certain courses are offered in schools and the engagement of individuals in the activities organized in the community. (Bronfenbrenner, 1992)

At the organizational level, it explores organizations and institutions in which individuals have social relationships and their impact on people's health. Some of the organizational level factors include institutional policies and provisions. In many recent publications, organizational level factors tend to be integrated into policy level and community level factors for easier analysis and interpretation. (Bronfenbrenner, 1992; Golden & Earp, 2012)

The policy level factors are also known as societal factors. It looks at broad societal level elements that contribute to create a climate which has a direct and indirect impact on people's health and wellbeing. These factors may include social and cultural norms, political systems, and relevant government policies. (Bronfenbrenner, 1992; Golden & Earp, 2012)

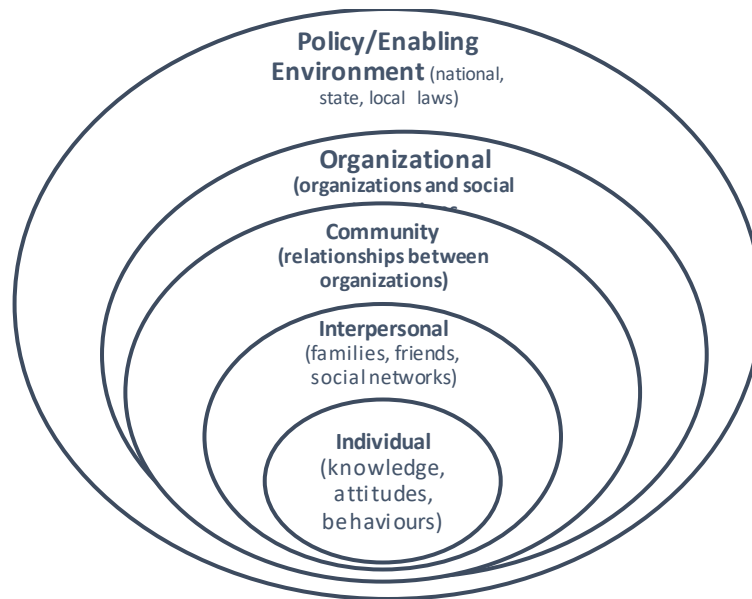


Figure 7 The social ecological model (Bronfenbrenner, 1992)

Many public health institutes, such as the Centre for Disease Control, the National Health Institute, the World Health Organization, and the United Nations have listed SEM as a key tool to investigate health challenges and design health promotion programmes. (Christensen, 2016; Golden & Earp, 2012) Health professionals, researchers and community workers have frequently used SEM to investigate determinants in relation to numerous public health problems, such as HIV/AIDS, sexual violence, and alcohol abuse, of which, many are related to SRH. (Coleman & Alonso, 2016; Espelage & Swearer, 2009; Grzywacz & Fuqua, 2000) Research has also been conducted applying SEM to understand the factors that influence people's use of family planning methods in India, Kenya and other countries. (Schölmerich & Kawachi, 2016) For example, in Kenya, Coleman and Alonso (2016) suggested that knowledge of family planning at the individual level, family income at the family level, and the patriarchy community and family planning services at the environment level were all key contributors to the high adolescent fertility rate within the country. Following analyses using the SEM model, Coleman and Alonso further developed recommendations for national policies and intervention programmes at the community level to change adolescents' behaviours. (Coleman & Alonso, 2016) Many other intervention programmes were also developed using the SEM model. For example, using SEM, the HEART project developed comprehensive interventions to address cardiovascular disease in the US-Mexico border region. (Balcazar et al., 2012) The set of interventions included education and knowledge sharing at the individual level, encouraging family members as champions at the inter-personal level, conducting community-based health promotion activities and cash transfer activities at the community level, and design and

implementation of a policy advocacy agenda to change the environment at the policy/societal level. (Balcazar et al., 2012)

In addition, many researchers have modified the SEM model for different contexts. (Rowe et al., 2013; Wold & Mittelmark, 2018) For example, in the study by Baral and colleagues to study health promotion programmes related to HIV and AIDS prevention, they have merged the community-level factors and the inter-personal level factors, viewing that both refer to factors measuring the environment close to individuals. (Baral et al., 2013) In the same study, policy environment and organization-level factors were merged as factors at these levels refer to broad influences.

In summary, SEM helps to break down the inter-linked determinants in various aspects and at different levels. In this study, with the SEM model, I would be able to divide the determinants of MCs non- use at the individual, inter-personal and environment levels. Additionally, the SEM model offers a clear pathway to develop responding strategies to address the determinants, for instance developing strategies addressing factors at the individual level, inter-personal level and environment level, in order to increase MC use during MRS among young people. (Grzywacz & Fuqua, 2000; McLeroy et al., 1988)

2.2.3 *Knowledge, Attitudes and Practice (KAP) Theory and Survey*

As stated in the literature review in the first chapter, SRH knowledge is one of the strongest determinants of MC use behaviour. This correlation can be supported and explained by the KAP Theory. (Ude-Akpeh & Ezeoke, 2017)

The KAP Theory, as shown in *Figure 7*, is another model used in the analyses. *Knowledge* refers to the capacity to acquire, process and comprehend information and skills; *Attitudes* refer to the inclination and self-consciousness to act in certain ways in certain situations; and *Practice* refers to the application of rules and knowledge into action. (Badran, 1995) The KAP theory divides the process of behaviour change into three steps, namely it starts with acquiring correct knowledge, which would generate attitudes and beliefs. The attitudes and beliefs will then change people's behaviour. (Rokeach, 1972) For example, in smoking cessation behaviour change, in order to stop people from smoking, according to the KAP Theory, the smokers need

to have the correct knowledge on the harm of smoking and the scientific ways to stop smoking, once that knowledge is established, it will enable smokers to have the awareness that they need to stop smoking in order to improve their health condition. When such awareness is in place, they would then take actions to stop smoking behaviour.

The theory suggests that increasing people's knowledge is the start to ultimately change people's behaviour. (Ude-Akpeh & Ezeoke, 2017) This theory is widely recognized by leading health organizations, such as the World Health Organization, the Centre for Disease Control and the National Health Institute and it is popularly used to design health intervention programmes on disease prevention, control and rehabilitation. (Badran, 1995)



Figure 8 The Knowledge, Attitudes and Practice Theory

The KAP survey, which was built based on the KAP Theory, was introduced in the late 1950s initially for family planning and population research. (Ude-Akpeh & Ezeoke, 2017) The KAP survey is widely used in the public health arena to identify knowledge gaps, cultural beliefs, and behavioural patterns and understand how they interlink with each other. (Jacobsen, 2020) For example, it has been used in promoting smoking prevention, diabetes management, and HIV prevention. (Delucchi et al., 2009; Raj & Angadi, 2010; Schopper et al., 1993) It has also been used previously in promoting the prevention of unsafe sex among young people. (Bongaarts, 1991; Silassie et al., 2016) The KAP survey is often administered in structured questionnaires, employing either or both quantitative and qualitative research methods. (Jacobsen, 2020)

In this study, the KAP model was integrated into the questionnaire design. Respondents were asked knowledge-level and attitude-level questions, such as whether they know how to prevent unintended pregnancies and there was a standard set of questions to measure respondents' knowledge level on SRH. Respondents were also asked behaviour-level questions, such as whether they have used MC during sexual intercourse.

2.3 Research setting

Several surveys have been conducted to investigate the health and wellbeing of young people in China in the past ten years, such as the *Survey on SRH of young people in Beijing, Shanghai and Guangzhou* conducted by the Shanghai Academy of Social Science and the Adolescent and Children Research Institute of China Youth Research Centre, the *Survey on the Marriage and Relationship of Chinese Young People* conducted by the All-China Youth Federation and the *Youth and Adolescent Health Survey* conducted by China Academy of Social Science. (Fang et al., 2020; Wu et al., 2013; Xu et al., 2020) However, none of these surveys could offer the level of insight sufficient to answer the research questions. In some surveys, the sample size was very limited, and mainly targeted young people from a few major cities or in some sub populations. (Fang et al., 2020) In other surveys, sex and SRH relevant topics were not included or only included with one or two questions. (Fang et al., 2020; Xu et al., 2020)

Hence, under such background, the NUSS-SRH was conducted by the Vanke School of Public Health at Tsinghua University (PI: Dr. Tang Kun, Associate Professor, Tsinghua University). The survey aimed to understand the situation of SRH among university and vocational school students in China and the results could offer a wide range of evidence to support national-level policy making and the designing of intervention programmes to prevent unintended pregnancies, HIV, and sexually transmitted diseases. NUSS-SRH received financial support from the China Family Planning Association and technical guidance from the national level technical committee, of which I was the co-lead. The survey took place from December 2019 to February 2020 across the country.

This study on finding the socioeconomic, demographic, and behavioural factors for the use of MC during MRS is based on the NUSS-SRH dataset. Several articles have been published using the NUSS-SRH dataset, although most of them have focused on topics other than contraceptive use. The published articles investigated Chinese young adults' attitudes towards sex, the role of social economic status and interpersonal relationships with sexual orientation, the association between mental health and risky health behaviours, and the association between early sexual initiation and suicide attempts. (Jin et al., 2021; C. Liu et al., 2021; Ren et al., 2022; Zou et al., 2022a)

2.4 Survey development process

The questions on the survey covered topics broadly related to SRH, such as the experience of violence, mental health, risky health behaviours as well as questions that are very important but culturally sensitive which were not normally included in other surveys, such as the experience of watching pornography, online dating experience, and number of sexual partners. (Zheng et al., 2010)

The questionnaire was developed by the principal investigator's team together with the technical committee members. For the questionnaire development process, in order to make the results internationally comparable, references had been made to the *Demographic Health Survey*, *UNFPA's Key Adolescent Health Indicators*, *WHO's Adolescent Health Framework*, *Social Sexology Research in Chinese Society* conducted by Renmin University, and *Adolescent Sexuality Education Research* conducted by Shanghai Institute for Planned Parenthood Research. (Fang et al., 2020) The questionnaire was initially drafted by Tsinghua University and the technical committee organized three rounds of reviews of the questionnaire to look into 1) its compatibility with other internationally used instruments 2) its logic, flow and cultural sensitivity and 3) the length and operationalization related issues.

After the technical committee and the PI's team completed the final draft, the survey was piloted in two universities in Beijing. These two universities were conveniently selected because of the connections with the PI's team. These two universities were then excluded in the actual survey. Thirty university students, both bachelor students and postgraduate students, from each school completed the final paper-based draft questionnaire. While filling in the questionnaire, students were asked to leave any comments beside a question if they found it illogical and/or difficult to understand. Ten interviews were conducted with the students to hear the overall reflections of filling in the questionnaire. Their responses were collected and reviewed. Revisions were subsequently conducted based on the feedback. The revisions were focused on the iteration of questions and the flow of questions. The finalised questionnaire was uploaded online for electronic administration.

As a key member of the technical committee, I have participated extensively in the survey development process, in particular reviewing the questionnaire, working with other technical committee experts to improve the questionnaire to ensure its international comparativeness, developing the pilot plan, overseeing the quality control of the pilot, and helping contact universities and colleges to undertake the pilot survey.

2.5 Sample

2.5.1 Sampling methods

A multi-stage sampling approach was followed, as shown in *Figure 9*. At the first stage, the country was stratified into three regions (East China, Central China, and West China) according to the guidelines from the National Bureau of Statistics. At the second stage, in each region, all higher education institutes, listed by the Ministry of Education, were divided into universities and vocational colleges. At the third stage, universities were divided into four groups: National First Rank Universities, National Second Rank Universities, Normal Bachelor Level Colleges, and Privately Owned Bachelor Level Colleges according to the Ministry of Education's categorization. The vocational colleges were divided into three groups: Exemplary Vocational College, Normal Vocational College, and Privately Owned Vocational College, according to the Ministry of Education's categorization. In total, 241 higher education institutes were selected from across China in 31 provinces.

At the educational institute level, convenience sampling was used to reach out to student respondents. I am aware of the bias created by convenience sampling, particularly around the concerns about the generalizability of the findings as convenience sampling can introduce selection bias, which affects the extent to which the analysis results can be inferred for population-level policies. (Mugo, 2002) Normally, convenience sampling would not be appropriate for use with inferential statistics, as the convenience sample is a non-probability sample, while the assumption of inferential statistics is that the samples should be random. (Emerson, 2015) In the case of this study, it is likely that the respondents who were recruited are more comfortable with answering the SRH questions, open to SRH topics, and have more knowledge of SRH. It is also likely that participants from certain backgrounds, such as from universities in the East part of China where the Internet is more accessible, are

disproportionately highly represented given the easier access to connect with them. (UNFPA, 2020) Therefore, the bias may make the results from the study difficult to be generalized for the whole population. (Emerson, 2015)

However, conducting a nationally-representative survey in China, considering China has more than 1.4 billion population and 30 million enrolled university students in 2021, is challenging in practice, as well as being complex and costly. (Xu et al., 2020) According to the review described previously, the most recent survey on young people' SRH, except NUSS-SRH, was implemented in 2009. This was more than 10 years before NUSS-SRH, during which period substantial changes have already taken place in young people's way of life. (Qiao et al., 2021; Zheng & Chen, 2011) With all these factors considered, using the NUSS-SRH dataset to answer my research question is the best choice under the current restrained circumstances.

Additionally, I have compared some of the key indicators from the NUSS-SRH database and other youth SRH research in China and found that they are consistent. For example, the NUSS-SRH database shows that 22.5% of the surveyed university students are sexually active and a previous national survey shows that 22.4% of the surveyed young people aged between 15-24 years old have engaged in premarital sex. (Zheng et al., 2010) Additionally, the NUSS-SRH database shows that there are around 21% of sexually-active university students who have used a traditional contraceptive method during MRS, while another study in China shows that around 25% of sexually active unmarried young people who and whose partners were using contraceptives, were relying on traditional contraceptive methods. (Li et al., 2013) Although, some indicators in the NUSS-SRH database and in previous studies are comparable, it is, again, not appropriate to generalize the findings from this study, which used a convenient sampling scheme, to the nationwide youth population.

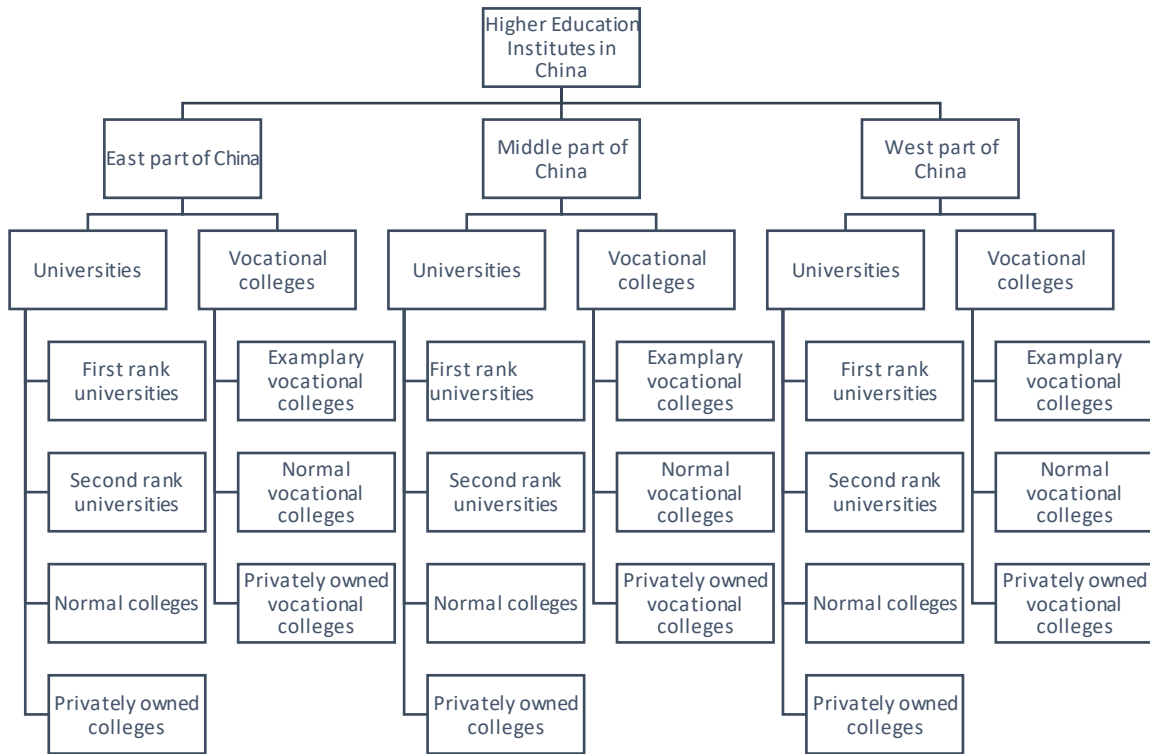


Figure 9 The multi-stage sampling process of the NUSS-SRH Survey

At the education institute level, all the selected institutes were contacted by the China Family Planning Association, which is the largest national level organization with branches across the country. (CFPA, 2022) Student volunteers were recruited by the China Family Planning Association and Tsinghua University. The web-based invitations for responding to the questionnaire were disseminated through social media, WeChat message, campus intranet and relevant student clubs. Student volunteers managed the process and served as the coordinator between respondents and the PI's team. The volunteers were responsible for answering the questions related to the survey, including questions on the consent form. Before data collection commenced, the student volunteers received a half day online training by the PI's team on the purpose and the implementation process of NUSS-SRH.

2.5.2 Missing data

All those who were included in the analyses had fully completed the survey. The logic of the questionnaire excluded the possibility of unfilled questions. The questionnaire was administered electronically, and participants were interviewed to answer each question using the e-system. Participants had to answer all the questions to complete the questionnaire, and, as such, there are no observations without values in the dataset. In the consent letter,

participants were informed of the scope of the study and that they could withdraw anytime during the data collection process if they felt uncomfortable. For all withdrawals, their partially filled questionnaire data were deleted. Therefore, it is not possible to analyse the partially filled questionnaire data for participants who withdrew midway through the questionnaire. In this respect, any biases associated with withdrawal cannot be understood.

In the analyses, within the NUSS-SRH study population, I excluded participants who indicated that they are studying in universities and colleges outside mainland China (N= 537), because the outcome of my study was to contribute to relevant policy and intervention development by the Chinese government in mainland China.

In addition, in the sexually active university students sub dataset, observations with illogical values were dropped in the analyses. During the cleaning of the raw dataset, I found that there were some illogical answers recorded in the dataset. For example, the following participants were excluded because they provide such answers. There were in total 1,057 observations (8.6% of total sexually active university students sub dataset) excluded in the analyses.

- 1) Participants who reported that they had an extraordinarily large number of girlfriends/ boyfriends and/or sexual partners, for example more than 100 (N= 319). There were 0.1% sexually active university student participants who reported that they had more than 100 previous sexual partners. For the number of romantic relationships, the Tsinghua University data cleaning team excluded participants who reported having more than 100 romantic relationships due to the unlikelihood of a young adult being able to maintain more than 100 romantic relationships. I conducted sensitivity analyses to test the cut-off point from 100 to 30 and 50 in the fully adjusted models in my analysis.
- 2) Participants whose reported age at having first sexual intercourse and/or whose age at having adolescent first romantic feelings is older than their current age (N= 298).
- 3) Participants who reported the age of having the first sexual intercourse and the age of having the first adolescent romantic feelings are abnormally young (10 years old or younger). The reason why the cut-off age is 10 years old is that the UN's definition of adolescents is people who are aged between 10-19 years old (N= 271). (UNFPA, 2018a)
- 4) Participants reported that they were studying postgraduate programmes in vocational schools. This is because vocational schools in China were not qualified to offer postgraduate programmes (N= 169).

The number of participants in the NUSS- SRH dataset, in the sexually active participants sub-dataset, in the exclusion dataset, and in the final dataset are shown in *Table 5*.

	Number of participants
Total participants in the NUSS-SRH survey	54,580
Participants studying outside mainland China	537
Sexually active participants from mainland China	12,280
Participants who had low quality data	1,057
Final sample size included in the analyses	11,223

Table 5 Demonstration of the sample size in various dataset

2.6 Study variables

The outcome variable is whether the respondent has used modern contraceptives during the most recent sex. It is a binary variable: 0 -means the respondents have used modern contraceptive methods (e.g., contraceptive pills, emergency pills, contraceptive injections, male condoms, female condoms, contraceptive implant, intrauterine device, and spermicide) during the most recent sexual intercourse, and 1 -means the respondents have not used modern contraceptive methods (e.g., no use of any contraceptive methods or only used traditional methods, such as the calendar method or withdrawal) during the most recent sexual intercourse.

There were in total 52 exposure variables identified from the questionnaire that are relevant to the study based on the literature review. All the relevant variables, including their original descriptions in the questionnaire and how they have been re-coded in the statistical analyses are presented in *Table 6*. In line with the questionnaire, the exposure variables are presented as demographic level factors, family level factors, health, and wellbeing factors, SRH knowledge related factors, and sexual behaviour related factors.

Name of the variable	Values of the variable	Corresponding question in the survey	Variable creation from the questionnaire
Demographic factors			
Gender	Male and female	What is your gender? (Male/ Female)	No modifications
The location of the school	Eastern China, Central China, and Western China	What is the name of your school?	With the name of the school, its location was tracked. The categorical variable was created based on the location of the school using the definitions from national guidelines.
The education level currently in	Vocational education level, bachelor's education level, master's education level and doctoral education level	What is the education level you are currently in? (Vocational education level, bachelor's education level, master's education level and doctoral education level)	No modifications
Age of the respondents	Under 18 years old, 18-22 years old, 22-26 years old and 26 years old above	When were you born? (Year, Month, Date)	The age was calculated using the date of birth and the date of survey completion
Home of origin	Eastern China, Central China and Western China	Before coming to school, where did you primarily live?	Categorical variable was created based on the place of living filled by

			respondents, using the definitions from national guidelines
Home region of origin	Urban region, rural region and township region	Before coming to school, you primarily lived in (urban region/ rural region/ township region)?	No modifications
Having a religion	Yes and no	Do you have a religion? (No/ Buddhism/ Taoism/ Christianity/ Muslim/ Catholic/ Other religions)	The new variable was developed to only identify if the respondent is religious (whether has a religion)
Being an ethnic minority	Yes and no	Are you an ethnic minority? (Yes/ No)	No modifications
Monthly living cost	Under 1,000 RMB, between 1,000-2,000 RMB, between 2,000-3,000 RMB, between 3,000-4,000 RMB and above 4,000 RMB	In the past 12 months, what was your average monthly living expenditure? (Excluding tuition, dormitory and other expenditures associated with schools)	Categorical variable was created based on the numeric value from the survey question
Family level factors			
Having left-behind child experience	Yes and no	Have you had left behind childhood experience? (Yes/ No)	No modifications
		Left-behind children refers to children whose parents left for city to work while leaving the	

		child behind for living with grandparents for a long period of time. (Jia & Tian, 2010)	
Father's education level	No formal education, primary school education, middle school education, high school education, vocational school education, undergraduate education, postgraduate education and unknown	What is the education level of your father? (No formal education/ primary school education/ middle school education/ high school education/ vocational school education/ undergraduate education/ postgraduate education/ unknown)	No modifications
Mother's education level	No formal education, primary school education, middle school education, high school education, vocational school education, undergraduate education, postgraduate education and unknown	What is the education level of your mother? (No formal education/ primary school education/ middle school education/ high school education/ vocational school education/ undergraduate education/ postgraduate education/ unknown)	No modifications
Only child in the family	Yes and no	How many siblings do you have in your family?	The new variable was created to only measure if the respondent has siblings or has no siblings

Parents divorced	Yes and no	Have you experienced your parents divorcing? (Never/ During my childhood/ During my adolescent years/ After I went to college)	The new variable was created to only measure if the respondent has experienced parents' divorce.
Parents passed away	No, mother passed away, father passed away, and both parents passed away	Have you experienced your mother pass away? (Never/ During my childhood/ During my adolescent years/ After I went to college) Have you experienced your father divorcing? (Never/ During my childhood/ During my adolescent years/ After I went to college)	The new variable was created to combine the two questions. The variable measured if the respondent has experienced any parent passing away and which parent it was, or whether both parents had passed.
Family income level	Very rich, rich, medium, poor, and very poor	From 1-7, how would you rate your family income level? (1 is very bad and 7 is very good)	The categorical variable was created. 1 refers to very poor, 2-3 refers to poor, 4 refers to medium, 5-6 refers to rich and 7 refers to very rich.
Family control	Very strict, strict, average, loose and very loose	From 1-7, how would you rate your family control level? (1 is very loose and 7 is very strict)	The categorical variable was created. 1 refers to very loose, 2-3 refers to loose, 4 refers to medium, 5-6 refers to strict and 7 refers to very strict.

Quality of parents' relationship	Very good, good, medium, bad and very bad	From 0-10, how would you rate the quality of your parents' relationship? (0 is the worst and 10 is the best)	The categoric variable was created. 1-2 refers to very bad, 3-4 refers to bad, 5-6 refers to medium, 7-8 refers to good and 9-10 refers to very good
Quality of mother child relationship	Very good, good, medium, bad and very bad	From 0-10, how would you rate the quality of your relationship with your mother? (0 is the worst and 10 is the best)	The categoric variable was created. 1-2 refers to very bad, 3-4 refers to bad, 5-6 refers to medium, 7-8 refers to good and 9-10 refers to very good
Quality of father child relationship	Very good, good, medium, bad and very bad	From 0-10, how would you rate the quality of your relationship with your father? (0 is the worst and 10 is the best)	The categoric variable was created. 1-2 refers to very bad, 3-4 refers to bad, 5-6 refers to medium, 7-8 refers to good and 9-10 refers to very good
Family members attitudes towards sex related topics	Very open, open, medium, conservative, and very conservative	What is your family members' attitudes towards sex? (Very open/ Open/ Medium/ Conservative/ Very conservative)	No modifications
Frequency of talking with parents on any sex related topics	Never, once or twice, sometimes, many times, and often times	What is the frequency of you talking with your parents on any sex related topics? (Never/ Once or twice/ Sometimes/ Many times/ Often)	No modifications
Frequency of talking to parents on sexual	Never, once or twice, sometimes, many times, and often times	What is the frequency of you talking with your parents on sexual behaviour related topics?	No modifications

behaviour related topics		(Never/ Once or twice/ Sometimes/ Many times/ Often)	
Frequency of talking to parents on contraceptive related topics	Never, once or twice, sometimes, many times, and often times	What is the frequency of you talking with your parents on contraceptive related topics? (Never/ Once or twice/ Sometimes/ Many times/ Often)	No modifications
Health and wellbeing factors			
Personal health status	Very healthy, healthy, average, unhealthy and very unhealthy	How would you rate your personal health condition? (Very healthy/ Healthy/ Average/ Unhealthy/ Very unhealthy)	No modifications
Physical appearance	Very bad, bad, good, and very good	From 0-10, how would you rate your appearance?	The categoric variable was created. 1-2 refers to very bad looking, 3-4 refers to bad looking, 5-6 refers to medium, 7-8 refers to good looking and 9-10 refers to very good looking.
Networking and social skills	Very bad, bad, good and very good social skills	From 0-10, how would you rate your networking skills?	The categoric variable was created. 1-2 refers to very bad, 3-4 refers to bad, 5-6 refers to medium, 7-8 refers to good and 9-10 refers to very good.

