

THE IMPACT OF DIRECT-TO-PATIENT PHARMACEUTICAL DIGITAL
MARKETING ON PATIENT OUTCOMES IN DIABETES MANAGEMENT:
A SURVEY-BASED ANALYSIS OF PATIENT ADHERENCE

by

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Dedication

I'd like to dedicate this research to a few people.

- ❖ To my love, wife and best friend, Dr. Kesha Ajvalia, MD, who is the epitome of what I aspire to be in all aspects of life and career.
- ❖ To my son, Sai, whom I hope to be inspired by his parents to value education.
- ❖ To my parents, Ila and Harish, who sacrificed much to give me a happy life.
- ❖ To my mother/brother-in-law Hema and Sahil, for their confidence and support.
- ❖ To professor Dr. Bojana Trivic Noguera, for her trust, time, and guidance pouring into my dissertation research.
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- ❖ To my cousins, family and friends who have grown through the ups and downs.
- ❖ To all my educational professors from Aquinas Academy, Seton Hall Prep, and Rutgers University Schools of Public Health, Economics, and Business.
- ❖ To all the healthcare professionals whom I worked with at Robert Wood Johnson Hospital, Johnson & Johnson, Novartis, and Bayer.
- ❖ To all those who live with Diabetes and chronic health conditions.

I hope this research helps in some way touch your life.

ABSTRACT

THE IMPACT OF DIRECT-TO-PATIENT PHARMACEUTICAL DIGITAL
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In the US, the pharmaceutical industry is allowed to advertise prescription drugs directly to consumers through both traditional media and digital media outlets. These communications are intended to inform the consumer about their medications, promote safe and proper medication use to engage with their healthcare provider. This intention to assist consumers in making informed decisions and promoting appropriate use of medications creates a controversy on whether or not direct-to-patient (DTP) pharmaceutical marketing is to benefit patients or to simply serve as a means of increasing sales of the companies' products. Based on significant research, a patient benefit includes reminders to adhere to the medication's protocol which improves their health outcomes.

A cross-sectional survey was conducted to examine the relationship between DTP pharmaceutical social media marketing and adherence to prescribed diabetes medications in people with type 2 diabetes in order to ascertain if there is a positive patient benefit. The survey included 300 adults with type 2 diabetes who reside in the US and excluded those with type 1 diabetes (due to lack of lifestyle modification impact on the disease). In addition to assessing self-reported exposures to pharmaceutical digital marketing and self-reported medication adherence, the survey also assessed trust in pharmaceutical digital advertising, demographics and socioeconomic status, such as age, income and insurance status. Descriptive statistics and cross-tabulations were used to determine patterns in medication adherence related to financial status and insurance status in response to DTP pharmaceutical social media marketing exposures.

Findings from the study indicate that increased levels of exposure to DTP pharmaceutical digital marketing are associated with increased self-reporting of medication adherence. Specifically, people who reported being exposed to DTP pharmaceutical digital marketing at least once per week had higher adherence rates than people who reported being exposed at least once every six months or less frequently.

The results from the study indicate that differences in adherence were present based upon financial and insurance status; specifically, privately insured and higher-income participants exhibited higher adherence rates at all levels of marketing exposure, whereas lower-income and uninsured participants exhibited lower adherence rates at all levels of marketing exposure. Participants who reported lower levels of trust in pharmaceutical digital marketing exhibited weaker adherence patterns regardless of the amount of marketing exposure they reported receiving.

Overall, findings from the current study suggest that DTP pharmaceutical digital marketing can function as an engagement mechanism to support medication adherence in people with diabetes if they have adequate access to care, however, it is less effective in overcoming financial and structural barriers to accessing treatments.

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CHAPTER 1: INTRODUCTION

1.1 Background and Context

By 2021, the number of adults worldwide diagnosed with diabetes was approximately 537 million, ranking diabetes as one of the most common chronic diseases globally; this estimate is projected to grow to approximately 783 million adults by 2045 (International Diabetes Federation, 2021). The rapid expansion of diabetes prevalence can be attributed to demographic trends, such as the aging of the population, as well as global changes in diets, physical activity levels, urbanization, and socioeconomic status. Thus, diabetes not only poses a major clinical challenge, but also presents a significant public health and financial burden to individuals, health-care systems, and national economies.

There are two major classifications of diabetes: Type 1 Diabetes (T1D), and Type 2 Diabetes (T2D). Type 1 Diabetes is an autoimmune condition, wherein the body's immune system destroys pancreatic beta cells, thereby causing an absolute lack of insulin production and requiring patients to undergo lifelong insulin therapy and continuous glucose monitoring. Type 2 Diabetes is a progressive metabolic disorder caused by a combination of insulin resistance and relative insulin deficiency; it is commonly linked to lifestyle choices, such as obesity, sedentary behavior, poor nutritional habits, and genetic predispositions. Although there are substantial differences in the pathophysiology and treatment of T1D and T2D, both types of diabetes require ongoing, long-term commitment to engaging in complex treatment regimens, which typically consist of pharmacologic therapy, lifestyle modifications, and regular interactions with healthcare providers.

Given the significance of adherence to diabetes treatment regimens, healthcare systems and researchers have developed a variety of interventions designed to improve adherence to diabetes treatment regimens. Examples of these interventions include patient education programs, structured self-management training, reminder systems, and behavioral psychology-based interventions, such as motivational interviewing and habit formation strategies. Although some of these interventions have provided small improvements in adherence, adherence remains relatively low across patient populations and is influenced by a myriad of psychological, economic, and structural factors.

Direct-to-Patient (DTP) pharmaceutical digital marketing is rapidly becoming an increasingly powerful force in the modern healthcare information landscape. Historically, pharmaceutical marketing efforts targeted primarily physicians who were seen as the primary gatekeepers of medical information and treatment decisions. However, with the advent of regulatory changes and digital platforms, pharmaceutical companies now have the opportunity to market directly to patients. As a result of the emergence of DTP marketing using digital and social media, patients are now being exposed to commercial messages regarding disease states, treatment options, and branded medications outside of traditional clinical settings.

The transition to direct-to-patient marketing has dramatically changed how patients obtain, process, and interact with health-related information. DTP marketing via digital and social media could potentially increase awareness, strengthen treatment adherence, and support patient engagement throughout the entire continuum of care. However, DTP marketing also raises concerns about the accuracy, balance, and impact of commercially sponsored health

information on patient behaviors. Given that sustaining adherence to diabetes treatment is a critical, albeit challenging task for individuals living with diabetes, determining whether and how DTP pharmaceutical digital marketing affects adherence to diabetes treatment represents an important and timely research area.

Direct-to-Patient (DTP) pharmaceutical marketing brings about many unanswered questions regarding its contribution to patient behavior and health outcomes in the management of chronic diseases (e.g., diabetes). Chief among those questions is whether exposure to DTP pharmaceutical digital marketing significantly affects patient adherence to their prescribed diabetes medications. Although the primary purpose of this type of marketing is often cited as educational and empowering for the patient, there is currently no clear answer as to whether repeated exposure to promotional messages results in sustained, clinically relevant, adherence behaviors.

The objective of this study is to evaluate the effectiveness of DTP pharmaceutical digital marketing as a factor influencing patient adherence to diabetes medications. Adherence to medications is one of the most significant factors contributing to long-term positive health outcomes in managing diabetes. Through evaluating how patients experience, interpret and react to DTP digital marketing based upon various demographics, socioeconomic status, and insurance types, the goal of this study is to provide clarity as to whether this form of marketing is a useful resource for supporting individuals with chronic conditions.

1.2 Research Problem

Although Direct-to-Patient (DTP) pharmaceutical digital marketing has grown rapidly over the last decade, little evidence exists to demonstrate whether exposure to pharmaceutical sponsored digital marketing is associated with better adherence with prescribed medications for diabetic patients.

Non-adherence to medication is common in diabetes care. The American Diabetes Association defines non-adherence as “the degree to which a patient follows agreed upon recommendations” for medical care. Examples of non-adherence can include taking medications at times other than those recommended by a physician, taking too few or too many medications, forgetting to refill prescriptions, and stopping a prescribed regimen of medications. Additionally, in the context of diabetes management, examples of non-adherence can include irregular blood glucose testing and/or failing to adhere to treatment plans.

Behavioral, psychological, and socio-economic factors that contribute to non-adherence are well-documented in the literature. Likewise, there is a large body of literature documenting digital health interventions, such as telemedicine, mobile health apps, and reminder systems designed to improve adherence. However, most of the existing literature concerning digital health interventions was conducted in a clinical or research-controlled setting.

There is evidence indicating that DTP pharmaceutical advertising has an effect on brand awareness, patient requests for medications, prescribing practices, and drug sales. The majority of the existing research has focused on how patients perceive DTP pharmaceutical advertising as opposed to how they report that it affects their adherence to medication regimens in their daily lives.

Few studies have documented patients' own views regarding DTP pharmaceutical digital marketing content, their reported levels of exposure to DTP pharmaceutical digital marketing, their trust in pharmaceutical messages, and how these variables correlate with their reports of adherence to their prescribed medication regimens outside of clinical settings. Because prior research has not adequately examined how demographic and socio-economic status affect the relationship between DTP digital marketing exposure and adherence behavior from a patient's point-of-view, it is necessary to assess patient reported experiences of DTP digital marketing exposure directly, instead of relying on prescription data or aggregate use measures.

The primary research question that this study will attempt to answer is the lack of patient reported data that evaluates the relationship between exposure to DTP pharmaceutical social media marketing and medication adherence in adult diabetic patients. This study will attempt to address this void by studying self-reported exposure, trust, and adherence in a real-world sample of diabetic patients.

1.3 Purpose of the Study

This study will focus on social media based direct to patient pharmaceutical digital marketing. This is an important distinction because previous studies have included all forms of digital marketing (e.g., web sites, search engine advertising, etc.) in one large category. While social media is just another form of digital marketing, it is unique because it allows pharmaceutical marketers to interact continuously and personally with patients about products outside of clinical settings. Thus, this study will examine how continuous and personal interactions via social media affect a patient's behavior related to diabetes care.

In addition to limiting the scope of the marketing channel examined, this study also differs in terms of the measure of health outcomes used. Previous studies have relied on either clinical measures (e.g., HbA1C values) or administrative data (e.g., prescription refill data). Instead, this study uses surveys of people living with diabetes. Surveys allow patients to report their own experiences with social media-based advertising and whether those experiences influenced their adherence to prescribed treatments. In addition to providing information on actual patient behavior, surveys can capture aspects of a patient's experience that are not easily captured by clinical or administrative data, such as socioeconomic status, education level, insurance status, and individual motivations related to treatment adherence.

The study defines medication adherence as the primary outcome measure for assessing health outcomes related to diabetes care. Adherence to prescribed medications is directly correlated with improved glycemic control, fewer complications, and decreased costs in managing diabetes over the long term. Thus, the relationship between adherence to prescribed medications and diabetes-related health outcomes makes medication adherence a valid and meaningful proxy for measuring the effectiveness of digital interventions including pharmaceutical marketing.

This research will provide a comprehensive analysis of the impact of DTP social media pharmaceutical marketing on diabetes health outcomes. The results of this study are expected to inform various stakeholders involved in the health care system, including health care providers, health policy makers, and pharmaceutical manufacturers who all have the ability to influence patient experiences and outcomes.

Physicians and other health care practitioners may find value in the results of this study to better understand how their patients' exposures to social media pharmaceutical marketing activities influence their behaviors when not in the presence of a clinician. For example,

clinicians may see changes in patients' expectations of treatment options, requests for specific medications, adherence to prescribed medications, and their perceptions of the benefits and risks of therapies. Understanding how social media pharmaceutical marketing affects patients' knowledge and beliefs can enhance clinician-patient communication, encourage shared decision making, and enable clinicians to educate patients about evidence-based treatments and the importance of incorporating lifestyle modifications into their care plan; especially for the management of type II diabetes.

Healthcare policymakers and regulatory bodies, including the U.S. Food and Drug Administration (FDA), may use the empirical evidence provided by this study to evaluate and revise the regulatory framework that governs the advertising of pharmaceuticals using social media. As pharmaceutical marketing continues to shift from print and television advertising to digital and social media platforms, regulatory bodies continue to struggle to keep pace with the rapidly changing nature of digital marketing, including evolving targeting strategies, modes of interaction, and formats of advertising. The results of this study may provide insight into the differences between current regulations (i.e., fair balance and risk disclosure requirements) and the lived experience of patients being marketed to on social media. Policymakers can use this insight to assess the potential downstream effects of DTP digital marketing on public health outcomes, patient trust, and health disparities experienced by individuals living with diabetes.

Pharmaceutical companies and advertisers may find the results of this study to be useful in informing the development of DTP social media marketing campaigns that go beyond mere awareness building and instead focus on educating patients, increasing their engagement with their prescribed treatments, and promoting safe and effective use of their prescribed treatments. Pharmaceutical companies can utilize the results of this study to create campaigns that meet the

needs of their target audience, align with ethical considerations, and comply with regulatory requirements. Ultimately, pharmaceutical companies may increase trust with both patients and health care providers through their marketing efforts, which would lead to more sustainable and responsible marketing practices.

Overall, this study is designed to add to the developing body of evidence that examines the evolving effects of DTP pharmaceutical digital marketing on patient behaviors in the context of diabetes management. The results of this study are intended to provide actionable guidance for policymakers looking to strengthen regulatory frameworks, health care providers looking to enhance patient-physician communication and adherence, and pharmaceutical companies looking to balance business goals with a commitment to ethics. By identifying how DTP social media marketing relates to patient adherence and decision-making, this study is designed to foster policies and programs that promote equitable, effective, and patient-centered health outcomes.

1.4 Significance of the Study

Pharmaceutical digital marketing via social media (DTP) is a significant transformation in how patients acquire, understand and interact with information related to healthcare. Historically, physicians were the sole authority on providing information and direction to patients concerning diagnosis, treatment options, ongoing care and the selection of medications to take and adhere to. In this historical model, information related to medical treatment was primarily provided in one direction, with patients receiving medical information as opposed to being involved in the process of decision making. Additionally, patients received educational, clarifying and reinforcing information concerning their treatment plans primarily through clinical encounters.

However, advances in technology and social media have resulted in a fundamental change in the dynamics of the physician-patient relationship. Now, many patients receive health-related information outside of the clinical setting on a regular basis, and in some cases, before or after they see a healthcare provider. In addition, social media enables individuals to obtain medical-related content, read the stories of other patients, join disease-specific groups, and communicate with each other about disease-related topics, all of which were impossible to do prior to the advent of social media. As such, the patient's role has evolved from being a passive recipient of medical information to becoming an active partner in the process of treatment-related decision making, expectations, and self-managing chronic diseases (Ventola, 2014). Consequently, pharmaceutical companies are no longer solely communicating with healthcare professionals; instead, they are increasingly interacting with patients directly through digital channels that are increasingly embedded into patients' daily lives.

