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Health Insurance Schemes and Chronic Disease Management Behaviours in China: Evidence from Women with Non-Communicable Diseases

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Background: Women in China bear a disproportionate burden of non-communicable diseases (NCDs), but limited evidence is available on whether different health insurance schemes are associated with chronic disease management behaviours.

Objective: To examine the association between insurance type and chronic disease management behaviors among insured Chinese women with NCDs.

Methods: We used data from a national cross-sectional online survey of approximately 7,000 women conducted in 31 provinces in China from 1 June to 20 August 2025 by the Institute for Health China Studies, Tsinghua University. Linear probability models with robust standard errors were used to estimate the associations between insurance type and three chronic disease management behaviours: medication adherence, lifestyle intervention, and health surveillance. Dietary regularity and health-product purchases were examined as spillover outcomes.

Results: Among survey respondents, 1,101 insured women aged 17–70 years reported at least one physician-diagnosed NCD. Compared with Urban Employee Basic Medical Insurance (UEBMI) enrollees, women covered by the government-funded medical subsidy program (GovMed) had a higher probability of medication adherence (β = 0.116, 95% CI: −0.003 to 0.236), whereas Urban–Rural Resident Basic Medical Insurance (URRMI) enrollees did not differ significantly (β = −0.026, 95% CI: −0.101 to 0.049). After adjustment, differences across schemes in lifestyle intervention and health surveillance were small and not statistically significant. Menopausal heterogeneity was concentrated in medication adherence: among post-menopausal women, GovMed enrollees had a 36.4-percentage-point higher probability of medication adherence than UEBMI enrollees (β = 0.364, 95% CI: 0.219 to 0.509). Supplementary commercial insurance was positively associated with health surveillance, but not with medication adherence or lifestyle intervention. Insurance-related differences in dietary regularity were weak and not statistically robust.

Conclusion: Insurance-related differences in chronic disease management among Chinese women with NCDs are most evident for medication adherence, particularly among post-menopausal women. Broader self-management behaviours appear less responsive to scheme differences.

Keywords: non-communicable diseases, chronic disease management, health insurance, menopause, commercial health insurance

Introduction

Non-communicable diseases (NCDs) are now the dominant source of morbidity and mortality worldwide and increasingly shape the fiscal and operational constraints of health systems.[1] According to the Global Burden of Disease Study, NCDs accounted for nearly two-thirds of global disability-adjusted life-years in 2023.[2] China mirrors this pattern: NCDs were responsible for about 91% of all deaths in 2021.[3] As life expectancy rises, women bear a particularly large share of this burden. Among Chinese older adults, for example, the prevalence of at least one chronic disease is higher in women

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than in men,[4] reflecting both longer survival and gender-specific risk profiles over the life course.[5,6] The menopausal transition is a critical turning point: declining estrogen levels accelerate cardiovascular and metabolic risks and contribute to higher post-menopausal morbidity.[7] Effective day-to-day management—taking medicines as prescribed, maintaining healthy lifestyles and monitoring key health indicators—can substantially slow disease progression and improve quality of life, whereas poor adherence leads to faster deterioration and higher hospitalisation risk.[8] Understanding what supports or constrains women's chronic disease management behaviours is therefore of central importance. This issue is especially salient in the context of medical insurance, as scheme design may shape women's financial and administrative access to routine follow-up care and long-term treatment. Against this background, the key research question of this study is whether enrolment in different basic medical insurance schemes is associated with chronic disease management behaviours among insured Chinese women with NCDs, and whether these associations differ by menopausal status, supplementary commercial insurance coverage, income, educational attainment, and regional context.

China's basic medical insurance system has achieved near-universal coverage through several distinct schemes, mainly including Urban Employee Basic Medical Insurance, (UEBMI), Urban–Rural Resident Basic Medical Insurance (URRMI),[9,10] and the government-funded medical subsidy program (GovMed).[9,10] Although these schemes share broadly similar benefit frameworks, they differ substantially in benefit generosity, outpatient reimbursement, and out-of-pocket cost-sharing.[11,12] As a result, women with non-communicable chronic diseases may face markedly different financial burdens and administrative barriers in accessing routine follow-up care and medications,[13] which may in turn be associated with heterogeneous patterns of chronic disease management behaviours.[14]

From a health-economics perspective, such variation is likely to arise because insurance design changes the price of care and medication faced by insured women, thereby shaping incentives for follow-up visits, treatment adherence, and routine monitoring.[15] Empirical evidence suggests that more generous reimbursement for outpatient services and prescription drugs lowers the marginal cost of chronic disease management, making it easier for patients to maintain regular contact with the health system and adhere to prescribed therapies.[16] Conversely, higher out-of-pocket payments may lead women to delay routine visits, reduce medicine use, or rely on less formal forms of self-management.[17] Insurance design therefore influences chronic disease management not only through financial protection, but also through the behavioural incentives embedded in reimbursement rules and cost-sharing arrangements.[18] At the same time, these incentives are unlikely to operate uniformly across women. A life-course perspective suggests that post-menopausal women, who often face higher health risks and multi-morbidity, may respond differently to insurance incentives than younger, pre-menopausal women.[19] Taken together, these considerations suggest that the association between insurance design and chronic disease management may vary across women at different life-course stages.

However, existing empirical evidence has not fully examined these pathways. Most studies on medical insurance in China and elsewhere focus on healthcare utilisation and expenditures—such as hospital admissions, physician visits, out-of-pocket spending, or catastrophic health expenditure—rather than patients' day-to-day management actions.[20,21] Direct evidence on whether insurance design affects NCD management behaviors, including medication adherence, lifestyle modification, and routine monitoring, remains comparatively limited and is often disease-specific.[22] Even where NCD management is analysed, populations are usually treated as homogeneous, with little attention to gender or biological life-stage heterogeneity.[22] Moreover, few studies jointly compare China's main basic medical insurance schemes while also considering the incremental role of commercial insurance.[18] These gaps are particularly salient for women with NCDs, for whom both insurance coverage and life-course transitions such as menopause may shape the capacity and willingness to invest in health.

This paper makes three contributions to the literature. First, previous studies have mainly examined the impact of health insurance types on healthcare utilization and medical expenditures, whereas this study shifts the research focus to the chronic disease management behaviors of female patients with non-communicable diseases. Specifically, this study constructs three core health management behaviors—medication adherence, lifestyle intervention, and health monitoring—thereby enriching the existing research literature on health insurance and women's health behaviors. Second, most existing studies on the heterogeneity of chronic disease management behaviors in women have focused on external conditions such as healthcare accessibility and regional disparities, often overlooking the uniqueness of individual life courses. This study fully considers the heterogeneous impact of menopause, a key physiological characteristic, on

women's health behaviors, further refining the heterogeneity boundary of the insurance–health nexus. Third, previous studies have largely neglected the role of private insurance as a supplementary source of coverage. By incorporating supplementary commercial insurance into both the main-effect and heterogeneity analyses, this study extends the literature from basic insurance differences alone to the broader association between multi-layered insurance arrangements and women's chronic disease management.