Alcohol consumption frequency	Never, several times a year, several times a month, 1-3 times a week, more than 3 times a week and every day	How often do you consume alcohol (Never/ Several times per year/ several times per month/1-3 times a week/ More than 3 times a week/ Every day)	No modifications
Smoking status	Never smoked, quit smoking and currently smoking	How often do you smoke? (Never/ Quitted smoking/ Currently smoking)	No modifications
Mental health illness	Yes and no	Have you ever been diagnosed any of the following mental health illness? (Depression, anxiety, bipolar disorder, obsessive compulsive disorder, nervosa, attention deficit hyperactivity disorder, post-trauma disorder, social phobia, personality disorder, schizophrenia, drug abuse and other mental illness)	The new variable was created to only measure if the respondent has any type of mental health illness.
Suicidal ideas and attempts	Never had suicidal ideas, had suicidal ideas, had suicidal attempt once and had suicidal attempt several times.	Have you ever attempted suicide? (Never had suicidal ideas, had suicidal ideas, had suicidal attempt once and had suicidal attempt several times.)	No modifications

Depression	Having moderate or severe depression, and having little or no depression	The measurement used the Patient Health Questionnaire (PHQ-9) standard questions.	The total scores were calculated according to the PHQ-9 instructions. For those scores above 10, it was categorized as having moderate or severe depressions. For those scores below 10, it was categorized as having little or no depressions.
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SRH knowledge related factors

Obtained SRH information from online	Yes and no	Have you ever searched any sex related information online, including contraceptive knowledge? (Yes/ No)	No modifications
Father answered SRH questions	‘I have never asked such questions’, ‘My father answers the questions very well’, ‘My father sometimes answers the questions’, ‘My father avoids those questions’, ‘My father avoids those questions and punishes me for asking those questions’	When you ask your father about any questions related to sex, can he answer? (I have never asked such questions/ My father answers the questions very well/ My father sometimes answers the questions/ My father avoids those questions/ My father avoids those questions and punishes me for asking those questions)	No modifications

Mother answered SRH questions	'I have never asked such questions', 'My mother answers the questions very well', 'My mother sometimes answers the questions', 'My mother avoids those questions', 'My mother avoids those questions and punishes me for asking those questions'.	When you ask your mother about any questions related to sex, can he answer? (I have never asked such questions/ My mother answers the questions very well/ My mother sometimes answers the questions/ My mother avoids those questions/ My mother avoids those questions and punishes me for asking those questions)	No modifications
Having attended sexuality education in schools	Yes and no	Have you ever attended sexuality education in school (Yes/ No/ Not sure)	I have combined the responses 'No' and 'Not Sure'.
The first time the respondents had sexuality education in school	Grade 1-3 in primary school, grade 4-6 in primary school, middle school, high school, grade 1-2 in college, grade 3-4 in college, and postgraduate	When was your first-time attending sexuality education in school? (Grade 1-3 in primary school/ Grade 4-6 in primary school/ Middle school/ High school/ Grade 1-2 in college/ Grade 3-4 in college/ Postgraduate)	No modifications

		[This question was only for respondents who said ‘Yes’ to having ever attended sexuality education in schools]	
The respondents were satisfied with the current situation on the provision of sexuality education in school	Very satisfied, moderately satisfied, average, moderately unsatisfied, very unsatisfied and not sure	Are you satisfied with the current situation on the provision of sexuality education in school? (Very satisfied/Moderately satisfied/Average/Moderately unsatisfied/ Very unsatisfied/ Not sure)	No modifications
Sexuality education in school have included any of the contraception related knowledge	Yes and no	Has your school sexuality education covered the following topics? (Mental health/ Sex and Morality/ Marriage and relationship/ Contraceptives/ Emergency contraceptives/ Sexually transmitted diseases and HIV/ Unintended pregnancies and abortion/ Sexual harassment)	The new categorical variable was created. ‘Yes’, refers to respondents who have studied contraceptives, emergency contraceptives and unintended pregnancies and abortion in sexuality education in school.
SRH knowledge level	0-9	This measurement used the Demographic Health Survey Questionnaire on Family Planning.	Respondents were asked to judge 9 standard statements related to SRH as true or false. Respondents receive one score for one correct judgment. The full score was 9.

Having the correct knowledge of preventing unintended pregnancies	Yes and no	How much do you agree with the following statement?(Contraceptives are not necessary in every sexual intercourse, as not all sexual intercourse will lead to pregnancies)	Respondents who reported ‘strongly disagree’ were categorized as having correct knowledge of preventing unintended pregnancies and respondents who reported ‘disagree’, ‘not sure’, ‘agree’ and ‘strongly agree’ were categorized as not having correct knowledge of preventing unintended pregnancies
Sexual behaviour level factors			
Whether the respondent is heterosexual	Yes and no	What is your sexual orientation? (Heterosexual, homosexual, bisexual, asexual, others, not sure)	The new categorical variable was created to only measure if the respondent was heterosexual
Number of boyfriends/ girlfriends had	0, between 0 and 3, and more than 3.	How many girlfriends and/ or boyfriends did you have so far?	The new categorical variable was created based on the number from the answers.
Number of sexual partners had	1, between 1 and 5, and more than 5	How many sexual partners did you have so far? (Only include sexual partners with whom you had virginal intercourse)	The new categorical variable was created based on the number from the answers. The analyses only focused on respondents who already

The age respondent had the first adolescent romantic feelings	Between age 8-15, between 15-20, between 20-25, and above 25	How old were you when you had the first adolescent romantic feelings?	had sexual intercourse experience, hence the minimum value is '1'. The new categorical variable was created based on the number (age) from the answers.
The age respondent had the first sexual intercourse	Between age 10-15, between 15-20, between 20-25, and above 25	How old were you when you had the first sexual intercourse?	The new categorical variable was created based on the number (age) from the answers.
The respondent engaged in high-risk sexual activities	Yes and no	Have you had spontaneous sex with a stranger and commercial sex so far?	The new categorical variable was created. For respondents who had spontaneous sex with a stranger and respondents who had commercial sex, they were categorized as had high-risk sexual activities.
The decision makers within the relationship over contraceptive use	Male was the decision maker, female was the decision maker, the decision was made jointly and no decision makers	In your daily life, who, between you and your partner, was the decision maker on the contraceptive use? (Myself/ My partner/ Jointly/ Hard to say/ Whatever contraceptive available at hand)	The new categorical variable was created. Based on the respondent's gender and the results from the question, the gender of the decision makers of contraceptive use were identified. 'Hard to say' and

			‘Whatever contraceptive available at hand’ indicate ‘No decision makers’ in contraceptive use.
The difficulty level to access MCs	Very easy, easy, difficult, and very difficult	When you need contraceptives, do you think they are easy to access? (Very easy/ Easy/ Difficult/ Very difficult)	No modifications
Whether the respondent obtained free modern contraceptives from the government?	Yes and no	Have you ever obtained any free contraceptive tools from family planning clinics, disease control department, schools, and hospitals? (Yes/ No)	No modifications
The experience of any sexual violence	Had experience of physical violence, had experience of verbal violence, and had no experience of any violence	Have you ever experienced the following situation? If yes, did you experience them during childhood/ adolescence/ in college? (Laughed at for the puberty and body change/ harassed with sex related languages, such as humiliation, dirty jokes and inappropriate flirt/ harassed with sex related languages online, such as humiliation, dirty jokes, and inappropriate flirt/ forced to take off cloth/	The new categorical variable was created. The first three behaviours (Laughed at for the puberty and body change/ harassed with sex related languages, such as humiliation, dirty jokes and inappropriate flirt/ harassed with sex related languages online, such as humiliation, dirty jokes, and

forced to have body touch/ forced to have oral sex/ forced to have sexual intercourse)

inappropriate flirt) were verbal harassment, the last four behaviours (forced to take off cloth/ forced to have body touch/ forced to have oral sex/ forced to have sexual intercourse) were physical harassment.

Outcome variable: the use of modern contraceptives during the most recent sexual intercourse

Whether the respondent used modern contraceptives during the most recent sexual intercourse? Yes and no

In the most recent sexual intercourse, have you/ your partner used any contraceptive methods? [Multiple choice] (No contraceptive methods used/ Contraceptive pills/ Emergency contraceptive pills/ Injectables/ Male condoms/ Female condoms/ Withdrawal/ Calendar method/ Spermicide/ Long-acting reversible contraceptives such as IUD and implant)

The new categorical variable was created. ‘Yes’, refers to respondent who have chosen at least one modern contraceptive method (contraceptive pills, emergency contraceptive pills, injectables, female and male condoms, spermicide and long-acting contraceptives). ‘No’, refers to respondents who do not fall into the ‘Yes’ category.

Table 6 The introduction of the dependent variable and potential independent variables

2.7 Analytical methods

Baseline socioeconomic, demographic, behavioural, and reproductive health characteristics of the participants were first tabulated and presented as counts and percentages for categorical variables or means with standard deviations (SDs) for continuous variables, where appropriate. These variables were first tabulated individually in the study database (among participants who are sexually active). Then, these variables were tabulated by gender to present the gender variance on the participating university students' characteristics.

To demonstrate the differences of selected characteristics between the study subset and the whole database, basic demographic and socioeconomic descriptive statistics were presented for both the main population and the study sub-population. Following that, the socioeconomic, demographic, behavioural, and reproductive health characteristics of the participants were presented by stratification of whether the participants used MC during MRS. *P values* were calculated in this step to explore the potential differences in the distribution of baseline characteristics between those who used MC and those who did not during MRS. *P values* were computed by chi-squared test for categorial exposures and Student's t-test for continuous exposures. (Pearson, 1900; Student, 1908)

Second, the unadjusted logistic regression models were calculated to investigate the crude association between the demographic, socioeconomic, and behaviour factors and the use of MC during MRS. (Cox, 1958) Odds Ratios (ORs) and 95% confidence intervals (CIs) were computed from the logistic regression models. The outcome variable was the use of MC during MRS (0 = used MC during MRS and 1 = not used MC during MRS) and the independent variables included 52 demographic, socioeconomic, and behaviour variables identified from the survey (one variable in the model at a time to compute crude association). Thus, the unadjusted logistic regression model became:

$$\log\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 X_1 + e_i$$

In the model, p_i = probability of the outcome variable (not used MC during MRS) for individual i . X_1 is the exposure under study (one of the 52 demographic, socioeconomic, and behaviour

variables). β_0 is the intercept and β_1 is the association parameter (log odds ratio). e_i represents random error for individual i in the model.

Wald tests were used to test the statistical significance of the parameters in the model and p values for each parameter in the crude association models were computed. (Wald, 1943)

Third, significant demographic, socioeconomic and behaviour factors from the second step were taken for progressive logistic adjustments of the association with the use of MC during MRS, meaning that I progressively added adjustment groups according to their relevance to the research question. Fourteen progressive logistic models were performed. The ORs of non-use MC during MRS and its 95% confidence interval were calculated. The progressive logistic regression models were:

$$\log\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 age + \beta_2 gender + \beta_3 edulevel + \beta_4 (added\ factor\ a) + \dots + \beta_n (added\ factor\ n) + e_i$$

In the model, p_i = probability of the outcome variable, which is did not use MC during MRS for individual i . β_0 is the intercept. The first model in the progressive adjustment adjusted for age, gender, and educational level of the participants and $\beta_1, \beta_2, \beta_3$, represents association parameters for age, gender, and educational level, respectively. Other factors were added in the model and β_4 to β_n refer to the association parameters for the added factors. e_i represents random error for individual i in the model.

According to the social ecological model, the first five models were factors at the individual level. They are as following:

- Model 1 included age, gender and education level;
- Model 2 included alcohol use and smoking;
- Model 3 included having a depression, having mental illness and having suicidal ideas;
- Model 4 included correct SRH knowledge quiz score and having correct knowledge of preventing unintended pregnancies;
- Model 5 included the monthly living cost and family income level.

The next six models have included factors at the inter-personal level. They are as following:

- Model 6 included parents' marriage status, parents' death, parents' marriage quality;
- Model 7 included number of romantic relationships had, number of sexual partners had, and whether having engaged in high-risk sex;
- Model 8 included the age of having first romantic relationship and the age of having first sexual intercourse;
- Model 9 included experience of talking with parents on contraceptive use and the experience of asking both the mother and the father on SRH questions;
- Model 10 included the decision makers of the contraceptive use;
- Model 11 included the experience of violence.

The last three models include factors at the environment level. They are as following:

- Model 12 included home regions, home locations, school locations and having left-behind child experience;
- Model 13 included religion and ethnicity;
- Model 14 included the difficulty level of accessing modern contraceptives.

With progressive adjustment, there exists a risk of over adjustment, where adjusting for a variable can affect the precision of the model and bring the possibility of multiple testing. The issue of multiple testing is built on the hypothesis testing and *p value* construct. *P value*, and confidence intervals, builds on the probability of events assuming the null hypothesis is true. Conventionally, if *p value* is less than 0.05, we say the test is statistically significant, meaning that the probability of obtaining the observed results, assuming that the null hypothesis is true, is less than 0.05. However, the more variables we adjust, the more tests we conduct, which means that events with low probability could happen by chance. (Bender & Lange, 2001; Schisterman et al., 2009) To adjust for multiple testing, Bonferroni correction was used to inform potential false positive results from multiple testing. (Sedgwick, 2012)

As a goodness of fit analysis, likelihood ratio tests (LR tests) were performed during the process of progressively conducting the multivariable logistic regression in order to understand the unique contributions of the newly added sets of variables and whether the new model is a better fit. Chi-squared values and *p values* are reported from the LR test. A *p value* <0.05 in the LR test indicates the new model is a better fit as compared to the previous model. (J. Zhang, 2002)

Fourth, the gender stratified adjustment logistic regression was conducted to investigate the association between the outcome variable, non-use of MC during MRS, and the independent variables included the following. The gender-stratified model was the same as the fully adjustment model (model 14) in the progressive adjustment mentioned above, except that gender was not adjusted in the model.

- education level,
- age,
- alcohol use,
- smoking,
- having a depression,
- having suicidal ideas,
- having mental illness,
- SRH knowledge quiz score,
- correct knowledge of preventing unintended pregnancies,
- family income level, parents' marriage status,
- parents death,
- the quality of parents' marriage,
- number of romantic relationships had,
- number of sexual partners had,
- having high risk sex,
- the age of first sexual intercourse,
- the age of first romantic relationship,
- the frequency of talking with parents on contraception,
- having searched SRH information online,
- having asked one's mother on SRH questions,
- the decision makers of the contraceptive use,
- university location,
- home region,
- home location,
- having violence experience,

- religion,
- ethnicity,
- having left-behind child experience,
- and the difficulty level of accessing modern contraceptives.

Last, the gender stratified adjustment logistic regression was conducted to understand the association between SRH knowledge quiz score and demographic, socioeconomic, and behaviour factors, including education level, age, alcohol use, smoking, having a depression, having suicidal ideas, having mental illness, correct knowledge of preventing unintended pregnancies, family income level, parents' marriage status, parents death, the quality of parents' marriage, number of romantic relationships had, number of sexual partners had, having high risk sex, the age of first sexual intercourse, the age of first romantic relationship, the frequency of talking with parents on contraception, having searched SRH information online, having asked one's mother on SRH questions, the decision makers of the contraceptive use, university location, home region, home location, having violence experience, religion, ethnicity, having left-behind child experience, and the difficulty level of accessing modern contraceptives. The models were fitted using ordered logistic regression with SRH score as the outcome. (Williams, 2006)

All the data analyses were performed using StataMP Version 17 (StataCorp. 2021).

2.8 Ethics and data security

The participants in NUSS-SRH were university students, including vocational colleges, from across China. Their age ranged from 17-24 years old. Parental consent was not required according to China's Law on the Protection of Minors. (Jie, 2015) The participants were recruited through campus networks and social media, facilitated by youth volunteers. The participation to the survey was voluntary. The administration of the survey was through an online questionnaire platform, which respected participants' privacy.

Prior to filling the questionnaire, the electronic consent form was presented to participants to review and sign. Only after signed consent was received, were participants then able to proceed to the questionnaire page. The participants were informed that their privacy would be strictly

protected throughout the research. Their personal information was not required throughout the questionnaire. Given the sensitivity of SRH issues, participants were able to withdraw from the survey anytime they felt uncomfortable, and their already filled answers would be eliminated accordingly.

The ethical approval for NUSS-SRH was obtained from the University of Tsinghua Vanke School of Public Health (Institution Review Board of Tsinghua University, Project Number: 20190083, approval time: October 30th, 2019). Ethical approval for this study was granted by the University of Bath Research Ethics Approval Committee for Health (REACH reference number: EP 22 078).

Data will be stored in a secure research folder on the University of Bath's X: Drive that only myself and my supervisor (Emma Solomon-Moore) have access to.

Chapter III: Results

This section presents the results from the statistical analyses which have been performed according to the strategies in the methodology section. There are six models used to identify and explain the associations between socioeconomic, demographic and behavioural factors, and the odds of not using MC during MRS among university students in China. Additional analyses have been conducted to identify the key determinants of increased SRH knowledge.

3.1 Basic characteristic

First, the basic characteristics of the study participants, those who were sexually active from the NUSS-SRH respondents, are presented in *Table 7*. Some key demographic characteristics of the entire sample of NUSS-SRH participants are then presented in comparison with the characteristics of the sexually active participants. Second, the cross tabulation of basic characteristics are shown comparing the use and non-use of MC during MRS. Third, the crude logistic regressions are presented between the socioeconomic, demographic and behavioural factors, and the odds of not using MC during MRS. Fourth, the progressive logistic models between the odds of not using MC during MRS and the socioeconomic, demographic and behavioural factors are shown. Fifth, the gender-stratified logistic adjustment association between the socioeconomic, demographic, and behavioural factors, and the non-use of MC during MRS are presented. Last, the gender-stratified logistic adjustment association between the socioeconomic, demographic, and behavioural factors and SRH knowledge score are shown.

The characteristics of the study participants, who were the sexually active sub-population from the NUSS-SRH respondents, are shown in *Table 7*. Variables are presented as demographic factors, family-related factors, health and well-being related factors, SRH-related factors, and sexual behaviour-related factors in line with the survey design.

The General Description of the Sexually Active University Students in the Analyses

Total	Female	Male
N= 11, 223	N= 6,459	N= 4,764

Demographic Factors

School location

East	6,519 (58.09%)	3,748 (58.03%)	2,771 (58.17%)
Central	2,081 (18.54%)	1,227 (19.00%)	854 (17.93%)
West	2,623 (23.37%)	1,484 (22.98%)	1,139 (23.91%)
<i>Current education level</i>			
Vocational education	2,823 (25.15%)	1,311 (20.30%)	1,512 (31.74%)
Bachelor education	7,288 (64.94%)	4,502 (69.70%)	2,786 (58.48%)
Postgraduate	1,112 (9.91%)	646 (10.00%)	466 (9.78%)
<i>Age</i>			
≤18 years old	1,654 (14.74%)	838 (12.97%)	816 (17.13%)
>18, ≤22 ¹	7,776 (69.29%)	4,598 (71.19%)	3,178 (66.71%)
>22, ≤26	1,629 (14.51%)	959 (14.85%)	678 (14.06%)
>26	164 (1.46%)	64 (0.99%)	100 (2.10%)
<i>Hometown origin</i>			
East	5,32 (47.41%)	3,075 (47.61%)	2,246 (47.15%)
Central	2,699 (24.05%)	1,545 (23.92%)	1,154 (24.22%)
West	3,189 (28.00%)	1,830 (28.33%)	1,359 (28.53%)
Outside mainland China	14 (0.12%)	9 (0.14%)	5 (0.10%)
<i>Religious</i>			
Yes	940 (8.38%)	495 (7.66%)	445 (9.34%)
No	10,283 (91.62%)	5,964 (92.34%)	4,319 (90.66%)
<i>Ethnic minority</i>			
Yes	1,108 (9.87%)	651 (10.08%)	457 (9.59%)
No	10,115 (90.13%)	5,808 (89.92%)	4,307 (90.41%)
<i>Monthly Expense (RMB)</i>			
<1,000	587 (5.23%)	327 (5.06%)	260 (5.46%)
≥1,000, <2,000	4,863 (43.33%)	2,793 (43.24%)	2,070 (43.45%)
≥2,000, <3,000	3,241 (28.88%)	1,899 (29.40%)	1,342 (28.17%)
≥3,000, <4,000	1,300 (11.58%)	759 (11.75%)	541 (11.36%)
≥4,000	1,232 (10.98%)	681 (10.54%)	551 (11.57%)
<i>Hometown region</i>			
Rural	1,517 (13.52%)	838 (12.97%)	679 (14.25%)
Suburban	3,296 (29.37%)	1,892 (29.29%)	1,404 (29.47%)

¹ Meaning 22 years old and 364 days

Urban	6,410 (57.11%)	3,729 (57.73%)	2,681 (56.28%)
<u>Family level factors</u>			
<i>Having left-behind childhood experience</i>			
Yes	3,241 (28.88%)	1,865 (28.87%)	1,376 (28.88%)
No	7,982 (71.12%)	4,594 (71.13%)	3,388 (71.12%)
<i>Father's education level</i>			
No formal education	302 (2.69%)	159 (2.46%)	143 (3.00%)
Primary school	1,354 (12.06%)	767 (11.87%)	587 (12.32%)
Middle school	3,280 (29.23%)	1,835 (28.41%)	1,445 (30.33%)
High school	2,911 (25.94%)	1,679 (25.99%)	1,232 (25.86%)
Vocational school training	1,317 (11.73%)	786 (12.17%)	531 (11.15%)
Bachelor's degree	1,518 (13.53%)	897 (13.89%)	621 (13.04%)
Postgraduate degree	387 (3.45%)	244 (3.78%)	143 (3.00%)
Don't know	154 (1.37%)	92 (1.42%)	62 (1.30%)
<i>Mother's education level</i>			
No formal education	694 (6.18%)	398 (6.16%)	296 (6.21%)
Primary school	1,912 (17.04%)	1,071 (16.58%)	841 (17.65%)
Middle school	3,090 (27.53%)	1,754 (27.16%)	1,336 (28.04%)
High school	2,735 (24.37%)	1,577 (24.42%)	1,158 (24.31%)
Vocational school	1,221 (10.88%)	736 (11.39%)	485 (10.18%)
Bachelor's degree	1,210 (10.78%)	713 (11.04%)	497 (10.43%)
Postgraduate degree	250 (2.23%)	158 (2.45%)	92 (1.93%)
Don't know	111 (0.99%)	52 (0.81%)	59 (1.24%)
<i>Only child in the family</i>			
Yes	4,761 (43.88%)	2,648 (42.03%)	2,113 (46.44%)
No	6,090 (56.12%)	3,653 (57.97%)	2,437 (53.56%)
<i>Self-rated family income level</i>			
Poor	851 (7.58%)	479 (7.42%)	372 (7.81%)
Medium	9,174 (81.74%)	5,336 (83.08%)	3,808 (79.93%)
Rich	1,198 (10.67%)	614 (9.51%)	584 (12.26%)
<i>Family discipline over children</i>			
Little discipline	704 (6.27%)	460 (7.12%)	244 (5.12%)
Medium discipline	7,441 (66.30%)	4,319 (66.87%)	3,122 (65.53%)

Strong discipline	3,078 (27.43%)	1,680 (26.01%)	1,398 (29.35%)
<i>Parents' marriage relationship</i>			
Very bad	476 (4.24%)	334 (5.17%)	142 (2.98%)
Bad	1,352 (12.05%)	915 (14.17%)	437 (9.17%)
Average	3,072 (27.37%)	2,015 (31.20%)	1,057 (22.19%)
Good	4,951 (44.11%)	2,650 (41.03%)	2,301 (48.30%)
Very good	1,372 (12.22%)	545 (8.44%)	827 (17.36%)
<i>Mother-child relationship</i>			
Very bad	110 (0.98%)	76 (1.18%)	34 (0.71%)
Bad	482 (4.29%)	349 (5.40%)	133 (2.79%)
Average	2,196 (19.57%)	1,518 (23.50%)	678 (14.23%)
Good	6,417 (57.18%)	3,711 (57.45%)	2,706 (56.80%)
Very good	2,018 (17.98%)	805 (12.46%)	1,213 (25.46%)
<i>Father-child relationship</i>			
Very bad	254 (2.26%)	168 (2.60%)	86 (1.81%)
Bad	1,022 (9.11%)	707 (10.95%)	315 (6.61%)
Average	3,173 (28.27%)	2,109 (32.65%)	1,064 (22.33%)
Good	5,318 (47.38%)	2,946 (45.61%)	2,372 (49.79%)
Very good	1,456 (12.97%)	529 (8.19%)	927 (19.46%)
<i>Parents are divorced</i>			
Yes	1,686 (15.02%)	1,108 (17.15%)	578 (12.13%)
No	9,537 (84.98%)	5,351 (82.85%)	4,186 (87.87%)
<i>Parents' death</i>			
No	10,756 (95.84%)	6,202 (96.02%)	4,554 (95.59%)
One parent passed away	445 (3.97%)	249 (3.86%)	196 (4.11%)
Both parents passed away	22 (0.20%)	8 (0.12%)	14 (0.29%)
<i>Frequency of talking with parents on contraception related topics</i>			
Never	7,624 (67.93%)	4,336 (67.13%)	3,288 (69.02%)
Once or twice	1,849 (16.48%)	1,067 (16.52%)	782 (16.41%)
Sometimes	1,325 (11.81%)	793 (12.28%)	532 (11.17%)
Many time	314 (2.80%)	189 (2.93%)	125 (2.62%)
Often	111 (0.99%)	74 (1.15%)	37 (0.78%)
<i>Frequency of talking with parents on specific sexual behaviour-related topics</i>			