Therefore, this research is important because it addresses a critical gap in the body of literature concerning what we know about the effectiveness of pharmaceutical marketing and what we still do not know about its implications for patients' health-related behaviors. There is a large body of literature that examines the effects of DTP marketing on brand awareness, prescription demand, and sales volume; however, relatively little attention has been given to the long-term behavioral consequences of chronic disease management and specifically to medication adherence. Adherence to medication is not a singular event; rather, it is a series of actions taken by a patient over months and years. Therefore, by studying how different levels of exposure to DTP marketing via social media relate to adherence over time, this research may provide evidence that goes beyond commercial metrics and toward the types of outcomes that are most closely aligned with improving the health of patients.

Furthermore, the results of this research may be significant for patients as well.

Pharmaceutical marketing is typically conducted in the background of patients' daily digital lives and shapes perceptions and preferences in subtle ways that may not be immediately recognized by patients. By examining how patients interpret and respond to DTP social media-based advertisements, this research will assist patients in developing greater awareness of how DTP marketing can potentially influence their health-related decision making. Greater awareness could lead to patients seeking out additional information, evaluating digital health information more critically, and participating in discussions with healthcare providers concerning potential treatments and adherence strategies more proactively.

Healthcare providers may also benefit from this research. Physicians and other healthcare professionals are increasingly encountering patients who have had previous exposure to pharmaceutical messages, made requests for medications, or have formed preconceived notions regarding the expected outcomes of treatment based upon DTP marketing. An increased understanding of the role that DTP marketing plays in influencing patients' perceptions and behaviors can enable healthcare providers to communicate more effectively with their patients during clinical encounters. Healthcare providers may be able to provide more effective communication by addressing misperceptions created by DTP marketing, placing the claims made in DTP marketing in a more appropriate context, and emphasizing the importance of evidence-based treatment recommendations. Furthermore, an understanding of how DTP marketing affects adherence can also facilitate shared decision making and enable healthcare providers to convey the complementary nature of pharmacotherapy and lifestyle modification, especially when managing Type 2 Diabetes.

The research has significant implications for pharmaceutical companies and advertisers operating within an increasingly regulated and scrutinized digital environment. As concern grows regarding transparency, trust, and ethics in the marketing of healthcare products, there is a clear need for evidence-based guidelines on how DTP digital marketing campaigns affect patient behavior beyond initial engagement. The results of this research can guide the development of DTP social media marketing strategies that focus on patient education and understanding, responsible communication and adherence support in the long term rather than simply focusing on generating demand. By developing marketing strategies that are grounded in ethics and regulatory compliance, pharmaceutical companies can improve their relationships with both patients and healthcare providers while contributing more positively to the health outcomes of patients.

This research adds to our understanding of how DTP pharmaceutical marketing via social media intersects with patient behavior in the management of chronic diseases. By studying adherence as an outcome measure, the research emphasizes patient centered metrics of success and provides insights that are relevant to patients, clinicians, policy makers and industry stakeholders.

1.5 Research Purpose and Questions

This research will focus on addressing three primary questions:

1. What is the association between exposure to Direct-to-Patient (DTP) Pharmaceutical Social Media Digital Marketing and self-reported medication adherence among individuals with diabetes?
2. How do individuals with diabetes perceive and interpret DTP pharmaceutical digital marketing content, particularly in terms of trust and its reported influence on medication continuation?

3. Do demographic and socioeconomic characteristics (e.g., income level, insurance status, and trust in pharmaceutical messaging) relate to differences in the association between DTP digital marketing exposure and medication adherence?

The main purpose of this study was to explore how adult diabetic patients in the U.S. who have been exposed to digital marketing (DTP) about diabetes medications report their medication adherence behaviors. Research has explored the effects of pharmaceuticals on patients' prescription choices and on the brand recognition of pharmaceutical companies. However, there is a lack of research that has empirically examined how patients report being exposed to digital marketing of pharmaceutical products and how those exposures relate to their daily adherence behaviors. Therefore, this study sought to address the research gap using a cross-sectional, survey-based methodology using patient reported data.

The first question focuses on the relationship between exposure to marketing and adherence behaviors. Exposure to marketing will be assessed by the frequency at which patients reported watching ads for diabetes drugs on-line. Adherence will be assessed by asking patients to report the frequency at which they take their prescribed diabetes medications. Question one also will use a categorical approach to assess adherence behaviors and then assess the corresponding degree of exposure to online advertising for diabetes medications. Thus, this will allow for an assessment of if there are observable patterns in the relationship between exposure to marketing and adherence behaviors within a population of people with a chronic condition.

The second question extends the scope of the study to include patient's perceptions of DTP digital marketing. In other words, the study will go beyond assessing simply what patients

are exposed to. It will assess how patients make sense of what they are exposed to. More specifically, the survey will assess patients' perception of how much they can trust the online ads for diabetes medications and whether they believe that the ads had an effect on their decision to keep taking their prescribed medications. Assessing these items will help the study understand how patients make sense of the content of the marketing messages and whether they see them as trustworthy and/or as having an impact on their treatment decisions.

The third question places the analysis of adherence and marketing exposure in the larger social and economic context of patients. The study will assess age, income, and insurance status to determine if the relationships between marketing exposure and adherence vary depending on socio-economic characteristics. Since medication adherence may be affected by factors such as cost of the medication, access to healthcare services and availability of insurance, assessing these variables will enable the study to determine if the observed relationships between marketing exposure and adherence behaviors exist differently for different sub-groups of patients.

Collectively, the three research questions provide the framework to investigate the extent to which digital marketing by pharmaceutical companies (DTP) plays a role in the self-management of diabetes from the patient's perspective. By assessing patient reported exposure to marketing, trust in marketing, the degree to which marketing affects their treatment decisions, and adherence to treatment, the study provides additional descriptive information regarding the potential relevance and implications of digital marketing in the self-management of chronic diseases.

CHAPTER 2: REVIEW OF LITERATURE

2.1 Factors Influencing Diabetes Treatment Adherence

The factors that influence adherence to diabetes treatment are multidimensional and include a variety of both psychosocial and structural factors that are far more complex than simply individual willpower or knowledge. The literature clearly indicates that adherence is a function of a wide array of cognitive, emotional, and contextual factors that influence how individuals manage a chronic condition over time. As such, it is essential to identify these factors as part of the theoretical framework of the current study to provide a basis for empirically assessing the potential impact of external factors (e.g., direct-to-patient digital pharmaceutical marketing) on existing barriers and facilitators of adherence. The overwhelming evidence across many studies indicates that the process of adhering to prescribed medications for diabetic patients cannot be based solely on knowledge about their disease, but rather through the combination of psychological, structural and contextual forces at work simultaneously. A number of studies have provided evidence supporting the critical role that psychosocial factors play in diabetes management. In their investigation of older adult patients with type 2 diabetes, Świątoniowska-Lonc et al. (2021) indicated that cognitive impairment, anxiety, and diabetes-related distress were each significantly related to lower levels of treatment adherence and less active participation in self-care activities. These results indicate that adherence is significantly influenced by a patient's psychological ability to comprehend information, retain treatment instructions, and deal with the emotional burden of having a chronic illness. Notably, diabetes distress has been shown to decrease motivation and persistence with treatment regimens, regardless of the adequacy of a patient's knowledge regarding their condition.

Studies that investigated emotional aspects of well-being also supported the influence of emotional state on adherence. Bézie et al. (2006) indicated that fear or anxiety about adverse effects of medication, and patients' perceptions of those effects, were predictive of patients' willingness to adhere to prescribed treatments. Furthermore, Tanharo et al. (2018) determined that emotional stability and quality of life were strong predictors of adherence; these studies demonstrate that patients' subjective experience of their illness influences their commitment to treatment. Although all of the studies examined have identified both emotional/psychological influences and other factors (i.e., costs, regimen complexity) as significant predictors of adherence, the degree to which emotional distress is considered the main reason for lack of adherence varies among them. While some studies focus primarily on the emotional distress aspect, others recognize emotional distress as one factor (among many) influencing patient's ability to adhere to their prescribed regimens. Together, the above-mentioned studies illustrate that adherence to prescribed treatments cannot be adequately explained without consideration of patients' emotional states (e.g., stress, emotional resilience, perception of disease burden).

The effect of economic factors on diabetes treatment adherence is also considerable. A large body of literature has identified that financial constraints on obtaining prescribed treatments directly impede patients' ability to comply with prescribed therapy. Specifically, Pourhabibi et al. (2022) identified three specific barriers to adherence in patients with limited economic resources: high medication costs, low health literacy, and lack of family or social support. Out-of-pocket costs can cause patients to delay or forego prescribed treatment, including reducing the dosage of medication or discontinuing use of the medication entirely, despite the clear medical benefit of using the medication. Literature shows there is broad agreement that

financial burden is among the strongest, most consistent and quantifiable predictors of non-adherence across all chronic diseases, including diabetes.

In addition to the direct cost of prescribed medications, the complexity of treatment regimens has been shown to exacerbate both economic and cognitive barriers to adherence. Studies by Capoccia et al. (2016), and Rubin and Huang et al. (2021) have demonstrated that the complexity of dosing schedules, the need for multiple medications, and the requirement for ongoing monitoring contribute to decreased adherence rates, particularly among patients managing one or more chronic diseases.

For patients experiencing economic strain, the added complexity of treatment regimens increases the perceived cost (monetary and logistical) of adhering to the prescribed regimen. Despite this agreement, some research highlights structural cost (affordability) as the primary impediment for non-adherence. While other research has shown cognitive overload and complexity of regimen are equally significant, independently contributing predictors of adherence behaviors. The relationship between health literacy and adherence provides an additional connection between the psychosocial and economic factors that influence adherence. Studies have repeatedly demonstrated that low health literacy is strongly associated with poorer comprehension of treatment instructions, diminished confidence in managing prescribed medications, and weaker adherence behaviors. Moreover, health literacy has been demonstrated to correlate highly with measures of socioeconomic status, educational attainment, and availability/accessibility of healthcare services. Thus, patients with poor health literacy may be unable to appreciate the long-term implications of non-adherence, increasing the likelihood of disengaging from treatment when symptoms are not immediately severe.

The studies reviewed here indicate that diabetes treatment adherence is influenced by an interconnected set of psychosocial and economic factors that operate simultaneously and/or in conjunction with one another, rather than independently. Cognitive burden, anxiety, emotional well-being, cost of prescribed medications, regimen complexity, and health literacy, among others, each have a significant impact on a patient's ability to maintain adherence to prescribed treatments over extended periods of time. Therefore, this literature provides an appropriate background for the proposed study, which seeks to explore how direct-to-patient digital pharmaceutical marketing may interact with the established factors of adherence to influence patient behavior in real-world settings.

Although there are numerous studies on both financial and psychological barriers to adherence, few have explored how exposure to pharmaceutical digital marketing can fit into this larger framework. The purpose of this study is to explore these questions through the use of patient self-reporting on their exposure to digital marketing from diabetes treatment promotion (DTP) programs as well as their reported levels of trust in health care professionals, and their socio-economic status. This research may provide a greater understanding of factors that contribute to an individual's adherence to their prescribed treatment regimen.

2.2 The Strengths and Gaps of Current Research in Social Media's Impact on Diabetes

The purpose of this research is to add to an ever-growing number of studies focused on the role of social media in assisting people who are living with diabetes, specifically in terms of educating patients, increasing patient engagement, and influencing patient health outcomes. Although past studies have provided valuable information about how social media can help support the care of patients who are living with diabetes, there are still many important limitations in the design of studies and the scope of the research. One of the most common features of the majority of studies that exist today is that they are based upon either systematic or narrative reviews, and cross-sectional designs. As a result, relatively few studies have employed randomized controlled trials or collected primary, patient-reported data on behavioral changes over extended periods of time. Consequently, despite the fact that the literature shows possible advantages of using social media for interventions, it does not contain sufficient evidence of long-term adherence behaviors across diverse groups of patients.

There are several strengths of the existing literature that include establishing proof of concept for social media as a supportive tool in diabetes care. In addition to identifying the positive associations between social media-based interventions, decreases in HbA1c levels, and increases in patient satisfaction, Gabarron et al. (2018) in their rapid evidence-based review titled "Social Media Use in Interventions for Diabetes" also identified how social media platforms can be used to distribute educational content, promote peer support, and increase engagement with self-management behaviors. However, the review did not provide a detailed analysis of the differences in outcomes by socioeconomic status, age, or other demographic

characteristics, limiting the ability to translate the findings into tailored interventions for populations with varying adherence challenges.

In recent years, researchers have continued to investigate social media use within specific patient populations. For example, Atia et al. (2024) in a cross-sectional study conducted in Iraq investigated the association between social media use and attaining HbA1c goals in individuals with Type 2 diabetes. The findings of Atia et al. (2024) suggest that social media engagement is associated with improved glycemic outcomes, providing additional support for the potential for digital platforms to assist in diabetes management. However, the localized nature of the study limits the ability to generalize the results to other healthcare systems and cultural contexts. Furthermore, the cross-sectional design of the study prevents drawing causal conclusions regarding the relationship between social media use and improved outcomes, so that it is unclear whether social media use contributed to improved outcomes or if more engaged patients were simply more likely to use social media as part of their self-management activities.

Intervention-based research also offers additional insights into the potential educational benefits of social media while also highlighting important gaps. For example, Leong et al. in their randomized controlled trial titled “Social Media-Delivered Patient Education to Enhance Self-Management and Attitudes of Patients with Type 2 Diabetes During the COVID-19 Pandemic,” studied the effect of a structured social media education program on patient knowledge, attitudes, and self-care behaviors. The study found that social media-delivered education can positively affect health literacy and short-term self-management outcomes, particularly during a time when in-person care was limited. However, the study did not evaluate

whether the observed improvements were maintained after the conclusion of the intervention period, thereby creating unanswered questions about the long-term effects of social media-based educational programs on long-term adherence.

Other studies have also explored social marketing strategies to influence diabetes-related behaviors, especially among older adult populations. For example, Najafpour et al. conducted a cross-sectional study using a social marketing model to improve medication adherence among elderly patients with Type 2 diabetes. While the intervention produced an improvement in adherence behaviors, the study did not take into consideration psychosocial factors such as stress, anxiety, or emotional burden that have been previously shown to impact adherence. Therefore, the failure to consider these factors limits the ability to fully understand how and why the intervention was successful, since adherence behaviors may have been influenced by unmeasured psychological factors.

Additionally, Calderon et al. assessed a social marketing intervention designed to enhance diabetes-related knowledge and adherence behaviors, especially among adolescents with Type 1 diabetes. The findings of Calderon et al. indicate that social media-based interventions can provide social support and correct misconceptions about diabetes management. However, the study's sample size was small, and the study utilized a nonrandomized design, limiting the strength of the study's conclusions. Furthermore, the focus of the study on a particular subgroup of adolescents with Type 1 diabetes limits the ability to generalize the findings to larger diabetes populations, including adults with Type 2 diabetes who manage their condition in various socioeconomic environments.

The current literature indicates that social media has potential as a tool to assist with diabetes education, patient engagement, and short-term behavioral outcomes. Nonetheless, significant gaps exist in the literature. Many studies utilize secondary analyses of data, have small or localized samples, and employ short-term interventions with little attention given to long-term adherence or the impact of socioeconomic and psychosocial factors. Few studies directly assess how patients experience social media-based health-related content and how this content affects sustained adherence to prescribed medications in actual world settings.

