The Adherence and Financial Impact of ADHD Medication Costs: A Comparative Study Between China and the USA

Lai, R. Y., & Anagnost, J.

Abstract:

Attention-deficit/hyperactivity disorder (ADHD) is a prevalent neurodevelopmental disorder that requires lifelong medication, yet adherence rates and financial burdens vary significantly across countries. This paper investigates the effects of ADHD medication costs on adherence and financial strain in China and the USA, exploring how price variations impact medication adherence within different healthcare systems. A comprehensive literature review was conducted using the PICO framework and organized in an Excel spreadsheet. Findings reveal that higher out-of-pocket costs are negatively correlated with adherence rates, with the impact being more pronounced in the US. Additionally, the financial burden of ADHD medications is significantly greater in the US with its less comprehensive healthcare system. This analysis provides insights into adherence barriers and financial challenges, offering suggestions for addressing similar issues in other countries with comparable healthcare contexts.

Introduction:

Attention-deficit/hyperactivity disorder (ADHD), affecting 5% of children and 2.5% of adults worldwide, is a common neurodevelopmental disorder. The typical behaviors are marked by symptoms of inattention, hyperactivity, and impulsivity, which can all lead to inconvenience in life. To manage these symptoms, a combination of medications and behavioral therapies is often used to relieve this disorder. The general mechanism behind ADHD drugs function by enhancing the levels of key neurotransmitters in the brain, such as dopamine and norepinephrine, which helps to improve attention, decrease hyperactivity, control impulsive behavior, and manage executive dysfunction (Cleveland Clinic, 2022).

ADHD medications are classified into two main categories: stimulants and non-stimulants. Stimulants, including drugs like methylphenidate and amphetamines, are the most commonly prescribed and are known for their efficacy in managing ADHD symptoms. Non-stimulants, such as atomoxetine and guanfacine, are typically used when stimulants are not effective or are not well-tolerated. In some cases, antidepressants are also prescribed to aid in ADHD treatment if the patient is also

paired with depression or anxiety. All of these drugs are unique and differ from generic medications as it specifically targets particular regions of the brain for adjustments.

Economically, the market for ADHD medications is substantial, with significant variations in drug availability and pricing across different countries. As of September 2023, some of the largest manufacturers of ADHD medications worldwide include Amneal Pharmaceuticals, Eli Lilly and Co., and Johnson and Johnson Services. The ADHD drug market continues to grow with its market size estimated at USD 14.3 billion in 2023 and is projected to grow at a compound annual growth rate (CAGR) of 3.7% from 2024 to 2030. This market is characterized by a moderate degree of innovation and high level of merger and acquisition (M&A) activity (Grand View Research, 2023). These trends suggest a continuous rising demand for ADHD drugs in recent years, potentially indicating its recognition and awareness worldwide.

After prescribing certain medications to patients, healthcare providers and clinics do not simply disregard what happens next. Instead, they actively track how patients are doing with taking their prescribed treatments. This practice is known as medication adherence, or drug compliance. Generally measured by "whether patients take their medications as prescribed (e.g., twice daily), as well as whether they continue to take a prescribed medication over time," this concept has become increasingly important over the past few decades (Ho et al., 2009). Tracking medication adherence allows healthcare providers to intervene and make adjustments to the treatment plan if needed, in order to optimize patient outcomes and prevent any adverse health consequences that may arise from poor adherence.

With rising healthcare costs and concerns over treatment outcomes, both providers and policymakers have started to pay closer attention to medication adherence and the factors that influence it. One crucial factor impacting drug adherence is the cost or price of the medication. In a broader context, a family's overall health is largely dependent on their economic stability, as the New York City Health Department has identified three key ways that poverty leads to poor health: financial pressures, unstable housing conditions, and lack of food security (How Economic Stability Creates Health, n.d.). These same economic factors similarly apply to medication adherence, as the price of a drug is a major consideration in a patient's decision to initiate or continue taking a prescribed medication. High out-of-pocket costs for medications can create significant financial burdens for patients, leading them to forego their prescribed treatments. For example, one study found that "if the actual price was much more than the estimated real-time benefit tool price, nearly 80% of respondents with cost-related nonadherence reported that it would affect their decision to start or keep taking a medication" (Dusetzina et al., 2023). Thus, the cost of the prescribed medication is a crucial determinant of patient adherence, as financial constraints can be a major barrier to obtaining and consistently taking necessary medications.