Never	7,296 (65.01%)	4,055 (62.78%)	3,241 (68.03%)
Once or twice	2,204 (19.64%)	1,328 (20.56%)	876 (18.39%)
Sometimes	1,476 (13.15%)	909 (14.07%)	567 (11.90%)
Many time	185 (1.65%)	125 (1.94%)	60 (1.26%)
Often	62 (0.55%)	42 (0.65%)	20 (0.42%)
<i>Family members' attitudes toward sex</i>			
Very conservative	4,082 (36.37%)	2,620 (40.56%)	1,462 (30.69%)
Conservative	3,690 (32.88%)	2,181 (33.77%)	1,509 (31.68%)
Average	2,134 (19.01%)	1,079 (16.71%)	1,055 (22.15%)
Open	1,149 (10.24%)	509 (7.88%)	640 (13.43%)
Very open	168 (1.50%)	70 (1.08%)	98 (2.06%)
<i>Frequency of talking with parents on any sex-related topics</i>			
Never	5,624 (50.11%)	3,057 (47.33%)	2,567 (53.88%)
Once or twice	2,961 (26.38%)	1,776 (27.50%)	1,185 (24.87%)
Sometimes	2,212 (19.71%)	1,368 (21.18%)	844 (17.72%)
Many time	322 (2.87%)	202 (3.13%)	120 (2.52%)
Often	104 (0.93%)	56 (0.87%)	48 (1.01%)
<u>Health and wellbeing level factors</u>			
<i>Health status</i>			
Very unhealthy	33 (0.29%)	15 (0.23%)	18 (0.38%)
Unhealthy	476 (4.24%)	332 (5.14%)	144 (3.02%)
Average	1,854 (16.52%)	1,237 (19.15%)	617 (12.95%)
Healthy	6,290 (56.05%)	3,869 (59.90%)	2,421 (50.82%)
Very healthy	2,570 (22.90%)	1,006 (15.58%)	1,564 (32.83%)
<i>Physical appearance</i>			
Very bad	129 (1.15%)	56 (0.87%)	73 (1.53%)
Bad	2,398 (21.37%)	1,520 (23.53%)	878 (18.43%)
Good	7,813 (69.62%)	4,533 (70.18%)	3,280 (68.85%)
Very good	883 (7.87%)	350 (5.42%)	533 (11.19%)
<i>Self-scored social skills</i>			
Very bad	236 (2.10%)	140 (2.17%)	96 (2.02%)
Bad	2,552 (22.74%)	1,774 (27.47%)	778 (16.33%)
Good	7,175 (63.93%)	4,139 (64.08%)	3,036 (63.73%)

Very good	1,260 (11.23%)	406 (6.29%)	854 (17.93%)
<i>Frequency of drinking alcohol</i>			
Never	4,648 (41.41%)	3,205 (49.62%)	1,433 (30.29%)
Several times a year	3,459 (30.82%)	1,964 (30.41%)	1,495 (31.38%)
Several times a month	2,543 (22.66%)	1,064 (16.47%)	1,479 (31.05%)
1-3 times weekly	419 (3.73%)	166 (2.57%)	253 (5.31%)
>3 times weekly	94 (0.84%)	39 (0.60%)	55 (1.15%)
Every day	81 (0.66%)	21 (0.33%)	39 (0.82%)
<i>Depression</i>			
Moderate or severe	4,547 (40.52%)	2,936 (45.46%)	1,611 (33.82%)
Little or no	6,676 (59.48%)	3,523 (54.54%)	3,153 (66.18%)
<i>Smoking status</i>			
Never smoked	7,874 (70.16%)	5,164 (79.95%)	2,710 (56.88%)
Quitted smoking	1,461 (13.02%)	774 (11.98%)	687 (14.42%)
Currently smoking	1,888 (16.82%)	521 (8.07%)	1,367 (28.69%)
<i>Have mental health illness</i>			
Yes	1,369 (12.20%)	981 (15.19%)	388 (8.14%)
No	9,854 (87.80%)	5,478 (84.81%)	4,376 (91.86%)
<i>Suicidal ideas and attempts</i>			
Never had ideas	5,751 (51.24%)	2,741 (42.44%)	3,010 (63.18%)
Had ideas	4,781 (42.60%)	3,199 (49.53%)	1,582 (33.21%)
Attempted suicide	432 (3.85%)	316 (4.89%)	116 (2.43%)
Attempted suicide several	259 (2.31%)	203 (3.14%)	56 (1.18%)
times			
<u>Sexual and reproductive health knowledge related factors</u>			
<i>Have searched SRH information online</i>			
Yes	10,333(92.07%)	6,067 (93.93%)	4,266 (89.55%)
No	890 (7.93%)	392 (6.07%)	498 (10.45%)
<i>Father has answered SRH questions</i>			
Never asked	9,174 (81.74%)	5,513 (85.35%)	3,661 (76.85%)
Answered very well	328 (2.92%)	82 (1.27%)	246 (5.16%)
Sometimes answers the	924 (8.23%)	366 (5.67%)	558 (11.71%)
questions			

He avoids those questions	572 (5.10%)	328 (5.08%)	244 (5.12%)
He avoids those questions and punishes me for asking	225 (2.00%)	170 (2.63%)	55 (1.15%)
<i>Mother has answered SRH questions</i>			
Never asked	7,677 (68.40%)	4,031 (62.41%)	3,646 (76.53%)
Answered very well	795 (7.08%)	570 (8.82%)	225 (4.72%)
Sometimes answers the questions	1,913 (17.05%)	1,346 (20.84%)	567 (11.90%)
She avoids those questions	645 (5.75%)	362 (5.60%)	283 (5.94%)
She avoids those questions and punishes me for asking	193 (1.72%)	150 (2.32%)	43 (0.90%)
<i>Satisfaction with the provision of sex education in school</i>			
Very satisfied	914 (8.14%)	341 (5.28%)	573 (12.03%)
Moderately satisfied	1,644 (14.65%)	854 (13.22%)	790 (16.58%)
Average	3,168 (28.23%)	1,808 (27.99%)	1,360 (28.55%)
Moderately unsatisfied	1,465 (13.05%)	1,016 (15.73%)	449 (9.42%)
Very unsatisfied	1,186 (10.57%)	773 (11.97%)	413 (8.67%)
Not sure	2,846 (25.36%)	1,667 (25.81%)	1,179 (24.75%)
<i>Sex education included contraception topics</i>			
Yes	4,269 (38.04%)	1,001 (15.49%)	488 (10.24%)
No	1,489 (13.27%)	2,361 (36.55%)	1,908 (40.05%)
Never attended sex education in school	5,465 (48.69%)	3,097 (47.95%)	2,368 (49.70%)
<i>The score for correct SRH knowledge (full score: 9)</i>			
Score 0	173 (1.54%)	56 (0.87%)	117 (2.46%)
Score 1	287 (2.56%)	113 (1.75%)	174 (3.65%)
Score 2	562 (5.01%)	235 (3.64%)	327 (6.86%)
Score 3	903 (8.05%)	402 (6.22%)	501 (10.52%)
Score 4	1,424 (12.69%)	753 (11.66%)	671 (14.08%)
Score 5	1,960 (17.46%)	1,110 (17.19%)	850 (17.84%)
Score 6	2,332 (20.78%)	1,423 (22.03%)	909 (19.08%)
Score 7	2,087 (18.60%)	1,350 (20.90%)	737 (15.47%)
Score 8	1,194 (10.64%)	800 (12.39%)	394 (8.27%)

Score 9	301 (2.68%)	217 (3.36%)	84 (1.76%)
<i>Attended sex education in school</i>			
Yes	5,758 (51.31%)	3,362 (52.05%)	2,396 (50.29%)
No	5,465 (48.69%)	3,097 (47.95%)	2,368 (49.71%)
<i>First time they received sex education in school</i>			
Grade 1-3	214 (1.91%)	116 (3.45%)	98 (4.09%)
Grade 4-6	1,036(9.24%)	734 (21.83%)	302 (12.60%)
Middle school	2,185 (16.39%)	1,258 (37.42%)	927 (38.69%)
High school	1,052 (9.24%)	508 (15.11%)	544 (22.70%)
1 st and 2 nd year in college	1,194 (10.64%)	704 (20.94%)	490 (20.45%)
3rd and 4th year in college	77 (0.69%)	42 (1.25%)	35 (1.46%)
Never	5,465 (48.69%)	3,097 (47.95%)	2,368 (49.70%)
<i>Have correct knowledge of preventing unintended pregnancies</i>			
Yes	7,689 (68.51%)	4,898 (75.83%)	2,791 (58.59%)
No	3,534 (31.49%)	1,561 (24.17%)	1,973 (41.41%)
<u>Sexual behaviour level factors</u>			
<i>Sexual orientation</i>			
Heterosexual	8,790 (78.32%)	4,922 (76.20%)	3,868 (81.19%)
Non-heterosexual	2,433 (21.68%)	1,537 (23.80%)	896 (18.81%)
<i>Experience of sexual violence</i>			
No	3,995 (35.60%)	1,668 (25.82%)	2,327 (48.85%)
Physical violence	408 (3.64%)	245 (3.79%)	163 (3.42%)
Verbal violence	6,820 (60.77%)	4,546 (70.38%)	2,274 (47.73%)
<i>Number of boyfriends/ girlfriends had</i>			
0	6,259 (55.77%)	5,781 (89.50%)	478 (10.03%)
>0, ≤3	3,576 (31.86%)	616 (9.54%)	2,960 (62.13%)
>3	1,388 (12.37%)	62 (0.96%)	1,326 (27.83%)
<i>Number of sexual partners had</i>			
1	6,415 (57.16%)	4,000 (61.93%)	2,415 (50.69%)
≥2, <5	3,438 (30.63%)	1,892 (29.29%)	1,546 (32.45%)
≥5	1,370 (12.21%)	567 (8.78%)	803 (16.86%)
<i>Age at the first adolescent romantic feelings</i>			
≥10, <15	2,965 (26.42%)	1,843 (28.53%)	1,122 (23.55%)

≥15, <20	7,098 (63.25%)	3,956 (61.25%)	3,142 (65.95%)
≥20	1,117 (9.95%)	641 (9.92%)	476 (9.99%)
<i>Age at first sexual intercourse</i>			
≥10, <15	215 (1.92%)	116 (1.08%)	99 (2.08%)
≥15, <20	7,461 (66.48%)	4,125 (63.86%)	3,336 (70.03%)
≥20, <25	3,424 (30.51%)	2,150 (33.29%)	1,274 (26.74%)
≥25, ≤30	123 (1.10%)	68 (1.05%)	55 (1.15%)
<i>Whether engaged in high-risk sex</i>			
Yes	1,871 (16.67%)	823 (12.74%)	1,048 (22.00%)
No	9,352 (83.33%)	5,636 (87.26%)	3,716 (78.00%)
<i>Decision-makers on contraception use</i>			
Female	1,323 (11.79%)	1,119 (17.32%)	204 (4.28%)
Male	2,982 (26.57%)	1,062 (16.44%)	1,920 (40.30%)
Both	5,782 (51.52%)	3,655 (56.59%)	2,127 (44.65%)
Not sure	1,136 (10.12%)	623 (9.65%)	513 (10.77%)
<i>Access to MCs</i>			
Very easy	4,129 (36.79%)	2,348 (36.35%)	1,781 (37.38%)
Easy	5,319 (47.39%)	3,088 (47.81%)	2,231 (46.83%)
Difficult	1,408 (12.55%)	809 (12.53%)	599 (12.57%)
Very difficult	367 (3.27%)	214 (3.31%)	153 (3.21%)
<i>Received MCs from FP clinics</i>			
Yes	9,646 (85.95%)	5,829 (90.25%)	3,817 (80.12%)
No	1,577 (14.05%)	630 (9.75%)	947 (19.88%)
<u>Use of modern contraceptives</u>			
<i>Used of any MCs in MRS</i>			
Yes	9,814 (87.45%)	5,702 (88.28%)	4,112 (86.31%)
No	1,409 (12.55%)	757 (11.72%)	652 (13.69%)
<i>Used any contraceptives in MRS including traditional methods</i>			
Yes	10,735(95.65%)	6,218 (96.27%)	4,517 (94.82%)
No	488 (4.35%)	241 (3.73%)	247 (5.18%)
<i>Used the contraceptive pills during MRS</i>			
Yes	509 (4.54%)	332 (5.14%)	177 (3.72%)

No	10,714(95.46%)	6,127 (94.86%)	4,587 (96.28%)
<i>Used contraceptive injectables during MRS</i>			
Yes	13 (0.12%)	5 (0.08%)	8 (0.17%)
No	11,210(99.88%)	6,454 (99.92%)	4,756 (99.83%)
<i>Used the female condoms during MRS</i>			
Yes	188 (1.68%)	86 (1.33%)	102 (2.14%)
No	11,035(98.32%)	6,373 (98.67%)	4,662 (97.86%)
<i>Used other long-acting reversible method such as IUD during MRS</i>			
Yes	8 (0.07%)	5 (0.08%)	3 (0.06%)
No	11,215(99.93%)	6,454 (99.92%)	4,761 (99.94%)
<i>Used the calendar method in MRS</i>			
Yes	778 (6.93%)	386 (5.98%)	392 (8.23%)
No	10,445 (93.07%)	6,073 (94.02%)	4,372 (91.77%)
<i>Used the withdrawal method in MRS</i>			
Yes	1,681 (14.98%)	942 (14.58%)	739 (15.51%)
No	9,542 (85.02%)	5,517 (85.42%)	4,025 (84.49%)
<i>Used emergency pills during MRS</i>			
Yes	477 (4.25%)	277 (4.29%)	200 (4.20%)
No	10,746 (95.75%)	6,182 (95.71%)	4,564 (95.80%)
<i>Used condom during MRS</i>			
Yes	9,228 (82.22%)	5,349 (82.81%)	3,879 (81.42%)
No	1,995 (17.78%)	1,110 (17.19%)	885 (18.58%)
<i>Used spermicide during MRS</i>			
Yes	21 (0.19%)	6,451 (99.88%)	4,751 (99.73%)
No	11,202 (99.81%)	8 (0.12%)	13 (0.27%)

Table 7 Basic characteristics of participants, N (%)

3.1.1 Demographic factors

There were 11,223 participants for the analyses, and 57% were female. At the personal demographic information level, 58%, 19%, and 23% of participants were studying in schools in the East, Central, and West parts of China, respectively. Currently, 25% of participants were studying in vocational school, 65% were studying at the bachelor's level, and 10% were in post-graduate studies. Most of the participants were between 18 and 22 years old (69%), 15% were under 18 years old, and 16% were older than 22 years old. In the database, age is a continuous variable. However, the relationship between age and MC use behaviour is likely to be not linear. For example, young people aged above 26 years old (the average first marriage age in China) may be looking for a stable partner to potentially form a family, hence their MC use behaviour and attitude might be different from other age group young people, and young people aged under 18 years old are not able to get married legally so their MC use behaviour and attitude might be different from other age group young people as well. In this context, I have converted age from a continuous variable to a categorical variable. Specifically, I have categorized age as up to and including 18 years old, between 19 and 22 years old, between 23 and 26 years old, and above 26 years old.

Forty-seven percent of the participants were originally from the East part of China, 24% were originally from the Central part of China, and 28% were originally from the West part of China. Eight percent of participants reported that they have a religion, and 10% were ethnic minority (non-ethnic Han). Most of the participants (43%) spent RMB 1,000-2,000 monthly (equivalent to 125 GBP-250 GBP) and 29% of participants spent RMB 2,000-3,000 monthly (250 GBP-375 GBP), 23% spent more than RMB 3,000 per month (more than 375 GBP). Fifty-seven percent of participants came from an urban region, 29% from a suburban region, and 14% from a rural region.

3.1.2 Family level factors

At the family factors level, 29% of participants had the left-behind child experience, meaning that they grew up in villages with their grandparents or unattended by direct guardians while their parents left to cities for work. Most of the participants' fathers had middle school (28%) and high school level (26%) education and 18% of participants' fathers had higher education degrees. Six percent of participants' mothers were illiterate, and 13% of participants' mothers had higher education degrees. Most of the participants (82%) reported that their family income level was medium, and 11% reported that their family income level was high. Twenty-seven

percent of participants said their family install very strong discipline over them. Though most participants (44%) reported that their parents' relationship was good, 4% and 12% said their parents' relationship was 'very bad' and 'bad', respectively. Seventy-four percent of the participants had an above-average relationship with their mothers. Fifty-nine percent of the participants had an above-average level of relationship with their fathers. Less than half (44%) of the participants were the only child in their family. Fifteen percent of the participants were from divorced families. Four percent of the participants had one or both parents passed away.

Around half of the participants had never spoken with their parents about any sex related topics while around 3% admitted they often talked with their parents on those issues. More than half (65%) of the participants had never spoken with their parents on specific contraception-related topics. Eleven percent of the participants had sometimes spoken with their parents on specific contraception-related topics. Respectively, 36% and 33% of participants said that their family members held 'very conservative' and 'conservative' attitudes toward sex-related issues.

3.1.3 Health and well-being level factors

At the personal health and wellbeing level, 56% and 23% of the participants think they were 'healthy' and 'very healthy', respectively. Less than 5% of the participants self – reported themselves as 'very unhealthy' and 'unhealthy'. Seventy percent of participants reported they were 'good looking'. However, 21% of the participants think that they were 'bad looking'. Respectively, 64% and 11% of participants said that they had 'good' and 'very good' social and networking skills. Respectively, 22.86% and 2.36% had 'bad' and 'very bad' social and networking skills. Forty percent of participants had moderate or severe depression, and 60% had little or no depression. Seventy percent of participants had never smoked, 13% had quit smoking, and 17% were currently smoking. Forty-one percent of participants had never drunk alcohol, and less than 1% drank every day. Twelve percent of participants had mental health illnesses, such as anxiety and schizophrenia. Forty-three percent of participants previously had suicidal ideas, 4% had attempted suicide once, and 2% had attempted suicide several times.

3.1.4 SRH knowledge related factors

At SRH knowledge level, 92% of participants had searched SRH information, including contraception knowledge, online. Eighty-two percent of participants had never asked SRH-related questions to their father. Two percent of participants' fathers punished them for asking SRH-related questions. Comparatively, 68% percent of participants had never asked their mothers about SRH-related questions and less than 2% said their mother punished them for asking such question. Around half (51%) of participants indicated that they have participated in school-based sex education and around 10% students mentioned that they received sex education prior to middle school. Most participants (38%) received sex education with contraception knowledge included. In a standard test on the knowledge of SRH, 3% got the full score, and the median score was 6 out of 9.

3.1.5 Sexual behaviours related factors

At the sexual behaviour level, 22% of participants indicated they were non-heterosexual. More than half (55%) of the respondents had never had a boyfriend or a girlfriend, 32% had less than three, and 12% had more than three relationships. Fifty-seven percent of respondents had one sexual partner, 31% had between two to five, and 12% had more than five sexual partners. Twenty-seven percent of respondents had their first adolescent romantic feelings between the age 8-15, 63% had their first adolescent romantic feelings between the age of 15-20, and 10% had their first adolescent romantic feelings beyond twenty years old. Two percent of respondents had their first sexual intercourse between the age of ten to fifteen, 66% had their first sexual intercourse experience between the age of fifteen to twenty, and 31% had their first sexual intercourse experience beyond the age of twenty. Seventeen percent of respondents had engaged in high-risk sex, including sex with multiple partners. In regard to decision-making on the use of contraceptives, 12% said females were the decision-makers, 27% said males were the decision-makers, 52% said the decisions were made jointly, and 10% said there was no clear decision-maker. Sixteen percent of respondents reported that they experienced some level of difficulties accessing MCs. Eighty-five percent have never received MCs from public family planning clinics. Thirty-five percent of respondents never experienced any forms of violence, 4% experienced physical violence, and 61% experienced verbal violence.

3.1.6 Use of contraceptives during MRS

Eighty-seven percent of participants used any form of MCs during MRS. As for the use of traditional contraceptive methods was, 7% of participants used calendar method and 15% of participants used the withdrawal method, which was the second most commonly used contraceptive method. The most commonly used MCs was male condoms (82%) and the least commonly used MCs were long acting reversible contraceptive methods (less than 2%).

3.2 Selected factors in the NUSS-SRH main dataset and the sexually active university student sub-dataset

As mentioned in previous chapter, there were 54,580 samples in the main NUSS-SRH survey. There were in total 12,280 sexually active participants, of which 1,057 were excluded due to low quality of the data described in the *Missing Data* section. The final included sample size was 11,223 participants. The comparison of selected demographic factors and health factors in the main dataset, among the excluded samples and finally included samples were shown in *Table 8*.

<i>Selected demographic factors and health factors in the main dataset, among the excluded samples and the finally included samples</i>			
	<i>Sexually active university students</i>		<i>NUSS-SRH dataset</i>
	<i>Included samples</i> (<i>N= 11,223</i>)	<i>Excluded samples</i> (<i>N=1,057</i>)	(<i>N=54,580</i>)
<i>Sex</i>			
Male	4,765 (42.45%)	548 (51.84%)	18,844 (34.53%)
Female	6,549 (57.55%)	509 (48.16%)	35,736 (65.47%)
<i>School location</i>			
East China	6,519 (58.09%)	640 (60.55%)	28,525 (52.26%)
Central China	2,081 (18.54%)	178 (16.84%)	13,314 (24.39%)
West China	2,623 (23.37%)	239 (22.61%)	12,741 (23.34%)
<i>Current education level</i>			
Vocational education level	2,823 (25.15%)	282 (26.68%)	19,253 (35.27%)
Bachelor education level	7,288 (64.94%)	674 (63.77%)	33,448 (61.28%)
Master education level	936 (8.34%)	75 (7.10%)	1,571 (2.88%)

Doctoral education level	176 (1.57%)	26 (2.46%)	308 (0.56%)
Age			
≤18 years old	1,654 (14.74%)	199 (18.83%)	17,500 (32.06%)
>18, ≤22 ²	7,776 (69.29%)	688 (65.09%)	33,968 (62.24%)
>22, ≤26	1,629 (14.51%)	132 (12.49%)	2,850 (5.22%)
>26	164 (1.46%)	38 (3.60%)	262 (0.48%)
Hometown origin			
East China	5,321 (47.41%)	503 (47.59%)	24,411 (44.73%)
Central China	2,699 (24.05%)	233 (22.04%)	15,316 (28.06%)
West China	3,189 (28.41%)	318 (30.09%)	14,814 (27.14%)
Outside mainland China	14 (0.12%)	3 (0.28%)	39 (0.07%)
Hometown region			
Urban	6,410 (57.11%)	611 (57.81%)	24,108 (44.17%)
Suburban	3,296 (29.37%)	301 (28.48%)	18,440 (33.79%)
Rural	1,517 (13.52%)	145 (13.72%)	12,032 (22.04%)
Only child in the family			
Yes	3,241 (28.88%)	313 (29.61%)	16,751 (31.64%)
No	7,982 (71.12%)	744 (70.39%)	36,186 (68.36%)
Father's education level			
No formal education	302 (2.69%)	41 (3.88%)	1,823 (3.34%)
Primary school	1,354 (12.06%)	156 (14.76%)	8,683 (15.91%)
Middle school	3,280 (29.23%)	273 (25.83%)	19,741 (36.17%)
High school	2,911 (25.94%)	259 (24.50%)	12,617 (23.12%)
Vocational school	1,317 (11.73%)	122 (11.54%)	4,391 (8.05%)
Bachelor's degree	1,518 (13.53%)	139 (13.15%)	5,200 (9.53%)
Master's degree and above	387 (3.45%)	47 (4.45%)	1,124 (2.06%)
Don't know	154 (1.37%)	20 (1.42%)	1,001 (1.83%)
Mother's education level			
No formal education	694 (6.18%)	71 (6.72%)	4,204 (7.70%)
Primary school	1,912 (17.04%)	170 (16.08%)	12,367 (22.66%)
Middle school	3,090 (27.53%)	288 (27.25%)	17,616 (32.28%)
High school	2,735 (24.37%)	258 (24.41%)	10,905 (19.98%)

² Meaning 22 years old and 364 days

Vocational school	1,221 (10.88%)	111 (10.50%)	3,862 (7.08%)
Bachelor's degree	1,210 (10.78%)	111 (10.50%)	3,894 (7.13%)
Master's degree and above	250 (2.23%)	31 (2.93%)	756 (1.39%)
Don't know	111 (0.99%)	17 (1.61%)	976 (1.79%)
<i>Health status</i>			
Very unhealthy	33 (0.29%)	6 (0.57%)	178 (0.33%)
Unhealthy	476 (4.24%)	65 (6.15%)	2,170 (3.98%)
Average	1,854 (16.52%)	201 (19.02%)	9,644 (17.67%)
Healthy	6,290 (56.05%)	492 (46.55%)	27,634 (50.63%)
Very healthy	2,570 (22.90%)	293 (27.72%)	14,954 (27.40%)
<i>Physical appearance</i>			
Very bad	129 (1.15%)	43 (4.07%)	1,513 (2.77%)
Bad	2,398 (21.37%)	272 (25.73%)	14,859 (27.22%)
Good	7,813 (69.62%)	623 (58.94%)	32,421 (59.40%)
Very good	883 (7.87%)	119 (11.26%)	5,787 (10.60%)

Table 8 Selected demographic factors and health factors in the main dataset and the sub-dataset for participants who had already had sexual intercourse

In order to better describe the dataset, I referred to the included samples (N=11,223) as the final dataset, and excluded samples (N=1,057) as the excluded dataset.

In the final dataset, 43% were male, higher than the percentage (34%) in the NUSS-SRH dataset while lower than the percentage (52%) in the excluded dataset. Compared to the included samples, in NUSS-SRH dataset there was a lower proportion of participants from schools in East part of China (58% vs. 52%) while among the excluded samples, there was a higher proportion of participants from schools in East part of China (58% vs. 60%). There was a lower proportion of students from vocational schools among the included samples, compared to among the excluded samples and in the NUSS-SRH dataset (25% vs. 27% and 35%). Meanwhile, there was a higher proportion of students at the bachelor education level in the final dataset, compared to the excluded dataset and in the NUSS-SRH dataset (65% vs. 64% and 61%). Among the included samples, there was a lower proportion of participants aged under 18 years old compared to excluded samples and the main samples (15% vs. 19% and 32%). There was a higher proportion of participants aged between 18-22 years old and 22-26

years old in the final dataset, compared to the excluded dataset and the NUSS-SRH dataset (18-22 years old: 63% vs. 65% and 62%; 22-26 years old: 15% vs. 12% and 5%).

The proportion of students originally from East China in the final dataset was around the same level compared to the excluded dataset (47%), and it was higher in the final dataset compared to the NUSS-SRH dataset (47% vs. 45%). In the included dataset, the proportion of participants from rural region was similar to proportion in the excluded dataset (57%) and higher than the NUSS-SRH dataset (22%). There was a lower percentage of participants being the only child in the family in the final dataset, compared to both excluded dataset and the NUSS-SRH dataset (28% vs. 29% and 32%, respectively). As for father’s education level, 17% of participants whose father had higher education in the final dataset, 18% in the excluded dataset and 11% in the NUSS-SRH dataset. As for mother’s education level, 13% of participants whose mother had higher education in the final dataset, same percentage in the excluded dataset and 9% in the NUSS-SRH dataset.

Five percent of participants in the final dataset felt they were unhealthy, compared to 7% in the excluded dataset and 4% in the NUSS-SRH dataset. Twenty-three percent of participants in the final dataset felt they did not have good appearance, compared to 30% in the excluded dataset as well as in the NUSS-SRH dataset.

3.3 Basic characteristics of participants by MC use during MRS

The basic characteristics of the participants by MC use during MRS are shown in *Table 9*. Variables are presented as demographic factors, family-related factors, health and well-being-related factors, SRH knowledge-related factors, and sexual behaviour-related factors.