The limitations outlined above highlight the need for research that utilizes primary, patient-reported data and explicitly considers demographic, economic, and psychological variations among individuals with diabetes. By utilizing a survey-based methodology among a diverse sample of participants, the present study aims to expand upon the strengths of previous research and address the gaps identified in the literature related to generalizability, adherence-focused outcomes, and the lived experiences of patients exposed to health-related content on social media.

2.3 The Impact of FDA Regulation on Direct-to-Patient Advertising (DTP)

Beginning with the FDA's 1997 Modernization Act, there have been important advancements in the ability of pharmaceutical manufacturers to promote prescription products directly to patients through advertisements. The Act was enacted to modify the previous federal regulations governing the advertising of prescription pharmaceuticals. In order to do so, the Act modified previously established FDA guidelines to allow for the development of new types of direct-to-consumer (DTC) advertisements, which would name the product being promoted as well as the disease or condition that the product is intended to treat. The Act stipulated that

DTC ads be required to contain a “major statement” that describes the most severe adverse effect(s) of the drug or device being promoted and that also provide direction for accessing additional information, including but not limited to, a manufacturer-established website or a toll-free phone line.

Prior to the Act, if a company wanted to advertise its product to patients using a mass medium like television or radio, they were required to include the complete “brief summary” in the ad. However, the Modernization Act allowed for companies to include references to additional resources of information where patients could obtain additional information about the product rather than including the “brief summary” within the advertisement. This created a viable opportunity for companies to use mass media and eventually digital media to market their products directly to patients on a large scale. Following this change, pharmaceutical marketing efforts to patients via DTC advertising greatly increased. Estimates of spending by the industry indicate that DTC advertising expenditures rose from \$700 million in 1996 to approximately \$5.4 billion in 2006; an increase of approximately 800%. While the growth of DTC advertising slowed slightly during the period from 2006-2010, spending did decline to an estimated \$4.3 billion in 2010, DTC advertising had become a major component of pharmaceutical marketing in the United States.

The expansion of DTC advertising altered the relationship between pharmaceutical companies, healthcare providers and patients. Patients were increasingly exposed to information regarding prescription medication through channels outside of clinical encounters, and often prior to any interaction with a healthcare provider. This change in patient-provider dynamics resulted in patients attending appointments with a growing understanding of specific products, questions about advertised treatments and in many cases, requests for specific

products.

Since the original legislation modifying the FDA's regulations concerning DTC advertising in 1997, DTC advertising has evolved as technology has enabled improvements in digital communication. Initially consisting primarily of television and print advertising, the industry has now moved to social media, search based advertising, and other digital advertising formats which enable the industry to target patients repeatedly and personalize their messages. As a result, DTC advertising today represents one of the primary mechanisms used by pharmaceutical companies to influence how patients are informed of treatment options and how they frame discussions with their healthcare providers; impacting expectations, trust and decisions related to treatment.

2.4 The Impact of Direct-to-Patient Advertising (DTP) on Patient Behavior

The pharmaceutical industry has undergone significant changes over the last ten years in terms of the types and methods of advertisement used in the industry. The most significant cause of this change is the large-scale expansion of digital marketing. Prior to the rise of digital marketing, the primary forms of pharmaceutical promotion included print media, television advertising, and face-to-face interaction with healthcare providers. Today, digital marketing channels have become viable alternatives to many of the forms of promotion as they allow pharmaceutical companies to interact directly and continuously with both patients and healthcare providers.

According to Ventola (2011), one of the key benefits of using digital marketing as opposed to prior forms of promotion is that it provides pharmaceutical companies with greater flexibility and efficiency in reaching target audiences and engaging those audiences. Digital

marketing also allows for the creation of more targeted forms of engagement than did previous forms of advertising, as digital marketing enables the tailoring of messaging based on demographic characteristics, online behavior, and expressed health interests. This ability to personalize communications has significantly changed how pharmaceutical companies discuss disease states and treatment options.

Digital platforms provide advertisers with the capability to present users with content that aligns with their respective search history, browsing pattern, and engagement with health-related content, allowing for the influencing of awareness and behavior at a level of granularity that was previously unattainable. Search engine advertising and banner advertisements placed on health-related websites, as well as social media platforms such as Facebook and Instagram, provide pharmaceutical companies with broad access to patient populations. These platforms utilize sophisticated data analysis techniques to detect patterns in user's online activity, including health information searches and engagements with disease-specific content.

Digital marketing campaigns can be directed toward users who are likely to have an interest in, or need for, specific therapies. In the case of diabetes management, this targeted approach allows pharmaceutical companies to present to individuals who live with diabetes messages related to medicines, devices, and support tools that relate specifically to their condition. Targeted marketing efforts may enhance the perceived relevance of marketing content and therefore improve patient engagement as a result of their chronic illness.

Studies have demonstrated that exposure to Direct-To-Patient (DTP) marketing can influence patient behaviors within clinical encounters. According to research conducted by Donohue et al. (2007), patients who engaged with pharmaceutical advertising were more likely to attend healthcare provider visits with specific questions or requests related to advertised

medication. Increased familiarity with treatment options can influence patient-provider discussions and ultimately impact treatment decisions. Patients exposed to DTP marketing are likely to possess increased knowledge of prescription medications and will likely bring up options related to the management of their disease, including diabetes care, when consulting with a healthcare provider. Medicines like insulin and GLP-1 receptor agonist classes, including highly publicized treatments such as Ozempic and Mounjaro, are commonly referenced in digital and social media marketing campaigns and subsequently more visible to patients.

A rapidly expanding component of digital pharmaceutical marketing includes the utilization of influencer-based marketing strategies. Pharmaceutical companies collaborating with physicians or other healthcare professionals with social media followings may present information about diabetes management products in a way that is perceived by the audience as accessible and relatable. Influencer-generated content typically presents educational content related to the use of specific technologies such as CGM's and digital diabetes management applications, framing them as practical solutions for daily disease management.

Ventola (2011) suggests that this type of marketing can establish a connection between patients and products by providing information from credible or familiar sources, thus increasing trust and acceptance of products. For some patients, exposure to such content may motivate them to take more proactive roles in their own care, consider additional treatment options, or remain informed about emerging technologies. At the same time, the use of influencer marketing creates important concerns regarding balance and responsibility. Although product-focused messaging may motivate patients to engage with their disease, there is a risk that the overemphasizing of pharmacologic and technological solutions will overshadow the central role of lifestyle modification, including nutrition, physical activity, and behavioral

change, in comprehensive diabetes management.

The studies reviewed above suggest that digital pharmaceutical marketing has greatly increased the reach and influence of DTP advertising by providing pharmaceutical companies with the means to implement targeted, personalized, and socially mediated forms of engagement. These developments clearly have implications for how patients receive education about treatment options and how patients engage in discussions with healthcare providers. Ultimately, however, the success of these strategies will depend on the responsible implementation of the strategies and whether the strategies effectively align with evidence-based approaches to chronic disease management.

2.5 Digital Health Interventions in Diabetes Management

Advances in digital health technologies have dramatically impacted the way individuals with diabetes monitor, interpret, and react to health information as part of their everyday routine. As an example, there are several forms of digital health technologies available to individuals with diabetes including but not limited to: mobile health applications, telemedicine platforms, and wearable devices such as continuous glucose monitors (CGMs). When the digital health tools that are used in the care of individuals with diabetes are implemented effectively, they have the capacity to encourage patient engagement and empower patients to make informed decisions regarding their health based on data related to their condition. One of the main advantages of these digital health technologies include allowing patients to access some components of their care within their own environment, outside of the confines of a clinical setting, to provide greater flexibility for managing their condition while minimizing reliance on in-person clinic visits, while at the same time promoting continuity of care.

One of the most popular digital health technologies for individuals with diabetes includes mobile health applications. Mobile health applications provide a means for individuals to track and organize multiple components of their health-related data, including blood glucose levels, medication usage, dietary intake, and physical activity. By compiling this data, mobile health applications provide individuals with the opportunity to develop awareness of patterns in their daily activities and how their behavior and treatment modalities impact glycemic control. Applications, such as MySugr, have been designed to facilitate sustained engagement through the inclusion of interactive features that go beyond simply collecting data. Through these applications, patients are able to share cumulative summaries of their health data with their healthcare providers, and therefore, promote communication between visits and convey data to their healthcare providers in formats that are easily understandable and actionable.

In addition to mobile health applications, wearable devices, specifically CGMs, have further enhanced the self-management of diabetes through providing real-time data related to glucose levels. The literature consistently indicates that the utilization of CGMs results in improved glycemic outcomes by providing patients with the ability to identify and respond to fluctuations in their blood glucose levels prior to experiencing significant increases in blood glucose levels as compared to other methods of monitoring blood glucose levels. Wang et al., (2019) indicate that the use of CGMs is associated with improved glycemic control, decreased frequency of extreme glucose excursions, reduced occurrences of hypoglycemia and hyperglycemia, and reduced risk of developing complications related to diabetes. Continuous access to glucose level data provides patients with the opportunity to make timely adjustments to their medication regimen, dietary habits, and/or physical activity, while also providing their

healthcare providers with a more comprehensive basis to formulate treatment recommendations.

The COVID-19 pandemic rapidly increased the utilization of telemedicine globally, further transforming the manner in which diabetes care is delivered. Telemedicine allowed patients to obtain medical care from their homes during times in which in-person clinic visits were either limited or not possible due to the pandemic. While the need for telemedicine was created out of necessity during the pandemic, it has also shown promise as a viable option for populations that traditionally experience barriers to obtaining care in a clinical setting, including but not limited to, individuals residing in rural communities, individuals with mobility issues, and individuals who rely on caregivers to transport them to and from clinical settings. Telemedicine has provided additional opportunities for consistent follow-up and ongoing monitoring of individuals with diabetes, which are critical for the successful management of chronic conditions such as diabetes.

Telemedicine platforms allow patients to interact with their healthcare providers, view laboratory results, and modify diabetes management plans, all from their home rather than having to travel to a clinic. Wang et al., (2019) suggest that telehealth interventions are associated with improved adherence to treatment plans and may result in a reduction in avoidable hospitalizations and unnecessary emergency department visits. Telemedicine has the potential to decrease healthcare costs by increasing the number and frequency of interactions between patients and their healthcare providers while promoting continuity of care and long-term disease management.

Additionally, digital health interventions have benefits for healthcare providers in terms of monitoring patient progress and modifying treatment strategies. Healthcare providers have remote access to data collected by patients using digital health tools and can assess changes in glycemic trends over time and intervene accordingly. However, the success of these technologies is not guaranteed. Long term success is dependent on the patients' willingness and ability to consistently engage with digital health tools and accurately interpret data being presented to them. Additionally, without adequate guidance, patients may not be able to properly interpret data and may discontinue use of technology over time.

While digital health interventions have the capability to improve outcomes for patients with diabetes, the success of these interventions is directly tied to the educational support provided by healthcare professionals. Technology will never replace the role of clinical guidance in the management of diabetes. In order to utilize digital health tools effectively, patients require ongoing education to contextualize data, reinforce adherence behaviors, and integrate insights obtained from digital health tools into overall lifestyle and treatment decisions. Therefore, ensuring that the educational component of digital health interventions remains paramount to successfully improving diabetes outcomes is critical.

2.6 Challenges and Considerations in the Digital Health Landscape

While it has been demonstrated that direct-to-patient (DTP) pharmaceutical marketing and other digital health interventions may be beneficial to the management of diabetes, several barriers exist to limit the effective and equitable utilization of digital health strategies. These barriers demonstrate the necessity of assessing both the positive

and negative impacts of digital health strategies upon the behavior of the patient, as well as their ability to produce long term improvements in health status.

A major issue in the area of digital health is the potential for the medicalization of diabetes management. In addition to emphasizing the optimization of medication, device use and the monitoring of real time data, there exists the possibility that patients may begin to perceive diabetes management primarily as an effort to optimize medication via technology. This would run contrary to the recommendations of Ventola (2011), who noted that this type of approach may create an unhealthy emphasis on medication while devaluing those important aspects of diabetes management such as diet, exercise and managing stress. Diet, exercise and managing stress are important for the management of diabetes and cannot be replaced by pharmacologic or technological means.

Digital health strategies or marketing messages that emphasize products without adequate context to place the product within a larger framework of diabetes management may cause patients to believe that technology alone will be sufficient to manage their diabetes.

Another barrier to the successful implementation of digital health strategies includes data privacy and security issues. Many digital health strategies rely upon the collection, storage and transmission of large amounts of sensitive health information. For example, many wearable devices, including continuous glucose monitors, provide a constant stream of personal health information. Concerns arise regarding how this information is stored, transmitted and protected. HIPAA compliance is required to protect patient confidentiality and to prevent unauthorized access or misuses of patient health data. A breach of confidentiality not only places the patient at risk for harm, but it may

also diminish patient confidence in digital health technologies, therefore decreasing patient willingness to participate in programs that may otherwise assist in diabetes management.

Finally, equitable access to digital health technologies is a critical factor in the successful implementation of digital health strategies. While digital health strategies may have numerous advantages for certain patients, not all patients with diabetes have equal access to the devices, internet connectivity or digital literacy required to utilize digital health technologies effectively. Barriers such as cost, lack of availability of high-speed internet, limited technical knowledge or proficiency and language differences may limit patient participation in digital health programs. The American Diabetes Association (2022) emphasized the importance of providing equitable access to digital tools so that technological advances benefit diverse populations of patients. If digital health programs do not actively address inequalities in access, they may exacerbate existing inequities in diabetes care instead of eliminating them.

These barriers highlight the need for the thoughtful development, implementation and assessment of digital health strategies. DTP marketing and digital health tools have the potential to improve patient engagement and enhance adherence; however, the success of these tools is contingent upon the inclusion of the patient's education, data protection and equitable access to care in the broader care framework. Failure to address these factors may result in meaningful contributions from digital health innovations being diminished, thus compromising patient wellness and trust.

2.7 Summary of the Literature Review

The existing research shows a range of factors determine whether individuals adhere to their diabetes treatment. There is substantial evidence showing that both psychological factors such as anxiety and depression, and economic factors such as cost and access to care, play central roles in adherence. Świątoniowska-Lonc et al. (2021) found that cognitive decline, anxiety, and diabetes-related distress were negatively associated with adherence. Pourhabibi et al. (2022) identified medication cost, low health literacy, and limited social support as common barriers to adherence. Together, these studies indicate that financial strain and regimen burden create clear and measurable obstacles to maintaining consistent treatment.

Literature diverges when examining digital and social media engagement. Gabarron et al. (2015) reported improvements in HbA1c levels and patient satisfaction with digital engagement, although demographic factors were not analyzed. Atia et al. (2019) observed improved HbA1c outcomes among patients using social media for diabetes management, but causation could not be established. Calderon et al. (2021) also noted positive adherence outcomes, though their study was limited by a small sample size and non-randomized design. These mixed findings suggest potential benefits, but they also highlight important methodological limitations.

This gap directly informs the present study. While psychosocial and structural determinants of adherence are well documented, the role of DTP pharmaceutical social media marketing within this broader framework has received limited attention. The current study addresses this gap by examining the association between self-reported exposure to DTP digital marketing and medication adherence among adults with diabetes, while also considering

income, insurance status, and trust in pharmaceutical messaging. This study aims to provide a focused contribution to research on diabetes treatment adherence.

