

WURJ

Williams Undergraduate Research Journal

Volume II
Fall 2022



**Out of the Frying Pan, Into
the Fire: Romania's Shift
to Communism** *Page 4*

**Closing the Educational
Gender Gap in Ethiopia**

Page 25

The Promise of Psilocybin
Page 37

CONTENTS

SOCIAL SCIENCES

04

Out of the frying pan, into the fire: An evaluation of the role of Human Agency in Romania's shift from fascism to communism in the mid 20th century

Utsav Bahl '25

16

Islamist Education: American-Funded Education in Afghanistan

Niko Malhotra '24

22

Always Leave Them Wanting More: Business in the Age of Scrolling, Reacting, and Posting

Caroline Case '22

25

Closing the Educational Gender Gap in Ethiopia: Perspectives from Behavioral Economics

Surya Kotapati '24

SCIENCES AND MATHEMATICS

31

The Effect of School Funding Inequality on Student Achievement Using Causal Inference Methods

Elijah Tamarchenko '23

37

The Promise of Psilocybin

Mukund Nair '22

43

Human exposure to bisphenol A from landfill leachate-contaminated water

Gwyneth Chilcoat '24

LETTER FROM THE PRESIDENT

Dear Reader,

It is my honor to present you with the second edition of the Williams Undergraduate Research Journal (WURJ), Williams College's first and only peer-reviewed publication highlighting student research across academic disciplines. From my talks with Nick Patino, the founder and former president of WURJ, I understood his vision for the journal to center around creating a platform for publishing student work at Williams on par with the platforms available to our peers at large universities. He recognized that despite the exceptional research being conducted by so many Williams students, most projects culminate in a final grade or maybe a poster presentation, with only a select few leading to publication. Accordingly, I hope that WURJ can give new value to the current pool of research papers sitting in students' Google Drive folders, allowing the authors to get exposure to the peer review process, and presenting the Williams community with exceptional examples of original student research.

Over the past year, I am proud to say that not only have we done tremendous work toward realizing Nick's original vision, but we've expanded on it as well. We more than tripled our number of submissions from the 2020-21 school year, and we've introduced an online platform to accommodate the additional papers. In conjunction with the career center, the student union, and other student organizations, we co-sponsored a series of talks with alumni on the theme "Debunking the Myth of the Perfect Williams Student." Additionally, we were awarded a grant of over four thousand dollars from the Office of Diversity, Equity, and Inclusion (DEI) to expand access to publication opportunities for individuals from underrepresented communities in academia. Through our continued involvement with the Office of DEI and Pathways for Inclusive Excellence, in conjunction with outreach to cultural studies departments and student groups

that aim to increase diversity in specific disciplines, I hope that WURJ can continue to evolve not only as a research journal, but also as a community of individuals committed to fostering inclusivity in academia.

In the spirit of the liberal arts mission of Williams College, we aimed to select articles for the 2021-22 print edition that could highlight both the breadth and depth of academic work being conducted by students at the College, many of which have been directly adapted from projects for classes and independent studies. Accordingly, to any Williams student who feels so inspired to get published themselves, I strongly encourage you to visit the submission form on our website (sites.williams.edu/WURJ) for more information.

The papers in this issue cover topics ranging from mid-twentieth century Romanian politics to business in the digital age to the benefits of psilocybin for treating mental illness, all of which present original perspectives for understanding and interpreting our world. It is my sincere hope that after reading these articles, you can come away not only with new knowledge on a diverse range of subjects, but also an increased curiosity for the concepts mentioned within.

WURJ is only made possible by the numerous contributions of authors, editors, graphic designers, board members, faculty, and staff who have committed their time and effort to achieve a common goal. I am immensely grateful for all of their hard work. Without further ado, I hope you enjoy this latest edition of WURJ.

Sincerely,



Raphael Rakosi-Schmidt
WURJ President

BOARD 2021-2022

EXECUTIVE BOARD

President

Raphael Rakosi-Schmidt '23

Editor in Chief

Social Sciences & Humanities

Caitlin Han '23

Editor in Chief

Natural Sciences & Mathematics

Daniela Galvez-Cepeda '24

Finance Officer

Chloe Moffitt '23

Communications Director

Maxwell Song '23

Outreach Coordinator

Destiny Crisp '23

Faculty Advisor

Professor Steven Miller

EDITORIAL BOARD

Managing Editor of Social Sciences

Paige Anna Busse '24

Managing Editor of Design

Jessica Zhu '25

Associate Editors

Eli Dugan '25
Jeana Fermi '25
Sarah Hartman '25

Riley Jung '24
Ari Quasney '25
Hannah Yoon '25

Cover Designer

Aiden Pham '24

SPECIAL THANKS

D. Clinton Williams

Jennifer Ceolinski

Office of Institutional Diversity,
Equity, and Inclusion

Out of the Frying Pan, Into the Fire: An Evaluation of the Role of Human Agency in Romania's Shift From Fascism to Communism in the Mid 20th Century

Utsav Bahl '25



(Portrait of King Michael)¹

Abstract

The field of modern eastern European history, as was the case with Soviet history, attracts few talented academics, and nearly none who do not have some predetermined political affiliations. This is largely due to the limited disclosure of communist associated archives in the late 20th century.² The bulk of Romanian historians tend to devote their career to ancient Romanian history, and those who do study modern events have tended to focus on the revisionist viewpoint of “inevitability”.³

¹ *Portrait of King Michael*, December 5, 2017, *Le News*, December 5, 2017, <https://lenews.ch/2017/12/05/former-king-michael-of-romania-dies-in-switzerland/>.

² Richard Pipes, “Preface,” in *Three Whys of the Russian Revolution* (London: Pimlico, 1998).

³ A form of historical determinism which suggests that certain events are unavoidable and certain to occur due to the preexisting circumstance of time and setting.

This revisionist (and post-Stalinist Soviet) scholarship has meant that the role of human agency in contemporary Romanian history is often overlooked, in the sense of agents acting on their own to influence history but also in terms of moral culpability. The purpose of this extended essay is to challenge the revisionist argument on Romanian historiography using a limited source base to discuss the key concept of human agency as defined above under the time period of 1939 to 1947. The historical analytical method of causation will be used to compare the two historical perspectives of human agency and inevitability.⁴ My conclusions based on these sources suggest that King Michael I and British Clandestine actions overall shaped the fate of the Romanian nation far more than any processes of historical determinism.

Introduction

Wednesday, August 23rd, 1944, HM Mihai (1940 to 1947), third and fifth Hohenzollern “by the grace of God and the will of the people, King of Romania” sat with General Constantin Sanatescu, the ex General Aurel Aldea who had been expelled by Marshal Ion Antonescu, and three civilians.⁵ Within a matter of hours, these six conspirators would change the course of Romanian history in an act of the utmost significance for the future development of the state. King Michael would lead a *coup d'état* against his own government to seize power from Ion Antonescu, the *de facto* dictator of Romania, ending Romania’s support to the Nazi regime and effectively shortening the war by six months as recognised by

⁴ The interplay of diverse and multiple events and circumstances which influence an outcome; Agents acting on their own to influence events.

⁵ Nicolette Franck, *La Roumanie Dans L'engrenage* (Paris: Elsevier-Sequoia, 1977), pp. 14-16

US President Harry S. Truman.⁶

As a nation, Romania went through more than twenty years of tyranny, and thus, developed prominent conditions for the rise of populist movements. No other marxist state fell through equally violent and more importantly, popular, upheaval. Today, Romania is encumbered with scandals of corruption amongst high ranking government officials.⁷ This is not inconsistent with its course of history, and could suggest a behavioural historical consciousness which is fostering interwar populist movements. For example, the same anti-communist rhetoric employed in modern Romanian politics, played a large part in the rise of Antonescu and his subsequent dictatorship which culminated in a grandest failure, as Romania became a satellite state of the USSR.

The role of King Michael I is unique to Romania. He ruled for a mere seven years, but his legacy is perhaps the most prominent in contemporary Romania. Similarly, the clandestine actions undertaken by the United Kingdom and the Americans to apportion Romania to the USSR to “preserve” Greece is hardly discussed in contemporary history. As Prince Nicholas of Romania pointed out, in large factions of Romanian civil society, there is a distrust towards the Anglo Romanian relationship due to the failure of the alliance to ensure Romanian sovereignty.⁸ The historiography surrounding Romanian history in the mid to late 20th century is very limited.

The methodology of this essay includes both primary and secondary sources namely works from previous diplomats and historians who worked in this time period namely Catherine Durandin in her book “*Histoire des Roumains*,” Nicolette Franck in her book “*La Roumanie dans l’engrenage*,” and Dennis Deletant in his work “*Clandestine British Actions in Romania*.⁹ These texts relate to the politically angled scope of this essay due to the authors’ involvements in diplomacy.

These sources, among others, provided a foundation for my extended essay, but they have their own biases and narrow perspectives. For more nuanced primary source research, I was able to access online Romanian archives. This was suitable because much of Romanian archives have not yet been examined, and therefore, there are no suitable interpretations or historiographies I could access on the topic from a post revisionist perspective.¹⁰ I also interviewed some notable figures, particularly Prince Nicholas of Romania, the grandson of King Michael I who grew up in his grandfather's house during the time of King Michael's exile from Romania.¹¹ Furthermore, I received interview documentation of King Michael I from his grandson and lawyer, which is currently unavailable to the wider public.¹² Additionally, I consulted Romanian historian Radu Albu Comanescu from the University of Cluj.¹³ These two primary sources provided the degree of unique understanding required to challenge the consensus of revisionist inevitability which this essay examines.

Historical Context

The modern Romanian nation was established in 1878. One of the most fatal misfortunes in Romanian history is that millions of Romanians failed to be incorporated into independent Romania, particularly from regions

⁶ Catherine Durandin, *Histoire Des Roumains* (Paris: Fayard, 1995); Nicolette Franck, *La Roumanie Dans L’engrenage* (Paris: Elsevier-Sequoia, 1977); Dennis Deletant, *British Clandestine Activities in Romania during the Second World War* (London: Palgrave Macmillan, 2016).

⁷ Challenging the revisionist school of thought through a lens other than the Orthodox perspective. In the case of Romania, revisionist historians argued inevitability, meanwhile Orthodox historians lacked a common consensus with most pointing to intentionalist clandestine actions by the USSR.

⁸ Appendix B (Bahl, Utsav, and Nicholas Medforth-Mills. Prince Nicholas Medforth-Mills of Romania regarding the role of his grandfather, King Michael I of Romania in the mid to late 20th Century and with regards to coup d'état against the regime dictator Ion Antonescu. Personal, November 28, 2019.)

⁹ Michael Regele Mihai. Other, n.d. Source Provided by Prince Nicholas of Romania, NOT OPEN FOR PUBLIC USE OR RELEASE. Transcript is with author of this paper, candidate gzs444, privately.

¹⁰ Appendix C (Bahl, Utsav, and Radu Albu Comanescu. Romania: From fascism to communism. Personal, July 16, 2020.)

such as Bessarabia, Transylvania, and Bukovina. In 1919, ethnic Romanians comprised a mere half of the Romanian population at large. As acknowledged by Prince Nicholas, during the reign of King Ferdinand and King Carol II, Romania developed culturally and economically.¹⁴ Indeed, Prince Nicholas would have a reason to advocate monarchism in Romania, coming from the royal family, but his claims are based on statistical proof of real economic growth. The Romanian real GDP rose by 96% from 1920 to 1940.¹⁵ The Romanian oil reserves played a large role in this newfound economic prowess. The cultural and economic rise of Romania after 1919 meant that her sovereignty could be challenged by ambitious neighbours such as the USSR. This coincided with an increased polarisation of politics in the 1930s, under King Carol II. This period of history in Romania is known as “the ebbing of History”.¹⁶ Institutions such as the parliament lost their power to the monarchy. At the same time, the right wing sentiment in Romania grew. The youth, in particular, supported right wing politics as a supporter of popular Romanian nationalist sentiment. For this reason, in the early 1930s, the LAM (a university created political party) organised a political unit known as the Iron Guard. This party was built on nationalist sentiment and making Romania a powerful country in the East and West. The monarchy and major political parties disagreed with the quasi-fascist ideologies of the Iron Guard, and even officially began taking action against its leaders. However, Carol’s fatal mistake was legitimising the Iron Guard by attacking its right wing rhetoric. In 1939, when it was clear that Carol’s previous successes were far behind him, he was forced to collaborate with the Iron Guard and its leader, Antonescu.

As part of the Molotov Ribbentrop Pact (August 23rd, 1939), the USSR was allowed to annex the historically-Romanian lands of Bessarabia and Northern Bukovina.¹⁷ In an attempt to at least secure the lands of Transylvania, King Carol appointed a pro German cabinet, effectively raising the Iron Guard to the most powerful party in Romania. To stop further border changes, as part of a new deal, ratified in September of 1940 in Craiova, Romania was forced to cede 30% of Transylvania to Hungary.¹⁸ This deal meant that the Nazis could secure Romanian borders and keep them safe from Soviet attacks, but it also turned public opinion heavily against King Carol. This was largely because the Romanian population at large felt this was an infringement on their national sovereignty at a time when populism was on the rise. Furthermore, public support for Nazism was low. In a futile attempt to save his power, King Carol asked Antonescu to form a coalition government, however, Antonescu seized the opportunity to take control himself. Carol was forced to abdicate and his 19 year old son, Michael, assumed the throne on 6th of September, 1940. The move meant that Ion Antonescu could take control of the Romanian state, but keep Michael as a figurehead of the monarchy to maintain popular support from the pro monarchist Romanians.

Antonescu subsequently purged members of the Iron Guard to consolidate his power and retain popularity amongst the Romanian people. By January 1941, Romania was a military dictatorship. Antonescu sought to secure Romania’s territories, threatened by the USSR and Hungary. This made his need to align with the Axis strong, and indeed, Antonescu formed a diplomatic relationship with Adolf Hitler.¹⁹ As Dennis Deletant noted,

Antonescu was far from being overawed by the Führer, and he was, perhaps, the only person ever allowed to

¹⁴ Appendix B (Bahl, Utsav, and Nicholas Medforth-Mills. Prince Nicholas Medforth-Mills of Romania regarding the role of his grandfather, King Michael I of Romania in the mid to late 20th Century and with regards to coup d'état against the regime dictator Ion Antonescu. Personal, November 28, 2019.)

¹⁵ Victor Axenciu and George Georgescu, “Gross Domestic Product – National Income of Romania 1862 – 2010. Secular Statistical Series and Methodological Foundations,” Munich Personal RePEc Archive (Munich Personal RePEc, October 16, 2017), Accessed 16 November 2020. https://mpra.ub.uni-muenchen.de/84614/1/MPRA_paper_84614.pdf.

¹⁶ Dennis Deletant, *British Clandestine Activities in Romania during the Second World War* (London: Palgrave Macmillan, 2016), p. 109.

¹⁷ A nonaggressive pact between Nazi Germany and USSR signed on the 23rd of August, 1939

¹⁸ Ion Scurtu, “Collection of Documents and Materials Regarding the History of Romania,” *Collection of Documents and Materials Regarding the History of Romania* (Bucharest: University of Bucharest, n.d.), pp. 122-124

¹⁹ The Axis powers was a military alliance between Imperial Japan, Nazi Germany, and Fascist Italy to oppose the French, British, Soviet, and later United States, alliance.

speak his mind directly and freely to Hitler, often contradicting him.

Deletant later noted in his book *Hitler's Forgotten Ally*, Hitler respected Antonescu a great deal, but also needed him because of Romania's oil reserves which sustained over half of Germany's war efforts.²⁰ The claims made by Detelant are based on his academic research on Romanian history. Nonetheless, as a British historian, there is a chance of overemphasising Antonescu's influence to shift the British guilt of not assisting Romania once they shifted to the allies.

The satisfaction of territorial needs initially made Antonescu popular. After the Battle of Stalingrad (August 23rd 1942 to February 2nd 1943), however, dismay with Romania's allegiance to the Axis intensified. Antonescu was unwilling to compromise, and therefore, on August 23rd, 1944, Michael led a *coup d'état* to seize control of the government. (See Appendix D: *Romanian Political Sentiment During The Second World War* for deeper context).

Inevitability

The question of inevitability in post-Soviet scholarship comes from the revisionist school of thought.²¹ The general consensus is that Soviet domination in Eastern Europe was an inevitable result of the rise of communism in Russia. This suggests that the shift towards communism was preordained, and indeed a popular revolution. This is the precise reason that much of Romanian and Eastern European history is disregarded. In reality, the issue is far more complex. Why did Finland, under similar circumstances, not fall to communism? Indeed, Romania did not simply shift from the Iron Guard to the Iron Curtain seamlessly. The infiltration of key aspects of the Romanian economy by far-right leaders began in the late 1920s.²²

In Romania, much like Nazi Germany, the fear of Soviet

infiltration fostered the consolidation of authoritarian power. The 1989 Romanian Revolution, which saw the end of communism, was so remarkably popular that one must ponder why Romania was communist in the first place. No other former Soviet or Soviet satellite state declared independence in such a violent manner. A simple solution comes from the geographical location of Romania. As Professor Comanescu put it,

If Romania had been in the same geographical location as France, for example, it would have followed a very similar course of history, for the Romanian people and their history, the geography has played the largest part.

Indeed, Romania never really had a popular sentiment for Nazism or communism, yet as it was right in the middle of the two, it had to side. Of course, this is easy to say in retrospect to the event. Comanescu's comment could also be limited by his Romanian nationality which would incentivise downplaying any popular communist sentiment due to the contemporary anti socialist sentiment in Romania. Nonetheless, the notion suggests a turn to communism was far more likely. However, Greece serves as a counterargument, as mentioned above. That does not mean that an argument for inevitability is non-existent.

The revisionist school of thought continuously proposed that the rise of communism in Romania was 'linear' and 'gradual' once allied victory was certain.²³ This is clear as the real rise of communism in Romania began far before the war had ended. In April of 1944, the Soviet Union began marching into Transnistria, and by August they were already in Bessarabia.²⁴ In that sense, Romania was on a path to communism before the King acted. If the Soviet Union were to 'liberate' Romania, as an Axis power, it would be able to justify communist

²⁰ Dennis Deletant, *Hitler's Forgotten Ally: Ion Antonescu and His Regime*, Romania 1940-44 (New York: Palgrave Macmillan, 2006).

²¹ The question of inevitability in history is a form of historical determinism which suggests that certain events are unavoidable and certain to occur due to the preexisting circumstance of time and setting.

²² Appendix B (Bahl, Utsav, and Nicholas Medforth-Mills. Prince Nicholas Medforth-Mills of Romania regarding the role of his grandfather, King Michael I of Romania in the mid to late 20th Century and with regards to coup d'état against the regime dictator Ion Antonescu. Personal, November 28, 2019.)

²³ Dan Little, "Marx's Ideas about Government," Marx's ideas about government, January 1, 1970, Accessed 05 October 2020. <https://understandingsociety.blogspot.com/2019/02/marxs-ideas-about-government.html>.

²⁴ Catherine Durandin, "Les Luttes De L'Entre-Deux-Guerres," in *Histoire Des Roumains* (Paris: Fayard, 1995), pp. 314-315.

control over Romania. Michael's *coup d'état* was a last resort to stopping communism in Romania. The Romanian army could have resisted occupation, but morale was broken as evidenced in the Jassy Kishinev Offensive (August 20th to August 29th, 1944).²⁵ The only obstacle to a communist Romania was the Iron Guard. If this pillar of fascism fell, then it followed that Romania would automatically fall to communism. This is a consequence of complicated Romanian history stemming from 1918.