<i>The percentage of participants by MC use during MRS</i>			
<i>N= 11, 223</i>	Yes	No	<i>p</i> [*]
<i>Demographic information</i>			
<i>Gender, %</i>			
Female	88.23	11.72	<0.001
Male	86.31	13.69	

<i>School location, %</i>			
East	89.29	10.71	<0.001
Central	85.34	14.66	
West	84.52	15.48	
<i>Current education level, %</i>			
Vocational education level	83.21	16.79	<0.001
Bachelor education level	88.61	11.39	
Postgraduate level	90.60	9.40	
<i>Age Group, %</i>			
≤18 years old	83.49	16.51	<0.001
>18, ≤22	88.10	11.90	
>22, ≤26	88.77	11.23	
>26	82.93	17.07	
<i>Hometown location, %</i>			
East	89.42	10.58	<0.001
Central	85.96	14.04	
West	85.45	14.55	
Outside mainland China	78.57	21.43	
<i>Religious, %</i>			
No	87.67	12.33	0.02
Yes	85.00	15.00	
<i>Ethnic minority, %</i>			
No	87.78	12.22	<0.001
Yes	84.39	15.61	
<i>Monthly expense, %</i>			
<1, 000	84.33	15.67	<0.001
≥1, 000, <2, 000	87.33	12.67	
≥2, 000, <3, 000	88.77	11.23	
≥3, 000, <4, 000	88.62	11.38	
≥4, 000	84.66	15.34	
<i>Hometown region, %</i>			
Urban	88.22	11.78	<0.001
Suburban	86.86	13.14	

Rural	85.43	14.57	
<i>Family-related factors</i>			
<i>Has left-behind child experience, %</i>			
No	88.29	11.71	<0.001
Yes	85.37	14.63	
<i>Father's education level, %</i>			
No formal education	89.07	10.93	0.01
Primary school	85.30	14.70	
Middle school	86.31	13.69	
High school	87.98	12.02	
Vocational school training	88.69	11.31	
Bachelor	89.13	10.87	
Master and above	89.66	10.34	
Don't know	84.42	15.58	
<i>Mother's education level, %</i>			
No formal education	87.32	12.68	<0.001
Primary school	84.64	15.38	
Middle school	86.93	13.07	
High school	87.68	12.32	
Vocational school training	89.19	10.81	
Bachelor	91.16	8.84	
Master and above	87.20	12.80	
Don't know	86.49	13.51	
<i>The only child in the family, %</i>			
No	86.27	13.73	<0.001
Yes	88.89	11.11	
<i>Having divorced parents, %</i>			
No	87.85	12.15	0.01
Yes	85.17	14.83	
<i>Parental death, %</i>			
No	87.60	12.40	0.06
One parent passed away	83.82	16.18	
Both parents passed away	86.36	13.64	

<i>Self-rated family income level, %</i>			
Poor	83.20	16.80	<0.001
Medium	87.78	12.22	
Rich	87.90	12.10	
<i>Family discipline installed on children, %</i>			
Little	87.36	12.64	0.96
Medium	87.50	12.50	
Strong	87.31	12.67	
<i>Parent marriage relationship, %</i>			
Very bad	83.82	16.18	0.07
Bad	86.76	13.24	
Average	88.22	11.78	
Good	87.68	12.32	
Very good	86.81	13.19	
<i>Mother-child relationship, %</i>			
Very bad	88.18	11.82	<0.001
Bad	83.20	16.80	
Average	87.39	12.61	
Good	88.19	11.81	
Very good	86.12	13.88	
<i>Father-child relationship, %</i>			
Very bad	86.61	13.39	0.29
Bad	85.71	14.29	
Average	87.77	12.23	
Good	87.85	12.15	
Very good	86.61	13.39	
<i>Family members' attitudes toward sex-related topics, %</i>			
Very conservative	87.73	12.27	0.68
Conservative	87.78	12.22	
Average	86.79	13.21	
Open	86.86	13.14	
Very open	85.71	14.29	
<i>Frequency of talking with parents on any sex-related topics, %</i>			

Never	86.95	13.05	0.45
Once or twice	87.91	12.09	
Sometimes	88.16	11.84	
Many times	87.89	12.11	
Often	84.62	15.38	
<i>Frequency of talking with parents on specific sexual behaviour related questions, %</i>			
Never	87.08	12.92	0.33
Once or twice	88.16	11.84	
Sometimes	88.28	11.72	
Many times	88.65	11.35	
Often	82.26	17.74	
<i>Frequency of talking with parents on contraception related topics, %</i>			
Never	86.93	13.07	0.02
Once or twice	88.25	11.75	
Sometimes	88.00	12.00	
Many times	91.36	8.64	
Often	82.91	17.09	
<i>Health and wellbeing</i>			
<i>Health status, %</i>			
Very unhealthy	87.35	12.65	0.01
Unhealthy	88.22	11.78	
Average	85.38	14.62	
Healthy	86.13	13.87	
Very healthy	81.82	18.18	
<i>Self-scored physical appearance, %</i>			
Very bad	82.17	17.83	<0.001
Bad	87.66	12.34	
Good	87.82	12.18	
Very good	84.37	15.63	
<i>Self-scored social networking skills, %</i>			
Very bad	85.17	14.83	0.26
Bad	87.54	12.46	
Good	87.74	12.26	

Very good	86.03	13.97	
<i>Frequency of drinking alcohol, %</i>			
Never	88.55	11.45	<0.001
Several times a year	87.83	12.17	
Several times a month	86.28	13.72	
1-3 times a week	82.34	17.66	
More than 3 times a week	73.40	26.60	
Every day	86.67	13.33	
<i>Having a depression, %</i>			
No	88.39	11.61	<0.001
Yes	85.84	14.16	
<i>Smoking status, %</i>			
Never smoked	89.19	10.81	<0.001
Quitted smoking	84.75	15.25	
Currently smoking	81.74	18.26	
<i>Mental health illness, %</i>			
No	87.71	12.29	<0.001
Yes	84.77	15.23	
<i>Suicidal ideas and attempts, %</i>			
Never had suicidal ideas	88.28	11.72	<0.001
Had suicidal ideas	86.91	13.09	
Attempted suicide once	83.61	16.37	
Attempted suicide several times	80.95	19.05	
Sexual and reproductive health knowledge			
<i>Have searched SRH related knowledge online, %</i>			
No	82.59	17.41	<0.001
Yes	87.76	12.24	
<i>Have SRH related questions answered by your father, %</i>			
I have never asked such questions	87.20	12.80	0.11
My father answers the questions very well	89.94	10.06	
My father sometimes answers the questions	88.31	11.69	
My father avoids those questions	89.69	10.31	
My father scolded me asking those questions	84.44	15.56	

<i>Have SRH questions answered by your mother, %</i>			
I have never asked such questions	86.86	13.14	0.04
My mother answers the questions very well	87.86	12.14	
My mother sometimes answers the questions	88.77	11.23	
My mother avoids those questions	89.36	10.64	
My mother scolded me asking those questions	83.98	16.02	
<i>Attended sex education in school, %</i>			
No	87.14	12.86	0.65
Yes	87.55	12.45	
<i>First-time receiving sex education in school, %</i>			
Grade 1-3	90.17	9.83	<0.001
Grade 4-6	90.53	9.47	
Middle school	87.52	12.48	
High school	84.51	15.49	
1 st and 2 nd year in college	87.10	12.90	
3 rd and 4 th year in college	92.21	7.79	
<i>The satisfaction level of the current situation on the provision of sex education in school, %</i>			
Very satisfied	87.31	12.69	<0.001
Moderately satisfied	86.56	13.44	
Average	86.58	13.42	
Moderately unsatisfied	90.72	9.28	
Very unsatisfied	89.54	10.46	
Not sure	86.40	13.60	
<i>The sex education you received included contraception topics, %</i>			
No	88.32	11.68	0.29
Yes	87.28	12.72	
<i>Score on correct knowledge of SRH (full score: 9), mean</i>	5.46	4.91	<0.001*
<i>Have correct knowledge of preventing unintended pregnancies, %</i>			
No	77.50	22.50	<0.001
Yes	91.92	8.08	
Sexual behaviour			
<i>Heterosexual, %</i>			

No	87.66	12.34	0.20
Yes	86.68	13.32	
<i>Number of boyfriends/ girlfriends had, %</i>			
0	88.61	11.39	<0.001
>0, ≤3	86.93	13.07	
>3	83.62	16.38	
<i>Number of sexual partners had, %</i>			
1	89.53	10.47	<0.001
≥2, <5	85.92	14.08	
≥5	81.28	18.72	
<i>The age of having the first adolescent romantic feelings, mean</i>	16.23	16.00	<0.001*
<i>The experience of sexual violence, %</i>			
No	87.75	12.25	0.13
Physical violence	84.32	15.68	
Verbal violence	87.29	12.71	
<i>The age of the first sexual intercourse, mean</i>	18.78	18.22	<0.001*
<i>Experience of high-risk sex, %</i>			
No	88.09	11.91	<0.001
Yes	83.93	16.07	
<i>The decision-makers on contraception use, %</i>			
Female	90.15	9.85	<0.001
Male	87.83	12.17	
Both	89.32	10.68	
Not sure	73.06	26.94	
<i>Self-reported difficulty level to access MCs, %</i>			
Very easy	90.31	9.69	<0.001
Easy	87.41	12.59	
Difficult	80.36	19.64	
Very difficult	80.26	19.74	
<i>Ever received MCs from the family planning clinics, %</i>			
No	87.44	12.56	0.48
Yes	86.82	13.18	

Table 9 The percentage of participants by MC use during MRS

**t test was used to compute p values for continuous variables and chi-square test was applied for categorical variables.*

3.3.2 Demographic information

The results showed that a lower proportion of female participants (12%) was found not using MC during MRS than male participants (14%). Respectively, 11%, 15%, and 15% participants from East, Central, and West parts of China did not use MC during MRS. With higher education level, there was a decrease in the proportion of MC non-use during MRS. Around 12% of participants between the age of 18-22 years and 11% of participants between ages 22-26 did not use MC during MRS, which was much lower than participants aged under 18 years old (17%) and participants aged above 26 years old (17%). Around 12% of non-religious participants did not use MC during MRS, lower than religious participants (15%). Around 12% of Ethnic Han did not use MC during MRS, lower than the ethnic minority participant population (16%).

Participants who spent monthly expenses between 2,000 RMB (250 GBP) and 4,000 RMB (500 GBP) had the lowest proportion (11%) of MCs non-use during MRS. Participants whose monthly expense was under 1,000 RMB (125 GBP) had the highest proportion (16%) of people not using MCs during MRS. Around 12% of participants from urban region, 13% from suburban areas, and 15% from rural areas did not use MCs during MRS.

3.3.2 Family-related factors

Students who had left-behind childhood experience had a higher proportion of MC non-use during MRS (15%) than students who did not have such experience. There was a gradual decrease in the non-use of MC during MRS with the advancement of fathers' and mothers' education levels. However, for participants whose mother and father did not have formal education, the proportion of MC non-use was also low (11%). Students who were the only child in the family had a lower proportion of MC non-use during MRS than student who were not (14% vs. 11%). Participants whose parents were divorced had higher proportion of MC non-use during MRS than participants whose parents were not divorced (15% vs. 10%). The proportion of participants not using MC during MRS among those whose parents had both

passed away (25%) was lower than those who had both parents still alive (12%). The proportion of people not using MC during MRS among participants who reported their family as ‘rich’, ‘moderate’ and ‘poor’ were at the similar level (13%).

A high proportion of MC non-use was observed among participants whose parents were in a ‘very bad marriage’ (16%), with the lowest observed among participant whose parents were in ‘average marriage’ and ‘good marriage’ (12%). Participants who had a ‘bad’ relationship with their mother reported the highest proportion of MC non-use during MRS (17%) compared to who had ‘good’, ‘normal’ and ‘very good’ relationships with their mother, and participants who had ‘bad’ relationship with their father also reported the highest proportion of MC non-use (14%) compared to who had ‘good’, ‘normal’ and ‘very good’ relationships with their father.

3.3.3 Health and well-being related factors

Around 18% of students who reported being ‘very healthy’ did not use MC during MRS, which is much higher than students who reported being ‘unhealthy’ (12%). Participants who reported ‘very bad’ (18%) and ‘very good’ (16%) physical appearance had a higher proportion of not using MC during MRS as compared to participants who reported more average physical appearance (12%). A higher proportion of MC non-use during MRS was observed among participants who reported that they have ‘very bad’ (15%) and ‘very good’ (14%) social skills, compared to participants who reported they have more average social skills (12%). Participants who had never drunk alcohol had the lowest proportion of MC non-use (11%), which was much lower than participants who drank alcohol more than three times a week (27%).

Participants who had never smoked had the lowest proportion of not using MCs during MRS (11%), while participants who were currently smoking had the highest proportion of MCs non-use during MRS (18%). For participants with depression, 14% had not used MCs during MRS, higher than participants who did not have depression (12%). Participants with any mental health illnesses had a higher proportion of not using MC during MRS (15%) than participants who did not have a mental health illness (12%). Participants who had never had suicidal ideas had the lowest proportion of MCs non-use (12%) while participants who had attempted suicide several times had the highest proportion of MCs non-use during MRS (19%).

3.3.4 SRH knowledge related factors

Participants who had searched SRH-related information online had a much lower likelihood of not using MCs during MRS (12%) compared to participants who had not searched such information online (17%). Participants whose mothers and fathers punished their children for asking SRH questions had high proportion of not using MC during MRS (16%). Participants who had their first sex education in primary school had lower proportion of not using MCs during MRS (10%) compared to participants who had their first sex education in middle school (12%) or high school (15%).

The mean score for SRH knowledge among those who used MCs during MRS was 5.5 out of 9, higher than the mean score among those who did not use MCs during MRS (4.9). Participants who had the correct knowledge of preventing unintended pregnancies had a much lower proportion of people not using MCs during MRS (8%) than participants who had incorrect knowledge (23%).

3.3.5 SRH behaviour related factors

Participants who never had a boyfriend or girlfriend had the lowest proportion of people not using MCs during MRS (11%), while participants who had more than three girlfriend/boyfriend had the highest proportion of people not using MCs during MRS (16%). Participants who had only one sexual partner had the lowest proportion of people not using MCs during MRS (10%) while participants who had more than five sexual partners had the highest proportion of people not using MCs during MRS (19%).

The average age of having the first adolescent romantic feelings for participants who used MCs during MRS was 16.23 years old, slightly older than participants who had not used MCs during MRS (16.00 years old). The average age of having the first sexual intercourse for participants who used MCs during MRS was 18.78 years old, older than the participants who did not use MCs during MRS (18.22 years old). A higher proportion of people not using MCs during MRS was observed among participants who have experienced physical violence (16%) compared to participants who have never experienced violence (12%).

Around 12% of participants who had not engaged in high-risk sex did not use MCs during MRS, lower than 16% for participants who had engaged in high-risk sex. Amongst participants who reported that there were no decision makers for contraceptive use, 27% of them reported not using MCs during MRS, higher than participants reporting female (10%), male (12%) and both (11%) being the decision maker(s) on contraceptive use. Participants who reported very easy access to MCs had the lowest proportion of people not using MCs during MRS (10%), while participants who reported very difficult access to MCs had the highest proportion of people not using them during MRS (20%).

3.4 Odds ratio from univariable logistic regressions

The unadjusted associations between sociodemographic and economic factors and odds of MC non-use during MRS are shown in *Table 10*. Variables are presented as demographic factors, family-related factors, health and well-being-related factors, SRH knowledge-related factors, and sexual behaviour-related factors. The Wald-test results are also shown in the table.

<i>The Odds Ratio of MC non-use during MRS from univariable logistic regressions</i>			
<i>N= 11, 223</i>	OR	95% CI	<i>p value in Wald-test</i>
Demographic information			
<i>Male vs. female</i>	1.19	1.08-1.34	<0.001
<i>School locations</i>			
East	1	1	<0.001
Central	1.43	1.25-1.66	
West	1.53	1.34-1.75	
<i>Current education level</i>			
Vocational education	1	1	<0.001
Bachelor education	0.64	0.56-0.72	
Master education	0.51	0.40-0.64	
Doctoral education	0.53	0.31-0.88	
<i>Age Group</i>			
≤18 years old	1	1	<0.001

>18, ≤22	0.68	0.59-0.78	
>22, ≤26	0.63	0.52-0.77	
>26	1.05	0.71-1.56	
<i>Hometown location</i>			
East	1	1	<0.001
Central	1.39	1.21-1.59	
West	1.43	1.26-1.62	
Outside mainland China	2.30	0.64-8.28	
<i>Religious vs. non-religious</i>	1.24	1.03-1.49	0.02
<i>Ethnic minority vs. ethnic Han</i>	1.31	1.11-1.56	<0.001
<i>Monthly expense</i>			
<1, 000	1	1	<0.001
≥1, 000, <2, 000	0.78	0.62-0.99	
≥2, 000, <3, 000	0.68	0.53-0.87	
≥3, 000, <4, 000	0.69	0.52-0.91	
≥4, 000	0.97	0.74-1.28	
<i>Hometown region</i>			
Urban	1	1	<0.001
Suburban	1.13	0.99-1.27	
Rural	1.28	1.09-1.50	
Family level factors			
<i>Had vs. had no left-behind child experience</i>	1.29	1.14-1.45	<0.001
<i>Father's education level</i>			
No formal education	1	1	<0.001
Primary school	1.40	0.96-2.04	
Middle school	1.29	0.90-1.84	
High school	1.11	0.77-1.59	
Vocational school training	1.04	0.71-1.52	
Bachelor	0.99	0.68-1.46	
Master and above	0.94	0.56-1.45	
Don't know	1.50	0.81-2.46	
<i>Mother's education level</i>			
No formal education	1	1	<0.001

Primary school	1.25	0.97-1.59	
Middle school	1.03	0.81-1.31	
High school	0.97	0.77-1.25	
Vocational school training	0.83	0.61-1.07	
Bachelor	0.67	0.49-0.88	
Master and above	1.01	0.65-1.51	
Don't know	1.08	0.62-1.93	
<i>Only child vs. not the only child</i>	0.79	0.70-0.88	<0.001
<i>Parents divorced vs. parents not divorced</i>	1.26	1.08-1.46	0.01
<i>Parental death</i>			
No	1	1	0.05
One parent passed away	1.36	1.05-1.77	
Both parents passed away	1.12	0.33-3.77	
<i>Self-rated family income level</i>			
Poor	1	1	<0.001
Medium	0.70	0.58-0.84	
Rich	0.68	0.53-0.86	
<i>Family discipline over children</i>			
Little	1	1	0.96
Medium	0.99	0.78-1.25	
Strong	1.00	0.78-1.28	
<i>Parents' marriage relationship</i>			
Very bad	1	1	0.05
Bad	0.80	0.60-1.06	
Average	0.70	0.54-0.91	
Good	0.75	0.58-0.96	
Very good	0.84	0.64-1.12	
<i>Mother-child relationship</i>			
Very bad	1	1	0.01
Bad	1.51	0.80-2.82	
Average	1.08	0.60-1.95	
Good	1.00	0.55-1.79	
Very good	1.20	0.66-2.17	

<i>Father-child relationship</i>			
Very bad	1	1	0.30
Bad	1.08	0.73-1.58	
Average	0.89	0.62-1.28	
Good	0.91	0.63-1.29	
Very good	1.05	0.72-1.53	
<i>Family members' attitudes toward sex-related topics</i>			
Very conservative	1	1	0.68
Conservative	1.00	0.88-1.15	
Average	1.09	0.91-1.23	
Open	1.09	0.90-1.31	
Very open	1.19	0.75-1.76	
<i>Frequency of talking with parents on any sex-related topics</i>			
Never	1	1	0.45
Once or twice	0.92	0.81-1.06	
Sometimes	0.90	0.79-1.06	
Many time	0.92	0.66-1.29	
Often	1.21	0.78-2.16	
<i>Frequency of talking with parents on specific sexual behaviour related questions</i>			
Never	1	1	0.34
Once or twice	0.92	0.80-1.07	
Sometimes	0.90	0.76-1.07	
Many time	0.86	0.54-1.37	
Often	1.45	0.75-2.80	
<i>Frequency of talking with parents on contraception related topics</i>			
Never	1	1	0.02
Once or twice	0.86	0.73-1.00	
Sometimes	0.89	0.75-1.07	
Many time	0.60	0.40-0.90	
Often	1.29	0.77-2.14	
Health and wellbeing			
<i>Health status</i>			
Very unhealthy	1	1	0.02

Unhealthy	0.92	0.78-1.01	
Average	1.18	0.95-1.34	
Healthy	1.11	0.81-1.40	
Very healthy	1.54	0.66-3.47	
<i>Self-scored physical appearance</i>			
Very bad	1	1	<0.001
Bad	0.65	0.41-1.03	
Good	0.72	0.41-1.01	
Very good	0.98	0.53-1.39	
<i>Self-scored social networking skills</i>			
Very bad	1	1	0.27
Bad	0.82	0.59-1.23	
Good	0.80	0.59-1.21	
Very good	0.93	0.68-1.45	
<i>Frequency of drinking alcohol</i>			
Never	1	1	<0.001
Several times a year	1.08	0.94-1.23	
Several times a month	1.24	1.08-1.43	
1-3 times a week	1.64	1.26-2.12	
More than 3 times a week	2.99	1.91-4.66	
Every day	1.43	0.75-2.73	
<i>Having or had vs. never had depression</i>	1.28	1.14-1.42	<0.001
<i>Smoking status</i>			
Never smoked	1	1	<0.001
Quitted smoking	1.49	1.27-1.74	
Currently smoking	1.85	1.61-2.11	
<i>Having or had vs. never had mental illness</i>	1.27	1.10-1.49	<0.001
<i>Suicidal ideas and attempts</i>			
Never had suicidal ideas	1	1	<0.001
Had suicidal ideas	1.14	1.01-1.27	
Attempted suicide once	1.45	1.11-1.89	
Attempted suicide several times	1.76	1.29-2.40	
Sexual and reproductive health knowledge			

<i>Searched SRH knowledge online vs. never</i>	0.67	0.56-0.81	<0.001
<i>Have SRH questions answered by your father</i>			
I have never asked such questions	1	1	0.15
My father answers the questions very well	0.86	0.61-1.20	
My father sometimes answers the questions	0.89	0.73-1.09	
My father avoids those questions	0.78	0.60-1.02	
My father scolded me asking those questions	1.29	0.91-1.83	
<i>Have SRH questions answered by your mother</i>			
I have never asked such questions	1	1	0.04
My mother answers the questions very well	0.91	0.73-1.14	
My mother sometimes answers the questions	0.83	0.71-0.97	
My mother avoids those questions	0.77	0.60-1.00	
My mother scolded me asking those questions	1.26	0.86-1.83	
<i>Have attended sex education vs. never</i>	0.96	0.86-1.07	0.51
<i>The first-time receiving sex education in school</i>			
Grade 1-3	1	1	<0.001
Grade 4-6	0.96	0.60-1.54	
Middle school	1.31	0.84-2.05	
High school	1.67	1.06-2.65	
1 st -2 nd year in college	1.38	0.87-2.19	
3 rd -4 th year in college	0.84	0.35-2.04	
<i>The satisfaction level of the current situation of the provision of sex education in school</i>			
Very satisfied	1	1	<0.001
Moderately satisfied	1.05	0.83-1.32	
Average	1.04	0.84-1.29	
Moderately unsatisfied	0.70	0.54-0.90	
Very unsatisfied	0.78	0.60-1.01	
Not sure	1.07	0.86-1.32	
<i>The sex education you received have included contraception topics vs. no</i>	1.11	0.93-1.33	0.26
<i>One score increase in SRH knowledge (full score= 9)</i>	0.87	0.85-0.90	<0.001

<i>Have correct vs. incorrect knowledge of preventing unintended pregnancies</i>	0.30	0.27-0.39	<0.001
Sexual behaviour			
<i>Heterosexual vs. non-heterosexual</i>	1.05	0.92-1.20	0.46
<i>Number of boyfriends/ girlfriends had</i>			
0	1	1	<0.001
>0, ≤3	1.17	1.03-1.32	
>3	1.51	1.31-1.76	
<i>Number of sexual partners the respondent had</i>			
1	1	1	<0.001
≥2, <5	1.40	1.23-1.58	
≥5	1.98	1.70-2.30	
<i>One year increase in the age of having the adolescent romantic feelings</i>	0.97	0.95-0.99	<0.001
<i>The experience of sexual violence</i>			
No	1	1	<0.001
Physical violence	1.33	1.01-1.76	
Verbal violence	1.04	0.93-1.17	
<i>One year increase in the age of the first sexual intercourse</i>	0.88	0.85-0.90	<0.001
<i>Engaged in high-risk sex vs. no</i>	1.41	1.24-1.61	<0.001
<i>The decision-makers for the contraception use between couples</i>			
Female	1	1	<0.001
Male	1.27	1.03-1.56	
Both female and male	1.09	0.90-1.33	
Not sure	3.29	2.65-4.09	
<i>Self-reported difficulty level to access modern contraceptives</i>			
Very easy	1	1	<0.001
Easy	1.34	1.18-1.52	
Difficult	2.28	1.93-2.68	
Very difficult	2.25	1.71-2.95	
<i>Have received vs. have not received any MCs from the family planning clinics</i>	1.05	0.90-1.23	0.51

Table 10 Odds ratio from univariable logistic regression of not using MC during MRS against socioeconomic, demographic, and behavioural factors

3.4.1 Demographic factors

Male participants were more likely to not use MCs during MRS (OR= 1.19, 95% CI: 1.08-1.34) than female participants. Compared to schools located in East China, participants from schools located in Central (OR= 1.43, 95% CI: 1.25-1.66) or West China (OR= 1.53, 95% CI: 1.34-1.75) were more likely to not use MCs during MRS. Compared to participants in vocational education, participants in bachelor education (OR=0.64, 95% CI: 0.56-0.72), master's education (OR= 0.51, 95% CI: 0.40-0.64), and doctoral education (OR= 0.53, 95% CI: 0.31-0.88) had lower odds of not using MCs during MRS. Participants aged between eighteen to twenty-two (OR= 0.68, 95% CI: 0.59-0.78), and between twenty-two to twenty-six (OR= 0.63, 95% CI: 0.52-0.77) had significantly lower odds of not using MCs during MRS, than participants aged under eighteen years old. Participants originally from the Central part of China (OR=1.39, 95% CI: 1.21-1.59) and West part of China (OR= 1.43, 95% CI: 1.26-1.62) were significantly more likely to not use MC during MRS than participants originally from the East part of China. Participants who had a religion had higher odds of not using MC during MRS compared to participants who did not have a religion (OR= 1.24, 95% CI: 1.03-1.49). Compared to Han Ethnicity, ethnic minority participants were more likely to not use MCs during MRS (OR= 1.31, 95% CI: 1.11-1.56). Participants whose monthly expenses were between 1,000-2,000 RMB (OR= 0.78, 95% CI: 0.62-0.99), 2,000-3,000 RMB (OR= 0.68, 95% CI: 0.53-0.87), and 3,000-4,000 RMB (OR= 0.69, 95% CI: 0.52-0.91) had lower odds of not using MCs during MRS than participants whose monthly expense were less than 1,000 RMB. Compared to participants who were originally from urban regions, participants who were originally from rural regions had higher odds of not using MCs during MRS (OR= 1.28, 95% CI: 1.09-1.50).

