Supplementary Online Content

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Methodology: Statistical model evaluating heterogeneous effects in subgroups

The RECORD Statement

This supplementary material has been provided by the authors to give readers additional information about their work.
Table S1. List of 25 VBP pilot drugs

| No | Drug name                                           | Disease                     | Patent expiration year (US) |
|----|-----------------------------------------------------|-----------------------------|-----------------------------|
| 1  | Flurbiprofen axetil                                 | analgesics                  | 1991                        |
| 2  | Dexmedetomidine                                     | analgesics                  | 2014                        |
| 3  | Cefuroxime axetil                                   | antibiotics                 | 2013                        |
| 4  | Montelukast                                         | asthma                      | 2012                        |
| 5  | Gefitinib                                           | cancer                      | 2017                        |
| 6  | Imatinib                                            | cancer                      | 2016                        |
| 7  | Pemetrexed                                          | cancer                      | 2017                        |
| 8  | Atorvastatin                                        | cardiovascular disease      | 2011                        |
| 9  | Rosuvastatin                                        | cardiovascular disease      | 2013                        |
| 10 | Clopidogrel                                         | cardiovascular disease      | 2012                        |
| 11 | Irbesartan                                          | cardiovascular disease      | 2011                        |
| 12 | Amlodipine                                          | cardiovascular disease      | 2007                        |
| 13 | Fosinopril                                          | cardiovascular disease      | 2003                        |
| 14 | Irbesartan and hydrochlorothiazide                  | cardiovascular disease      | 2011                        |
| 15 | Lisinopril                                          | cardiovascular disease      | 2002                        |
| 16 | Losartan                                            | cardiovascular disease      | 2009                        |
| 17 | Enalapril                                           | cardiovascular disease      | 2000                        |
| 18 | Smectite                                            | diarrhea                    | -                           |
| 19 | Entecavir                                           | hepatitis B                 | 2015                        |
| 20 | Tenofovir disoproxil                                | hepatitis B                 | 2017                        |
| 21 | Escitalopram                                        | mental disorders            | 2011                        |
| 22 | Paroxetine                                          | mental disorders            | 2001                        |
| 23 | Olanzapine                                          | mental disorders            | 2013                        |
| 24 | Risperidone                                         | mental disorders            | 2007                        |
| 25 | Levetiracetam                                       | seizure                     | 2011                        |
Figure S1. Quantity of drug purchase stratified by cities and drug categories over time. Dots indicate observed monthly purchase quantity (Qty, measured in DDD) per 1,000 population. The solid lines show the model fitted regression line, and the dashed lines represent model-estimated expected (i.e., counterfactual) purchase had the pilot program not occurred. The observed nadir in drug purchases in a calendar year coincides with the annual lunar new year in February.
Figure S2. Spending on drug purchase stratified by cities and drug categories over time. Dots indicate observed monthly spending (Expnd, measured in CNY) on drug purchase per 1,000 population. The solid lines show the model fitted regression line, and the dashed lines represent model-estimated expected (i.e., counterfactual) purchase had the pilot program not occurred. The observed nadir in drug purchases in a calendar year coincides with the annual lunar new year in February.
Figure S3. Expected (counterfactual estimate) versus actual (factual estimate) purchase by drug categories, March-September 2019. (A) Expected versus actual purchase quantity (in thousand) by drug categories; (B) Expected versus actual purchase quantity (in 1,000 DDD) and spending (in 100,000 CNY) for all drugs. Specific point estimates for absolute change and the corresponding 95% confidence intervals are provided in Table 2.
Table S2. Observed average monthly drug purchase before and after the pilot program