The postwar Romanian state, indeed, had great economic potential, but it was territorially dissatisfied. Moreover, Carol II made little effort to harmonise its new ethnically diverse populations. In the 1930s, the infant mortality rate was the highest in Europe, unemployment skyrocketed, and whereas illiteracy rates in central Europe virtually disappeared, Romania had a 42.2% illiteracy rate in 1930.²⁶ Prior to the 1930s, unlike other Eastern European states after the Great War, Romania chose to emulate the central European model, under King Ferdinand. This saw massive economic and social progress. As Professor Comanescu noted

...political parties after the creation of a greater Romania, meant the conservative party died out. This was made to create a middle class by the rule of the liberals and socialists. It was shifting towards a Scandinavian model, but the laws were not passed to solidify these laws. It left a void in the right wing of the Romanian politics which was supported by Romanian advocates of democracy

In this sense, the polarisation of Romanian politics meant Antonescu's rise to power was inevitable. However, the Iron Guard's support was so strongly based upon its anti-communist rhetoric that it became the only pillar between Romania and communism. As Prince Nicholas notes in his interview with me,

The Soviet Union began infiltrating, gradually, aspects of the Romanian economy and culture as

early as 1933. The efforts of Carol to deteriorate Soviet influence through an alliance with the Anglo-Americans failed, and the Iron Guard filled that void.

In such a sense, the Moscow Armistice (1944) was nothing more than symbolic; Romania was inevitably communist.²⁷

Human Agency

The question of human agency in Romania is largely ignored due to the lack of historiography surrounding post Soviet Romania before the revisionist interpretation of Eastern European communism. The role of King Michael is often shadowed by the clandestine activities of the allies in Romania, as well as the fragile interwar diplomacy in Europe.²⁸ One of the larger reasons Michael's role is underplayed is because of his age.²⁹ Nonetheless, during King Michael's second reign he had considerable influence.

One of the most prominent acts of human agency is the new 1933 Romanian constitution which established a centralised state where the power was in the hands of the government in Bucharest.³⁰ This essentially made it so that Antonescu inherited the structural system necessary for a dictatorship. The story goes that King Michael signed off control of the state to Antonescu, not as the result of incompetence, but because it was consistent with contemporary political sentiment.³¹ However, the

²⁷ Andrew Heninen, "Armistice Agreement between the USSR and the United Kingdom, on the One Hand, and Finland and Romania on the Other," Armistice Agreement, 1997, Accessed 11 July 2020 http://heninen.net/sopimus/1944_e.htm.

²⁸ Dennis Deletant, "Clandestine British Operations in Romania, 1942-1943," in *British Clandestine Activities in Romania During the Second World War* (Hounds Mills, Hampshire: Palgrave Macmillan, 2016), pp. 90-107; A. J. P. Taylor, *The Origins of the Second World War* (London: Penguin, 1964), p.108.

²⁹ Catherine Durandin, "Les Luttes De L'Entre-Deux-Guerres," in *Histoire Des Roumains* (Paris: Fayard, 1995), p. 323.

³⁰ EUROPEAN COMMISSION FOR DEMOCRACY THROUGH LAW, "The Role of the Constitutional Court in the Consolidation of the Rule of Law," Venice Commission, 1994, <https://www.venice.coe.int/webforms/documents/default.aspx?pdffile=CDL-STD%281994%29010-e>, p. 104

³¹ Catherine Durandin, "Les Luttes De L'Entre-Deux-Guerres," in *Histoire Des Roumains* (Paris: Fayard, 1995), pp. 316-318.

²⁵ Nicolette Franck, *La Roumanie Dans L'engrenage* (Paris: Elsevier-Sequoia, 1977), p. 167.

²⁶ Dennis Deletant, "Clandestine British Operations in Romania, 1942 -1943," in *British Clandestine Activities in Romania During the Second World War* (Hounds Mills, Hampshire: Palgrave Macmillan, 2016), p. 109.

1933 constitution set by the monarchy earlier made it so that Antonescu did not establish a dictatorship, but instead almost inherited one. The will of the Romanian people to keep Romanian territories safe forced King Carol to transfer power to Antonescu as his last act prior to his abdication and Michael reaffirmed this.³² The actions of Antonescu and King Michael after Carol's abdication, however, were driven by the same interests. In the 1940s onwards, it seems that Romania was not driven by ideological aims, but rather territorial ones and preserving sovereignty. A popular political adage at the time was "*We will always be with Germany against the Soviet Union, and always with the Anglo-Americans against the Germans.*"³³ This maxim shows that political policy was aimed at securing Romania's sovereignty above all, and did not have any strong ideological drive.

Perhaps, one of the most significant arguments in favour of human agency is a comparative argument with Greece and Finland. In Western scholarship, where the question of inevitability is most prominent, one would suggest that Axis failure in the war meant that Romania's geographical location suggested it would inevitably become communist. Therefore, all Michael did was shorten the war, and extend Romania's sovereignty by a year at best. However, Greece and Finland illustrate that not all countries in certain geographical regions had to become communist. The common misconception is that Michael accepted communism as a natural result of shifting sides in the war but proactively acted on his personal accord to switch sides, as he saw it, in his own words, as the *lesser of two evils*, as he once referenced to in an unpublished interview.³⁴ This can only be said in retrospect, which is the tone in which Michael spoke when he referred to this event over half a century later.³⁵

³² Appendix C (Bahl, Utsav, and Radu Albu Comanescu. Romania: From fascism to communism. Personal, July 16, 2020.)

³³ *Ibid*

³⁴ Appendix B (Bahl, Utsav, and Nicholas Medforth-Mills. Prince Nicholas Medforth-Mills of Romania regarding the role of his grandfather, King Michael I of Romania in the mid to late 20th Century and with regards to coup d'état against the regime dictator Ion Antonescu. Personal, November 28, 2019.); Michael. Regele Mihai. Other, n.d. Source Provided by Prince Nicholas of Romania, NOT OPEN FOR PUBLIC USE OR RELEASE. Transcript is with author of this paper, candidate gzs444, privately.

Romania's leading politicians such as Iuliu Maniu were working in tandem with both Antonescu and Michael overtly.³⁶ This meant that although Antonescu did not support Michael's efforts to make an agreement with the Allies, he actively chose to be oblivious to the talks, and even participated in them secretly before concluding that it would be too dangerous. On the 13th of April 1944, the Kremlin submitted the following agreement,

*At this crucial time for the existence of the Romanian people, the Soviet Government... states in front of the whole world that it does not intend to destroy the Romanian state, nor to annex territories beyond the frontiers of 1941, nor to change the existing social system of the country.*³⁷

This document was submitted only 4 months prior to Michael's *coup d'état*. Indeed, the document would likely have been exaggerated as Romania's exit from the Axis would be a guaranteed success. Nonetheless, the public disclosure of the document and its strictly contemporary nature suggests that there was some truth to the Kremlin's statement. The Yalta Conference, which decided the fate of the Romanian people, would not take place until 4th February 1945. Furthermore, the Yalta Conference promised that all original governments would be restored to the liberated countries with the exception of Romania and Bulgaria. As a result, if Romania was an exception to the liberation rule, how can its geography alone be blamed if Greece, with a similar geographical position, was not excluded from this rule? Even more so, if proximity to the Soviet Union, alliance with the Axis powers, and effective invasion meant that communism was unavoidable, then why was Finland, in those exact conditions to Romania but in the North, able to survive? The answer lies within the nature of the Anglo-Soviet relationship at the end of the Second World War. Michael

³⁵ *Ibid*

³⁶ Dennis Deletant, "Clandestine British Operations in Romania, 1942-1943," in *British Clandestine Activities in Romania During the Second World War* (Hounds Mills, Hampshire: Palgrave Macmillan, 2016), p. 113.

³⁷ Ion Scurtu, "Collection of Documents and Materials Regarding the History of Romania," *Collection of Documents and Materials Regarding the History of Romania* (Bucharest: University of Bucharest, n.d.), pp. 219-220.

acted to preserve the sovereignty of Romania, but in doing so essentially ensured the fate of the Romanian people. On August 5th of 1944, Michael finalised the details for a *coup d'état* on his own government in Cairo.³⁸ However, instead of dictating the terms prior to the *coup*, he acted with the help of the Soviets prior to any agreement. The King, requested as noted in a rare memorandum of secret Anglo-Romanian talks by Henry Spitzmuller (a French diplomat serving in Romania for the Allied interests) in autumn of 1943, Michael revealed to a secret British intelligence officer that

*A putsch would lead to the complete and immediate occupation of Romania by Germany which would then have all of their resources at disposal immediately. The Marshal...continues to impose on the country a policy which is contrary to its wishes and its interests. If the Allies made a landing in the Balkans, everything would be simpler.*³⁹

The King, indeed, was only reflecting on his contemporary situation in Romania. Michael had his own agenda. Nonetheless, the strictly limited audience that was informed of Michael's decision means this source can actually provide a rare and candid glimpse into the Anglo-Romanian talks before the *coup d'état*. It is interesting to note the date of the document was about two months prior to the Tehran conference. This conference (November 28th to December 1st, 1943) dismissed the Churchill Doctrine, which had hoped for an Allied liberation from the Mediterranean and Middle East, but Stalin rejected this outright.⁴⁰ Anglo-American landings in the Balkans before the Russians would therefore not be possible, sealing Romania's fate. Truman later noted, "*The bravery of King Michael, and the exit of Romania from the war, shortened the war by at least six months.*"⁴¹

³⁸ Dennis Deletant, "Clandestine British Operations in Romania, 1942 -1943," in *British Clandestine Activities in Romania During the Second World War* (Hounds-mills, Hampshire: Palgrave Macmillan, 2016), p. 114.

³⁹ Ion Scurtu, "Collection of Documents and Materials Regarding the History of Romania," *Collection of Documents and Materials Regarding the History of Romania* (Bucharest: University of Bucharest, n.d.), pp. 118.

⁴⁰ Nicolette Franck, "La Trahison De L'Ouest," in *La Roumanie Dans L'engrenage* (Paris: Elsevier-Sequoia, 1977), pp. 70-72.

It should be distinguished that Truman released this statement despite Romania already having been ceded to the Soviets in private, suggesting that there was no reason to glorify the role of Romania to Anglo-American interests. Truman's suggestion that Romania shortened the war essentially made it harder to justify for the Soviets to take total control over Romania, as it made an argument of liberation ambiguous. In August 1944, an Allied victory was not guaranteed. Therefore, Michael initially had the upper hand in pro-Allied talks. On the 29th of June, the Germans managed to hold off the Soviets in the Battle of Tannenberg line (July 25, 1944 to September 19, 1944), maintaining a solid position in Eastern Europe. Axis defeat was by no means a certainty in 1944. Romania, therefore, changed allegiances; they were not "liberated".

Michael's decision to proceed with arresting Antonescu was overtly anti-communist, rather than anti-fascist. As stated above, the primary objective of Romanian diplomacy was to ensure sovereignty, the ideological preference in Romania was neither fascist, and it was far from communist (representing some 1,000 people at most).⁴² The reactionary negotiating policy by Michael, by requesting the aid of the Soviets in the Balkans, meant that any intervention on the part of the Allies would be as a form of liberation, therefore allowing the Soviets to dictate the future of Romanian politics. On the same day that the media celebrated as the French were liberated, June 29th, 1944, the Soviet army marched into Romania in parallel to the liberation of France, although in completely unrelated circumstances. The King, having supplied the Allies with a vital boost towards victory, had just fallen victim to the Anglo-American foreign policy which had neglected Eastern European and the Middle Eastern nations for the last half-century. In February 1945, Churchill confirmed to Stalin what the world should have already known: the very essence of the Romanian state,

⁴¹ Truman, Harry S. Letter from Harry S. Truman to King Michael I of Romania. Geneva : Property of King Michael I's Lawyer, 1945.

⁴² Appendix B (Bahl, Utsav, and Nicholas Medforth-Mills. Prince Nicholas Medforth-Mills of Romania regarding the role of his grandfather, King Michael I of Romania in the mid to late 20th Century and with regards to coup d'état against the regime dictator Ion Antonescu. Personal, November 28, 2019.)

sovereignty, shall no longer be gifted to the Romanian people.

Conclusion

In Romania, by April 1944, there was nothing but relentless pressure from both the East (Soviets) and West (Germany). Unsuccessful in diplomacy, the King accomplished a miracle of saving the face of the Romanian people before the end of the war. Consequently though, more than 66 years of sovereignty died. The suggestion is not that Michael should be held responsible. Indeed, the fate of the Romanian people was decided already in Yalta, and Tehran before that. The switch to the Allies was a last effort to save Romanian sovereignty, a concept which dictated Romanian civil society in the 1940s. Michael's defiance should be remembered as an act of not only courage, but nationalism. Nonetheless, the failure to negotiate appropriate terms meant that Romania was too late to stop the rise of communism, a phenomenon that had been a feature in Romania since the early 1930s and remained until the collapse of the communist regime in 1989. If Romania's proximity to the Soviets, alliance with the Axis, and effective invasion meant that communism was unavoidable, then why was Finland, in the exact same circumstances, able to salvage sovereignty? Romania's economic prowess certainly played a factor, but diplomacy has a lot more to answer for. The contemporary works of Nicollete Franck and my personal interviews with Prince Nicholas of Romania and historian Radu Albu Comanescu suggest that geography, but above all, failed diplomacy, is the unsung ruler of causation in Romania's shift from fascism to communism. This, indeed, discredits much of the popular revisionist historiography, shedding light on the prominence of human agents such as King Michael and clandestine British actions in Romania. Indeed, there are inherent biases within these politically angled sources to magnify Michael's role. However, the supplementary archives accessed which have likely either been unseen or dismissed by modern Eastern European historians tends to agree with a more prolific role of human agents in Romania.

The lack of dedicated efforts to study Eastern European and Romanian history due to the pre-existing paradigm of revisionist historiography in ex-communist states has led to a willful ignorance of orthodox interpretations of Romanian history and a complete

absence of any post-revisionist arguments. This has tainted my investigation, making secondary sources limited. Similarly, while archives are available, the large scope of these records meant that the resources available for this essay were insufficient to fully uncover the full hidden gems present in archival materials. Nonetheless, this investigation fulfils its aim to challenge revisionist arguments on Romanian history and note the prominence of human agency as the key determinant in Romania's shift from fascism to communism. Lessons from Romania should serve as a stark reminder that in the great efforts we make to avoid our deepest fears, we often lead ourselves nothing but closer to them. Like the great stories of Scylla and Charybdis, Romanian national integrity is often undermined by its geography. However, it is the actions of these human agents that made one outcome far more likely than another. Communism in Romania began with the rise of fascism. Therefore, while it was the human agents who influenced the shift from fascism to communism in Romania, it was the rise of fascism that truly altered the course of Romanian history.

Acknowledgments

The author would like to acknowledge Andrew James Kinghorn, for his advisory role in completing this project and for reviewing the paper, and Dennis Deletant, Emeritus Professor of Romanian Studies at UCL and Ion Rațiu Professor of Romanian Studies at Georgetown University, for his reviewing of the paper and helpful feedback.

Appendix

Appendix A

Documentation of Harry S Truman's Letter to King Michael I of Romania thanking him for his aid in the war, and for his 'courageous' coup d'état

Copy on request if permission is granted (I received this documentation from the personal lawyer of King Michael who I met at my internship at the Geneva City Mayor's Office, and helped put me in contact with Prince Nicholas of Romania). Permission to attach this to the public essay is not granted, but can be given on a private case by case basis.

Appendix B (Transcribed manually)

*Personal Interview with Prince Nicholas of Romania
(Request access: ub2@williams.edu)*

Appendix C (Notes)

*Personal Interview with Professor Radu Albu Comanescu
of the University of Cluj*

Western

-Specific nations that lived there

-Romanians lived somewhere else, they would have the same history as France

-Geography and History (The distinction between West and East)

-It is probably, Romania and Poland are probably the nations the most shaped by their geographical location (intersection areas), Romania (central, eastern, middle east).

-Pressure was tough enough to take in a lot (they were empires) from surrounding countries.

-Romania's geographic location was crucial in being played between Germany and the Soviet Union, but also resources. The only monarchy neighbouring the Soviet Union meaning Romania was enemy number 1 for Marxist Leninists, but Stalin had a lot of sympathy for King Michael which was not (reports telegrams Romanian communist and Stalin).

-Romania was going to suffer the pressure, but no one could know how?

-Paper napkin (Romanians are very frustrated), that napkin was signed October 1944, Soviets had already occupied Romania in September 12th 1944.

-Gates to Europe's south east, so Britain asked for 10% to stop putting pressure on Greece, and the Suez Canal.

-Inspiration that came from Mussolini, and fascism. Italian

fascism was considered with a positive way, created order, boosted economy, and kept away communism.

-Pillar of the Anglo French order in Europe.

-All political parties accepted that Carol comes back, even from 1930 the political spectrum felt the need of a stronger regime.

-Authoritarian rule, leftist social policies (king of the peasants)

-Push came on mystical anti semite combination.

-Ethnical diversity of Romania would matter because

1. It influenced our foreign policy (alliances to keep Hungarians and Bulgarians down)

2. Anti Semitism stimulated by Nazi Germany influence, and fascism in general. Moldavia had a large Jewish population coming in from Galicia, which were stimulated by leading political figures in Romania.

3. Hungarian problem? Constitution of 1933 focused on a unified central state, instead of trying to keep to the Romanian image. Antonescu did not love Transylvania because of foreigners.

"We will always be with Germany against the Soviet Union, and always against the Anglo Americans against the Germans"

Since 1933 convince ourselves with the Anglo American request that we negotiate with the Soviet Union, they had to see the foe as the ally as the ally of our allies. It was a game of smoke and mirrors.

Antonescu tolerated the opposition parties' negotiations knowing that Germany would lose the war to the allies.

Babuj question? Antonescu wanted communists included in Romanian government to appease the Soviets, but all communists were not truly Romanian. The link between communism and Judaism became a lot more strong as a result.

Worst fear was to see Romania become a soviet satellite state.

Communism was not a Romanian phenomenon until the Soviet occupation of Romania. It was an imposition with no political support with less than 1,000 supporters.

Presence of the King was to save Romania for three years.

King Michael, by arresting Antonescu, to finally send the message to the allies that we had shifted because the Russian's had already started to occupy Bessarabia and Transnistria by April 1944, and by July they were approaching Bucharest.

Queen Hellen, given the history of her own family, she already knew that the royalty would not end well. The King could not influence the course of Romanian history unless he seceded to the will of the anglo americans.

Constitution prohibited the King passing laws, without the approval of his communist powers.

They already started to erode the Romanian ministry.

Negotiations about abdication started in March 1945.

King Michael, if he had not arrested Antonescu, the Russians would have advanced anyway, if he had not been arrested he probably would have been killed anyway.

Communism in Soviet was generational, Romanian communism saw a lot more rebellion.

Substantial differences in terms of political elites, communists in Romania were imported, they allied themselves with outlaws, by the mid 1960

The Soviets did not see Romania as anything more than agricultural and industrial land.

Romania created a good relationship with China from the 60s onwards which stays to this day.

Stalinism and Romanian politics were very closely aligned, but the Soviets only saw Romania as a tool.

Corrupt government,

In 1960s the structure of government changed completely changing from communism more towards socialism.

Romania could not shift towards an alliance with the West. It was a result of the communist geography.

Hozzelhern was democratising the politics of Romania embracing democratic parliamentarian rule. It was an expression of political will, political parties after the creation of a greater Romania, the conservative party died out. This was made to create a middle class by the rule of the liberals and socialists. It was shifting towards a scandinavian model, but the laws were not passed to solidify these laws. It left a void in the right wing of the Romanian politics which was supported by Romanian advocates of democracy, and the liberals attempted to fill this void but they were unsuccessful.

The emergence of nationalism in the 1930s , and the scars of not building an ethnically Romanian state.

The quality of the ideas deteriorated, and Romanian self identity began to fall apart.

The Liberals designed the constitution of 1993, and this issue simply persisted.

After the mid 1930s, foreign influence began to pour in with ideas and partnerships especially after the war with Spain and this shifted Romania from its natural course of history.

