

Spring 6-12-2024

Intimacy Without The Chance Of Heartbreak For Richer, For Poorer, In Sickness & In Health

Cynthia Nguyen

Follow this and additional works at: <https://digitalcommons.spu.edu/honorsprojects>



Part of the [Categorical Data Analysis Commons](#), [Macroeconomics Commons](#), [Social Statistics Commons](#), and the [Statistical Models Commons](#)

Recommended Citation

Nguyen, Cynthia, "Intimacy Without The Chance Of Heartbreak For Richer, For Poorer, In Sickness & In Health" (2024). *Honors Projects*. 227.

<https://digitalcommons.spu.edu/honorsprojects/227>

This Honors Project is brought to you for free and open access by the University Scholars at Digital Commons @ SPU. It has been accepted for inclusion in Honors Projects by an authorized administrator of Digital Commons @ SPU.

**Intimacy Without The Chance Of Heartbreak
For Richer, For Poorer, In Sickness & In Health**

by

Cynthia Nguyen

Faculty Mentors:

Dr. Brian Gill, Dr. Geri Mason

Honors Program Director:

Dr. Joshua Tom

A project submitted in partial fulfillment of the requirements
for the Bachelor of Arts degree in Honors Liberal Arts
Seattle Pacific University
2024

Presented at the SPU Honors Research Symposium
Date: May 18, 2024

Abstract

The present study investigates the effect of the COVID-19 pandemic on the consumption of porn, shifts in the production of porn consumed between men and women, and the breakdown of any pattern in adult content via film, pictures, and audio. A quantitative approach was done by using R to analyze data pulled off of Pornhub, Reddit's GoneWildAudio subreddit, and Archive of Our Own from 2018 to 2023. Statistical inference and modeling is used to attempt to find a pattern in the production of online porn across three mediums over several years before, during, and after the pandemic. Regardless of events and conditions that occurred during or due to the pandemic, there seems to be no decrease in production of works on the analyzed platforms. Newly uploaded works seem to follow a linear relationship with time even when consumers may be facing financial, social, mental, or physical hardships during the COVID-19 pandemic. Furthermore, it may be possible that any pattern that persisted before any crisis continues to. Given how large the porn industry has grown and how underanalyzed the production of porn is across several mediums during times of financial and social hardship more research is crucial to understanding the economic impact on the consumption and production of porn.

Keywords: pornography, consumption, production, COVID-19

Introduction

You hand your laptop over to your friend, before they can type anything into the search bar, your social life flashes before your eyes. You can't help but think, "Did I delete my search history earlier?" Sex is a subject we rarely want to bring up in our day to day lives despite a large majority of us taking part in sexual intimacy with others and/or independently. Pornography and masturbation are also subjects we rarely want to exit closed quarters. By definition, pornography is "printed or visual material containing the explicit description or display of sexual organs or activity, intended to stimulate erotic rather than aesthetic or emotional feelings" (Oxford Reference). The latter portion of the definition is the key to distinguishing an anatomy and physiology textbook and pornography. The online pornographic and adult content industry has grown from \$607.72 million to \$976.91 million going from 2018 to 2022 in the United States alone (Statista, 2022). This study intends to show the possible impacts of the events that occurred during and due to the COVID-19 pandemic in the production of pornography, as well as participate in taboo-destruction of porn and how essential it is to keep an eye on an industry that remains relatively unregulated and hidden behind closed doors and deleted search histories.

This study aims to answer the question: between 2018 to 2023, what changes occurred in the production and consumption of pornography across various mediums, and could these changes be correlated with the COVID-19 pandemic's lockdown conditions potentially lowering barriers to entering the industry? An analysis of the previous literature on the pornography industry will be done followed by the method and descriptive statistics of data pulled off of three platforms: Pornhub, Reddit's r\GoneWildAudio subreddit, and Archive of Our Own's explicit works. The descriptive statistics will include visualizations to highlight patterns and aid in the data analysis which includes summarizing the data through models and hypothesis testing to show a story of what happened over time and what may come.

Literature Review

Multiple aspects of pornography have been studied, mainly from a sociological lens, and more from the side of consumption. While production of pornography is not studied as often as the consumption of it, it is still essential to understand the effects of pornography and its consumption, and topics on the sex industry as a whole should be investigated via the previous literature on the topics. Previous literature also tended to speak more in a binary frame of “men” and “women” or “male” and “female,” so there will be a gap in studies across other genders or sex such as nonbinary, gender-fluid, or intersex individuals.

Demand for and Perception of Pornography

Demand and supply growth in the general sex industry is facilitated by economic growth, the development of the Internet, globalization, and shifts in attitude around sexuality (Hakim, 2015). With technology advancing, it gets easier and easier to be exposed to pornography. There has always been great concern regarding children and younger people being exposed, and is often argued to have negative impacts. While children and adolescents do not necessarily all feel distressed in the face of unwanted exposure, there is a consistent minority that experience distress (Flood, 2009). While the youth grow to become naturally sexual beings, they should be provide with age-appropriate material due to sexual abuse and poor sexual and emotional health stemming from sexual ignorance (Flood, 2009). However, pornography does not show sex in realistic ways, often does not educate on intimacy on romance, marginalizes groups, and occasionally eroticizes violence (Flood, 2009). While the presence of aggressive pornography is not particularly increasing, teenagers being exposed to violent pornography has been related to teenage dating violence mainly in male adolescents (Rostad et al., 2019). Together with Flood (2009), Rostad et al. (2019) emphasizes how exposure to sexist and violent pornography should be minimized and alternative sources of education on healthy sexual behavior and relationships while not sacrificing sexual speech should be provided to encourage healthy interpersonal and sexual relationships. In a review, there has been research cited that indicates a possible relationship existing between

pornography consumption and violent attitudes against women and objectifying women (Hernandez, 2011). Though, in a study linking psychopathology to pornography consumption in an individual assessing 226 male participants, it is mentioned that the association between consumption of porn and abusive attitudes toward women is mainly seen in adults with more antisocial personalities (Egan & Parmar, 2013). This once again shows how important it is for children and adolescents to begin learning about how to have healthy relationships amongst other people.

While the sex industry is technically an equal opportunities space, female demand is lacking while the main audience's focus on female performers leads to them earning more than their male colleagues (Hakim, 2015). The perception of performers in the sex industry as a whole and in pornography has been studied in multiple papers. In a study where 165 undergraduate students in an introductory to psychology class at an urban Southern California university were surveyed on what they perceived to be the work motivation for pornography actors, showed how male actors were attributed more positive motivations and negative attitudes towards pornography were positively correlated to students attributing more negative motivations to female actors (Evan-DeCicco & Cowan, 2001). Due to men being perceived with higher sexuality than women, the students believed that female actors were more likely than male actors to be coerced into the industry and were mainly doing it for money compared to male actors being perceived to be motivated by sexual liberation, fantasy fulfillment, or generally enjoying the work (Evan-DeCicco & Cowan, 2001). Evan-DeCicco & Cowan (2001) also found that male students rated male and female actors more equally while female students rated male actors more positively than female actors. They speculated that it is possible this difference is due to female students holding female actors to higher standards being they are also female or fear the socially deviant actions of the female actors would be reflected on women as a whole. This falls in line with Paasonen (2021) where women would distinguish their preferences from women as a whole while explaining that there is a difference between the ethical, political, and moral values they live by versus the sexual scenarios they wish to engage with. In a study on feminists who consume pornography, all participants also highlight one of the roles of porn to be a sexual fantasy (Macleod, 2021). As there is a fear of

pornography influencing negative attitudes towards women, women who indulge in pornography or any kinks that may seem to objectify themselves or place them in a submissive position to a man will want to reiterate that their sexual preferences do not imply their core values.

On the topic of coercion, a study which examined the responses of 1767 female actors regarding their work motivation and likes and dislikes with their work showed that about 20% of participants believe exploitation occurs, but less than 1% (only one participant) marked that they were exploited (Griffith et al., 2012). While the perception of female actors being motivated by money is in-line with the true most frequent motivator for porn actresses to have entered the industry, there were different reasons the women needed money ranging from paying bills or tuition, supporting their family, and being broke (Griffith et al., 2012). One of the most favorable aspects of being a porn actress was the people, where interviewed porn actresses agreed that individuals within the industry were more accepting and non-judgmental in comparison to those outside of the industry, but coworkers or management and producers can also be difficult to work with as the category of ‘people’ was also identified as the most negative aspect of the job (Griffith et al., 2012). Though, a study analyzing 476 American adult pornography consumers regarding their exposure to accounts on how studios treated performers, their beliefs on the prevalence of mistreatment, and efforts they have taken to do their due diligence on studios or defend mistreated performers indicated that most participants were unconcerned about mistreatment, but did take some action upon learning about it even if it was no longer interacting with a studio’s videos (Tollini & Diamond-Welch, 2021). This means that if consumers were made more directly aware of mistreatment in the industry, there would be actions taken to reprimand producers on the consumer side.

Pornography and (Dis)satisfaction

Overall, there has also been research that shows a connection between pornography and sexual dissatisfaction. Significant relationships have been found where pornography consumption has been positively associated with arousal from porn, which predicts a preference for porn over partners and leads to a negative association with sexual satisfaction and relationship satisfaction (Wright et al., 2021). With relationship dissatisfaction, there are concerns regarding porn consumption and infidelity. Through a

series of studies, Lambert et al. (2012) found that pornography consumption is related to lower reported commitment to relationships, that consumers behaved in a way where outside parties can tell they have a low degree of commitment, and this all leads to higher levels of infidelity. It was also found that in comparison to those who continued consuming, participants in the study who refrained from consumption reported higher levels of commitment to their partners (Lambert et al., 2012). The element of unrealistic acts in porn tend to also be a worry concerning why a person may feel dissatisfied with sex in real life. Interview data from 30 men who consume pornography has found that viewers navigate between the 'real' and 'unreal' elements of pornography through personal, social, and temporal bases (Taylor, 2022). Taylor (2022) also found that men who interact with porn with varying levels of critical thinking to experience pleasure in pornography, establishing the differences between genuine and performed pleasure from actors. Similar attitudes can be seen in the consumption of consensual non-consensual work. Some participants in an empirical study on feminists who use pornography want to view consensually produced non-consensual works that come off as realistic where participants want to simultaneously be convinced and not convinced of the scene's realism (Macleod, 2021). That is, there is an element of suspension in disbelief with any pornography, especially extreme pornography similar to consensual non-consensual work, is consumed.

Briefly looking at a study on 164 males, pornography consumption is related to socioemotional closeness which is realized through meaningful interactions with significant others (Popovic, 2011). Popovic (2021) found that male pornography users likely use porn as an escape from intimacy and expression to search for intimacy, but age was not able to be better controlled for this study. However, given the relation between pornography consumption and sexual and relational satisfaction seen in Wright et al. (2021), it can be speculated that part of why there is dissatisfaction is due to the escape from intimacy with one's significant other.

Women and Pornography

In the sample of 476 pornography consumers Tollini & Diamond-Welch (2021) analyzed, it reflected previous findings where men are more likely to consume pornography than women. This smaller proportion can also be seen in the lack of studies on women in relation to pornography. A systematic review and thematic synthesis of research papers on pornography use by women in committed relationships found that there are multiple papers that show how pornography had both an enhancing and diminishing influence on sexual pleasure such as reassurances of the body appearance but also misrepresentation of sexual acts or expressions of pleasure, and these opinions in some cases came from the same group of women surveyed (Litsou et al., 2021). In the context of feminism, Macleod (2021) presents findings on how feminists try to have more consumer awareness by avoiding pornography that is unethically produced while not devaluing the labor of sex workers. They looked for agency, which contrasts objectification of the female body, and often wanted a specific element of relatability described as “wishing” that they were the woman on screen which connects with a sense of realism and authenticity to the pornography (Macleod, 2021). As mentioned in the previous section on how consumers have a suspension of disbelief while consuming porn, there is a limit on what can be feasibly overlooked to be perceived as authentic. Similar to how Taylor (2022) showed men engaging with pornography, Attwood et al. (2021) spoke on how engagement with porn is complex in a study focusing on the everyday engagements with porn focusing on women aged 18-25. Participants noted that engaging with porn led to “sense-making and sensory processes” in the context of sexuality. It has also been shown in a 2017 journalistic survey of 2438 Finnish women that there are gaps between pornographic and sexual preferences where there is no direct connection between a person’s sense of sexual self and porn consumption patterns (Paasonen, 2021). Paasonen (2021) gives an example of this with a participant being a lesbian woman deriving pleasure from heterosexual porn but still acknowledging they would not want to have sex with a man.

Another topic to note is how the bondage, discipline/domination, submission/sadism, and masochism (BDSM) subcultural group falls into the picture. Of the 19 participants in Guglielmi &

Reddy-Best (2021), all identifying as women in the BDSM community, they participated in the community to gain a sense of community, explore more of their sense of self, and seek out sexual liberation via fantasy. Through BDSM, these women were able to take control of their bodies, reclaim their sexualities, and felt more empowered and confident even if some of them were occasionally hesitant to disclose their participation (Guglielmi & Reddy-Best, 2021). Agency also can be expressed through dress negotiations and interactions with others involved in their lifestyle (Guglielmi & Reddy-Best, 2021). Alike the feminists from Macleod (2021), these women actively reject a patriarchal society and its expectations, valuing agency in their pornography and dress respectively.