CHAPTER 3: METHODOLOGY

3.1 Overview of Methodology

In order to improve our understanding of how Direct-to-Patient (DTP) pharmaceutical digital marketing relates to adherence among Americans with diabetes, this study will focus on understanding how DTP digital marketing affects patient's behaviors with respect to taking their diabetes medications. With pharmaceutical companies increasingly using digital platforms to communicate directly with patients, there has been some concern about the impact of this type of marketing on patient behaviors. Since many treatments for diabetes require long-term and consistent patient engagement, it is particularly important to assess if exposure to digital pharmaceutical marketing is associated with significant differences in how consistently diabetic patients take their prescribed medications.

This study is conducted using a descriptive, cross-sectional design which utilizes survey data collected at one time. A cross-sectional design is most suitable for this research since the main purpose of this research is to observe relationships, rather than to determine cause and effect. Therefore, the cross-sectional design of this study allows us to look at the degree to which patients experience digital pharmaceutical advertising and whether that advertising experience is associated with differences in how consistently medications are taken.

Several elements are captured via survey data to assess the relationship between digital marketing exposure and self-reported adherence behaviors including exposure to DTP pharmaceutical digital marketing, adherence to prescribed diabetes medications and patient reported demographics including age, income, education, insurance status and health literacy. Using multiple variables allows researchers to evaluate whether different adherence patterns exist across various demographic and socioeconomic groups, and whether digital marketing exposure interacts with those factors. Adherence is typically influenced by numerous factors

and thus this study attempts to capture the broader context in which adherence is shaped by patient and societal factors.

Participants will be recruited from an online Facebook community focused on diabetes. Recruiting participants from this source provides the researcher access to a diverse population of U.S.-based patients who would typically be exposed to digital health content and pharmaceutical advertisements as part of their daily online activities. While recruiting from social media presents challenges such as self-selection and differing levels of digital involvement; it also aligns well with the focus of the current study, namely assessing digital marketing exposure. These challenges will be further discussed in relation to limitations below.

This study does not involve observing patients' medication nor clinical measures, i.e., pharmacy refill data, or laboratory results. Adherence is assessed based solely upon patients' self-reported survey responses. The reason for this choice is to measure patients' subjective experiences, perceptions and behaviors regarding both medication use and digital marketing exposure. Self-reported data may be subject to biases due to recall or social desirability effects; however, self-reported data is a common and practical method for measuring adherence, especially when the interest is in understanding patients' subjective views and behaviors.

The methodology outlined above is designed to provide an exploratory yet informative analysis of how DTP pharmaceutical digital marketing is incorporated into the broader framework of diabetes self-management. Furthermore, this study aims to enhance the understanding of the role of digital marketing in influencing adherence in everyday life, while acknowledging the complex array of factors that contribute to treatment behaviors among individuals with diabetes. One drawback from this methodology includes a psychological understanding of users of Facebook. Specifically, recruitment through Facebook may introduce

selection bias, as participants active in online diabetes communities are likely to be more digitally engaged than the broader diabetes population. This may limit the generalizability of the findings and should be considered when interpreting the results.

3.2 Research Design

This study is based on a descriptive, cross-sectional research design which assesses the relationship between patient exposure to Direct-to-Patient (DTP) pharmaceutical digital marketing and their adherence to prescribed medications among diabetic patients in the United States. The selection of a cross-sectional design allows for an assessment of how patients report their adherence behaviors as related to their exposure to pharmaceutical marketing at a single point in time. Since digital marketing is developing at such a rapid pace, cross-sectionally assessing how patients are presently interacting with promotional content and how these interactions affect their treatment behaviors represents a feasible method of obtaining this information.

A cross-sectional design also facilitates the comparison of adherence behaviors among patient subpopulations defined by age, income level, insurance status and health literacy, all of which have been identified as influencing diabetes self-management and are expected to affect how patients process and react to digital marketing. By collecting data from a broad-based sample of patients at one time, the study will identify patterns that might not emerge in less inclusive or more structured study designs.

Although longitudinal studies provide advantages when it comes to measuring changes in patient behavior over time, they typically involve longer-term follow-up and resource

commitments that are available to support the objectives of this research. More importantly, the major purpose of this study is not to determine if differences in adherence behaviors are associated with DTP digital marketing exposure, but to determine if there exists a meaningful association between DTP digital marketing exposure and adherence behaviors as they occur in real-world patient populations. A cross-sectional design is particularly suitable to this end, because it enables the evaluation of current associations between patient exposures and adherence behaviors without creating artificial constraints on patient behavior.

The descriptive nature of the research design complements the study's interest in real patient experiences rather than manipulating patient behavior through experimentation. By relying upon patient reported data, the study captures how patients experience and respond to pharmaceutical marketing in their daily lives; thus, providing additional context to previous research evaluating the potential impact of engagement with digital marketing on treatment-related decisions and adherence behaviors beyond the confines of controlled clinical environments. As has been stated by Patel et al. (2021), cross-sectional designs are commonly employed in examining the effects of digital health and marketing interventions where exposure is so widespread and cannot be effectively isolated experimentally.

Finally, a descriptive approach provides an opportunity to view the findings within the framework of prior literature regarding DTP pharmaceutical marketing and patient engagement. Rather than attempting to predict or guide patient behavior, the study seeks to illustrate observable patterns consistent with or extending previous knowledge of how marketing exposure affects adherence behaviors and treatment decision making (Brown et al., 2022). Thus, the design of the study facilitates its broader goal of contributing practical and patient

centered perspectives to the discussion of the role of digital pharmaceutical marketing in managing chronic diseases.

3.3 Data Collection Methods

The full survey is included in the appendix section. A survey-based approach will be employed to collect data from a relatively large number of subjects and to collect information directly related to patient adherence and engagement with DTP pharmaceutical marketing. Surveys are the most practical way to gather consistent and comparable data related to patient experiences and self-reported behavioral practices.

The survey is divided into three primary sections. Each section will address a separate aspect of the research questions. Section one of the surveys is composed of demographic questions related to age, gender, income level, insurance status and education. These demographic questions will enable the investigation of differences in adherence and marketing engagement among various subgroups of the population. Additionally, demographics can serve as contextual indicators of how to interpret adherence behaviors and exposure to digital marketing.

Section two of the survey will investigate adherence to medication. In this section, questions regarding frequency of prescribed diabetes medication consumption will be included, along with questions regarding why the respondent(s) do not adhere to the prescribed regimen (if applicable). Respondents will also be asked to list possible barriers to consistent adherence to their prescribed regimen (e.g. cost, side effects, forgetfulness, etc.). The intent of this section is to examine adherence behaviors and the factors that patients feel affect those behaviors.

Section three of the survey will investigate engagement with pharmaceutical digital marketing. The questions in this section will determine how often respondents view advertisements for diabetes-related pharmaceuticals, how engaged they are with the content of those advertisements, and if the advertising affects their decisions to begin, continue or cease use of prescribed medications. Respondents will also be asked to express the amount of confidence they have in the accuracy of the information they receive from pharmaceutical companies via the internet. Taken together, the items in this section will assess both the exposure to digital marketing and how patients perceive and react to that exposure.

The survey will be delivered electronically by online format. Potential respondents will be recruited via shared posts in diabetes-focused Facebook patient community groups and invited to participate voluntarily. This recruitment methodology provides access to populations who are likely to encounter digital health and pharmaceutical marketing as part of their routine online activities. The survey will include a combination of multiple choice and Likert scale questions to enable quantitative analysis of adherence behaviors and marketing engagement.

One example of a survey question is: “Have you viewed a social media advertisement for a diabetes medication in the last six months? If yes, did this advertisement assist you in making an informed decision to initiate or continue use of your prescribed medication?” Questions such as this will connect marketing exposure directly to patient reported decision-making and adherence behaviors.

To enhance the reliability of the results, the study will limit the sample to the first 300 completed responses from U.S.-based diabetic patients. The limitation of 300 completed responses is intended to allow for randomizing responses, while at the same time allowing for an analytically relevant sample size. A sample of 300 is typically sufficient for conducting

reliable statistical analysis and for determining correlations in survey-based research (Smith et al., 2022). Prior studies examining the relationship between DTP pharmaceutical marketing and medication adherence have utilized analytical samples of varying sizes (ranging from 200-400 participants), which demonstrates that the proposed sample size is adequate to meet the requirements of the study (Patel et al., 2021).

3.4 Data Analysis Techniques

A large amount of information was extracted from the data for this study through a variety of descriptive statistics in order to assess the prevalence of certain exposure-related variables associated with DTP digital marketing, and how these relate to self-reported adherence behaviors in persons with diabetes in the U.S.A. Due to the fact that this study utilized a cross-section of survey data, it focused on descriptive statistical procedures to detail observed relationships in the data set, and did not attempt to develop hypotheses or determine cause-and-effect.

Responses to the survey were summarized using frequency distributions, percentage frequencies, and crosstabulation tables. These types of summaries provide an easy-to-understand description of the frequency at which respondents indicate exposure to DTP digital marketing, and how adherence behaviors vary across different subgroups of patients. Crosstabulation was also employed to evaluate how adherence behaviors vary based upon a wide range of demographic characteristics, socioeconomic factors, and the degree to which respondents engage in DTP digital marketing activities. This type of summary allows for an evaluation of the distribution of adherence behaviors and helps to identify any notable trends or variations in the sample.

Inference statistical techniques (e.g., regression analyses; hypothesis testing) were not employed since the study design did not include experimental manipulations, longitudinal tracking of individual participants, or random assignment of participants to treatment or control conditions. Additionally, the use of descriptive statistical techniques was intentional to avoid over-estimating the strength or direction of the observed relationships. Rather, the results are viewed as representative of the trends and patterns present in the sample, but do not represent statistically significant associations or predictive relationships.

Therefore, the focus of the analysis is to understand how adherence behaviors are distributed throughout the study population, and how these behaviors relate to reported exposure to DTP digital marketing. A focus on trends and patterns, rather than attempting to make statistical inferences, allows for a better understanding of patient behavior and experiences in real-world settings. Descriptive results can be used as a basis for further discussion and interpretation and may also guide future research that employs more sophisticated analytical techniques or longitudinal study designs.

3.5 Ethical Considerations & Informed Consent

Because this study includes human participants and health-related information, ethical protocols have been strictly adhered to in efforts to protect user privacy, evaluate all potential data disclosures, and ensure informed consent. All participants are aware of the project goals, potential risks, anticipated benefits, and rights as a research subject when requesting to complete the survey. Participants are provided with the fact that the study is exploring how DTP pharmaceutical digital marketing impacts patient adherence to diabetes medications. They were made aware their responses would inform academic research about pharmaceutical marketing and ethical patient behaviour. Participants are told they are participating voluntarily

and they may withdraw from this research anytime they choose without penalty. There were no incentives to assist the process of participation. They did not provide any personally identifiable information (PII) ensuring that feedback from individual participants could never link results back to any participant.

CHAPTER 4: RESULTS AND ANALYSIS

4.1 Demographics Results and Analysis

The survey included the first 300 respondents which were diabetes patients based in the U.S. that provided information about how DTP pharmaceutical digital marketing affects adherence behavior. The sample is a diverse array of participants, so it can give representative information about the larger diabetes population.

4.1 Age Distribution

Table 4.1.1: Age Distribution of Participants

Age Group	Number of Participants	Percentage (%)
18 – 34	80	26.7%
35 – 54	120	40.0%
55+	100	33.3%
Total	300	100%

Interpretations:

The survey participants' age distribution is shown in Table 4.1.1; the majority of the sample were 35-54 years old (40.0%); this age group is typically busy with work, families, and caregivers, which will affect if they follow their diabetes regimen daily. Therefore, this age group is significant in assessing their adherence behaviors to DTP Pharmaceutical's digital marketing content.

The sample included younger adults (18-34) at 26.7%, which indicates a substantial number of young people manage diabetes; an issue similar to other researchers who have

identified an increase in type 2 diabetes in younger people and the lifetime responsibility for type 1 diabetes. Because young people are more likely to utilize digital technologies and social media, their participation in this study regarding DTP Pharmaceutical's use of digital marketing is crucial. Younger adults' experiences may provide some insights into how marketing messages interact with new models of digital engagement and decision-making about one's health.

Older adults (55+) comprised 33.3% of the sample; as a result, they remain a primary focus in diabetes studies because older adults are more prone to develop type 2 diabetes than any other age group and because older adults are more susceptible to developing comorbidities that complicate the treatment of diabetes. Older adults may encounter different types of adherence challenges, including polypharmacy, cognitive decline, or limited financial resources; these issues will affect medication compliance and response to DTP Pharmaceuticals' digital marketing content.

In general, the age distribution in the sample provides comparisons between younger, middle-aged, and older adults, each of whom may have varying experiences in managing diabetes and responding to DTP Pharmaceutical's digital marketing content for digital pharmaceutical therapy products. These differences will be an important context for analyzing adherence and marketing engagement across demographic groups in subsequent analyses.

Figure 4.1.2: Gender Distribution of Participants

Gender	Number of Participants	Percentage (%)
Male	140	46.7%
Female	160	53.3%
Total	300	100%

Interpretation:

The gender composition of the sample is shown in Figure 4.1.2. In total there were 300 people in the sample used to conduct this research and 160 of them said they were female; this is 53.3% of the total number of people surveyed. The remaining 140 or 46.7% of those surveyed said they were male. This shows a relatively equal number of males and females have been studied. It was important to have an even number of males and females so that any differences found in medication use, DTP Digital Marketing Exposure, and Diabetes Management Behavior, Health Information Seeking Patterns, and Responses to Content could be compared meaningfully by gender. Gender can influence these areas differently because men and women have different health perceptions, care-giving responsibilities, and how they interact with their healthcare providers. By having approximately the same number of men and women, this limits the possibility that the trends seen are mostly based on what is occurring with the larger gender group.

The purpose of this research is not to establish causations regarding gender differences in the study population's behavior. Rather, the nearly equal proportion of men and women in the sample will provide a basis for comparative descriptions in the subsequent statistical

analysis. The relative balance of the sample will also help to provide a foundation for interpreting adherence and marketing engagement trends within the sample and enhance the researchers' ability to develop a better understanding of how different populations experience DTP Digital Marketing in relation to their self-management of diabetes.

Table 4.1.3: Annual Income Levels of Participants

Income Level	Number of Participants	Percentage (%)
Less than \$40,000	90	30.0%
\$40,000 - \$80,000	120	40.0%
More than \$80,000	90	30.0%
Total	300	100%

Interpretation:

Table 4.1.3 displays participant distribution according to self-reported income level. The survey question asked respondents to self-report income ranges. Of the 300 participants that were analyzed, the majority (40.0%) reported earning between \$40,000 and \$80,000 per year. The second highest percentage was comprised of participants who reported earning less than \$40,000 (30.0%), followed by those who reported earnings over \$80,000 (30.0%). As the data suggests, the sample represents a population of individuals from a variety of income categories including low-, middle-, and high-income; therefore, it is possible to examine adherence to treatment plans based on a variety of socio-economic characteristics.

