

The adherence and financial impact of ADHD medication costs: A comparative study between China and the USA



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ABSTRACT

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In our developing world, mental disorder stigmas decrease significantly as psychological diagnoses and education evolve. Attention-deficit/hyperactivity disorder (ADHD), as one of the most prevalent mental disorders, yet, still faces challenges in varying adherence rates and brings a financial burden to families. This paper aims to investigate the effects of ADHD medication costs on adherence and financial strain in China and the USA, exploring how price variations impact these factors within different healthcare systems and cultures. To achieve this, we conducted a comprehensive literature review using the PICO framework for keyword searching and organized our sources in an Excel spreadsheet. This methodology allowed us to clearly identify and compare key trends in the two countries. Our findings indicate that higher out-of-pocket costs are negatively correlated with adherence rates, with this impact being more pronounced in the US for the first hypothesis. For the second hypothesis, the results showed that the financial burden of ADHD medications is significantly greater in the US due to its less effective healthcare system. This analysis gathers and evaluates factors that lead to adherence barriers and financial challenges, offering insights for policymakers seeking to implement improvements in these areas. Additionally, the paper proposes practical policy changes in the end that could enhance affordability and accessibility of ADHD medications in both China and the USA.

Contribution/ Originality: Unlike the majority of studies evaluating prices' impact by numbers, we examines it through a holistic lens, incorporating cultural stigma as a significant factor. By focusing on China and the USA, we provide a comparative analysis of two typical countries with polar opposite systems, which was not addressed in many previous research.

1. INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is a common mental disorder that affects a large proportion of the population—5% of children and 2.5% of adults—worldwide. Children with ADHD often possess observable behaviors of inattention, hyperactivity, and impulsivity, while adults may be unable to follow instructions and concentrate for a long time. To manage the inconveniences caused by these symptoms, a combination of medications and behavioral therapies is often used to relieve this disorder. The general mechanism behind ADHD drugs functions by enhancing the levels of key neurotransmitters in the brain, such as dopamine and

norepinephrine, which 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. Non-stimulants, such as atomoxetine and guanfacine, are used as a second option if 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 experiencing depression or anxiety. All of these drugs are unique and differ from generic medications because they specifically target particular regions of the brain for adjustments.

Economically, the market for ADHD medications has been substantial in recent years due to widespread common knowledge on the internet and better education. However, there is significant variation in drug availability and pricing internationally. 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, which are mainly from North America or Europe. There is an absence of other regions such as Asia. However, overall, the market continues to grow, with its size estimated at USD 14.3 billion in 2023 and projected to grow at a compound annual growth rate (CAGR) of 3.7% from 2024 to 2030 (Grand View Research, 2023). These trends suggest a continuously rising demand for ADHD drugs in recent years, potentially indicating that increasing recognition and awareness in developing regions are driving up diagnoses.

Returning to the macroeconomic environment, the microeconomic situation for ADHD medications is also improving. After prescribing certain medications to patients, healthcare providers and clinics no longer just send the patients home without further check-ins. Instead, they actively track how patients are doing with taking their prescribed treatments. This has led to a measurement of how active the patients are in following their treatment. This 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, Bryson, & Rumsfeld, 2009). Tracking adherence allows healthcare providers to intervene and make adjustments to the treatment plan if needed. Furthermore, it optimizes treatment outcomes and prevents any side effects or negative health consequences that may arise.

This development has led to further investigations of adherence rates, specifically the reasons behind them. 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, 2024). These same economic factors similarly apply to medication adherence: the price of a drug—such as out-of-pocket costs—is a major consideration in a patient's decision to initiate or continue taking a prescribed medication if they are economically unstable. 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.

Moreover, medication adherence and the broader healthcare system are also potentially affiliated as it can have a significant impact on whether patients are able to afford and access the medications they are prescribed. In countries such as the United States and China, varying out-of-pocket costs for medications and government policies related to healthcare and drug pricing can largely determine the adherence rate in different countries.

Specifically, 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 and prevention of abusive

settings of price; in this way, no individual faces risk of bankruptcy from health concerns. Beyond such direct effects on individual and national finances, this universal healthcare model also yields broader societal benefits with equitable access, which leads to less competition that can potentially sky-rock demand. 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 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 affect 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. We hypothesized 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 propose that in the USA, where there is lower ADHD, or mental disorder in general, social stigma compared to China, adherence might be relatively higher. However, the higher income inequality and less comprehensive healthcare coverage in the USA could have a negative impact. Thus, while comparatively more positive cultural perceptions in the USA might foster higher adherence, the financial barriers might counterbalance this effect, leading to lower adherence rates compared to China. For the second hypothesis, we investigated the financial implications of ADHD medication costs for families 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. By comparing USA and China's healthcare systems, we anticipated that the financial burden of ADHD medications would be more pronounced for low-income families in the USA. This is because China's more extensive universal health coverage offers better support to low-income families, while the USA does not have an accessible healthcare system.