Moreover, medication adherence and the broader healthcare system are interdependent. The structure, coverage, and accessibility of a country's healthcare system can have a significant impact on whether patients are able to afford and access

the medications they are prescribed, which in turn affects the overall rate of medication adherence. Differences in healthcare systems between countries, such as the United States and China, can lead to divergent patterns of drug adherence. Some key factors that contribute to these differences include out-of-pocket costs for medications, government policies related to healthcare and drug pricing, and the overall affordability and accessibility of the healthcare system. These differences can largely determine the adherence rate in different countries.

In China, healthcare is almost universal, with 95%+ of Chinese citizens having public health insurance — significantly higher than in the US (Fang, 2020). In such a case, the nation would benefit in several areas. The most apparent benefit is the elimination of financial barriers to medical care, as no individual faces risk of bankruptcy from health concerns, which allows for a healthier population and a more productive workforce overall. Beyond such direct effects on individual and national finances, this universal healthcare model also yields broader societal benefits. By ensuring equitable access to care, the system promotes greater social equality and improved health outcomes across all demographics. The control of medicine prices by the government would also prevent abusive price control by corporations. Nevertheless, universal healthcare has its own drawbacks, too. Because of the extremely high demand on healthcare providers and clinics, this often leads to unacceptably long wait times for patients, potentially resulting in adverse health outcomes from delayed treatment. Additionally, resources may be prioritized for more common medical conditions over rare diseases or end-of-life care. In such cases, patients requiring specialized or advanced treatments may face higher out-of-pocket costs to seek care from private providers or even treatment from abroad. However, the most significant drawback of universal healthcare, especially in highly populated countries like China, is perhaps the staggering cost, where the immense financial burden can force governments to ration medical services or reallocate funding away from other critical social programs (The Up to Us Team, 2021). In the US, on the other hand, the healthcare system is predominantly privatized, with the majority of citizens relying on employer-provided or individually purchased insurance plans. These two countries, having almost an opposite situation, would shape the adherence rate of medications very differently.

In this paper, we explored two key research questions regarding ADHD medication in China and the USA. First, we examined how price variations influence medication adherence, hypothesizing that higher out-of-pocket costs for ADHD medications would lead to lower adherence rates, particularly in countries with less comprehensive healthcare coverage and higher levels of social stigma. We posited that in the USA, where there is lower social stigma around ADHD compared to China, adherence might be relatively higher. However, the higher income inequality and less comprehensive healthcare coverage in the USA could negatively impact adherence. Thus, while cultural perceptions might foster higher adherence in the USA, the financial barriers might counterbalance this effect, potentially leading to lower adherence rates compared to China. Second, we investigated the financial implications of ADHD medication costs in both countries. We hypothesized that high medication prices would impose a greater financial burden on families in countries with less universal health coverage and

insurance benefits. Given that the USA has poorer universal health coverage and less comprehensive insurance compared to China, we anticipated that the financial burden of ADHD medications would be more pronounced for low-income families in the USA. Although the US has more financial assistance programs, the high medication prices make these aids necessary but insufficient. Conversely, China's more extensive universal health coverage offers better support to low-income families, suggesting that the financial burden of ADHD medications is likely greater in the USA than in China.

Method:

Researchers John Anagnost (JA) and Rachel Lai (RL) conducted a comprehensive search of the current literature to explore the research topic and test the proposed hypotheses. The databases selected for the search were Google Scholar, JSTOR, National Library of Medicine (PubMed), and the Journal of Medical Economics. These databases were chosen as they are recognized as leading sources for accessing peer-reviewed journal articles, studies, and other authoritative academic literature across a range of disciplines. Specifically, the National Library of Medicine (PubMed) and the Journal of Medical Economics are found extremely relevant to the topic of search as they consist of abundant articles relating ADHD drugs in the medical area to economic aspects. The researchers focused primarily on identifying experimental and observational studies relevant to the research questions, though they did not exclude editorials or commentaries from the final spreadsheet.