The natural evolution of Romanian politics ended by the mid 1930s with King Carol's influence on Romania.

Romania was confronted with numbers coming from American and Israeli specialists, it took Romania a long while to differentiate between how many Jews died in Romania and how many died in the greater Romania which Romanians had actually little control over.

The Antonescu regime was ordered to save Jews if they were saving the economy, and Antonescu tried to save Jews in a way to help facilitate talks with the Anglo Americans and keep capital in Romania, but the Germans

knew this was an issue and they ordered Antonescu to massacre Jews in the reoccupation zones to deteriorate any future talks between Romania and anglo americans.

Romanian state assumed responsibility for 400,000 Jews, but the Romanian nature was disorganised but we know it is clear that the Romanian state persecuted Jews far more than the Romanian people.

Caucescu was in power at a time where nationalism was on the rise again, and he supported rediscovering Romanian unity to legitimise his power. When King Carol II was imitating the fascist model, that became the model for Romanian communism. Psychological dictatorship continued from 1930 to 1990 almost indiscretively, the constitution of 1939 essentially led Romania to become a one party state.

Communism did not repeat the mistakes of instability that led to Antonescu's demise.

The instability continued into Romanian politics today, Romanian domestic policy has always been so heavily influenced by foreign policies and a transaction based society.

Appendix D

Romanian Political Sentiment During The Second World War (La Roumanie dans l'Engrenage, Nicollete Franck, Analysed by Candidate gzs444)

Initially, the Molotov Ribbentrop Pact was beneficial for the Romanian people, as it secured the Romanian territories and allowed Romania to fight the Soviets in Bessarabia and Northern Bukovina which was primarily successful. This made Antonescu very popular, however, in 1942, after the Battle of Stalingrad (August 23rd 1942 to February 2nd 1943) and a series of losses in the Soviet Union as Prince Nicholas said “*the alarm bells went ringing*.” Again, Nicholas says this only in retrospect. Furthermore, as the grandson of the King, he has spent most of his life researching his father’s work and the history of Romania in the 20th century. As a combination of these two factors, Prince Nicholas could have been inclined to suggest that Antonescu was not favourable amongst the Romanian population, a claim that can only

be substantiated with further research. Nonetheless, works such as those of Nicolette Franck, show that as it became abundantly clear that the Axis were no longer favourites to win the war, and the efforts of the Romanian army in Bessarabia were failing; public support left Antonescu. After the Soviet victory at Stalingrad in January of 1943, it became clear to Antonescu that he would have to switch sides. However, whereas the allegiance to Hitler by Romanian people was not ideological, but purely a business deal which expired the minute it worked against Romania’s interests, Antonescu stood firmly that he had an infamous ‘gentleman’s agreement’⁴³ with Hitler to go to the end of the world with him. This did not sit well with key members of the Romanian ministry, and particularly King Michael of Romania. On the 23rd of August, 1943, King Mihai arrested Marshal Ion Antonescu with the support of the allies ending his military dictatorship, and formally aligning Romania with the allies. King Michael promptly took control of the state, but by August of 1944 the Soviets entered Romania. This led to an internal power struggle for three years which ended with the forced abdication of King Michael under the threat of the murder of hundreds Romanian children taken hostage by the Soviets in Bucharest.

Works Cited

- Amt, Auswärtiges. 2020. “Germany and Romania: Bilateral Relations.” German Federal Foreign Office. <https://www.auswaertiges-amt.de/en/aussenpolitik/romania/227976>.
- Axenciu, Victor., and George Georgescu. 2017. “Gross Domestic Product – National Income of Romania 1862 – 2010. Secular statistical series and methodological foundations.” Romanian Academy Publishing House. https://mpra.ub.unimuenchen.de/84614/1/MPRA_paper_84614.pdf.

⁴³ AuswärtigesAmt, “GermanyandRomania: BilateralRelations,” German Federal Foreign Office, October 13, 2020, <https://www.auswaertiges-amt.de/en/aussenpolitik/romania/227976>.

- Cașu, Igor. 2009. Începuturile resovietizării Basarabiei și starea de spirit a populației (martie-septembrie 1944). Bucharest: Cartier Publishing House. Retrieved August 7, 2020 from https://www.academia.edu/21744867/%C3%8Enceputurile_resovietiz%C4%83rii_Basarabiei_%C8%99i_starea_de_spirit_a_popula%C5%A3iei_martie-septembrie_1944_
- Comanescu, Radu A. July 2020. Interview with Professor Radu Albu Comanescu [Online interview].
- Deletant, Dennis. 2016. British Clandestine Activities in Romania during the Second World War. London: Palgrave MacMillan UK.
- Deletant, Dennis. 2006. Hitler's Forgotten Ally: Ion Antonescu and His Regime, Romania 1940-44. New York: Palgrave Macmillan.
- Dumbrava, Costica. 2013. "Rolling Back History: The Romanian Policy of Restoration of Citizenship to Former Citizens." Citizenship in Southeast Europe. Last modified April 15, 2013. <https://www.citsee.eu/citsee-story/rolling-back-history-romanian-policy-restoration-citizenship-former-citizens>.
- Durandin, Catherine. 1995. Histoire des Roumains. Paris: Fayard.
- Flaks, Michaël. 2016. "Regele Mihai, în revista elvețiană Passé simple." Passé simple in Familia Regală a României. Last modified October 24, 2017. <http://www.romaniaregală.ro/atitudini/regele-mihai-in-revista-elvetiana-passe-simple/>.
- Franck, Nicolette. 1992. O înfrîngere în victorie: Cum a devenit România, din Regat, Republică Populară (1944-1947). București: Humanitas.
- Frussetta, James, and Anca Glont. 2009. "Interwar Fascism and the Post-1989 Radical Right: Ideology, Opportunism and Historical Legacy in Bulgaria and Romania." Communist and Post-Communist Studies 42, no. 4 (2009): 551–71. <https://doi.org/10.1016/j.postcomstud.2009.10.001>.
- Heninen, Andrew. 1997. "Armistice Agreement between the Union of Soviet Socialist Republics and the United Kingdom of Great Britain and Northern Ireland, on the One Hand, and Finland on the Other." http://heninen.net/sopimus/1944_e.htm.
- Hitchens, Keith. 1992. "Historiography of the Countries of Eastern Europe: Romania." The American Historical Review 97, no. 4 (October 1992):1064–83.<https://www.jstor.org/stable/pdf/2165493.pdf?refreqid=excelsior%3A77326f999046ba23973a740619062fd>
- Ioanid, Radu. 2008. The Holocaust in Romania: The destruction of Jews and Gypsies under the Antonescu regime, 1940-1944. Chicago, IL: Ivan R. Dee.
- Little, Dan. 2019. "Marx's ideas about government." Understanding Society. Last modified February 20, 2019. <https://understandingsociety.blogspot.com/2019/02/marxs-ideas-about-government.html>.
- Medforth-Mills, Nicholas. 2019, November 28. Interview by Utsav Bahl. with Prince Nicholas of Romania [Personal interview].
- Of Romania, K. (Director). (n.d.). Despre Viata [Video file]. Not officially published, special access provided by Prince Nicholas of Romania.
- Pipes, Richard. 1998. "Preface." Essay. In Three Whys of the Russian Revolution. London: Pimlico.
- Le News. 2017. "Former King Michael of Romania dies at his home in Switzerland". Last modified December 5, 2017. <https://lenews.ch/2017/12/05/former-king-michael-of-romania-dies-in-switzerland/>.
- Stone, Dan. (n.d.). "Romania from Fascism to Communism in the BBCM Reports." <https://www.iwm.org.uk/sites/default/files/files/2018-11/Romania%20from%20Fascism%20to%20Communism%20in%20the%20BBCM%20Reports%20-%20Dan%20Stone.pdf>
- Truman, Harry S. Letter from Harry S. Truman to King Michael I of Romania, Geneva, 1945. Property of King Michael I's lawyer.

Islamist Education: American-Funded Textbooks In Afghanistan

Niko Malhotra '24

Across Taliban controlled areas of Afghanistan, thousands of children are indoctrinated in an Islamist ideology through jihadist textbooks that incorporate violence and militarism through lessons to teach children basic reading and mathematics skills.¹ Learning the alphabet, these children are taught “*Jim [is for] Jihad*. *Jihad is an obligation. My [uncle] went to the jihad. Our brother gave water to the Mujahidin . . .*” Textbooks designed to teach math and language arts are filled with depictions of Kalashnikov rifles, grenades, and military ammunition.² However, the great irony is that these textbooks were produced, funded, and distributed by the US government using taxpayer dollars. The Taliban regime which President Bush deplored as an enemy which “aids terrorists” and “barbaric criminals who profane a great religion by committing murder in its name” is using and reprinting American-funded materials to propagate its radical ideology among the Afghan youth.³ Why would the United States fund textbooks that promote a dangerous message antithetical to American values?

After the Soviet Union invaded Afghanistan in 1979, the United States in coordination with regional partners such as Saudi Arabia and Pakistan launched a covert campaign, Operation Cyclone, to support the Afghan mujahideen resistance to the Soviet occupation. While American funding for weapons and military equipment for the mujahideen is well known, many are unaware of the significant expenditures by the American government through USAID to provide educational materials and textbooks to mujahideen parties and Afghan children.⁴ Published and distributed by the University of Nebraska-Omaha (UNO), this program attempted to encourage a violent resistance to Soviet forces in Afghanistan by shaping the educational program of Afghan youth.

However, the content of these textbooks blatantly promoted jihad, militancy, and violence through graphic language and imagery. The textbooks included clear

messages aimed at evoking hostility towards Russian invaders and promoting violent retribution against occupiers of Afghanistan. Textbooks designed to teach children to read and basic mathematics simultaneously emphasize weapons, killings, jihad, and Islamism. Although American officials claimed that they did not want to impose American values on Afghan educators, their failure to question the radical content presented in the textbooks reveals how countering Soviet communist influence transcended the potential destabilizing consequences of this program on the Afghan political situation. This intervention in Afghan education is emblematic of a broader pattern in how American policymakers fail to consider the long-term ramifications of their actions on the everyday lives of the Afghan people.

Origins of USAID/UNO Educational Program

As depicted in the Hollywood film Charlie Wilson’s War, the United States government through the CIA launched a covert operation to supply the Afghan seven-party mujahideen alliance with weapons through Pakistan’s intelligence service ISI to fight back against Soviet forces which had invaded Afghanistan.⁵ This funding amounted up to \$500 million a year and was matched dollar for dollar by Saudi Arabia. The Saudi government intent on spreading their interpretation of Islam, wahhabism, in Afghanistan became aligned with American objectives in Afghanistan which aimed to undermine the Soviet Union in the Cold War.⁶

Alongside this funding for arms and military equipment, the United States Agency for International Development (USAID) issued a \$50 million grant that ran from 1986 to 1994 to fund the development and publication of textbooks for Afghan children and mujahideen fighters through the creation of the Education Sector Support Project (ESSP) in Afghanistan.⁷ In a

Rapid Assessment submitted to USAID in 1988, the ESSP's central objective is described as supporting "primary schools in Afghanistan" and "literacy training in Pakistan for Afghan Freedom Fighters (Mujahideen)."⁸ This educational program would both educate the mujahideen fighting the Russians and children throughout Afghanistan. Through ESSP, USAID contracted the University of Nebraska-Omaha (UNO) to provide education for Afghan refugees in Pakistan as well as Afghans remaining in Afghanistan through the development and distribution of educational materials, particularly textbooks.

American education funding was utilized to provide an alternative to the Marxist and secular education imposed by the Soviets in Afghanistan. The ESSP coordinated with the mujahideen parties to form the Education Council of the Seven Party Alliance (ECSPA) composed of the education presidents of each party who in turn would set up the Educational Center for Afghanistan (ECA). ESSP documents produced by UNO describe the American intervention in the Afghan education system as a direct counter to the "'Sovietization' of Afghan education."⁹ Through the same CIA and ISI networks used to funnel weapons to the mujahideen, UNO oversaw the distribution of educational kits of textbooks and other materials funded by the USAID grant to schools across Afghanistan and the refugee camps on the Pakistan border.

Development of Textbooks

Despite their reprehensible Islamist ideologies, American policymakers exalted the mujahideen as exponents of American values solely because of their primary role in the opposition to Soviet forces in Afghanistan. These mujahideen parties, especially Hezb-e Islami led by Gulbadin Hekmatyar and Jamiat-e Islami led by Burhanuddin Rabanni, were dominated by hard-core Islamist factions resolved to establish a fundamentalist order in Afghanistan. While these parties are broadly condemned today, President Ronald Reagan praised the mujahideen as "brave freedom fighters challenging the Evil Empire" and "the moral equivalent of the Founding Fathers [of America]."¹⁰ UNO officials provided the mujahideen representatives in the ECA the freedom to develop the textbook content which would be taught to school age children and mujahideen fighters.

The content generated by the ECA was published by UNO in both Pashto and Dari, the most widely spoken languages of Afghanistan.

Mujahideen representatives in the ECA appealed to American anti-communist sentiment in pursuing educational aid. Writing to US Ambassador Robert Wood, they state how "the current struggle of the Afghans the holy Jihad ... routed from a strong faith and belief in Islam, peace and freedom is a fierce blow to the Russian communism which is the enemy of freedom-loving people everywhere. We should not forget the importance of education for the successful continuation of our struggle."¹¹ In this context, jihad is portrayed as aligned with American values of freedom which are being threatened by communism and the Soviet Union, and the ECA representatives use this rhetoric to justify American educational aid to the mujahideen.

Through these textbooks, the mujahideen officials of the ECA emphasized violent Islamist rhetoric promoting jihad and resistance to foreign invaders of Afghanistan. However, UNO officials did not object to these depictions of Islamic militancy in these textbooks for the first five years. In an interview with Raheem Yaseer, an Afghan educator in UNO's Peshawar office, Yaseer asserted that UNO staff did not intervene in the textbook development because of "Afghan religious and cultural sensitivities" and that the "University of Nebraska did not wish to be seen as imposing American values on Afghan educators."¹² American officials were clearly aware of the troubling violent depictions and content of these textbooks but did not object because the radical messaging was aligned with American objectives to weaken Soviet control and influence in the region. While UNO representatives and American officials argue that these textbooks were designed to teach Afghan youth to love their nation, the textbooks rather reflected a "love for militant ideology."¹³ The alignment of the Islamist jihadist ideology of the mujahideen parties with the American anti-Soviet agenda provided the conditions for the unquestioned development and widespread distribution of these problematic textbooks among the Afghan population.

Analysis of Textbooks

The content of these textbooks is extremely disturbing, for it exposes primary school children with

violent, militant material as part of their basic education. The purpose of this Islamist content is to shape and indoctrinate the minds of young people against the Soviet invaders of Afghanistan and support the radical interests of the mujadeen parties. In “‘A’ is for Allah, ‘J’ is for Jihad,” Craig Davis translates the textbooks and reveals its disconcerting content. A first-grade language arts textbook introduces children to the alphabet through violent examples:

Ti [is for] Rifle (*tufang*).

Javad obtains rifles for the Mujahidin . . .

Jim [is for] Jihad.

Jihad is an obligation. My [uncle] went to the jihad.

Our brother gave water to the Mujahidin . . .

Dal [is for] Religion (*din*).

Our religion is Islam. The Russians are the enemies of the religion of Islam . . .

Zhi [is for] Good news (*muzhdih*).

The Mujahidin missiles rain down like dew on the Russians. My brother gave me good news that the Russians in our country taste defeat . . .

Shin [is for] Shakir.

Shakir conducts jihad with the sword. God becomes happy with the defeat of the Russians . . .

Zal [is for] Oppression (*zulm*).

Oppression is forbidden. The Russians are oppressors. We perform jihad against the oppressors . . .¹⁴

This textbook teaches fundamental literary skills within the context of instilling hatred towards Russian invaders, promoting a normalization of violence and weaponry, and emphasizing a conception of Islamic honor through jihad. Rather than teach the alphabet through common everyday objects, young children are taught within the framework of a radical political ideology committed to defeating Russian invaders through violent jihad. The indoctrination of children with this militant ideology runs counter to American values and objectives in educational development, but because these ideas are beneficial to the American anti-Soviet agenda, the troubling nature of this content is overlooked by USAID officials and UNO employees.

Similarly, primary school math textbooks produced by UNO and funded by USAID incorporate Islamist ideology to promote violence against Soviet soldiers. A third grade math textbook teaches subtraction

through this problem: “One group of mujahideen attacks a group of 50 Russian soldiers. In that attack, 20 Russians were killed. How many Russians fled?”¹⁵ Furthermore, a fourth-grade math textbook puts forward this problem: “The speed of a Kalashnikov bullet travels at 800 meters per second. If a Russian is at a distance of 3200 meters from the mujahid, and that mujahid aims at the Russian’s head, calculate how many seconds it will take to strike the Russian in the forehead.”¹⁵ These examples normalize violence in the everyday lives of Afghan children and groom Afghan youth to participate in the mujahideen resistance to Russian forces.



Figure 1. A page from a third-grade language arts textbook¹⁵

These textbooks also included imagery of weapons which presented a visual emphasis on the themes of violence and militarism in a manner that is searing and profound to the minds of young children. Figure 1 pictures a page from a third-grade language arts textbook with a caption that reads “Jihad – Often many different wars and conflicts arise among people, which cause material damages and loss of human life. These wars and disputes occur among people for the sake of community, nation, territory, or even because of language differences, and for the sake of progress . . .”¹⁵ The striking visual component of Figure 1 serves to reinforce the message of the text, teaching the importance of sacrifice and imploring children to engage in violent jihad. By conveying

this persistent message, these American-funded textbooks designed to improve Afghan education serve a duplicitous purpose to bolster the ideological tenacity of the mujahideen resistance to Soviet communist invaders.

Distribution of Textbooks

The ECA was provided the discretion on the best strategy for distribution and where the educational materials should be delivered. USAID documents detail which ESSP schools materials were distributed to as well as their mujahideen party affiliation and the number of students at each school. These schools controlled by the ECA and ESSP were both within Afghanistan and “cross-border schools” in the refugee camps on the Pakistan border.¹⁶ Many of these schools were madrassas, Islamist schools often funded by the Saudi government, that provided a direct pipeline to the mujahideen fighting forces.¹⁷ American policy was geared to strengthening mujahideen forces, and these textbooks served to accomplish both developmental objectives as well as hardening Afghan youth against Soviet invaders.

The breadth and impact of this USAID program was not incidental but rather acutely transformative for the Afghan educational system, as these American-funded educational materials were able to reach and influence millions of children across Afghanistan. In the UNO/ESSP 1992 Annual Report to USAID, Thomas Gouttierre, the head of the Center of Afghanistan Studies at UNO, describes how “UNO's involvement has included the support of some 1180 schools inside Afghanistan, 1031 refugee schools in Pakistan, and logistical and professional support for curriculum development, teacher training, and monitoring through an on-site management unit, the Education Center for Afghanistan.”¹⁸ Additionally, the annual report describes how 62 grade 1-6 textbooks were prepared and printed and that 2.3 million textbooks were distributed to ECA schools and another 6.7 million textbooks were distributed to non-ECA and refugee schools.¹⁹ Through American taxpayer dollars, these radical and violent textbooks became core staples of Afghan education despite their potential consequences on childhood development and the stability of the Afghan political system. However, they were allowed to be widely produced and distributed unquestioned by the American government because of their success in fostering anti-Soviet sentiment.