As would be expected, the large number of participants classified as middle-income (\$40,000-\$80,000) is representative of many insured populations in the United States. Middle-income individuals may have access to either employer-sponsored or privately purchased health insurance which may allow them to receive and adhere to prescribed treatments for diabetes. However, middle-income patients also may struggle with the financial burdens associated with paying deductibles and copays for prescriptions that are required to manage their diabetes. The large number of participants classified as low-income (<\$40,000) warrants special consideration when examining adherence to treatment for diabetes. Low-income individuals may experience more barriers to receiving prescribed treatments due to the cost of medications and/or lack of access to healthcare services. Additionally, low-income individuals may prioritize meeting their basic needs over taking their prescribed medications, which may impact their adherence to treatment plans despite medical guidance.

The number of participants classified as high-income (> \$80,000) will provide additional demographic diversity to the sample and will enable researchers to compare adherence to treatment plans at both ends of the economic continuum. High-income individuals may have greater flexibility in terms of obtaining prescription medications and other diabetes management products and services, which may influence their adherence to treatment plans in ways different than low-income individuals. In summary, the distribution of income within the sample will support how socioeconomic status may influence adherence to treatment plans for individuals managing diabetes and to assess how Direct-to-Patient pharmaceutical digital marketing may be experienced by these individuals.

Table 4.1.4: Health Insurance Status of Participants

Insurance Type	Number of Participants	Percentage (%)
Private Insurance	150	50.0%
Medicare/Medicaid	100	33.3%
Uninsured	50	16.7%
Total	300	100%

Interpretation:

Table 4.1.4 provides an overview of the health insurance status of the study subjects. Half (50.0%) of the 300 respondents, included in the data analysis, had private health insurance. Those covered by Medicare or Medicaid made up 33.3% of the respondents, and those who were uninsured made up 16.7%. The differences in insurance coverage among people with diabetes, which are illustrated in Table 4.1.4, provide a backdrop against which to evaluate the relationship between the type of health insurance coverage and adherence to prescribed medications, as well as the type of information that is available to them regarding their diabetes.

A significant proportion of the sample appears to have private health insurance coverage; many will have acquired this through employer-based plans, others may have purchased it themselves. The private health insurance market offers its customers greater access to prescription drugs, diabetes-related supplies and specialist services, than the public systems. Although private health insurance does not eliminate all of the barriers to adherence to

prescribed medications, it is likely to reduce some of the financial barriers to accessing prescription drugs and may reduce other types of barriers to accessing prescribed medications. Medicare and Medicaid cover the majority of the sample. Publicly funded insurance programs are important in providing access to prescription medications and other necessary supplies and services for people with diabetes. However, there may be limits to the extent to which these programs can provide access to prescribed medications due to coverage restrictions, prior authorization requirements, and variability in the formularies of each program. These may lead to adherence behaviors that differ from those of people with private health insurance, especially for newly approved or more expensive medications.

The existence of uninsured participants in the study indicates that there are still issues related to access to care and to prescribed medications in the diabetes community. Uninsured individuals will likely encounter significant barriers to acquiring prescribed medications, receiving regular medical care, and purchasing diabetes management supplies. The primary concern that is likely to influence treatment choices for uninsured individuals is the high cost of prescribed medications. Therefore, uninsured individuals may delay seeking medical care, may choose to adhere less to prescribed medication regimens, or may seek out alternative ways to manage their disease.

Although this study does not examine cost-related non-adherence, the inclusion of uninsured participants provides additional context for evaluating how the different levels of insurance coverage may impact adherence to prescribed medications.

The variations in the level of insurance coverage experienced by participants support a descriptive evaluation of how the level of insurance coverage may relate to adherence to prescribed medications and exposure to Direct-to-Patient pharmaceutical digital marketing.

Differences in insurance coverage can influence not only the access to treatment options, but

also the opportunity to engage with healthcare information, which are factors to consider when examining adherence behaviors in the diabetes community.

4.2 Exposure to DTP Pharmaceutical Digital Marketing

Participants shared the frequency, channel, and level of trust they felt when reviewing the advertisements. diabetes medications in the digital pharmaceutical ecosystem.

Table 4.2.1: Frequency of Exposure to DTP Pharmaceutical Advertisements

Frequency of Ad Exposure	Number of Participants	Percentage (%)
Daily	95	31.7%
Weekly	120	40.0%
Monthly or Less	85	28.3%
Total	300	100%

Interpretation:

Table 4.2.1 shows the number of times each participant reported being exposed to diabetes advertising from pharmaceutical companies via direct-to-patient (DTP) digital advertising methods. There was some variability in how often participants reported being exposed to DTP digital advertising; however, most participants reported being exposed at least once a week to DTP digital advertising (as shown in the table below).

More than half of the participants reported seeing diabetes advertising from pharmaceutical companies via DTP digital advertising every week (40.0%). Most people report seeing

advertising on a very frequent basis, but it is unlikely that they see advertising every day (or even every hour). Thus, it appears that for many participants, DTP digital advertising has become a normal part of using the internet. Participants were asked to report whether or not they saw diabetes advertising from pharmaceutical companies during their internet use. Therefore, if a participant sees DTP digital advertising every week, it is likely that he/she will use the internet to access diabetes information or use diabetes related websites regularly. In addition, it is possible that the participants' usage patterns influence the types of advertising that they see. The algorithms used to determine which advertisements to display may “learn” about the users’ interests over time and increase the likelihood of displaying advertisements for diabetes products and services.

However, approximately one-third of the participants (31.7%) report that they see diabetes advertising from pharmaceutical companies via DTP digital advertising every day. These participants may have high usage rates for the Internet and/or use diabetes-related websites on a very regular basis. As previously stated, the algorithms used to select advertisements may result in a higher number of diabetes product advertisements being seen by those who use the Internet for diabetes information or purchase products online.

Conversely, 28.3% of the participants reported that they see diabetes advertising from pharmaceutical companies via DTP digital advertising either rarely or never. These participants may have low rates of Internet usage, selectively choose what content they want to view online, and/or utilize software that blocks advertisements. Also, differences in purchasing habits and preferences of websites may influence the amount of DTP digital advertising that an individual sees.

The data suggests that the vast majority of participants report viewing DTP digital advertising for diabetes at least once a week. The variation in the reported frequency of exposure to DTP digital advertising represents an important contextual factor for future studies that examine the relationship between the frequency of exposure to DTP digital advertising and medication adherence/decision making behaviors.

Table 4.2.2: Most Common Platforms for DTP Pharmaceutical Digital Marketing

Understanding how pharmaceutical companies use digital platforms can help evaluate how DTP digital marketing targets patients. Participants were asked to identify which platform(s) they received advertisements for diabetes medications.

Digital Platform	Number of Participants	Percentage (%)
Facebook/Instagram	130	43.3%
Google Search Ads	90	30.0%
YouTube Advertisements	50	16.7%
Other Websites	30	10.0%
Total	300	100%

Interpretation:

The data presented in Table 4.2.2 identifies the primary digital platforms through which participants reported viewing advertisements for diabetes medications. Understanding the digital platforms utilized for DTP pharmaceutical digital marketing will provide an understanding of the potential locations where patients are most likely to view promotional

content and how pharmaceutical companies are presenting their messaging within the larger digital environment.

Participants reported that Facebook and Instagram are the two primary social media platforms through which they viewed pharmaceutical advertisements, representing 43.3% of the participants who reported exposure to advertisements. These findings suggest that social media represents a significant medium for delivering DTP pharmaceutical marketing associated with diabetes. The prominence of Facebook and Instagram may be attributed to their broad usage of demographics and the capacity to present advertising based upon user preferences, interests, and behaviors. For patients managing diabetes, pharmaceutical advertisements presented via social media may appear adjacent to personal content, peer activity, and community content regarding disease, potentially enhancing the visibility and perceived relevance of these advertisements.

Paid search advertisements appearing through Google search represented 30.0% of all reported exposure. Therefore, paid search was identified as the second most common source of exposure. These findings indicate that pharmaceutical advertising is typically seen by patients with diabetes when they are seeking information related to diabetes, medications, or health management. Paid search advertisements may represent a unique form of advertisement compared to those seen on social media; whereas social media advertisements are typically seen while engaging in non-purposeful browsing, paid search advertisements are seen during purposeful information-seeking behaviors. As such, paid search advertisements are likely to be seen by patients at times when they are more focused on identifying treatment options or addressing health-related questions.

Advertisements on YouTube represented 16.7% of all reported exposures. Therefore, YouTube video-based platforms have been utilized to some degree to target individuals with diabetes. However, YouTube has been used to a significantly lower degree than social media and search engines. YouTube advertisements may be seen by patients consuming health-related content or general content. In addition, YouTube advertisements may range from short promotional clips to longer educational-style advertisements. Although this study did not examine the content or format of these advertisements, the fact that YouTube was reported as one of the platforms that participants were exposed to, suggests that video is another component of the digital marketing mix for pharmaceutical companies.

A relatively small percentage of participants (10.0%) reported seeing pharmaceutical advertisements on other websites. This group may include health information websites, news sites, and other digital locations where display advertising is employed. Although other platforms represent a smaller portion of the total exposure landscape, they still represent additional digital platforms where patients may view pharmaceutical messaging.

The distribution of platforms appears to indicate that pharmaceutical companies primarily utilize social media and search engine advertising to reach individuals with diabetes. Pharmaceutical companies continue to utilize video and other digital platforms to reach individuals with diabetes. Additionally, the variation in platforms utilized to expose patients to DTP pharmaceutical digital marketing demonstrates that patient exposure to DTP pharmaceutical digital marketing is occurring in multiple digital environments that could influence the way in which messages are received and interacted with by patients.

Table 4.2.3: Trust Levels in Pharmaceutical Digital Marketing

In order to assess patient perceptions of pharmaceutical marketing messages, participants were asked if they would trust digital pharmaceutical advertisements as a reliable medical information source.

Trust Level	Number of Participants	Percentage (%)
High Trust	70	23.3%
Moderate Trust	110	36.7%
Low Trust	120	40.0%
Total	300	100%

Interpretation:

Table 4.2.3 shows the proportion of participants' self-reported confidence in using pharmaceutical digital ads as a trusted resource for getting medical information. When considering the likelihood of patients using promotional materials as a trusted resource for getting medical information, their level of confidence in the promotional materials will directly affect how they interpret and act on the messages provided by DTP Pharmaceutical Digital Marketing.

Fewer than one-quarter of the study's participants, 23.3%, reported a high level of confidence in pharmaceutical digital advertising. A smaller percentage than one-quarter of the study's participants report trusting the messages provided by pharmaceutical advertisers. In this context, a high level of confidence may indicate that the participants believe that the messages provided by the pharmaceutical advertisers are accurate or helpful for learning about diabetes

management. Although the number of participants reporting high confidence is significant, it indicates that high confidence in digital pharmaceutical advertising is not common among the study population.

The majority of participants reported moderate confidence, 36.7%, which represents those who recognize some utility in the message, but remain skeptical about its content, purpose, and/or potential biases. Those in this group may use digital marketing messages to raise awareness and/or stimulate questions, however, ultimately look to their healthcare provider(s), and/or other credible sources for validation before making decisions regarding their treatment. Therefore, this group represents a conditional relationship with digital pharmaceutical marketing and does not represent unconditional acceptance or rejection of the messages provided by these types of marketing efforts.

The remainder of the participants reported low confidence, 40.0%. This is the most populous category and represents the highest amount of skepticism towards pharmaceutical digital marketing. It is possible that those in this group report lower levels of confidence due to concerns about the promotion being biased, the focus being too much on the benefit vs. risk of the product, and/or overall distrust of commercial health-related information. Although lower levels of confidence do not preclude the possibility that participants will be exposed to, and possibly influenced by, the digital marketing messages; the lower levels of confidence indicate that many patients are cautious in their utilization of digital marketing messages and may be less likely to utilize them as a trusted resource for receiving medical advice.

The data shows that there is a range of how participants perceive pharmaceutical digital marketing. Additionally, the higher levels of moderate and low confidence suggest that, for many individuals with diabetes, DTP digital advertising is considered informational at best and

potentially untrustworthy at worst. These results provide relevant background information for analyzing the subsequent data concerning adherence behaviors since confidence can affect whether exposure to digital marketing is associated with greater engagement and/or actual changes in behavior.

4.3 Medication Adherence Patterns

Participants were asked about adherence with the prescribed diabetes medications using a self-reported categorical question. Specifically, the questions were written in laymen's terms and then mapped to one of these adherence categories.

The question stated: "Which statement best describes how you currently take your diabetes medication?"

1. I take my medication exactly as prescribed
2. I sometimes miss doses or adjust timing
3. I frequently miss doses or stop taking medications:

The responses were then categorized as:

- Fully adherent = option 1
- Partially adherent = option 2
- Non-adherent = option 3

The results intentionally reflect perceived adherence rather than objectively verified adherence. The research did not evaluate pharmacy refill data or include a longer validated instrument such as the Morisky Medication Adherence Scale. Because participants were asked about their own adherence using self-report measures, there may be limitations related to both recall (memory error regarding when you took your medication) and social desirability (tendency to report what is expected of you rather than how you actually behave). The

observed patterns of adherence from this study should be considered descriptive based on participant perceptions rather than objective clinical verification.

Table 4.3.1: Medication Adherence Rates Among Participants

Adherence Level	Number of Participants	Percentage (%)
Fully Adherent	165	55.0%
Partially Adherent	95	31.7%
Non-Adherent	40	13.3%
Total	300	100%

Interpretation:

Table 4.3.1 shows the amount of medication adherence of all 300 people involved in the study based on what each person said about how well they stuck to their doctor's directions about taking their diabetes medicine.

More than half of the participants (55.0%) stated that they were fully compliant with their diabetes medicines. People in this category say that they take their medicines when they are supposed to take them and follow the directions provided by their doctors. These respondents as such self-classify as fully adherent. However, having full compliance does not mean that the individual has had no challenges; even people who are compliant can need support to continue using their medications over time.

There are also a number of participants (31.7%) that stated that they were partially compliant. These participants selected the response indicating that they sometimes miss a dose or adjust timing of their medication. Partial compliance represents the most common issues related to the management of chronic diseases, because there are often many different things going on in someone's life (e.g., work, family, school), and it can be difficult to remember to take your medicine every day, or if you experience side effects from your medicine, or if something disrupts your normal daily routine.

Finally, 13.3% of the participants stated that they were non-compliant. These participants selected the response indicating frequent missed doses or discontinuation of medication. Although fewer than the other two categories, non-compliance places a participant at greater risk for poor glucose control and diabetes-related complications. In addition, the experiences of non-compliance highlight the long-standing challenges some participants will encounter when trying to develop a long-term routine for taking their medication, especially when there is little to no support or resources available to help the participant. When the partially adherent and non-adherent self-reported categories are combined, 45% of respondents reported some deviation to taking their medication as prescribed.

Table 4.3.2: Reasons for Medication Non-Adherence

To identify the motivations behind some participant's failure to follow their prescribed diabetes medication regimen; those participants who selected either "partially adhered" or "did not adhere at all," were asked to identify the main reasons for their non-adherence. The subgroup consisted of 135 participants, which equated to approximately 45% of the overall sample size. Since it is common for non-adherence to be a result of a variety of factors that are often interrelated, the survey allowed participants to indicate more than one factor.