The search terms were developed using the PICO (Population, Intervention, Comparison, Outcome) framework to capture the key elements of the research questions and hypotheses. For example, terms such as "ADHD drugs China" and "ADHD drugs US" were utilized to examine both hypotheses, each focusing on a specific population that the researchers wish to examine and compare. More specific terms like "ADHD drug adherence rate" were employed to address the outcome measures particularly focused on in Hypothesis 1, while terms like “low-income families ADHD” and “financial burden ADHD” were used in the research for Hypothesis 2.

The initial screening of the identified studies was conducted by reviewing both the title and abstract. The researchers primarily checked whether the title and/or abstract contained the key words and concepts relevant to the research questions and hypotheses. Then, to determine if a study should be included for further analysis, the researchers examined the relevance of the study to the specific hypothesis being investigated. Studies that were deemed highly relevant to the hypotheses were then included for a more detailed review and evaluation.

The researchers created a comprehensive Excel spreadsheet, including two separate pages for each hypothesis, to organize the data extracted from the included studies. This spreadsheet contained the following columns: title of the study, study type, author, analytical model, results, year of publication, and any relevant notes or observations. This organized approach allowed the researchers to efficiently synthesize the

information across the studies, identify patterns and trends, and develop a cohesive understanding of the existing literature to address the research questions.

Results:

***Results related to Hypothesis 1*:**

Why young people stop taking their attention deficit hyperactivity disorder medication: A thematic analysis of interviews with young people (Daniel et al., 2022)

This study used a series of semi-structured interviews with young people as qualitative data to analyze the reasons behind their discontinuation of prescribed medication. The results present the following rationales: perceived lack of benefit, views of ADHD as a childhood issue, life changes disrupting medication routines, and difficulties accessing appropriate healthcare services during the transition from child to adult care.

Although not specifically mentioned, “challenges in accessing services” indicates possible higher out-of-pocket costs in the process of obtaining the prescribed medication. These economic obstacles may include transportation costs and opportunity costs for the patient, which lower adherence rates among young people with ADHD moving into adulthood. Another indication is made with young people’s “Perceptions of ADHD.” This reason explains how views on ADHD as merely a childhood issue can affect the adherence rate as the patient’s age increases, suggesting that certain social stigma does amplify the motivations of young people stopping the medications.

Strategies for improving ADHD medication adherence (Kelly I et al., 2019)

This study summarized the key factors associated with nonadherence to ADHD medication, including caregiver/family, child/adolescent, medication-related, and healthcare/system factors. Caregiver/family includes a general negative view of ADHD and stigmatization of the medications; child/adolescent elaborates on specific behaviors of certain ages and ethnicities; medication lists factors related to the medicine itself and aftercare; healthcare/system expands its focus on characteristics of the community and external factors. By analyzing them, the researchers outlined various strategies on how to improve medication adherence in patients with ADHD based on the existing literature, including behavioral strategies, clinical interventions, peer support models, and health disciplinary-reducing interventions.

Several aspects mentioned by the study stressed the equal importance of the factors investigated. This means that the higher out-of-pocket costs indicated in the healthcare/system portion, though playing a major role, weren’t exactly the most significant reason behind the low adherence rate. However, it is true that this study touched upon the effects of social stigma, low socioeconomic status, and poor

healthcare systems of a country. These all align with the paper's Hypothesis 1 and contribute to the reasons behind the low adherence rate.

Why is there an ADHD medication shortage in 2024? What's making generics of Vyvanse, Adderall and more so scarce (Tin, 2024)

This article explained that the ADHD medication shortage in the United States in 2024, driven by supply chain issues, manufacturing problems, and regulatory constraints, will continue as many generic manufacturers are still struggling to keep up with demand.

The ADHD medication shortage, particularly for generic drugs, could lead to higher out-of-pocket costs for individuals needing these treatments, which suggests an association with lower medication adherence rates. This shortage shows that, with a private healthcare system, the shortage and the economic burden it brings are magnified.

The Influence of Parents on Medication Adherence of Their Children in China: A Cross-Sectional Online Investigation Based on Health Belief Model (Pu et al., 2022)

This study was done in China, using a cross-sectional survey. The results suggest that parents' perceptions of their children's susceptibility to illness, the severity of their children's conditions, the benefits of medication adherence, and external cues to action were positively associated with their children's medication adherence. While parents' perceived barriers to medication adherence were negatively associated, parental education level and family income were also significantly linked to children's medication adherence.