| Drug type       | Purchase quantity\(^1\) Mean (SD) | Spending on drug purchase\(^1\) Mean (SD) |
|-----------------|-----------------------------------|----------------------------------------|
|                 | Pre-pilot                         | Post-pilot                             |
|                 | Absolute change                   | Relative change, %                     | Pre-pilot                         | Post-pilot                             | Absolute change | Relative change, %  |
| Pilot cities\(^2\) |                                   |                                        |                                   |                                       |                  |                          |
| All             | 23863 (3185)                      | 21061 (1492)                           | -2802                            | -11·7                                 | 10845 (1405)     | 7541 (818)             | -3305                        | -30·4                        |
| Selected        | 3263 (536)                        | 6358 (529)                             | 3095                             | 94·9                                  | 1594 (257)       | 984 (252)             | -609                         | -38·2                        |
| Originator      | 7529 (1015)                       | 5351 (417)                             | -2178                            | -28·9                                 | 4069 (501)       | 2503 (261)             | -1566                        | -38·5                        |
| Alternative     | 6893 (856)                        | 7897 (626)                             | 1004                             | 14·6                                  | 2517 (302)       | 3196 (266)             | 678                          | 26·9                         |
| Other           | 6177 (1051)                       | 1455 (539)                             | -4723                            | -76·5                                 | 2666 (446)       | 858 (287)             | -1808                        | -67·8                        |
| Non-pilot cities\(^2\) |                                   |                                        |                                   |                                       |                  |                          |
| All             | 1956 (539)                        | 1982 (567)                             | 26                               | 1·3                                   | 1206 (308)       | 1236 (340)             | 30                           | 2·5                          |
| Selected        | 493 (118)                         | 457 (126)                              | -36                              | -7·3                                  | 256 (62)         | 261 (79)              | 5                            | 2·0                          |
| Originator      | 556 (167)                         | 565 (192)                              | 9                                | 1·6                                   | 399 (113)        | 385 (122)             | -14                          | -3·5                          |
| Alternative     | 421 (136)                         | 437 (129)                              | 16                               | 3·8                                   | 190 (57)         | 222 (63)              | 32                           | 16·8                         |
| Other           | 486 (133)                         | 523 (127)                              | 37                               | 7·6                                   | 361 (99)         | 368 (84)              | 7                            | 1·9                          |
| All drugs by cities |                                   |                                        |                                   |                                       |                  |                          |
| Beijing         | 15417 (2131)                      | 15287 (1217)                           | -130                             | -0·8                                  | 6693 (908)       | 5490 (465)             | -1203                        | -18·0                        |
| Shanghai        | 7822 (1303)                       | 4966 (1204)                            | -2855                            | -36·5                                 | 3809 (569)       | 1809 (596)             | -1999                        | -52·5                        |
| Xi'an           | 624 (127)                         | 808 (219)                              | 183                              | 29·3                                  | 344 (60)         | 241 (58)              | -103                         | -29·9                        |
| Changsha        | 835 (238)                         | 829 (205)                              | -6                               | -0·7                                  | 469 (126)        | 481 (91)              | 12                           | 2·6                          |
| Zhengzhou       | 1121 (316)                        | 1153 (476)                             | 32                               | 2·9                                   | 737 (189)        | 755 (300)             | 19                           | 2·6                          |

\(^1\) Quantity is measured in 1,000 DDD, and spending is presented in 100, 000 CNY