There is a large gap in the literature concerning the production of pornography in general. This is a project that analyzes online pornography production to better understand the overall production trends within the industry regarding: production in three different online mediums, whether a time of financial and social crisis affects trends, and if it is possible to forecast where production trends will go. It is important to acknowledge that there are many angles an analysis on pornography production can come in at, but this project aims to objectively look at the production regardless of the ethics during production of any works, motivators to upload works, and mass deletions or reuploads of work as the data for all of these factors was not available at the time of completing this project.

Motivation

Part of taboo-destruction is understanding how critical it is to address topics that may be out of our own comfort zone to learn of the realities others may live or something that we may all be experiencing in silence. In the words of Aldous Huxley, “Facts do not cease to exist because they are ignored,” and the taboo nature of topics surrounding sex should be studied as the Internet grows and fuels the growth of the pornography industry. This project was completed in an attempt to also build more ground for research on sexual health and interactions with pornography as it becomes increasingly easier to be exposed to. Berdychevsky & Carr (2020) state that sexuality research has multiple obstacles that

include how uncomfortable people may feel as their preconceived notions are challenged and methodological challenges. One of the largest challenges for this project was finding the data.

There are two main hypotheses within this study looking at the consumer and producer behavior over 2018 to 2023. They aim to predict the possibility of statistically significant changes in consumption and production during the pandemic and shifts in how prolific the production is across different mediums.

Hypothesis #1

There is an overall positive rate of production across all mediums. This is based off of Hakim (2015) highlighting the overall sex industry's growth that is partially facilitated by the Internet.

Hypothesis #2

There is a change of either a distinct increase or decrease in production during the COVID-19 pandemic. This could be due to how much time individuals may have during lockdowns were set in place or lockdowns leading to studios needing to put on hold filming and uploading. Griffith et al. (2012) mentions how difficult it is to see what constitutes a porn actor given how the Internet allows for individuals to bypass needing a film crew, a producer, or director by using whatever camera they have around to film and upload behind a paywall or gain ad revenue. There is a chance that production patterns may not change as the offset of no studios being able to produce may be balanced out by how many individual creators upload themselves.

Method

All the data worked with was imported into RStudio to be explored for any irregularities, prepared with wrangling and cleaning, and then analyzed. All functions used were part of base R and the following packages:

- RedditExtractoR: "an R package for extracting data out of Reddit" (Rivera, 2022)
- Tidyverse: "an opinionated collection of R packages designed for data science. All packages share an underlying design philosophy, grammar, and data structures" (Tidyverse, n.d.)

The quantitative analysis was done in two parts, the descriptive statistics and then minimal modeling based on information presented by the descriptive statistics.

The goal was to explore three mediums of pornography: videos, audio, and written works. The platforms that were chosen were Pornhub, Reddit's r/GoneWildAudio subreddit (GWA), and Archive of Our Own (AO3) to represent the mediums respectively. Pornhub is one of the first and remains a major online pornography platform to offer free viewing of video porn. It is also one of the only pornography platforms that releases large datasets and performs its own data analytics of all its traffic on its Webmasters page. In a similar fashion of being able to freely upload onto Pornhub, its audio porn counterpart is GWA. GWA is a subreddit where users can upload audio porn and scripts for audio porn individually or in collaboration with other users (r/gonewildaudio [GWA], n.d.). Most audios will be uploaded onto sites such as Soundgasm and Erocast, but links to these sites will be posted on GWA due to the other platforms not having as user-friendly search interface. Unlike Pornhub, GWA posts are all from individual users and do not have studio productions of audio porn. Similarly, AO3 is a platform where users can upload written works, typically fandom based work, that ranges from non-romantic, non-explicit work to hard explicit content (Organization for Transformative Works [AO3], 2009). All three of these platforms were chosen given how large their followings are, how they all hold a large amount of online pornography, and have relative ease of access to their data for the purpose of this study.

Production pattern is easily found by measuring total monthly uploaded works on Pornhub and AO3. For GWA, a post ranks in descending order under Top of All Time depends on an internal calculated score based on how much interaction the post garnered. Interaction comes in the form of users upvoting, commenting, and giving awards to a post. GWA's data will be structured to show how many posts from each year between 2018 and 2023 made it into the first 1000 spots in Top of All Time. Given these 1000 posts are a systematic sample of all posts on GWA, it can give insight into if audio porn is becoming more popular or engaged with over time. At a categorical level, it can also give insight into whether or not specific categories are more popular than others. Overall, by looking at the engagement from consumers of audio porn, it can be used to forecast possible shifts in production of audio porn.

The two primary parts of this quantitative analysis are divided by each platform. The first portion will be going through descriptive statistics to address any data points that visually stand out in time series graphs and aid in choosing how to model the pattern of production in the second portion. Graphs produced will all have time set as the independent variable while monthly total uploaded content will be measured. Percent change in monthly totals will also be graphed to catch any patterns on a monthly basis. The second portion will be focused more on showing statistical evidence of if there is a significant relationship between the years observed and production and what pattern that relationship may continue to follow.

Data Collection

Data was collected from the three sites as best as they could be done within the scope of the project and the technological capabilities of a laptop. The process of data collection and variable descriptions from each platform will be expounded below. All datasets were filtered to go from January 1st of 2018 to May 4th of 2024.

Pornhub

Due to some technical difficulties, on pulling data directly from Pornhub using Webmasters, the data would have been over 30 gigabytes that provided information on site traffic rather than production (Pornhub). The data from Pornhub came indirectly from Kaggle. This data was extracted by user Azaari (2023) with two datasets, “videos” and “categories_index.” About ten random videos were manually verified to check for the accuracy of the datasets by searching provided urls and going over all information each variable provided. The dataset “videos” contained all the necessary information for this study as each row represented a video that was uploaded to the platform. The raw data after filtering for January 1st of 2018 and onward had 3,950,202 rows. The most recent video in the dataset was October 18th of 2023, which means close to 4 million videos were uploaded in a span of 5.75 years. Variables in the raw dataset included the exact timestamp down to the millisecond of when a video was uploaded, the uploader, the title and description of the video, and the hyperlink to the video. No data was missing in this dataset.

No points were omitted in the preparation process. The main wrangling that was done was breaking down the time of upload down into the year and month to then sum to get the monthly total of videos posted and then calculate percent change using Equation (2). The description for all the variables used in visualizations and analysis is seen in Table 1.

Table 1. Variable Descriptions of Pornhub Data

Variable Name	Variable Description
year	Year video was posted
month	Month video was posted
days_since	Number of days since January 1st, 2018 to the current date
total	Monthly total of videos posted
percent_change	Percent change in monthly total of videos posted; Calculated by dividing the difference between the present month and the previous month by the previous month

GoneWildAudio

The package `RedditExtractoR` was used to extract data from the GWA subreddit using the “`find_thread_urls`” function where it was sorted to pull the first 11 pages of top posts of all time on the subreddit. “Top of All Time” is calculated internally where in general, posts with the highest amount of upvotes and comments are sorted in descending order. Due to the limitations of the function and Reddit’s API data pulling permissions, it was only able to pull 1000 posts. Each row of the dataset represents one post which includes variables such as the full title of the post which includes all the tags, the user who posted, the date the post was posted, number of upvotes and comments the post received, and the URL to the post. However, the objective of pulling the posts off of the subreddit is to analyze if there was a shift in who audio porn was aimed at (male speaker for female listener, female speaker for male speaker, etc.). In theory, if there was an increase in more audios for female listeners over the observed years, then there was likely a demand from female listeners that drove an increase in the production of audios for female listeners.

The GWA subreddit has a tagging system which denotes if the post is a script, a post filling a script, an original audio, or an improvised audio, what is depicted in the audio posted, and the sex of the speaker and intended listener. The variable descriptions can be found in Table 2 below.

Table 2. Variable Descriptions of GWA Data

Variable Name	Variable Description
url	URL to Reddit Post
date	Date posted in YYYY-MM-DD format
year	Year when the post was uploaded
author	Reddit username
title	Title of the audio posted
type	Category tag denoting the romantic and/or sexual relationship depicted in the work
F4F	Female Speaker for Female Listener
F4M	Female Speaker for Male Listener
M4F	Male Speaker for Female Listener
M4M	Male Speaker for Male Listener
n_type	Total audios of a specific category tag

Archive of Our Own

The data from AO3 was manually entered into a comma-separated values file before being imported into RStudio. The dataset serves to measure how many new written works were created each month from January 2018 to May 2024 under the rating “Explicit” in categories split off into whether a work is female on female, female on male, male on male, and the sum of those categories. Each row represents one month and the rest of the information was pulled by using the search feature of AO3 allows for filtering all works newly created between two dates under manually set filters by entering “created_at:["2018-01-01" TO "2024-05-04"]” into the search bar and by each category. Similar to the Pornhub data, percent change in monthly totals were also calculated by Equation 2. All variable descriptions can be reviewed in Table 3.

Table 3. Variable Descriptions of AO3 Data

Variable Name	Variable Description
year	The year filtered
month	The month filtered
month_num	Number associated with the month
days_since	Number of days since January 1st, 2018 to the current date
category	Category tags to denote what kind of romantic and/or sexual relationship(s) will be depicted
F/F	Female/Female relationship
F/M	Female/Male relationship
M/M	Male/Male relationship
All	Sum of F/F, F/M, M/M works
total	Monthly total of works in a particular category
percent_change	Percent change in monthly total of works in a particular category; Calculated by dividing the difference between the present month and the previous month by the previous month

Modeling

The two techniques used will be simple linear modeling and ANOVA. Conditions for a simple linear model are linearity, the error distribution is centered at zero, uniform spread, and independence between errors (Cannon et al., p. 27). The second condition is covered by using a least squares regression, the “lm()” function in R, which forces the residual mean to be zero. Uniform spread, or the homoscedasticity, of the variance in the points was met by running diagnostic plots. Lastly, the linearity between the independent and dependent variables seen in visuals created for the descriptive statistics of the Pornhub and AO3 data covers the first condition. The models can be expressed with Equation 1.

$$y_i = \beta_0 + \beta_1 x_i + \varepsilon_i \quad (1)$$

- i represents individual months
- β_0 and β_1 represents the coefficient of the intercept of the linear model and the coefficient of the rate of change in monthly total works over one month
- x represents the days since January 1st, 2018
- y represents the monthly total of works uploaded and

- ε represents the difference between expected monthly total and actual monthly total uploaded works

Besides looking at monthly total works, percent changes in those totals were also calculated in the Pornhub and AO3 data. All percent change calculated in this study follows Equation (2) below.

$$\text{Percent Change (\%)} = \frac{\text{This Month} - \text{Last Month}}{\text{Last Month}} * 100 \quad (2)$$

However, as seen later in the descriptive statistics section, the percent change was not used as a variable in any modeling or ANOVA.

Due to how different the GWA data was from the other two platforms, one-way ANOVAs were used to see if there was a statistically significant relationship between the year (treated as a categorical variable) and number of works that made it to the “Top of All Time” within each year across all categories. Based on Cannon et al. (2019), Equation (3) represents the one-way ANOVA model (p. 207).

$$y = \mu + \alpha_i + \varepsilon \quad (3)$$

- μ represents the overall mean in number of works in Top of All Time in all groups
- α_i represents the overall mean over in the i^{th} group
- y represents the number of works of the specific group in a specific year
- ε represents the error term

Unlike linear regressions, ANOVA will not be able to tell us much beyond whether there is a significant difference between categories or years such as how different they are from each other or which category or year is most different from the others.

Assumptions

Besides assumptions such as all data pulled is accurate and samples are an accurate representation of all the data that exists on each site, there is one other key assumption that would interfere with the development of the visualizations and models used in this project.

One of the reasons for not including data from other platforms of the three mediums is the need to consider if content was crossposted across various platforms. Even within platforms, there is a chance reposting is done when one user downloads the work of another and reuploaded on the same platform. The likelihood of internal reposting occurring on Pornhub is more likely compared to GWA and AO3 due to how much larger the platform is and how moderators are likely to catch reposts on GWA and community backlash would mitigate reposts on AO3. Though there is still a non-zero possibility that some audio porn may be crossposted on Pornhub, however with the assumption that no reposted content nor crossposting occurred, we can control for the potential of high interaction being due to a particular actor/artist/author.

Limitations

This study is looking at whether there is a correlation between times of hardship and porn consumption and production, but correlation does not imply causation. There could be a variety of reasons for any changes or nonchanges on both sides of the porn industry. Shifts or lack thereof can be from the business structure of porn production companies being economically shock proof, looming variables that balance out the effects of the pandemic lockdown conditions, or demographic shifts. This study does not directly look at data of new studios, actors, artists, or authors popping up during the pandemic, but rather goes into if production patterns change due to some form of economic stability. Without looking at data across several other times of crisis, we cannot be sure of whether it is lockdown conditions, financial difficulties, or increased exposure to porn leading to any changes we see.

It is important to acknowledge that production does not fully show the picture of what could be occurring on the consumption side of the market and vice versa. There is a chance that there were dips in traffic to all sites that did not affect the rate of production coming due to producers not being sensitive to consumer preferences or production schedules already being set in stone. This study is only trying to look at if there is a trend in production patterns over time over three mediums of pornography at categorical levels when possible.

Results

Once visualizations were made, patterns were easily discernible. The descriptive statistics informed which model(s) could be used to map the historical pattern, represent an insight at a larger scale of the porn industry, and project its growth rate. The descriptive statistics will be covered first for each platform and followed by statistical analyses in the same manner.