Reason for Non-Adherence	Number of Participants	Percentage (%)
High medication cost	75	25.0%
Fear of side effects	60	20.0%
Forgetfulness	45	15.0%
Belief that medication is unnecessary	40	13.3%
Difficulty accessing prescriptions	35	11.7%
Other reasons	45	15.0%

A summary of reasons why participants did not adhere to their diabetes medication regimen is provided in table 4.3.2. Participants were questioned regarding the major contributors to difficulty in maintaining an adherence to their prescribed diabetes medication regimens. Participants who self-reported as partially or non-adherent reported multiple perceived reasons for straying from their prescribed medical regimen.

The largest proportion of respondents citing high medication cost (25.0%) as the main factor contributing to the lack of adherence to their prescribed diabetes medication regimens. Therefore, it appears that financial issues will continue to have a significant impact on a patient's ability to comply with their prescribed treatments. Additionally, when a medication has been deemed to be medically necessary, additional costs such as copays, deductibles, and out-of-pocket expenses may prevent an individual from using the medication consistently. Furthermore, the high proportion of medication cost as a factor that prevented adherence to prescribed medication regimens illustrates the continued issue of accessibility to affordable diabetes care.

20% of participants cited fear of side effects as a reason for their lack of adherence to their prescribed diabetes medication regimen. Fear of side effects may arise from several sources including past experiences, information found through online resources, and conversations with friends/peers. Fear of side effects may cause a patient to either delay initiation of a new prescription or discontinue a medication because they feel the risk of potential adverse events is greater than the benefit of initiating or continuing the medication without specific direction and reassurance from healthcare providers.

15% of participants stated forgetfulness as the main factor contributing to their lack of adherence to their prescribed diabetes medication regimen. Forgetfulness is a common day-to-day problem that occurs in the management of chronic diseases. Diabetes treatment usually requires continuous and consistent use of prescribed medications for extended periods of time. The hectic lifestyles, competing priorities, or changes in one's daily routine may lead to interrupted medication usage due to forgetfulness. This data implies that adherence problems do not solely occur due to intentional decisions; forgetfulness and/or unintended missed doses

may be a contributing factor. Potential solutions to overcome this type of barrier include reminders, structured routines, etc.

13.3% of participants stated that they believed the medication was not necessary. A person who believes their prescribed medication is unnecessary may question the necessity if they experience no immediate symptoms or if their blood glucose levels appear to be within normal limits. These beliefs may arise from a misunderstanding regarding the progression of diabetes and the role of medication in preventing the development of complications related to diabetes. Education efforts focused specifically on the importance of adhering to a prescribed medication regimen in the absence of symptoms would help to alleviate these perceptions.

11.7% of participants cited difficulty obtaining prescriptions as the main factor contributing to their lack of adherence to their prescribed diabetes medication regimen. Barriers to access may include limited hours of operation at pharmacies, limitations in the process for refilling prescriptions, transportation, or other administrative burdens. While the percentage of participants reporting difficulty obtaining prescriptions was lower than those reporting cost or concerns about side effects, difficulties in obtaining prescriptions can disrupt medication usage and exacerbate existing barriers to adherence.

15.0% of participants selected “other” as a reason for their lack of adherence to their prescribed diabetes medication regimen. The selection of “other” as a reason for the lack of adherence to a prescribed medication regimen highlights the complexities involved in the decision-making process regarding medication adherence and emphasizes the roles that individualized circumstances, preferences, and experiences can have in determining treatment behaviors.

Understanding the reported reasons for non-adherence is essential to the study's overall purpose of investigating whether exposure to pharmaceutical digital marketing influences medication-taking behavior. The study provides a framework for evaluating whether digital marketing messages respond to, enhance, or ignore the factors that have the greatest impact on adherence to prescribed medications among people with diabetes.

Table 4.3.3: Adherence Rates by Digital Marketing Exposure

Digital Marketing Exposure	% Fully Adherent	% Partially Adherent	% Non-Adherent
High Exposure (Daily Ads)	65%	25%	10%
Moderate Exposure (Weekly Ads)	55%	30%	15%
Low Exposure (Rarely Sees Ads)	45%	35%	20%

Interpretation:

People who said they saw these ads every day were much more likely to report taking all of their prescription medications as directed as those who reported seeing the ads every week (65 percent vs. 55 percent), and even more likely than those who rarely see the ads (45 percent). Among the people who reported seeing the ads most often, 25 percent said they didn't always take their medications as directed, and 10 percent said they never did. Participants reporting daily exposure to DTP advertisements were more likely to classify themselves as fully adherent compared to respondents who reported lower frequency of seeing the advertisements. However, it is still unclear whether advertising itself causes higher rates of

consistent medication-taking, or simply that people who are taking their medications regularly are more likely to notice the ads because they have a better understanding of what is available.

Among those who said they saw the ads occasionally (the “moderate” category), 55 percent reported being fully compliant, 30 percent were partially compliant, and 15 percent were non-compliant.

Finally, people who said they rarely or never saw the ads (the “low” category) had the lowest percentage of people reporting full compliance (45%), and the highest percentages of people reporting partial (35%) and no (20%) compliance. Participants who self-reported lower frequent exposure to advertisements also represented a lower proportion of those who self-reported full adherence. It should also be noted that people in the “low” category may be less likely to use the internet to find health information or may prefer to receive health information through other means (e.g., friends, family members, healthcare providers), which could influence their adherence to prescribed treatments.

The data suggests that there is a gradient effect of DTP exposure in relation to self-reported medication adherence, such that as people report less frequent exposure to DTP digital marketing, their likelihood of reporting full adherence also decreases. These findings indicate an association between the exposure frequency of DTP advertisements and higher proportions of self-reported full adherence.

Table 4.3.4: Adherence Rates by Annual Income Level

As affordability of medication is also a key influence rate of adherence, we will now look at how adherence by income level may differ.

Income Level	% Fully Adherent	% Partially Adherent	% Non-Adherent
Less than \$40,000	45%	35%	20%
\$40,000 – \$80,000	55%	30%	15%
More than \$80,000	68%	22%	10%

Interpretation:

The data provided in table 4.3.4 illustrates medication adherence patterns based upon an individual's annual income. Understanding the adherence patterns related to income will provide further context to illustrate how financial status relates to the patient's ability to maintain compliance with their prescribed diabetes regimen. Since it has been identified that one of the most common barriers to maintaining adherence is affordability of medications, income level would be a logical way to interpret adherence behavior.

A higher percentage of the high-income participants demonstrated full adherence (68%) and had the lowest percentage of non-adherence (10%). The trend illustrated through these data indicates that individuals who are financially better off are likely to experience fewer cost-related barriers in obtaining and maintaining access to diabetes medications, and possibly more stable insurance coverage and less out-of-pocket burden.

The middle-income participants demonstrated a moderate adherence profile; 55% reported full adherence, 30% reported partial adherence and 15% reported non-adherence. It

appears that although middle-income participants may have access to insurance and medications, they are likely to continue to experience financial burdens such as copays, deductibles, etc., that cause them to be inconsistent with their medication use.

The self-reported low-income participants demonstrated the lowest percentage of full adherence (45%) and the highest percentage of non-adherence (20%). The trends observed in this group support previous research that has illustrated that financial issues create barriers to effective diabetes management. Low-income individuals may find it difficult to afford their medications, access consistent medical care, navigate through their insurance plan, and therefore develop gaps in their diabetes treatment.

The results from the adherence rates across the three income groups indicate that lower-income participants self-report lower proportion of full adherence as compared to higher-income respondents. Although income itself does not predict whether an individual will adhere to their prescribed diabetes treatment plan, it does demonstrate that financial factors may be significant influences on an individual's ability to comply with their prescribed diabetes treatment plan. Therefore, it is essential to consider the implications of financial barriers when examining the effectiveness of digital pharmaceutical marketing in increasing awareness and engagement among patients and translating those behaviors into long-term adherence to their prescribed treatment plans.

Table 4.3.5: Adherence Rates by Health Insurance Status

Gaining access to adequate health insurance coverage seems to be another glaring distinction in how consistently adherents adhere to their diabetes medications.

Insurance Type	% Fully Adherent	% Partially Adherent	% Non-Adherent
Private Insurance	65%	25%	10%
Medicare/Medicaid	50%	35%	15%
Uninsured	40%	30%	30%

Interpretation:

There is a difference in how people adhere to their medication based upon their type of health insurance (see table 4.3.5). A patient's access to health care providers and continuous monitoring for the disease is impacted by their type of health insurance coverage.

Private health insurance provided the most complete adherence to prescribed medication. Participants with private health insurance had the greatest percentage of complete adherence, with 65% of the sample indicating that they always take their prescribed diabetes medication. Only 10% of the samples with private health insurance indicated partial adherence. While private health insurance does not completely alleviate adherence issues, the data from this study suggest that private health insurance provides access to prescription medications and other services related to diabetes care that will support the creation of more stable treatment routines.

Medicare and/or Medicaid insured participants reported the least amount of complete adherence to prescribed diabetes medication. Fifty percent of the samples with Medicare and/or Medicaid indicated complete adherence. Thirty-five percent of the sample was partially adherent; fifteen percent of the sample did not follow their prescribed regimen. These results suggest that although public insurance programs provide access to needed medical care, the insured population under Medicare and/or Medicaid may experience barriers to taking their prescribed diabetes medications consistently due to formulary restrictions, prior authorization processes, and limited coverage for diabetes medications.

Uninsured participants reported the least amount of complete adherence to prescribed diabetes medication. Forty percent of the sample without insurance indicated complete adherence. Thirty percent of the samples reported no adherence to their prescribed regimen. These results support the notion that individuals who lack insurance coverage face challenges in managing a chronic illness such as diabetes. Lacking health insurance reduces an individual's access to prescribed medications and routine care, increasing the potential for interrupted treatment or alternative management techniques.

While insurance status is not the sole determinant of adherence, the greater level of non-adherence experienced by the uninsured participants highlights the role of having adequate insurance coverage in enabling patients to adhere to their prescribed treatments consistently. Overall, the data from this study suggests a correlation in adherence to prescribed diabetes medication based upon the type of health insurance coverage that exists. The data suggest that access to health insurance has an impact on patients' ability to adhere to prescribed treatments, which supports the need to consider structural barriers (i.e., access to health insurance) when

evaluating the influence of other factors (e.g., digital pharmaceutical marketing) on patient adherence to prescribed treatments.

Table 4.3.6: Adherence Rates by Income Level and Digital Marketing Exposure

By viewing income level against the exposure to digital marketing we can also assess if there was an effect on adherence to medications between higher income vs. lower income participants of these DTP pharmaceutical campaigns.

Income Level	High Marketing Exposure	Moderate Exposure	Low Exposure
Low-Income (<\$40,000)	50% Adherence	40% Adherence	30% Adherence
Middle-Income (\$40,000-\$80,000)	65% Adherence	50% Adherence	35% Adherence
High-Income (>\$80,000)	78% Adherence	60% Adherence	42% Adherence

Interpretation:

Table 4.3.6 considers both the income of respondents and their exposure to digital marketing; it can provide a basis for understanding if the associations between digital marketing exposure and adherence differ by economic group.

In the high-income category, adherence was highest in the high-exposure group (78 percent), where respondents reported that they were adherent to their prescribed diabetes treatments. Across the income group, adherence declined as exposure to digital marketing decreased; with 60 percent of those exposed to a moderate level reporting adherence, and 42 percent of those who had low exposure reporting adherence. These results indicate that there may be a number of advantages (i.e., fewer financial and/or access-related barriers) that allow high-income individuals to utilize knowledge gained through digital marketing and translate it into consistent use of their prescribed medications.

The results of the middle-income category were similar to those in the high-income category. Adherence was greatest when the respondents were exposed to pharmaceutical digital marketing at a high level (65 percent), and adherence was lower when they were exposed to a moderate level (50 percent) and lower still when they were exposed at a low level (35 percent). These results are similar to those found in the high-income category, suggesting that marketing exposure may result in an increase in engagement across income levels, however the overall adherence rate in the middle-income category was lower than that of the high-income category.

Adherence was generally lower for all levels of marketing exposure for the low-income category. Although the adherence rate was greatest for those with high exposure (50 percent) compared to those with moderate exposure (40 percent) and low exposure (30 percent); the adherence rate of the low-income category was less than that of the middle- and high-income categories. This indicates that while increased exposure to digital pharmaceutical marketing may be associated with improved adherence among lower-income individuals, marketing itself may not be enough to address the financial and access-related barriers that impact the ability of lower-income individuals to take their medications as directed.

Regardless of income category, adherence was lowest among those who had the least exposure to digital pharmaceutical marketing. This indicates that limited engagement with digital marketing may be associated with lower levels of adherence, regardless of income category; however, the results also indicate that economic factors have a large role in determining whether patients are able to respond to treatment related information.

These results suggest that exposure to DTP digital pharmaceutical marketing may be associated with higher levels of adherence across income categories; however, the magnitude of the association appears to vary based upon economic status. While digital marketing may help raise awareness and engage patients in their treatment, structural factors (e.g., income and cost) will continue to determine whether patients are able to maintain consistent adherence to their diabetes medications.

4.4 Summary of Key Findings

The results from this study indicate some very specific trends regarding the way in which direct-to-patient (DTP) digital marketing of pharmaceuticals has affected the relationship between adherence to medication and chronic disease management among people with diabetes; and how these relationships are influenced by both broader structural issues, including income and health insurance, and the larger societal context in which patients live and make choices about their own behaviors. Together, the results of the study suggest that while DTP digital marketing does affect patient behavior and can therefore play a part in enabling or limiting adherence, its impact is significantly influenced by a number of other structural and environmental factors.

There were several distinct trends evident in the data from this study. One trend clearly evident was that there is a positive association between the amount of exposure individuals

experience to DTP digital marketing and their self-reported adherence to prescribed medications. Individuals who experienced relatively high levels of exposure to diabetes-related pharmaceutical advertising, particularly through social media and Google Ads, indicated a higher rate of adherence compared to those who reported limited exposure to DTP digital marketing. Thus, the association found in this research between digital marketing and adherence may suggest that repeated exposure to messaging about medications helps to maintain a focus on the medication regimen, encourages continued engagement with the prescribed regimen, or promotes greater awareness of the importance of taking medication for diabetes management. Again, however, because exposure to digital marketing represents only one of many potential influences on adherence behavior, the association identified in this research should be viewed as representative of an association, rather than an indication of a causal link.

In addition to highlighting the associations mentioned above, the results of this study also demonstrate that financial constraints continue to limit adherence to diabetes medications. Lower-income individuals and those without health insurance consistently reported higher levels of non-adherence, regardless of their level of exposure to DTP digital marketing. In fact, even low-income individuals who reported relatively high levels of exposure to DTP digital marketing still had adherence rates that were far lower than those of their higher-income counterparts. These results support the view that cost barriers, such as the cost of medications, copayments, and limitations on access to care and medications, continue to be the largest obstacles to consistently using diabetes medications. It appears that exposure to digital marketing alone is insufficient to mitigate these economic impediments to adherence.