\(^2\) Pilot cities: Beijing, Shanghai and Xi’an. Non-pilot cities: Changsha and Zhengzhou
|                        | Immediate Change<sup>1</sup> | Monthly Change<sup>2</sup> |
|------------------------|-----------------------------|-----------------------------|
|                        | RR (95% CI)  | p-value | RR (95% CI)  | p-value |
| **Selected Drug**      |               |         |               |         |
| Beijing                | 2.55 (2.29, 2.82) | <.001   | 0.98 (0.97, 0.99) | .006   |
| Shanghai               | 2.08 (1.69, 2.56) | <.001   | 0.97 (0.92, 1.03) | .372   |
| Xi'an                  | 2.26 (1.86, 2.74) | <.001   | 1.17 (1.13, 1.22) | <.001  |
| Changsha               | 0.75 (0.66, 0.84) | <.001   | 1.00 (0.98, 1.03) | .992   |
| Zhengzhou              | 1.24 (0.93, 1.65) | 0.144   | 0.89 (0.80, 0.99) | .026   |
| **Originator**         |               |         |               |         |
| Beijing                | 0.64 (0.60, 0.69) | <.001   | 1.00 (0.98, 1.01) | .505   |
| Shanghai               | 0.72 (0.61, 0.85) | <.001   | 0.82 (0.79, 0.86) | <.001  |
| Xi'an                  | 0.60 (0.50, 0.72) | <.001   | 1.07 (1.05, 1.09) | <.001  |
| Changsha               | 0.93 (0.80, 1.08) | <.001   | 1.06 (1.03, 1.09) | <.001  |
| Zhengzhou              | 1.42 (1.06, 1.89) | <.001   | 0.84 (0.76, 0.93) | <.001  |
| **Alternative Drug**   |               |         |               |         |
| Beijing                | 1.00 (0.93, 1.08) | .967    | 1.00 (0.98, 1.02) | .919   |
| Shanghai               | 1.53 (1.30, 1.79) | <.001   | 0.94 (0.90, 0.99) | .028   |
| Xi'an                  | 1.11 (0.99, 1.24) | .063    | 1.00 (0.98, 1.02) | .993   |
| Changsha               | 0.64 (0.53, 0.78) | <.001   | 1.05 (1.01, 1.09) | .022   |
| Zhengzhou              | 1.33 (1.01, 1.75) | <.041   | 0.85 (0.77, 0.94) | .001   |
| **Other Drug**         |               |         |               |         |
| Beijing                | 0.45 (0.39, 0.52) | <.001   | 0.92 (0.90, 0.95) | <.001  |
| Shanghai               | 0.16 (0.12, 0.22) | <.001   | 0.76 (0.72, 0.81) | <.001  |
| Xi'an                  | 0.29 (0.20, 0.44) | <.001   | 0.89 (0.81, 0.99) | .024   |
| Changsha               | 0.91 (0.76, 1.08) | <.001   | 1.02 (0.98, 1.06) | .387   |
| Zhengzhou              | 1.50 (1.18, 1.90) | <.001   | 0.87 (0.81, 0.94) | <.001  |
| **All Non-selected Drug** |           |         |               |         |
| Beijing                | 0.73 (0.69, 0.77) | <.001   | 0.99 (0.98, 1.00) | .023   |
| Shanghai               | 0.73 (0.62, 0.85) | <.001   | 0.89 (0.86, 0.93) | <.001  |
| Xi'an                  | 0.71 (0.61, 0.83) | <.001   | 1.01 (0.99, 1.03) | .323   |
| Changsha               | 0.82 (0.70, 0.98) | <.001   | 1.04 (1.00, 1.08) | .034   |
| Zhengzhou              | 1.42 (1.09, 1.84) | <.009   | 0.85 (0.78, 0.93) | <.001  |
| **All Drug**           |               |         |               |         |
| Beijing                | 0.91 (0.86, 0.95) | <.001   | 0.99 (0.98, 0.99) | <.001  |
| Shanghai               | 0.90 (0.77, 1.07) | <.236   | 0.92 (0.88, 0.96) | <.001  |
| Xi'an                  | 1.11 (0.96, 1.29) | <.168   | 1.07 (1.05, 1.09) | <.001  |
| Changsha               | 0.80 (0.69, 0.94) | <.005   | 1.03 (0.99, 1.06) | .097   |
| Zhengzhou              | 1.37 (1.05, 1.78) | <.020   | 0.86 (0.78, 0.95) | .002   |
| **All Drug (Spending)**|               |         |               |         |
| Beijing                | 0.75 (0.72, 0.79) | <.001   | 0.98 (0.97, 0.98) | <.001  |
| Shanghai               | 0.73 (0.73, 0.85) | <.001   | 0.88 (0.84, 0.92) | <.001  |
| Xi'an                  | 0.66 (0.54, 0.81) | <.001   | 1.05 (1.02, 1.08) | <.001  |
| Changsha               | 0.97 (0.87, 1.08) | <.069   | 1.00 (0.98, 1.02) | .962   |
| Zhengzhou              | 1.43 (1.11, 1.83) | <.005   | 0.86 (0.79, 0.94) | .001   |

<sup>1</sup> Monthly quantity of purchase.