Descriptive Statistics

For each analyzed platform, there are summaries of statistics in tables and primary visualizations that show the overall pattern across any categories that were measured. Most visualizations will have a trend line added in using Tidyverse's "geom_smooth()" function. This function plots a blue line that represents the trend line through the data and has a gray band that represents the standard error of where specific points on the trend line could be. If points fall within the gray band, they are closer to aligning with the trend line. The more points fall outside the band, the more they stray from the trend. Most visualizations will also have a blue shade over a period of time which will represent a time of crisis. The two times of crisis highlighted are the 2008 financial crisis and the COVID-19 pandemic. The former spans from December 2007 to June 2009 according to Federal Reserve History (Rich, 2013). And, the latter spans from about January 20th, 2020 (Center of Disease Control, 2023) to May 5th, 2023 when the World Health Organization (2013) announced COVID-19 was no longer a global health emergency.

Pornhub

Starting with Pornhub, the summary of statistics pulls data from January 2017 to October 2023 to analyze which can be seen in the year-month minimum and maximum (Table 4). The main focus will be on the total amount of monthly uploads and the percent change in those uploads from one month to the next. The minimum amount of uploads that occurred in a month is 6,556 videos in February 2017 and the maximum is 125,402 in August 2023. Given the median is smaller than the mean, it appears that the amount of videos is not evenly distributed over time. That is, there is a higher amount being uploaded in recent years compared to earlier years. Looking at percent change, there is a 3.34% increase in monthly

videos uploaded on average. The largest decrease in uploads is going from August to September in 2023 where September sees a 42.47% decrease compared to August. The largest increase in uploads is going from September to October in 2017 where October sees a 21.49% increase compared to September.

Table 4. Summary of Statistics for Pornhub Data

Variable	Mean	Median	Minimum	Maximum
year-month	2021-09	2022-02	2017-01	2023-10
year	2021	2022	2017	2023
month	6.501 (mid-June)	7 (July)	1 (January)	12 (December)
total	48173	47274	6556 (Feb. 2017)	125402 (Aug. 2023)
percent_change	3.335%	3.605%	-42.474% (Sep. 2023)	21.485% (Oct. 2017)

More information can be seen in Figure 1 concerning total monthly uploads. It is important to note that the visuals and the summary of statistics range from 2017 to 2023 to gain a better window of view of the pattern. For modeling purposes, the years analyzed go from 2018 to 2023 to increase the linearity of the trend line. From January 2017 to September 2023, there's been a relatively slow quadratic increase. While during the pandemic, there seems to be slightly more volatility, this volatility can be seen since mid-2019.

In an attempt to control for financial crises, a similar graph was made ranging from the launch of Pornhub on May 25th of 2007 to the end of 2011 to view any effects the 2008 financial crisis may have had. Figure 2 does differ greatly from Figure 1 in the sense that there seems to be larger changes seen between each month. However, a conclusion cannot be drawn on whether or not the financial crisis led to the large spike seen in the beginning of 2008 and overall upswing seen after 2009. The spike may be users becoming more accustomed to using Pornhub or an increase in users overall which then begin stabilizing into an upward trend in uploads.

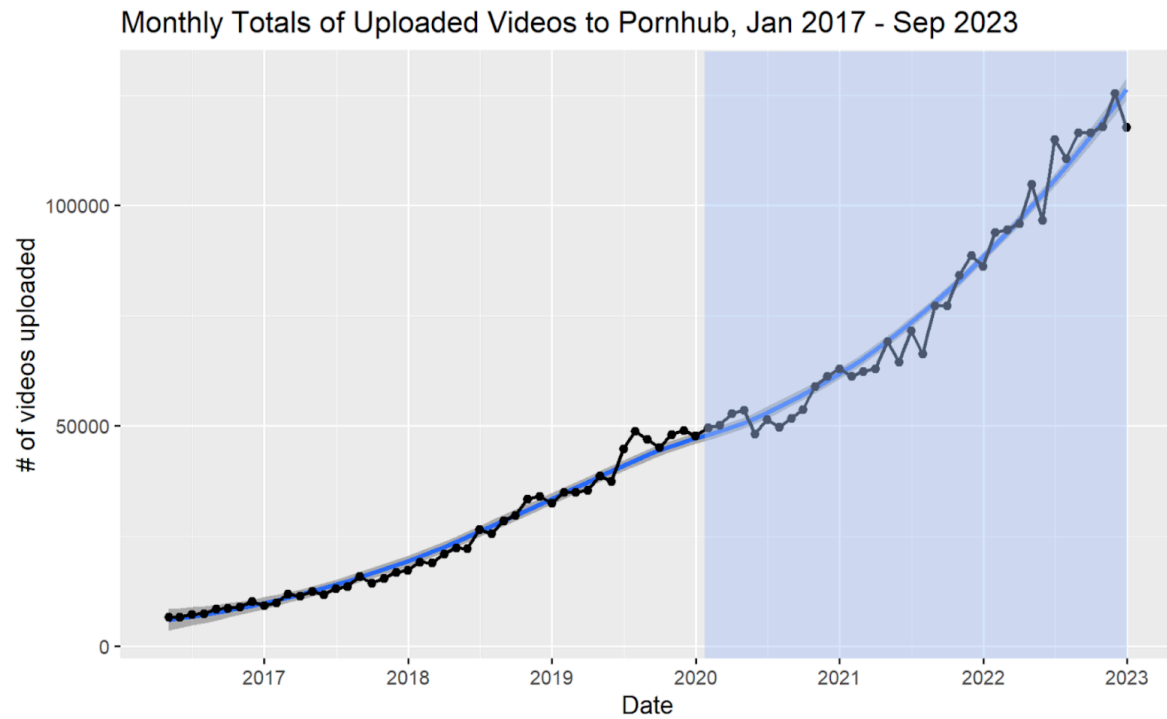
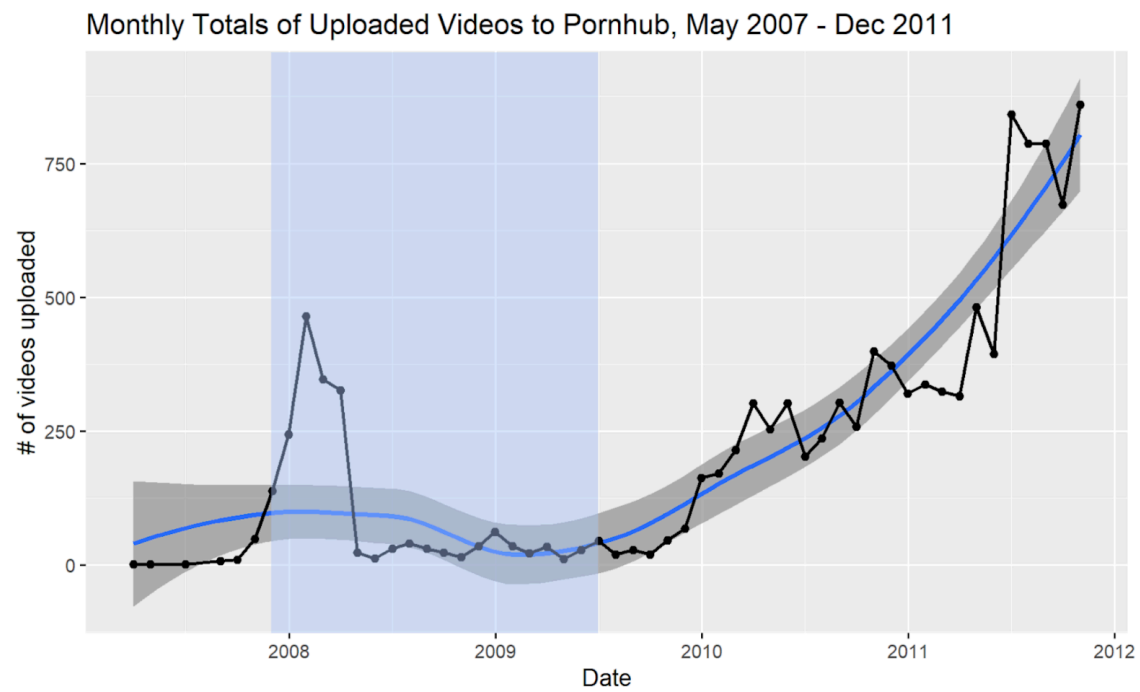
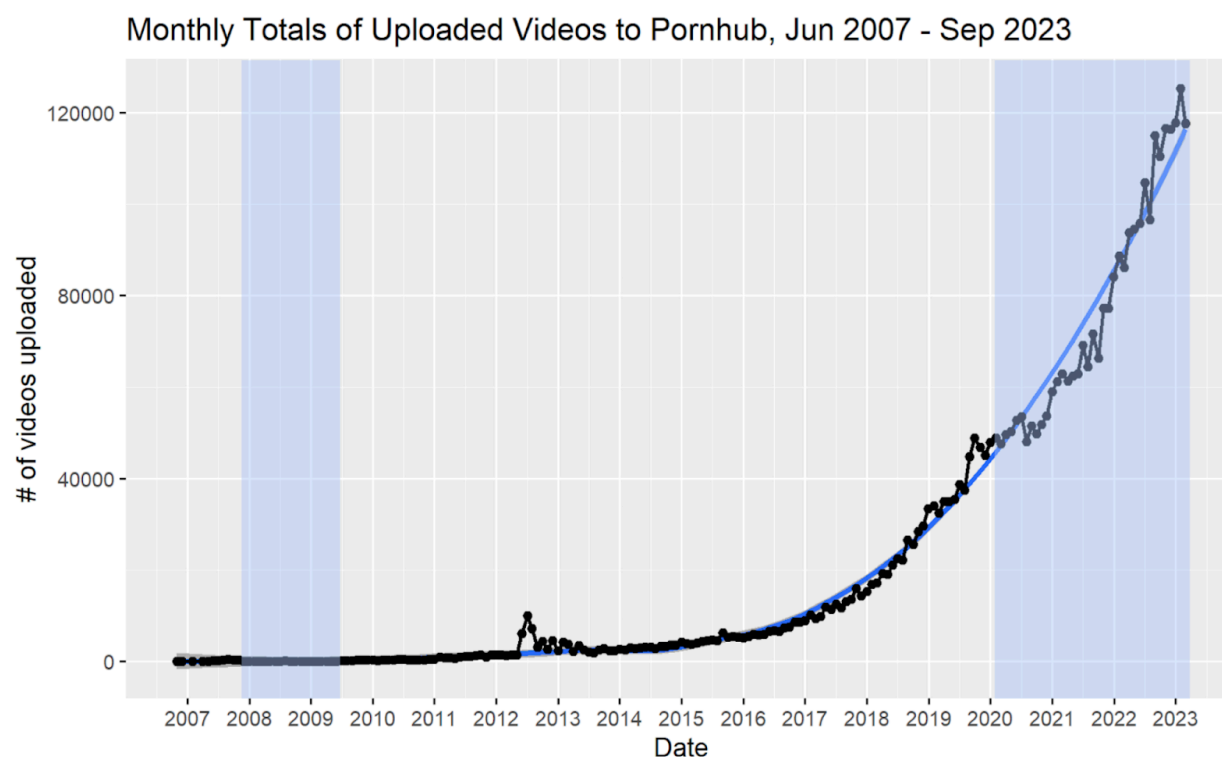
Figure 1.**Figure 2.**

Figure 3 provides a much better overview of the production pattern on Pornhub from the beginning to the most recent available date. Looking at a larger range shows that any volatility seen in Figure 2 seems close to flat in Figure 3. Based on the trend line, the production pattern follows an exponential pattern. There is a noticeable spike in uploads in the middle of 2012. This spike remains unexplained as the data available does not show mass deletions of videos. Speculating, it could be possible that there was a mass reupload of videos followed by a wave of mass deletions or some other factor entirely. Looking at the highlighted timeframes, there does not seem to be a large veer off course from an exponential trend seen in videos uploaded. While there seems to be an underproduction going from mid-2020 to 2022 based on the actual data points being lower than the trend line, it is followed by months that produce over the trend line. This similar pattern can be seen over 2016 to mid-2020. There are months that produced less than expected going from 2016 to the end of 2018 followed by months that produced more than expected from the end of 2018 to mid-2020. Looking back at Figure 2, it is clear that there are also months that starting about 2011 where there was a clear underproduction followed by an overproduction based on the trend line. The months beginning 2011 are outside of the gray band of the trendline, meaning that these changes in production are genuinely under or over the expected production rate. This can also be seen in the months plotted in Figure 1 and Figure 3. Overall, Figure 3 shows that any visual under- or overproduction that appears during highlighted timeframes follow a pattern that already exists outside of those timeframes.

Figure 3.

Going over the percent change in total monthly uploads, Figures 4 and 5 aim to show if there is a pattern in the year that sees spikes or dips and if there is usually a relatively positive increase in uploads overall. Figure 4 shows a consistent alternating increase and decrease in percent change, but most months see a positive rate of change. On further inspection on a year by year basis, there is typically an alternating pattern that is similar across 2018 to 2022, but 2023 sees a more consistent drop in production. The main difference between all years is the range in percent change (see Appendix A). Only about 21 months out of the 80 months measured had a negative percent change, and there does not appear to be a consistent pattern in months that have a negative percent change compared to the previous month. Figure 5 shows percent change from the full time range. The volatility during the time of the 2008 financial crisis is reflected in the highlighted section on the left of Figure 5, but the percent change seems to bounce between about -15% and 20% after mid-2016. As mentioned before, it is unclear why there was a sudden large increase in uploads in 2012 to 2013. This larger time range shows that the amount of uploads did not appear to have large spikes or dips months prior to, during, and after the pandemic.