The objective of this study is to examine how enrolment in different basic medical insurance schemes is associated with chronic disease management behaviours among insured Chinese women with non-communicable diseases. Specifically, we focus on three dimensions of chronic disease management: medication adherence, lifestyle intervention, and health surveillance. We further examine whether these associations differ by life-course stage, supplementary commercial insurance coverage, income group, educational attainment, and regional context. The remainder of the paper is structured as follows. Literature Review reviews the related literature. Methods and Materials describes the data, variables, and methods. Result presents the empirical results, including baseline regressions, robustness checks, heterogeneity analyses, and spillover effects. Discussion discusses the findings, and Conclusion concludes.

Literature Review

To clarify why insurance type may matter for women's chronic disease management, we first review the broader evidence on health insurance, healthcare use, and NCD-related outcomes. A large body of empirical work has examined how health insurance affects healthcare use, spending, and health outcomes. A systematic review of studies from low- and middle-income countries reported that 32 of 40 evaluations found higher healthcare utilization among the insured and 26 of 46 documented improved financial protection, while evidence for better health outcomes was only moderate.[23] In high-income settings, randomized evidence from the Oregon Medicaid lottery showed that gaining public insurance increased outpatient, preventive and hospital use, reduced out-of-pocket spending and medical debt, and improved self-reported health.[24] Longitudinal evidence from the United States similarly suggested that more years of continuous coverage were associated with lower risks of reporting fair or poor health.[25] Turning to NCDs, a systematic review of 24 studies reported that health insurance could promote healthier lifestyles and was associated with a lower prevalence of NCDs, although findings were heterogeneous across contexts.[26] Evaluations of the Patient Protection and Affordable Care Act in the U.S. further highlighted that expanding coverage increased the use of preventive and chronic-disease services and strengthened financial security, while downstream health gains depended on benefit design and delivery capacity.[27] This evidence suggests that insurance can influence NCD care through affordability and access, but it does not fully explain which concrete management behaviours such as medication adherence, lifestyle change, or routine monitoring are most responsive to insurance coverage.

This behavioural question becomes particularly important in China, where near-universal insurance coverage coexists with substantial differences in benefit design and reimbursement rules across schemes. In China, rapid expansion of social health insurance has greatly increased coverage and improved financial protection, but concerns remain regarding benefit adequacy and equity.[11] The New Cooperative Medical Scheme (NRCMS), introduced in 2003, led to marked increases in healthcare use among rural residents, particularly inpatient admissions, and even contributed to lower incidence of infectious diseases through improved health knowledge and behaviors associated with insurance coverage.[28] Similarly, insured individuals were more likely to obtain needed NCD diagnosis and treatments. A repeated cross-sectional study from 1991 to 2009 showed that health insurance increased the probability of receiving treatment by 28.7% among diagnosed hypertensives compared to propensity-matched individuals not covered by health insurance.[29] A recent nationwide study of chronic obstructive pulmonary disease found that patients with URRMI and UEBMI were over twice as likely to have their condition diagnosed, compared to the uninsured.[30] Complementary evidence on diabetes indicated that reducing out-of-pocket costs for outpatient care could increase health-seeking behavior and improve health outcomes, underscoring the importance of reimbursement rules for routine management.[31] However, an analysis of rural older adults suggested that NRCMS did not significantly increase their medical service use or reduce overall expenditures for NCD treatment.[32] These mixed findings indicate that insurance expansion alone is insufficient and point to the need to examine how compensation schemes may affect management behaviours.

Some studies linked China's different insurance programs, commonly characterized by GovMed, payroll-financed UEBMI, and the resident scheme (URRMI/NCMS, later integrated as URRMI), to persistent inequities in access and outcomes. A large study in Shaanxi province found that enrollees in the more generous UEBMI scheme reported better health-related quality of life than those covered by the URBMI or the rural cooperative scheme.[33] Outcome-focused analyses among older adults similarly reported that UEBMI enrollees exhibited better self-reported health and functioning than those covered by URRMI or NCMS, highlighting outcome gaps aligned with scheme generosity.[34] Using repeated national survey data between 2008 and 2018, a study documented persistent (though in some dimensions narrowing) disparities in utilization and underutilization between UEBMI and resident schemes, implying that "near-universal" coverage does not automatically eliminate scheme-related inequity.[35] Policy evaluation of the URRMI and NCMS integration reform showed that integration can improve outpatient benefit equity and reduce pro-rich inequities in benefit receipt, suggesting an equity-enhancing role for consolidation.[36] However, the integration did not improve the health of the central region and low-income groups, and the lack of access to health care for low-income groups was not effectively reduced.[37] Although these studies clarify that scheme generosity is linked to service use and broad health outcomes, they rarely follow the pathway further to assess whether women translate more generous coverage into daily actions.

The insurance-behaviour pathway also needs to be interpreted through a life-course lens. Menopause is a life stage with profound health implications for women's health behaviors and NCD risk,[19] yet it has received limited attention in empirical health economics studies of insurance impact. Medically, women experience a notable increase in cardiovascular disease risk around menopause, as declining estrogen levels adversely affect cholesterol profiles and vascular function.[38] Menopause also brings elevated risks of metabolic syndrome, osteoporosis, arthritis, and other chronic ailments.[39,40] Beyond biomedical changes, the menopause transition often coincides with shifts in health-related behaviors and needs. Women may experience symptoms (eg. vasomotor symptoms, sleep disturbances, mood changes) that can indirectly affect lifestyle habits.[41] In a cross-sectional study of menopausal women, the majority had only moderate adherence to recommended diet and exercise regimes.[42] Dietary patterns may also shift after menopause, with evidence suggesting higher intakes of total sugars driven by sweets and desserts.[43] Despite menopause being a pivotal life stage for women's health, few studies have incorporated menopausal status as a dimension of heterogeneity when evaluating insurance or policy effects. A recent review on menopausal care disparities in the United States noted that insurance access can influence treatment options for menopausal symptoms, but systematic attention to menopause in health services research remains limited.[44]

Taken together, the existing literature points to a coherent but incomplete pathway: health insurance may reduce financial barriers to care; China's different insurance schemes create unequal benefit generosity; and women's life-course stage may influence how these incentives are converted into daily chronic disease management. However, a clear gap remains. Most prior studies examine service utilization, expenditures, diagnosis, or broad health outcomes, while direct evidence on specific management behaviours—medication adherence, lifestyle intervention, and health surveillance—among women with NCDs remains limited. No study to date has simultaneously focused on women with NCDs and compared how different basic medical insurance types, including GovMed, UEBMI, and the integrated URRMI, are associated with these day-to-day management behaviours. Moreover, prior studies did not incorporate menopausal status or the presence of supplementary commercial insurance as potential modifiers of insurance-related behavioural differences. Therefore, this research aims to fill this gap by linking insurance design explicitly to women's chronic disease management behaviours within a unified empirical framework.