<sup>2</sup> Immediate change refers to the change in March 2019; monthly change refers to the gradual change from April-September 2019.
Table S4. Overall Changes in purchase stratified by drug and cities, March- September 2019

| City       | Drug       | Expected | Model-fitted actual | Absolute Change | Relative Change (%) | p-value |
|------------|------------|----------|---------------------|-----------------|---------------------|---------|
|            |            |          |         | Estimate | 95% CI       | Estimate | 95% CI       |         |
| Beijing    | Selected   | 1186     | 2858    | 1672     | 1553-1784   | 141.5    | 120.3-163.5 | <0.0001 |
|            | Originator | 4951     | 3133    | -1818    | -2019-1619  | -36.7    | -39.4-33.8  | <0.0001 |
|            | Alternative| 3849     | 3864    | 15       | -240-262   | 0.5      | -5.9-7.2    | 0.9000  |
|            | Other      | 2311     | 830     | -1481    | -1662-1313  | -64.1    | -67.0-61.0  | <0.0001 |
|            | Non-selected| 11103   | 7835    | -3268    | -3818-2731  | -29.4    | -32.9-25.8  | <0.0001 |
|            | All        | 12316    | 10697   | -1619    | -2268-994   | -13.1    | -17.5-8.5   | <0.0001 |
|            | All (spending)| 54606  | 38422   | -16184   | -18643-13774| -29.6    | -32.7-26.4  | <0.0001 |
| Shanghai   | Selected   | 664      | 1270    | 606      | 453-749    | 92.9     | 58.7-132.2  | <0.0001 |
|            | Originator | 1217     | 527     | -690     | -889-515   | -56.5    | -62.7-49.5  | <0.0001 |
|            | Alternative| 1178     | 1532    | 353      | 208-497    | 30.3     | 16.4-45.4   | <0.0001 |
|            | Other      | 1798     | 157     | -1641    | -2054-1287 | -91.2    | -93.0-88.9  | <0.0001 |
|            | Non-selected| 4159   | 2219    | -1941    | -2609-1347 | -46.3    | -54.1-37.6  | <0.0001 |
|            | All        | 4831     | 3482    | -1349    | -2157-645  | -27.5    | -38.5-15.5  | <0.0001 |
|            | All (spending)| 24806  | 12666   | -12140   | -15609-9017| -48.7    | -55.3-41.4  | <0.0001 |
| Xi’an      | Selected   | 89       | 325     | 236      | 216-258    | 267.5    | 228.8-309.0 | <0.0001 |
|            | Originator | 119      | 87      | -32      | -51-14     | -26.4    | -37.4-13.7  | <0.0001 |
|            | Alternative| 118      | 131     | 13       | 1-24       | 11.0     | 0.8-21.9    | 0.0340  |
|            | Other      | 90       | 20      | -70      | -86-56     | -77.7    | -82.3-72.1  | <0.0001 |
|            | Non-selected| 324   | 239     | -86      | -128-47    | -26.1    | -35.2-16.2  | <0.0001 |
|            | All        | 413      | 565     | 152      | 98-204     | 37.1     | 21.4-54.8   | <0.0001 |
|            | All (spending)| 2227  | 1687    | -540     | -979-153   | -23.6    | -37.1-8.2   | 0.0022  |
| Changsha   | Selected   | 196      | 146     | -50      | -58-41     | -25.3    | -28.7-21.6  | <0.0001 |
|            | Originator | 109      | 120     | 12       | 4-20       | 11.0     | 3.3-19.4    | 0.0046  |
|            | Alternative| 185      | 138     | -47      | -61-33     | -25.3    | -31.5-18.8  | <0.0001 |
|            | Other      | 179      | 171     | -8       | -20-4      | -4.3     | -10.5-2.1   | 0.1864  |
|            | Non-selected| 461   | 430     | -31      | -61-2      | -6.7     | -12.7-0.4   | 0.0368  |
|            | All        | 658      | 576     | -81      | -119-45    | -12.3    | -17.4-7.1   | <0.0001 |
|            | All (spending)| 3456  | 3357    | -99      | -249-50    | -2.8     | -7.0-1.5    | 0.1906  |
| Zhengzhou  | Selected   | 190      | 169     | -21      | -54-11     | -10.4    | -25.4-6.8   | 0.2096  |
|            | Originator | 312      | 269     | -43      | -103-14    | -13.1    | -28.8-5.1   | 0.1508  |
|            | Alternative| 196      | 165     | -32      | -67-2      | -15.7    | -30.2-0.9   | 0.0620  |
|            | Other      | 190      | 190     | 0       | -40-37     | 0.9      | -18.2-23.0  | 0.9734  |
|            | Non-selected| 696   | 623     | -73      | -206-51    | -9.9     | -25.9-8.4   | 0.2510  |
|            | All        | 888      | 793     | -95      | -261-59    | -10.1    | -25.7-7.6   | 0.2308  |
|            | All (spending)| 5595  | 5210    | -385     | -1331-531  | -6.5     | -21.4-10.4  | 0.4172  |