Figure 4.

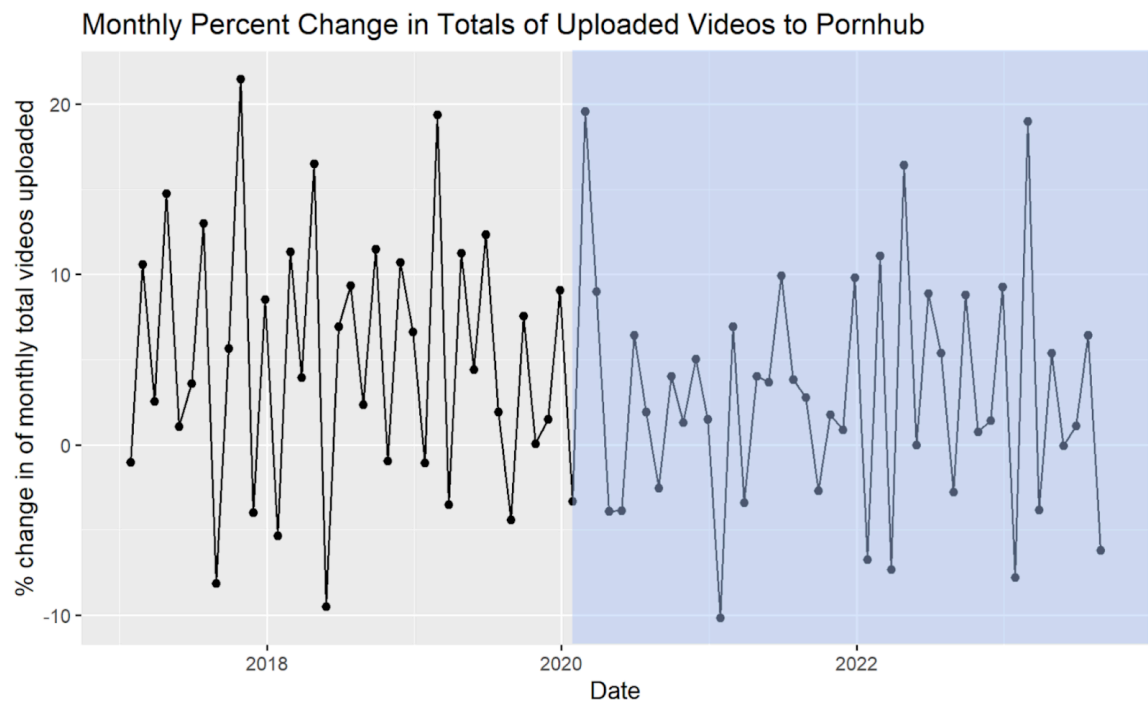
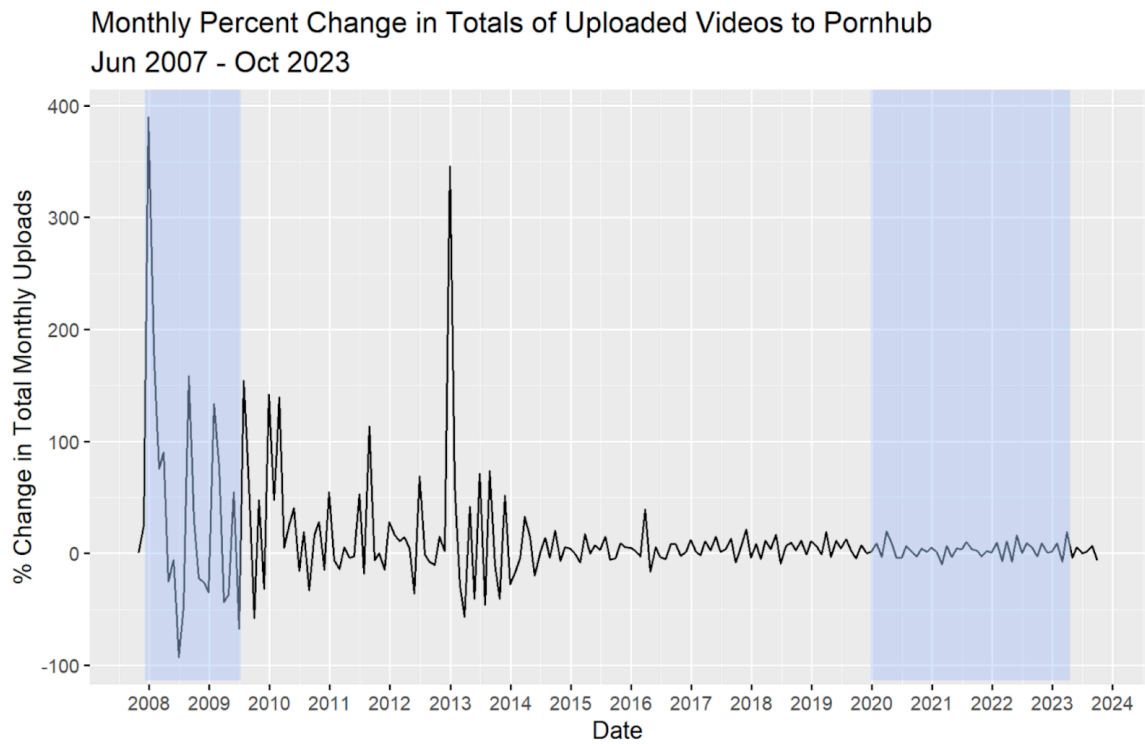


Figure 5.



GoneWildAudio

Moving on to GWA's data, the count of audio posts in the Top of All Time of the subreddit by category were analyzed as well as the proportions of posts by category. Table 5 shows the oldest post was from 2018 and the most recent is in 2024. The main purpose of Table 5 is to observe the proportions of each category that made it into Top of All Time over 2018 and up until May 2024. The majority of posts were in the F4M category followed by M4F, M4M, and F4F. Same-sex audios are not as popular as heterosexual audios, holding less than 1% of the audios in the top 1000 posts in Top of All Time combined. F4M audios are over twice as popular as M4F audios, with 68% of the top 1000 posts in the Top of All Time being F4M and only about 31.69% being M4F audios.

Table 5. Total audios created by category in GWA's Top of All Time

Variable	Mean	Median	Minimum	Maximum
year	2021	2021	2018	2024
type				
F4F	0.103%			
F4M	68.000%			
M4F	31.690%			
M4M	0.205%			
n_type				
F4F	0.143	0	0	1 (2022)
F4M	94.714	39	1	239 (2022)
M4F	44.143	13	0	134 (2023)
M4M	0.286	0	0	1 (2023)

Aggregated, there was more interaction with these posts over the years but a slight decrease in 2023 (Figure 6). At a categorical level, the overall pattern is reflected in F4M posts, but M4F posts have a relatively constant increase in interaction over the years (Figure 7). Looking at Figure 6, it appears that there was a significant increase in interaction with audios starting in 2020. Based on how increased engagement in M4F posts over time, it is possible that GWA saw an increase in production for M4F

audios. It is unclear what may have caused a slight decrease in F4M audios in Top of All Time comparing 2022 to 2023, but it is the first decrease seen in the timeframe in the category, so a clear pattern cannot be established without gathering more data on later years. 2024 was not plotted to compare due to it being our current year at the time the data was collected. There is a jump of nearly 200 more posts going from 2020 to 2021, about 100 more going from 2021 to 2022, and a dip of about 20 posts from 2022 to 2023.

Figure 6.

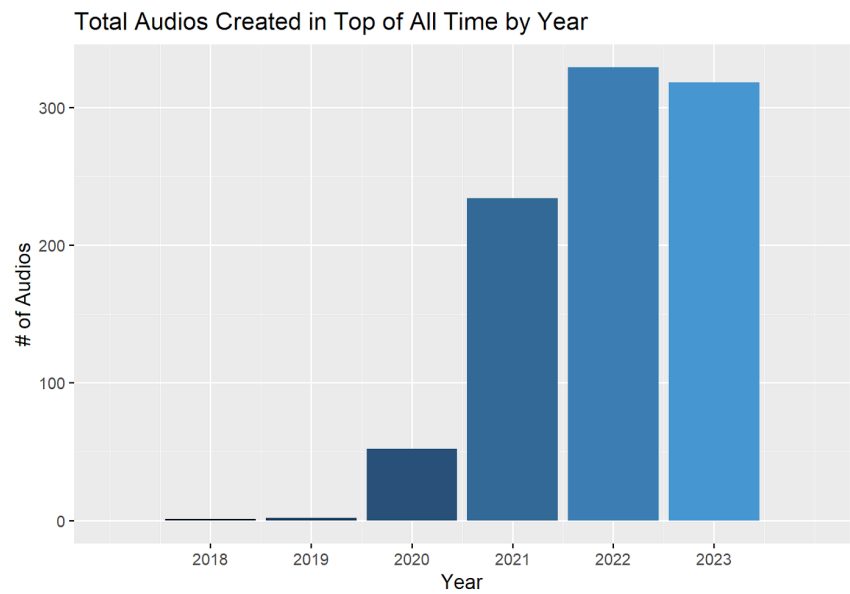
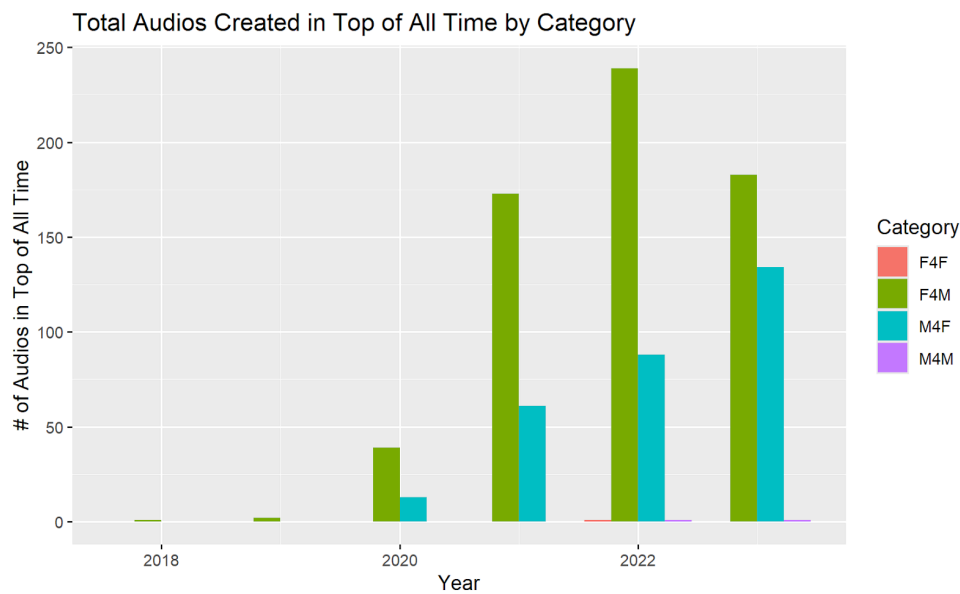


Figure 7.



Archive of Our Own

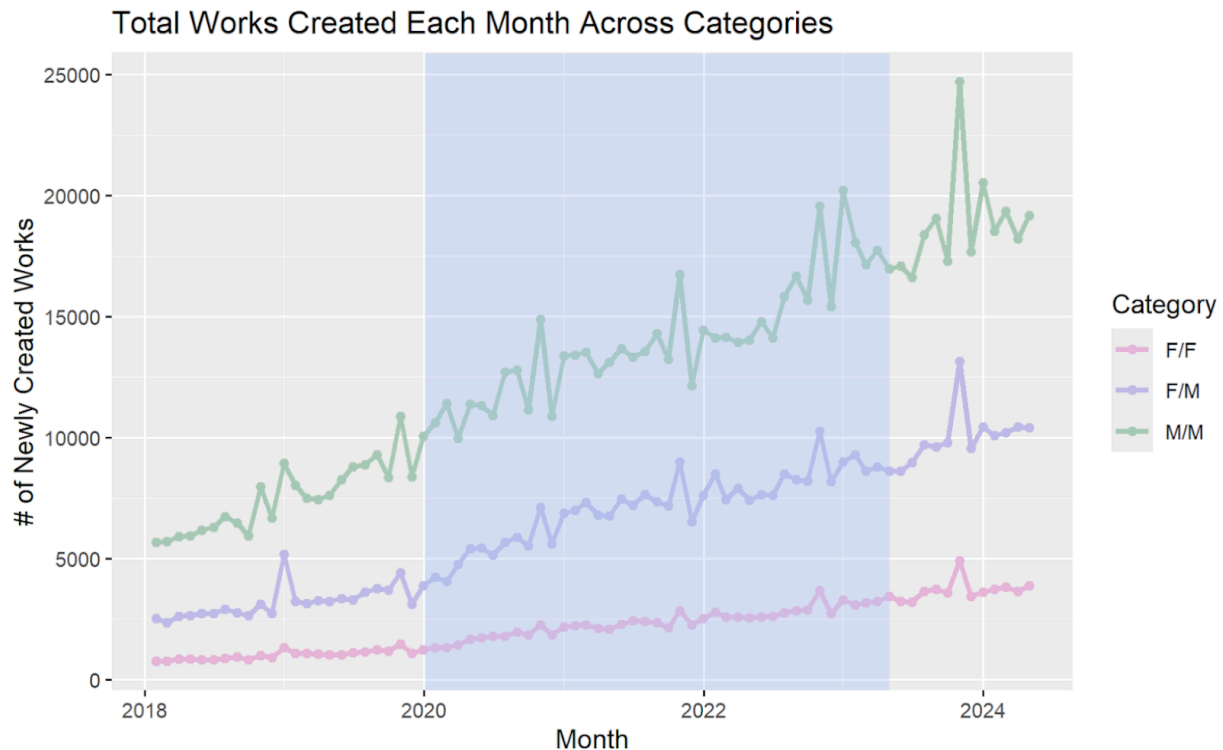
The structure of AO3's data is a slight combination of Pornhub's clear total monthly uploaded works and categories like GWA, so we can look at percent change and beyond an aggregated level into categories. The summary of statistics shows that the data collected ranges from January 2018 to April 2024 as seen by the extrema of the year-month variable (Table 6). Aggregated, the most amount of newly created explicit works occurred in October 2023 while the least is in February 2018. The month with the most amount of works created within that month is October 2023 for across all categories. This may be in line with not just production being at an increasing rate, but also lines up with events such as Kinktober. Kinktober is a prompt based challenge that "encourages the creation of erotic fanworks," including written work, across fandoms of all kinds that "focus on specific kinks" in October (Fanlore). Kinks can include but are not limited to spanking, dirty talk, and edgeplay, which all leads to more works being created annually in October as users are encouraged to write every day based on the daily prompt that they can set for themselves or cite from someone else. In the context of Kinktober, it is unsurprising that the minimum and maximum drops and jumps in percent change occur in the October to December months as there will be a spike in production through October and begin to drop in November. Other events that could affect production in late fall and early winter months can be fanfiction written in the theme of holidays or other challenges like No Nut November.