These results suggest that higher social stigma and negative cultural perceptions around ADHD have a negative effect on adherence rates. The population studied, China, is also significant as the hypothesis projects it to have such social indications.

Evidence of Low Adherence to Stimulant Medication Among Children and Youths With ADHD: An Electronic Health Records Study (Biederman, 2019)

The study analyzed electronic medical record data to assess adherence to ADHD stimulant medications, finding that only 46% of patients refill their prescriptions as needed to be considered consistently medicated. A regression model showed patient characteristics were only modest predictors of adherence, with lower adherence among patients seen by primary care providers, older patients, and females.

The results of this study bring attention to the age and gender of the patients in relation to adherence rates. As the analysis suggests, this difference may be attributed to the variation of primary care for the patients, including factors such as the availability and

ability of psychiatrists in clinics. Further, the solution provided in the study that encourages changes that familiarize patients with the disorder indicates that outside, or societal factors, such as cultural stigma, may play a role in the adherence rate of ADHD drugs. With a more negative view caused by poor understanding of the disorder, adherence rates may be lowered.

***Results related to Hypothesis 2*:**

Attention-deficit/hyperactivity disorder medication consumption in 64 countries and regions from 2015 to 2019: a longitudinal study (Chan et. al, 2023)

This is a longitudinal trend study that explores the consumption rates of ADHD drugs across 64 countries, including the US and China, over the years from 2015 to 2019. Through this time period, multinational ADHD medication consumption increased by 9.72% annually. Consumption was measured by Defined Daily Dose per 1,000 child and adolescent inhabitants per day (DDD/TID). This rise was notable in high-income countries, with consumption rates reaching 6.39 DDD/TID in 2019, but not in middle-income countries. In upper-middle-income countries, consumption was 0.37 DDD/TID, and in lower-middle-income countries, it was 0.02 DDD/TID. The US had a DDD/TID of 107.15 in 2015 and 110.28 in 2019, with an average annual percent growth rate of 0.61; China had a DDD/TID of 0.04 in 2015 and 0.10 in 2019, with an average annual percent growth rate of 24.59. Despite the annual growth rate of consumption in China (24%) being much larger than in the US (0.61%), absolute consumption levels were higher in the US than in China.

This association shows that high-income countries, such as the US, have notably higher ADHD medication usage rates compared to middle-income countries. However, the US lacks universal health coverage and has less comprehensive insurance benefits compared to China. This suggests that factors beyond universal health coverage and insurance benefits, such as the high cost of medications or other healthcare policies, may influence medication consumption rates. Conversely, the lower consumption rates in middle-income countries, including China, despite its more extensive financial assistance programs, suggest how these factors may be overshadowed by the direct economic status of a nation measured by GDP per capita and social views such as recognition of the important role of pharmacological treatment of ADHD.

Economic burden of attention-deficit/hyperactivity disorder among children and adolescents in the United States: a societal perspective (Schein et. al, 2022)

This cross-sectional study of ADHD's economic burden in the US revealed that ADHD imposes a significant societal cost of $19.4 billion for children and $13.8 billion for adolescents annually. The largest share of these costs, nearly 50%, is attributed to education expenses, with special education services being a major factor. Direct healthcare costs and caregiving also contribute significantly, with children and adolescents bearing a combined excess cost of about 20% of the total societal burden of ADHD, including the additional $122.8 billion burden on adults with the condition.

The results imply that high medication costs impose a greater financial burden on families in countries with less comprehensive health coverage. In the US, where universal health coverage is less extensive and insurance benefits are less comprehensive, the financial strain of ADHD medications is exacerbated for low-income families despite existing financial assistance programs. The high medication prices in the US mean that even with financial aid, the burden remains substantial.