Note: Quantity of purchase is presented in 10,000 DDD, expenditure on purchase is presented in 100,000 CNY.
Methodology: Statistical model evaluating heterogeneous effects in subgroups

\[
\log \left( E(Y_{jt}) \right) = \beta_0 + \sum_{i=2}^{i=j} \beta_{base} C_i D_j + \sum_{i=2}^{i=0} \beta_{slope} C_i + \sum_{i=0}^{i=2} \beta_{level\_change} C_i D_j X_t + \sum_{i=0}^{i=2} \beta_{slope\_change} C_i D_j (T-T_0) * X_t + \sum_{m=2}^{m=12} \beta_m M
\]

where \( Y_p \) is the independent outcome variable (either monthly purchase quantity/spending) for drug type \((D) j\) in city \((i)\) at time \(t\), \(T\) and \(T - T_0\) is the time (month) since the start of the study (January 2018) and the time since the implementation of pilot program \((T_0: March 2019)\) respectively. \(X_t\) is an indicator variable where pre-intervention is coded as 0 and post-intervention is coded as 1. \(M\) is the indicator variable for calendar month used to account for seasonal variation.
The RECORD statement – checklist of items, extended from the STROBE statement, that should be reported in observational studies using routinely collected health data.

| Item No. | STROBE items | Location in manuscript where items are reported | RECORD items | Location in manuscript where items are reported |
|----------|--------------|-----------------------------------------------|--------------|-----------------------------------------------|
| **Title and abstract** | | | RECORD 1.1: The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included. | | Line 45. "We obtained monthly prescription drug purchase data for all purchases from public medical institutions in the three large pilot cities (Beijing, Shanghai and Xi’an) and two non-pilot cities (Changsha and Zhengzhou) between January 2018 to September 2019.” |
| 1 | (a) Indicate the study’s design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found | | RECORD 1.2: If applicable, the geographic region and timeframe within which the study took place should be reported in the title or abstract. | |
| | | | RECORD 1.3: If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract. | |

**Introduction**

| Background rationale | 2 | Explain the scientific background and rationale for the investigation being reported | | “However, their analysis only compared the absolute change in the period before and after the policy implementation, without considering confounding by secular trends. In addition, most literature focused on the |
No studies have evaluated the implementation of the pilot in other large cities. Therefore, a more comprehensive and rigorous evaluation is crucial to evaluating the effectiveness of the pilot.

**Objectives**

3  State specific objectives, including any prespecified hypotheses

“Our study aims to evaluate the impact of the pilot on drug procurement using an interrupted time series analysis with controls in the three large pilot cities (i.e., Beijing, Shanghai, and Xi'an) with a total population of about 60 million. We also examine if the patterns of change associated with the reform differed by cities, drugs, and therapeutic categories. Since the majority of individuals seek care in public hospitals in China, and hospitals automatically convert prescriptions to selected generics, our analysis is generalizable to almost the entire population in these pilot cities.”

**Methods**

4  Present key elements of study design early in the paper

“We examined changes in the pattern of drug procurement associated with the implementation of the pilot using interrupted time-series (ITS) design, a quasi-experimental design for strong causal inference in the evaluation of population-
| **Setting** | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection. |
|------------|---|----------------------------------------------------------------------------------------------------------------------------------|
| **Participants** | 6 | (a) **Cohort study** - Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up.  
Case-control study - Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls.  
Cross-sectional study - Give the eligibility criteria, and the sources and methods of selection of participants.  
(b) **Cohort study** - For matched studies, give matching criteria and number of exposed and unexposed.  
Case-control study - For matched studies, give matching criteria and the number of controls per case. |

**RECORD 6.1:** The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided.

**RECORD 6.2:** Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided.

**RECORD 6.3:** If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the number of individuals.

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“Our investigators at Wuhan University Global Health Institute obtained data on monthly purchase of each of the 25 bid-winning drugs for pooled procurement (selected drugs) between January 2018 to September 2019. The three pilot cities included Beijing, Shanghai and Xi’an in mainland China.”