At a categorical level, nearly 60% of works created in the timeframe have M/M relationships, nearly 30% are F/M relationships, and only a little over 10% of them are F/F works. On average, all categories see a 2.5-3.0% increase in production every month. It is interesting to note that the category with the highest percent change on average is F/M followed by F/F. It may be possible that these categories are slowly becoming more popular as there were historically not as many works in these categories compared to the M/M category. Comparing average percent change to the median shows that the distribution of percent change is right skewed, which means there tends to be larger increases in production from month to month compared to drops.

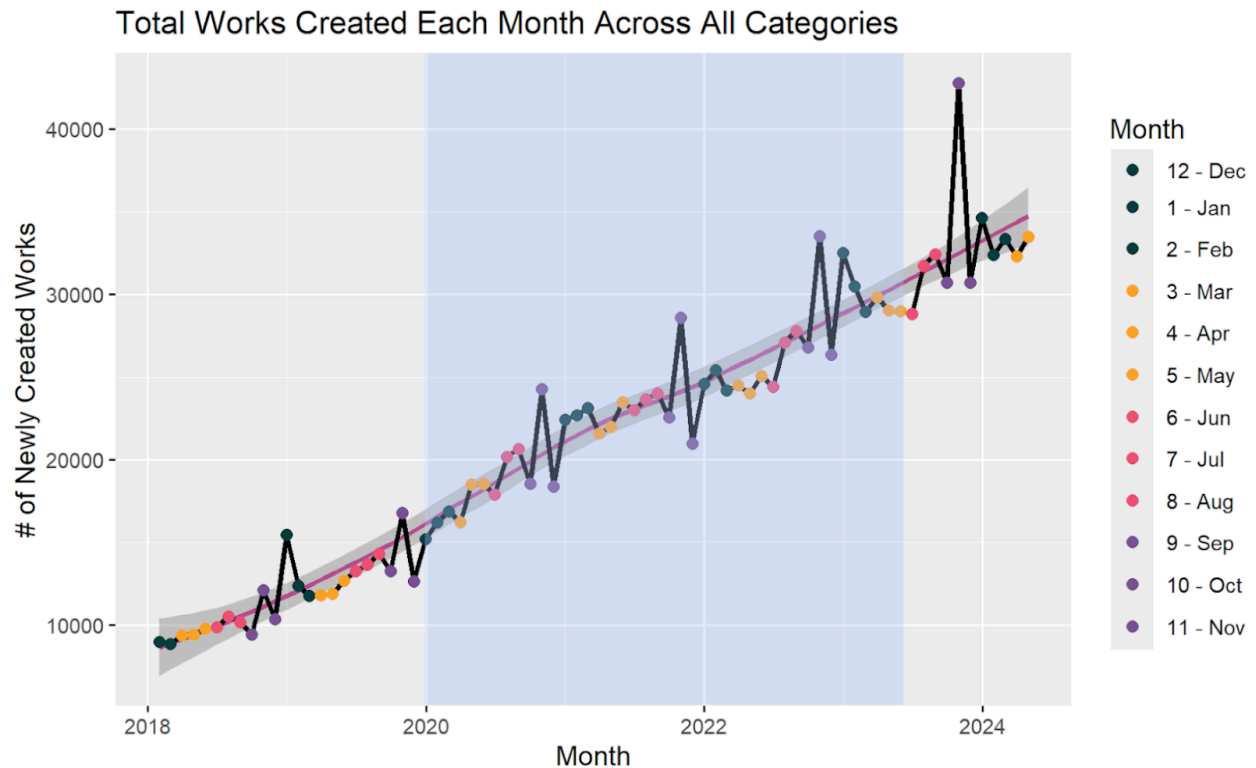
Table 6. Summary of Statistics for AO3 Data

Variable	Mean	Median	Minimum	Maximum
year-month	2021-03	2021-03	2018-01	2024-04
year	2021	2021	2018	2024
month_num	6.289 (June)	6 (June)	1 (January)	12 (December)
category				
F/F	10.191%			
F/M	29.933%			
M/M	59.875%			
All	100.000%			
total				
F/F	2179	2214	773 (Jan. 2018)	4933 (Oct. 2023)
F/M	6401	6944	2354 (Feb. 2018)	13145 (Oct. 2023)
M/M	12804	13288	5676 (Jan. 2018)	24725 (Oct. 2023)
All	21385	22500	8835 (Feb. 2018)	42803 (Oct. 2023)
percent_change				
F/F	2.980%	2.010%	-30.144% (Oct. 2023)	45.664% (Nov. 2018)
F/M	3.061%	1.553%	-37.206% (Dec. 2018)	88.299% (Nov. 2018)
M/M	2.628%	0.835%	-28.473% (Oct. 2023)	42.812% (Sep. 2023)
All	2.694%	1.526%	-28.269% (Oct. 2023)	49.478% (Nov. 2018)

More on the production rate of each category can be seen in Figure 8 and 9. Looking at specific categories shown in Figure 8, the rate of production for all categories is much more linear than Pornhub's in the same timeframe, and in descending order of rate goes M/M, F/M, and F/F. There is much less volatility in F/F and more volatility in M/M.

Figure 8.

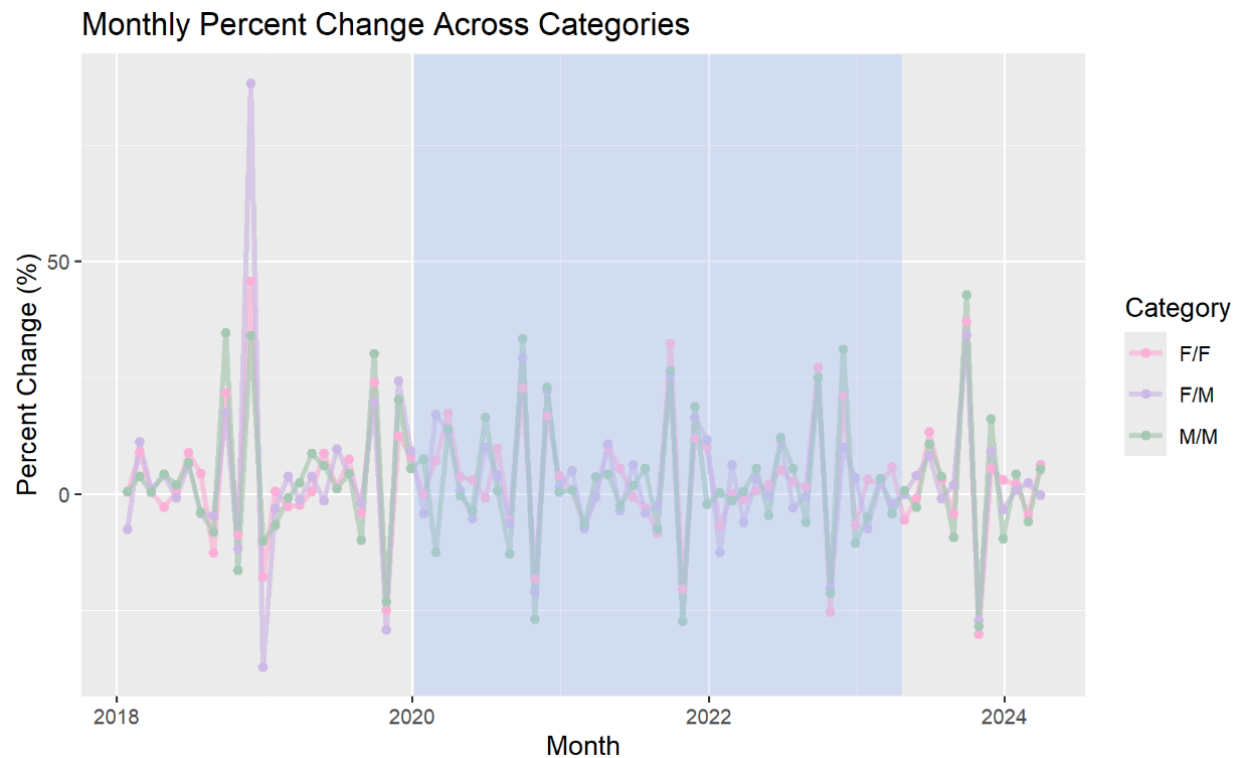
Combining all the categories gets Figure 9 which has been color coded by month to better catch the seasons and the month of October. All the large peaks in production tended to be October, and the patterns of peaking tended to follow in all categories seen looking back at Figure 8. There was an instance seen in December of 2018 where there was a large peak in new works created, even more than that year's October, that breaks the Kinktober peaking pattern. There is no clear explanation for this peak, but it does not occur again in the following years. The pattern of production by season also seems to not change much heading in and out of the COVID-19 pandemic. There did seem to be a more stable rate in the spring and summer months before COVID-19, so there may be a chance that there is a correlation between the pandemic and production during those months. A trend line was plotted behind all the connected data points, and it looks quite linear.

Figure 9.

Turning to monthly percent change, Figure 10 shows that large percent change in production usually is seen in the same direction for across all categories. These large spikes and drops are seen in late parts of the plotted years which reflects around the time of Kinktober and the holidays where more themed works are encouraged to be produced as part of challenges or holiday spirit. The largest spike is seen in late-2018 in F/M works where there was an over 88% increase in the previous month's works. This large spike is expectedly followed by a steep drop in production compared to the next month. Besides these two large changes, percent change tended to bounce around a little below -25% to about 35% for all categories around Kinktober. Outside of Kinktober, the change bounced around about -15% to 20%. These patterns did not seem to be disturbed during the pandemic either, given that there were no extremely low or high percent changes similar to the one seen late-2018. Upon closer inspection, the fall months have much more synchronized percent change across categories and there is not clear consistency seen in any other months other than alternating positive and negative percent change (see Appendix B).

Compared to Pornhub, monthly percent change tends to bounce across 0% across the years more, meaning that the change in uploads of new works is increasing at a more constant pace on AO3 than Pornhub.

Figure 10.



Statistical Analysis/Modeling

All statistical analysis or modeling performed are presented in summary tables. Breaking the usual sequence, ANOVA of GWA will be addressed first while the regressions for Pornhub and AO3 will be analyzed after.

GoneWildAudio

The main ANOVA that was run was setting year as a categorical variable and aggregating works across categories to analyze if the difference in total works that made it to Top of All Time between years was statistically significant. Looking at the p-value off of Table 7, 0.01576, shows that there is a statistically significant difference between the years. However, we cannot derive any other conclusion such as which year is most different from the others via ANOVA, which is why descriptive statistics was

also provided previously where there were large jumps of over 100 posts between a couple years. One conclusion that can be speculated is that combining the large jumps during the COVID-19 pandemic and the differences in works per year evidently being statistically significant is that there may have been an increase in exposure to audio porn or overall higher interaction with audio porn posts during those years. The increase in interaction would lead to more posts from the years the pandemic spanned to show up in Top of All Time. This then may lead to higher production, but further data must be collected to be able to do regressions similar to Pornhub and AO3. At a categorical level, the categories that showed statistically significant differences were mainly F4M and M4F which can be seen in the plots in the previous section where the overall pattern followed F4M audios and M4F saw large increases in audios within the Top of All Time posts of GWA (see Appendix C).