Methods and Materials

Study Area and Period

The microdata used in this paper are derived from the special survey data of the White Paper on Women's Health, which was organized and conducted by the Institute for Health China Studies, Tsinghua University, from June 1 to August 20, 2025. The survey first adopted a matched sampling method to allocate the sample size based on the resident female population of 31 provinces (autonomous regions and municipalities directly under the Central Government) in 2024, followed by a random sampling with unequal probability method to select a total of 7,000 female respondents aged 18–70 years.

Study Design

This study employed a cross-sectional survey design. This design was appropriate for the research objective because the study aimed to compare chronic disease management behaviours across women enrolled in different health insurance schemes at a common reference period, rather than to estimate dynamic treatment effects over time. Given the available data structure, the analysis focuses on associations between insurance type and chronic disease management behaviours rather than causal effects.

Study Population

The present study is a secondary analysis of the original survey. The analytic sample was restricted to insured women who reported having at least one non-communicable disease (NCD) as of the survey reference time point (00:00 on June 1, 2025). After applying the study eligibility criteria, the final analytic sample consisted of 1,101 respondents. These women were classified into three mutually exclusive insurance groups based on self-reported enrolment: GovMed (n = 75, 6.81%), UEBMI (n = 711, 64.58%), and URRMI (n = 315, 28.61%).

Sample Size Calculation and Justification

The original survey targeted 7,000 female respondents nationwide, with sample allocation based on the provincial distribution of the resident female population in 2024. The present study is a secondary analysis restricted to respondents who met the eligibility criteria for this paper, namely insured women with at least one non-communicable disease (NCD), yielding a final analytic sample of 1,101. No separate a priori power analysis was conducted specifically for this secondary analysis. Accordingly, the sample size used in this study was determined by eligibility within the nationally implemented original survey rather than by a study-specific power calculation.

Inclusion and Exclusion Criteria

The present study is a secondary analysis restricted to respondents in the original survey who met the eligibility criteria for this paper. Eligible respondents were women aged 18–70 years who were enrolled in one of the three basic medical insurance schemes examined in this study (GovMed, UEBMI, or URRMI) and who reported having at least one non-communicable disease (NCD) as of the survey reference time point. Respondents were excluded if they were uninsured, reported no NCD, lacked valid information on insurance type, or had missing information on the key outcome variables. Applying these criteria yielded a final analytic sample of 1,101 insured women with at least one NCD.

Data Collection Tool, Operational Definitions, and Measurements

Data Collection Tool

The original survey was administered online through Wenjuanxing. The questionnaire was constructed by combining multiple modules, including several sections adapted from existing scales and several project-specific items developed for the White Paper on Women's Health survey. The final questionnaire was further refined through expert discussion and internal review before field implementation. The instrument covered socio-demographic characteristics, health insurance enrolment, chronic disease status, health-related behaviours, and supplementary insurance coverage. This modular design allowed the survey to capture both standardized health-related constructs and policy-relevant behavioural information.

Outcome Variables and Measurements

Our main outcome variables cover different dimensions of NCD management. We construct three binary indicators based on the question asking how respondents manage their chronic conditions: "medication adherence" takes the value 1 if the respondent reports taking medicines as prescribed by doctors, and 0 otherwise; "lifestyle intervention" takes the value 1 if the respondent reports adopting lifestyle-related changes, and 0 otherwise; and "health surveillance and early warning" takes the value 1 if the respondent reports regularly monitoring health indicators, and 0 otherwise.

In addition, we examine two behaviors as spillover outcomes. "Regular meals" is an ordered categorical variable that takes the value 1 if the respondent reports eating every meal carefully and on time, 2 if meals are basically regular except on weekends and holidays, and 3 if meals are irregular and taken whenever she feels like eating. "Annual health product

purchase frequency" is an ordered measure of the frequency of purchasing health products over the past year, with higher values indicating more frequent purchases.

Explanatory Variables and Measurements

The key explanatory variable is insurance type. We distinguish three mutually exclusive schemes based on self-reported enrolment: GovMed, UEBMI and URRMI. In the regression models we include two dummy variables for GovMed and URRMI, taking UEBMI as the reference category. The associated coefficients therefore measure differences in chronic-disease management behaviours between GovMed or URRMI enrollees and otherwise comparable UEBMI members.

To examine heterogeneity, we consider several additional variables. Menopause (Menopause) is a binary indicator equal to 1 if the respondent reported having reached menopause and 0 otherwise. Commercial insurance (ComIns) equals 1 if she reported owning at least one commercial medical insurance policy and 0 otherwise. We also examine heterogeneity by income group (low, middle, and high), educational attainment (lower education versus postgraduate education), and region (eastern, central, and western China). These variables are interacted with insurance type, or used in subgroup analyses, to test whether the association between basic insurance schemes and NCD management differs across life-course stage, supplementary insurance coverage, socio-economic status, educational background, and regional context.

Covariates and Measurements

Following the health-economics literature, we control for a range of socio-demographic and health characteristics that may influence both insurance choice and chronic-disease management. These covariates include age; monthly post-tax household per-capita income; educational attainment; marital status; hukou type (urban versus rural); occupation type; and place of residence (urban district, urban–rural fringe, town or village). To capture health needs and endowments, we include the self-rated health score, the number of chronic conditions, and indicators for current smoking and alcohol use. These controls aim to reduce confounding arising from systematic differences in health status, preferences and socio-economic resources across insurance schemes.

Data Quality Control

Before formal field implementation, the questionnaire was pilot-tested by the survey team. During survey administration, Wenjuanxing applied quality-control procedures to its sample pool, including logic checks and duplicate-response verification, to improve response consistency and reduce the risk of invalid or repeated submissions. After data collection, the returned questionnaires were further reviewed by the research team for completeness, consistency, and eligibility before the final analytic sample was constructed.

Data Analysis

Given the cross-sectional nature of the data, we adopt a regression framework to examine the association between medical insurance type and chronic disease management behaviors among women. Our baseline specification is a linear probability model (LPM) estimated by ordinary least squares for each outcome of interest. For respondent i and outcome k, the estimating equation is:

$$Y_{ik} = \alpha_k + \beta_{1k} GovMed_i + \beta_{2k} URRMI_i + X_i\prime\gamma_k + \varepsilon_{ik}$$

where Y_{ik} denotes one of the three chronic disease management behaviors—medication adherence, lifestyle intervention, or health surveillance—and GovMed_i and URRMI_i are dummy variables indicating enrollment in government medical insurance and Urban–Rural Resident Medical Insurance, respectively. Urban Employee Basic Medical Insurance (UEBMI) serves as the omitted reference category. The vector X_i includes the set of covariates described above. The coefficients β_{1k} and β_{2k} capture differences in the probability of engaging in each management behavior between GovMed/URRMI and UEBMI enrollees, conditional on observed characteristics. All models are estimated on the sample of women with at least one diagnosed chronic condition, and heteroskedasticity-robust standard errors are reported.

We used the LPM as the baseline specification because its coefficients can be directly interpreted as percentage-point differences in probability and are straightforward to compare across outcomes. At the same time, because LPMs may

generate fitted probabilities outside the (0,1) range, we conducted robustness checks using Logit models and reported average marginal effects.