2. METHOD

Researchers John Anagnost (JA) and Rachel Lai (RL) conducted a comprehensive search of the current literature to explore the research topic and compared the results to the proposed hypotheses. We selected Google Scholar, JSTOR, National Library of Medicine (PubMed), and the Journal of Medical Economics as these databases are leading sources for accessing peer-reviewed journal articles, studies, and trusted academic literature across a range of topics. Specifically, the National Library of Medicine (PubMed) and the Journal of Medical Economics are found extremely relevant to the topic of search as they specialize in articles of ADHD drugs in the medical area, economic aspects, and a combination of both. The researchers focused primarily on identifying experimental and observational studies relevant to the research questions. However, they also included editorials or commentaries from the final spreadsheet due to their value in reporting timely discoveries or news.

The search terms were developed using the PICO (Population, Intervention, Comparison, Outcome) framework. For "population", we searched for terms such as "ADHD patients in China/USA" and "ADHD effect on family", focusing on the same type of families that are in different countries. While for "Intervention" and "Comparison", we looked for longitudinal experiments that investigate the effects of different factors on adherence rate and financial situation in "China/USA" and "Low-income/High-income". Lastly, for outcomes we focused on terms that can indicate our own hypothesis, such as "economic burden of ADHD". For hypothesis one, we

specifically searched for “Cultural Stigma ADHD” and “Healthcare effects on mental disorder drugs”. For hypothesis two, we changed the terms to “financial burden on ADHD families” and “low-income families affected by ADHD price”. Our first step in reviewing the founded articles was to read both the title and the abstract. The researchers primarily checked whether the title and/or abstract contained the key words and concepts relevant to the research questions and hypotheses. If it does and the study seems interesting and highly related to the hypotheses, we separate it into a document for a more detailed review and evaluation.

In this process, the researchers created a comprehensive Excel spreadsheet of two separate pages for each hypothesis to organize the data. This spreadsheet contained important columns that helped the researchers to quickly find a study or compare trends: title of the study, study type, author, analytical model, results, year of publication, and any relevant notes or observations.

3. RESULTS

3.1. Results Related to Hypothesis 1

3.1.1. *Why Young People Stop Taking their Attention Deficit Hyperactivity Disorder Medication: A Thematic Analysis of Interviews with Young People (Titheradge et al., 2022)*

This study used a series of semi-structured interviews with young people to analyze the reasons behind their discontinuation of prescribed medication. Several main reasons are high opportunity costs, false perception of ADHD as a childhood issue, life changes such as moving, and difficulties to access appropriate healthcare services.

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.

3.1.2. *Strategies for Improving ADHD Medication Adherence (Kamimura-Nishimura, Brinkman, & Froehlich, 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.

3.1.3. *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.

3.1.4. The Influence of Parents on Medication Adherence of Their Children in China: A Cross-Sectional Online Investigation Based on Health Belief Model (Ge 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.

3.1.5. Evidence of Low Adherence to Stimulant Medication among Children and Youths with ADHD: An Electronic Health Records Study (Biederman et al., 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.

3.2. Results Related to Hypothesis 2

3.2.1. Attention-Deficit/Hyperactivity Disorder Medication Consumption In 64 Countries and Regions from 2015 to 2019: A Longitudinal Study (Adrienne 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. 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.

3.2.2. 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 analysis is conducted in a span of two years and evaluates the economic burden of ADHD patients, specifically children and adolescents, in the US. The results revealed that ADHD imposes a significant societal cost of \$19.4 billion for children and \$13.8 billion for adolescents annually. The highest percentage, nearly 50%, is due to special education service expenses. Direct healthcare costs and caregiving is also a major factor.

The results imply that a poor healthcare system does play a significant role in determining how much financial burden ADHD patients are bearing. Specifically, the high out-of-pocket costs is the major issue with most of the children or adolescents not insured. To infer context around the child, this also leads to a high economic burden on their families. For low-income families, this burden may be much greater and may lead to a lower standard of living for them.

3.2.3. Utilization of Drugs for Attention-Deficit Hyperactivity Disorder among Young Patients in China, 2010–2019 (Wang, Wu, Yu, & Yu, 2022)

This longitudinal study is the first to assess ADHD medication trends in young outpatients in China. The study lasted 9 years and its results indicate 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 and the total expenditure also rose from 276,580 to 2,412,308 Chinese Yuan (CNY).

The results in this study can be inferred with China's recent year developments, where there was more recognition of the disorder domestically. This means that, by controlling the variable of lack of education in mental disorders, China's healthcare system can immediately provide a foundation for the ADHD medication market to grow.

4. DISCUSSION

In this study, we investigated two key aspects of ADHD medication in China and the USA: the impact of price variations on medication adherence and the financial implications of medication costs. The purpose of this exploration was to provide a more holistic review on the challenges ADHD patients still face today. By delving deep into two representative countries, China and USA, for comparison, we want to provide insights for reform changers based on properties in different regions. Challenges that ADHD worldwide face is not an issue that can be solved with one solution. Policy makers must consider factors of cultural stigma, healthcare systems, and family economic status composition in detail and in reference in different countries.