Table 7. Analysis of Variance Table on GWA Across Categories

Category:	All				
Response:	Number of Works				
	<i>Df</i>	<i>Sum of Sq.</i>	<i>Mean Sq.</i>	<i>F-value</i>	<i>p-value</i>
Year	3	45728	15242.6	4.391	0.01576
Residuals	20	69426	3471.3		

Pornhub

The intercept being a large negative number is due to the line being fit to the data points from 2018 to 2023 and not accounting for any previous years. As shown in the descriptive statistics, the production pattern follows an exponential trend. For the sake of interpretation and getting an approximation of near-future years, a linear regression was only run from 2018 to 2023. If a line was fitted to only those points, then it would be relatively steep compared to earlier time frames as an exponential line gets steeper as you move horizontally along the line. This would lead to a large negative number for the intercept. The coefficient of the days_since variables is interpreted as approximately 50 videos are uploaded to Pornhub every day between the years 2018 and 2023. Within this timeframe, this linear regression explains about 94.12% of the variance seen in the number of videos uploaded every month. The p-value is extremely close to zero, which means there is a statistically significant relationship

between time and number of videos uploaded. This is expected based on the graphs plotted in the descriptive statistics section.

Observing the residuals, there was a median of 125 more videos seen in the data versus the expected number of videos to be uploaded. That is, the median is an overestimate of about 125 videos using the model. Based on the differences between the median to the upper quartile and lower quartile, the median is closer to the upper quartile, which means the distribution of residuals is more negative or left skewed. That is, there is a higher frequency of underestimated monthly total uploads with this model. This is likely due to how it is a straight line being fit to a more curved line, but given other factors such as the p-value and R-squared value, a linear regression did fit the production pattern between 2018 and 2023 relatively well.

Table 8. Summary of Linear Regression on Pornhub

	<i>Minimum</i>	<i>Q1</i>	<i>Median</i>	<i>Q3</i>	<i>Maximum</i>
Residuals:	-14399.1	-4527.7	125.4	3456.8	20034.0
Coefficients:		<i>Estimate</i>	<i>Standard Error</i>	<i>t-value</i>	<i>p-value</i>
(Intercept)		-193876.096	7645.096	-25.36	< 0.00
Days_Since		50.412	1.539	32.76	< 0.00
R-Squared	0.9412				
Adj. R-Squared	0.9404				
p-value	< 0.00				

Archive of Our Own

The intercept is largely positive here since AO3's data points had a more linear pattern compared to Pornhub. The coefficient of days_since is interpreted as about 11-12 written works are created every day within the timeframe of 2018 through 2023. Similar to Pornhub, the linear regression explains about 94.45% of the variance seen in the monthly total upload of new explicit works across all categories. Similar summaries can even be seen in specific categories and the rate of works created each day can be broken down further. About 1 work under F/F, about 4 under F/M, and about 6 under M/M every day within the timeframe analyzed (see Appendix D). Given the p-values being near 0 and R-squared values

being over 92% for all linear regressions, the production pattern of AO3 explicit works does seem to be linear. That is, increasing at a constant rate.

Inspecting the residuals from Table 8 shows that, similar to Pornhub, there are more underestimates when looking at all explicit works. At a categorical level, unlike Pornhub, they are slightly more positively skewed except for M4M. That is, there are more overestimates in all other categories except for M4M, which means that the majority of underestimates of monthly new works created are under M4M. Looking at M4M's R-squared value, it is the smallest one compared to the other categories sitting at 92% while the others are over 93% (see Appendix D). The slight difference in percentage of variance explained by the model could mean that M4M is not quite as linear as the other categories.

Table 9. Summary of Linear Regression on AO3 Across All Categories

	<i>Minimum</i>	<i>Q1</i>	<i>Median</i>	<i>Q3</i>	<i>Maximum</i>
Residuals:	-3328.4	-1126.9	-59.7	774.8	5360.6
Coefficients:		<i>Estimate</i>	<i>Standard Error</i>	<i>t-value</i>	<i>p-value</i>
(Intercept)		8166.788	408.936	19.97	< 0.00
Days_Since		11.529	0.3413	33.78	< 0.00
R-Squared	0.9445				
Adj. R-Squared	0.9437				
p-value	< 0.00				

Discussion

This project examined the production pattern of online pornography across three mediums during the COVID-19 pandemic. Pornhub continues to have an exponential trend through the pandemic and even through the 2008 financial crisis. AO3 production remained relatively linear, production increasing at a constant rate. GWA saw a constant increase in interaction with M4F audios, but the majority of works highly interacted with remains to be F4M. However, the interaction seen in F4M audios may dip slightly in the coming years. GWA was the only platform that saw a significant change in anything between years. In the context of previous literature, a constant increase in demand for M4F audios may show that audio porn is more relatable and connects better to a female audience, which is what Macleod (2021) showed

women were seeking for in pornography. The higher interaction for F4M audios reflects previous studies that found men consuming more porn than women (Tollini & Diamond-Welch, 2021). As for the unchanging overall trend seen in Pornhub and AO3, the previous literature does not quite speak on the production side, however porn production has gotten easier as the Internet develops. In the context of the hypotheses, Hypothesis #1 was correct as there was an overall positive trend in production at least for Pornhub and AO3. But, Hypothesis #2 was undermined given the trends did not see a large dip or spike in production during the months of the pandemic.

Implications concerning the conclusions drawn from the analyses are mainly concerning when looking at pornography posted from an abusive standpoint. If Pornhub is reflective of all video pornography production, users and sites should become wary of the sites' policies concerning screening or moderating videos to ensure all content uploaded was produced and uploaded consensually by all parties involved in the production. With AI on the rise, the fear of generative videos and deep fakes where new faces can be pasted on previously made videos or entirely generated videos may lead to pornography uploaded with malicious intent. Looking into production patterns may give platforms an idea of how much they need to invest in having a system in place to handle reports, especially with how heinous nonconsensual posts can be.

Further Research

More research into the sex industry in general should be done as sexual health has been shown to be quite tied with social behavior according to previous literature. It may be worthwhile to look at the differences between finding entertainment online versus at a strip club where consumers are also only able to view the entertainment provided. With the rise of OnlyFans and other subscription services, it would also be important to see the connection between parasocial relationships and consumer behavior especially in pornography production as Popovic (2011) previously showed the use of porn as an escape from intimacy. Explicit live streams may also be related to parasocial relationships in pornography consumption as well since viewers can see an actor live and interact using a chat feature. More research

should also be done on what motivates anyone to begin producing porn or enter into the industry in general to better understand how much agency there truly is.

Given the scope of this project, all mediums and all sites within each medium could not be analyzed. Theoretically, all the models could be done to further analyze a variety of category types on all platforms. Besides looking at relationship tags, tags regarding kinks could also be analyzed using similar methods. Patterns in production by individual creators and studios could also be analyzed too. The methods likely can be scalable to all forms of pornography, mediums and business models as long as the data is freely available or capable of being scrapped relatively cleanly. However, this study was unable to analyze platforms that have a paid subscription service run by individual creators such as OnlyFans and Patreon. Free audios are usually uploaded to Soundgasm and Erocast which are then linked on a GWA Reddit post. There typically is crossposting between audio erotica on GWA and platforms that have a built-in structure to access locked content by becoming a subscriber (Syrin Audios, TryQuinn, Patreon). Patreon also allows for a variety of mediums of content to be uploaded to be subscribed to such as audio, videos, pictures, digital art, and more. Pornhub and XVideos likely also have some crossposting activity that needs to be considered too. To control for all the crossposting would be difficult but in theory, if the data is available, analyzing production patterns should be possible. Books or ebooks production could also be mapped out if given data from publishers or authors themselves.

This study also does not cover explicit art commissions or Rule 34 artists. Rule 34 refers to an Internet meme stating that “if it exists, there is porn of it” (Rule 34). Art would also likely be crossposted across several platforms such as Patreon or X (formerly known as Twitter). It would likely be difficult to get an accurate measure of the amount of works that are considered explicit, but a sample of artists could be taken to see how fast production is collectively. Hentai in video or manga form also could be tracked, but the “hentai” tag would have to be filtered on sites like Pornhub and XVideos while uploads of hentai manga can be tracked on sites such as NHentai. With the consideration of more mediums and more platforms, it would give an idea of shifts in preferences over time and pornographic preferences may have influenced societal and economic behavior as they have influenced pornography itself.

References

- Attwood, F., Smith, C., & Barker, M. (2021). Engaging with pornography: An examination of women aged 18–26 as porn consumers. *Feminist Media Studies*, 21(2), 173-188.
- Azaari. (2023, October 21). *Pornhub Videos*. Kaggle. <https://www.kaggle.com/datasets/azaari/phub-videos?resource=download&select=videos.csv>
- Berdychevsky, L., & Carr, N. (2020). Innovation and impact of sex as leisure in research and practice: Introduction to the special issue. *Leisure Sciences*, 42(3-4), 255-274.
- Cannon, A. R., Cobb, G. W., Hartlaub, B. A., Legler, J. M., Lock, R. H., Moore, T. L., Rossman, A. J., & Witmer, J. A. (2019). *STAT2 : Modeling with Regression and ANOVA* (Second edition). W. H. Freeman.
- Centers for Disease Control and Prevention. (2023, March 15). *CDC Museum Covid-19 Timeline*. Centers for Disease Control and Prevention. <https://www.cdc.gov/museum/timeline/covid19.html#:~:text=January%2020%2C%202020,respond%20to%20the%20emerging%20outbreak.>
- Egan, V., & Parmar, R. (2013). Dirty Habits? Online Pornography Use, Personality, Obsessionality, and Compulsivity. *Journal of Sex & Marital Therapy*, 39(5), 394–409.
<https://doi.org/10.1080/0092623X.2012.710182>
- Erotic Audio Hosting*. Erocast. <https://www.erocast.me/>
- Evans-DeCicco, J. A., & Cowan, G. (2001). Attitudes toward pornography and the characteristics attributed to pornography actors. *Sex roles*, 44, 351-361.
- Flood, M. (2009). The harms of pornography exposure among children and young people. *Child Abuse Review*, 18(6), 384-400. doi:<https://doi.org/10.1002/car.1092>
- Griffith, J. D., Adams, L. T., Hart, C. L., & Mitchell, S. (2012). Why become a pornography actress?. *International Journal of Sexual Health*, 24(3), 165-180.
- Guglielmi, J., & Reddy-Best, K. L. (2021). BDSM, Dress, and Consumption: Women's Meaning Construction Through Embodiment, Bodies in Motion, and Sensations. *Clothing and Textiles Research Journal*, 0887302X211061020.

- Hakim, C. (2015). Economies of Desire: Sexuality and the Sex Industry in the 21st Century. *Economic Affairs (Institute of Economic Affairs)*, 35(3), 329–348.
- Hernandez, D. (2011). The Effects of Consuming Pornography: Men's Attitudes toward Violence against Women, Dominance and Objectification of Women, and Sexual Expectations of Women. *Perspectives (University of New Hampshire)*, 116–123.
- Kinktober. Fanlore. (2023, October 2). <https://fanlore.org/wiki/Kinktober#:~:text=Kinktober%20is%20a%20multifandom%20prompt,that%20focus%20on%20specific%20kinks>.
- Lambert, N. M., Negash, S., Stillman, T. F., Olmstead, S. B., & Fincham, F. D. (2012). A love that doesn't last: Pornography consumption and weakened commitment to one's romantic partner. *Journal of Social and Clinical Psychology*, 31(4), 410-438. doi:<https://doi.org/10.1521/jscp.2012.31.4.410>
- Litsou, K., Graham, C., & Ingham, R. (2021). Women in Relationships and Their Pornography Use: A Systematic Review and Thematic Synthesis. *Journal of Sex & Marital Therapy*, 47(4), 381–413. <https://doi.org/10.1080/0092623X.2021.1885532>
- Macleod, P. J. (2021). How feminists pick porn: Troubling the link between 'authenticity' and production ethics. *Sexualities*, 24(4), 673-693.
- NHentai. NHentai. <https://www.nhentai.net/>
- OnlyFans. OnlyFans. <https://www.onlyfans.com/>
- Organization for Transformative Works. (2009, November 14). *Archive of Our Own beta*. Archive of Our Own. <https://archiveofourown.org/>
- Paasonen, S. (2021). 'We watch porn for the fucking, not for romantic tiptoeing': extremity, fantasy and women's porn use. *Porn Studies*, 1-14.
- Patreon. Patreon. <https://www.patreon.com/>
- Popovic, M. (2011). Pornography Use and Closeness with Others in Men. *Archives of Sexual Behavior*, 40(2), 449–456. <https://doi.org/10.1007/s10508-010-9648-6>
- Pornhub Webmasters. Pornhub Porn Videos. (n.d.). <https://www.pornhub.com/webmasters>
- pornography. *Oxford Reference*. Retrieved 3 Jun. 2024, from <https://www.oxfordreference.com/>

[view/10.1093/oi/authority.20110803100337901](https://www.10.1093/oi/authority.20110803100337901).

Quinn - The App for Audio Erotica. Quinn. <https://www.tryquinn.com/categories/storytelling>

r/gonewildaudio. Reddit. (n.d.). <https://www.reddit.com/r/gonewildaudio/>

Rich, R. (2013, November 22). *The Great Recession*. Federal Reserve History.

<https://www.federalreservehistory.org/essays/great-recession-of-200709#:~:text=Lasting%20from%20December%202007%20to,longest%20since%20World%20War%20II.&text=The%20Great%20Recession%20began%20in,notably%20severe%20in%20several%20respects>

Rivera, I. (2022, March 2). *Ivan-Rivera/Redditextractor: A minimalistic R wrapper for the reddit API*.