To assess whether the association between insurance type and chronic disease management differs across key subgroups, we further estimated models with interaction terms of the form:

$$Y_{ik} = \alpha_k + \beta_{1k} GovMed_i + \beta_{2k} URRMI_i + \delta_{1k}(GovMed_i \times Z_i) + \delta_{2k}(URRMI_i \times Z_i) + \theta_k Z_i + X_i'\gamma_k + \varepsilon_{ik}$$

where Z_i denotes a heterogeneity dimension, including menopause status (post-vspre-menopause) and commercial medical insurance coverage (with vs without commercial coverage). These specifications allow us to test whether the association between basic medical insurance and chronic disease management is stronger among women in different life-course stages, with or without supplementary insurance. We interpret the interaction coefficients and their associated linear combinations using marginal predictions for each insurance–subgroup combination.

Finally, we conducted a set of robustness checks to assess the sensitivity of our findings, including re-estimating the models using Logit models with average marginal effects, excluding respondents in the two lowest income categories, and applying propensity-score weighting based on a multinomial treatment model of insurance type. Throughout, the cross-sectional nature of the data means that our estimates should be interpreted as associations rather than causal effects. All statistical analyses were conducted using Stata 15.

Missing Data Handling

The analytic sample was restricted to respondents with non-missing information on insurance type, NCD status, and the key outcome variables required for this study. In the main analyses, observations with missing values on variables required for a given specification were excluded from that specification. No multiple imputation procedure was applied, and the regression analyses were therefore based on complete cases.

Result

Descriptive Analysis

Table 1 highlights several policy-relevant differences across insurance groups. In unadjusted comparisons, GovMed participants showed the highest medication adherence, UEBMI enrollees reported the highest level of health surveillance,

Table 1 Descriptive Statistics

Variable	Full Sample	GovMed	UEBMI	URRMI	F-Test	p_value
Outcome						
Medication adherence	0.45 (0.50)	0.59 (0.50)	0.45 (0.50)	0.43 (0.50)	3.16	0.043
Lifestyle intervention	0.43 (0.50)	0.48 (0.50)	0.45 (0.50)	0.38 (0.49)	2.65	0.071
Health surveillance	0.37 (0.48)	0.33 (0.47)	0.40 (0.49)	0.31 (0.46)	4.03	0.018
Spillover outcomes						
Regular meals	1.86 (0.64)	1.83 (0.64)	1.79 (0.60)	2.01 (0.71)	12.63	<0.001
Supplement purchase frequency	1.84 (1.06)	1.72 (1.12)	1.89 (1.07)	1.77 (1.04)	2.05	0.129
Covariates						
Age	33.12 (8.83)	30.81 (9.33)	35.07 (8.05)	29.28 (9.02)	54.45	<0.001
Monthly net per capita income	4.05 (0.91)	4.19 (0.87)	4.19 (0.82)	3.70 (1.03)	34.63	<0.001
Number of chronic conditions	1.20 (0.50)	1.25 (0.50)	1.21 (0.52)	1.16 (0.46)	1.68	0.187
Educational Attainment	3.99 (0.52)	4.08 (0.71)	4.06 (0.42)	3.82 (0.63)	25.44	<0.001

(*Continued*)

Table 1 (Continued).

Variable	Full Sample	GovMed	UEBMI	URRMI	F-Test	p_value
Self-rated health	3.07 (1.00)	2.84 (1.01)	3.05 (0.96)	3.17 (1.05)	3.94	0.020
Permanent residence	1.56 (0.91)	1.41 (0.87)	1.41 (0.75)	1.94 (1.11)	40.79	<0.001
Marital status	2.57 (0.73)	2.37 (0.78)	2.71 (0.66)	2.30 (0.79)	40.69	<0.001
Occupation type	5.99 (2.44)	4.64 (2.65)	6.50 (1.79)	5.14 (3.19)	50.48	<0.001
Urban hukou	1.35 (0.48)	1.29 (0.46)	1.25 (0.43)	1.61 (0.49)	71.17	<0.001
Current smoker	0.05 (0.22)	0.04 (0.20)	0.05 (0.21)	0.07 (0.26)	1.85	0.158
Alcohol	0.20 (0.40)	0.21 (0.41)	0.21 (0.41)	0.16 (0.37)	1.73	0.178
Heterogeneity indicators						
Menopause	0.10 (0.30)	0.09 (0.29)	0.11 (0.32)	0.07 (0.26)	2.04	0.158
Commercial Insurance	0.63 (0.48)	0.73 (0.45)	0.68 (0.47)	0.48 (0.50)	20.99	<0.001
Observations	N=1101	N=75	N=711	N=315		

Notes: Values are means with standard deviations in parentheses.

and URRMI participants had the highest frequency of regular meals. These differences were statistically significant for medication adherence, health surveillance, and regular meals. Because the insurance groups also differed systematically in socio-demographic and health-related characteristics, the adjusted regression analyses reported below are needed to assess whether these crude differences persist after accounting for compositional variation.

Basic Regression Results

Table 2 presents unadjusted and adjusted estimates from linear probability models (LPMs) with robust standard errors for the associations between insurance type and chronic disease management behaviours. In the unadjusted models, women

Table 2 Baseline Associations Between Insurance Type and Chronic Disease Management Behaviours

	Medication Adherence		Lifestyle intervEntion		Health Surveillance	
	(1)	(2)	(3)	(4)	(5)	(6)
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
GovMed (vs UEBMI)	0.141 (0.023,0.258)	0.116 (−0.003,0.236)	0.027 (−0.092,0.146)	0.020 (−0.100,0.139)	−0.068 (−0.180,0.045)	−0.055 (−0.173,0.062)
URRMI (vs UEBMI)	−0.017 (−0.083,0.049)	−0.026 (−0.101,0.049)	−0.072 (−0.137,-0.007)	−0.032 (−0.106,0.042)	−0.090 (−0.152,-0.027)	−0.057 (−0.130,0.015)
Age		−0.006 (−0.011,-0.001)		0.004 (−0.002,0.009)		−0.001 (−0.006,0.004)
Monthly net per-capita income		0.049 (0.014,0.083)		0.015 (−0.019,0.048)		0.033 (0.000,0.065)
Educational attainment		−0.037 (−0.096,0.023)		0.064 (0.005,0.122)		0.050 (−0.007,0.107)
Urban hukou		−0.041 (−0.110,0.028)		−0.023 (−0.091,0.046)		0.009 (−0.058,0.077)
Marital status		0.034 (−0.018,0.085)		0.035 (−0.017,0.087)		0.057 (0.007,0.106)
Occupation type		−0.005 (−0.019,0.009)		−0.017 (−0.030,-0.004)		0.002 (−0.011,0.015)
Permanent residence		0.048 (0.013,0.083)		0.002 (−0.033,0.037)		0.025 (−0.009,0.058)

(*Continued*)

Table 2 (Continued).