3.4.2 Family related factors

Participants who had left-behind childhood experiences had significantly higher odds of not using MCs during MRS than participants who had no such experience (OR= 1.29, 95% CI: 1.14-1.45). Participants whose parents were divorced were more likely to not use MCs during MRS compared to participants whose parents were not divorced (OR=1.26, 95% CI: 1.08-1.46).

Having one parent pass away was associated with higher odds of not using MCs during MRS than having both parents alive (OR= 1.36, 95% CI: 1.05-1.77). Being the only child in the family was associated with lower odds of not using MCs during MRS (OR=0.79, 95% CI: 0.70-0.88). Coming from a self-rated ‘average’ (OR= 0.70, 95% CI: 0.58-0.84) or ‘rich’ (OR= 0.68, 95% CI: 0.53-0.86) family was associated with lower odds of not using MCs during MRS, compared to coming from a self-rated ‘poor’ family. Participants who talked with their parents on contraception-related topics many times had lower odds of not using MCs during MRS compared to participants who never talked about such topics with their parents (OR=0.60, 95% CI: 0.40-0.90).

3.4.3 Health and well-being related factors

Drinking alcohol several times a month (OR= 1.24, 95% CI: 1.08-1.43), once to three times weekly (OR= 1.64, 95% CI: 1.26-2.12), and more than three times weekly (OR= 2.99, 95% CI: 1.91-4.66) were associated with higher odds of not using MCs during MRS, compared to participants who never drunk alcohol. Participants who had depression were more likely to not use MCs during MRS than participants who had no depression (OR= 1.28, 95% CI: 1.14-1.42). Participants who smoked, including who had quit smoking (OR=1.49, 95% CI: 1.27-1.74) and who were currently smoking (OR= 1.85, 95% CI: 1.61-2.11) were more likely to not use MCs during MRS than participants who had never smoked. Having mental health illness was associated with higher odds of not using MCs during MRS compared to having no mental health illness (OR= 1.27, 95% CI: 1.10-1.49). Participants who had suicidal ideas (OR= 1.14, 95% CI: 1.01-1.27), who had attempted suicide once (OR= 1.45, 95% CI: 1.11-1.89), or who had attempted suicide several times (OR= 1.76, 95% CI: 1.29-2.40), were more likely to not use MCs during MRS compared to participants who never had suicidal ideas.

3.4.4 SRH related factors

Participants who had searched SRH information online had lower odds of not using MCs during MRS than participants who had not searched such information online (OR= 0.67, 95% CI: 0.56-0.81). Participants whose mothers sometimes answered SRH questions (OR= 0.83, 95% CI: 0.71-0.97), or whose mothers avoided SRH questions (OR= 0.77, 95% CI: 0.60-1.00) had lower odds of not using MCs during MRS than participants who never asked SRH

questions to their mothers. Participants who attended their first sex education during high school were more likely to not use MCs during MRS than participants who attended such education in primary school grade one to three (OR= 1.67, 95% CI: 1.06-2.65). One unit increase in SRH knowledge score was associated with 0.87 the odds of not using MCs during MRS (95% CI: 0.85-0.90). Having the correct knowledge of preventing unintended pregnancies was associated with lower odds of not using MCs during MRS compared to having incorrect knowledge (OR= 0.30, 95% CI: 0.27-0.39).

3.4.5 SRH behaviour related factors

Participants who have had one to three boyfriends/ girlfriends (OR= 1.17, 95% CI: 1.03-1.32) or who have had more than three (OR= 1.51, 95% CI: 1.31-1.76) had higher odds of not using MCs during MRS compared to participants who have never had a boyfriend or girlfriend. Participants who have had two to five sexual partners (OR= 1.40, 95% CI: 1.23-1.58) or who have had more than five sexual partners (OR= 1.98, 95% CI: 1.70-2.30) had higher odds of not using MCs during MRS, compared to participants who have had only one sexual partner. One year increase in the age they started to have adolescent romantic feelings was associated with lower odds of not using MCs during MRS (OR= 0.97, 95% CI: 0.95-0.99), and a one-year increase in the age they had their first sexual intercourse was associated with lower odds of not using MCs during MRS (OR= 0.88, 95% CI: 0.85-0.90). Participants who had experienced physical violence were more likely to not use MCs during MRS than participants who had no violence experience (OR= 1.33, 95% CI: 1.01-1.76). Engagement in high-risk sex was associated with higher odds of not using MCs during MRS (OR= 1.41, 95% CI: 1.24-1.61). Having no clear decision maker in the relationship (OR= 3.29, 95% CI: 2.65-4.09) or males being the decision makers (OR= 1.27, 95% CI: 1.03-1.56) for contraceptive use was associated with higher odds of not using MCs during MRS, compared to females being the decision makers for contraceptive use. Having 'easy' access (OR= 1.34, 95% CI: 1.18-1.52), having 'difficult' access (OR= 2.28, 95% CI: 1.93-2.68), or having 'very difficult' access (OR= 2.25, 95% CI: 1.71-2.95) to MCs was associated with higher odds of not using MCs during MRS compared to having 'very easy' access to MC.

3.5 Odds ratio from progressive logistic multivariable regression

The logistic regression with progressive adjustment of the association between socioeconomic and behavioural variables and the use of MCs during MRS are shown in *Table 11*. Variables were progressively adjusted in 14 models by adding additional variables. The odds of MC non-use during MRS among university students were shown.

Odds ratio from progressive logistic multivariable regression of not using modern contraceptives during the most recent sex against socioeconomic, demographic, and behavioural factors

N= 11,223	Mode	Model	Model	Model	Model	Model	Model	Model	Model	Model	Model	Model	Model	Model
	1 ³	2 ⁴	3 ⁵	4 ⁶	5 ⁷	6 ⁸	7 ⁹	8 ¹⁰	9 ¹¹	10 ¹²	11 ¹³	12 ¹⁴	13 ¹⁵	14 ¹⁶
<i>Male vs. female</i>	*1.13 (1.01-1.27)	1.10 (0.89-1.13)	1.08 (0.95-1.22)	*0.87 (0.77-0.99)	*0.87 (0.76-0.99)	0.87 (0.77-0.99)	*0.76 (0.62-0.93)	*0.73 (0.60-0.89)	*0.73 (0.59-0.90)	*0.73 (0.60-0.90)	*0.74 (0.60-0.91)	*0.74 (0.60-0.91)	*0.74 (0.60-0.91)	*0.74 (0.60-0.91)
<i>Education level</i>														
Vocational college	1	1	1	1	1	1	1	1	1	1	1	1	1	1

³ Model 1: Age, gender, education level

⁴ Model 2: Model 1 + Alcohol use & Smoking; *LR Chi2(3)= 55.82, p<0.001*

⁵ Model 3: Model 2 + Depression & suicidal ideas and attempts & having a mental illness; *LR Chi2(4)= 25.13, p<0.001*

⁶ Model 4: Model 3 + SRH score & Correct knowledge of preventing unintended pregnancies; *LR Chi2 (2)= 403.42, p<0.001*

⁷ Model 5: Model 4 + Monthly expense & Self-rated family income level; *LR Chi2 (3)= 10.45, p= 0.015*

⁸ Model 6: Model 5 + Parents marriage status & Parents death & Self-rated parents' relationship; *LR Chi2 (4)= 7.11, p= 0.130*

⁹ Model 7: Model 6 + Number of romantic relationships & Number of sexual partners & engaged in high-risk sex; *LR Chi2(5)= 25.95, p<0.001*

¹⁰ Model 8: Model 7 + First romantic relationship age & first sexual intercourse age; *LR Chi2(2)= 25.33, p<0.001*

¹¹ Model 9: Model 8 + Ever talked with parents about contraception & SRH questions answered by mothers & Have searched SHR knowledge online; *LR Chi2(7)= 8.94, p= 0.257*

¹² Model 10: Model 9 + The person making decisions on the contraceptive use; *LR Chi2(3)= 126.86, p<0.001*

¹³ Model 11: Model 10 +School location & Home region & have left-behind child experience & Hometown location; *LR Chi2(8)= 22.55, p= 0.004*

¹⁴ Model 12: Model 11 +Having a religion & Ethnic minority; *LR Chi2 (2)= 2.02, p= 0.364*

¹⁵ Model 13: Model 12 + Self-reported difficulty level of accessing modern contraceptives; *LR Chi2(1)= 45.79, p<0.001*

¹⁶ Model 14: Model 13 + Sexual Violence; *LR Chi2 (2) = 4.26, p= 0.018*

Bachelor studies	*0.65 (0.57-0.74)	*0.71 (0.62-0.81)	*0.70 (0.61-0.80)	*0.81 (0.71-0.93)	*0.81 (0.71-0.93)	*0.82 (0.71-0.94)	*0.83 (0.72-0.95)	*0.85 (0.74-0.97)	*0.85 (0.74-0.98)	*0.84 (0.73-0.97)	*0.85 (0.74-0.99)	*0.84 (0.73-0.98)	*0.84 (0.73-0.97)	*0.84 (0.72-0.97)
Post graduate studies	*0.53 (0.40-0.69)	*0.60 (0.45-0.78)	*0.61 (0.46-0.80)	*0.70 (0.53-0.93)	*0.70 (0.53-0.93)	*0.71 (0.53-0.94)	*0.72 (0.54-0.96)	*0.75 (0.56-0.99)	*0.76 (0.57-0.99)	*0.74 (0.57-0.99)	0.76 (0.67-1.01)	0.76 (0.56-1.01)	0.76 (0.57-1.01)	0.76 (0.57-1.02)
<i>One year age increase</i>	1.00 (0.97-1.03)	1.00 (0.97-1.04)	1.00 (0.97-1.04)	1.03 (0.99-1.06)	1.02 (0.99-1.06)	1.02 (0.99-1.06)	1.02 (0.98-1.05)	*1.05 (1.01-1.10)	*1.05 (1.01-1.10)	*1.05 (1.01-1.10)	*1.05 (1.01-1.10)	*1.05 (1.01-1.09)	*1.06 (1.02-1.10)	*1.06 (1.01-1.10)
<i>Alcohol use</i>														
No/ rarely		1	1	1	1	1	1	1	1	1	1	1	1	1
At least monthly		1.01 (0.88-1.15)	0.99 (0.87-1.13)	0.99 (0.86-1.14)	0.99 (0.86-1.14)	0.99 (0.86-1.14)	0.94 (0.82-1.08)	0.95 (0.83-1.10)	0.95 (0.83-1.10)	0.94 (0.81-1.07)	0.94 (0.82-1.09)	0.94 (0.82-1.09)	0.95 (0.82-1.10)	0.95 (0.82-1.10)
<i>Smoking</i>														
Never		1	1	1	1	1	1	1	1	1	1	1	1	1
Quitted smoking		*1.44 (1.22-1.70)	*1.39 (1.18-1.64)	*1.29 (1.09-1.53)	*1.29 (1.09-1.53)	*1.28 (1.08-1.52)	*1.22 (1.03-1.45)	*1.23 (1.04-1.46)	*1.23 (1.04-1.47)	*1.22 (1.02-1.45)	*1.20 (1.01-1.43)	*1.20 (1.00-1.42)	*1.20 (1.01-1.43)	*1.21 (1.01-1.44)
Currently smoking		*1.70	*1.63	*1.50	*1.49	*1.47	*1.35	*1.32	*1.33	*1.30	*1.26	*1.25	*1.26	*1.26

	(1.45- 1.99)	(1.39- 1.91)	(1.27- 1.76)	(1.27- 1.76)	(1.25- 1.74)	(1.14- 1.60)	(1.12- 1.57)	(1.21- 1.58)	(1.10- 1.55)	(1.05- 1.50)	(1.05- 1.50)	(1.05- 1.50)	(1.06- 1.50)
<i>Moderate & severe vs. little & no depression Suicide</i>		*1.20	*1.16	*1.15	*1.15	1.14	1.13	1.14	1.12	1.12	1.12	1.11	1.10
		(1.07- 1.36)	(1.03- 1.32)	(1.02- 1.30)	(1.02- 1.31)	(1.00- 1.29)	(1.00- 1.28)	(1.00- 1.29)	(0.98- 1.27)	(0.99- 1.27)	(0.99- 1.27)	(0.97- 1.26)	(0.97- 1.25)
Never had suicide ideas		1	1	1	1	1	1	1	1	1	1	1	1
Had suicide ideas		*1.19	*1.16	*1.16	*1.15	1.14	1.12	1.13	1.12	1.12	1.12	1.12	1.11
		(1.03- 1.24)	(1.02- 1.31)	(1.02- 1.32)	(1.01- 1.31)	(0.96- 1.38)	(0.99- 1.28)	(0.99- 1.29)	(0.98- 1.28)	(0.98- 1.28)	(0.98- 1.28)	(0.98- 1.28)	(0.97- 1.27)
Had suicide attempts		*1.48	*1.42	*1.41	*1.40	*1.33	*1.30	*1.31	1.29	1.28	1.29	1.28	1.27
		(1.01- 1.63)	(1.11- 1.82)	(1.10- 1.81)	(1.09- 1.80)	(1.04- 1.71)	(1.01- 1.67)	(1.02- 1.68)	(1.00- 1.66)	(1.00- 1.66)	(1.00- 1.66)	(0.99- 1.65)	(0.99- 1.64)
<i>Mental illness vs. no illness One unit increase in</i>		1.22	1.20	1.19	1.19	1.15	1.16	1.17	1.17	1.17	1.17	1.17	1.17
		(0.94- 1.34)	(1.00- 1.44)	(0.99- 1.43)	(0.99- 1.43)	(0.96- 1.38)	(0.97- 1.40)	(0.97- 1.41)	(0.97- 1.41)	(0.97- 1.40)	(0.97- 1.40)	(0.96- 1.40)	(0.97- 1.41)
			*0.94	*0.94	*0.94	*0.93	*0.93	*0.94	*0.94	*0.95	*0.95	*0.95	*0.95

<i>SRH</i>	(0.91-	(0.91-	(0.91-	(0.91-	(0.91-	(0.91-	(0.91-	(0.92-	(0.92-	(0.92-	(0.92-
<i>knowledge</i>	0.96)	0.97)	0.96)	0.96)	0.96)	0.97)	0.97)	0.98)	0.98)	0.98)	0.98)
<i>score</i>											
<i>Correct vs.</i>	*0.32	*0.32	*0.32	*0.33	*0.33	*0.33	*0.35	*0.35	*0.35	*0.35	*0.35
<i>incorrect</i>	(0.28-	(0.29-	(0.29-	(0.29-	(0.29-	(0.30-	(0.31-	(0.31-	(0.31-	(0.31-	(0.31-
<i>knowledge</i>	0.36)	0.36)	0.36)	0.37)	0.37)	0.38)	0.39)	0.40)	0.40)	0.40)	0.40)
<i>of</i>											
<i>preventing</i>											
<i>pregnancy</i>											
<i>Self-rated family income level</i>											
Poor		1	1	1	1	1	1	1	1	1	1
Medium		*0.75	*0.76	*0.75	*0.79	*0.80	*0.80	*0.83	0.83	0.83	0.83
		(0.62-	(0.62-	(0.61-	(0.64-	(0.65-	(0.65-	(0.67-	(0.67-	(0.67-	(0.67-
		0.91)	0.93)	0.92)	0.97)	0.98)	0.99)	0.99)	1.00)	1.02)	1.02)
Rich		*0.74	*0.74	*0.74	*0.74	*0.75	*0.75	*0.78	*0.78	*0.80	*0.82
		(0.58-	(0.58-	(0.57-	(0.57-	(0.58-	(0.58-	(0.62-	(0.62-	(0.63-	(0.67-
		0.86)	0.87)	0.87)	0.87)	0.88)	0.88)	0.90)	0.90)	0.91)	0.91)
<i>Parents</i>			1.19	1.17	1.18	1.18	1.20	1.19	1.18	1.17	1.17
<i>divorced vs.</i>			(0.99-	(0.97-	(0.98-	(0.98-	(1.00-	(0.98-	(0.98-	(0.97-	(0.97-
<i>not</i>			1.43)	1.41)	1.42)	1.43)	1.45)	1.44)	1.43)	1.42)	1.42)
<i>divorced</i>											

<i>Parents death</i>									
Both alive	1	1	1	1	1	1	1	1	1
One parent passed away	1.27 (0.97- 1.66)	1.26 (0.94- 1.65)	1.26 (0.96- 1.66)	1.26 (0.96- 1.65)	1.26 (0.96- 1.67)	1.26 (0.95- 1.65)	1.26 (0.95- 1.65)	1.26 (0.95- 1.65)	1.25 (0.95- 1.65)
Both parents passed away	0.61 (0.17- 2.15)	0.60 (0.17- 2.13)	0.61 (0.17- 2.15)	0.62 (0.18- 2.21)	0.69 (0.19- 2.48)	0.70 (0.19- 2.49)	0.70 (0.19- 2.50)	0.70 (0.19- 2.50)	0.69 (0.19- 2.48)
<i>Number of boyfriends/ girlfriends had</i>									
0		1	1	1	1	1	1	1	1
>0, ≤3		1.17 (0.96- 1.42)	1.19 (0.98- 1.45)	1.19 (0.98- 1.45)	1.19 (0.98- 1.46)	1.20 (0.99- 1.47)	1.20 (0.99- 1.47)	1.21 (0.99- 1.48)	1.21 (0.99- 1.48)
>3		1.12 (0.89- 1.40)	1.16 (0.90- 1.49)	1.21 (0.94- 1.56)	1.23 (0.95- 1.60)	1.25 (0.96- 1.62)	1.25 (0.96- 1.63)	1.26 (0.97- 1.64)	1.27 (0.97- 1.64)
<i>The number of sexual partners had</i>									
1		1	1	1	1	1	1	1	1
≥2, <5		1.21	1.21	1.20	1.18	1.15	1.14	1.13	1.12

	(1.00- 1.38)	(1.00- 1.35)	(0.99- 1.35)	(0.99- 1.33)	(0.99- 1.32)	(0.98- 1.32)	(0.97- 1.30)	(0.97- 1.30)
≥ 5	*1.46	*1.46	1.21	1.21	1.21	1.22	1.22	1.22
	(1.18- 1.81)	(1.18- 1.84)	(0.95- 1.53)	(0.94- 1.52)	(0.94- 1.52)	(0.96- 1.55)	(0.96- 1.55)	(0.96- 1.55)
<i>Had vs. had no high risk sexual activities</i>	1.06	1.07	1.08	1.05	1.07	1.07	1.07	1.06
	(0.88- 1.28)	(0.89- 1.29)	(0.89- 1.30)	(0.87- 1.27)	(0.88- 1.29)	(0.88- 1.30)	(0.88- 1.29)	(0.88- 1.29)
<i>One year increase in age of having first adolescent romantic feelings</i>		1.03	1.03	1.03	1.03	1.03	1.03	*1.03
		(1.00- 1.06)	(1.00- 1.06)	(1.00- 1.06)	(1.00- 1.06)	(1.00- 1.06)	(1.00- 1.06)	(1.01- 1.06)
<i>One year increase in age of first sexual intercourse</i>		*0.90	*0.90	*0.90	*0.91	*0.91	*0.91	*0.91
		(0.87- 0.94)	(0.86- 0.94)	(0.87- 0.94)	(0.87- 0.94)	(0.87- 0.94)	(0.87- 0.94)	(0.87- 0.94)

<i>Frequency of talking with parents about contraceptive knowledge</i>						
Never	1	1	1	1	1	1
Sometimes	0.90 (0.78- 1.04)	0.88 (0.76- 1.04)	0.90 (0.78- 1.04)	0.90 (0.78- 1.04)	0.91 (0.78- 1.05)	0.91 (0.79- 1.05)
Often	0.80 (0.56- 1.13)	0.79 (0.55- 1.12)	0.81 (0.57- 1.15)	0.81 (0.57- 1.16)	0.82 (0.57- 1.16)	0.82 (0.58- 1.18)
<i>Have searched SRH knowledge online vs. never</i>	0.91 (0.75- 1.11)	0.87 (0.72- 1.07)	0.88 (0.72- 1.07)	0.88 (0.72- 1.08)	0.88 (0.72- 1.07)	0.88 (0.72- 1.07)
<i>Have SRH questions answered by your mother</i>						
Never asked	1	1	1	1	1	1
My mother answers the questions well	1.10 (0.86- 1.42)	1.15 (0.89- 1.48)	1.16 (0.90- 1.49)	1.15 (0.89- 1.49)	1.16 (0.90- 1.50)	1.17 (0.91- 1.51)

My mother	0.95	0.97	0.98	0.98	0.97	0.97
sometimes	(0.80-	(0.82-	(0.82-	(0.82-	(0.82-	(0.82-
answers the	1.13)	1.16)	1.61)	1.16)	1.16)	1.16)
questions						
My mother	0.83	0.85	0.86	0.86	0.85	0.85
avoids those	(0.63-	(0.65-	(0.66-	(0.65-	(0.65-	(0.65-
questions	1.08)	1.11)	1.29)	1.13)	1.12)	1.12)
My mother	1.18	1.22	1.22	1.22	1.18	1.18
scolded me	(0.78-	(0.81-	(0.81-	(0.80-	(0.77-	(0.78-
for asking	1.78)	1.85)	1.85)	1.85)	1.79)	1.80)
those						
questions						
<i>Decision makers on contraceptive use</i>						
Female		1	1	1	1	1
Male		1.09	1.10	1.09	1.09	1.08
		(0.87-	(0.87-	(0.87-	(0.86-	(0.86-
		1.37)	1.38)	1.37)	1.36)	1.36)
Both		1.18	1.20	1.21	1.21	1.20
		(0.96-	(0.98-	(0.98-	(0.98-	(0.98-
		1.45)	1.48)	1.48)	1.49)	1.48)
Hard to say		*2.77	*2.80	*2.80	*2.75	*2.74

	(2.19- 3.51)	(2.21- 3.54)	(2.21- 3.54)	(2.17- 3.47)	(2.16- 3.47)
<i>School location</i>					
East China		1	1	1	1
Middle China		1.18 (0.96- 1.43)	1.18 (0.96- 1.43)	1.17 (0.93- 1.43)	1.16 (0.95- 1.42)
West China		1.14 (0.94- 1.38)	1.13 (0.93- 1.38)	1.13 (0.93- 1.37)	1.13 (0.93- 1.38)
<i>Hometown location</i>					
East China		1	1	1	1
Middle China		1.14 (0.94- 1.39)	1.14 (0.94- 1.38)	1.12 (0.93- 1.36)	1.12 (0.93- 1.35)
West China		1.15 (0.95- 1.39)	1.12 (0.93- 1.37)	1.11 (0.91- 1.35)	1.10 (0.91- 1.34)
<i>Region of hometown</i>					
Urban		1	1	1	1
Township		1.05	1.05	1.05	1.05

	(0.92-	(0.91-	(0.91-	(0.91-
	1.21)	1.20)	1.20)	1.20)
Rural	1.10	1.10	1.10	1.09
	(0.92-	(0.91-	(0.91-	(0.90-
	1.33)	1.31)	1.30)	1.30)
<i>Left behind</i>	1.05	1.04	1.04	1.04
<i>child exp.</i>	(0.93-	(0.93-	(0.92-	(0.91-
<i>Vs. no</i>	1.19)	1.19)	1.19)	1.19)
<i>Religious</i>		1.04	1.04	1.04
<i>vs. non-</i>		(0.85-	(0.85-	(0.85-
<i>religious</i>		1.27)	1.27)	1.27)
<i>Ethnic</i>		1.15	1.15	1.15
<i>minority vs.</i>		(0.94-	(0.95-	(0.95-
<i>majority</i>		1.39)	1.40)	1.40)
<i>Difficult vs.</i>			*1.66	*1.66
<i>easy access</i>			(1.43-	(1.43-
<i>to MCs</i>			1.91)	1.91)
<i>Sexual violence</i>				
No				1
Physical				*1.38
violence				

	(1.02-
	1.85)
Verbal	1.02
violence	(0.89-
	1.17)

Marked in bold and with “*”: *p* value <0.05 in the multivariable logistic regression model.

Table 11 Odds ratio from progressive logistic multivariable regression of not using modern contraceptives during the most recent sex against socioeconomic, demographic and behavioural factors

In the fully adjusted model (model 14), I found that gender (p value= 0.004), education level (p value= 0.030), age (p value= 0.012), smoking cigarettes (p value= 0.010), SRH knowledge (p value= 0.001), having correct knowledge on preventing pregnancies (p value< 0.001), family income (p value= 0.045), age of having the first romantic feelings (p value= 0.031), age of having the first sex (p value< 0.001), experience of violence (p value= 0.036), decision makers on contraceptive use between the couple (p value< 0.001) and access to MC (p value= 0.002) are all significantly associated with university students' non-use of MCs. More detailed results are presented below.

In the fully adjusted model, compared to females, male students had lower odds of not using MCs during MRS (OR=0.74, 95% CI: 0.60-0.91). Conversely, in the basic adjustment model, male students, as compared to female students, were more likely to not use MCs during MRS (OR= 1.13, 95% CI: 1.01-1.27). After adjusting for alcohol use and smoking, the association between gender and the use of MCs during MRS became non-significant. However, after further adjusting for SRH knowledge and correct knowledge of preventing pregnancies being male was associated with a decreased odds of non-use of MCs. The adjustment of new variables did not further attenuate the association.

Compared to vocational students, bachelor students had lower odds of not using MCs during MRS (OR=0.84, 95% CI: 0.72-0.97). The associations were significant in all progressive logistic models. In the fully adjusted model, compared to vocational students, there was no significant difference in the odds of not using MCs during MRS among post-graduate students (OR=0.76, 95% CI: 0.57-1.02). However, in the basic adjustment model, postgraduate students had lower odds of not using MCs during MRS than vocational students (OR= 0.53, 95% CI: 0.40-0.69). The association became non-significant after adjusting for the variables: having ever talked with parents about contraception, having SRH questions answered by your mother, and searching for SRH information online.

In the fully adjusted model, one year increase in age was associated significantly with higher odds of non-use of MCs during MRS (OR= 1.06, 95% CI: 1.01-1.10). The association was consistent in all progressive logistic models. The Bonferroni corrections showed a significant p value as well.

Students who had smoking experience, including those who had quit smoking and who were currently smoking, had significantly higher odds of not using MCs during MRS (OR= 1.21, 95%CI: 1.01-1.44; OR=1.26, 95% CI: 1.06-1.50 respectively), as compared to students who have never smoked.

Having moderate or severe depression was initially associated with higher odds of not using MCs during MRS (OR= 1.20, 95% CI: 1.07-1.36) compared to having little or no depression. After adjusting for the person making decisions on the contraceptive use, the association attenuated and became non-significant, including in the fully adjusted logistic model.