Through reviewing the literature, our findings largely support the original hypotheses. The results indicate that financial barriers due to lack of a proper healthcare system significantly influence medication adherence in the USA, which had a greater effect than the negativeness social stigma in China brings. Further, the financial burden of ADHD medication is more severe in the USA, where higher out-of-pocket 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."

4.1. 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 Titheradge 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” (Titheradge et al., 2022). 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 (Kamimura-Nishimura 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 (Kamimura-Nishimura 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 et al. (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 et al., 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 Kamimura-Nishimura et al. (2019) and Ge 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 (Kamimura-Nishimura et al., 2019). 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” (Kamimura-Nishimura et al., 2019). This is significant in China, as highlighted by Titheradge et al. (2022). In the study, one significant finding was that perceived severity has significant positive direct impacts on medication adherence (Titheradge et al., 2022). This shows that the patient’s belief on whether to continue the medication greatly impacts adherence. Thus, with a cultural impact of being told or recognized as ADHD not being a real disorder due to the lack of education, the patients would discontinue their prescriptions. This supports our hypothesis that a comparatively more positive cultural perception higher adherence in the USA may lead to higher adherence rate than China.

4.2. Interpretation of Findings Related to Hypothesis 2

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 (Adrienne 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. The rationale behind this can 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 thus decreases the demand for ADHD medications as they may be categorized as a normal good by the patients. Because the patients consider that the medication is a “luxury” instead of a “necessity”, 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).

4.3. 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 also 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.

5. LIMITATIONS

One major limitation is that not all related literature is included in the final analysis. There may be factors that were not seen due to the lack of scope of the research terms. This may lead to confounding variables and results may not be all attributed to what’s mentioned in the study. 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 that the hypothesis did not account for the effects of the patients’ ages on medication adherence. In Biederman’s paper, 2019, it was discovered that younger patients may face different challenges compared to older individuals. This was not one of the factors considered in the hypothesis and was only discovered during the review process. This may be related to cultural stigma and could have been further incorporated into the hypothesis.

The study also did not address the impact of supply chain shortages on medication adherence. For example, the shortage of Vyvanse by Takeda due to supply chain issues highlights how disruptions can significantly affect

medication availability (How Economic Stability Creates Health, 2024). This is a crucial factor to adherence and yet was not considered in the study. This may lead to sorting its effect onto other factors.

6. CONCLUSION

This study found that ADHD adherence is relatively better in China as it has a more complete healthcare system despite its higher social stigma compared to the USA. Also, there is a higher economic burden on low-income families with less comprehensive healthcare systems. Our results suggest an urgent need to customize policy changes based on different countries. We suggest future research to examine the long-term effects of healthcare reforms on ADHD medication adherence and explore whether that alleviates the economic burdens from low-income families.

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REFERENCES

- Adrienne, Y. L. C., Ma, T.-T., Lau, C. Y. W., Ip, P., Coghill, D., Gao, L., . . . 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., . . . 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>
- Cleveland Clinic. (2022). *ADHD medications: How they work & side effects cleveland clinic*. <https://my.clevelandclinic.org/health/treatments/11766-adhd-medication>
- 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). *China | commonwealth fund*. <https://www.commonwealthfund.org/international-health-policy-center/countries/china>
- Ge, P., Liu, S.-t., Xu, S.-x., Zhang, J.-z., Lai, Y.-j., Fu, R.-c., . . . Wu, Y.-b. (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*, 845032. <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.
- 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. (2024). *Environment & health data portal*. <https://a816-dohbsp.nyc.gov/IndicatorPublic/data-stories/economic-stability/#:~:text=Health%20is%20determined%20by%20many>
- Kamimura-Nishimura, K. I., Brinkman, W. B., & Froehlich, T. E. (2019). Strategies for improving ADHD medication adherence. *Current Psychiatry*, *18*(8), 25–38.

- Schein, J., Adler, L. A., Childress, A., Cloutier, M., Gagnon-Sanschagrín, P., Davidson, M., . . . 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), 193-205. <https://doi.org/10.1080/13696998.2022.2032097>
- The Up to Us Team. (2021). *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-GIEQsLfqh6BoCfPcQAvD_BwE
- Tin, A. (2024). *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/>
- Titheradge, D., Godfrey, J., Eke, H., Price, A., Ford, T., & Janssens, A. (2022). Why young people stop taking their attention deficit hyperactivity disorder medication: A thematic analysis of interviews with young people. *Child: Care, Health and Development*, 48(5), 724-735. <https://doi.org/10.1111/cch.12978>
- Wang, Z., Wu, X., Yu, Z., & Yu, L. (2022). Utilization of drugs for attention-deficit hyperactivity disorder among young patients in China, 2010-2019. *Frontiers in Psychiatry*, 12, 802489. <https://doi.org/10.3389/fpsy.2021.802489>

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