Estimating the Socioeconomic Impact of Innovative Drugs on the Macroeconomy: A Case Study of Blood Cancer in China

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INTRODUCTION

Innovative drugs not only confer health benefits but also have a profound impact on social economy[1]. Including new drugs in health insurance reimbursement amplifies this influence. According to *pharmcube*[2]， From 2018 to 2023, China launched 482 innovative drugs, 268 of which were added to the National Reimbursement Drug List (NRDL). Since 2018, the NRDL has led to price reductions of 50-60%, resulting in savings of approximately $100 billion in medical expenses[3]. However, whether this will promote labor recovery, physical capital accumulation, and contribute to GDP growth remains uncertain.

OBJECTIVE

I. To assess the socioeconomic impact of innovative drugs, utilizing China's hematological oncology drugs as a case study to evaluate their effects on human capital, physical capital, healthcare expenditures, and GDP
II. To expand the perspective on the value assessment of innovative drugs from a microeconomic to a macroeconomic framework
III. To identify and articulate the mechanisms and factors through which innovative drugs exert their influence on the macroeconomy

METHOD

We proposed a new perspective of value for innovative drugs—socioeconomic value. By incorporating the impact of health technologies, we have refined the production function(formula1) to develop a novel model for assessing the socioeconomic value of innovative drugs[4].

Formula 1: $$Y_t = A_t K_t^{\alpha} H_t^{1-\alpha}$$

We calculated GDP under the factual scenario and two hypothetical scenarios—1) where innovative drugs are not included in healthcare insurance (denoted as "no NRDL"), 2) where they are not launched (denoted as "no launch"). These scenarios are represented as $Y_t, \overline{Y}_t, \overline{\overline{Y}}_t$, respectively. $\overline{Y}_t - Y_t$ represents the impact of including innovative drugs in NRDL, $\overline{\overline{Y}}_t - Y_t$ represents the impact of innovative drugs launching.

RESULTS

We included 43 approved hematologic oncology drugs, of which 29 were covered by insurance. On average, these insured drugs saw a price reduction of 46.9%, saving $3.8 billion in healthcare costs. We found that the equivalent of 6,712 fully healthy workers were saved, and 4,229 deaths prevented during the post-market stages, with the healthcare system contributing 50%. (Table1)

Table1 The impact of launch and NRDL of innovative drugs on mOS, mortality rates, deaths, and labor supply

	multiple myeloma	leukemia	lymphoma	total
average mOS (mo)				
factual scenario	47.25	206.62	96.61	123.75
no NRDL scenario	45.61	202.61	82.47	117.97
no launch scenario	43.96	200.53	75.59	115.22
impact on mOS(mo)				
NRDL	1.64	4.01	14.14	5.78
launch	3.29	6.09	21.02	8.54
annual death rate(%)				
factual scenario	20.92%	12.06%	19.17%	16.91%
no NRDL scenario	21.56%	12.16%	20.10%	17.41%
launch	22.15%	12.24%	20.60%	17.74%
impact on annual death rate(%)				
NRDL	-0.64%	-0.10%	-0.93%	-0.50%
launch	-1.22%	-0.18%	-1.43%	-0.83%
saving lives				
NRDL	989	1052	313	2353
launch	1431	2297	500	4229
increase on labor supply				
NRDL	1115	1231	901	3247
launch	1877	2487	2348	6712

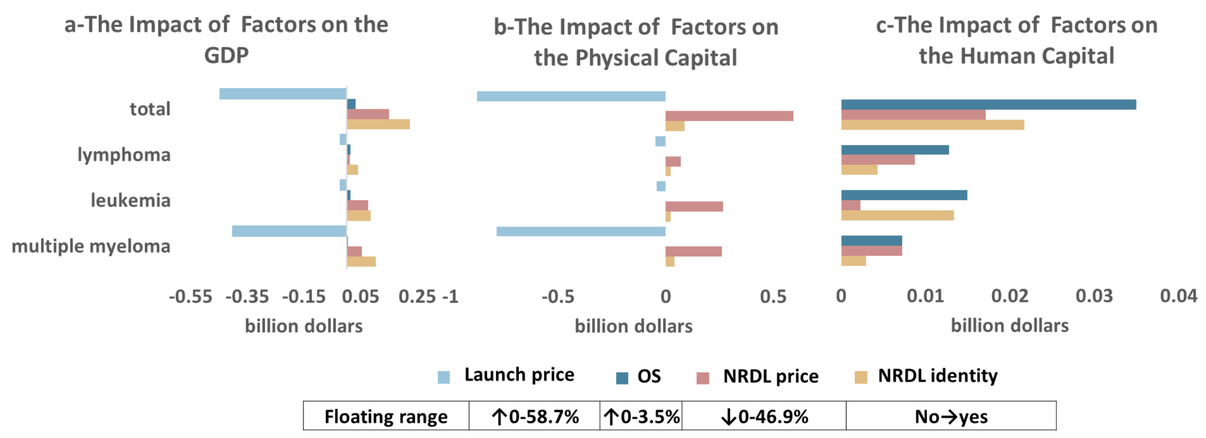
Through the combined effects of health improvements and healthcare expenditure savings, we estimated that post-market and post-reimbursement phases contributed approximately $-0.03 billion and $0.39 billion to GDP, respectively. (Table2)

Price fluctuations were the key factor affecting productivity. (Figure1)

Table2 The impact of launch and NRDL of innovative drugs on GDP, human capital, physical capital, and drug expenditure

	multiple myeloma	leukemia	lymphoma	Total
GDP loss from disease (billion dollars)				
factual scenario	2.12	7.98	4.73	14.83
no NRDL scenario	2.28	8.14	4.80	15.22
no launch scenario	1.89	8.14	4.77	14.79
impact on GDP (billion dollars)				
NRDL	0.16	0.16	0.07	0.39
launch	-0.23	0.15	0.04	-0.03
human capital loss (billion dollars)				
factual scenario	0.97	7.21	3.74	11.92
no NRDL scenario	0.98	7.22	3.75	11.96
no launch scenario	0.99	7.24	3.76	11.99
impact on human capital (billion dollars)				
NRDL	0.01	0.02	0.02	0.04
launch	0.02	0.03	0.03	0.07
physical capital loss (billion dollars)				
factual scenario	1.96	0.71	0.80	3.48
no NRDL scenario	2.26	1.00	0.92	4.18
no launch scenario	1.49	0.96	0.85	3.29
impact on physical capital(billion dollars)				
NRDL	0.30	0.29	0.12	0.70
launch	-0.48	0.25	0.04	-0.19
drug expenditure (billion dollars)				
factual scenario	4.86	1.97	2.16	15.84
no NRDL scenario	6.86	3.22	2.77	22.92
no launch scenario	2.71	2.98	2.40	13.77
impact on drug expenditure (billion dollars)				
NRDL	-1.99	-1.24	-0.61	-7.08
launch	2.16	-1.01	-0.24	2.06

Figure1 The impact Factors of Innovative Drugs on GDP, physical and human capital



CONCLUSIONS

We conducted a novel assessment of the impact of innovative drug launches and insurance access on the macroeconomy using an enhanced production function model.

Our empirical analysis of China’s hematological oncology drugs revealed that these factors can have both positive and negative effects on the macroeconomy, allowing us to identify the ‘critical price’ for achieving positive GDP growth.

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