Backlash to USAID/UNO Program

After 9/11, the role of American aid in promoting Islamist educational content during the late 1980s and early 1990s became subject to harsh criticism from journalists and American citizens troubled by the role of these textbooks in fomenting violent, radical ideologies in Afghanistan. In the aftermath of the American invasion of Afghanistan in 2001, the United States government again committed to providing textbooks and educational support to Afghan schools. However, it wrestled “with the unintended consequences of its successful strategy of stirring Islamic fervor to fight communism. What seemed like a good idea in the context of the Cold War is being criticized by humanitarian workers as a crude tool that steeped a generation in violence.”²⁰ The textbooks sent to Afghanistan in the early 2000s were the same textbooks published by UNO decades earlier, and US foreign aid workers in Pakistan had to scrub the textbooks of their violent and disturbing content. Further revealing the destructive ramifications of the USAID/UNO program, international organizations such as UNICEF have resorted to destroying the old “militarized” textbooks paid for by American taxpayer dollars.²¹ The extensive efforts to minimize the consequences of these textbooks reveals how their content was antithetical to American values, and their development and distribution was inconsistent with American developmental objectives in the region. American policymakers did not consider the consequences of their militant educational material which may have contributed to the rise of radical Islamist organizations such as the Taliban in Afghanistan who now employ these textbooks for their ideological purposes today.

Additionally, the role of UNO in overseeing this USAID education program has come under intense scrutiny because the content of the textbooks UNO developed and distributed may run counter to the purported mission of American educational institutions. Millions of textbooks filled with propagandist and militant content all display the UNO logo on the back, indicating the university's direct and prominent role in overseeing this program. However, this involvement drew backlash from organizations such as Nebraskans for Peace who became troubled with the university's role in engendering radical, militant ideologies in Afghan children and argue that the program may violate the university's own ethics policy.²²

The Center for Afghanistan Director Thomas Goutierre has defended his organization's efforts in Afghanistan by calling criticisms "revisionist" and emphasizing the Center's efforts in building cultural understanding and empowering the Afghan people.²³ Nevertheless, after the US government stopped funding UNO's educational program, UNO became involved with many high-ranking leaders of the Taliban who they brought on tours of the United States despite the heinous human rights record of the Taliban in Afghanistan, and in particular facilitated overtures on behalf of the Unocal corporation to convince the Taliban to approve a pipeline through the country.²⁴ When asked to comment on UNO's involvement in the USAID program, the current Director of Afghanistan Studies, Sher Jan Ahmadzai, responded that "UNO's involvement, as I know it, was technical" and was "not sure if [he] can be of any help."²⁵ By absolving UNO of any material involvement in this educational program, Ahmadzai reveals how UNO's role in developing these textbooks may have harmed the university's reputation, and his response may serve to evade taking responsibility for the consequences of these textbooks in Afghanistan.

Conclusion

The greatest legacy of this USAID/UNO program is how it primed a generation of Afghan youth for militancy and violent extremism. In her book Schools for Conflict or for Peace in Afghanistan, Dana Burdes describes how "educational content that teaches bias or hatred toward a particular group fosters discriminatory and exclusionary attitudes and behaviors, which contribute to underlying conditions for conflict ... curricular content that glorifies war, militancy, and the use of force is likely to increase normative support for violence and militancy more generally."²⁶ By propagandizing Afghan children with themes of violent Islamism for anti-Soviet objectives, American policymakers put their military and foreign policy goals over the wellbeing of Afghan youth by laying the groundwork for future conflict through shaping the psychology of an entire generation of Afghans towards violence. After the Soviet withdrawal, the ensuing civil war and the rise of the Taliban may indicate the detrimental repercussions of these textbooks on Afghan society, and their impact can be clearly seen in how the Taliban spent \$1 million in 2007 to set up schools in Southern

Afghanistan with the 1980s mujahideen curriculum.²⁷

These unintended consequences are emblematic of American policy in Afghanistan which has repeatedly pursued short-term objectives in self-interest without questioning their potential long-term effects. From President Bush's mission of nation building to the mass collection of biometric data, American policymakers have failed to consider how their policies impact the lives of Afghan citizens and potentially destabilize the fragile political system of Afghanistan. As the US withdraws its last remaining troops, Americans must critically examine the consequences of their involvement in Afghanistan and apply those lessons to future foreign policy and military endeavors around the globe in the coming decades.

Acknowledgements

Professor David Edwards helped advise and guide the course of the research. Additionally, he was a crucial resource in understanding the complex cultural and political dynamics of Afghanistan.

Endnotes

1. Tharoor 2014
2. Davis, 90
3. Bush, October 7th, 2001
4. Hoodbhoy, 21-24
5. Nichols 2007
6. Burde, 69-70
7. Shirazi, 222
8. USAID October 1988, 5
9. USAID 1987, 6
10. Hoodbhoy, 26-27
11. USAID January 1988, 56
12. Davis, 93
13. Spink, 199
14. Davis, 90
15. Davis, 92
16. USAID January 1988, 14-55
17. Shirazi, 221
18. USAID 1992, 2
19. USAID 1992, 14
20. Stephens and Ottoway 2002
21. Burde, 82-83
22. Johnson 2005
23. Linthicum 2010

24. Berens 2001
25. Email Correspondence, April 27th, 2021
26. Burde, 58
27. Jones, 117

Works Cited

- Berens, Michael J. "University Helped U.S. Reach out to Taliban." *Chicagotribune.com*, Chicago Tribune, 22 October 2001, www.chicagotribune.com/nation-world/sns-worldtrade-university-ct-story.html.
- Burde, Dana. "Jihad Literacy." =*Schools for Conflict or for Peace in Afghanistan*, 2014, pp. 55–88.
- Crilly, Rob. "'Infidels Are Our Enemy': Afghan Fighters Cherish Old American SchoolbooksR." *Al Jazeera America*, 7 Dec. 2014, america.aljazeera.com/articles/2014/12/7/afghan-fighters-american-textbooks.html.
- Davis, Craig. "'A' Is for Allah, 'J' Is for Jihad." *World Policy Journal*, vol. 19, no. 1, 2002, pp. 90–94.
- Gibbons-Neff, Thomas. "ISIS Is Rewriting Textbooks to Push Its Violent Ideology. The U.S. Once Did Something Similar in Afghanistan." *The Washington Post*, WP Company, 28 Apr. 2019, www.washingtonpost.com/news/checkpoint/wp/2016/07/27/isis-is-rewriting-textbooks-to-push-it-s-violent-ideology-the-u-s-once-did-something-similar-in-afghanistan/.
- Hoodbhoy, Pervez. "Afghanistan and the Genesis of Global Jihad." *Peace Research*, vol. 37, no. 1, May 2005, pp. 15–30.
- Johnson, Jenna. "Controversial Textbook Topics OKed by UNO." *The Daily Nebraskan*, The Daily Nebraskan, 20 Apr. 2005, www.dailynbraskan.com/controversial-textbook-topics-oked-by-uno/article_874a37e2-2682-5011-85cd-001a98867b3a.html.
- Jones, Adele. "Curriculum and Civil Society in Afghanistan." *Harvard Educational Review*, vol. 79, no. 1, 2009, pp. 113–122.
- Linthicum, Kate. "In Nebraska, a Center for Afghanistan Studies - and for Controversy." *Los Angeles Times*, Los Angeles Times, 27 Mar. 2010, www.latimes.com/archives/la-xpm-2010-mar-27-la-na-afghanistan-studies28-2010mar28-story.html.
- "Mission and History." *University of Nebraska-Omaha*, University of Nebraska Omaha, 20 June 2017, www.unomaha.edu/international-studies-and-programs/center-for-afghanistan-studies/about-us/mission-and-history.php.
- Nichols, Mike, director. *Charlie Wilson's War*. Universal Pictures, 2007.
- "Presidential Address to the Nation." *The White House*, 7 October 2001, https://georgewbush-whitehouse.archives.gov/news/releases/2001/10/20011007-8.html. Press release.
- Shirazi, Roorzbeh. "Islamic Education in Afghanistan: Revisiting the United States' Role." *CR: The New Centennial Review*, vol. 8, no. 1, 2008, pp. 211–233.
- Spink, Jeaniene. "Education and Politics in Afghanistan: the Importance of an Education System in Peacebuilding and Reconstruction." *Journal of Peace Education*, vol. 2, no. 2, Sept. 2005, pp. 195–207.
- Stephens, Joe, and David Ottaway. "The ABC's of Jihad in Afghanistan." *Washington Post*, WP Company, 23 Mar. 2002, www.washingtonpost.com/archive/politics/2002/03/23/from-us-the-abcs-of-jihad/d079075a-3ed3-4030-9a96-0d48f6355e54/?utm_term=.f51bd1f3f461.
- Tharoor, Ishaan. "The Taliban Indoctrinates Kids with Jihadist Textbooks Paid for by the U.S." *The Washington Post*, WP Company, 8 December 2014, www.washingtonpost.com/news/worldview/wp/2014/12/08/the-taliban-indoctrinates-kids-with-jihadist-textbooks-paid-for-by-the-u-s/.
- United States, USAID, Bell, Chester, et al. *Rapid Assessment Education Sector Support Project for Afghanistan*, Education Development Center, 1988.
- United States, USAID, Crandall, Larry. "Sovietization of Afghan Education, 1987.
- United States, USAID, Gouttierre, Thomas. *UNO/ESSP Fiscal Year 1992 Annual Report*, 1992.
- United States, USAID, Rahmanzai, Raqim. *Quarterly Report for Sept 1, 1987 Through Jan 31, 1988*, 1988.

Always Leave Them Wanting More: Business in the Age of Scrolling, Reacting, and Posting

Caroline Case '22

“If you’re not paying for the product, you are the product.” This statement and its application to social media asks users to consider their social media platforms through a different lens. As people scroll through Facebook timelines and Twitter feeds, the platforms themselves can fade into the background. The inspiring posts and provoking comments take center stage, so that users feel immersed in a virtual town square. However, while no user assumes that the grounds of the town square have an agenda, social media platforms are businesses, not simply spaces in which to share thoughts. This unnerving acknowledgement highlights the transactional aspect of social media — because most social media sites are free, platforms must find sneakier ways to generate revenue, exploiting users in the process. Most social media profits come from advertisements; thus, the more views of an advertisement, the more revenue is generated for the platform (McFarlane). This business structure classifies social media users as the commodity, while the advertisers are the true clients. Thus, the sites’ objectives boil down to one mission: keep users scrolling. In an effort to increase interaction, social media sites capture users’ attention through deliberate psychological manipulation. Although social media sites market themselves as wholesome and respectable companies (McFarlane), ultimately their business designs unfairly capitalize on users’ natural susceptibility to addiction, characterizing social media as an exploitative industry.

The “checking” design of social media platforms fosters obsession with the sites so that users constantly dedicate their attention to the feed. To access information offered on social media sites, users must check the app or website. This checking behavior differs from ordinary, offline human conversation because it involves a fear of missing out. When users log off of a social media site, they exclude themselves from any interesting activity on the platform. Instead, the idea of possible entertainment through the site lingers. Users inevitably surrender to the

ever-present promise of new entertainment, and social media sucks them into the virtual world as they check the app or website.

Once a user checks social media, the platform offers many different ways to interact with the community on the site. The different levels of participation fall into the categories of passive scrolling, simple content creation with reactions, and involved content creation with posts. Passive scrolling exposes the user to the content that other users, whether their friends, followers, or strangers, have created. While scrolling, users maintain invisibility; social media sites rarely broadcast the presence of scrollers. Users can therefore make their presence known by reacting to posts with likes, favorites, retweets, and comments, for example. These reactions reflect the personality of the user; liked posts correspond to offline passions and retweets imply agreement. Thus, the activity of reaction on social media is more elaborate and calculated than simple scrolling. Even more involved is the act of posting. Whether a life update or impersonal opinion, posts are subject to approval or disapproval by the social media’s audience.

Each piece of social media’s three-pronged system of interaction attracts users to the site and captivates their attention differently. First, although scrolling is the most passive, it can be the most mesmerizing. Social media apps and websites often use vertical layouts, so that scrolling down reveals more content as the site constantly updates the feed with new posts and stories. Social media feeds are endless. This design encourages users to interact constantly with unlimited entertainment. Also, users can refresh their feed to pull up a totally new set of content, which incorporates a thrill of the unknown. The repetitive nature of passive scrolling combined with the occasional exciting moment of seeing a new post creates an addicting model that constantly promises more excitement for the small cost of the users’ time and attention. Most users cannot refuse this offer.

Similarly, the reaction stage of participation has become an addiction for many social media users. The opportunity for likes, shares, comments, and notifications triggers the brain's dopamine reward system. The brain's reaction to seeing a new like on a post is psychologically the same rush that gamblers experience from a roulette wheel or that cocaine users experience from the use of drugs: the neurotransmitter dopamine is released, which makes the users feel good ("Social Media Addiction"). Evolutionarily, dopamine release as a result of positive social interaction helped humans become communal creatures. Social media capitalizes on this natural psychological reaction in order to boost participation. Once users get a taste of notification dopamine, they seek more positive feedback from the social media site. As a result, social media has become a popular coping mechanism, as users flee to websites for positive feedback ("Social Media Addiction"). In addition, these dopamine hits have introduced a social etiquette around likes and comments on social media. When a close friend posts, social pressure requires friends to like the post and produce a witty, charming comment, so that the poster feels socially validated and can experience a dopamine rush. These online customs also boost participation with the site.

Lastly, content creation is the most socially risky, and so can spark the most addictive tendencies. The Addiction Center contends that one reason for such obsession over posts is their personal nature. Offline, "people talk about themselves around 30 to 40% of the time," while on social media, "people talk about themselves a staggering 80% of the time" as they post life updates and celebrate accomplishments ("Social Media Addiction"). Even seemingly non-personal posts, such as restaurant reviews or advice columns, reflect opinions of the posters and are subject to the hunger for positive feedback. The design of social media centers positive feedback around posts; most expressions of social acceptance on social media are restricted to likes and to comments on posts. Thus, users obsess over the reactions to their posts, constantly checking the platform to learn more about its reception.

Social media's structure exploits human patterns of attention to boost interaction with their sites, and therefore interactions with advertisements. The spikes of dopamine that users experience with new notifications are natural and can be healthy. Humans evolved to derive

motivation from dopamine in order to keep pursuing positive goals, including social contentment ("Social Media Addiction"). However, such goals on social media are unachievable. Social media promises fulfillment in meaningful social interactions, but most online communication is self-centered and shallow. The social sites guarantee the feeling of acceptance through just the right number of likes, but in reality, no number of likes can be high enough. By promising meaningful aspects of fellowship but providing only a shell of them, social media exploits basic physiological reactions to keep its users checking, scrolling, liking, and posting.

The encouragement of addiction and obsession pervades the designs of social media sites, all so that users will participate more with the platform and therefore encounter more advertisements. Even worse, social media sites deliberately developed in pursuit of ensnaring their users. Sean Parker, a founder of Facebook who worked on the original design of the social network, warned that during the genesis of Facebook, "the thought process that went into building these applications, Facebook being the first of them, ... was all about: 'How do we consume as much of your time and conscious attention as possible?'" (Allen). The biggest social media platform in the world founded itself upon the exploitation of human nature. Regardless of Facebook posts' impacts on society, as a business, the company's revenue is in fact generated through exploitation of weaknesses in the human psyche. Because of Facebook's influence in the social media business, many other sites have followed suit with a financial model based on addiction.

Rushing to their own defense, social media platforms claim that they merely provide pathways for connecting people (McFarlane). These gods of social interaction portray themselves as merely roads upon which users drive. Like roads, some trips on social media are smooth, and some involve collisions. On roads, drivers pass billboards, and on social media, users scroll past advertisements. In this analogy, social media seems innocent — because it seems silly to expect a road to take responsibility for any wrecks they produce. A road is only a link, and drivers must regulate themselves. This innocent, positive narrative is the one that social media sites promote in order to avoid any liability. In reality, users on social media sites do not have freedom over their use of the platform. Social media algorithms determine the content with which users interact, and these algorithms

even predict how users themselves will react to posts. Where roads are not reliant upon any addictive tendencies of their users, social media thrives on psychological manipulation. Most importantly, social media builds a sense of destination without delivering its users anywhere. When users check social media, they hope to find social fulfillment, but the shallow, insincere nature of social media cannot transport them there. Instead, only the revenue-generating aspect of this analogy can hold. As users scroll and scroll, hoping to arrive at contentment, they pass many billboards, and money lands in social media's pocket. Always leave them wanting more.

Acknowledgements

This piece was adapted from a short paper assignment for SOC 212: Understanding Social Media, taught by Professor Nicholas Carr.

Works Cited

- Allen, Mike. "Sean Parker Unloads on Facebook: 'God Only Knows What It's Doing to Our Children's Brains.'" *Axios*, 15 Dec. 2017, wwwaxios.com/sean-parker-unloads-on-facebook-god-only-kno-s-what-its-doing-to-our-Childrens-brains-1513306792-f855e7b4-4e99-4d60-8d51-2775559c2671.html.
- Karameh, Louna. "Are Social Media Exploiting Our Social Capital?" *Medium*, JSC 224 Class Blog, 18 Feb. 2019, medium.com/jsc-224-class-blog/are-social-media-exploiting-our-social-capital-e6cfaf18f48.
- McFarlane, Greg. "How Facebook, Twitter, Social Media Make Money From You." *Investopedia*, Investopedia, 28 Aug. 2020, www.investopedia.com/stock-analysis/032114/how-facebook-twitt-r-socialmedia-make-money-you-twtr-lnkd-fb-go-og.aspx.
- "Social Media Addiction." *Addiction Center*, 30 Mar. 2021, www.addictioncenter.com/drugs/social-me-dia-addiction/.
- Vasilachi, Andrei. "How Social Media Exploits Your Mind." *Medium*, The Ascent, 1 Nov. 2019, medium.com/the-ascent/how-social-media-exploits-your-mind-67acfefaf1f0b.

Closing the Educational Gender Gap in Ethiopia: Perspectives from Behavioral Economics

Surya Kotapati '24

Abstract

Social planners in developing countries have sound reasons to focus on girls' educational attainment. It is well established, for instance, that the attrition of female students from an education system after primary schooling not only lowers their future earnings but also results in such spillover effects as diminished social mobility and worse public health outcomes. Recent work in behavioral economics has uncovered an explanation for why many developing countries systematically underinvest in girls' education: the interaction between bounded human rationality and prevailing social norms that subordinate girls' human capital development to that of boys. Taking up the case of Ethiopia, which exhibits one of the widest gender gaps in educational attainment globally, this paper advances a proposal to mitigate the differential attrition of female students toward the end of and after primary school. Present-biased parents likely systematically overvalue the immediate benefits of their children withdrawing from school relative to the increased future income from greater educational attainment, and prevailing social norms in Ethiopia amplify the effects of the present bias with respect to female students. This paper presents a two-pronged behavioral intervention to counter those effects. First, primary school-leaving girls should be enrolled by default in secondary school to harness the human tendency toward the status quo. Further, parents should be awarded conditional cash deposits that would be redeemable after their female children complete a given year of primary schooling, as opposed to an ex-ante cash transfer; loss aversion dictates that this would present a stronger incentive because a loss relative to a reference point is more painful than an equivalent gain is pleasurable.

Introduction

While more girls are entering school in Ethiopia than ever before, there is much progress to be made in keeping them there. In 2015, the gross primary and secondary school enrollment ratios¹ for female students in Ethiopia were 96.1% and 30.3%, respectively—and these metrics have remained consistently lower for girls than for boys (UNESCO Institute for Statistics 2020).

Since the early 1990s, Ethiopian policy makers have sought to address the gender disparity in educational attainment (Rose 2004). Female students largely leave school during the latter years of primary school and the intervening period between the end of primary school and the start of secondary school (York, Rose, and Pankhurst 2021; UNESCO 2009). This trend is particularly troubling in light of evidence showing that increasing girls' educational attainment bolsters future earnings and generates wider benefits to society, including better public health outcomes and more robust intergenerational mobility (King and Winthrop 2015). The challenge in Ethiopia, then, is to retain female students as they progress through upper primary school and in the period between the end of primary school and the start of secondary school.