Utilization of Drugs for Attention-Deficit Hyperactivity Disorder Among Young Patients in China, 2010–2019 (Wang et al., 2022)

This longitudinal study, the first to assess ADHD medication trends in young outpatients in China, examined 27,882 prescriptions from 2010 to 2019. It found a substantial increase in both the number of prescriptions and associated costs for ADHD drugs over this period. Specifically, prescriptions rose from 902 in 2010 to 4,531 in 2019, while total expenditure surged from 276,580 to 2,412,308 Chinese Yuan (CNY). The study noted a significant rise in costs, with the 2019 yearly cost being more than eight times higher than in 2010, despite a fivefold increase in prescriptions.

Here, the results suggest a positive correlation between the costs and the number of prescriptions. This may be attributed to the fact that there was, as mentioned in the study, more recognition of the disorder in China in recent years. Additionally, these trends align with recent changes in China's economic situation and healthcare policies. Despite the significant rise in medication costs, improvements in healthcare coverage and financial aid assistance have likely facilitated increased access to ADHD medications (Jakovljević et al., 2023).

Discussion:

This study sought to investigate two key aspects of ADHD medication management in China and the USA: the impact of price variations on medication adherence and the financial implications of medication costs. We hypothesized that higher out-of-pocket costs would result in lower adherence rates, especially in countries with less comprehensive healthcare coverage, greater income inequality, and higher social stigma. We also hypothesized that the financial burden of ADHD medication would be more pronounced in the USA due to its less comprehensive health coverage compared to China. The purpose of this exploration was to enhance understanding of ADHD treatment and highlight the broader global context of managing this disorder. By examining the effects of economic and cultural factors on adherence and financial burden, this study aims to shed light on the current challenges in ADHD treatment. The insights gained could inform policy improvements, offering suggestions for more effective management and calling for reforms in both countries.

Our findings largely support these hypotheses. The results indicate that financial barriers, including out-of-pocket costs, significantly influence medication adherence in

both countries, with cultural factors like social stigma playing a critical role in China. The financial burden of ADHD medication is indeed more severe in the USA, where less extensive healthcare coverage and higher medication costs exacerbate the economic strain on families. However, there are limitations to our findings as unexpected factors also played a major role, which we will discuss in “Limitations.”

Interpretation of Findings Related to Hypothesis 1

The findings largely align with the hypothesis, where financial barriers, specifically out-of-pocket costs, are significant factors that lower adherence rates. As suggested in the study by Daniel et al. (2022), the challenges in accessing services—which not only attribute high out-of-pocket costs to the price of the drug but also include transportation, opportunity, and other possible costs in the process of obtaining the medicine—are key factors in why young people in both countries stop taking their ADHD medications. In fact, these access costs are often much higher than the prescription itself, as evident in an interviewee explaining “‘about £20 every time I go and see them. And another £8 to get the prescription’” and “‘I hate the constant appointments, because I used to have to travel to [Town] for my appointments’” (Daniel et al., Table 2). These implicit costs may be neglected in previous assumptions that driving down the prices of these drugs would lead more people to continue buying them. This supports the hypothesis that higher out-of-pocket costs lead to a lower adherence rate.

Higher out-of-pocket costs are also associated with the country’s healthcare system, where “limited insurance coverage” in a country can lead to a significant burden on families (Kelly et al., 2019). Another more subtle reason behind this is that, with a poor healthcare system, patients often lack trust in local clinics and have a poor working alliance with their clinicians (Kelly et al., 2019). This decreases their willingness to collaborate with the clinics and increases the likelihood of forgoing their current treatment. This ethos of the drug provider proved significant, as the study done by Biederman (2019) found that “adherence was somewhat better for patients receiving prescriptions from psychiatric versus non-psychiatric clinics, which may reflect either the severity of these patient populations or a greater ability of psychiatrists to motivate adherence” (Biederman, 2019). The care setting, which includes environmental factors other than the drug itself, was shown to be greatly important to patients in adhering to the medications in both China and the US. Specifically, in the US, with its ADHD medication shortage, the market is slow to react with a poor healthcare system. The economic burden imposed by an extended medication shortage in the US exposed the drawbacks of low healthcare coverage and decreased the ability of families to continuously afford prescribed ADHD drugs (Tin, 2024). This consolidates and extends our hypothesis that healthcare systems magnify high out-of-pocket costs, leading to lower adherence rates.