	Medication Adherence		Lifestyle intervEntion		Health Surveillance	
	(1)	(2)	(3)	(4)	(5)	(6)
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Number of chronic conditions		0.072 (0.018,0.126)		0.098 (0.029,0.167)		0.114 (0.044,0.184)
Self-rated health		−0.030 (−0.060,-0.001)		0.017 (−0.013,0.046)		−0.005 (−0.034,0.024)
Smoke		0.076 (−0.060,0.212)		−0.032 (−0.173,0.108)		0.173 (0.033,0.313)
Alcohol		−0.033 (−0.108,0.042)		−0.071 (−0.145,0.002)		−0.054 (−0.125,0.017)
Adjusted covariates	No	Yes	No	Yes	No	Yes
Observations	1101	1101	1101	1101	1101	1101
R-squared	0.006	0.046	0.005	0.036	0.007	0.048

Notes: Entries are β coefficients with 95% confidence intervals in parentheses. UEBMI is the reference group for insurance type,The same applies hereinafter.

covered by GovMed had a 14.1-percentage-point higher probability of medication adherence than those enrolled in UEBMI (β = 0.141, 95% CI: 0.023 to 0.258). By contrast, URRMI enrolment was associated with a lower probability of lifestyle intervention (β = −0.072, 95% CI: −0.137 to −0.007) and health surveillance (β = −0.090, 95% CI: −0.152 to −0.027), relative to UEBMI. These crude differences are broadly consistent with the wider literature suggesting that insurance generosity and benefit adequacy are associated with differential access to treatment and chronic-disease care, while scheme-related disparities remain present even under near-universal coverage.

After adjusting for socio-demographic characteristics, health status, and health-related behaviours, these cross-scheme differences became notably smaller. For medication adherence, the GovMed–UEBMI difference decreased from 0.141 to 0.116, and its 95% confidence interval crossed zero (95% CI: −0.003 to 0.236). The URRMI–UEBMI difference also remained statistically insignificant after adjustment (β = −0.026, 95% CI: −0.101 to 0.049). For lifestyle intervention, the previously negative URRMI–UEBMI association was attenuated from −0.072 to −0.032 (95% CI: −0.106 to 0.042). A similar pattern was observed for health surveillance, where the URRMI–UEBMI difference declined in magnitude from −0.090 to −0.057 (95% CI: −0.130 to 0.015). Substantively, this attenuation suggests that part of the raw between-scheme variation reflects compositional differences in age, income, education, and disease burden across enrollees rather than insurance type alone.

This pattern also helps clarify this study's contribution to the existing literature. Prior studies, especially in China, have mainly focused on healthcare utilization, expenditures, diagnosis, and broad health outcomes, and have generally shown that insurance expansion improves access while leaving persistent scheme-related inequalities in place. By contrast, our analysis focuses on three specific chronic disease management behaviours—medication adherence, lifestyle intervention, and health surveillance—among insured women with NCDs. The results suggest that insurance-related differences are more visible for medication adherence than for lifestyle intervention or health surveillance. This is an important nuance, because medication adherence is more directly linked to reimbursement design, drug affordability, and continuity of treatment, whereas lifestyle change and routine monitoring may depend more strongly on individual capability, time constraints, and health awareness beyond insurance coverage alone.

Supplementary Commercial Insurance and Chronic Disease Management

Table 3 reports the associations between supplementary commercial insurance and chronic disease management behaviours, estimated using linear probability models with robust standard errors. The models control for basic insurance type as well as socio-demographic and health-related covariates. Overall, supplementary commercial insurance is significantly associated with health surveillance, but not with medication adherence or lifestyle intervention.

Table 3 Adjusted Associations Between Supplementary Commercial Insurance and Chronic Disease Management Behaviours

	Medication Adherence, β (95% CI)	Lifestyle Intervention, β (95% CI)	Health Surveillance, β (95% CI)
With commercial insurance	0.049 (−0.015,0.113)	0.037 (−0.027,0.100)	0.110 (0.049,0.170)
GovMed (vs UEBMI)	0.119 (−0.002,0.240)	0.016 (−0.105,0.136)	−0.062 (−0.178,0.053)
URRMI (vs UEBMI)	−0.017 (−0.093,0.059)	−0.031 (−0.105,0.043)	−0.049 (−0.122,0.023)
Observations	1101	1101	1101
R-squared	0.037	0.037	0.058

Specifically, women with supplementary commercial insurance had a 4.9-percentage-point higher probability of medication adherence than those without such coverage, but the estimate was not statistically significant (β=0.049, 95% CI: −0.015 to 0.113). For lifestyle intervention, the estimated association was also positive but small and statistically insignificant (β=0.037, 95% CI: −0.027 to 0.100). In contrast, supplementary commercial insurance was significantly associated with a higher probability of regular health surveillance, with an estimated increase of 11.0 percentage points (β=0.110, 95% CI: 0.049 to 0.170).

With respect to basic insurance type, neither GovMed nor URRMI differed significantly from UEBMI across the three outcomes after controlling for supplementary commercial insurance and other covariates. Taken together, these results suggest that the association of supplementary commercial insurance is concentrated in health surveillance, a behaviour that more directly involves periodic follow-up and routine monitoring, whereas its associations with medication adherence and lifestyle intervention appear limited.

Robustness Check

Table 4 reports three sets of robustness checks. Columns (1)–(3) report average marginal effects from logit models. The positive GovMed–UEBMI association for medication adherence remains statistically significant (β = 0.123, 95% CI: 0.002 to 0.243), while the URRMI–UEBMI difference remains insignificant. For lifestyle intervention and health surveillance, neither GovMed nor URRMI differs significantly from UEBMI.

Columns (4)–(6) report estimates from a restricted sample excluding respondents in the two lowest income categories. In this sample, the positive GovMed–UEBMI association for medication adherence remains statistically significant (β = 0.125, 95% CI: 0.001 to 0.249). For lifestyle intervention, estimated differences across insurance groups remain insignificant. For health surveillance, the URRMI–UEBMI difference becomes significantly negative (β = −0.095, 95% CI: −0.161 to −0.030), while the GovMed coefficient remains insignificant.

Columns (7)–(9) report propensity-score-weighted estimates based on a multinomial treatment model. After weighting, the positive GovMed–UEBMI association for medication adherence remains and becomes larger in magnitude (β = 0.205, 95% CI: 0.053 to 0.358), whereas the URRMI–UEBMI difference remains insignificant. For lifestyle intervention and health surveillance, none of the weighted estimates are statistically significant. Overall, these robustness checks support the main finding that insurance-type differences are concentrated in medication adherence.

Heterogeneity Analyses

Heterogeneity by Menopausal Status

Table 5 shows that menopausal heterogeneity is mainly concentrated in medication adherence. Among pre-menopausal women, neither GovMed nor URRMI differs significantly from UEBMI. Among post-menopausal women, however, GovMed enrollees have a significantly higher probability of medication adherence than UEBMI enrollees (β = 0.364, 95% CI: 0.219 to 0.509), whereas the URRMI–UEBMI difference remains statistically insignificant. The interaction p-value of 0.013 indicates significant heterogeneity by menopausal status.