Compared to having no suicidal ideas, having suicidal thoughts was significantly associated with an increased likelihood of not using MCs during MRS (OR= 1.19, 95%CI: 1.03-1.24) initially. Further, the association became non-significant after adjusting for number of boyfriend or girlfriend had, number of sexual partners had and whether engaged in high-risk sex. Compared to having no suicidal ideas, having attempted suicide was initially significantly associated with higher odds of not using MCs during MRS (OR=1.48, 95% CI: 1.01-1.63). After adjusting for the self-reported difficulty level of accessing MCs, the association became non-significant, including in the fully-adjusted logistic model.

In the fully-adjusted model, each one unit increase in SRH knowledge score was significantly associated with lower odds of not using MCs during MRS (OR=0.95, 95% CI:0.92-0.98). This association was consistent in all progressive models. Students who had correct knowledge of preventing unintended pregnancies had significantly lower odds of not using MCs during MRS (OR=0.35, 95% CI: 0.31-0.40) than students who had incorrect knowledge. The association was consistent in all progressive adjustment models. The Bonferroni corrections showed a significant *p value*.

Compared to students who reported low family income, students who reported high family income had significantly lower odds of not using MCs during MRS (OR= 0.82, 95% CI: 0.67-0.91). The association was consistent in all progressively adjusted models. In addition, students who reported medium family income levels initially had significantly lower odds of not using MCs during MRS (OR= 0.75, 95% CI: 0.62-0.91). However, the association attenuated after adjusting for having a religion and being an ethnic minority person.

Having more than five sexual partners was initially significantly associated with a higher likelihood of not using MCs during MRS (OR= 1.46, 95% CI: 1.18-1.81). The association became non-significant after adjusting for ever talked with parents on contraception topics, having SRH questions answered by your mother, and having searched SRH questions online. This association was not significant in the fully adjusted logistic model.

In the fully adjusted model, one year increase in the age of having the first adolescent romantic feelings (OR=1.03, 95% CI: 1.00-1.06) and one year increase in the age of having first sexual intercourse (OR= 0.91, 95% CI: 0.87-0.94) were significantly associated with respectively higher and lower odds of not using MCs during MRS. These associations were significant in all progressive logistic models. The Bonferroni corrections showed significant *p values*.

Compared to couples where females make decisions on contraceptive use, couples who did not have a decision maker for contraceptive use had significantly higher odds of non-use of MCs during MRS in the fully adjusted model (OR= 2.74, 95% CI: 2.16-3.47). The association was consistent through all progressive logistic models. The Bonferroni corrections showed a significant *p value* as well. No significant differences in the odds of MCs use during MRS had been observed among couples with males or with two parties jointly making decisions in contraceptive use compared to couples with females making decisions in contraceptive use.

Students who reported having difficulties accessing MCs had significantly higher odds of not using MCs during MRS than students who did not report difficulties accessing MCs in the fully adjusted model (OR= 1.66, 95% CI: 1.43-1.91). The association was consistent in all progressive logistic models. The Bonferroni corrections showed a significant *p value* as well.

In the fully adjusted model, students who experienced physical violence had significantly higher odds of non-use of MCs during MRS (OR= 1.38, 95% CI: 1.02-1.85) compared to students who had no experience of violence.

On the LR tests, it was found that, except Model 6, Model 9 and Model 12, all new models were a better fit than the previous model.

3.6 Odds ratio from gender-stratified logistic adjustment multivariable regression

The gendered stratified logistic adjustment of the association between socioeconomic and behavioural variables and the non-use of MC during MRS are shown in *Table 12*.

<i>Odds ratio of not using MCs during MRS</i>		
	Gender stratified (Female)	Gender stratified (Male)
N	6,458	4,765
<i>Male vs. female</i>	-	-
<i>Currently enrolled education level</i>		
Vocational college	1	1
Bachelor studies	0.86 (0.70-1.06)	0.78 (0.63-0.96)
Post graduate studies	0.66 (0.43-0.99)	0.82 (0.54-1.24)
<i>One year increase in age</i>	1.05 (0.99-1.11)	1.08 (1.02-1.14)
<i>Alcohol use</i>		
>monthly vs. none or rarely	0.86 (0.69-1.07)	1.03 (0.85-1.25)
<i>Smoking</i>		
Never smoked	1	1
Quitted smoking	1.45 (1.14-1.84)	0.99 (0.77-1.30)
Currently smoking	1.78 (1.33-2.39)	1.09 (0.87-1.36)
<i>Having moderate or severe vs. no or little depression</i>	1.09 (0.92-1.30)	1.08 (0.89-1.31)
<i>Suicide ideas and attempts</i>		
Never had suicide ideas	1	1
Had suicide ideas	1.07 (0.89-1.30)	1.07 (0.89-1.31)
Had suicide attempts	0.98 (0.70-1.36)	1.71 (1.11-2.63)
<i>Having mental illness vs. having no mental illness</i>	1.24 (0.98-1.57)	0.97 (0.70-1.34)
<i>One unit increase in SRH knowledge score</i>	0.95 (0.91-0.99)	0.92 (0.90-0.99)
<i>Correct vs. incorrect knowledge of preventing pregnancy</i>	0.27 (0.23-0.32)	0.45 (0.38-0.54)

<i>1,000 yuan increase in monthly expense</i>	0.97 (0.92-1.02)	0.97 (0.91-1.01)
<i>Self-rated family income level</i>		
Poor	1	1
Medium	0.88 (0.65-1.17)	0.83 (0.61-1.13)
Rich	0.80 (0.58-1.11)	0.80 (0.57-1.12)
<i>Parents divorced vs. not divorced</i>	1.22 (0.95-1.56)	1.08 (0.78-1.48)
<i>Parents death</i>		
Both parents are alive	1	1
One parent passed away	1.21 (0.82-1.78)	1.27 (0.85-1.88)
Both parents passed away	1.61 (0.30-8.60)	0.32 (0.04-2.67)
<i>One unit increase in self rated parents' relationship quality score</i>	0.99 (0.95-1.03)	1.04 (0.99-1.08)
<i>Number of boyfriend or girlfriend</i>		
0	1	1
>0, ≤3	1.81 (1.39-2.34)	0.65 (0.47-0.89)
>3	1.89 (0.96-3.72)	0.77 (0.54-1.10)
<i>Number of sexual partners</i>		
1	1	1
≥2, <5	1.21 (0.99-1.48)	0.93 (0.74-1.15)
≥5	1.08 (0.75-1.56)	1.09 (0.79-1.51)
<i>Had high risk sexual activities vs. had no high-risk sexual activities</i>	1.09 (0.82-1.46)	0.94 (0.72-1.22)
<i>One year increase in the age of having first adolescent romantic feelings</i>	1.06 (1.02-1.10)	0.99 (0.95-1.04)
<i>One year increase in the age of first sexual intercourse</i>	0.89 (0.84-0.94)	0.93 (0.87-0.99)
<i>Frequency of talking with parents on contraceptive knowledge</i>		
Never	1	1
Sometimes	0.86 (0.70-1.06)	0.96 (0.78-1.18)
Often	0.80 (0.50-1.30)	0.89 (0.51-1.54)
<i>Have searched vs. have not searched SRH knowledge online</i>	1.00 (0.73-1.37)	0.81 (0.62-1.05)

<i>Have SRH questions answered by your mother</i>		
Never asked	1	1
My mother answers the questions well	1.41 (1.03-1.93)	0.64 (0.38-1.07)
My mother sometimes answers the questions	0.96 (0.76-1.20)	1.01 (0.76-1.34)
My mother avoids those questions	0.70 (0.47-1.05)	0.96 (0.66-1.40)
My mother scolded me for asking those questions	1.17 (0.71-1.93)	1.27 (0.55-2.89)
<i>The person normally making decisions on contraceptive use</i>		
Female	1	1
Male	1.23 (0.92-1.65)	0.88 (0.57-1.36)
Both	1.30 (1.01-1.66)	0.99 (0.65-1.52)
Hard to say	3.34 (2.50-4.46)	2.01 (1.28-3.18)
<i>University location</i>		
East China	1	1
Middle China	1.22 (0.92-1.62)	1.14 (0.85-1.53)
West China	1.07 (0.82-1.40)	1.25 (0.93-1.68)
<i>Hometown location</i>		
East China	1	1
Middle China	1.05 (0.80-1.38)	1.17 (0.89-1.54)
West China	1.29 (0.99-1.67)	0.88 (0.65-1.19)
<i>Region of hometown</i>		
Urban	1	1
Township	1.06 (0.88-1.29)	1.06 (0.87-1.30)
Rural	1.44 (1.11-1.86)	0.85 (0.65-1.12)
<i>Had vs. had no left-behind child experience</i>	0.90 (0.75-1.08)	1.20 (0.99-1.46)
<i>Has a religion vs. has no religion</i>	1.16 (0.88-1.53)	0.93 (0.69-1.25)
<i>Ethnic minority vs. majority</i>	1.16 (0.89-1.51)	1.17 (0.86-1.59)
<i>Have difficulty vs. easy access to MCs</i>	1.78 (1.46-2.16)	1.51 (1.22-1.87)
<i>Have experienced violence</i>		
No violence	1	1
Physical violence	1.21 (0.78-1.89)	1.69 (1.12-2.56)

Verbal violence	1.03 (0.84-1.26)	1.01 (0.84-1.21)
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Table 12 Odds ratio from gender stratified logistic adjustment multivariable regression of not using MC during MRS against socioeconomic, demographic and behavioural factors.

In the gender stratification, male bachelor students had significantly lower odds of not using MCs during MRS than male vocational school students (OR=0.78, 95%CI: 0.63-0.96). A significant association was not observed among female students. Female postgraduate students had lower odds of not using MCs during MRS than female vocational school students (OR= 0.66, 95%CI: 0.43-0.99). A significant association was not observed among male postgraduate students.

One year increase in age was associated with higher odds of not using MCs during MRS among male students (OR=1.08, 95% CI: 1.02-1.14), and no such significant association was observed among female students.

Having smoking experience, including having quit smoking and currently smoking, was associated with higher odds of not using MCs during MRS, as compared to having no smoking experience among female students (for female students who had quit smoking OR=1.45, 95% CI: 1.14-1.84; for female students currently smoking OR=1.78, 95% CI: 1.33-2.39). Such significant associations were not observed among male students.

Male students who had attempted suicide were significantly more likely to not use MCs during MRS than male students who had no suicidal ideas (OR=1.71, 95% CI: 1.11-2.63). No such significant associations were found among female students.

Both male (OR=0.27, 95% CI: 0.23-0.32) and female (OR= 0.45, 95% CI: 0.38-0.54) students who had correct knowledge of preventing unintended pregnancies had lower odds of MC non-use during MRS compared to those who had incorrect knowledge of preventing unintended pregnancies. Per one unit increase in SRH knowledge score was associated with lower odds of not using MCs during MRS for both male (OR=0.95, 95% CI: 0.91-0.99) and female (OR= 0.92, 95% CI: 0.90-0.99) students.

Female students who had a moderate number (0-3) of romantic relationships were more likely to not use MCs during MRS (OR= 1.81, 95% CI: 1.39-2.34), while male students who had a moderate number of romantic relationships had lower odds of not using MCs (OR= 0.65, 95%

CI: 0.47-0.89), compared to students had no romantic relationships.

A yearly increase in the age of the first adolescent romantic feelings was associated with higher odds of not using MC among females (OR=1.06, 95%CI: 1.02-1.10). A yearly increase in the age of first sexual intercourse was associated with lower odds of not using MC among both males (OR=0.93, 95% CI: 0.87-0.99) and females (OR= 0.89, 95% CI: 0.84-0.94).

Female students whose mother answered their SRH questions very well had significantly higher odds of not using MCs during MRS (OR= 1.41, 95% CI: 1.03-1.93) compared to female students who had never asked SRH questions to their mother.

Both female (OR=1.34, 95% CI: 2.50-4.46) and male (OR=2.01, 95% CI: 1.28-3.18) students who reported that there were no decision makers for using contraception had significantly higher odds of not using MCs during MRS, as compared to students who said that females were the decision maker in contraceptive use. Female students who reported that couples make joint decisions on contraceptive use had significantly higher odds of not using MCs during MRS than female students who said they were the decision makers in contraceptive use (OR=1.30, 95% CI: 1.01-1.66).

Female rural students were more likely to not use MCs during MRS than female urban students (OR=1.44, 95% CI: 1.11-1.86). No such association was found among male students.

Having self-reported difficulties accessing MCs was associated with a significantly higher likelihood of not using MCs during MRS for both male (OR=1.51, 95% CI: 1.22-1.87) and female students (OR=1.78, 95% CI: 1.46-2.16).

Male students who experienced physical violence were more likely to not use MCs during MRS (OR= 1.69, 95% CI: 1.12-2.56) than male students who didn't experience violence. No significant association was found in female students.

3.7 Odds ratio from gender stratified logistic adjustment multivariable regression of SRH knowledge quiz score

The odds ratio from gender stratified ordinal regression of the nine-point SRH test against socioeconomic, demographic and behavioural factors and the odds ratio from the ordered logistic models of the nine-point SRH test against socioeconomic, demographic and behavioural factors are shown in *Table 13*.

Odds ratio of one unit increase in SRH knowledge score			
	Ordered logistic model	Gender stratified (Male)	Gender stratified (Female)
N	11,223	6,458	4,765
<i>Male vs. female</i>	0.64 (0.57-0.71)	-	-
<i>Education level</i>			
Vocational college	1	1	1
Bachelor studies	1.52 (1.40-1.65)	1.71 (1.51-1.94)	1.39 (1.24-1.56)
Postgraduate studies	1.71 (1.47-1.99)	1.80 (1.43-2.28)	1.65 (1.35-2.01)
<i>One year increase in age</i>	1.13 (1.10-1.15)	1.13 (1.09-1.17)	1.12 (1.08-1.15)
<i>Alcohol use</i>			
>monthly vs. none or rarely	0.94 (0.86-1.01)	0.88 (0.79-0.98)	0.98 (0.88-1.11)
<i>Smoking</i>			
Never smoked	1	1	1
Quitted smoking	0.99 (0.89-1.09)	0.91 (0.78-1.06)	1.05 (0.91-1.20)
Currently smoking	0.86 (0.78-0.95)	0.84 (0.74-0.96)	0.86 (0.72-1.02)
<i>Having moderate or severe depression vs. no or little depression</i>	0.90 (0.84-0.97)	0.88 (0.78-0.98)	0.92 (0.84-1.01)
<i>Suicide</i>			
Never had suicidal ideas	1	1	1
Have had suicidal ideas	1.08 (1.01-1.16)	1.12 (0.99-1.25)	1.06 (1.02-1.32)
Have attempted suicide	1.18 (1.01-1.37)	1.26 (0.94-1.68)	1.18 (0.99-1.41)

<i>Mental illness vs. no mental illness</i>	1.13 (1.01-1.26)	1.10 (0.90-1.33)	1.16 (1.02-1.32)
<i>Correct vs. incorrect knowledge of preventing pregnancy</i>	1.73 (1.61-1.86)	1.77 (1.60-1.97)	1.72 (1.55-1.91)
<i>Self-rated family income level</i>			
Poor	1	1	1
Medium	1.13 (0.99-1.28)	1.03 (0.85-1.25)	1.20 (1.01-1.42)
Rich	1.12 (0.95-1.31)	1.01 (0.79-1.28)	1.20 (0.96-1.49)
<i>Parents divorced vs. parents not divorced</i>	0.96 (0.86-1.07)	0.92 (0.76-1.11)	0.97 (0.85-1.11)
<i>Parents death</i>			
Both parents are alive	1	1	1
One parent passed away	1.11 (0.94-1.31)	1.23 (0.96-1.58)	1.00 (0.81-1.25)
Both parents passed away	0.53 (0.26-1.07)	0.83 (0.34-2.00)	0.39 (0.12-1.24)
<i>One unit increase in self rated parents' marriage quality score</i>	0.98 (0.97-0.99)	0.98 (0.95-0.99)	0.98 (0.96-0.99)
<i>Number of boyfriend or girlfriend had</i>			
0	1	1	1
>0, ≤3	1.22 (1.10-1.35)	1.71 (1.43-2.06)	0.91 (0.79-1.03)
>3	1.37 (1.19-1.57)	1.79 (1.46-2.20)	1.31 (0.93-1.85)
<i>Number of sexual partners had</i>			
1	1	1	1
≥2, <5	0.97 (0.89-1.05)	0.91 (0.80-1.03)	1.03 (0.92-1.14)
≥5	0.98 (0.85-1.14)	1.03 (0.84-1.26)	0.96 (0.78-1.19)
<i>Had high risk sexual activities vs. had no high risk sexual activities</i>	1.07 (0.96-1.20)	1.02 (0.87-1.19)	1.25 (1.06-1.47)
<i>One year increase in age of first adolescent romantic feelings</i>	1.00 (0.99-1.01)	0.97 (0.95-0.99)	1.03 (1.01-1.04)
<i>One year increase in age of first sexual intercourse</i>	0.98 (0.96-1.01)	0.99 (0.96-1.03)	0.97 (0.94-1.01)
<i>Frequency of talking with parents on SRH topics</i>			
Never	1	1	1
Sometimes	1.09 (1.01-1.17)	1.06 (0.94-1.20)	1.09 (0.99-1.21)
Often	1.18 (0.99-1.41)	1.19 (0.89-1.58)	1.18 (0.94-1.49)

<i>Have searched vs. have not searched SRH knowledge online</i>	2.46 (2.18-2.79)	2.09 (1.77-2.47)	2.87 (2.39-3.44)
<i>Have SRH questions answered by your mother</i>			
Never asked	1	1	1
My mother answers the questions well	1.24 (1.08-1.42)	1.34 (1.05-1.72)	1.20 (1.01-1.41)
My mother sometimes answers the questions	1.18 (1.08-1.29)	1.24 (1.06-1.45)	1.15 (1.02-1.28)
My mother avoids those questions	1.14 (0.99-1.31)	1.26 (1.02-1.56)	1.10 (0.91-1.32)
My mother scolded me for asking those questions	1.18 (0.91-1.52)	0.54 (0.31-0.92)	1.44 (1.08-1.92)
<i>Decision makers on contraceptive use</i>			
Female	1	1	1
Male	0.84 (0.75-0.95)	1.12 (0.87-1.44)	0.67 (0.57-0.78)
Both	1.06 (0.96-1.18)	1.23 (0.96-1.58)	1.06 (0.94-1.19)
Hard to say	0.82 (0.72-0.95)	0.97 (0.73-1.28)	0.82 (0.70-0.98)
<i>School location</i>			
East China	1	1	1
Middle China	0.90 (0.81-1.00)	0.9 (0.77-1.09)	0.88 (0.76-1.01)
West China	0.86 (0.77-0.96)	0.83 (0.70-0.98)	0.86 (0.75-0.99)
<i>Hometown location</i>			
East China	1	1	1
Middle China	0.98 (0.89-1.09)	1.02 (0.88-1.20)	0.97 (0.84-1.10)
West China	0.97 (0.87-1.08)	0.95 (0.81-1.12)	1.02 (0.89-1.17)
<i>Region of hometown</i>			
Urban	1	1	1
Township	0.90 (0.84-0.97)	0.89 (0.79-0.99)	0.92 (0.83-1.01)
Rural	0.73 (0.66-0.81)	0.69 (0.59-0.81)	0.75 (0.65-0.86)
<i>Had vs. had no left-behind child experience</i>	0.91 (0.85-0.98)	0.88 (0.79-0.99)	0.93 (0.84-1.03)
<i>Has a religion vs. has no religion</i>	0.98 (0.87-1.11)	1.04 (0.88-1.24)	0.95 (0.80-1.11)
<i>Ethnic minority vs. majority</i>	0.75 (0.67-0.84)	0.69 (0.58-0.82)	0.78 (0.68-0.91)

<i>Have difficulty vs. easy access to MCs</i>	0.81 (0.74-0.88)	0.89 (0.78-1.02)	0.76 (0.67-0.85)
<i>Violence</i>			
No violence	1	1	1
Physical violence	1.07 (0.90-1.29)	1.06 (0.81-1.40)	1.14 (0.90-1.46)
Verbal violence	1.13 (1.05-1.21)	1.08 (0.97-1.19)	1.22 (1.10-1.35)

Table 13 Odds ratio from gender stratified logistic adjustment multivariable regression of one score increase in SRH knowledge quiz score against socioeconomic, demographic and behavioural factors

3.7.1 Ordered logistic model

The association between socioeconomic and behavioural factors and SRH knowledge score was presented in Table 13. In the fully adjusted ordered logistic model, males had a lower odd of having a higher SRH score (OR=0.64, 95%CI: 0.57-0.71). Being one year older was associated with higher odds of having a higher SRH score (OR= 1.13, 95% CI: 1.10-1.15).

Compared to vocational level education, participants who were studying at a bachelor level education had a significantly higher odds of having a higher SRH score (OR=0.64, 95%CI: 0.57-0.71). Compared to vocational level education, participants who were studying at a postgraduate level had a significantly higher odds of having a higher SRH score (OR= 1.74, 95% CI: 1.47-1.99). Compared to schools in East part of China, participants from schools in West part of China were less likely to have higher SRH scores (OR= 0.86, 95% CI: 0.77-0.96).

Participants who were currently smoking were less likely to have a higher SRH score (OR= 0.86, 95% CI: 0.78-0.95), compared to participants who never smoked. Participants who had moderate or severe depression had significantly lower odds of having a higher SRH score (OR= 0.90, 95% CI: 0.84-0.97) compared to participants who had no or little depression.

Having suicidal ideas was associated with higher odds of having a higher SRH score (OR= 1.08, 95% CI: 1.01-1.16), as compared to participants having no suicidal ideas. Having attempted suicide previously was associated with higher odds of having a higher SRH score (OR= 1.18, 95% CI: 1.01-1.37) as compared to having no suicidal ideas. Participants who had

a mental illness were more likely to have a higher SRH score (OR= 1.13, 95% CI: 1.01-1.26) compared to participants who had no mental illness.

Participants who had correct knowledge of preventing unintended pregnancies were more likely to have a higher SRH score (OR= 1.73, 95% CI: 1.61-1.86) than participants who had incorrect knowledge of preventing unintended pregnancies. Participants who had searched SRH knowledge online were more likely to have a higher SRH score (OR= 2.46, 95% CI: 2.18-2.79) than participants who had not searched SRH knowledge online.

Compared to participants who had no previous boyfriends or girlfriends, participants who had between one to three boyfriends or girlfriends were more likely to have higher SRH scores (OR= 1.22, 95% CI: 1.10-1.35), and participants who had more than three boyfriends or girlfriends were also more likely to have higher SRH scores (OR= 1.37, 95% CI: 1.19-1.57).

Participants who sometimes talked to their parents about contraceptive topics were more likely to have a higher SRH score than participants who never talked to their parents on contraceptive topics (OR= 1.09, 95% CI: 1.01-1.17). Compared to participants who had never asked their mothers about SRH related questions, participants whose mothers answered those questions well (OR= 1.24, 95% CI: 1.08-1.42), and participants whose mothers sometimes answered those questions (OR= 1.18, 95% CI: 1.08-1.29) were more likely to have a higher SRH score.

Participants who said males were the decision-makers on contraceptive use (OR= 0.84, 95% CI: 0.75-0.95) and who said there were no decision-makers on contraceptive use (OR= 0.82, 95% CI: 0.72-0.95) had lower odds of having a higher SRH score, than participants who said females were the decision makers on contraceptive use.

Participants who were originally from townships (OR= 0.90, 95% CI: 0.84-0.97) and rural (OR= 0.73, 95% CI: 0.66-0.81) localities had lower odds of having a higher SRH score than participants who were originally from urban localities. Having left-behind childhood experience was associated with lower odds of having a higher SRH score, as compared to having no left-behind childhood experiences (OR= 0.91, 95% CI: 0.85-0.98). Being an ethnic minority was associated with lower odds of having a higher SRH score, compared to being an ethnic majority (OR= 0.75, 95% CI: 0.67-0.84).

Participants who reported having difficulties accessing MCs had lower odds of having a higher SRH score (OR= 0.81, 95% CI: 0.74-0.88), compared to participants who reported no difficulties accessing MCs.

Participants who experienced verbal violence were more likely to have higher SRH scores than participants who experienced no violence (OR= 1.13, 95% CI: 1.05-1.21).

3.7.2 Gender-stratified order logistic models

Male participants who reported current smoking, compared to who never smoked, were less likely to have a higher SRH score (OR=0.84, 95%CI: 0.74-0.96), which is consistent with the results shown in the unstratified model. The association was not significant for female participants.

Having moderate or severe depression, compared to having little or no depression among male participants was associated with lower odds of having a higher SRH score (OR= 0.88, 95% CI: 0.78-0.98), which is consistent with the results shown in the unstratified model. The association was not significant for female participants.

Female participants who had suicidal ideas, compared to who never had suicidal ideas, were more likely to have a higher SRH score (OR= 1.06, 95% CI: 1.02-1.32), which is consistent with the results in the unstratified model. The association was not significant for male participants.

Compared to female participants who had no mental illness, those who had mental illness had higher odds of having a higher SRH score (OR= 1.16, 95% CI: 1.02-1.32), which is consistent with the results in the unstratified model. The association was not significant for male participants.

The results on having correct knowledge of preventing unintended pregnancies, for both male and female participants were similar to the results in the unstratified model.

Female participants who reported medium-level family income were more likely to have a higher SRH score (OR= 1.20, 95% CI: 1.01-1.42), than female participants who reported low-level family income. No significant associations were found among male participants and in the unstratified model.

One unit increase in self-rated parents' marriage quality was associated with lower odds of having a higher SRH score for both male participants (OR= 0.98, 95% CI: 0.95-0.99) and female participants (OR= 0.98, 95% CI: 0.96-0.99). No such significant associations were found in the unstratified model.

Male participants who had between one to three (OR= 1.71, 95% CI: 1.43-2.06) romantic relationships, and who had more than three romantic relationships (OR=1.79, 95% CI: 1.46-2.20), as compared to having no romantic relationships, were more like to have a higher SRH score, which is consistent with the results in the unstratified model. No such significant associations were found among female participants.

Having experience of high-risk sex among female participants was associated with higher odds of having a higher SRH score (OR= 1.25, 95% CI: 1.06-1.47). However, no significant associations were found among the male participants or in the unstratified model.

One year increase in age of having the first adolescent romantic feelings was associated with higher odds of having a higher SRH score (OR= 1.03, 95% CI: 1.01-1.04). However, no significant associations were found among the male participants or in the unstratified model.

On whether mothers answered SRH questions, male students who reported that their mothers avoided those questions had higher odds of having a higher SRH score (OR= 1.26, 95% CI: 1.02-1.56) than those who never asked their mothers those questions. The association was not significant in the unstratified model. Male participants who reported that their mothers scolded them for asking SRH questions were less likely to have a higher SRH score (OR= 0.54, 95% CI: 0.31-0.92), while female students who reported that their mother scolded them for asking SRH questions were more likely to have a higher SRH score (OR= 1.44, 95% CI: 1.08-1.92). No such significant association was found in the unstratified model.