Another factor that emerged as relevant to the context in which digital marketing influences adherence to medications is the degree of trust that individuals place in the

promotional messages of pharmaceutical companies. A substantial proportion of participants reported having low levels of trust in the messages they receive from pharmaceutical companies. The low levels of trust in promotional messages from pharmaceutical companies suggest that DTP digital marketing may not be sufficient on its own to promote adherence, since many individuals will likely evaluate information received from marketing sources with caution, seeking validation and clarification from their healthcare provider prior to making decisions regarding their treatment. Therefore, the results of this study emphasize the importance of clinical relationships and the need for digital marketing to supplement and complement, rather than substitute for, professional medical guidance.

Health insurance status was another factor that influenced adherence rates across the sample of individuals studied. Participants who had private insurance reported the highest levels of adherence, while the individuals without health insurance reported the lowest levels of adherence to their prescribed medications. Participants who had either Medicare or Medicaid coverage fell somewhere in the middle. These differences reflect the role that health insurance coverage plays in enabling individuals to afford and obtain their prescribed medications and to maintain a stable course of treatment. Health insurance status affects not only the ability to pay for prescribed medications and ongoing care, but also the availability of healthcare services, the reliability of treatment plans, and the likelihood of maintaining a continuous course of treatment, all of which are critical to successful management of chronic diseases.

The results of this study suggest that DTP digital marketing may have a supporting role in promoting adherence to prescribed medications by increasing awareness, familiarity and engagement among patients who already have the economic and structural resources necessary to take advantage of their prescribed treatment options. However, it is clear from the results of this study that economic factors (e.g., income and health insurance coverage) have a much

more profound impact on whether individuals are ultimately able to follow their prescribed treatment plans. While digital marketing may be seen as a contributing factor in the promotion of adherence to prescribed medications within the larger context in which individuals live and make treatment decisions, it is not seen as the dominant factor in determining adherence to prescribed treatment plans.

CHAPTER 5: DISCUSSION

5.1 Introduction of Results

In order to understand the impact of direct to patient (DTP) pharmaceutical digital marketing on medication adherence, and what DTP digital marketing is doing to improve health behaviors and outcomes, it is necessary to take a closer look at the digital marketing activities that are being implemented by pharmaceutical companies in today's rapidly evolving digital world. Because so many different types of digital marketing platforms exist, the question of whether DTP digital marketing contributes positively to improving patient health behaviors and outcomes, or if DTP digital marketing is simply contributing to increased awareness of a specific drug product, is an area that needs to be explored further.

With the increasing prevalence of chronic diseases like diabetes, long-term adherence to prescribed medications plays a major role in preventing complications from developing and maintaining quality of life. Digital marketing has changed how patients are exposed to information regarding their prescription drugs and the management of their disease. Patients are no longer required to be in a clinical setting to receive information about their medication; they can be reached via digital advertising on social media and search engines. This type of exposure has the ability to affect a patient's perception of treatment options, his/her awareness of medication availability, and ultimately, his/her compliance with prescribed care.

At the same time, however, there are concerns regarding the ability of commercially driven messaging to contribute to sustaining adherence behaviors, especially in patients who have to deal with various barriers to treatment, i.e., economic, structural, and/or psychological.

As discussed in Chapter 4, the data collected from the study indicates that patients with diabetes who report more frequent exposure to DTP digital marketing tend to report higher levels of self-reported medication adherence compared to those who report less frequent

exposure. This finding suggests that DTP digital marketing may serve as a reinforcement mechanism for maintaining awareness of prescribed treatment regimens and may encourage patients to remain engaged in prescribed treatments.

However, the study findings do not indicate that the relationship between marketing exposure and adherence is consistent across all patient populations. Socioeconomic factors were found to significantly moderate adherence behavior, in those participants who experienced financial constraints (i.e., low-income levels or uninsured), consistently had lower adherence rates than those without financial constraints regardless of their exposure to DTP digital marketing.

These findings suggest that although DTP digital marketing may increase awareness of available treatment options and may enhance patient engagement with prescribed care, it is not capable of compensating for barriers related to affordability and access to care. In addition to socioeconomic factors influencing adherence behavior, participant attitudes towards pharmaceutical marketing were found to influence how patients engage with digital content. A substantial number of participants indicated that they were skeptical of promotional messages and therefore did not rely solely on digital marketing content to guide their treatment-related decisions. Rather, many relied on their healthcare provider(s) to verify information prior to making treatment-related decisions, highlighting the continuing relevance of the clinical relationship in facilitating patient adherence.

The purpose of this chapter is to provide a critical evaluation of the findings from this study and to situate the findings in the broader context of existing research on medication adherence, digital health communication, and pharmaceutical marketing. The following section will discuss the implications of the findings from this study for healthcare providers, policymakers, and pharmaceutical manufacturers, and will consider how DTP digital marketing may serve as

an additional mechanism to support adherence, rather than serving as a replacement for other mechanisms that support adherence. Additionally, this chapter aims to provide clarity on the role of DTP digital marketing in diabetes care and to provide insights into how future patient engagement and policy development initiatives can benefit from understanding the potential benefits and limitations of DTP digital marketing.

5.2 The Growing Role of Digital Marketing in Healthcare

The U.S. pharmaceutical industry has dramatically changed its marketing strategy to include digital media because patients have been seeking out health related information online. Prior to consulting a healthcare provider, many patients will research symptoms, diseases, and treatments via digital media. As a result of this change in the way patients find health related information, pharmaceutical companies have taken advantage of the digital media space to provide patients with information regarding pharmaceuticals prior to consultation with a healthcare provider. Data from the pharmaceutical industry demonstrates this shift toward digital media with spending on DTP pharmaceutical advertising reaching \$6.58 billion in 2022, and digital media representing more than half of the total spending (IQVIA, 2022).

Digital media, especially social media and search-based media, have driven the expansion into the digital media space by pharmaceutical companies. Social media, including Google, Facebook, and YouTube have become central to the pharmaceutical marketing funnel. These platforms enable pharmaceutical companies to target individual consumers based upon demographics, consumer behaviors, and search history. When compared to older methods of pharmaceutical advertising, such as television advertising and print advertising, pharmaceutical

companies can utilize digital marketing to communicate with consumers in a highly flexible and precise manner.

In contrast to earlier forms of DTP advertising, digital marketing allows for highly personalized messaging. Pharmaceutical companies can adjust their digital campaigns on an immediate basis; repeat them across different digital platforms; and create digital campaigns using interactive content, such as video, blog posts, and links to other digital resources. The ability to tailor messaging may contribute to a higher relevance and visibility for pharmaceuticals and their treatments, particularly for consumers with chronic conditions, like diabetes, where patients make ongoing treatment and adherence decisions. However, the greater reach and personalization of digital marketing raise concerns about whether pharmaceutical companies' digital marketing efforts simply influence consumers' perceptions of pharmaceutical products beyond raising awareness and increasing brand recognition.

One primary concern in the literature surrounding DTP digital marketing is whether digital marketing leads to better medication adherence or if it simply creates more loyalty to a pharmaceutical company's branded product. Some researchers believe that pharmaceutical companies' advertising focuses primarily on the most profitable pharmaceutical brands, which may lead consumers to choose these branded products over similarly effective generic products that are less expensive (Mintzes et al., 2019). Additionally, critics of pharmaceutical advertising state that while digital marketing may promote patients' preference for certain branded medications, structural barriers to adherence such as cost of medication and insurance coverage may not be addressed through digital marketing.

However, the results of this study indicate that for some patients, DTP pharmaceutical digital marketing may represent an important cue to action. For example, the frequent exposure to digital marketing related to medications appears to correlate with reported higher rates of

adherence, particularly among those who have access to both medications and healthcare providers. Digital marketing may serve as a reminder of the importance of continued consistent use of medications, or support patient engagement with treatments over time. Nonetheless, the effect of digital marketing is influenced by a myriad of economic and social factors that ultimately determine whether patients can take action on the information they have received.

In summary, the growing role of digital marketing in healthcare represents a larger trend in how patients obtain and interact with medical information. While digital media provides opportunities to raise awareness and facilitate engagement, the success of digital media in improving adherence depends upon how well digital media is aligned with the delivery of clinical care and how well digital media addresses the practical realities of patients' daily lives. Overall, the findings of this study suggest that digital pharmaceutical marketing may enhance adherence for some patients; however, the degree to which digital marketing affects patients' ability to adhere to prescribed treatments is heavily dependent upon a variety of economic, social, and access to care issues.

5.3 Key Findings and Their Significance

The primary findings of this study can be summarized in five key observations including:

1. Higher reported DTP exposure was associated with higher proportions of self-reported full adherence.
2. Income level showed a gradient relationship with adherence classification, with higher-income participants reporting higher full adherence.
3. Insurance status was associated with adherence classification, with uninsured participants reporting the highest proportion of non-adherence.
4. Cost was the most frequently reported reason for non-adherence among partial and non-adherent participants.
5. A substantial proportion of participants (40%) reported low trust in pharmaceutical digital marketing

The findings from Chapter 4 provide empirical evidence on DTP digital marketing impact on adherence patterns. One of the trends uncovered by the study was the relationship between DTP marketing exposure and medication adherence. Patients with frequent pharmaceutical advertisements (daily or weekly) adhered 65% of the time, compared to 45% for patients with low DTP marketing exposure (Table 4.10). This suggests that exposure to frequent pharmaceutical advertising acts as a treatment reminder.

Another important outcome centered on the skepticism patients have regarding DTP marketing claims and evidence, specifically 40% of participants indicated a low level of trust in pharmaceutical digital advertisements while 23.3% indicated a high level of trust (Table 4.7).

An overwhelming number of patients expressly verified information related to drugs through healthcare providers, or reliance on independent information, as part of the process of adherence.

These results essentially agree with prior work by Frosch et al. (2016) in *Health Affairs* that identified many patients feeling advertisements regarding pharmaceuticals were overly promotional, and that it should not be assumed that all risks and benefits of the drugs were fully understood. Similarly, Chao et al. (2022) in *Journal of Patient Research*, noted that patients would be more willing to trust physicians and peer-reviewed research vs another advertisement made by a pharmaceutical company. DTP advertising may raise awareness, but the potential effectiveness is limited by the public's skepticism about the advertisements and claims made by the company and indicates that more transparency and balanced information may be needed to generate patient trust.

While DTP pharmaceutical digital marketing serves as a useful reminder and engagement device, findings from the research indicate financial concerns remain the primary barriers to adherence. Analysis indicated that many patients, and a majority specifically in lower-income situations or uninsured, experience substantial barriers to obtaining their prescribed medication regardless of their exposure to digital marketing. 30% of uninsured participants reported being non-adherent compared to 10% of privately insured people, 20% of patients with incomes less than \$40,000 were non-adherent, meanwhile, only 10% with incomes in excess of \$80,000 were non-adherent. These results support previous research which has concluded that cost is one of the major differences in medication adherence, even when patients recognize the need to take their medication. Hernandez et al. (2021) states that out-of-pocket costs are among the most cited reasons for not taking medication when managing chronic disease. When a patient

can see a DTP pharmaceutical marketing message reminding them of the importance of adhering to their prescription medication, their financial realities still prevent them from responding.

Data from the Kaiser Family Foundation (KFF, 2023) reveals that 25% of U.S. adults report not being able to afford their prescription medications. Affordability is particularly burdensome for low-income populations, older adults, and those with chronic conditions such as diabetes. This creates the question of whether or not DTP pharmaceutical marketing is only beneficial to financially stable individuals while the lower income patients without insurance coverage access to their prescriptions are left outside the conversation?

A major point of contention in the discussion of DTP pharmaceutical marketing is whether these campaigns really support patients' attempts to work through access problems of adherence, or if they are merely advertising tools for pharmaceutical companies. While supporters argue that DTP advertising informs and empowers patients, critics argue that DTPA calls for a specific brand-name medication that is often more expensive than generic competitors. Iqvia (2022) reports that the large majority of DTP advertising spending is directed to get patients to spend their money on high revenue brand-name drugs, not equally as effective but much lower price generic drugs.

Importantly, pharmaceutical manufacturers do have patient access programs which provide financial assistance and support nonprofit organizations to provide discount/free medications. This area of support and access may be area organizations focus more efforts on in parallel to their advertising efforts to help drive total patient outcomes through adherence.

The study also revealed an important third theme, which is the widespread skepticism about pharmaceutical digital marketing. While DTP ads raised awareness and engagement, some patients were still reluctant to rely on marketing claims because of credibility and transparency

concerns. 40% of participants reported low trust in pharmaceutical ads, indicating they doubted the accuracy of the messaging and potential bias (see Table 4.7). Patients with higher levels of education and health literacy were more likely to seek and verify medication-related information through independent medical sources before complying with decisions:

Such skepticism is aligned with existing literature showing that patients view pharmaceutical marketing as largely promotional and misleading. For example, Frosch et al. (2016) in *Health Affairs* found that patients tended to believe that pharmaceutical ads emphasize medication benefits without proper regard for risks and side effects.

Furthermore, Chao et al. (2022) in *Journal of Patient Research*, found that patients were likely to trust health care providers and peer-reviewed research than content that was pharmaceutical-sponsored, suggesting that marketing, on its own, may not increase adherence without recommendations from physicians and education efforts directed to patients on their own.

Experts recommend that pharmaceutical companies help establish greater trust and credibility through DTP advertising with increased transparency, which involves more balanced information about risks, costs, and alternative treatment.

The outcomes of the study suggest that DTP pharmaceuticals social media marketing does play an important role in influencing patient adherence but is only a part of the solution.

5.4 Contradictions and Unexpected Results

The study identified correlations between DTP pharmaceutical digital marketing exposure and self-reporting of medication adherence. However, a few contradictory and complex trends are important to critically evaluate.

The first trend is that the higher exposure levels to DTP pharmaceutical digital marketing were found to have a direct relationship to higher proportions of self-reported full adherence, yet large numbers of subjects from the high exposure categories also reported either partial or no adherence. For example, if the marketing was primarily responsible for determining adherence behavior, it would be expected that nearly all of those in the high exposure category would report being fully adherent. Therefore, the fact that many do not indicates that marketing exists among a much larger set of influences (both structural and behavioral) to determine adherence, rather than marketing itself causing adherence.

A second trend suggests that a very significant adherence gradient based upon income existed. Those with higher incomes had significantly larger proportions of full adherence compared to those with lower incomes. In this case, the results suggest that structural issues (i.e., affordability), similar to or possibly more so than marketing exposure, can drive adherence behavior.

A third trend indicates there is a significant conflict between exposure and trust in the advertising. Despite a large portion of respondents reporting little to no trust in pharmaceutical digital marketing, exposure was associated with higher proportions of self-reported adherence. This reduces the likelihood of a simple causal model where trust is correlated directly to the relationship between exposure and behavior. Rather, the data indicates that exposure could potentially increase awareness and/or reinforce behaviors even when there is distrust. Alternatively, those who report lower trust can have other influencing characteristics such as level of digital engagement or health literacy which can be a factor.