This paper argues that Ethiopian parents' present bias, or tendency to care disproportionately about immediate outcomes, contributes significantly to the attrition of female students from the education system. Present-biased parents likely systematically overvalue the near-term benefits of their children withdrawing from school relative to the increased future income from greater educational attainment, and prevailing social

¹ Gross enrollment ratio is defined as the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education.

norms in Ethiopia amplify the effects of the present bias with respect to female students.

To mitigate the effects of parents' myopic decision-making, primary school-leaving girls should be enrolled by default in secondary school to increase retention by harnessing parents' status quo bias. Moreover, at the start of each year of upper primary schooling, parents should be awarded conditional cash deposits redeemable after their female children complete the academic year. This would more strongly discourage parents from pulling girls out of upper primary school than a traditional cash transfer given the human tendency of loss aversion.

Background

The Ethiopian school system comprises eight years of primary education, divided into a four-year "lower" cycle and another four-year "upper" cycle, followed by four years of secondary education (Trines 2018). Due to prevailing social norms, Ethiopian families perceive the present benefits associated with dropping out of school to be higher for girls than for boys. For example, girls are far more likely to be expected to contribute to domestic work than boys are (King and Winthrop 2015), so families are more likely to benefit from greater domestic help if a girl drops out than if a boy does. Moreover, early marriage of girls, which is incompatible with school attendance (Raj et al. 2019), is highly prevalent in Ethiopia (Rose and Al-Samarrai 2001). Ethiopian families likely derive utility from their daughters conforming to this gender norm, as norms are often seen as signals of optimal decision-making, while failing to follow them typically elicits social sanctions. This utility makes the perceived present benefit of pulling a girl out of school greater than it is for boys.

Social norms also lead parents to perceive the future returns to keeping female children in school to be lower than they are for male children. Ethiopian society generally views men as more "competitive" and "brave" and thus more capable breadwinners than women, who are seen as "obedient" and "shy" (Emirie 2005). As a result, skilled employment opportunities continue to favor men in Ethiopia (Rose 2004), and the low participation of Ethiopian women in the skilled workforce has been demonstrated to compel more female students to drop out early from school (United Nations 2011). Thus, social norms and their labor market outcomes lead parents to

view the future returns to education for girls as lower than they are for boys.

The education system's failure to retain female students likely has a significant negative impact on both their future earnings and the welfare of Ethiopian society as a whole. Mincer's Human Capital Function demonstrates that a premature end to schooling is likely to depress the future earnings of Ethiopian women in the workforce (Patrinos 2016). Indeed, the average private rate of return to workers' earnings for an additional year of primary schooling is 32.5%, and 19.2% for an additional year of secondary schooling in Ethiopia (Joshi and Verspoor 2013). Studies in similar policy contexts have shown that the returns to schooling do not differ significantly by gender (Deolalikar 1993). Educating women can also generate improvements across important dimensions of public health, resulting in lower infant mortality rates and higher rates of vaccination (King and Winthrop 2015). Finally, better-educated mothers are significantly more likely to invest heavily in their children's human capital; they are also likely to be highly salient role models for their children (Rose 2004). Accordingly, reducing gender inequality in education in Ethiopia has significant potential to boost women's earnings and generate wider benefits to society at large.

Theory

This paper argues that Ethiopian parents' present bias contributes significantly to the attrition of female students from the education system. The Family-Economy hypothesis posits that a parent's decision to continue their child's education depends on an analysis of the immediate and future benefits to the family (Morduch 2000). Ethiopian families deciding whether to withdraw their child from school weigh the present rewards of their child dropping out, such as the ability to enter the workforce or to tend to household duties, against the future benefits of their child continuing their education. Present-biased families likely overvalue the immediate benefits to their child dropping out relative to increased future earnings. Indeed, empirical work in a similar policy context has shown that families systematically overweight immediate benefits while discounting future rewards to education in a quasi-hyperbolic manner (Lichand and Thibaud 2022).

Standard economic models assume that individuals rationally discount future rewards exponentially by the

factor δ , where $0 \leq \delta \leq 1$, in a time-consistent manner. By contrast, behavioral economists argue that the discount factor grows smaller the farther the rewards are projected into the future. In this case, Ethiopian families deciding whether to keep their children in school discount the perceived utility from leaving school at all future dates by an additional constant factor β , where $0 \leq \beta \leq 1$, which reflects their disproportionate emphasis on the present benefits of leaving school. The following equation represents the perceived utility function U_t for these families:

$$U_t = u_t + \beta\delta u_{t+1} + \beta\delta^2 u_{t+2} + \beta\delta^3 u_{t+3} + \dots$$

Present bias might be particularly relevant in this context because the period to enroll a student for the next year of school is between July and September, immediately preceding the time of Ethiopia's main harvest (United States Department of Agriculture 2008; Trines 2018; Rose and Al-Samarrai 2001). Most Ethiopian parents are engaged in agrarian work (International Monetary Fund 2008), and preharvest financial pressures have been shown to increase the cognitive loads on farmers (Mani et al. 2013). Greater cognitive loads increase present bias (Shiv and Fedorikhin 1999), and thus lower the likelihood of long-term investments in human capital during such times.

Accordingly, present-biased Ethiopian parents are more likely to pull their children, regardless of their gender, out of school at earlier stages than if they were perfectly rational actors. However, as established in the previous section, the prevailing social norms in Ethiopia lead parents to perceive a female student's future returns to education—or u_{t+1} , u_{t+2} , u_{t+3} , and so on—as lower than they are for male students, and the present benefits to dropping out— u_t —as higher than they are for male students. It follows that when families are deciding whether to pull their child out of school, they are more likely to perceive u_t as greater than u_{t+1} , u_{t+2} , and u_{t+3} for female students than for male students at any given t . Present bias is thus likely to result in dropouts at earlier stages for female students than male students in Ethiopia.

Suggested Behavioral Policy Solution

This paper argues for a two-pronged behavioral intervention to improve the retention of female students

as they progress through the upper primary level and to raise the likelihood that female students continue from upper primary to secondary school. First, enrolling primary school-leaving girls in secondary school by default could increase secondary school enrollment by taking advantage of their parents' status quo bias. Girls completing their eighth, and final, year of primary school would automatically be enrolled in the secondary school for their area. The public education system in Ethiopia operates in a similar manner to America's school district system in terms of geographics, so there is a natural location fit for every student (Aschale 2017). Ethiopian parents' choices would be biased toward the status quo, or automatic secondary school enrollment, as it is laborious for people to make the active choice to opt out of the default (Ghesla et al. 2019). Traditional economic models predict that defaults have little to no impact on outcomes—decision makers would just opt out of any default that is inconsistent with their preferences. In reality, however, defaults significantly impact decision-making because individuals are biased toward the status quo. This is true even in highly consequential decision contexts, such as education (Madrian 2014).

A default would be particularly suited to mitigate the effects of present bias in this policy context because Ethiopian parents likely experience high cognitive load during the period of enrollment, as discussed earlier. In short, a default would cause Ethiopian families to be less likely to withdraw their daughters from the schooling system before secondary school because it is simply more inconvenient to do so. Convenience is especially relevant during the time of low mental bandwidth that coincides with the enrollment period.

Our policy intervention must also address the high dropout rates of female students toward the end of primary school. Girls' progress through upper primary schooling can be incentivized by awarding their families conditional cash deposits of \$50 that are only redeemable upon completion of each year. If a girl were to begin her fifth year of primary school and drop out before finishing it, the cash deposit of \$50 would no longer be available to her family. If a girl misses school on a regular basis, her family would be notified via text message about the deposit they could lose, making the loss frame salient. A \$50 deposit would represent a significant incentive for families to ensure that their daughters progress through upper primary school, given that the per capita income

of Ethiopia is \$890 (World Bank 2021). This amount is comparable to that used in a successful cash transfer program in Malawi (Baird et al. 2011). Moreover, the Ethiopian government spent about \$193 educating each pupil in 2018 (Education Policy and Data Center 2019), and a \$50 per year payment to less than 50% of all pupils would represent a 12.95% increase in expenditure at most. Given its potential for outsized benefits to overall social welfare, this increase in expenditure could be funded by a World Bank Institutional Development Fund (IDF) grant, which Ethiopia has been awarded in the past for other women's development initiatives (World Bank 1999).

Under traditional economic models, this prong of the policy proposal would have an identical effect as a conditional cash transfer (CCT) program that simply awards a cash deposit to a family after their daughter completes a year of education. Behavioral economics refutes that argument: in reality, families are “reference dependent,” and their point of reference for a traditional CCT would be the state of the world where they do not yet have \$50, while their point of reference in our intervention would be the state of the world where they already have \$50. To families participating in a traditional CCT program, the prospect of being awarded the \$50 deposit would represent a relative “gain” since they do not have it yet. Meanwhile, families receiving the proposed intervention would view the prospect of not being able to redeem the \$50 deposit as a relative “loss” given that they already “have” it in this frame. Prospect Theory posits that people are loss averse—a given loss is more painful to them than an equivalent gain is pleasurable—so the potential \$50 “loss” in our proposed solution would be more painful to families than the potential \$50 “gain” from traditional CCTs would be pleasurable (Kahneman and Tversky 1979). Therefore, the second prong of our solution would more strongly incentivize Ethiopian families to ensure that their daughters progress through upper primary schooling than traditional CCTs would.

Conclusion

Increasing the number of years girls spend in school can bolster future incomes, have outsized effects on key public health indicators, and generate positive human capital spillover effects. However, parents' present bias likely leads to early dropouts, and female students feel this effect at earlier stages than male

students given Ethiopia's unique sociocultural context. The Ethiopian government must retain female students as they progress through upper primary school and in the period between the end of primary school and the start of secondary school. Enrolling primary school-leaving girls in secondary school by default and awarding parents \$50 cash deposits that would only be redeemable upon their children completing each year of upper primary schooling would address this disparity. A difference-in-differences study conducted on a sample of upper primary schools in the same region of Ethiopia would be a feasible method of determining this intervention's causal effects. These design elements have the potential to greatly improve the efficacy of conditional cash transfer programs used to boost critical drivers of human development in similar cultural and socioeconomic contexts.

Acknowledgements

This article was adapted from a policy proposal originally written for ECON 233: Behavioral Economics and Public Policy, taught by Professor Matthew Chao.

References

- Aschale, Tagele Mossie. 2017. “Assessment of Schools Spatial Distribution and Identifying Suitable Areas by Using GIS Technology: In Case of Debre Markos Town North Western Ethiopia.” *Journal of Resources Development and Management* 35.
- Baird, Sarah, Craig McIntosh, and Berk Özler. 2011. “Cash or Condition? Evidence from a Cash Transfer Experiment.” *The Quarterly Journal of Economics* 126(4): 1709–53. <https://doi.org/10.1093/qje/qjr032>.
- Deolalikar, Anil B. 1993. “Gender Differences in the Returns to Schooling and in School Enrollment Rates in Indonesia.” *The Journal of Human Resources* 28(4): 899. <https://doi.org/10.2307/146297>.
- Education Policy and Data Center. 2019. “National Education Profile 2018 Update.” https://www.epdc.org/sites/default/files/documents/EPDC_NEP_2018_Ethiopia.pdf.

- Emirie, Guday. 2005. "Early Marriage and Its Effects on Girls' Education in Rural Ethiopia: the Case of Mecha Woreda in West Gojjam, North-Western Ethiopia." Dissertation, University of Gottingen.
- Ghesla, Claus, Manuel Grieder, and Jan Schmitz. 2019. "Nudge for Good? Choice Defaults and Spillover Effects." *Frontiers in Psychology* 10. <https://doi.org/10.3389/fpsyg.2019.00178>.
- Herath, Subhangi. 2011. Rep. Women's Access to Decent Work. New York, New York: United Nations Commission on the Status of Women.
- Hodal, Kate. 2017. "Revealed: the 10 Worst Countries for Girls to Get an Education." *The Guardian*, October 11, 2017. <https://www.theguardian.com/global-development/2017/oct/11/revealed-the-10-worst-countries-for-girls-to-get-an-education-international-day-girl>
- International Monetary Fund. 2014. "The Federal Democratic Republic of Ethiopia: Selected Issues Paper." IMF Staff Country Reports 14(304). <https://doi.org/10.5089/9781498335294.002>.
- Joshi, Rajendra, and Adriaan Verspoor. 2013. "Secondary Education in Ethiopia: Supporting Growth and Transformation." World Bank. <https://doi.org/10.1596/978-0-8213-9727-5>.
- Kahneman, Daniel, and Amos Tversky. 1979. "On the Interpretation of Intuitive Probability: A Reply to Jonathan Cohen." *Cognition* 7(4): 409–11. [https://doi.org/10.1016/00100277\(79\)90024-6](https://doi.org/10.1016/00100277(79)90024-6).
- King, Elizabeth M., and Rebecca Winthrop. 2015. Working paper. Today's Challenges for Girls' Education. Washington, DC: Brookings Institution.
- Lichand, Guilherme, and Juliette Thibaud. 2022. "Parent-bias." University of Zurich, Department of Economics, Working Paper No. 369, November 2020, <https://dx.doi.org/10.2139/ssrn.3737685>
- Madrian, Brigitte C. 2014. "Applying Insights from Behavioral Economics to Policy Design." *Annual Review of Economics* 6(1): 663–88. <https://doi.org/10.1146/annurev-economics-080213-041033>.
- Mani, Anandi, Sendhil Mullainathan, Eldar Shafir, and Jiaying Zhao. 2013. "Poverty Impedes Cognitive Function." *Science* 341(6149): 976–80. <https://doi.org/10.1126/science.1238041>.
- Morduch, J. 2000. "Sibling rivalry in Africa." *The American Economic Review*, 90(2): 405– 409.
- Patrinos, Harry. 2016. "Estimating the Return to Schooling Using the Mincer Equation." *IZA World of Labor*. <https://doi.org/10.15185/izawol.278>.
- Raj, Anita, Marissa Salazar, Emma C. Jackson, Natalie Wyss, Katherine A. McClendon, Aarushi Khanna, Yemeserach Belayneh, and Lotus McDougal. 2019. "Students and Brides: a Qualitative Analysis of the Relationship between Girls' Education and Early Marriage in Ethiopia and India." *BMC Public Health* 19(1). <https://doi.org/10.1186/s12889018-6340-6>.
- Rose, Pauline. 2004. Rep. Can Gender Equality in Education Be Attained? Evidence from Ethiopia. UNESCO Education for All Global Monitoring.
- Rose, Pauline and Sameer Al-Samarrai. 2001. "Household Constraints on Schooling by Gender: Empirical Evidence from Ethiopia." *Comparative Education Review* 45(1): 36. <https://doi.org/10.2307/1188874>.
- Shiv, Baba, and Alexander Fedorikhin. 1999. "Heart and Mind in Conflict: The Interplay of Affect and Cognition in Consumer Decision Making." *Journal of Consumer Research* 26(3): 278–92. <https://doi.org/10.1086/209563>.
- Trines, Stefan. 2018. "Education in Ethiopia." *World Education News and Reviews*. Last modified November 15, 2018. <https://wenr.wes.org/2018/11/education-in-ethiopia>.

UNESCO. 2009. "Ethiopia." http://www.unesco.org/eri/cp/factsheets_ed/et_EDFactSheet.pdf.

UNESCO Institute for Statistics. 2020. "School Enrollment (% Gross) - Ethiopia." World Bank Group. Accessed May 23, 2021. <https://data.worldbank.org/indicator/SE.SEC.NENR.MA?locations=ET>.

United States Department of Agriculture. 2008. "Ethiopia 2008 Crop Assessment Travel Report". Accessed May 23, 2021. https://ipad.fas.usda.gov/highlights/2008/11/eth_25nov2008/.

World Bank. 1999. "Ethiopia: Women's Development Initiatives." <https://documents1.worldbank.org/curated/en/780341468746346948/pdf/multi0page.pdf>.

"Ethiopia: Overview." 2021. Accessed May 23, 2021. <https://www.worldbank.org/en/country/ethiopia/overview#:~:text=With%20more%20than%20112%20million,per%20capita%20income%20of%20%24850>.

Yorke, Louise, Pauline Rose, and Alula Pankhurst. 2021. "The Influence of Politics on Girls' Education in Ethiopia." In Reforming Education and Challenging Inequalities in Southern Contexts, edited by Pauline Rose, Madeleine Arnot, Roger Jeffrey, and Nidhi Singal. 98–119. Taylor & Francis. <https://doi.org/10.4324/9780429293467-7>.

The Effect of School Funding Inequality on Student Achievement Using Causal Inference Methods

Elijah Tamarchenko '23

1. Introduction

Income inequality in the U.S is currently at an all time high and actively increasing, which in turn is causing an increase in the inequality in public school funding (Boustan et al., 2013). In the 1960's Coleman (1968) published the Coleman report, a massive research paper which found that factors outside of student body composition - factors such as school funding, resources, teacher quality - had very little to do with student achievement. Since then, researchers have had mixed results in trying to disprove most of the results from the Coleman report, and in attempting to prove that school related factors have a heavy influence on the achievement of their students (Downey and Condron, 2016). Neymotin (2010) found that there was little evidence that changes in school funding had any effect on the graduation rates of students in public high schools in Kansas, and Han et al. (2021) found that even though increased funding had an effect on student achievement, this improvement was only due to improvement of the already high achievers, and had little impact on the students who were struggling. In contrast, Kreisman and Steinberg (2019) found that in Texas, an increase in funding had a large effect on graduation rates and college enrollment, and that this change was actually more prominent in poorer districts where more struggling students are present. This finding was supported by Lafortune et al. (2018) who found that increasing funding in low-income districts improved student performance in the long run. Thus the problem of the impact of funding on student achievement is still a debated one, with many results on either side of the argument, although recent research tends to trend towards affirming the relationship. The problem of determining whether school funding has an effect on the achievement of school is an essential one to tackle, especially since there have been recent trends towards prioritizing school funding towards schools with higher

student achievement, which could potentially widen the student achievement gap and increase segregation and inequity in the U.S educational system (Ostrander, 2015). I agree with the criticisms of the Coleman report, and hypothesize that a below average amount of funding in a school is a direct cause of lower student proficiency, specifically as measured by the MCAS (Massachusetts Comprehensive Assessment System). I create a causal graph using previous literature and expert knowledge, and then use backdoor adjustment and AIPW (Augmented Inverse Probability Weighting) in order to test this causal relationship, and find that decreases in school funding are indeed a direct cause of decreases in the student proficiency in the school.

2. Preliminaries

An ADMG (Acyclic Directed Mixed Graph) $G = (V, E)$ is defined as a graph that contains only directed and bidirected edges, with at most one directed and one bidirected edge in between each pair of vertices, and no directed cycles in G , i.e. such that there is no sequence $V_i \rightarrow V_k \rightarrow \dots \rightarrow V_i$ in the graph. A directed edge from $V_i \rightarrow V_j$ in this case will be inferred as stating that V_i is a potential directed cause of V_j , and likewise a bidirected edge from $V_i \leftrightarrow V_j$ implies that both V_i and V_j have a potential shared direct cause U_k , which is unmeasured and thus omitted from the graph. According to these specifications of the ADMG, the joint distribution $p(V)$ factorizes with respect to G according to the following distribution function:

$$p(V) = \prod_{i=1}^k p(V_i | \text{pa}_G(V_i))$$

where $\text{pa}_G(V_i)$ are the parents of the vertex V_i in G , defined as having a directed edge into V_i . In simple terms, this

function for $p(V)$ states that the joint distribution is equal to the multiplicative sum of the conditional probability of each vertex in the graph given their parents. Thus the joint distribution is characterized by the average causal effect the parents of vertices have on their children.