Table 4 Robustness Checks

	Alternative Estimator (Logit AME)			Income Sensitivity: Excluding the Two Lowest Income Groups			Propensity-Score Weighting		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Medication adherence β (95% CI)	Lifestyle intervention β (95% CI)	Health surveillance β (95% CI)	Medication adherence β (95% CI)	Lifestyle intervention β (95% CI)	Health surveillance β (95% CI)	Medication adherence β (95% CI)	Lifestyle intervention β (95% CI)	Health surveillance β (95% CI)
GovMed	0.123 (0.002,0.243)	0.017 (−0.101,0.136)	−0.055 (−0.173,0.063)	0.125 (0.001,0.249)	0.025 (−0.099,0.148)	−0.080 (−0.200,0.041)	0.205 (0.053,0.358)	0.005 (−0.136,0.145)	−0.042 (−0.183,0.099)
URRMI	−0.019 (−0.095,0.056)	−0.034 (−0.108,0.040)	−0.055 (−0.128,0.017)	−0.017 (−0.095,0.060)	−0.025 (−0.102,0.052)	−0.068 (−0.143,0.007)	−0.015 (−0.109,0.078)	−0.045 (−0.135,0.045)	−0.036 (−0.124,0.051)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1101	1101	1101	1037	1037	1037	1101	1101	1101

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Table 5 Heterogeneous Associations Between Insurance Type and Chronic Disease Management Behaviours by Menopausal Status

Subgroup	Comparison	Medication Adherence, β (95% CI)	Lifestyle Intervention, β (95% CI)	Health Surveillance, β (95% CI)
Pre-menopause (n=990)	GovMed vs UEBMI	0.091 (−0.039, 0.221)	0.026 (−0.099, 0.152)	−0.063 (−0.186, 0.060)
	URRMI vs UEBMI	−0.024 (−0.102, 0.054)	−0.046 (−0.122, 0.030)	−0.070 (−0.145, 0.005)
Post-menopause (n=111)	GovMed vs UEBMI	0.364 (0.219, 0.509)	−0.074 (−0.437, 0.288)	−0.009 (−0.395, 0.378)
	URRMI vs UEBMI	−0.052 (−0.285, 0.181)	0.130 (−0.109, 0.369)	0.084 (−0.145, 0.313)
P for interaction	Menopause status × insurance type	0.013	0.282	0.440

By contrast, we find no clear evidence of menopausal heterogeneity in lifestyle intervention or health surveillance. In both cases, subgroup estimates are statistically insignificant and the interaction p-values are 0.282 and 0.440, respectively. Figure 1 further illustrates higher predicted probabilities of medication adherence among post-menopausal women, particularly among GovMed enrollees. Overall, these results suggest that menopausal heterogeneity is mainly reflected in medication adherence.

Heterogeneity by Commercial Insurance Coverage

Table 6 reports no statistically significant heterogeneity by supplementary commercial insurance coverage. The interaction p-values are 0.506 for medication adherence, 0.691 for lifestyle intervention, and 0.467 for health surveillance. Although the GovMed–UEBMI difference in medication adherence is larger among women without commercial insurance than among those with commercial insurance, subgroup differences are generally small and statistically insignificant across outcomes. Taken together, these results suggest that supplementary commercial insurance does not systematically modify the association between basic insurance type and chronic disease management behaviours.

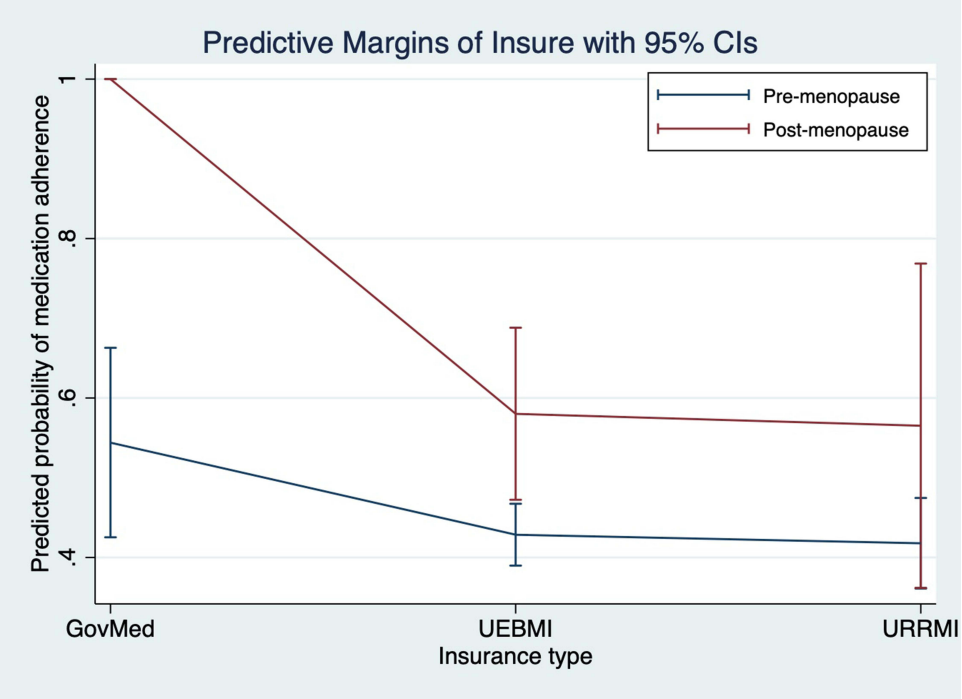

Figure 1 Predicted probability of medication adherence by insurance type and menopause status.

Table 6 Heterogeneous Associations Between Insurance Type and Chronic Disease Management Behaviours by Supplementary Commercial Insurance Coverage

Subgroup	Comparison	Medication Adherence, β (95% CI)	Lifestyle Intervention, β (95% CI)	Health Surveillance, β (95% CI)
No commercial insurance (n=410)	GovMed vs UEBMI	0.205 (−0.020, 0.430)	0.094 (−0.141, 0.329)	−0.142 (−0.312, 0.028)
	URRMI vs UEBMI	0.011 (−0.095, 0.118)	−0.038 (−0.142, 0.067)	−0.088 (−0.187, 0.011)
With commercial insurance (n=691)	GovMed vs UEBMI	0.078 (−0.062, 0.218)	−0.011 (−0.149, 0.126)	−0.035 (−0.177, 0.107)
	URRMI vs UEBMI	−0.047 (−0.143, 0.050)	−0.021 (−0.116, 0.074)	−0.025 (−0.119, 0.068)
P for interaction	Commercial insurance × insurance type	0.506	0.691	0.467

Heterogeneity by Income Group

Table 7 shows that income-related heterogeneity is concentrated in lifestyle intervention. The interaction p-value is 0.032, indicating that the association between insurance type and lifestyle intervention differs across income groups. The pattern is non-monotonic: the GovMed–UEBMI difference is positive among low-income women, negative among middle-income women, and positive again among high-income women, although the subgroup-specific confidence intervals include zero.

For medication adherence and health surveillance, we do not find evidence of systematic income-based heterogeneity. The interaction p-values are 0.725 and 0.746, respectively, and subgroup estimates are generally small and statistically insignificant. Overall, these findings suggest that income heterogeneity is limited and is mainly reflected in lifestyle intervention.