Further, cultural factors also significantly impact medication adherence, as demonstrated by studies like those by Kelly et al. (2019) and Pu et al. (2022). The perceptions of ADHD drugs as “will get better,” “medication is to cope with school,” “perceived ability to cope,” and “relationship to higher education” all contribute to the

decrease in adherence rates (Kelly et al., Table 2). Social stigmas, such as the belief that ADHD is “a disorder that would no longer require treatment as they get older,” pose an issue in convincing patients to continue their medications. Often, incorrect methods of self-diagnosing ADHD due to a lack of knowledge can lead to “some young people interpreting improvements or changes in their symptoms as indicating that they no longer had ADHD” (Kelly et al., 2019). Specifically, we found that in China, higher social stigma around ADHD, coupled with economic barriers, contributes to lower adherence rates. The perception of ADHD as a childhood issue in China, as highlighted by Daniel et al. (2022), further lowers adherence as patients age. In the study, one significant finding was that perceived severity has significant positive direct impacts on medication adherence, while perceived susceptibility has a significant negative direct impact (Daniel et al., 2022). This shows that the patient’s belief and view on whether to continue the medication greatly impact adherence. Thus, with a cultural impact of being told or recognized as ADHD not being a real disorder, the patients, or children in this study, would discontinue their prescriptions. This supports our hypothesis that while cultural perceptions may foster higher adherence in the USA, financial barriers can counterbalance this effect, leading to lower adherence rates compared to China.

Interpretation of Findings Related to Hypothesis 2

Our findings confirm that the financial burden of ADHD medications imposed on families is more severe in the USA compared to China. Despite the USA's stronger overall economic status, the growth rate of ADHD medication consumption in China was significantly higher, with an annual increase of 24% compared to just 0.61% in the USA (Chan et al., 2023). This means that the economic strength of a country is not a major factor influencing financial decisions by individuals. Instead, the extensiveness of healthcare coverage and the amount of financial assistance programs may be more significant.

Further, the study by Schein et al. (2022) reveals that ADHD imposes a substantial societal cost in the US, with high out-of-pocket expenses exacerbating the financial strain on families. The rationale behind this financial burden may be explained by the role of the income effect. With increasing costs of ADHD drugs, families feel constrained in their purchasing power for other goods. This adversely decreases the demand for ADHD medications as they may be categorized as a normal good by the patients. Under this circumstance, with no other financial assistance, it is very likely that patients feel pressured by the financial burden of purchasing these medications.

In contrast, China’s healthcare system, which offers more extensive universal coverage, helps to mitigate the financial burden of ADHD medications, despite the rising costs (Wang et al., 2022). It is reasonable to attribute the rapid rise in consumption in China to the increasing recognition and prescriptions of ADHD medications. The reason why increasing these factors can raise the consumption rate is due to China’s extensive healthcare system and assistance programs. In Wang et al.’s analysis, it was mentioned that “National Institute for Health and Care Excellence guidelines do not recommend drug treatment with ADHD medications in patients aged under 6 years.” Clear

guidelines and monitoring were made possible due to a strong healthcare system. The willingness of families to consume such drugs, facilitated by national healthcare organizations, can be buttressed in just 50 years (Wang et al., 2022).

Suggested Policy Changes:

For the United States, policymakers can look into improving their healthcare system, leading to greater access to comprehensive care for patients. By considering expanding universal health coverage or Medicaid to include ADHD medications, more families, especially those in poor socioeconomic status, will have less financial burden in purchasing the needed prescriptions. Financial assistance programs can also be proposed, as they function in a similar manner. With programs such as income-based sliding scales for medication costs, tax deductions for medical expenses related to ADHD treatment, or direct subsidies for families below a certain income threshold, the pressure imposed by increasing costs will not be as intimidating. These measures will also contribute to an increase in adherence rates as the medications become more affordable and accessible.

For China, on the other hand, policies can be changed to eliminate the negative cultural stigma around ADHD. This would not only include promoting and raising awareness of the disorder through education but also supporting research and innovation. Governments and healthcare organizations can launch public awareness campaigns to educate the public about ADHD, emphasizing the importance of medication adherence and rejecting stereotypical opinions. This would increase the willingness of stakeholders to invest in research and development to discover new, cost-effective ADHD treatments as the demand for them increases. Additionally, policy incentives could be provided for the development of generic versions of ADHD medications to make them more affordable.