The conditional independence statements implied by G can be found using m-separation (a measure of disconnectedness in graphs) using the ordinary global Markov property, which states that for all disjoint subsets of vertices X, Y, Z in G ,

$$(X \perp\!\!\!\perp Y | Z)_{m\text{-sep in } G} \Rightarrow X \perp\!\!\!\perp Y | Z \text{ in } p(V)$$

where $X \perp\!\!\!\perp Y | Z$ implies that X is conditionally independent of Y given Z . This property thus states that conditional independence statements that hold in G through mseperation will also hold in the joint distribution $p(V)$ that we defined earlier. We can further refine this equation through the faithfulness assumption, which states that data coming from a system which adheres to a causal graph will contain the same relations which we have discovered using our m-separation algorithm. Thus,

$$(X \perp\!\!\!\perp Y | Z)_{m\text{-sep in } G} \Leftrightarrow X \perp\!\!\!\perp Y | Z \text{ in } p(V)$$

meaning that an independence relation in G implies an independence relation in $p(V)$ and vice-versa.

The Average Causal Effect (ACE) is a measure of the total effect of a treatment A on outcome Y , along all of the causal pathways, defined by the function

$$ACE = E[Y(a)] - E[Y(a')]$$

where a denotes the presence of a treatment and a' denotes the absence of the treatment. The ACE can be interpreted as the amount with which we expect Y to differ between the presence of the treatment and the counterfactual (the absence of treatment).

3. Methods

3.1 Data

In order to estimate the causal effect of school funding on student achievement, we use data from Massachusetts public schools, since MA has a very detailed formula for the calculation of funding for public

schools. In order to measure student achievement, I first looked at a variety of factors, such as SAT scores, MCAS scores, and graduation rates. Since the SAT tends to be self selective and thus would introduce a missing data problem, I decided to use the MCAS results from 10th grade students, since the MCAS is mandated for all students, and thus does not sustain any missing data bias. This data is in the form of the percentage of students who have been deemed advanced or proficient in the results of the exam. Thus, this thus further restricts us to public high schools in Massachusetts. The data regarding school statistics and makeup was collected from a series of reports by the Massachusetts Department of Education. The dataset was then augmented with reports on the median income of every MA town, collected from the United States Census, with reports on the median property value of every town, collected from the Massachusetts Association of Realtors, the Cost of Living of every town in Massachusetts, and the political affiliation of every town, measured by the proportion of Democratic votes in the 2020 election. Since school sizes may vary greatly and thus total funding is not comparable, we will be using spending per pupil as our measure of school funding, since this is what is used by the state in order to compute the funding of schools. The median per pupil spending in Massachusetts is \$14,116, and thus we define as our treatment variable whether a school has spend above \$14,116 per pupil during the academic year.

3.2 Graph Elicitation

In order to determine the causal effects of school funding on student achievement, we first need to construct an ADMG of the causal relations between the covariates and potential causes of all variables. Since we have a very large list of potential variables, an automatic graph creation algorithm would be highly inefficient, and in the field of public policies it may also be very inaccurate. Thus, the determination of causality between variables which determines the presence of an edge in the ADMG as described in the preliminary section - will be done through a thorough review of the previous literature on the subject. We will restrict ourselves to papers which imply causal relations between the variables, as papers which only admit to correlation will not give us the necessary priors to assume the conditional independence implied by causation.

Since I identified 16 variables to be essential to include in the DAG, and since the possibility of both a directed and undirected edge in between each node allows for a total of 345 different edges, I have included literature reviews for only those edges I deemed most important to the causal estimation. The rest of the edges can thus be assumed to be included/excluded due to either absurdity or sensibleness. The incoming edges to MCAS Scores were found to be class size, student ethnicity, teacher characteristics (Tow, 2006), socio-economic status (parent income), and native language (Hampden-Thompson and Johnston, 2006). All of the edges incoming to School Funding were found through a review of the formula that the state of Massachusetts uses to distribute funding to schools. These factors are Special Education Needs, Native Language of students, student ethnicity, average town property value, average parent income, and average cost of living. Furthermore, the edge between Political Affiliation and School Funding was included because towns may choose to use more funding than the state has deemed necessary for them, choices which usually fall along party lines (Russo et al., 2015). Deng (2020) found that native language had an impact on the earnings, and it is also known that race/ethnicity has an impact on income in the US (Akee et al., 2019). For lack of collected metric on teacher quality in the available data, I used teacher salary as a proxy for teacher quality, represented by a bidirectional edge between teacher salary and teacher quality, since increases to teacher salary has been found to increase the quality of the teachers (Leigh, 2012).

There is no edge from MCAS Scores to property value since Clapp et al. (2008) found that test scores have no impact on the property value of the surrounding area. There is no edge from MCAS Scores to teacher quality, since it has been found that teachers do not choose their schools based on the achievement of students, and that quality teachers prefer to stay at their school than transfer to one that may be considered "better" (Boyd et al., 2011). Figure 1 shows the final graph achieved through this elicitation. Variables for School Resources, Teacher Quality, and Home Life have been included in the graph despite being unmeasured variables since they provide clarity to the relationships between the rest of the variables.

After graph elicitation, I tested every single conditional independences implied by the graph that we found using an odds ratio test, and found 95% confidence

intervals using a 1000 sample bootstrap with replacement.

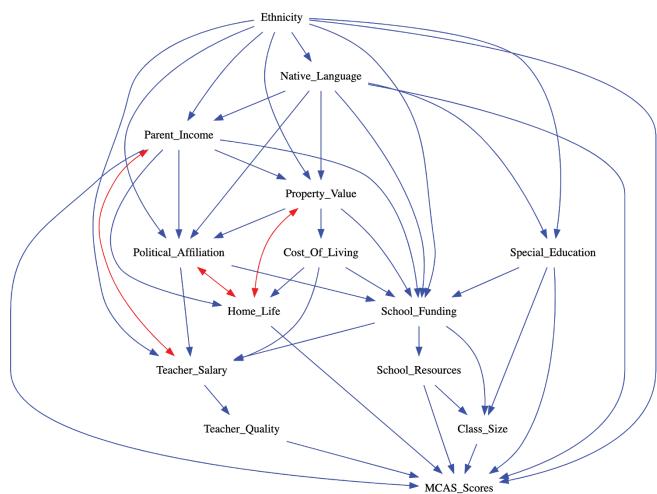


Figure 1: Original DAG derived from the graph elicitation

3.3 Casual Identification/Estimation

I will be computing the average causal effect (ACE) of school funding on the MCAS Scores of students. In order to do this, I will be using the backdoor criterion, originally conceived by Pearl (1995). Since the data does not come from randomized controlled trials, the backdoor criterion allows us to adjust for confounders in our attempt to isolate the ACE. The criteria denoted by the backdoor criterion to identify a set of conditioning variables Z are that the variables in Z cannot be descendants of A (School Funding), and that the variables in Z block all paths from Y (MCAS Scores) to A which end with an edge incoming to A , either a directed or bidirected edge. Using these criteria, we can identify the variables that we should include in Z , which would be the set {Special Education, Native Language, Ethnicity, Political Affiliation, Property Value, Parent Income, Cost Of Living}. This set is also an optimal minimal set, since it includes only factual parents of School Funding in the set, and since removing any one of these variables would cause the set to stop being a valid backdoor set. Thus, this set also provides us with the highest precision estimator relative to all of the other possible backdoor adjustment sets.

Using this backdoor set Z , I then computed the ACE using AIPW (Augmented Inverse Probability Weighting) method, which states that given a valid backdoor adjustment set Z on A and Y , the following equation holds true

$$ACE = E[Y(a) - Y(a')] = E\left[\frac{\mathbb{I}(A=a)}{p(A|Z)} * (Y - \mathbb{E}[Y|A, Z]) + \mathbb{E}[Y|A=a, Z]\right]$$

$$-E\left[\frac{\mathbb{I}(A=a')}{p(A|Z)} * (Y - \mathbb{E}[Y|A, Z]) + \mathbb{E}[Y|A=a', Z]\right]$$

We compute ACE using the Python Ananke package specified by Bhattacharya et al. (2020). The propensity score model used for $p(A|Z)$ would be a logistic regression, since we turn school funding into an indicator variable which is 1 when the average funding per pupil is above the mean funding in the state (\$14,116), and 0 otherwise. Our model for $E[Y|A, Z]$ is a regular regression model. This allows our estimates of the ACE using the AIPW to be double robust, which means that the ACE computed will converge to the truth when one of the following is true:

- The model $p(A|Z)$ is correctly specified
- The regression model for $E[Y|A, Z]$ is correctly specified.

In order to compute the confidence intervals for our ACE we ran 10,000 bootstrap samples with replacement and an alpha level of $\alpha = 0.05$. The confidence intervals settled down after around 5,000 bootstrap samples, and thus 10,000 was deemed enough to produce significant intervals.

4. Results

In Table 1 (Page 16) we see all of the odds ratios associated with the DAG we elicited for the data. A majority of the confidence intervals have values very close to 1 with narrow confidence intervals, which leads us to believe that the DAG we created could be the true DAG for the data. Special Education Teacher Salary| Ethnicity, Political Affiliation has a very small odds ratio ($2.7 \cdot 10^{-17}$), but because of the extremely wide confidence interval range ($1.2 \cdot 10^{-13}, 8.5 \cdot 10^{47}$), which could be explained by the small size of the dataset, since we are only looking at Massachusetts public high schools, and the large amount of variables that we are conditioning on. However, the rest of the odds ratios are within the defined $[0,1]$ range with minimal variation. Furthermore, the edges implied by removing the conditional independences which are computed to have large amounts of variation, such as the one described above, have found to have no effect on

the backdoor adjustment set. Thus, despite the 3 variables with large ranges for the odds ratio, we can continue with the DAG that we elicited in good faith. Thus, we are under the working assumption that the graph we are using is the true causal DAG, and that any edges which may have been added or omitted which should have been in the causal graph have no effect on the analysis done.

The ACE found exemplifies how many more students are deemed to have passed the MCAS proficiency level based when the school has above average funding, compared to the counterfactual. Our results show that for schools with above average funding, 2.17% more students are deemed proficient, with a confidence interval of (0.11, 4.56). This means that we can say with significance that school funding Figure 2 shows a graph of student achievement on the MCAS exam plotted against the per pupil spending of the school, colored using the median income of the town that the school is in. Looking at this figure we see the difficulty of a straightforward statistical analysis of the relationship between our treatment and outcome, since the data is stratified by so many different variables. We see here that all of the lower achieving schools are also schools in low income areas, where school funding has been increased due to government aid and support. In Figure 3 we see the student achievement again plotted against per pupil spending, but this time divided by ethnicity. We again see a similar division, with schools with more diversity corresponding to the schools in low income areas which see lower academic achievement.

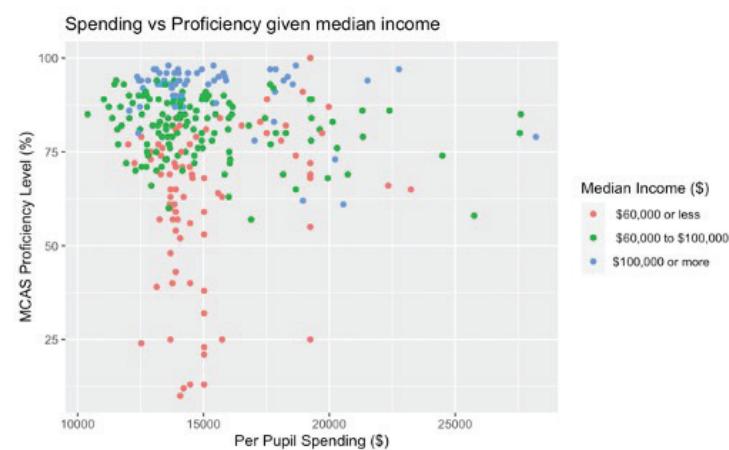


Figure 2: Proficiency Levels of students in a school given the per pupil spending, colored by median income level of the town

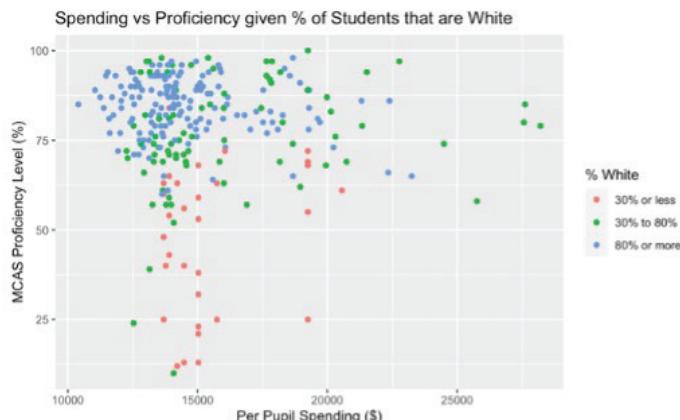


Figure 3: Proficiency Levels of students in a school given the per pupil spending, colored by the proportion of the school that is 'white'

Thus there is the importance of taking into account all of the other variables that may have a direct influence on student achievement, which is why taking a causal inference approach can help us make sense of the direct relationship. Although 2% is fairly small, with around 900,000 students in Massachusetts, this would account for about 18,000 students being below proficiency.

5. Discussion & Conclusion

The results of this paper are in line with the current range of critiques regarding the original Coleman Report published in the 1960's. Through the use of causal inference techniques I have found that decreases in the amount of per pupil funding provided by the school cause an increase in the amount of students that are deemed unprepared by the state, specifically when focusing on public high-school students in the state of Massachusetts. Thus, the public policy conversation regarding the equitable distribution of resources to schools in the U.S. should include the discussion of achieving equitable school funding, especially since better funded schools are often located in richer areas, since these areas have more funding that they can choose to allocate towards the schools, and thus the income inequality in the U.S. is directly related to the educational inequity.

In this paper I focused specifically on the state of Massachusetts, since MA has a very well defined school funding formula, and readily available data regarding its public schools. However, in the last few decades Massachusetts has taken steps towards achieving a more

equitable distribution of funding in the state, which elicited the creation of the Chapter 70, which is what is used now to fund public schools (Berger and McLynch, 2006). Thus, Massachusetts is ahead of many of the other states in the U.S, which have done very little to combat the inequity in schools since the 1960s. Furthermore, Massachusetts is a fairly homogeneous state in regard to income and population size with respect to many of the other states in the U.S, where some rural schools may have less than 100 students. Thus, an analysis of the causal effect of funding on student achievement in states with less defined funding formulas and in states with a greater amount of income inequality would increase the evidence for federal reforms regarding school funding.

References

- Randall Akee, Maggie R Jones, and Sonya R Porter. Race matters: Income shares, income inequality, and income mobility for all us races. *Demography*, 56(3):999–1021, 2019.
- Noah Berger and Jeff McLynch. Public school funding in massachusetts. *Massachusetts Budget and Policy Center*, 2006.
- Rohit Bhattacharya, Razieh Nabi, and Ilya Shpitser. Semiparametric inference for causal effects in graphical models with hidden variables. *arXiv preprint arXiv:2003.12659*, 2020.
- Leah Boustan, Fernando Ferreira, Hernan Winkler, and Eric M Zolt. The effect of rising income inequality on taxation and public expenditures: Evidence from us municipalities and school districts, 1970–2000. *Review of Economics and Statistics*, 95(4) :1291–1302, 2013.
- Don Boyd, Hamp Lankford, Susanna Loeb, Matthew Ronfeldt, and Jim Wyckoff. The role of teacher quality in retention and hiring: Using applications to transfer to uncover preferences of teachers and schools. *Journal of Policy Analysis and Management*, 30(1): 88–110, 2011.
- John M Clapp, Anupam Nanda, and Stephen L Ross. Which school attributes matter? the influence of school district performance and demographic composition on property values. *Journal of urban Economics*, 63(2):451–466, 2008.
- James S Coleman. Equality of educational opportunity. *Integrated education*, 6(5):19–28, 1968.

Ruyue Deng. The effect of the native language on immigrants. 2020.

Douglas B Downey and Dennis J Condron. Fifty years since the coleman report: Re-thinking the relationship between schools and inequality. *Sociology of Education*, 89(3): 207–220, 2016.

Gillian Hampden-Thompson and Jamie Johnston. Variation in the relationship between non school factors and student achievement on international assessments. 2006.

Dongsook Han, Sangheon Kim, Heeran Park, and Hosung Sohn. Promoting student achievement in high school using school funding: evidence from quantile regression discontinuity design. *Asia Pacific Education Review*, 22(2):193–208, 2021.

Daniel Kreisman and Matthew P Steinberg. The effect of increased funding on student achievement: Evidence from texas's small district adjustment. *Journal of Public Economics*, 176:118–141, 2019.

Julien Lafortune, Jesse Rothstein, and Diane Whitmore Schanzenbach. School finance reform and the distribution of student achievement. *American Economic Journal: Applied Economics*, 10(2):1–26, 2018.

Andrew Leigh. Teacher pay and teacher aptitude. *Economics of education review*, 31(3): 41–53, 2012.

Florence Neymotin. The relationship between school funding and student achievement in kansas public schools. *Journal of Education Finance*, pages 88–108, 2010.

Rachel R Ostrander. School funding: Inequality in district funding and the disparate impact on urban and migrant school children. *BYU Educ. & LJ*, page 271, 2015.

Judea Pearl. Causal diagrams for empirical research. *Biometrika*, 82(4):669–688, 1995.

Charles J Russo, William E Thro, and Frank M Batz. Financing education: An overview of public school funding. *School Business Affairs*, 81(10), 2015.

Charlene Tow. The effects of school funding on student academic achievement. *Unpublished undergraduate thesis. University of California, Berkeley*, Berkeley, CA, 2006.

| Conditional Independence Testing | | |
|---------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------|
| Conditional Independence | OR | Confidence Interval |
| Ethnicity $\perp\!\!\!\perp$ Cost Of Living Property Value | 1.03 | (0.986, 1.078) |
| Ethnicity $\perp\!\!\!\perp$ Class Size Political Affiliation, Funding | 0.986 | (0.966, 1.007) |
| Native Language $\perp\!\!\!\perp$ Cost Of Living Property Value | 0.98 | (0.927, 1.033) |
| Native Language $\perp\!\!\!\perp$ Class Size Funding, Political Affiliation | 1.025 | (0.999, 1.051) |
| Native Language $\perp\!\!\!\perp$ Teacher Salary Funding, Political Affiliation, Cost Of Living, Ethnicity | $2.7 * 1^{-17}$ | $(1.2 * 10^{-13}, 8.5 * 10^{47})$ |
| Income $\perp\!\!\!\perp$ Cost Of Living Property Value | 1 | (1.00006, 1.00035) |
| Income $\perp\!\!\!\perp$ Special Education Native Language, Ethnicity | 0.999 | (.9999, 1.00001) |
| Income $\perp\!\!\!\perp$ Class Size Political Affiliation, Funding | 1 | (0.999, 1) |
| Property Value $\perp\!\!\!\perp$ Teacher Salary Funding, COL, Political Affiliation, Ethnicity, | 0.996 | (0.984, 1.005) |
| Property Value $\perp\!\!\!\perp$ Special Education Ethnicity, Native Language | 0.999 | (0.999, 1) |
| Property Value $\perp\!\!\!\perp$ Class Size Funding, Political Affiliation | 1 | (1, 1) |
| Special Education $\perp\!\!\!\perp$ Cost Of Living Funding, Political Affiliation | 0.993 | (0.945, 1.033) |
| Special Education $\perp\!\!\!\perp$ Teacher Salary Ethnicity, Political Affiliation | $1.3 * 10^5$ | $(3.6 * 10^{-22}, 8.5 * 10^{27})$ |
| Cost Of Living $\perp\!\!\!\perp$ Political Affiliation Property Value | 1.002 | (0.998, 1.005) |
| Cost Of Living $\perp\!\!\!\perp$ Class Size Funding, Political Affiliation | 1.022 | (1.008, 1.039) |
| Political Affiliation $\perp\!\!\!\perp$ Special Education Ethnicity, Native Language | 0.872 | (0.026, 29.979) |
| Political Affiliation $\perp\!\!\!\perp$ Class Size Funding, Political Affiliation | 1.927 | (0.696, 5.549) |
| Teacher Salary $\perp\!\!\!\perp$ Class Size Funding, Political Affiliation | 1.0001 | (1.00005, 1.001) |

Table 1: The conditional independences implied by the DAG and their respective odd ratio

The Promise of Psilocybin

Psilocybin as a Treatment Modality for Depression

Mukund Nair '22

1. Introduction

1.1 Psilocybin

Throughout history, humankind has sought to make sense of life in a variety of creative ways. It should come as no surprise then that psychedelics, with their capability to induce hallucinations, ecstasy, and other mind-expanding states of consciousness, are on this list. (Vollenweider and Kometer, 2010). Used in a variety of rituals, psychedelics have piqued human curiosity and become embedded in the cultural lifestyles of people across the globe, even today.