“The three pilot cities included Beijing, Shanghai and Xi’an in mainland China. These cities were chosen to represent diverse geographical locations (located in the north, east, and central China, respectively). Two comparable non-pilot cities (Changsha and Zhengzhou) were used to control for potential confounding factors that would affect both pilot and non-pilot cities.”
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable. | RECORD 7.1: A complete list of codes and algorithms used to classify exposures, outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided. | “Two outcome variables were measured in this study: monthly purchase quantity and spending. Purchase quantity was measured by Defined Daily Doses (DDDs), which was developed by the WHO Collaborating Center for Drug Statistics Methodology and used in previous studies…. X_i is an indicator variable where pre-intervention period is coded as 0 and post-intervention period is coded as 1. M is the indicator variable for calendar month used to account for seasonal variation.” |
| Data sources/measurement | 8 | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. | “Two comparable non-pilot cities (Changsha and Zhengzhou) were used to control for potential confounding factors that would affect both pilot and non-pilot cities.” |
| Bias | 9 | Describe any efforts to address potential sources of bias | “Each subgroup defined by intervention group (pilot cities versus non-pilot cities), intervention city (Beijing, Shanghai, Xi’an, Changsha and Zhengzhou), drug type (selected, originator, alternative and other drugs), and therapeutic category (cardiovascular disease, mental disorder and cancer) was analyzed separately.” |
respectively. \( X \) is an indicator variable where pre-intervention period is coded as 0 and post-intervention period is coded as 1. \( M \) is the indicator variable for calendar month used to account for seasonal variation."

| Study size | 10 | Explain how the study size was arrived at |
|------------|----|----------------------------------------|
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why |
| Statistical methods | 12 | (a) Describe all statistical methods, including those used to control for confounding  
(b) Describe any methods used to examine subgroups and interactions  
(c) Explain how missing data were addressed |

"Each subgroup defined by intervention group (pilot cities versus non-pilot cities), intervention city (Beijing, Shanghai, Xi’an, Changsha and Zhengzhou), drug type (selected, originator, alternative and other drugs), and therapeutic category (cardiovascular disease, mental disorder and cancer) was analyzed separately."

"The three disease categories were chosen because they account for 17 out of the 25 pooled procurement drugs and are the leading causes of disability-adjusted life year in China."

"Given a disperse variation structure in procurement quantity and skewness in spending, we used negative binomial regression and log-linked Gamma Generalized Linear Model (GLM) for purchase quantity and spending respectively."
| Data access and cleaning methods | .. | RECORD 12.1: Authors should describe the extent to which the investigators had access to the database population used to create the study population. |
|----------------------------------|----|----------------------------------------------------------------------------------------------------------------------------------|
|                                  | .. | RECORD 12.2: Authors should provide information on the data cleaning methods used in the study. |
| Linkage                         | .. | RECORD 12.3: State whether the study included person-level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of |

**To evaluate heterogeneous effects in subgroups, we examined how the main policy effect terms interacted with each subgroup (see the methods section in the Supplementary Appendix).**

“Yilin Chen, Xu Ji and Hong Xiao had full access to, verified all the data in the study, and take responsibility for the accuracy of the data analysis.”