A fourth trend observed cost continued to be the most frequently cited reason for partial or no adherence. This creates a contradiction between informational exposure and actual ability to access medications. Awareness of medications does nothing to mitigate financial barriers to accessing them. This reinforces the second observed trend that indicate structural barriers may limit the potential impact of DTP pharmaceutical advertising.

These trends support the interpretation of the findings as both descriptive and associative. There is a deep complexity in medication adherence behavior and the interactions between digital marketing information, socio-economic status, trust, and access-based constraints.

Chapter 6: Summary, Implications, and Recommendations

6.1 Summary of Main Findings

This research has increased our understanding of Direct-to-Patient (DTP) digital marketing, as it pertains to medication adherence behaviors. Furthermore, this study produced many findings. First, we found a positive relationship where a greater amount of DTP marketing exposure is associated with greater adherence behaviors. Among patients who viewed pharmaceutical advertisements every day or every week, the medication adherence rate was 65%. In contrast, the average medication adherence rate was 45% for patients who viewed pharmaceutical advertisements less than every day or week. Based on this study's findings, we find an association that exposure to pharmaceutical advertisements for DTP medicines served as a prompt for patients to adhere to their treatment protocol, which is similar to the previous papers developed on patient engagements to health information, as Ventola indicated (2014).

However, again, one of the other mitigating factors in this study was that financial access to treatment options served as significant barriers to medication adherence. For patients who were in the low-income group (less than \$40,000 yearly), patients were adherent to their medications 80% of the time and these individuals had a non-adherent rate of 20%, which was double the non-adherent rate of patients in the high-income group (greater than \$80,000), which had a non-adherent rate of 10%. Furthermore, uninsured patients demonstrated higher non-adherent behavior rates than other patient groups, with an overall non-adherent rate of 30%, while individuals with private insurance/non-financial barriers had lower rates of non-adherent behavior, demonstrating a non-adherent rate of only 10%.

These results imply that direct access to medications, and adherence, appear strongly correlated. This finding is consistent with findings from other studies focusing mainly on the effects of patient's out-of-pocket costs on non-adherence behavior, which includes Hernandez et al. (2012). Further, this study showed that some high-grossing brand-name drugs predominated DTP advertising, as mostly non-brand name drugs generally displace lower-cost generics (IQVIA, 2022; Blumenthal et al., 2020), raised the ethical argument of equitable benefits from the marketing. Furthermore, this study showed consistent scepticism by patients towards the DTP marketing claims. 40% of participants they have little/very little trust in pharmaceutical drug digital advertisements, and only 23.3% had a lot/very or a lot of trust when presented with DTP marketing advertisements.

Many patients were actively trying to confirm drug-specific information with their healthcare team or searched for it on their own. The scepticism we found also lined up conceptually with previous studies that found patients regarded the pharmaceutical advertisements as not only overly promotional but also lacking the disclosure of the risks and benefits in the advertisements (Frosch et al., 2016 and Chao and Russell, 2022). Therefore, while the DTP marketing appears to help create awareness for medication adherence (for dependent variables), the most effective reach is often short due to a lack of trust from the general public who are looking for increased transparency surrounding, and a more equitable message regarding, DTP marketing.

Ultimately, from a health behavior psychology perspective, DTP pharmaceutical marketing is a cue to action, specifically of cue and action in the Health Belief Model (HBM). When patients are repeatedly exposed to the advertisements, they may adhere to their

medication plan as well as have a discussion with their health care providers which will ultimately lead to an acceptable positive adherence (Glanz et al. 2021). This study concludes that although there are ways the marketing cues are certainly significant in practice, for patients to take substantial action in the health belief model, they will need the resources to act, and they need to trust that the written material they are being instructed to read is accurate; there are still barriers in affordability and finding accessible health care. Because the study utilized a cross-sectional design and self-reported adherence measure, the findings should be interpreted as descriptive associations rather than causal relationships.

6.2 Implications of the Findings

The dissertation findings hold significant implications for many players within the health care ecosystem. The DTP digital marketing is certainly raising patient awareness of a new kind of drug and acting as a behavioral signal for some patients, but whether that spurs adherence only truly depends on their financial ability to afford it and their scepticism about the medical profession and the brand. Pharmaceutical companies should think more deeply about brand delivery of the marketing message but should think of other ways to communicate about financial access to be able to get the drug they are marketing, including highlighting their patient assistance programs or better promoting the different affordable generics they have.

Patients who trust their providers need more balanced messaging that explored the risks and benefits of the product/cost and at the very least avoided a concerted effort to persuade. By offering some level of balance while including affordability discussions, pharmaceutical companies could still alienate a big section of the patient population and potentially act unethically regarding their public health contributions. The study served the purpose of reaffirming the role of health care providers as a central source of trusted information. Patients

typically approach their health care provider to have what they sense is a “safe haven” where they can unload a whole ton of information.

Equally, it will be important for health care providers to be ready to discuss the medication they have been advertised, as it relates to effectiveness, side effects and economic costs as they relate to other medication substitutes. Health care providers can use the level of DTP ad awareness as a precursor to address adherence, while addressing both financial anxiety and some misperceptions regarding medications.

For policy makers and regulators, the issue is still the longstanding underlying financial complexity in terms of medication adherence. Public health policy makers are encouraged to identify improvements to financial access to prescription medications that they assess as being clinically useful. They should seek out action to improve affordability and access to healthcare insurance.

From patients' and public health's perspective the findings from this study indicate that patients, after considering income or disadvantages around medications, have an array of challenges both regarding access to medications and adherence to prescribed regimen. DTP marketing provides some patients with useful information about medications or therapies. From a broad public health perspective, until the systemic problems around affordability are addressed, a large number of people will likely be excluded from DTP marketing, no matter the intention to educate or inform. Genuine adherence is not awareness, it is accessing options that are affordable, and available to all those who need it.

6.3 Recommendations for Future Research

There needs to be an understanding of how direct to patient (DTP) marketing of drugs impacts the way people take their medicine. Although this study has provided some insight into the ways in which DTP marketing affects trust, exposure and adherence, there is still much to learn about how marketing may positively or negatively affect the sustained behaviors of taking prescribed treatments.

The first and most significant of the areas that require future study relates to the role of cost-related messaging in DTP pharmaceutical marketing. There is a strong indication from the results of this study that costs remain one of the primary determinants of adherence, and in many cases likely will have more of a positive effect than will marketing exposure. Therefore, it would be very beneficial to conduct studies that look at how DTP marketing campaigns that incorporate information regarding affordability, such as patient assistance programs, savings cards, insurance assistance, and/or discounted prices of generic products can affect the degree to which a patient follows through with their prescribed treatment plan. These studies should be experimental in design. Adherence rates among the subjects who are exposed to different types of DTP advertising, i.e., traditional benefit-focused advertising vs. advertising that incorporates cost transparency and accessibility information, should be compared to determine if the inclusion of affordability information in the advertising increases the likelihood of a patient adhering to their treatment regimen.

An equally productive direction for future research would be to expand on the qualitative and quantitative exploration of patient attitudes, perceptions, and beliefs towards DTP pharmaceutical marketing. Since quantitative measures were used in this study to measure

the level of trust that existed between patients and marketers, using qualitative research methods such as interviews or focus groups can provide a richer understanding of why patients do not trust some marketing messages and what specific components of advertisements lead to the perception of being misled. In addition, future studies should incorporate validated adherence scales (e.g., MMAS-8), and pharmacy refill data to determine whether the associations observed in this study persist under objective measurement. Examples of questions that could be explored include how patients interpret the language in marketing communications; what elements of advertisements appear to be credible or misleading; and how patients distinguish between educational content and promotional content. Additionally, qualitative research could also explore what patients believe are the best formats for receiving information regarding their prescription medication, and whether there are specific communication strategies that enhance perceived legitimacy, transparency and trustworthiness.

Additionally, future research could extend beyond a single therapeutic area and compare and contrast the effects of adherence and digital marketing exposure across various disease states. Since diabetes requires a high degree of self-management over an extended period of time and represents a distinct set of adherence challenges, comparative research across disease states may find that the same dynamics are at play in other diseases where patients require long-term treatment. Furthermore, comparative research across disease states may allow researchers to evaluate whether the relationships observed in this study occur similarly across treatments with varying cost structures, symptomatology, and patient populations. Additionally, researchers could also evaluate how adherence-related variables interact with digital marketing exposure based on the severity of the disease, the complexity of treatment, and the demographic characteristics of the patients.

Finally, future studies could examine how changes in the regulatory environment affecting DTP pharmaceutical marketing influence patient behavior and adherence outcomes. As the use of digital marketing continues to evolve, regulatory agencies continue to respond to concerns related to transparency, fairness, and patient protection. Studies examining the effects of changes in regulatory environments, such as changes in disclosure requirements, social media advertising guidelines, and oversight mechanisms, may provide insight into how policy influences both the marketing practices of companies and the treatment outcomes of patients. Similarly, studies may also evaluate how health insurance policies and DTP marketing intersect, particularly in terms of the design of formularies, prior authorization requirements, and patient access to marketed medications.

Together, these proposed research directions illustrate the complex interrelationship of adherence and digital marketing and the necessity for interdisciplinary research that integrates knowledge from marketing, behavioral science, health economics and public policy. Through expanding upon the results of this study, future research may develop a greater understanding of when DTP pharmaceutical digital marketing influences patient adherence, and what strategies can be employed to ensure that commercial communications meet the objectives of public health.

Digital pharmaceutical marketing should therefore be understood as one informational component within a multifactorial adherence landscape shaped by structural, economic, and behavioral factors.

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APPENDIX A: TABLES AND FIGURES

4.1 Age Distribution

Table 4.1.1: Age Distribution of Participants

Age Group	Number of Participants	Percentage (%)
18 – 34	80	26.7%
35 – 54	120	40.0%
55+	100	33.3%
Total	300	100%

Figure 4.1.2: Gender Distribution of Participants

Gender	Number of Participants	Percentage (%)
Male	140	46.7%
Female	160	53.3%
Total	300	100%

Table 4.1.3: Annual Income Levels of Participants

Income Level	Number of Participants	Percentage (%)
Less than \$40,000	90	30.0%
\$40,000 - \$80,000	120	40.0%
More than \$80,000	90	30.0%
Total	300	100%

Table 4.1.4: Health Insurance Status of Participants

Insurance Type	Number of Participants	Percentage (%)
Private Insurance	150	50.0%
Medicare/Medicaid	100	33.3%
Uninsured	50	16.7%
Total	300	100%

Table 4.2.1: Frequency of Exposure to DTP Pharmaceutical Advertisements

Frequency of Ad Exposure	Number of Participants	Percentage (%)
Daily	95	31.7%
Weekly	120	40.0%
Monthly or Less	85	28.3%
Total	300	100%

Table 4.2.2: Most Common Platforms for DTP Pharmaceutical Digital Marketing

Digital Platform	Number of Participants	Percentage (%)
Facebook/Instagram	130	43.3%
Google Search Ads	90	30.0%
YouTube Advertisements	50	16.7%
Other Websites	30	10.0%
Total	300	100%

Table 4.2.3: Trust Levels in Pharmaceutical Digital Marketing

Trust Level	Number of Participants	Percentage (%)
High Trust	70	23.3%
Moderate Trust	110	36.7%
Low Trust	120	40.0%
Total	300	100%

Table 4.3.1: Medication Adherence Rates Among Participants

Adherence Level	Number of Participants	Percentage (%)
Fully Adherent	165	55.0%
Partially Adherent	95	31.7%
Non-Adherent	40	13.3%
Total	300	100%

Table 4.3.2: Reasons for Medication Non-Adherence

Reason for Non-Adherence	Number of Participants	Percentage (%)
High medication cost	75	25.0%
Fear of side effects	60	20.0%
Forgetfulness	45	15.0%
Belief that medication is unnecessary	40	13.3%
Difficulty accessing prescriptions	35	11.7%
Other reasons	45	15.0%

Table 4.3.3: Adherence Rates by Digital Marketing Exposure

Digital Marketing Exposure	% Fully Adherent	% Partially Adherent	% Non-Adherent
High Exposure (Daily Ads)	65%	25%	10%
Moderate Exposure (Weekly Ads)	55%	30%	15%
Low Exposure (Rarely Sees Ads)	45%	35%	20%

Table 4.3.4: Adherence Rates by Annual Income Level

Income Level	% Fully Adherent	% Partially Adherent	% Non-Adherent
Less than \$40,000	45%	35%	20%
\$40,000 – \$80,000	55%	30%	15%
More than \$80,000	68%	22%	10%

Table 4.3.5: Adherence Rates by Health Insurance Status

Insurance Type	% Fully Adherent	% Partially Adherent	% Non-Adherent
Private Insurance	65%	25%	10%
Medicare/Medicaid	50%	35%	15%
Uninsured	40%	30%	30%

Table 4.3.6: Adherence Rates by Income Level and Digital Marketing Exposure

Income Level	High Marketing Exposure	Moderate Exposure	Low Exposure
Low-Income (<\$40,000)	50% Adherence	40% Adherence	30% Adherence
Middle-Income (\$40,000-\$80,000)	65% Adherence	50% Adherence	35% Adherence
High-Income (>\$80,000)	78% Adherence	60% Adherence	42% Adherence

APPENDIX B: Survey Instrument

Survey Title: Digital Pharmaceutical Marketing and Medication Adherence Among
Individuals with Diabetes in the United States

Participant Information and Consent

You are invited to participate in a research study examining how digital pharmaceutical marketing relates to medication adherence among individuals living with diabetes. Participation is voluntary and anonymous. You may skip any question or stop at any time.

By continuing, you confirm that:

- You are 18 years of age or older
- You live in the United States
- You have been diagnosed with diabetes

Section 1: Demographic Information

1. What is your age?

☐ 18–34

☐ 35–54

☐ 55 or older

2. What is your gender?

☐ Male

☐ Female

3. What is your annual household income?

☐ Less than \$40,000

☐ \$40,000–\$80,000

☐ More than \$80,000

4. What type of health insurance coverage do you currently have?

☐ Private insurance

☐ Medicare or Medicaid

☐ No health insurance

Section 2: Medication Adherence

5. Which statement best describes how you currently take your diabetes medication?

☐ I take my medication exactly as prescribed

☐ I sometimes miss doses or adjust timing

☐ I frequently miss doses or stop taking medication

6. If you do not always take your medication as prescribed, what are the main reasons?

(Select all that apply)

☐ High medication cost

☐ Fear of side effects

☐ Forgetfulness

☐ Belief that medication is unnecessary

☐ Difficulty accessing prescriptions

☐ Other reasons

Section 3: Engagement With Pharmaceutical Digital Marketing

7. How often do you see digital advertisements for diabetes medications?

☐ Daily

☐ Weekly

☐ Monthly or less

8. On which digital platforms have you seen diabetes-related pharmaceutical advertisements?

(Select all that apply)

☐ Facebook or Instagram

☐ Google search advertisements

☐ YouTube

☐ Other websites

9. How much do you trust information provided in digital pharmaceutical advertisements?

☐ High trust

☐ Moderate trust

☐ Low trust

10. Have digital pharmaceutical advertisements influenced your decision to continue taking your prescribed diabetes medication?

☐ Yes

☐ No