Specifically, naturally occurring indoleamines have a long history of use in the Americas. Psychoactive mushrooms, containing psilocybin and its dephosphorylated metabolite psilocin, were used by the Aztecs in the 15th century and have since been an important part of certain Mexican healing ceremonies. By the 1960s this knowledge arrived in the United States and research on psilocybin as a therapeutic had begun and indicated promising effects as an aid in shortening psychotherapy (Vollenweider and Kometer et al., 2010; Busch and Johnson, 1950). However, they were banned soon after, declared as drugs with no therapeutic use and a high potential for abuse.

Only recently, with the establishment of conditions for safe administration, has there been a willingness in the scientific community to study these drugs, leading to a well-documented rise in research in the last 10-15 years (Muttoni et al., 2019; Tullis, 2021). Today, psilocybin-assisted psychotherapy shows great promise as a novel therapeutic for depression and other mental health disorders (Tullis, 2021).

1.2 Depression

Mental health disorders are the leading cause of

disability affecting approximately 350 million people worldwide (Murray, 2013; de Gregorio et al., 2021). More specifically, almost 40% of the Mental Health global disability burden is accounted for by depressive disorders alone (Whiteford, et al., 2013). Globally, the lifetime prevalence of depression is conservatively estimated to be around 10.8% (Lim et al., 2018). Impacted by the COVID-19 pandemic, this number is estimated to have increased to around 25% (Bueno-notivol et al., 2021).

Depression is not only prevalent but is a serious and unremitting disease with grave consequences, especially if left untreated. In its most severe form, depression can lead to suicidal ideation which disproportionately affects young adults and is now the second leading cause of death for adults aged 18-35 in the United States (CDC, 2020). Depressive episodes also lead to an increased risk of future episodes; approximately 80% of patients requiring psychiatric attention for a depressive episode will experience another one within the year (Kumagai et al., 2019; Kessler et al., 2003). Moreover, around 40% of patients who discontinue treatment relapse into a state of depression within the year (Kato et el., 2020).

Even though many treatments exist for depression today, the efficacy of these therapeutics remains relatively low. Selective serotonin reuptake inhibitors (SSRIs), selective norepinephrine reuptake inhibitors (SNRIs), and atypical antidepressants, medicines collectively known as second-generation antidepressants (SGAs), are included in the first line of depression therapy (APA, 2019). Yet only 54% of adults show improvement after taking antidepressant medication (Levkovitz et al., 2011). Comparatively, 35-40% of adults showed improvement with just placebo treatment (Furukawa et al., 2016). Thus, compared to placebo, the efficacy of these medicines is still quite low. Moreover, we remain unable to predict which interventions will be most effective for individual patients (Holmes et al., 2018; Cuijpers et al., 2020). As a result, utilizing different treatments is necessary in order

to find one that is effective for each patient. Unfortunately, patients who do not respond to multiple treatments have a poor prognosis (Cleare et al., 2015). Currently, interventions to treat patients with treatment-resistant depression are not very effective, have a great deal of stigma around them, and have significant side effects (Rucker et al., 2016).

The potential seen in psychedelics, historically and in modern research, and the need for continued exploration of novel therapeutics for depression indicate that psilocybin may hold the key to improving depression and other abnormal psychologies resulting from repetitive, entrenched, and often negative patterns of thought (Byock, 2018; Rucker et al., 2016; LaBua, 2021). In this article, I review current treatments used for depression, the need for new therapeutic modalities, and focus on the promise of psilocybin as a new therapeutic.

2. Treatments for Depression

2.2 Current

The APA recommends either psychotherapy, pharmacotherapy (using an SGA), or a combination of the two as first-line treatment for adult depression (APA, 2019).

2.2.1 Psychotherapies

Psychotherapies are interventions that approach depression from a psychological perspective and aim to reduce or eliminate depressive symptoms. They are often delivered by a trained professional or taught to be self-administered (Weisz et al., 2006). Psychotherapies differ in length, goals, and structure. It is possible that psychotherapies, being the multidimensional interventions they are, might have complicated mechanisms of action that cannot be captured in simple causal relationships (Lemmens et al., 2016). Different therapies used today include behavioral, cognitive, cognitive-behavioral, mindfulness-based cognitive, psychodynamic, supportive, and interpersonal therapy.

Although there have been mixed results in the literature, recent reviews indicate that there are no significant differences in the efficacy of various psychotherapies (Cuijpers et al., 2008). Thus, the APA recommends a combination of one of these

psychotherapies and SGAs as the initial treatment for adults suffering from depression (APA, 2019).

Finally, even though psychotherapies are the gold standard of care for patients with depression, they have significant drawbacks. For example, reviews show that evidence-based psychotherapies will be beneficial for 75% of patients (APA, 2020). Although this is a large number, its impact is reduced by the fact that patients only need to show some benefit, an outcome that is difficult to standardize and measure, to qualify in this category. Psychotherapies also take a great deal of time to be effective with only 50% of patients showing reliable improvement after 8-10 weeks of therapy (Lambert and Vermeersch, 2002).

2.2.2 Pharmacotherapies

Meta-analyses also show that SGAs and CBT are both similarly effective in treating the symptoms of patients with mild to severe depression (Gartlehner et al., 2015; Khan et al., 2012). Furthermore, all SGAs are efficacious compared to placebo (Cipriani et al., 2018). Yet only around 60% of patients treated with an antidepressant will show a positive response (Arroll et al., 2005). Studies also suggest that a combination of psycho and pharmacotherapy may be more effective than anyone alone (Khan et al., 2012).

Finally, even though they are effective drugs, SGAs have important drawbacks. SGAs can take weeks to be effective and only around 50% of patients respond to the first antidepressant they try (Frodl, 2017). Furthermore, fear of adverse side effects keeps 20% of patients from even filling their prescriptions for antidepressants (Amick et al., 2015).

2.3 The Need for a New Treatment Modality

Psycho and pharmacotherapies have significant drawbacks that need to be considered and improved. For both psychotherapy and pharmacotherapy, delay of effectiveness is one of the largest disadvantages. The delay between initial treatment and maximum reduction of depressive symptoms can take 8-12 weeks for SGAs and 15-20 sessions for psychotherapies (Cipriani et al., 2018). Especially for antidepressants, this lag in effectiveness is associated with an increased risk of suicidal behavior (Jick et al., 2004), psychosocial losses

from continuing depressive symptoms, ineffective treatment, and consequent poor adherence to medication (Machado-Vieira et al., 2010). The risk of adverse effects in pharmacotherapies for depression is also significant with 60% of patients experiencing at least one adverse event during treatment with an SGA (Amick et al., 2015). These adverse side effects frequently lead to the discontinuation of treatment by patients as well (Amick et al., 2015). Research also shows that long-term dosage of SGAs may be ineffective and harmful to patients (Hengartner, 2020).

For about 70% of patients, their initial treatment will not work (whether medicine or therapy alone or together) necessitating second-step treatments (Gartlehner et al., 2015). The delay of efficacy, risk of adverse side effects, and lack of long-term effectiveness in current therapeutics emphasize the need for a novel depression treatment.

3. Psilocybin and Psychotherapy

Results from animal research with psilocybin contradict data from human studies. Most importantly, functional activity in certain resting state networks increases after psilocybin administration in humans. In mice, however, these effects were minor and may be due to the species specific different pharmacological mechanism of psilocybin or differing drug administration protocols (Grandjean et al., 2021). As a result, this review will focus on psilocybin's effects on humans.

The default mode network (DMN), a brain network important in high order cognitive functions and active in humans during periods of wakeful rest, is unsuccessfully downregulated in patients with depression (Sheline et al., 2009). Psilocybin treatment shows an initial decrease in functional connectivity between parts of the DMN followed by an increase in DMN connectivity long term, all while correlating with improved depressive symptoms. This indicates that psilocybin may work by 'resetting' the DMN, where its initial disintegration enables later re-integration (Carhart-Harris et al., 2017).

Furthermore, Psilocybin's effects are not limited to the DMN. Whole-brain analyses show increases in right-amygdalar activity, consequently increased responses to happy and fearful faces, and correlated with improvements in depressive symptoms (Roseman et al., 2018). Increased amygdalar activity irrespective of

emotional valence suggests that psilocybin encourages patients to work through emotions rather than avoid them. Increased Openness and Extraversion scores on personality assessments (specifically the Revised NEO Personality Inventory, NEO-PI-R) post-psilocybin treatment support this (Erritzoe et al., 2018). These findings suggest that psilocybin may indeed work by modulating top-down emotional control.

Patients treated with psilocybin also showed immediate and lasting improvements in depressive symptoms (Roseman et al., 2018; Carhart-Harris et al., 2016; Griffiths et al., 2016; Ross et al., 2016). In two double-blind studies adopting a crossover model, patients exhibited significant anxiolytic and antidepressant effects that lasted for up to six months resulting from just one full dose of psilocybin (Griffiths et al., 2016; Ross et al., 2016). It is important to note that one study used a low dose of psilocybin (1 mg/70 kg) as a placebo and the other used niacin. Using low dose psilocybin as a placebo mitigates expectancy effects as patients expect to receive psilocybin in each session. This comes at the cost of being unable to ensure that patients will not have a psychoactive experience and create an effective control group. Meanwhile, niacin ensures that no psychoactive effects are experienced but participants can identify it as the placebo. These studies were also done in patients suffering from life-threatening cancer, a population that does not reflect the makeup of patients suffering from treatment-resistant depression. Even with these limitations, these initial studies indicate that psilocybin's rapid and long-lasting effects are worth further research (McCorvey et al., 2016).

Finally, few adverse events were reported with psilocybin treatment. Only 12% of study participants described a negative change in psychosocial or mental function compared to 60% of patients experiencing at least one adverse event while taking SGAs (Studerus et al. 2011). This effect may be confounded by the fact that many study participants were experienced with psychedelics; however, with the development of rigorous guidelines for human psychedelic research, significant adverse events are rare (Barrett et al., 2020; Johnson et al., 2008).

4. Future Directions

Even with this evidence, we are far from declaring psilocybin a panacea. Questions remain regarding how exactly it works, how it compares directly with modern antidepressants, and even what effects its continuous use might have on humans, to name a few. These are all important areas for future research.

The solution to our current mental health crisis then, may not be the immediate adoption and extensive use of psilocybin, but an openness to studying it further. Although psilocybin has been seen as an illicit substance by the modern world thus far, we must set this stigma aside so that we can learn more about this promising drug. Furthermore, the onus is on us, as members of the public, to help shift the global perspective on psilocybin. Whether it be advocating for changes in drug scheduling and helping speed up research on psilocybin or staying well informed about studies done with psychedelics and rectifying the modern stigma surrounding their use, we hold the power to help research that will improve the mental health of millions happen.

The gravity of the situation is such that we cannot afford to leave any stone unturned. In our ever-competitive and increasingly complex world, mental health issues are not going away. They are simply doing more harm to people earlier on in their lives. But, by remaining unbiased and letting the science move forward, we may be able to change that. Our openness today will improve mental healthcare tomorrow so we can mold strong people and forge a stronger future.

Acknowledgements

This piece is adapted from a paper written for NSCI 401: Topics in Neuroscience, taught by Professor Victor Cazares. The author would like to thank Professor Cazares for his detailed review and support. Without his guidance, this piece could not have been crafted. The author would also like to thank Nat Davidson '22 for her help editing this piece line by line.

Works Cited

American Psychological Association. (2019). Clinical practice guideline for the treatment of depression across three age cohorts. Retrieved from <https://www.apa.org/depression-guideline>

American Psychological Association. (2020, July 31). Understanding psychotherapy and how it works. <http://www.apa.org/topics/psychotherapy/understanding>

Amick, Halle R, et al. "Comparative Benefits and Harms of Second Generation Antidepressants and Cognitive Behavioral Therapies in Initial Treatment of Major Depressive Disorder: Systematic Review and Meta-Analysis." *BMJ*, 2015, <https://doi.org/10.1136/bmj.h6019>.

Arroll, B. "Efficacy and Tolerability of Tricyclic Antidepressants and SSRIs Compared with Placebo for Treatment of Depression in Primary Care: A Meta-Analysis." *The Annals of Family Medicine*, vol. 3, no. 5, 2005, pp. 449–456., <https://doi.org/10.1370/afm.349>.

Barrett, Frederick S., et al. "Emotions and Brain Function Are Altered up to One Month after a Single High Dose of Psilocybin." *Scientific Reports*, vol. 10, no. 1, 2020, <https://doi.org/10.1038/s41598-020-59282-y>.

Bueno-Notivol, Juan, et al. "Prevalence of Depression during the COVID-19 Outbreak: A Meta-Analysis of Community-Based Studies." *International Journal of Clinical and Health Psychology*, vol. 21, no. 1, 2021, p. 100196., <https://doi.org/10.1016/j.ijchp.2020.07.007>.

Busch, AK, and WC Johnson. "L.S.D. 25 as an Aid in Psychotherapy; Preliminary Report of a New Drug." *Diseases of the Nervous System*, vol. 11, no. 8, 1950, pp. 241–3. Byock, Ira. "Taking Psychedelics Seriously." *Journal of Palliative Medicine*, vol. 21, no. 4, 2018, pp. 417–421., <https://doi.org/10.1089/jpm.2017.0684>.

Carhart-Harris, Robin L, et al. "Psilocybin for Treatment-Resistant Depression: fMRI Measured Brain Mechanisms." *Scientific Reports*, vol. 7, no. 1, 2017, <https://doi.org/10.1038/s41598-017-13282-7>.

Carhart-Harris, Robin L, et al. "Psilocybin with Psychological Support for Treatment Resistant Depression: An Open-Label Feasibility Study." *The Lancet Psychiatry*, vol. 3, no. 7, 2016, pp. 619–627., [https://doi.org/10.1016/s2215-0366\(16\)30065-7](https://doi.org/10.1016/s2215-0366(16)30065-7).

Cipriani, Andrea, et al. "Comparative Efficacy and

- Acceptability of 21 Antidepressant Drugs for the Acute Treatment of Adults with Major Depressive Disorder: A Systematic Review and Network Meta-Analysis." *The Lancet*, vol. 391, no. 10128, 2018, pp. 1357–1366., [https://doi.org/10.1016/s0140-6736\(17\)32802-7](https://doi.org/10.1016/s0140-6736(17)32802-7).
- Cleare, Anthony, et al. "Evidence-Based Guidelines for Treating Depressive Disorders with Antidepressants: A Revision of the 2008 British Association for Psychopharmacology Guidelines." *Journal of Psychopharmacology*, vol. 29, no. 5, 2015, pp. 459–525., <https://doi.org/10.1177/0269881115581093>.
- Cuijpers, Pim, et al. "Psychotherapy for Depression in Adults: A Meta-Analysis of Comparative Outcome Studies." *Journal of Consulting and Clinical Psychology*, vol. 76, no. 6, 2008, pp. 909–922., <https://doi.org/10.1037/a0013075>.
- Cuijpers, Pim, et al. "Treatment Outcomes for Depression: Challenges and Opportunities." *The Lancet Psychiatry*, vol. 7, no. 11, 2020, pp. 925–927., [https://doi.org/10.1016/s2215-0366\(20\)30036-5](https://doi.org/10.1016/s2215-0366(20)30036-5).
- De Gregorio, Danilo, et al. "Hallucinogens in Mental Health: Preclinical and Clinical Studies on LSD, Psilocybin, MDMA, and Ketamine." *The Journal of Neuroscience*, vol. 41, no. 5, 2020, pp. 891–900., <https://doi.org/10.1523/jneurosci.1659-20.2020>.
- Erritzoe, D., et al. "Effects of Psilocybin Therapy on Personality Structure." *Acta Psychiatrica Scandinavica*, vol. 138, no. 5, 2018, pp. 368–378., <https://doi.org/10.1111/acps.12904>.
- Frodl, Thomas. "Recent Advances in Predicting Responses to Antidepressant Treatment." *F1000Research*, vol. 6, 2017, p. 619., <https://doi.org/10.12688/f1000research.103001.1>.
- Furukawa, Toshi A, et al. "Placebo Response Rates in Antidepressant Trials: A Systematic Review of Published and Unpublished Double-Blind Randomised Controlled Studies." *The Lancet Psychiatry*, vol. 3, no. 11, 2016, pp. 1059–1066., [https://doi.org/10.1016/s2215-0366\(16\)30307-8](https://doi.org/10.1016/s2215-0366(16)30307-8).
- Gartlehner, Gerald. *Nonpharmacological versus Pharmacological Treatments for Adult Patients with Major Depressive Disorder*. Agency for Healthcare Research and Quality, 2015.
- Grandjean, Joanes, et al. "Psilocybin Exerts Distinct Effects on Resting State Networks Associated with Serotonin and Dopamine in Mice." *NeuroImage*, vol. 225, 2021, p. 117456., <https://doi.org/10.1016/j.neuroimage.2020.117456>.
- Griffiths, Roland R, et al. "Psilocybin Produces Substantial and Sustained Decreases in Depression and Anxiety in Patients with Life-Threatening Cancer: A Randomized Double-Blind Trial." *Journal of Psychopharmacology*, vol. 30, no. 12, 2016, pp. 1181–1197., <https://doi.org/10.1177/0269881116675513>.
- Hengartner, Michael P. "How Effective Are Antidepressants for Depression over the Long Term? A Critical Review of Relapse Prevention Trials and the Issue of Withdrawal Confounding." *Therapeutic Advances in Psychopharmacology*, vol. 10, 2020, p. 204512532092169., <https://doi.org/10.1177/2045125320921694>.
- Holmes, Emily A, et al. "The Lancet Psychiatry Commission on Psychological Treatments Research in Tomorrow's Science." *The Lancet Psychiatry*, vol. 5, no. 3, 2018, pp. 237–286., [https://doi.org/10.1016/s2215-0366\(17\)30513-8](https://doi.org/10.1016/s2215-0366(17)30513-8).
- Jick, Hershel. "Antidepressants and the Risk of Suicidal Behaviors." *JAMA*, vol. 292, no. 3, 2004, p. 338., <https://doi.org/10.1001/jama.292.3.338>.
- Johnson, MW, et al. "Human Hallucinogen Research: Guidelines for Safety." *Journal of Psychopharmacology*, vol. 22, no. 6, 2008, pp. 603–620., <https://doi.org/10.1177/0269881108093587>.
- Kato, Masaki, et al. "Discontinuation of Antidepressants after Remission with Antidepressant Medication in Major Depressive Disorder: A Systematic Review and Meta-Analysis." *Molecular Psychiatry*, vol. 26, no. 1, 2020, pp. 118–133., <https://doi.org/10.1038/s41380-020-0843-0>.
- Khan, Arif, et al. "A Systematic Review of Comparative Efficacy of Treatments and Controls for Depression." *PLoS ONE*, vol. 7, no. 7, 2012, <https://doi.org/10.1371/journal.pone.0041778>.
- Kumagai, Narimasa, et al. "Predicting Recurrence of Depression Using Lifelog Data: An Explanatory Feasibility Study with a Panel VAR Approach." *BMC Psychiatry*, vol. 19, no. 1, 2019, <https://doi.org/10.1186/s12888-019-2382-2>.