Female students who reported that their partners (OR= 0.67, 95% CI: 0.57-0.78) or no-one (OR= 0.82, 95% CI: 0.70-0.98) were the decision makers on the use of contraceptives were less likely to have a higher SRH score, which is consistent with the results in the unstratified model.

The results on school location, for both male and female participants, were similar to the results in the unstratified model. Compared to East China, both female (OR= 0.86, 95% CI: 0.75-0.99) and male (OR= 0.83, 95% CI: 0.70-0.98) participants from the schools in the West part of China were less likely to have higher SRH scores.

Male participants who had left-behind childhood experience had lower odds of having a higher SRH score (OR= 0.88, 95% CI: 0.79-0.99). However, no such significant association was observed among female participants.

Female participants who had experienced verbal violence were more likely to have a higher SRH scores (OR= 1.22, 95% CI: 1.10-1.35), whereas no such significant association was found among male participants.

Chapter IV: Discussion

This thesis explored the socioeconomic, demographic and behavioural determinants of non-use of MCs during MRS among sexually active Chinese university students. In this discussion chapter, key findings from the study are summarized and presented in the first section. In the second section, the associations between MC non-use during MRS and the identified key socioeconomic, demographic, and behavioural factors are discussed at the individual level, the interpersonal level and the environment level, according to SEM. I further discuss if and how the socio-economic, demographic and behavioural factors are associated with SRH knowledge increase and ultimately behaviour change according to the *Knowledge, Attitude, and Practice Model*. In the fourth section, I discuss the strengths and the unique knowledge contributions of this study. In the fifth section, I discuss the limitations and future research recommendations. Lastly, based on the results, analyses, and previous discussions, I illustrate the implications of this study and proposed policy recommendations based on the evidence presented.

4.1 Overview of key findings

The study sample is composed of 11,223 sexually active university students derived from a national survey sample of 54,580 university students from across mainland China. The study samples cover both male and female students, students from schools in East, Central and West China, students from all levels of universities, and students in vocational schools, colleges, and postgraduate programmes.

4.1.1 Overview of determinants of MCs non-use

Several key findings were illustrated by the above investigations. After progressively adjusting for identified confounders, I observed that significant risk factors for not using MCs during MRS included being female, being older, being vocational school students, having smoking experience, having a lower level of SRH knowledge (including knowledge on preventing unintended pregnancies), not coming from a rich family, being older when having the first adolescent romantic feelings, being younger during the first sexual intercourse, not having a clear plan for contraceptive use before sex, having difficulties accessing MCs, and having experienced physical violence.

4.1.2 Overview of gender-stratified knowledge- practice interaction

From a knowledge-practice perspective, I found that males had a lower SRH score compared with females, although males had lower odds of not using MCs during MRS. Compared to vocational level education, participants who were studying at bachelor and postgraduate levels had significantly higher odds of having a higher SRH score, which is consistent with the findings that vocational level education is a risk factor of not using MCs during MRS. Increase in age was associated with higher SRH knowledge score, which contradicts the findings that increase in age was a risk factor of MC non-use during MRS. Participants who had smoking experience were less likely to have a higher SRH score, which is consistent with a significantly increased odds of not using MCs during MRS among participants who were currently smoking. Having a low family income was not associated with SRH knowledge, albeit it being a risk factor for MC non-use during MRS. Being older during their first romantic relationship and being younger during the first sexual intercourse were not associated with SRH knowledge in the overall model, which contradicted the behavioural pattern. Participants who reported there not being a decision maker in their relationship for contraceptive use had lower odds of having a higher SRH score, aligning with the behavioural findings that reporting no decision makers on contraceptive use is a risk factor of MC non-use during MRS. Participants who reported having difficulties accessing MCs had a higher SRH knowledge, which is consistent with the behaviour pattern that having reported difficulties accessing MC was associated with a higher odds of not using MCs during MRS. Participants who had experienced physical violence did not demonstrate a lower SRH knowledge score, which is inconsistent with the behavioural result.

4.2 The association between MC non-use and socioeconomic, demographic and behavioural factors

According to the adjusted *Social Ecological Model*, socioeconomic, demographic and behavioural determinants could be categorized into three levels: the individual level factors, the inter-personal level factors, and the environmental level factors, as illustrated in the Methodology chapter. The socioeconomic, demographic and behavioural factors that were found significantly correlated with non-use of MC during MRS from the study are shown in *Figure 10*.

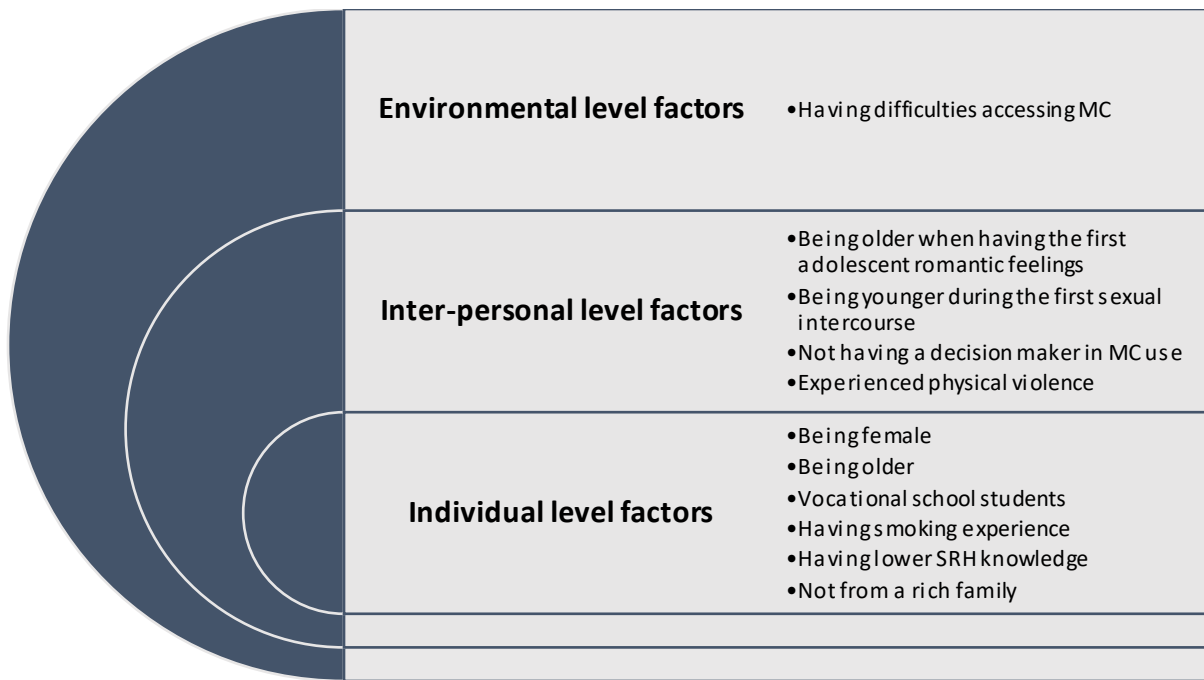


Figure 10 Risk factors of MC non-use during MRS among Chinese university students, categorized according to the adjusted Social Ecology Model

4.2.1 Individual level factors

Female university students were significantly less likely to use MCs during MRS compared with male university students. This might be due to reporting bias. My research showed that contraception among Chinese university students were most commonly practiced by males, hence males were more likely to report using them. My research shows that 81.58% of sexually active university students indicated that they used male condoms in MRS. The second most commonly used MCs among sexually-active university students were the emergency pill (4.23%), much less used compared to male condoms. Among Chinese young people, male condoms are commonly used for various reasons, such as their easy access from the supermarket, their social and cultural acceptability under China's family planning campaign, and their affordability. (Long et al., 2012) Many female-used MCs would require counselling and clinical operations, such as IUD and other Long Acting Reversible Contraceptives (LARC). (Hubacher & Trussell, 2015) However, in China, the family planning counselling services are not tailored for unmarried young people. Research shows that oftentimes unmarried young people in China would not have the opportunity in family planning clinics and hospitals to discuss with health service providers about the most appropriate MCs to use based on their lifestyle and health situations. Without it, unmarried female youth could not access some MCs,

such as LARC. (Feng et al., 2020) Hence, it is important to ensure that health and family planning services are in place to offer counselling and other clinical assistance to young people to choose and use the most appropriate MC methods.

This study found that with increased age, male university students had a higher odds of MC non-use during MRS. However, this finding contradicts previous literature where it was indicated that among college students in China contraceptive non-use was associated with younger age. (Long et al., 2016) Systematic analyses of the global burden of disease associated with contraceptive use also revealed that globally the older age group (20-24 years old) generally had a higher MC prevalence rate and higher needs met by MCs, compared to the younger age group population (15-19 years old). (Haakenstad et al., 2022) In my analyses, although the overall trend suggested that each year increase in age was associated with higher odds of MC non-use, when I further investigated, analyses by age group showed that the use of MC increased by age except for the above 26 years old group. The reverse association as shown in the per unit increase in age may be caused by extreme values (the age above 26 group). According to the data, among students younger than 18 years old, 17% did not use MC during MRS; among students aged between 18 to 22 years old, 12% did not use MC during MRS; while among students aged between 22 to 26 years old, 11% did not use MC during MRS, which are in line with other evidence. However, among students aged older than 26 years old, 18% did not use MCs during MRS. This might be because in China, the average first marriage age in 2020 was 28.6 years old. (The Seventh Census Leading Group of China, 2020) It is possible that students in the survey aged above 26 years old, were preparing to form a new family and have children, hence the use of MCs during MRS was lower. This finding also indicates that the younger aged population were at a greater risk of unprotected sex. Therefore, it is important to keep in mind when designing interventions to promote safe sex, that younger populations (aged under 22) should be included as well.

It is important to note that age, as a variable in the regression models in the current analysis, was handled as an independent variable and no interaction analysis was conducted. Previous studies have shown that age can interact with other factors to influence sexual behaviours. For example, age is associated with the accumulation of SRH knowledge. (Zhang, 2010) Even with the same level of knowledge, participants in different age groups may demonstrate difference in behaviour due to maturity, therefore creating interaction between knowledge and age on behavioural outcomes. (Herwandha & Prastuti, 2020) With the age increase, young people are

more likely to initiate sex which increases their MC use behaviour. (Shu et al., 2016) Besides, in this study, around 16% of the participants are over 26 years old, the average marriage age in China. When young people get older, it is possible that some of them may want to form families, which would influence sexual behaviour. Furthermore, the association between age and knowledge and behaviour could prove to be non-linear, adding complexity to the interpretation. The detailed statistical analysis of age is beyond the scope of this thesis but future research may illustrate the mechanism by which chronological age impacts sexual behaviours and SRH knowledge among unmarried young people in China.

Studying at a vocational school was found to be a risk factor for MCs non-use during MRS among both male and female university students. This finding can be reinforced by previous literature. (Lou et al., 2008; Y. Wang et al., 2020) In China's education system, there are several levels of education institutes that offer university education: public universities, private universities, and vocational colleges. (Guo & Wang, 2020) Students are admitted to public universities, private universities and vocational colleges based on their College Entrance Examination Scores with vocational colleges normally admitting the lowest scoring students. (Durdin & Yang, 2006) There are several reasons that might explain why being a vocational school student is a risk factor. Research shows that vocational school students in China often have poorer health behaviours, for example they are more likely to be smoking, drinking alcohol and experiencing physical violence. (Hu et al., 2018) Students in vocational schools also tend to come from families with lower social status, including lower parental education level. (Zeng et al., 2019) The quality education, including health education, in public universities and private universities are much better than vocational schools, and the school management over student campus life in public and private universities is stricter than in vocational schools. (Wang et al., 2014) Hence, it is important for future programmes to invest in improving vocational school students' knowledge and change their attitudes and behavioural in order to increase the MC uptake and prevent unintended pregnancies.

Smoking was included as a variable in the full regression model primarily because research shows that smokers and alcohol abusers tend to perceive health risks differently than others, including the risks brought by unsafe sex. (Hansen et al., 2010) A study shows that young female smokers are likely to have lower risk perceptions than their non-smoking peers, leading to differences in lifestyles, identities and opinions on certain issues, including having unsafe sex. (Sansone et al., 2015) Therefore, this sub-group population may be highly selective and

future qualitative interview studies may be useful to understand in-depth their behaviour and intentions. (Hu et al., 2018)

In the current study, it was found that having smoking experience, including past smoking experience, was a risk factor for MC non-use during MRS among female university students only. No such association was found among male university students. The positive correlation between smoking and non-use of contraceptives has previously been demonstrated in other studies of young people in China. (Wang et al., 2015; Y. Wang et al., 2020; Zhang et al., 2022) Other research from Nordic countries, Hong Kong SAR and in the United States also indicate that compared with women who have never smoked, those who had smoking experience were more likely to have multiple sexual partners, have lower frequency of contraceptive use, and more likely to experience unintended pregnancies and STDs. (Hansen et al., 2010; Lam et al., 2001; Zabin, 1984) There are several possible reasons for this correlation. Substance use, including smoking cigarettes and drinking alcohol, may change an individual's perception of risk and impulsivity that leads to poor judgement and impulsive behaviours. (O'Cathail et al., 2011) It may also embolden individuals to take risks for pleasure, thus not using contraceptives during sexual intercourse. (Kang et al., 2010) In China, the cultural norm is that smoking is associated with masculinity, and the social acceptability for females and youth to smoke is very low. (Sansone et al., 2015) In this context, adolescent and youth smokers, particularly female adolescent and youth smokers, are seen as rebellious and undisciplined. Such labelling may further encourage them to adopt more high risk health behaviour, such as MCs non-use. Peer influence is another factor, given that students who smoke may engage in a friendship circle that encourages risky behaviour, including unprotected sex. (Song et al., 2014) Hence, it is suggested that policy makers and project designers could link MC use promotion campaign with smoking rehabilitation and smoking prevention campaigns to better target high-risk populations.

Having less SRH knowledge was found to be a risk factor for MC non-use among both male and female Chinese university students. SRH knowledge was measured by a standard nine questions from the Demographic Health Survey Questionnaire on Family Planning where respondents were asked to judge 'true or false' for nine SRH related statements ranging from contraception to STDs. This finding on the correlation between SRH knowledge and contraceptive use could be supported by many studies from China. (Wang et al., 2015; Y. Wang et al., 2020; Xiao, 2012; Yip et al., 2013) Globally, small-and large-scale research has also

shown the close correlation between knowledge and sexual behaviour. They found that having more knowledge related to SRH is associated with responsible and safe sexual behaviours. (Blanc & Way, 1998; Genz et al., 2017; Makinwa-Adebusoye, 1992; Nsubuga et al., 2015) Theories have been used to prove the impact of knowledge on behaviour, including *the Knowledge, Attitudes and Practices Theory* which was used in this study. It explains that correct knowledge would generate good attitudes and beliefs which may then change people's behaviour. (Ude-Akpeh & Ezeoke, 2017). With the association between SRH knowledge and MCs use behaviour identified, I will have a section later in the thesis to further investigate how to improve SRH knowledge, in order to promote MCs use behaviour.

Not coming from a rich family was found to be a risk factor for MCs non-use among university students. In literature focusing on Chinese university students, family wealth level was not found to be a determinant of contraceptive use. (Wang et al., 2019) However, studies have found that students' monthly expenditure correlates with contraceptive use. University students who had the lowest monthly expenditure level had higher odds of not using contraceptives. (Sun et al., 2013; Y. Wang et al., 2020) However, literature from other countries agreed with my finding that young people from poor families tend to have worse health outcomes and engage in risky health behaviours, such as having unprotected sex. (Asamoah & Agardh, 2018; Santelli et al., 2000) The possible explanation for this correlation is that poor families are more likely to have parents with a lower social status and limited resources to support their children's education. (Field, 2010) Therefore, the health knowledge and attitudes among children and young people from poor families are lower than their counterparts from richer families, which may further lead to risky health behaviours such as having unprotected sex. (Currie, 2009) In order to promote MC use among university students, it could also be effective to link such programmes with the poverty alleviation projects across the country in order to target the high-risk youth population.

4.2.2 *Inter-personal level factors*

At the inter-personal level, there are in total four risk factors identified for the non-use of MC during MRS by university students. The first risk factor is having their first adolescent romantic feelings at an older age. Having adolescent romantic feelings in Chinese language context may refer to having puberty debut. This association was significant only among female students. There were no similar findings from previous literature in China. In other countries, however, research shows that the earlier young people have puberty, the more likely they will engage in

unprotected sex since their knowledge and skills may not be sufficient to make informed decisions and they may not be able to access MC methods due to legal, financial or social barriers. (Manlove et al., 2007) Therefore, the findings from the present study are inconsistent with the international evidence. One hypothesis is that the contradiction between the current result and international study is the result was impacted by extreme values. With the current evidence, it is very difficult to form another strong hypothesis to explain the finding. Hence, I suggest future studies to focus on this association and explore the possible reasons behind it.

Having their first sexual intercourse at a younger age was associated with higher odds of contraceptive non-use during MRS by both male and female university students. This finding was supported by previous literature. Research among college students in China shows that younger age at the first sexual intercourse was associated with higher odds of having unintended pregnancies, lower frequencies of contraceptive non-use regularly, not using contraceptive correctly, and lower odds of using contraceptives consistently. (J. Li et al., 2015; Fang Ruan et al., 2019; Tang et al., 2013; Zhou et al., 2013) Studies in China and other countries have also found that early initiation of sexual activities was not only associated with contraceptive non-use but also other risky sexual behaviours and adverse health outcomes at a later age, such as having multiple sexual partners, having HIV infections, and having other STDs. (Haydon et al., 2012; Ma et al., 2009; Ramiro et al., 2015) The possible explanation for the correlation between the MC non-use during MRS and early sexual onset is that when early initiators were having their first sexual experience, they might be too young to have sufficient knowledge to protect themselves; they might not have enough power to negotiate with partners on contraceptive use; and, they might not have easy access to MCs when they need them. Furthermore, research suggests that sexual behaviour early in life has a significant impact on subsequent sexual behaviours. (Tang et al., 2013) Once the behaviour of having unprotected sex is established at an early age, they are likely to continue this manner in later life. (Finer & Philbin, 2013; Shafii et al., 2004) Hence, in future efforts, intervention programmes to promote MC use among young people in China should advocate for delaying the first sexual initiation and that young people should have it only when they are equipped with sufficient knowledge.

This study suggests that not having a decision maker for contraceptive use was associated with higher odds of MC non-use during MRS among both male and female university students in China. This finding resonates with previous research in China. Researchers have found that Chinese university students who have prepared condoms before sex and who have

communicated the plan of using condoms with partners were more likely to use condoms during sexual intercourse. (Wang et al., 2015; Xiao et al., 2010) Both male and female students who felt contraception is their own responsibility, as compared to partner's responsibility, were more likely to use contraception. (Long et al., 2019; Long et al., 2012) This finding is reinforced by studies from outside China as well. Research show that if no-one between the partners was preparing for contraceptive use, the odds of not using contraceptive at all was much higher. (Dehlendorf et al., 2017; DeRose & Ezech, 2010) All the MC methods require preparation ahead of the sexual intercourse, ranging from purchasing from stores to inserting a device in the body in a clinical setting. Having a decision maker for contraceptive use entails at least one person would be more likely to shoulder the responsibility and lead the efforts of communicating, negotiating, preparing and practicing MC use. This might explain the reason why having a decision maker between partners was associated with higher odds of MC use among university students. This finding suggests that in the MCs use promotion campaign programmes in the future, contraception responsibility should be one of the key topics to be included.

Many studies have found a strong relationship between experiences of violence (not limited to violence within a relationship) and contraceptive non-use both in China and globally, and this association was demonstrated in my study as well. (Bergmann & Stockman, 2015; Stephenson et al., 2008; Yu et al., 2013) However, most of the studies have focused on domestic violence toward women and indicated that as the more vulnerable party, when in an abusive relationship, women were not able to negotiate contraceptive use with their partners and refuse unsafe sex. (Bergmann & Stockman, 2015) This study did not focus on domestic violence but rather on general physical and verbal violence experience. No significant association was found among female university students, but it was found that male students who reported having experience of physical violence had higher odds of MCs non-use during MRS. There are possible explanations for this correlation. Firstly, same as their female counterparts, if a male is in an abusive relationship, he may not have the confidence and skills to negotiate and practice contraceptive use against the violent perpetrator's will. (Stephenson et al., 2008) Secondly, research shows that children and adolescents who are victims of violence are significantly more likely to become violent perpetrators, particularly in a marriage and/or relationship. (Finkelhor & Dziuba-Leatherman, 1994) As such, a male university student who was a violence victim once, might turn into a domestic violence perpetrator, refusing to negotiate with partners on contraceptive use, and enforce unsafe sex. (Anda et al., 2002) Therefore, this finding suggested

that in the future national violence prevention, particularly the domestic violence prevention mechanism, it is important to have a pillar on the discussion of safe sex.

4.2.3 Environment level factors

At the environment level, both male and female students who reported difficult access to MCs were more likely to not use MCs during MRS. This finding is consistent with previous studies of Chinese university students. They found that if university clinics offer free and accessible condoms and reproductive health counselling, students from that university were more likely to use condoms in MRS and use contraceptives frequently. (Z. Liu et al., 2021; Long et al., 2016; Long et al., 2012) Global research has produced similar findings that affordable and convenient access to contraceptives is a key determinant for young people's consistent use of contraceptives. (Ross & Hardee, 2013) Any limitations on young people's access to condoms significantly decreases the frequency of contraceptive use. (Boudreaux et al., 2020) This finding is particularly important during the COVID-19 pandemic where the supply of contraceptives has suddenly been disrupted. (Lewis et al., 2021) To address young people's convenient access to contraceptives, society needs to promote the provision of youth-friendly health services that offers young people contraceptive tools and information safely, conveniently, and timely. (Tylee et al., 2007) For example, in the Netherlands, in order to promote young people's easy access to contraceptives, youth clinics have adapted working hours, relocated to places near young people, trained health service providers to respect young people's SRH, and implemented social media campaigns to attract young people. (Van Der Doef & Reinders, 2018)

4.3 The socioeconomic, demographic and behavioural determinants for higher SRH knowledge and contraceptive non-use

Among the above identified individual level MC-use behavioural determinants, many of them, such as age and gender, are factors that are non-modifiable. For example, interventions and policies could not be designed to change people's gender and age in order to improve their MC-use behaviour. While factors like family income, smoking experience, and university level are wider socioeconomic issues rather targetable by health interventions. Though modifiable, no evidence are available to prove whether these factors (family income, smoking and university level) would cause MC non- use behaviour, hence it's groundless to design

interventions targeting individual’s income, smoking experience, and/or university level, in order to promote their MC-use behaviour.

As for the inter-personal level and environmental level behavioural determinants, such as the age of having the first adolescent romantic feelings and the age of engaging in first sexual activities, according to SEM, they typically require longer time periods to allow the policies and interventions to firstly change the environments and the inter-personal relationships, then have an impact among individuals. (Ude-Akpeh & Ezeoke, 2017) As such, in order to design policies and interventions to improve university students’ MC-use behaviour, SRH knowledge, one of the modifiable individual-level determinants should be given special attention, as this would seem to be easiest to modify, with interventions that are scalable and sustainable. Previous research has showed that improving SRH knowledge could improve MC-use behaviour. (Bongaarts, 1991) The influence of knowledge on behaviour is also theorised in the KAP Theory which has been discussed previously. (Ude-Akpeh & Ezeoke, 2017)

Therefore, in my research, I have further investigated the factors associated with increased SRH knowledge. These analyses will support me to develop insightful policy recommendations to improve university students’ SRH knowledge, and further to enhance their MC-use behaviour. *Table 14* shows the summary of the determinants identified from the logistic regression model that have significant associations with SRH knowledge. All determinants were categorized according to SEM at the individual level, at the inter-personal level, and at the environmental level. ‘+’ refers to a positive association between the determinant and SRH knowledge, while ‘-’ refers to a negative association between the determinant and SRH knowledge.

Environmental level factors	<ul style="list-style-type: none"> - Originally from rural region (-)¹⁷ - Ethnic minority (-) - Having difficulty accessing MCs (-)
Inter-personal level factors	<ul style="list-style-type: none"> - Being older in the first romantic relationship (+)¹⁸ - Ever had boyfriends/ girlfriends (+) - Engaged in high-risk behaviour (+) - Spoken to parents about SRH topics (+) - Searched SRH information online (+)

¹⁷ (-): Negative correlation

¹⁸ (+): Positive correlation

	<ul style="list-style-type: none"> - Your mother answered your SRH questions (+) - Your mother punished you for asking SRH questions (-) - Experienced verbal violence (+) - No decision maker for MC use (-)
Individual level factors	<ul style="list-style-type: none"> - Female (+) - Age increase (+) - Not coming from a rich family (+) - Had suicidal attempts and ideas (+) - Had mental illness (+) - Vocational school student (-) - University in West part of China (-) - Left-behind child experience (-) - Currently smoking (-) - Frequent alcohol consumption (-) - Moderate or severe depression (-) - Parents have a good relationship (-)

Table 14 Summary of determinants associated with increased SRH knowledge

4.3.1 Individual level factors

At the individual level, there were 12 determinants identified that have a significant association with SRH knowledge. The first determinant is being female. Culturally, SRH has been seen as a woman's issue as it is related to bearing children. (Fang & Kaufman, 2008) Therefore, substantially more interventions and research studies have been conducted in China to investigate female's SRH, leaving men's SRH issues neglected. (Zou et al., 2013) With more programmes and policies available that have aimed to improve women's SRH, their SRH knowledge has increased. (Zhang, 2011) This may explain why being female is associated with increased SRH knowledge. Informed by this finding, I suggest future research, intervention programmes and policies on SRH not only include female youth but also male youth as well.

Increased age was associated with increased SRH knowledge, which is intuitive, and this association was significant both among female and male populations. With the increase in age, young people receive more information on SRH through school-based education sessions, internet, peers, and other means. (Zheng et al., 2010) Older young people, for

example people aged ≥ 24 years old compared to people aged under 18 years old, also have better judgement on the information they have received. (Nsubuga et al., 2015) However, it is important to be aware that in the current society where young people are having sexual debuts earlier in life than previous generations, it is important to ensure that when they engage in sexual activities at a young age, they also have the information and knowledge to protect themselves from STDs, unintended pregnancies and other adverse health outcomes. (Guo et al., 2012)

As for the factors related to family, not coming from a rich family was a protective factor for SRH knowledge and a risk factor for MC-use behaviour for both male and female populations. The possible explanation might be that in universities and colleges, students coming from lower socioeconomic backgrounds are more likely to behave carefully, and be attentive to subject learnings in-class, including school-based health classes. (Li & Qiu, 2018). Though students from lower socioeconomic backgrounds have improved SRH knowledge, my study showed that they were less likely to translate this knowledge into practice, namely their use of MCs. One possible explanation might be that in a sexual relationship, many determinants are at play for the use of MCs, not only knowledge. (Wang et al., 2019) The conjecture is that students coming from lower socioeconomic family backgrounds may be lacking the skills and confidence to negotiate with partners on contraceptive use, and they might not have sufficient resources to obtain appropriate MCs when needed. In such cases, it is suggested that SRH education should not only focus on knowledge, but also life skills, enabling students to translate their knowledge into practice. I recommend more studies to be conducted in this area.