Heterogeneity by Educational Attainment

Table 8 provides limited evidence of heterogeneity by educational attainment. Among the three outcomes, the smallest interaction p-value is observed for health surveillance (p = 0.087), suggesting weak evidence of differential patterns by education group. In particular, the URRMI–UEBMI difference in health surveillance is negative and close to statistical significance among women with lower education, but positive and imprecisely estimated among postgraduates.

For medication adherence and lifestyle intervention, interaction p-values are 0.333 and 0.793, respectively, indicating no clear education-based heterogeneity. Overall, the results suggest that educational heterogeneity is weak in this sample.

Heterogeneity by Region

Table 9 shows limited evidence of regional heterogeneity. The interaction p-values are 0.487 for medication adherence, 0.785 for lifestyle intervention, and 0.378 for health surveillance, indicating that regional differences are not statistically significant overall.

Table 7 Heterogeneous Associations Between Insurance Type and Chronic Disease Management Behaviours by Income Group

Subgroup	Comparison	Medication Adherence, β (95% CI)	Lifestyle Intervention, β (95% CI)	Health Surveillance, β (95% CI)
Low income (n=276)	GovMed vs UEBMI	0.202 (−0.111,0.515)	0.222 (−0.059, 0.503)	−0.130 (−0.381, 0.120)
	URRMI vs UEBMI	0.051 (−0.072,0.175)	−0.078 (−0.199, 0.044)	−0.082 (−0.200, 0.037)
Middle income (n=424)	GovMed vs UEBMI	0.081 (−0.098, 0.260)	−0.163 (−0.329, 0.002)	−0.018 (−0.194, 0.158)
	URRMI vs UEBMI	−0.055 (−0.173, 0.064)	−0.026 (−0.144, 0.091)	−0.092 (−0.203, 0.020)
High income (n=401)	GovMed vs UEBMI	0.125 (−0.062, 0.313)	0.150 (−0.033, 0.333)	−0.066 (−0.252, 0.121)
	URRMI vs UEBMI	−0.036 (−0.162, 0.089)	0.009 (−0.115, 0.132)	−0.004 (−0.126, 0.118)
P for interaction	Income group × insurance type	0.725	0.032	0.746

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Table 8 Heterogeneous Associations Between Insurance Type and Chronic Disease Management Behaviours by Educational Attainment

Subgroup	Comparison	Medication Adherence, β (95% CI)	Lifestyle Intervention, β (95% CI)	Health Surveillance, β (95% CI)
Lower education (n=994)	GovMed vs UEBMI	0.132 (−0.005, 0.269)	−0.000 (−0.138, 0.138)	−0.022 (−0.152, 0.108)
	URRMI vs UEBMI	−0.022 (−0.098, 0.053)	−0.048 (−0.123, 0.026)	−0.073 (−0.146, 0.001)
Postgraduate (n=107)	GovMed vs UEBMI	0.148 (−0.107, 0.403)	0.024 (−0.227, 0.275)	−0.175 (−0.432, 0.081)
	URRMI vs UEBMI	0.203 (−0.090, 0.496)	0.058 (−0.244, 0.360)	0.186 (−0.099, 0.471)
P for interaction	Education group × insurance type	0.333	0.793	0.087

Table 9 Heterogeneous Associations Between Insurance Type and Chronic Disease Management Behaviours by Region

Subgroup	Comparison	Medication Adherence, β (95% CI)	Lifestyle Intervention, β (95% CI)	Health Surveillance, β (95% CI)
Eastern (n=492)	GovMed vs UEBMI	0.218 (0.062, 0.374)	0.009 (−0.147, 0.166)	−0.051 (−0.208, 0.106)
	URRMI vs UEBMI	−0.035 (−0.146, 0.077)	−0.003 (−0.112, 0.105)	−0.012 (−0.117, 0.094)
Central (n=321)	GovMed vs UEBMI	0.012 (−0.207, 0.231)	0.068 (−0.149, 0.285)	−0.013 (−0.211, 0.185)
	URRMI vs UEBMI	0.002 (−0.120, 0.124)	−0.012 (−0.135, 0.112)	−0.027 (−0.145, 0.092)
Western (n=288)	GovMed vs UEBMI	0.031 (−0.296, 0.358)	−0.038 (−0.365, 0.289)	−0.058 (−0.405, 0.289)
	URRMI vs UEBMI	−0.047 (−0.179, 0.086)	−0.096 (−0.223, 0.030)	−0.160 (−0.281, −0.039)
P for interaction	Region × insurance type	0.487	0.785	0.378

Some subgroup-specific associations are nevertheless notable For medication adherence, the positive GovMed–UEBMI difference is concentrated in eastern China (β = 0.218, 95% CI: 0.062 to 0.374), while no significant GovMed–UEBMI differences are observed in central or western China. For health surveillance, URRMI enrollees in western China have a significantly lower probability of health surveillance than UEBMI enrollees (β = −0.160, 95% CI: −0.281 to −0.039), whereas corresponding differences in eastern and central China are not significant. For lifestyle intervention, no clear regional pattern emerges. Taken together, these results suggest that region is not a major source of systematic heterogeneity in the association between insurance type and chronic disease management behaviours.

Overall, the heterogeneity analyses suggest that subgroup variation is most pronounced for menopausal status, with some additional evidence for income-related heterogeneity in lifestyle intervention. By contrast, heterogeneity by commercial insurance coverage, educational attainment, and region is generally limited.

Spillover Behaviours

Table 10 explores whether insurance type is associated with broader spillover behaviours, namely high-frequency supplement purchase and meal regularity.

For high-frequency supplement purchase (Column 1), neither GovMed nor URRMI differs significantly from UEBMI (GovMed: β = −0.126, 95% CI: −0.382 to 0.130; URRMI: β = −0.017, 95% CI: −0.093 to 0.059), suggesting limited evidence of insurance-related differences in frequent health-product purchases.

For the meal-regularity score (Column 2), the GovMed–UEBMI difference is close to zero (β = −0.003, 95% CI: −0.150 to 0.144), while the URRMI–UEBMI estimate is positive but imprecisely estimated (β = 0.082, 95% CI: −0.014 to 0.177). Compared with insurance type, these spillover behaviours appear to be more strongly related to individual

Table 10 Associations Between Insurance Type and Spillover Behaviours

	High-Frequency Supplement Purchase, β (95% CI)	Regular Meals Score, β (95% CI)
GovMed (vs UEBMI)	−0.126 (−0.382,0.130)	−0.003 (−0.150,0.144)
URRMI (vs UEBMI)	−0.017 (−0.093,0.059)	0.082 (−0.014,0.177)
Observations	1101	1101
R-squared	0.062	0.129

socio-demographic and health characteristics. Overall, the results suggest that insurance type explains relatively little variation in these broader spillover behaviours beyond core chronic disease management.