- LaBua, Ravital Segal. "The Effect of Psilocybin on Personality." *City University of New York, ProQuest Dissertations Publishing*, 2021, pp. 1–193.
- Lambert, Michael J., and David A. Vermeersch. "Effectiveness of Psychotherapy." *Encyclopedia of Psychotherapy*, 2002, pp. 709–714., <https://doi.org/10.1016/b0-12-343010-0/00084-2>.
- Lemmens, Lotte H.J.M., et al. "Mechanisms of Change in Psychotherapy for Depression: An Empirical Update and Evaluation of Research Aimed at Identifying Psychological Mediators." *Clinical Psychology Review*, vol. 50, 2016, pp. 95–107., <https://doi.org/10.1016/j.cpr.2016.09.004>.
- Levkovitz, Yeciel, et al. "Efficacy of Antidepressants for Dysthymia." *The Journal of Clinical Psychiatry*, vol. 72, no. 04, 2011, pp. 509–514., <https://doi.org/10.4088/jcp.09m05949blu>.
- Lim, Grace Y., et al. "Prevalence of Depression in the Community from 30 Countries between 1994 and 2014." *Scientific Reports*, vol. 8, no. 1, 2018, <https://doi.org/10.1038/s41598-018-21243-x>.
- Machado-Vieira, Rodrigo, et al. "The Timing of Antidepressant Effects: A Comparison of Diverse Pharmacological and Somatic Treatments." *Pharmaceuticals*, vol. 3, no. 1, 2010, pp. 19–41., <https://doi.org/10.3390/ph3010019>.
- McCorvy, John D, et al. "Psilocybin for Depression and Anxiety Associated with Life Threatening Illnesses." *Journal of Psychopharmacology*, vol. 30, no. 12, 2016, pp. 1209–1210., <https://doi.org/10.1177/0269881116675771>.
- Murray, Christopher J.L., and Alan D. Lopez. "Measuring the Global Burden of Disease." *New England Journal of Medicine*, vol. 369, no. 5, 2013, pp. 448–457., <https://doi.org/10.1056/nejmra1201534>.
- Muttoni, Silvia, et al. "Classical Psychedelics for the Treatment of Depression and Anxiety: A Systematic Review." *Journal of Affective Disorders*, vol. 258, 2019, pp. 11–24., <https://doi.org/10.1016/j.jad.2019.07.076>.
- Roseman, Leor, et al. "Increased Amygdala Responses to Emotional Faces after Psilocybin for Treatment-Resistant Depression." *Neuropharmacology*, vol. 142, 2018, pp. 263–269., <https://doi.org/10.1016/j.neuropharm.2017.12.041>.
- Ross, Stephen, et al. "Rapid and Sustained Symptom Reduction Following Psilocybin Treatment for Anxiety and Depression in Patients with Life-Threatening Cancer: A Randomized Controlled Trial." *Journal of Psychopharmacology*, vol. 30, no. 12, 2016, pp. 1165–1180., <https://doi.org/10.1177/0269881116675512>.
- Rucker, James JH, et al. "Psychedelics in the Treatment of Unipolar Mood Disorders: A Systematic Review." *Journal of Psychopharmacology*, vol. 30, no. 12, 2016, pp. 1220–1229., <https://doi.org/10.1177/0269881116679368>.
- Sheline, Yvette I., et al. "The Default Mode Network and Self-Referential Processes in Depression." *Proceedings of the National Academy of Sciences*, vol. 106, no. 6, 2009, pp. 1942–1947., <https://doi.org/10.1073/pnas.0812686106>.
- Studerus, Erich, et al. "Acute, Subacute and Long-Term Subjective Effects of Psilocybin in Healthy Humans: A Pooled Analysis of Experimental Studies." *Journal of Psychopharmacology*, vol. 25, no. 11, Nov. 2011, pp. 1434–1452., <https://doi.org/10.1177/0269881110382466>.
- Tullis, Paul. "How Ecstasy and Psilocybin Are Shaking up Psychiatry." *Nature*, vol. 589, no. 7843, 2021, pp. 506–509., <https://doi.org/10.1038/d41586-021-00187-9>. Vollenweider, Franz X., and Michael Kometer. "The Neurobiology of Psychedelic Drugs: Implications for the Treatment of Mood Disorders." *Nature Reviews Neuroscience*, vol. 11, no. 9, 2010, pp. 642–651., <https://doi.org/10.1038/nrn2884>.
- Weisz, John R., et al. "Effects of Psychotherapy for Depression in Children and Adolescents: A Meta-Analysis." *Psychological Bulletin*, vol. 132, no. 1, 2006, pp. 132–149., <https://doi.org/10.1037/0033-2909.132.1.132>.
- Whiteford, Harvey A, et al. "Global Burden of Disease Attributable to Mental and Substance Use Disorders: Findings from the Global Burden of Disease Study 2010." *The Lancet*, vol. 382, no. 9904, 2013, pp. 1575–1586., [https://doi.org/10.1016/s0140-6736\(13\)61611-6](https://doi.org/10.1016/s0140-6736(13)61611-6).

Human Exposure to Bisphenol A From Landfill Leachate-Contaminated Water

Gwyneth Chilcoat '24

Introduction

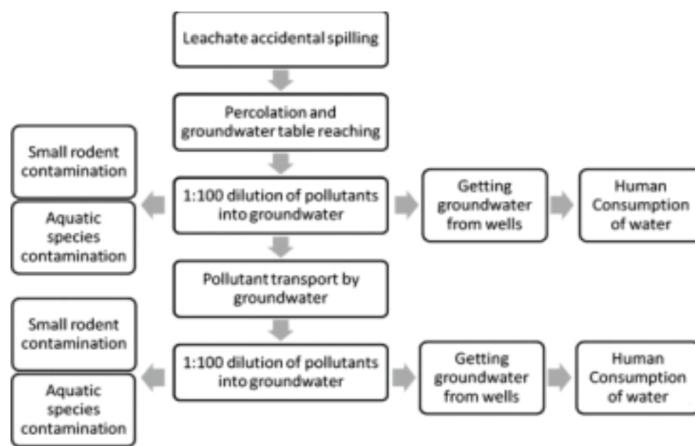
Landfills are the preeminent mechanism for waste disposal in much of the world. Landfills compare favorably to other waste disposal methods such as dumping or incineration from a public health perspective, but their human health implications still warrant concern. It is near-impossible to generalize about the health consequences of landfills because each one is unique, dependent on local production, consumption, and disposal choices. Leachate is a suspension of solids in liquid that forms as liquid from the waste and precipitation that falls on the landfill percolate through the waste; therefore, leachate composition is dependent upon landfill composition. Consequently, leachate is contaminated with landfill toxins such as heavy metals, pathogens, and toxic chemicals, including xenobiotic endocrine-disrupting compounds (EDCs) (Kjeldsen et al., 2002). EDCs harm human and environmental health by imitating hormones, thereby disrupting endocrine pathways. They are prevalent in landfills because many chemicals used in plastics, flame retardation, and a variety of industrial processes are estrogenic (National Institute of Environmental Health Sciences, 2020). This paper focuses on one of the most widespread EDCs in municipal solid waste (MSW) landfill leachate: bisphenol A (BPA). I will examine the pathway from landfill to drinking water contamination, the health effects of exposure, and the significance of BPA contamination.

Discussion

Pathway

Leachate collection systems that transport leachate for treatment at a wastewater treatment plant (WWTP) are increasingly common, but they are not ubiquitous, and collection systems must be regularly maintained to be

effective (Ramke, 2018, Idowu, 2019). There are two main pathways by which untreated leachate can contaminate groundwater, both of which landfill design attempts to prevent (see Figure 1). First, leachate can escape through holes in the leachate-containing layers of the landfill and leach into groundwater (Szymanski et al., 2018). Second, precipitation may cause leachate runoff which can then leach into groundwater (Aziz, 2013). As a result, well water in the vicinity of landfills can be contaminated by leachate (Talalaj and Dzienis, 2006). BPA is known to contaminate water, and landfill leachate contamination is a hypothesized cause because it is present at high volumes in landfills and many products containing BPA are disposed of in landfills (Vandenberg et al., 2007). In 2008, Bertanza and Pedrazzini published a review on EDCs in landfill leachate and municipal wastewater. They state that “municipal sewage and municipal wastewater treatment effluents are considered to be a major source of [EDC] pollution,” which is troubling due to the significant human health implications of EDC pollution and the spottiness of leachate monitoring across the globe (Yang et al., 2008).



Human health concerns

Studying the health effects of EDCs is challenging because endocrine disruption has a broad array of physiological effects and because all humans are exposed to background levels of EDCs. Bisphenol A is a well-known endocrine disruptor that differs from others commonly found in landfill leachate, such as dioxins and biphenyls, in that it is still produced at high volumes. BPA is used in plastic and epoxy manufacturing, and humans are exposed to BPA from drinking out of water bottles and eating food out of cans contaminated with the substance (Baderna et al., 2011, Bauer, 2019). Although diet is considered to be the greatest source of BPA intake for humans, populations drinking landfill leachate-contaminated water may unknowingly consume far higher levels of BPA. Vandenberg et al. (2007) found over 150 studies of BPA exposure showing animal health impacts such as cancers and fertility problems at low dose exposure and that “many of these endpoints are in areas of current concern for human epidemiological trends.” Research is present on the health consequences of direct exposure to leachate and some routes of exposure to BPA, but research on exposure to BPA from leachate-contaminated water is lacking. Scientists have calculated levels at which EDCs become harmful to human health and compared those to EDC concentration in landfill leachate and leachate-contaminated water, but have failed to directly link EDC exposure from landfills to health problems (Bertanza and Pedrazzini, 2008).

Significance

Measurements detecting BPA in landfill leachate began around 2000 and over the past few years has focused mainly on developing leachate treatments, suggesting that researchers find landfill leachate BPA exposure potentially harmful enough to expend resources to find solutions. It should be noted that although not the focus of this paper, BPA’s estrogenic properties harm environmental health (Bertanza and Pedrazzini, 2008, Baderna et al., 2011, Vandenberg, 2007). Studies on leachate composition from around the world usually detect BPA if they test for it, which is consistent with what is known about the prevalence and range of the substance. One study which collected data on dozens of leachate toxins at a landfill in Italy over the span of 11 years found BPA in 90% of

sampling campaigns, a higher frequency than any other toxin studied (Baderna et al., 2011). Furthermore, there is evidence to suggest that BPA is the most significant EDC in landfill leachate: one study in Osaka North Port, Japan, showed that BPA accounted for 84% of estrogenic effects caused by leachate contamination of groundwater (Kawagoshi et al., 2013). However, because leachate composition is highly variable between different landfills, further research is required to validate or qualify those results on a broader scale.

Conclusions

BPA exposure via landfill leachate is concerning because research on contamination pathways suggests landfill leachate can contaminate drinking water, BPA is frequently cited as a leachate contaminant because it is produced at high volumes, and BPA consumption presents well-known threats to human health. However, no published research has determined whether leachate contamination results in BPA levels sufficiently high to cause human health consequences. Most existing research on the subject is very narrow in scope, examining only one or two steps of the pathway from BPA dumping to human exposure and health consequences. It is difficult to draw generalizations from such studies. Although BPA was the focus of this paper because it is reliably present in landfills and is a known toxin, other leachate-contaminating toxins—such as other EDCs, pathogens, and heavy metals—warrant further research because they are under-researched and present possible public health problems. No papers reviewed in this study were able to ascertain both drinking water contamination from leachate and an observable effect on human health in the affected community. I infer that this absence, rather than indicating that no such correlation exists, may be due to the difficulty of undertaking such large, interdisciplinary studies—and may be underscored by explicit and implicit discrimination against the marginalized communities that tend to live in these hazardous environments. A direct link between landfill-related BPA contamination and human health problems may be hard to quantify in part due to the diverse range of its potential health effects. I advise researchers to focus particularly on interdisciplinary research (i.e., collecting health data and sampling water in a community that is suspected to be exposed to leachate-contaminated drinking water) and on following possible

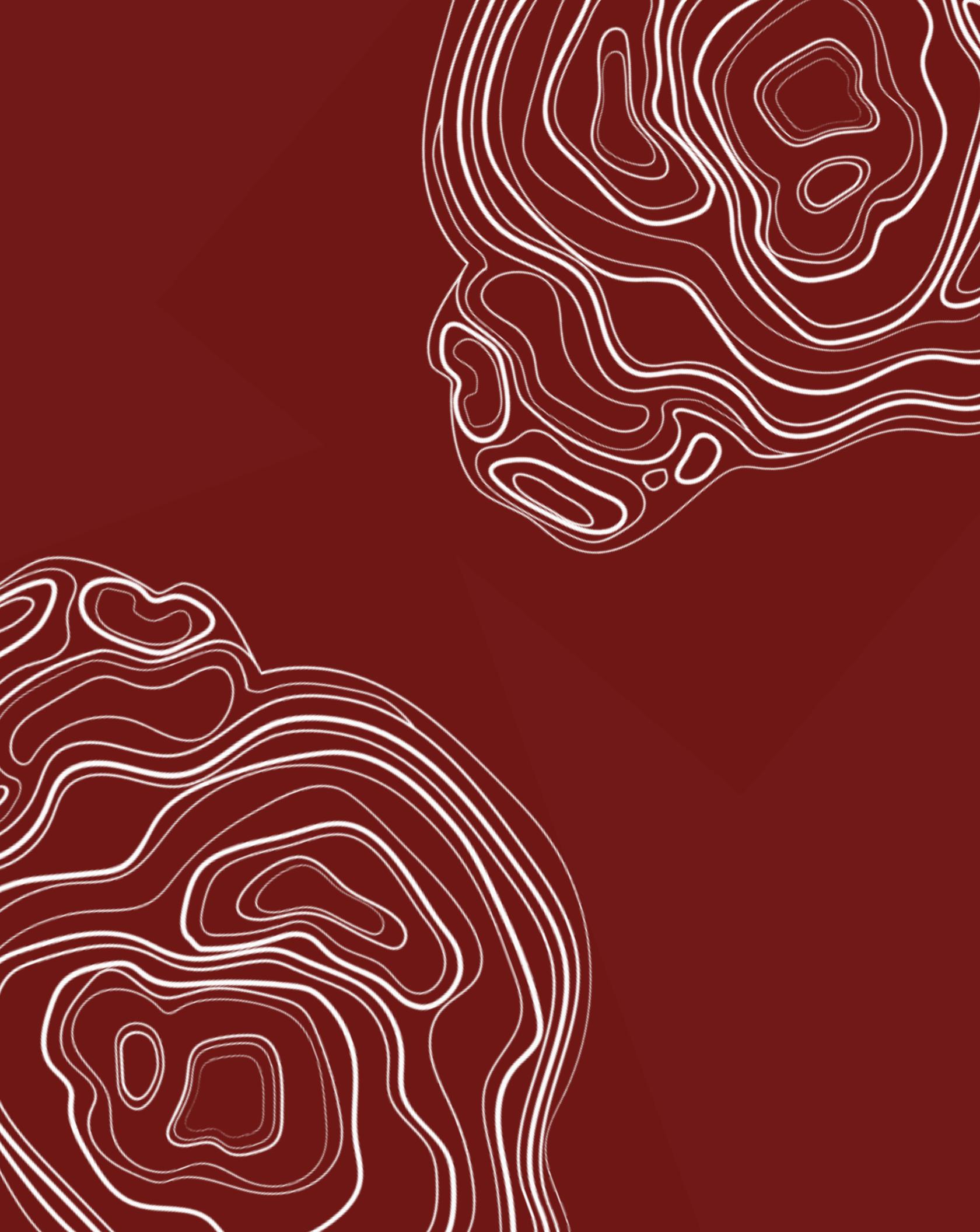
exposure victims from prenatal development for decades in order to collect data on BPA levels in tissues and rates of illnesses known to be caused by BPA exposure compared to control populations.

Acknowledgements

This paper benefited from guidance and revisions provided by Professor Rónadh Cox. Theresa Morley-McLaughlin '21 and Austin Huang '21.5 were instrumental to the early stages of research on this project.

References

- Aziz, SQ (2013). Produced Leachate from Erbil Landfill Site, Iraq: Characteristics, Anticipated Environmental Threats and Treatment, Conference: The 16th International Conference on Petroleum, Mineral Resources and Development.
- Baderna, D, Maggioni, S, Boriani, E, Gemma, S, Molteni, M, Lombardo, A, Colombo, A, Bordonali, S, Rotella, G, Lodi, M, & Benfenati, E (2011), A combined approach to investigate the toxicity of an industrial landfill's leachate: chemical analyses, risk assessment and in vitro assays, *Environmental Research*, v. 111, p. 603–613.
- Baderna, D, et al. (2011). Composition of leachate: most recurrent compounds in 55 monitoring campaigns done in 11 years. Five campaigns were done yearly (one every 2 months excluding July and August). [Diagram]. Retrieved from <https://doi.org/10.1016/j.envres.2011.01.015>.
- Baderna, D, Caloni, F, Benfenati, E (2018), Investigating landfill leachate toxicity in vitro: A review of cell models and endpoints. *Environment International*, v. 122, p. 21-30.
- Bauer, BA (2019), What Is BPA, and What Are the Concerns about BPA?, Mayo Clinic, Mayo Foundation for Medical Education and Research, 18 Dec. 2019, www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/expert-answers/bpa/faqs-20058331.
- Bertanza, G, Pedrazzani, R (2008), Presence of EDCs (endocrine disrupting compounds) in landfill leachate and municipal wastewaters, M. Pawłowska, L. Pawłowski (Eds.), Management of Pollutant Emission from Landfills and Sludge, Taylor and Francis Group, London.
- Idowu, IA, Atherton, W, Hashim, K, Kot, P, Alkhaddar, R, Alo, B. I., & Shaw, A (2019), An analyses of the status of landfill classification systems in developing countries: Sub Saharan Africa landfill experiences, *Waste Management*, v. 87, p. 761-771.
- Kawagoshi, Y., Fujita, Y., Kishi, I., Fukunaga, I (2003), Estrogenic chemicals and estrogenic activity in leachate from municipal waste landfill determined by yeast two-hybrid assay, *Environmental Monitoring and Assessment*, v. 5 p. 269-274.
- Kjeldsen, P, Barlaz, MA, Rooker, AP, Baun, A, Ledin, A, Christensen, TH (2002), Present and long-term composition of MSW landfill leachate: A review, *Critical Reviews in Environmental Science and Technology*, v. 32, p. 297-336.
- National Institute of Environmental Health Sciences (2020), Endocrine Disruptors. Retrieved December 15, 2020 from <https://www.niehs.nih.gov/health/topics/agents/endocrine/index.cfm>
- Ramke, HG, (2018), Leachate collection systems. *Solid Waste Landfilling: Concepts, Processes, Technology*, 345.
- Szymański, K, Janowska, B, Iżewska, A, Sidełko, R, Siebielska, I (2018), Method of evaluating the impact of landfill leachate on groundwater quality, *Environmental Monitoring and Assessment*, v. 190.
- Talalaj, IA, Dzienis, L (2006), Influence of Leachate on Quality of Underground Waters, *Polish Journal of Environmental Studies*, v. 16, p. 139-144.
- Vandenberg, LN, Hauser, R, Marcus, M, Olea, N, Welshons, WV (2007), Human exposure to bisphenol A (BPA), *Reproductive Toxicology*, v. 24, p. 139-177.
- Yang, K, Zhou, XN, Yan, WA, Hang, DR, Steinmann, P (2008), Landfills in Jiangsu province, China, and potential threats for public health: leachate appraisal and spatial analysis using geographic information system and remote sensing, *Waste Management*, v. 28, p.2750-2757.



*For more information, or to access our online articles,
please visit sites.williams.edu/WURJ*