The other family-related factor that was associated with lower SRH knowledge for male students was left-behind childhood experience. There were about 70 million left-behind children in China in 2020. (Gu, 2022) Left-behind childhood experience normally refers to children whose parents move to cities for work and leave children behind with grandparents in the village. (Wen & Lin, 2012) Left-behind children normally receive education in poorer school settings and grew up with little guidance from parents, which has led them to lower academic performances, behavioural problems, and poorer health outcomes. (Q. Li et al., 2015) As such, left-behind children receive little quality education and advice from guardians on SRH. (Fellmeth et al., 2018; Pan & Ye, 2017) This finding suggests that national policies

should be strengthened to invest in education programmes for left-behind children, to improve their SRH knowledge and promote health behaviours.

Being a vocational school student is a risk factor for both SRH knowledge and MC-use behaviour for male and female students. As discussed in the previous chapter, vocational school students tend to have lower academic attainment so their knowledge and learning skills, including for health education, are lower compared to their counterparts in universities. (Durden & Yang, 2006) The educational resources available in vocational schools in China are also not as well funded as in universities. (Wang et al., 2014) Hence, the quality of the health education provided and the platforms where students could discuss issues like safe sex, may not be sufficient in vocational schools. (Guo & Wang, 2020)

Studying in universities in the West part of China was found to be associated with lower SRH knowledge, compared to their counterparts in the East part of China, for both male and female students. The reason might be similar: universities in the West part of China, the poorest region in the country, may not have sufficient resources to offer quality health education sessions and platforms for students to learn and discuss SRH-related topics. (Gu, 2003) Therefore, this finding suggests that future policies and efforts should address SRH knowledge gap among vocational school students and students in universities in the West part of China, for example investing more financially to fund special SRH educational sessions for students in vocational schools and higher education institutes in the West part of China.

Regarding substance use, being a current smoker was a risk factor for both SRH knowledge and MC use behaviour for male and female students. Additionally, frequent alcohol consumption was associated with lower SRH knowledge for male students. The possible explanation may be that in many education systems, substance use and safe sex are taught together in health education sessions. Therefore, students who have insufficient health knowledge may lack the knowledge on smoking and drinking prevention and the use of MCs to prevent unintended pregnancies. (Pedrana et al., 2020) In addition, smokers and frequent alcohol drinkers tend to care less about the impact of risky behaviours on the health wellbeing, hence they may not actively seek protective measures, such as SRH knowledge to prevent unintended pregnancies. (Park et al., 2015) This finding suggests that health education programmes, initiatives and policies could be more integrated to cover a wide range of issues, such as smoking cessation, alcohol drinking prevention and MC use. It also

suggests that safe sex education could target university students who are smokers and male frequent alcohol drinkers.

4.3.2 *Inter-personal level factors*

Having no decision makers on contraceptive use was a risk factor for both SRH knowledge and MC-use behaviour. According to this finding, having neither sexual partner in a relationship taking responsibility for contraceptive use was associated with lower SRH knowledge. The possible explanation for this correlation may be that because of limited SRH knowledge, the student may not have the awareness to take responsibility or take the lead in using MCs. (Long et al., 2019) Therefore, it is important to strengthen the education on contraceptive responsibility-related discussions in health education sessions.

Being older when first experiencing adolescent romantic feelings was found to be positively associated with increased SRH knowledge among female university students. The possible explanation is that, with the increase of SRH knowledge, female students may have less curiosity and impulse in romantic relationships (Shu et al., 2016) Many parents have concerns that having more SRH knowledge, for example through taking sex education in school, may inspire young people to have romantic relationships and other sexual engagements, including high- risk sex. (Mellanby et al., 1995) Globally, research has rejected that hypothesis, revealing that increased SRH knowledge does not lead to more active sexual activities. (Holzner & Oetomo, 2004) My study findings also support the global evidence and suggest that young people with greater SRH knowledge were actually associated with having their first adolescent romantic feelings later in time. This finding from my study may be used in discussions regarding convincing parents to allow their children to participate in SRH education sessions.

Having spoken to parents about SRH issues, having searched SRH questions online, and your mother answering your SRH questions were all associated with increased SRH knowledge for both male and female students. This suggested that parents and online platforms could be constructive means to deliver young people's SRH knowledge. A national survey in China in 2010 also found that the Internet and parents are among the top five sources where young people learn about SRH knowledge. (Zheng et al., 2010) My study showed that students who reported that their mother scolded them for asking SRH questions tended to have lower SRH knowledge. This finding is also reinforced by Zhang and colleagues that young people are

more likely to learn about SRH knowledge in a supportive family environment. (Zhang et al., 2007) Informed by this finding, it is suggested that policies and guidance need to be developed to support young people to learn SRH knowledge in the family environment and through credible sources online. Guidance should also be developed to support parents to provide their children with quality SRH information as well as support young people to identify how to seek the credible online SRH knowledge resources online.

Having experienced verbal violence and having engaged in high-risk sex were associated with greater SRH knowledge among female students. The possible explanation for this correlation may be that having experienced violence and high-risk sex behaviour were associated with lower social economic status, and lower social economic status was associated with lower knowledge of SRH. (Bergmann & Stockman, 2015; Stephenson et al., 2008) Another possible explanation may be that increased SRH knowledge could help raise female students' awareness for safe sex. It could also equip female students with measures for self-protection. (Yang, 2011) With increased awareness and self-protection measures, female students could be more likely to identify and report different forms of violence and high-risk sex behaviours. (Liu et al., 2010) Therefore increased SRH knowledge was found to be associated with having experienced verbal violence and having engaged in high-risk sex. To identify the reasons behind the association, more research is recommended to further investigate the reasons behind these associations, especially to understand the casual relationships.

4.3.3 Environmental level factors

At the environmental level, not coming from an urban region was associated with lower SRH knowledge for both male and female students. This might be due to the poor health services and education in rural areas which have been discussed in the previous section (on left-behind childhood experience). Although China has experienced substantial social and economic development in the past four decades since opening up, the rural and urban development disparity remain, and the gap was wider 10 years ago when the study participants were at the age of attending the compulsory education in the rural region. (Weiping, 2018)

Besides that, this study also found that being an ethnic minority youth was associated with lower SRH knowledge. The ethnic minority population in China mostly live in remote and underdeveloped rural regions. (Wang & Keats, 2005) It is possible that because of the limited

resources for health education in schools and in health clinics in rural regions and in ethnic minority communities, children and adolescents could not acquire much-needed SRH information. (Wang et al., 2018) Additionally, other barriers, such as language barriers, cultural barriers and religious barriers experienced by ethnic minority communities could also prevent adolescents and youths from accessing SRH knowledge. (Anachebe & Sutton, 2003) It is suggested that government policies should address SRH knowledge needs of adolescents and youths in rural and ethnic minority regions, enabling education and health departments to provide local adolescents and youths with culturally sensitive, scientific and context appropriate SRH information and education.

Students who perceived difficulties with accessing MCs had lower levels of SRH knowledge. This finding suggested that students with greater SRH knowledge may perceive fewer difficulties with obtaining MCs. Research in other countries confirmed this result, showing that with adequate SRH knowledge, young people would know where to get MCs and how to use them effectively to prevent unintended pregnancies and STDs. (Ivanova et al., 2018; Thongmixay et al., 2019) This evidence indicates a linkage between SRH knowledge and young people's perception of access to MCs. It also revealed the benefits of providing SRH knowledge to young people, potentially capacitating young people to view accessing MCs as an easier matter.

4.4 Unique contributions of this study

Although according to the literature review, there are quite a few studies conducted in China investigating the determinants of young people's use of contraceptives, this research has novel and unique perspectives, illustrated below.

- 1) This study presented the most recent and comparatively comprehensive overview of the issue of the use of MC during MRS among Chinese university students. The study is based on a national-level large sample survey which was conducted in between November 2019 to April 2020. The wide coverage of geographic locations, types of higher education institutes, and age groups allowed me to present the complexity and depth of the Chinese university students' SRH issues. Most of the other studies have either focused on a sub-population such as students majoring in fine arts or in limited geographic locations. (D. Zhang et al., 2010; Zou et al., 2013)

- 2) According to the literature review, this study is the only study in recent years in China that has focused on young people's MC use behaviour as the outcome variable, as compared to contraceptive use generally as the outcome variable in other studies. Contraceptives include MCs and traditional contraceptives, and traditional contraceptives have been proven to be less effective to prevent unintended pregnancies. (Hubacher & Trussell, 2015) Therefore, findings from this study would be able to better support policy development to design interventions to effectively prevent unintended pregnancies through advancing MC use behaviour among university students.
- 3) After analysing the determinants of MC use behaviour, this study has stepped further to identify the determinants of increased SRH knowledge among Chinese university students. As previous research showed, increased SRH knowledge is strongly correlated with improved MC use behaviour. (Asamoah & Agardh, 2018; Yakubu & Salisu, 2018) The findings highlight key populations, for example, vocational college students, who both lack the correct SRH knowledge and are less likely to use MCs during MRS. It is possible that with education and information programmes in place, key populations such as vocational college students' SRH knowledge could be improved and further change their MC use behaviour.
- 4) This study provides gender stratified analysis to assess the association between MC non-use behaviour and social, economic and behavioural determinants among male and female university students respectively. Other studies conducted in China based on national surveys did not include gender-stratified analyses on the determinants, though their authors have recommended future studies to perform such analyses. (M.-y. Wang et al., 2019; Zheng et al., 2010) As SRH is a gender sensitive topic, interventions designed for female and male students in China are different. For example, health education sessions delivered in education institutes for boys and girls are often separated. Also, there are health promotion activities conducted respectively in male and female university students' dormitories. (Du et al., 2021) This study will inform how to better shape those interventions to cater to the different needs of male and female university students.
- 5) This study included a wide range of determinants, which is unique based on reviewing relevant literature. The original questionnaire had 100 questions broadly related to SRH,

based on the literature the survey questions were shortlisted and 52 questions were included in the first-round analyses. The questions cover various aspects of young people's life, ranging from demographic information, to family, social network, health and wellbeing and sexual behaviours. The wide range of determinants also allowed the logistic regression to control for potential confounding factors. Additionally, to better structure the analyses, my study employed the social ecological model to group socio-economic, demographic and behavioural factors at three levels: individual level, interpersonal level and environment level. The grouping of determinants will enable readers to see more clearly at level a certain issue exists and thus, how to develop responding strategies.

- 6) This study has a strong policy lens in China's context which is unique. Equipped with data and solid analyses, I have developed policy recommendations based on my decade years of work experience in supporting SRH policy making in China. Particularly, with each finding, I have developed a corresponding policy recommendation. Those recommendations are not asking the decision makers to simply develop new and stand-alone regulations, but rather trying to situate the policy recommendations in the current health and education systems, through finding synergies and strengthening the current policy frameworks and implementation tools. The presentation of my findings and policy recommendations are designed to be easy to be understood by Chinese policy makers.

4.5 Limitations and future research recommendations

There are several limitations involved in the study design, data collection and analyses as summarized in *Table 15*.

- 1) On study design, the NUSS-SRH is a cross-sectional survey. The causal inference of MC use during MRS and identified social, economic and demographic factors could not be attained due to the nature of the dataset (Jacobsen, 2020). For example, it is possible that the use of MC during MRS has caused the change of the identified factors, instead of the other way around. Therefore, it is recommended that a cohort study be conducted to provide more insights on the causal relationship between the outcome variable and identified significant determinants.

Besides that, given the nature of the quantitative survey, the dataset could not offer in-depth answers on how and why those associations were found. It is recommended that future studies build a qualitative study component to interview stakeholders in order to understand the reasons behind the findings. For example, in the study, it was found that female university student smokers are less likely to use MCs during MRS compared with female university student non-smokers. This sub-population (young female smokers) is a very selective group and may have a different identity and assessment of health risks, sex, relationships and other issues. (Sansone et al., 2015) However, there is limited research in China from a social science perspective to understand Chinese young female smokers' behaviour and intentions. It would be beneficial to interview young female university student smokers to understand their rationale, in order to develop effective policy interventions.

Additionally, compared with 35.9 million university students in China in 2021, this sample size is still small. (Statistica, 2022) Regardless, it is one of the largest cross-sectional studies to focus on university students' SRH issues in the past five years. (Wang et al., 2019) With sufficient resources, it is recommended that future researchers gather SRH data from an even larger youth population, so that the study could be more representative and generalisable.

- 2) On the quality of data and potential bias, my study employed a convenience sampling strategy at the university level, i.e., those who were contacted by the study coordinator and who were willing to participate completed the survey. The convenience sampling method could create bias as I have already discussed thoroughly in Chapter 2. (Mugo, 2002) It is likely that those who completed the survey were those who were more interested in SRH, hence having more knowledge of SRH. It is also likely that those who responded to the survey may have better access to the online questionnaire. Because of such selection bias in the convenience sampling scheme, the findings from the study may not be easily generalisable for the larger Chinese university student population. To avoid the bias created by convenience sampling, it is recommended that in the future, a nationally representative survey to be conducted, with the sampling strategies carefully implemented.

The NUSS- SRH took place from November 2019 to February 2020. The COVID-19 virus started to spread extensively regionally and nationally from January 2020 onwards which has caused panic and massive lockdowns in China. (Tang et al., 2020) It has had direct and indirect impacts on people's livelihood and well-being including their mental health and SRH behaviours. (Tang et al., 2020) Hence, the data collected may only reflect young people's temporary lifestyle during COVID-19, which is a bias. For example, it is likely that the mental health outcomes may be worse for respondents who were experiencing long time compulsory home quarantine. In addition, the frequency of having sexual intercourse among university students may be decreased significantly due to the suspension of campus lives and students returning back to their hometowns to study online. Therefore, it's recommended to conduct the survey once again after the COVID-19 pandemic is over in China, to better understand the real situation.

As the survey took place to collect information based on participants' recollections, there is recall bias in the dataset, which may be a cause of inaccuracy in the study results (Jacobsen, 2020). A reporting bias may also exist as sometimes respondents may not report their true experience, or intentionally hide certain information given SRH is a culturally-sensitive topic in China, especially among unmarried young people. (Dowd & Zajacova, 2010) To limit recall bias and reporting bias, it is recommended that, a feasibility or a validity study could be conducted to help limit these biases. However, it is very difficult to completely avoid the recall bias and the reporting bias.

- 3) On the analysis, though the focus of this study on MC non-use is already an advancement as compared to investigating contraceptive use in general in previous studies, this study did not elaborate on the determinants for various kinds of MCs and the determinants for the combination of different methods for dual and multiple protections, due to the scope limitation. It is important to note that the determinants for use of different MCs and dual/ multiple projections may vary significantly. Consequently, the interventions to improve different kinds of MC uptake would also vary. (Tukue et al., 2020) It is recommended that future studies to find the determinants for non-use of each MC, so that more tailored intervention programmes and policy approaches could be developed to improve young people's uptake of MCs.

Besides that, although the survey questionnaire already covered 100 questions, there are still important demographic, socioeconomic and behaviour variables that may have not been captured in the survey, such as young people’s negotiation skills and the experience of visiting reproductive health clinics. These unmeasured variables might be residual confounding in the analyses; hence the results might be biased. (Fewell et al., 2007) It is recommended that literature reviews and consultations be thoroughly organized to design and validate the survey questionnaire in the future studies, ensuring it covers a comprehensive list of indicators.

The limitations and recommendations for future studies are summarized in *Table 15*.

Limitations of the current study	Future research recommendations
<p>On the study design, the cross-sectional nature of the dataset does not allow me to identify whether the association is a casual relationship; The quantitative data only provides the view on the situation, with limited insights into ‘why’ and ‘how’ the association exists; Comparatively small sample size makes it difficult to generalize the study findings to the larger population.</p>	<ul style="list-style-type: none"> - Conduct cohort studies in the future to determine the time sequence of the events and inform causality. - Equip the quantitative survey with the qualitative interviews with stakeholders in the future research. - Increase the sample size in the survey in the future.
<p>On the quality of data and potential bias: with the convenience sampling, the dataset is difficult to be used in inferential statistics; Due to the extreme environment during COVID-19 lockdown in China, the collected data may not reflect the respondents’ real experience and situations; The reporting bias and the recollection bias from respondents are also expected in the dataset.</p>	<ul style="list-style-type: none"> - Conduct nationally representative survey and avoid using convenience sampling the future, if resources allow, to ensure the findings are generalisable. - Conduct another round of NUSS-SRH once the COVID-19 pandemic is over, especially once people’s life has returned to normal. - Conduct a feasibility or a validity study to help limit the recall bias and reporting bias.

<p>On the choice of dependent and independent variables: the study has not elaborated the determinants for each MC use; the survey questions missed some potentially important factors for MC use among university students.</p>	<ul style="list-style-type: none"> - Expand the scope of research in the future to investigate the determinants of using different kinds of MC among university students. - Conduct literature review and validation consultations in the future to ensure all the relevant factors potentially associated with the MC use are included in the survey questionnaire.
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Table 15 Limitations of the current study and future study recommendations

4.6 Impacts of the study and policy recommendations

This study has generated valuable results, based on which several policy recommendations were developed as shown in *Table 16*.

Before illustrating the recommendations, it is important to note that China has already developed solid policy frameworks and strategies on health and education over the past four decades since opening up, as discussed in Chapter 1. (Li & Fu, 2017) Given its large population and wide geographic coverage, it's important to be careful with developing any additional stand-alone policies as it may be difficult, unsustainable and costly to implement throughout the country. (Fang & Kaufman, 2008) Therefore, the approaches for the policy recommendations in this study avoided suggesting adding completely new regulations, but rather focused on current policy improvement and integrations.

Specifically, the policy recommendations from this study could be categorized into three aspects: 1) strengthening the policy integration on the issue of promoting MCs use among young people with other policy agendas and the broader environment; 2) identifying high-risk sub-populations and developing tailored approaches to advance SRH for the target population; 3) further promoting relevant education and youth friendly health services as the foundation to address the issue.

Unique and important findings from this study	Policy recommendations
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<p>The study has identified a few sub-groups of high-risk populations for lower SRH knowledge and non-use of MCs.</p> <p>The high-risk population according to the study includes male youth, younger-aged adolescents, students from rural regions, students from the West part of China, students from less wealthy families, student smokers and who experienced violence, students who are from an ethnic minority, students with left-behind childhood experience, and students who are studying at vocational schools.</p>	<p><i>Strengthen sex education and SRH information provision to high-risk populations, through investing extra resources to ensure ‘no one is left behind’.</i></p> <p>It is recommended that the government should provide more resources to develop high quality sex education, and SRH information to cover the vulnerable youth population. Particularly, it is recommended that sex education should be made available earlier for young people and in sex educations, teachers/ facilitators need to ensure the quality messages are getting across to both male and female participants. If necessary, special programmes could be built to reach the ‘last mile’. For example, special education and information programmes with local language and culture sensitivity would largely benefit young people in ethnic minority communities. As each vulnerable population are different, it is suggested that technical consultations to be conducted to design the most appropriate approach to reach each high risk and vulnerable sub- populations.</p> <p><i>Integrate youth MC promotion campaigns and policies with existing health promotion and harm reduction campaigns and broader policies in China.</i></p> <p>This study has found that coming from a less-wealthy family was associated with MC non-use in China. The ‘poverty alleviation’ and ‘striving for common prosperity’ are two key national policy strategies in China with designated high-level government bodies overseeing the implementation of such policies. If this issue (promoting MC use among university students) could be integrated as a pillar in the broader ‘poverty alleviation’ and ‘common prosperity’ strategies, it will enjoy higher political prominence. Additionally, it would</p>
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	<p>also improve SRH knowledge and reproductive health outcomes of young people from poor households.</p> <p>This study has revealed that Chinese university student smokers had lower SRH knowledge and higher odds of not using MCs. This study also revealed that university students who had experienced physical violence were less likely to use MCs. Smoking, violence, and MC non-use are all risky health behaviours that undermine people’s health and wellbeing. As the Chinese government undertakes various health promotion and harm reduction campaigns, it is suggested that the government should integrate these healthy promotion campaigns strategically, ensuring that these campaigns and initiatives could reinforce each other and not work in silos.</p>
<p>This study shows that most university students in China chose male condoms as the primary contraceptive to prevent unintended pregnancies. The uptake of other MCs was extremely low.</p>	<p><i>Expand the coverage of SRH services to unmarried young people and ensure they are available through university clinics.</i></p> <p>These services should include family planning counselling, so that university students, in particular female students, can choose and obtain the most appropriate contraceptive measures based on their own situation. It is also recommended that health service providers help educate young people and the public to break the misbelief that MCs (except condoms) are designed only for married couples. The SRH service providers should also endeavour to make MC options available in the clinical institutes or at least able to refer young people to places that can assist them with using MCs.</p>
<p>This study has found that university students in China receive SRH knowledge effectively</p>	<p><i>Enable families and online/ social media hosts to provide high quality SRH information to young people</i></p>

<p>from their parents and through online platforms.</p>	<p>It is suggested that government agencies should set up credible, friendly and scientific online platforms to discuss key SRH issues with young people. For example, with the popularity of TikTok among young people, it is suggested that NGOs and local government to support credible education institute to disseminate quality SRH knowledge through the TikTok channel. Besides that, it is also suggested that health and education technical agencies should develop guidance to enable parents to effectively communicate with their children on SRH issues.</p>
<p>University students who reported that within their relationship if there was a decision maker on contraceptive use, they would have higher odds of using MC during MRS. Having a decision maker on contraceptive use is also associated with increased SRH knowledge.</p>	<p><i>Improve the current sex education and health education programmes to include content on skills and responsibilities on family planning.</i></p> <p>It is suggested that sex education and health education should not only focus on SRH knowledge, but also talk about skills and responsibilities on family planning and contraceptive use, including raising their awareness that using MC is your own responsibility. The skills and awareness will help young people translate their knowledge into practice. Such education models have already been described in the International Technical Guidelines on Sexuality Education, a guidance issued by the UN and endorsed by leading international experts. (UNFPA et al., 2018) However, the guideline has not yet been fully implemented in China by the Chinese government. It is suggested that the current sex education and health education programmes align with the International Guidelines.</p>

Table 16 Policy recommendations based on the findings from the study.

Chapter V: Conclusions

SRH is a key health issue for young people globally. In China, unintended pregnancies among young people are becoming a major public health challenge. Research shows that the primary reason for unintended pregnancies among Chinese unmarried young people is the non-use of MCs. Therefore, this study has focused on finding the determinants of MC non-use among sexually-active Chinese university students. With nearly 60% gross enrolment rate of tertiary education in China 2022, the results shown in this study provide a glimpse of the situation for unmarried young people in general. It is important to note that university students in China normally are not married due to legal barriers and cultural disapprovals. Therefore, the MC non-use among university students is potentially due to unmet needs for family planning.

This study revealed a much higher level of MC use prevalence among sexually active Chinese university students (87%), as compared to the contraceptive prevalence rate among unmarried young people globally (57%). However, there are still around 13% of sexually-active Chinese university students according to this study that are not using MCs at all during MRS, exposing them to health risks, including but not limited to unintended pregnancies. Therefore, this study will support policy development to further reduce the unmet needs for family planning among unmarried young people, including sexually active university students in China.

According to the literature review, there are quite a few publications in China that have discussed the determinants of contraceptive use among university students. However, those publications did not focus on modern contraceptive use. Some of those studies only investigated a small number of participants or were conducted in a small geographic area (e.g., a single college, city or province). The scopes of those studies were limited, too, as they only researched some social and demographic determinants. This study, however, utilized the most recent national level survey data, and investigated 52 social, economic, demographic and behavioural factors, including some less discussed but relevant factors, for the non-use of MCs among sexually active Chinese university students. This study has further explored the determinants of increased SRH knowledge among university students in China.

The NUSS-SRH, a national large sample survey on young people's SRH in China, was used in this study with 11,223 sexually active Chinese university student respondents included in the analysis. Employed with progressive multivariable logistic regression analysis, the study has found that there are eleven socioeconomic, demographic, and behavioural factors associated

with MC non-use among sexually active Chinese university students: they are age, gender, education institutes, smoking experience, SRH knowledge, family wealth, age at the first adolescent romantic feelings, age at the sexual debut, having a decision maker in MC use, physical violence experience and the difficulty level of accessing MCs. Gender disparities on the correlation between the socioeconomic, demographic and behaviour determinants and MC non-use behaviour were also observed. These findings are generally in line with the findings from other countries, especially that having a decision maker on MC use, having correct SRH knowledge and having convenient access to MC are often found associated with MC use behaviour in other countries. Whereas, this study is unique in pointing out that vocational college students in China are less likely to use MC during MRS, as compared to their university counterparts.

This study has further revealed how these identified factors were associated with both SRH knowledge and MC use behaviour. Being a vocational student, have smoking experience and having no decision makers on contraceptive use were risk factors for both SRH knowledge and MC use behaviour. Being older, being older when engaged in the first romantic relationship and coming from a rich family are protective factors for SRH knowledge but risk factors for MC use behaviour. While most of these findings are similar to the findings from other countries, this study is unique to point out that being a vocational college student is both a risk factor for SRH knowledge as well as MC use behaviour and that engaging in the first romantic relationship is a protective factor for SRH knowledge but a risk factor for MC use behaviour.

Based on the study findings, policy recommendations are developed, linking to the unique and important findings from the study. The policy recommendations focus on improving the existing policies and facilitate policy integration, rather than developing completely new regulations and policy for government to implement across the country. It is suggested that SRH education and health services policies could be further strengthened to include high risk and vulnerable populations. They are male youth, younger-aged adolescents, students from rural regions, students from the west part of China, students from less wealthy families, university student smokers and university students who experienced violence, students who are from an ethnic minority, students with left-behind childhood experience, and students who are studying at vocational schools. As compared to global literatures, some of the vulnerable populations were uniquely found in this study, such as vocational college students and students with left- behind childhood experience. It is also suggested that youth MC promotion policies

could be better integrated with other public health policies and national initiatives such as integrating SRH pillar in China's Harm Reduction Initiatives and Poverty Reduction Initiatives. Additionally, key policies, such as SRH services and sex education policies, could be refined to improve their quality and availability to university students. It will allow them to use the most appropriate MC method, not simply male condoms. Lastly, the study recommends that the current sex education programmes to level up the discussion on social skills with which young people can transform SRH knowledge into actions. Sex education policies, in the meantime, should enable online platforms and parents to deliver quality SRH knowledge and information to young people.

Though there are limitations in the study in the areas of study design, quality of the dataset and the in-depthness of the analysis, this study contributed uniquely to the knowledge on youth SRH in China and proposed policy pathways to improve the use of MCs among Chinese university students. The findings from the study will support decision makers to develop policies and interventions to prevent unintended pregnancies and STDs among Chinese young people and enable Chinese young people to make informed and responsible decisions on their body and family planning. Based on the findings, the study has also suggested potential areas for future research to deepen the understanding of the determinants of MC use among Chinese youth population.

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