“Our investigators at Wuhan University Global Health Institute obtained data on monthly purchase of each of the 25 bid-winning drugs for pooled procurement (selected drugs)”

“Analyses were conducted in R-version-4.0.2 (R-Project for Statistical Computing) using data obtained on October 23, 2020.”
| Results | 13 | (a) Report the numbers of individuals at each stage of the study (e.g., numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed)  
(b) Give reasons for non-participation at each stage.  
(c) Consider use of a flow diagram | RECORD 13.1: Describe in detail the selection of the persons included in the study (i.e., study population selection) including filtering based on data quality, data availability and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram. | “In total, 20.5 billion CNY was spent on 481.5 billion drugs in pilot cities, and 2.6 billion CNY was spent on 41.3 million drugs in non-pilot cities from January 2018 to September 2019 (Table S2).” |
| --- | --- | --- | --- | --- |
| Participants | 13 | (a) Report the numbers of individuals at each stage of the study (e.g., numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed)  
(b) Give reasons for non-participation at each stage.  
(c) Consider use of a flow diagram | RECORD 13.1: Describe in detail the selection of the persons included in the study (i.e., study population selection) including filtering based on data quality, data availability and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram. | “In total, 20.5 billion CNY was spent on 481.5 billion drugs in pilot cities, and 2.6 billion CNY was spent on 41.3 million drugs in non-pilot cities from January 2018 to September 2019 (Table S2).” |
| Descriptive data | 14 | (a) Give characteristics of study participants (e.g., demographic, clinical, social) and information on exposures and potential confounders  
(b) Indicate the number of participants with missing data for each variable of interest  
(c) Cohort study - summarise follow-up time (e.g., average and total amount) |  | |
| Outcome data | 15 | Cohort study - Report numbers of outcome events or summary measures over time  
Case-control study - Report numbers in each exposure category, or summary measures of exposure  
Cross-sectional study - Report numbers of outcome events or summary measures |  | |
| Main results | 16 | (a) Give unadjusted estimates and, if applicable, confounder-adjusted |  | The results section |
estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included

(b) Report category boundaries when continuous variables were categorized

(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period

| Other analyses | 17 | Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses | The last paragraph of the results sections. |
|----------------|----|-------------------------------------------------------------------------------------------------|------------------------------------------|

**Discussion**

| Key results | 18 | Summarise key results with reference to study objectives | “Over the first seven months of implementation, we found that the VBP pilot program resulted in an increase in the purchase of accredited generics in place of lower quality generics and off-patent branded drugs, resulting in lower total drug purchasing costs.” |
|-------------|----|----------------------------------------------------------------|--------------------------------------------------------------------------------|

| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias | RECORD 19.1: Discuss the implications of using data that were not created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they | “There are several limitations to this study. First, because the dataset spans a relatively short post-intervention period, our findings only reflected the impact of the VBP policy in the pilot phase and may not generalize to further reform and all settings. More rounds of VBP have been rapidly carried out in the country and assessing long-term trend in purchasing quantity and spending is critical. Although early-stage |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | China’s new VBP policy has demonstrated initial success in containing drug prices and reshaping the composition of the Chinese pharmaceutical market | Evaluation could guide policy makers, healthcare providers and patients to better understand the reform and adapt accordingly, assessing further rounds of large-scale VBP programs after the pilot is equally important. Additionally, the fourteen-month pre-pilot data may not be sufficient to model the pre-pilot or counterfactual post-pilot trends. However, the consistently observed trends and seasonal patterns in the purchase of drugs of any category in all pilot and non-pilot cities, and, to our knowledge, the lack of uncontrolled potential time-varying confounders, suggest that our assumption about the counterfactual post-pilot based on existing information is valid. Lastly, our analysis only focused on drug purchase quantity and health facilities’ drug spending. Further research assessing the impact of the VBP policy on other outcomes, including drug prescription/utilization patterns, quality of drug, patients’ health outcomes and payments on drugs, as well as the landscape of pharmaceutical industry in China is needed. |

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in favor of generics of high quality and low prices.

| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | "Since the majority of individuals seek care in public hospitals in China, and hospitals automatically convert prescriptions to selected generics, our analysis is generalizable to almost the entire population in these pilot cities." |

| Other Information | | | |

| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | |

| Accessibility of protocol, raw data, and programming code | | | RECORD 22.1: Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code. |

*Reference: Benchimol EI, Smeeth L, Guttmann A, Harron K, Moher D, Petersen I, Sørensen HT, von Elm E, Langan SM, the RECORD Working Committee. The REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement. *PLoS Medicine* 2015; in press.

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