Limitations:

One primary limitation of this study relates to the search strategy and selection criteria used for identifying relevant literature. It is possible that not all pertinent studies were included in the final analysis. The researchers acknowledge that additional relevant literature might exist but was either not discovered or did not make it to the final selection process. This limitation suggests that the study's findings could be influenced by the availability of literature and may not fully represent the entire spectrum of research on ADHD medication adherence and financial impacts. Further, the lack of availability of data in China might indicate the thoroughness of the analysis on comparing the two countries.

Another significant limitation was identified during the review process. Specifically, the hypothesis did not sufficiently account for variations in patient age when examining medication adherence. In the paper of Biederman, 2019, it was discovered that younger patients may face different challenges compared to older individuals, who might deal with issues related to autonomy and changing healthcare needs. The study's lack of

consideration for these age-related differences potentially limits the comprehensiveness of the findings regarding adherence rates.

Additionally, the study did not address the impact of supply chain shortages on medication adherence. Recent reports, such as the shortage of Vyvanse by Takeda due to supply chain issues, highlight how disruptions can significantly affect medication availability and adherence (Fierce Pharma, 2024). These supply chain problems can pose financial barriers and lead to reduced adherence, a factor not incorporated into the study's hypotheses or analysis. This oversight limits the study's ability to provide a complete picture of the financial factors affecting medication adherence.

Conclusion:

This study investigated the effects of price variations on ADHD medication adherence in China and the United States. We found that higher out-of-pocket costs lead to reduced adherence rates, with this effect being more pronounced in countries with greater cultural stigma, less comprehensive healthcare, and higher income inequality. Additionally, the financial burden of ADHD medications is more severe in the US, attributed to its less comprehensive healthcare system and limited financial assistance programs. These findings highlight the need for targeted strategies to improve ADHD medication adherence and alleviate financial burdens, tailored to the specific conditions of each country. In China, addressing cultural stigma through educational initiatives is crucial, while the US should focus on healthcare reforms to enhance the system and expand financial assistance programs. Implementing these changes is essential for improving treatment outcomes in both nations. The study's country-specific approach offers insights that could be relevant to other countries facing similar challenges. Future research should examine the long-term effects of healthcare reforms on ADHD medication consumption and adherence and explore how cultural perceptions of ADHD evolve over time. Additionally, studies should consider the impact of age and ethnicity when researching ADHD medications.

References

Adrienne, Y. L. C., Ma, T.-T., Lau, C. Y. W., Ip, P., Coghill, D., Gao, L., Jani, Y., Hsia, Y., Wei, L., Taxis, K., Simonoff, E., Taylor, D., Lum, T. Y., Man, K. K. C., & Ian. (2023). Attention-deficit/hyperactivity disorder medication consumption in 64 countries and regions from 2015 to 2019: A longitudinal study. The Lancet, 58, 101780. https://doi.org/10.1016/j.eclinm.2022.101780

Biederman, J., Fried, R., DiSalvo, M., Storch, B., Pulli, A., Woodworth, K. Y., Biederman, I., Faraone, S. V., & Perlis, R. H. (2019). Evidence of low adherence to stimulant medication among children and youths with ADHD: An electronic health records study. Psychiatric Services, 70(10), 874–880. https://doi.org/10.1176/appi.ps.201800515

Bokhari, F. A. S., & Fournier, G. M. (2013). Entry in the ADHD drugs market: Welfare impact of generics and me-too's. The Journal of Industrial Economics, 61(2), 339–392. https://doi.org/10.1111/joie.12017

Chan, W. W. Y., Shum, K. K., & Sonuga‐Barke, E. J. S. (2022). Attention‐deficit/hyperactivity disorder (ADHD) in cultural context: Do parents in Hong Kong and the United Kingdom adopt different thresholds when rating symptoms, and if so why? International Journal of Methods in Psychiatric Research, 31(3). https://doi.org/10.1002/mpr.1923

Cleveland Clinic. (2022, October 6). ADHD medications: How they work & side effects. Cleveland Clinic. https://my.clevelandclinic.org/health/treatments/11766-adhd-medication