GitHub. <https://github.com/ivan-rivera/RedditExtractor?tab=readme-ov-file>

Rivera, I. (2023, March 17). *RedditExtractoR: Reddit Data Extraction Toolkit*. CRAN.

Rostad, W. L., Gittins-Stone, D., Huntington, C., Rizzo, C. J., Pearlman, D., & Orchowski, L. (2019). The

Association Between Exposure to Violent Pornography and Teen Dating Violence in Grade 10

High School Students. *Archives of sexual behavior*, 48(7), 2137–2147.

<https://doi.org/10.1007/s10508-019-1435-4>

Rule 34. Rule 34. <https://www.rule34.xxx/>

Sarker, R., Roknuzzaman, A. S. M., Nazmunnaahar, Shahriar, M., Hossain, M. J., & Islam, M. R. (2023,

September 5). *The who has declared the end of pandemic phase of COVID-19: Way to come back*

in the normal life. Health science reports. [https://www.ncbi.nlm.nih.gov/pmc/articles/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10478644/#:~:text=Therefore%2C%20the%20World%20Health%20Organization,life%20on%20May%205%2C%202023)

[PMC10478644/#:~:text=Therefore%2C%20the%20World%20Health%20Organization,life%20on%20May%205%2C%202023](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10478644/#:~:text=Therefore%2C%20the%20World%20Health%20Organization,life%20on%20May%205%2C%202023).

Soundgasm. Soundgasm. <https://soundgasm.net/>

Statista. (June 19, 2022). Market size of the online pornographic and adult content industry in the United

States from 2018 to 2023 (in million U.S. dollars) [Graph]. In Statista. Retrieved May 08, 2024,

from <https://www.statista.com/statistics/1371582/value-online-website-porn-market-us/>

Syrin ~ Sexy Audio Experiences for Humans. Syrin. <https://www.syrin.com/>

Taylor, K. (2022). “I’ve got to put one side aside if I want to enjoy it”: Pornography, Perceived Reality,

and Pornography Viewers' Negotiated Pleasures. *Sexuality & Culture*, 26(4), 1215–1234.

<https://doi.org/10.1007/s12119-021-09939-1>

Tollini, C., & Diamond-Welch, B. (2021). American Adult Pornography Consumers' Beliefs and Behaviors Related to Pornography Studios Mistreating Their Performers. *Sexuality & Culture*, 25(6), 2176–2207. <https://doi.org/10.1007/s12119-021-09872-3>

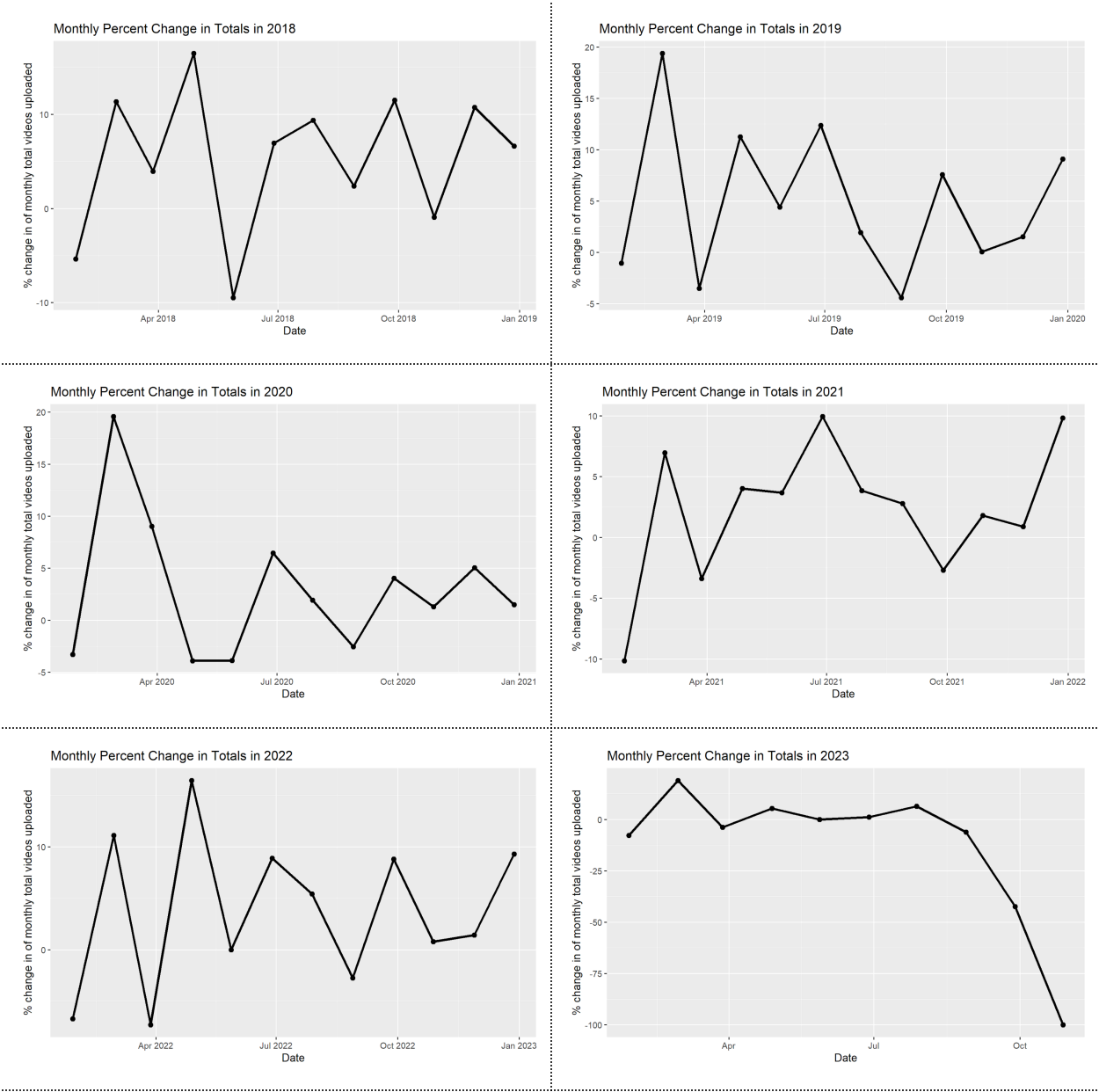
Wright, P. J., Paul, B., Herbenick, D., & Tokunaga, R. S. (2021). Pornography and Sexual Dissatisfaction: The Role of Pornographic Arousal, Upward Pornographic Comparisons, and Preference for Pornographic Masturbation. *Human Communication Research*, 47(2), 192–214.

<https://doi.org/10.1093/hcr/hqab001>

X. X Corp. <https://www.twitter.com/>

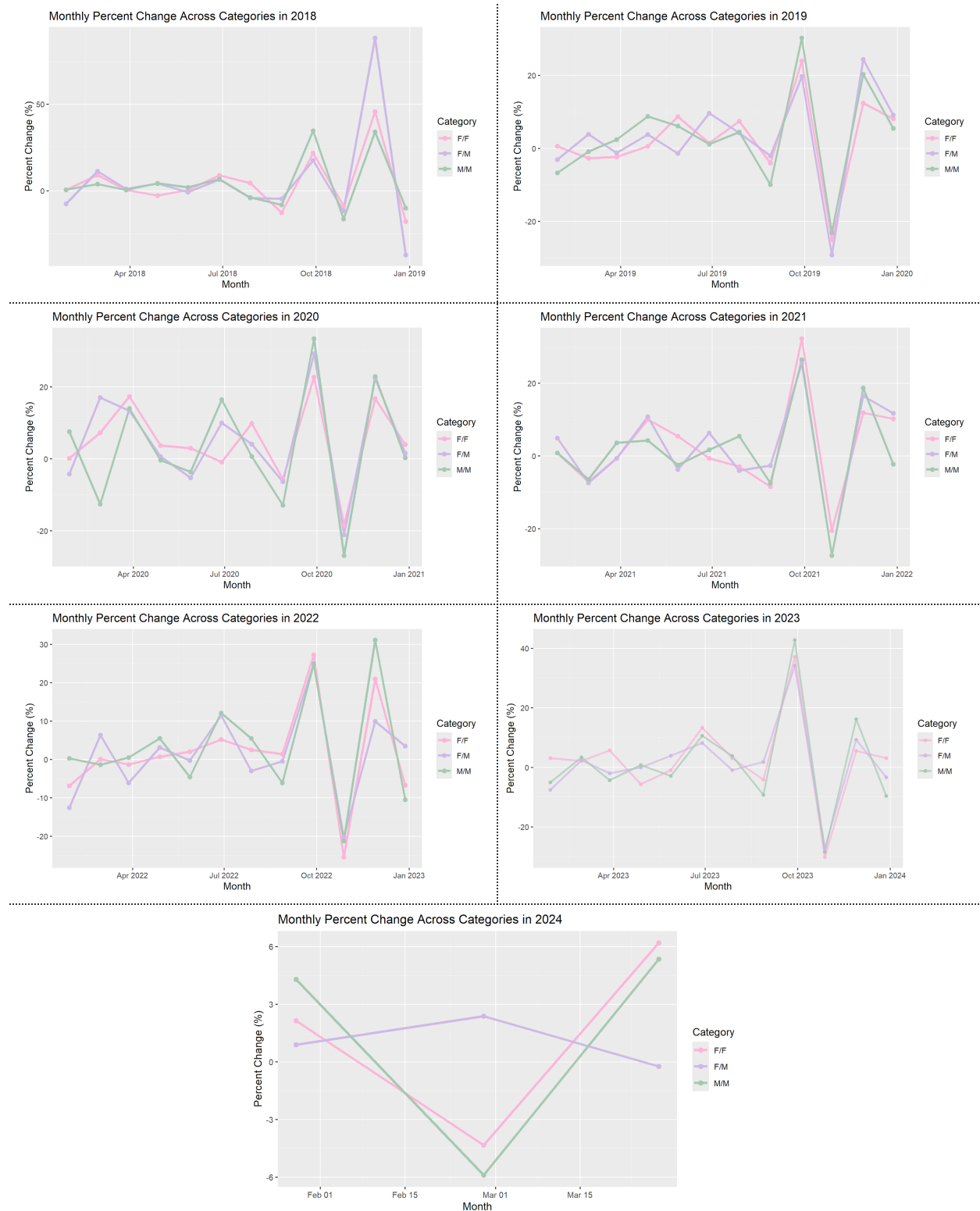
XVideos. XVideos. <https://www.xvideos.com/>

Appendix A
Monthly Percent Change in Total Videos Uploaded to Pornhub by Year



Appendix B

Monthly Percent Change in Total Works Created to AO3 by Year



Appendix C
Summary Tables at the Categorical Level for GWA

Table C1. ANOVA on GWA for F4M

Category:	F4M				
Response:	Number of Works				
	<i>Df</i>	<i>Sum of Sq.</i>	<i>Mean Sq.</i>	<i>F-value</i>	<i>p-value</i>
Year	1	44000	44000	16.869	0.01477
Residuals	4	10436	2609		

Table C2. ANOVA on GWA for M4F

Category:	M4F				
Response:	Number of Works				
	<i>Df</i>	<i>Sum of Sq.</i>	<i>Mean Sq.</i>	<i>F-value</i>	<i>p-value</i>
Year	1	13776.1	13776.1	45.493	0.00252
Residuals	4	1211.3	302.8		

Table C3. ANOVA on GWA for F4F

Category:	F4F				
Response:	Number of Works				
	<i>Df</i>	<i>Sum of Sq.</i>	<i>Mean Sq.</i>	<i>F-value</i>	<i>p-value</i>
Year	1	0.12857	0.12858	0.7297	0.44110
Residuals	4	0.70476	0.17619		

Table C4. ANOVA on GWA for M4M

Category:	M4M				
Response:	Number of Works				
	<i>Df</i>	<i>Sum of Sq.</i>	<i>Mean Sq.</i>	<i>F-value</i>	<i>p-value</i>
Year	1	0.91429	0.91429	8.7273	0.04179
Residuals	4	0.41905	0.10476		

Appendix D
Summary Tables at the Categorical Level for AO3

Table D1. Summary of Linear Regression on AO3 for F/F

	<i>Minimum</i>	<i>Q1</i>	<i>Median</i>	<i>Q3</i>	<i>Maximum</i>
Residuals:	-380.5	-129.12	-38.39	117.69	665.61
Coefficients:		<i>Estimate</i>	<i>Standard Error</i>	<i>t-value</i>	<i>p-value</i>
(Intercept)		531.892	45.20	11.77	< 0.00
Days_Since		1.4276	0.0377	37.84	< 0.00
R-Squared	0.9553				
Adj. R-Squared	0.9546				
p-value	< 0.00				

Table D2. Summary of Linear Regression on AO3 for F/M

	<i>Minimum</i>	<i>Q1</i>	<i>Median</i>	<i>Q3</i>	<i>Maximum</i>
Residuals:	-1453.23	-465.53	-78.94	249.98	1857.93
Coefficients:		<i>Estimate</i>	<i>Standard Error</i>	<i>t-value</i>	<i>p-value</i>
(Intercept)		2058.898	151.469	13.59	< 0.00
Days_Since		3.7879	0.1264	29.96	< 0.00
R-Squared	0.9305				
Adj. R-Squared	0.9295				
p-value	< 0.00				

Table D3. Summary of Linear Regression on AO3 for M/M

	<i>Minimum</i>	<i>Q1</i>	<i>Median</i>	<i>Q3</i>	<i>Maximum</i>
Residuals:	-2246.0	-749.3	-113.5	475.5	3294.0
Coefficients:		<i>Estimate</i>	<i>Standard Error</i>	<i>t-value</i>	<i>p-value</i>
(Intercept)		5575.998	258.607	21.56	< 0.00
Days_Since		6.3131	0.2159	29.25	< 0.00
R-Squared	0.9274				
Adj. R-Squared	0.9263				
p-value	< 0.00				

Appendix E
Honors Symposium Speech
Orally presented on May 18th, 2024

Slide 1. Introduction

Hello!