Discussion

In this national study of insured Chinese women with NCDs, we found that the type of medical insurance held was significantly associated with NCD management behaviors. To our knowledge, this national study of insured Chinese women with NCDs provides timely evidence that variation in basic medical insurance design was associated with measurable differences in medication adherence among women with NCDs, with GovMed showing a higher level of adherence and commercial insurance ownership being linked to additional differences in selected management behaviours. These findings can help policymakers optimize insurance design to strengthen NCD control and promote equitable access to healthcare services.

First, we find that differences across China's three basic medical insurance schemes are concentrated in medication adherence rather than in lifestyle modification or health surveillance. Relative to women enrolled in UEBMI, GovMed beneficiaries exhibit a significantly higher probability of taking chronic disease medications as prescribed, while URRMI enrollees do not differ significantly from UEBMI. This aligned with broader research on financial protection and NCD management.[15,45] GovMed is a more generous, government-funded insurance plan, and our results supported the idea that greater subsidy of care could remove cost barriers and improve patients' consistency in taking prescribed medications.[46,47] In a broader context, expansions in insurance generosity (for example, through public programs) were associated with reduced cost-related nonadherence and improved access to medications.[48] Prior evidence also showed that reducing the financial burden of medications, either through government insurance or targeted subsidy programs, improved adherence among people living with chronic illnesses.[49]

However, after adjustment for socio-economic and health characteristics, scheme type showed only weak relationships with reported lifestyle changes or routine monitoring of health indicators. Notably, this should not be interpreted as unimportant findings. Unlike medication adherence, lifestyle intervention and routine monitoring are not primarily determined by whether medical costs are reimbursed. Broader self-management behaviours are more strongly related to health literacy, self-efficacy, social support, and primary-care-based self-management support.[50] This suggest that insurance reform alone is unlikely to be sufficient for improving all dimensions of chronic disease management. Policies aimed at lifestyle change and routine monitoring should be combined with structured follow-up in primary care, health education, digital self-monitoring tools, and family- or community-based behavioural support.

Second, our heterogeneity analysis underscores the importance of life-course stage. Post-menopausal women show substantially higher medication adherence than their pre-menopausal counterparts, and the adherence gap between GovMed and UEBMI is especially pronounced after menopause. One plausible interpretation is that the onset of menopause, together with a rising burden of multi-morbidity, increases both the perceived returns to adherence and the frequency of clinical contact, amplifying the salience of generous coverage.[51–53] For GovMed beneficiaries, who generally face lower point-of-care costs, the combination of greater health needs and weaker price barriers may help explain the higher adherence observed in this group.[54] Among UEBMI and URRMI enrollees, higher cost-sharing for outpatient drugs may continue to constrain adherence even when health risks rise. The absence of comparable scheme

differences in lifestyle change or monitoring again suggests that financial incentives embedded in insurance contracts are more effective for medication-related behaviors than for broader health-promoting activities.[55,]

Third, supplementary commercial insurance was associated with selected chronic disease management behaviours, with the most consistent association observed for regular health surveillance. This pattern is consistent with previous evidence suggesting that supplementary private health insurance in China may be linked to healthcare utilization, healthcare-seeking behaviour, physical examination, and residual out-of-pocket burden.[18,56] However, this interpretation should be cautious. Commercial insurance ownership is voluntary and not randomly assigned, and women who purchase supplementary coverage may differ from non-purchasers in health awareness, risk aversion, financial literacy, socioeconomic resources, access to health information, and preferences for preventive care.[57] Commercial insurance ownership may partly identify a subgroup of women who are more financially able or more inclined to engage in preventive and monitoring behaviours.

Our analysis of spillover behaviours provides exploratory evidence on broader preventive practices. URRMI enrolment was associated with a higher probability of frequent health-product purchases, while the association with dietary regularity was weaker. One possible hypothesis is that women enrolled in less generous resident insurance schemes may rely more on over-the-counter supplements as an informal supplement to their health management.[58] However, this interpretation is speculative because the survey did not capture motivations for purchase, product type, perceived effectiveness, or whether these products substituted for formal care or prescribed medication. Future qualitative or longitudinal research is needed to determine whether such purchases reflect complementary prevention, unmet need, health anxiety, commercial marketing exposure, or substitution for evidence-based care.

Our findings have several implications for policy and practice. First, the finding that scheme-related differences were most apparent for medication adherence suggests that improving outpatient drug benefits and reducing avoidable cost-sharing may help support medication adherence among women with NCDs, particularly among URRMI enrollees. Second, the weak or null associations between insurance type and lifestyle intervention or health surveillance indicate that insurance reform alone is unlikely to ensure comprehensive NCD management. Financial protection should therefore be combined with structured primary-care follow-up, gender-sensitive health education, behavioural counselling, and practical support for routine self-monitoring. Third, the stronger association observed among post-menopausal women highlights the need for a life-course perspective in chronic disease management. Mid-life and older women may face increasing multimorbidity and treatment needs, and insurance policies should be better aligned with these changing health risks. Finally, the findings related to supplementary commercial insurance should be interpreted from an equity perspective. Although commercial coverage may provide additional financial protection for some women, reliance on voluntary private insurance could reinforce inequalities if uptake is concentrated among women with greater socioeconomic resources, stronger health awareness, or higher risk aversion. Strengthening the depth and equity of basic medical insurance should therefore remain central to chronic disease management policy.

Several limitations should be acknowledged. First, the analysis was cross-sectional, based on a single survey of women in 2025, which limited our ability to draw causal inferences about the effect of insurance on behaviors. Second, all outcome variables were self-reported, which introduced the potential for reporting bias and measurement error.[14] Medication adherence, lifestyle intervention, and health surveillance were measured using survey responses rather than objective records. These measures may therefore be affected by recall bias, social desirability bias, or differences in respondents' understanding of the survey items. Although the survey questions were standardized, the absolute levels of reported management behaviours should be interpreted cautiously. Finally, our outcomes were intermediate health behaviors rather than clinical endpoints. We did not directly measure health indicators or hard outcomes like hospitalization in this study. In the future, longitudinal studies or trials would be valuable to confirm that the insurance-related differences in self-management we observed do result in meaningful health gains over time.

Conclusion

In summary, this study provides new evidence that health insurance type and coverage features are associated with differences in chronic disease management behaviours among insured women with NCDs in China. These associations are most evident for medication adherence, particularly among post-menopausal women. As China continues to face

a growing NCD burden among women, insurance policy should be integrated with life-course-oriented and equity-focused strategies, including improved outpatient drug benefits, primary-care follow-up, health education, and support for routine self-monitoring.

Patient and Public Involvement Statement

Patients and the public were not involved in the design, conduct, reporting, or dissemination plans of this cross-sectional online survey conducted via the Wenjuanxing platform.

Data Sharing Statement

The data supporting the findings of this study are available from the corresponding author Jue Liu (jueliu@bjmu.edu.cn) upon reasonable request.

Ethics Approval

This study was approved by the Medical Scientific Research Ethics Committee of Peking University Third Hospital (IRB00006761-M20251006). The study was conducted in accordance with the Declaration of Helsinki.

Consent to Participate

Electronic informed consent was obtained from all participants prior to completing the online questionnaire.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

Wenwen Liu and Liangyu Kang are co-first authors for this study. The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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