Desai, S., & McWilliams, J. M. (2018). Consequences of the 340B drug pricing program. New England Journal of Medicine, 378(6), 539–548. https://doi.org/10.1056/nejmsa1706475

Dusetzina, S. B., Besaw, R. J., Whitmore, C. C., Mattingly, T. J., II, Sinaiko, A. D., Keating, N. L., & Everson, J. (2023). Cost-related medication nonadherence and desire for medication cost information among adults aged 65 years and older in the US in 2022. JAMA Network Open, 6(5), e2314211. https://doi.org/10.1001/jamanetworkopen.2023.14211

Fang, H. (2020, June 5). China | Commonwealth Fund. Commonwealth Fund. https://www.commonwealthfund.org/international-health-policy-center/countries/china

Fielding, J. (2018). Comparing the United States' and China's shifting health challenges. American Journal of Public Health, 108(12), 1603–1606. https://doi.org/10.2105/ajph.2018.304782

Ge, P., Liu, S., Xu, S., Zhang, J., Lai, Y., Fu, R., Ke, X., Zhao, J., Bian, Y., & Wu, Y. (2022). The influence of parents on medication adherence of their children in China: A

cross-sectional online investigation based on health belief model. Frontiers in Public Health, 10. https://doi.org/10.3389/fpubh.2022.845032

Grand View Research. (2023). Attention deficit hyperactivity disorder (ADHD) market size, share & trends analysis report by drug type (stimulants, non-stimulants), by age, by distribution channel, by region, and segment forecasts, 2024 - 2030. Grand View Research. https://www.grandviewresearch.com/industry-analysis/attention-deficit-hyperactivity-disorder-adhd-market

Ho, P. M., Bryson, C. L., & Rumsfeld, J. S. (2009). Medication adherence. Circulation, 119(23), 3028–3035. https://doi.org/10.1161/circulationaha.108.768986

How economic stability creates health. (n.d.). Environment & Health Data Portal. https://a816-dohbesp.nyc.gov/IndicatorPublic/data-stories/economic-stability/#:~:text=Health%20is%20determined%20by%20many

Jakovljević, M., Chang, H.-Y., Pan, J., Guo, C., Jin, H., Hu, H., Danko Grujic, Li, Z., & Shi, L. (2023). Successes and challenges of China's health care reform: A four-decade perspective spanning 1985—2023. Cost Effectiveness and Resource Allocation, 21(1). https://doi.org/10.1186/s12962-023-00461-9

Reynolds, E. L., Burke, J. F., Banerjee, M., Kerber, K. A., Skolarus, L. E., Magliocco, B., Esper, G. J., & Callaghan, B. C. (2020). Association of out-of-pocket costs on adherence to common neurologic medications. Neurology, 94(13), e1415–e1426. https://doi.org/10.1212/wnl.0000000000009039

Scheffler, R. M., Hinshaw, S. P., Modrek, S., & Levine, P. (2007). The global market for ADHD medications. Health Affairs, 26(2), 450–457. https://doi.org/10.1377/hlthaff.26.2.450

Schein, J., Adler, L. A., Childress, A., Cloutier, M., Gagnon-Sanschagrin, P., Davidson, M., Kinkead, F., Guerin, A., & Lefebvre, P. (2022). Economic burden of attention-deficit/hyperactivity disorder among children and adolescents in the United States: A societal perspective. Journal of Medical Economics, 25(1), 1–48. https://doi.org/10.1080/13696998.2022.2032097

The. (2021, June 17). A comprehensive guide to understanding universal health care in the US. Itsuptous.org. https://www.itsuptous.org/blog/Universal-Health-Care?gad_source=1&gclid=CjwKCAjwy8i0BhAkEiwAdFaeGHjfBAIOWHDmW6589vNbfGytiKnorT1DspiuJ384NT-GlEQsLfqh6BoCfPcQAvD_BwE

Tin, A. (2024, February 8). Why is there an ADHD medication shortage in 2024? What's making generics of Vyvanse, Adderall and more so scarce. CBS News. https://www.cbsnews.com/news/adhd-medication-shortage-cause/

World Health Organization. (2003). Evidence for action.
https://iris.who.int/bitstream/handle/10665/42682/9241545992.pdf