I am Cynthia Nguyen. I study Applied Math and Economics which has given me the tools to analyze pornography production patterns.

Unlike the rest of my peers on today's panel, I will be looking at production instead of consumption. Production is on the supply side while consumption is on the demand side.

Nothing in this presentation will refer directly to explicit content.

All graphics are just graphs.

And frankly, it is not as exciting as you may think it is.

But, there may be some heavy topics in the implications of the results and during Q & A.

I understand if you make expressions of discomfort during any moment of this presentation.

Slide 2. Definition

So... what is pornography?

Pulled straight off of Google (Oxford Languages), pornography is defined as:

“Printed or visual material containing the explicit description or display of sexual organs or activity, intended to stimulate erotic rather than aesthetic or emotional feelings.

Intention is the key to distinguishing porn from say...

- An anatomy and physiology book or
- A video documentation of surgeries or
- A pamphlet on symptoms from STIs

Slide 3. Context

Now, there's a lot on the consumption and effects of porn out there.

- How it affects certain age groups
- How it affects relationships
 - How it affects relationships between guys
 - How it affects relationships between non-wedded couples
 - How it affects relationships between married couples
 - How it affects your relationship with yourself
- Perceptions of pornography over time
 - Perceptions of porn from women
 - Perceptions of porn from feminists
- Porn addiction
- Whether or not higher consumption leads to seeking out more extreme porn

But, on the other side of the coin is production. Research usually focuses on motivators for going into the industry or perceptions and their effects on actors in porn.

For such a large industry, production patterns are not analyzed as often as consumption patterns. With so much consumption and research on demand, what does the supply look like? Was it affected by the pandemic?

Now, ...why does this matter in general?

- Sex-related topics are often kept behind closed doors
- Taboo-destruction is integral to beginning to become more aware of our behavior and health in relation to our bodies

A philosopher, Aldous Huxley, once wrote, “facts do not cease to exist because they are ignored”

And, I sought out these facts.

Slide 4. Forms of Pornography Analyzed

Pornography comes in a variety of forms.

Though, there are three main mediums porn can be uploaded:

- Video
- Audio
- Written

In theory, if we can measure the number of newly uploaded content over time, we can map out a pattern in production.

I collected data off of three sites.

Slide 5. The Specific Platforms

- For videos - Pornhub
- For audios - a subreddit called r/GoneWildAudio which allows for adults to post erotic audios individually or in collaboration with other members
- For written work - Archive of Our Own which is a platform people can post written work whether it be original work or fanfiction. I made sure to filter for only works that have an explicit rating.

Now, let's walk through my process.

Slide 6. Overview of Process

I definitely received weird looks as I tended to search for data while I was out in public, and well...

Something about seeing “Pornhub” or “Hot Mom’s Near You” on a college student’s laptop while they’re downloading a large file all while in a cafe really raises eyebrows.

Luckily, data collection went relatively smoothly.

- Pornhub releases raw data free to download and other data nerds have made their cleaned up or samples of this large dataset available to download off of spaces such as Github and Kaggle
- RedditExtractoR, a package for R, aided in data collection off of r/GWA
- But, there was no easy way out with AO3. I had to manually enter in every month’s number of works for multiple categories for multiple years... my wrist has not stopped hurting.

After collection comes wrangling which is basically rounding up the data I need like wrangling cows.

Once I wrangle the relevant variables, I can begin visualizing the data with graphs to catch patterns or outliers to then statistically analyze.

Slide 7. Variables and Descriptions

As mentioned before, I had to get my relevant variables.

Overall, all data had a published date whether it was Month-Year or just the Year.

I then had to calculate the monthly total of uploaded content.

In some cases, I was able to get totals down by category.

Now, onwards to visualizations!

Slide 8. Pornhub Visual (COVID-19 Pandemic)

Let’s start with Pornhub.

All highlighted areas on these graphs are an aid to identify some time of crisis.

Keep in mind these are monthly totals of newly uploaded work.

We see here an overall increasing rate of production. It isn’t quite linear or a straight trend line, but it seems like the COVID-19 pandemic did not lead to a very noticeable decrease or increase. Otherwise, we’d see a sharp kink in the blue line.

To see if there was any change during a different crisis, I checked earlier years. Specifically the 2008 Financial Crisis.

Slide 9. Pornhub Visual (2008 Financial Crisis)

Right off the bat, there appears to be much more volatility. However, the spike you see around the end of 2007 to 2008 and also the overall upswing afterwards is not necessarily due to the crisis.

Pornhub was created about the end of May 2007.

There's a chance the uptick may be due to people beginning to get used to using the site. Though it could also be due to people being pushed to the fringe and needed to make money fast.

However, if we zoom out to get a bigger picture we see this...

Slide 10. Pornhub Visual (Overall)

...there seems to have been a trend all along...

This is an exponential pattern. If we zoomed up enough, there'd be a lot of erraticness.

But, zoomed out, we begin to see production does not quite ramp up or down into a different pattern and tends to even out along a stable exponential trend.

There is this uptick in 2012, but there is a chance that it may have been a mass reupload of content that was previously deleted when accounts were previously unverified. The data collected is only on new uploads and does not have any information on deletions.

Now, let's glimpse at r/GWA.

Slide 11. GWA Visual

Due to the nature of the data, it is not going to be similar to the other two platforms.

To get into a subreddit's Top of All Time, there is an internal score calculated based on the interactions the post has garnered.

In theory, the higher the score a post gets, the more demand it likely has. This can set trends for producers to follow on consumer preferences.

But for now, we can get a better look at changes in production by categories over the recent years.

The pattern overall seems to be an increase from 2018 to 2022, followed by a slight decrease in 2023.

Looking at individual categories, we can see that the overall pattern is the same for Female Speaker for Male Listener works, but that there is a consistent increase in Male for Female works. And, nearly no Male for Male and Female for Female works that had large interaction.

Slide 12. AO3 Visual

Looking at AO3's data points, it is similar to Pornhub where a clear trend emerges.

There is an overall linear trend where the monthly totals increase at a steady rate over time. The pandemic did not really affect the trend though it can be argued there seems to be larger spikes when they do occur.

There's more volatility with Male/Male works than other categories and higher production as well. Female/Female work does not have as much volatility but is produced the least, while Male/Female works are somewhere in the middle.

Slide 13. Data Analysis

Based on patterns seen in the graphs, we can look into which tools to use for statistical analysis. A linear regression was run on Pornhub and AO3 data, and an ANOVA, an extension of t-testing, was run on GWA data.

A linear regression is basically fitting a straight line through the data. Any curve zoomed in looks relatively straight, so we are fitting these lines to only 2018 to 2023 as they are also the years all the datasets have in common.

ANOVA, or Analysis of Variance, is used to usually see if there is a statistically significant difference between one variable between two or more groups.

Regressions allow us to have a chance to predict future production as well. With ANOVA, we can only parse out whether there was a large change in the amount of works that made it to Top of All Time between each year and within categories.

After some fun coding and statistics, we have these results...

Slide 14. Main Results

Approximately 50 videos were uploaded per day onto Pornhub between 2018 and 2023
Approximately 12 new works were created per day on AO3 between 2018 and 2023
And, there is an overall higher amount of interaction with audio porn in recent years.

So, what have we learned?

Slide 15. Conclusion

Regardless of if the world is prospering or on fire, porn production marches on. To anyone thinks times of hardships leads to more consumption which then incentivizes more production, I'll have to sink that ship and say... we were headed in this direction anyway.

This also means that being a producer is one of the most economic shock-proof professions to go into...

...yay...

So...what does this all mean?

Slide 16. Implications

There has been previous work that shows the creation of the Internet jumpstarted more media production and porn follows this trend.

Smart technology allows for access anywhere you can get WiFi or a signal.
Being exposed is easier, which is why parental safety features and SafeSearch are important features.

With AI being introduced, it will likely further allow for faster production... deepfakes can be created where new faces can be pasted over previous videos or videos can be generated entirely.

While it may level off one day, as nothing can remain exponential...

- How often will sites need to do clean sweeps or become actively involved with moderating or screening content?
- [solemn tone] How much more difficult will it be to report content for being posted abusively, nonconsensually, or with malintent in general?

[Call to action]

While it is not the most safe for work concern, nor is it pretty,

- If you want to live in a world where anything sex-related is coming from a positive and safe background or is regulated carefully,
- We must remember to hold platforms that allow for explicit content to be posted accountable and active in moderating

Slide 17. Thank You

[Uplifting]

Thank you for staying for this project and not immediately turning away due to its topic.
I'm more than happy to answer any hot and heavy questions after we all learn more about consumption.

Appendix F

Honors Symposium Slides

**Intimacy Without the Chance of Heartbreak
for Richer, for Poorer,
in Sickness and in Health:**
Analyzing Pornography Production Patterns
Cynthia Nguyen

1

Pornography
/pɔːˈnɒɡrəfi/
printed or visual material containing the explicit
description or display of sexual organs or activity,
intended to stimulate erotic
rather than aesthetic or emotional feelings.
(Oxford Languages)

2

Context

Problem:
Lack of analysis on
production patterns of
porn
Large industry, not a lot
of information out there

Significance:
The taboo nature of
sex-related topics leads
to heads turning away
from questioning such
topics

3

Looking at three different mediums
porn can be uploaded

- Video
- Audio
- Written

In theory...
Measure amount newly uploaded ⇒ Production Pattern

4

Video Audio Written

Pornhub r/GoneWildAudio (GWA) Archive of Our Own (AO3)

5

Data Processing

Data Collection
Pornhub releases
raw data free to
download
Reddit/ExtractAll
package for reddit,
data
Manually entered
AO3 data

Data Wrangling
Understand & fill in
missing data
Select/create
relevant variables
Look at statistical
summaries of
relevant variables

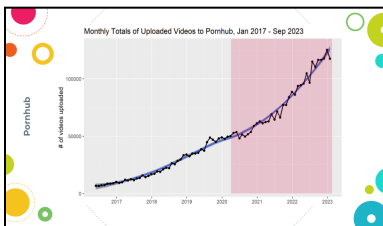
Visualizations
Create graphs to
see patterns and
outliers
Keep in mind for
modeling

Statistics
Make predictive
models based off
patterns from visuals
Interpret statistical
significance
relationships

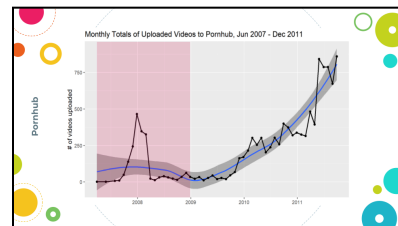
6

Variables	Description
Month-Year	Month and year of uploaded content
Total	Monthly total of uploaded content
Category	Category tag of what kind of romantic and/or sexual relationship(s) will be denoted
for GWA	FxF: Female speaker, Female listener FxM: Female speaker, Male listener MxM: Male speaker, Male listener MxF: Male speaker, Female listener
for AO3	MF: Female/Male relationship MM: Male/Male relationship

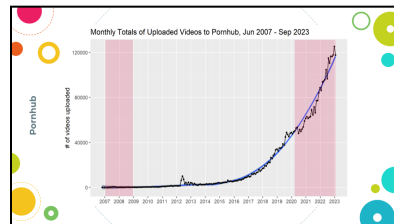
7



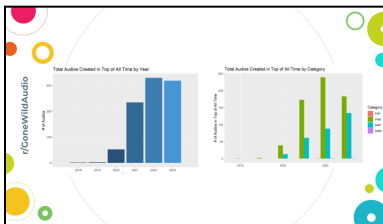
8



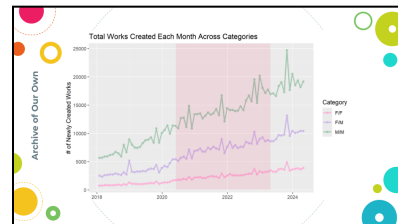
9



10



11



12

Linear Regression
Target Variable:
Monthly Total of Uploaded
Content
Independent Variables:
Date (Year-Month)
Jan 2018 - Sep 2023

T-Testing
Target Variable:
Total Works in
Top of All Time
Independent Variables:
Year
2018 - 2023
Alternative Hypothesis:
There is NOT
an equal amount of works
in Top of All Time
each year

13

~50 videos uploaded per day
On Pornhub between 2018 and 2023

~12 new works created per day
On AO3 between 2018 and 2023

Higher demand in audio porn in recent years
On r/GWA

14

Conclusion

- It was going in this direction anyway...
- The production is ever increasing
- Being a producer is one of the most economically shock-proof professions
- Whether there is revenue, if there's time and people who want to create it, it will be created

15

Implications

Growth may be more correlated with technological advancement

- Smart technology
- AI Deepfaking

There will be a day it all levels off...

- But how often will sites need to do a clean sweep of content?
- Until then, how much more difficult will it be to see action?

16

Thank You

Any questions?

17