

Frail, frumpy and forgotten.

A REPORT ON THE MOVIE ROLES OF WOMEN OF AGE.

WRITTEN BY



Geena Davis Institute
on Gender in Media
If she can see it, she can be it.™

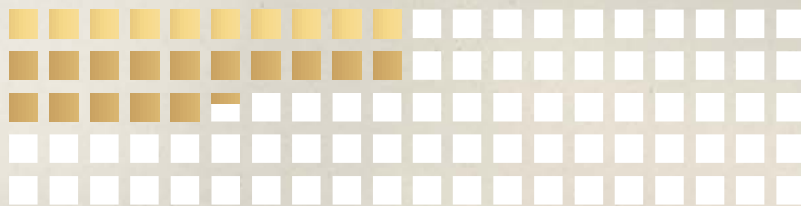
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Executive Summary

This is the first global study to systematically analyze representations of older adults, with a specific focus on women ages 50+ in entertainment media. A majority of older adults (77%) have experienced ageism, most commonly being treated as frail or shown disrespect because of their age.¹ In this study, we examine the extent to which entertainment media contributes to ageism by erasing older adults and presenting them in stereotypical ways in the top-grossing films of 2019 in Germany, France, the UK, and the US. Here is a summary of our major findings, followed by the full report below.

**FEMALE CHARACTERS
MAKE UP ONLY 25.3%
OF CHARACTERS 50+**



0% OF

**LEADS
AGES 50+
ARE FEMALE**

FEMALE CHARACTERS 50+ ARE MORE LIKELY THAN MALE CHARACTERS 50+ TO BE SHOWN AS

SENILE

(16.1% VERSUS 3.5%)

HOMEBOUND

(16.1% VERSUS 2.4%)

FEEBLE

(19.4% VERSUS 5.9%)

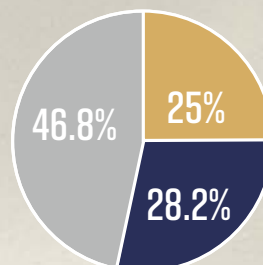
FRUMPY

(19.4% VERSUS 4.7%)

ONLY ONE-IN-FOUR FILMS PASS THE AGELESS TEST

IN ORDER TO PASS THIS TEST, A FILM MUST HAVE:

1. AT LEAST ONE FEMALE CHARACTER WHO IS 50+ WHO MATTERS AND IS TIED INTO THE PLOT IN SUCH A WAY THAT THEIR REMOVAL WOULD HAVE A SIGNIFICANT EFFECT; AND
2. THAT CHARACTER MUST BE PRESENTED IN HUMANIZING WAYS AND NOT REDUCED TO AGEIST STEREOTYPES.



■ NO FEMALE CHARACTER AGES 50+

■ STEREOTYPED FEMALE CHARACTER AGES 50+

■ NON-STEREOTYPED FEMALE CHARACTER AGES 50+

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Introduction

The purpose of this study is to examine representations of older adults in entertainment media, with a particular focus on how older women are represented. A majority of older adults (77%) say they have experienced ageism, most commonly being treated as frail or shown disrespect because of their age.² We are interested in determining the extent to which entertainment media contributes to ageism by erasing older adults and presenting them in stereotypical ways. More specifically, we focus on the ways in which people ages 50 and older are represented in the top-grossing films in Germany, France, the U.K., and the U.S.

This is the first global study to systematically analyze representations of older adults in entertainment media. Ageism is surprisingly acceptable in many societies, from self-deprecating jokes about "senior moments" to judging others for clothing or hairstyles that are deemed as not "age appropriate." According to the World Health Organization, ageism is a surprisingly acceptable prejudice throughout the world.³ Anti-ageism advocate Ashton Applewhite points out that "the experience of reaching older age can be better or worse, depending on the culture in which it takes place." We join this conversation with an in-depth analysis of how characters ages 50+ are depicted in the most-watched films in four countries.

This report starts with a summary of previous studies on ageism and media representations of older adults. We then describe the methodology of this study and present an overview of the sample. Our findings are presented in the next section, followed by the conclusion and recommendations for improving media representations of older adults.

Previous Research on Ageism in Media

Older adults in many countries face ageism, "a process of systematic stereotyping of and discrimination against people because they are old, just as racism and sexism accomplish this with skin color and gender."⁴ Older adults are stereotyped as mentally feeble or senile, inflexible in thought and manner, and old-fashioned in morality and skills. This type of prejudice is remarkably acceptable in most cultures.⁵ Unlike other prejudices, which are manifestations of fear of difference, ageism is unique in targeting our future selves.⁶ This is striking because aging is unavoidable for all regardless of race, class, gender, sexuality, or ability.

Combating ageism is critically important because our society is aging. In 2017, the global population ages 60 or over was approximately 962 million, twice as large as in 1980.⁷ By 2030, older adults are expected to outnumber children under 10, and by 2050 older adults are expected to outnumber adolescents and emerging adults ages 10 to 24.⁸

Combating ageism is also important because ageism has negative impacts on the health and well-being of older adults who face employment discrimination and poorer quality health care as a result of age-based biases. For example, people who hold more negative stereotypes of older adults are more likely to expect worse outcomes from their own experiences of aging.⁹ This internalization of stereotypes is referred to as stereotype embodiment.¹⁰ Stereotype embodiment has been shown to impact life satisfaction, physical health and functioning, physical activity, and even mortality.¹¹ This research makes clear that ageism disrupts active aging (a

concept launched by WHO in 2002), defined as "the process of optimizing opportunities for health, participation, and security in order to enhance quality of life as people age." The concept of active aging goes beyond physical health or participation in the workforce, emphasizing "continuing participation in social, economic, cultural, spiritual, and civic affairs" by older adults.¹²

In this study, we are interested in understanding whether media representations play a role in reinforcing harmful stereotypes of older adults. The few previous studies on this topic find media promote ageism in two primary ways: erasing older adults and presenting them in stereotypical ways. We present findings on both forms of ageism below.

Older adults as a whole are grossly underrepresented in media, although older women are further marginalized in comparison to men in older generations. Lauzen and Dozier (2005) find that the invisibility of older people on television is common. Americans ages 60+ make up 19% of the population, but are only 4% of major television characters.¹³ In a recent AARP study, only 15% of print media images feature those over age 50, despite the fact that this age group makes up one-third of the U.S. population.¹⁴ Older women are particularly erased in entertainment media. Older male characters outnumber older female characters two-to-one, and only 11% of male characters on television between ages 50 and 64 are perceived as "old" compared to 22% of female characters.¹⁵

When older adults are depicted in entertainment media, it is often in stereotypical ways.¹⁶ They are typically shown as exaggerated or distorted portraits of older people.¹⁷ More specifically, they are often represented as unproductive, dependent members of society who are out of touch with technological advances. People older than 50 form one-third of the American labor force, however, only 13% of the images analyzed by the AARP showed older adults working. Additionally, about 70% of adults over 50 are shown by themselves, with a partner, or with a medical practitioner.¹⁸ These stereotypical portrayals paint an inaccurate picture of older adults who are divorced from the work force and are dependent on the labor of others, like medical personnel or spouses. In contrast, younger adults are shown with friends, co-workers and actively engaged with others.¹⁹ Also, less than 5% of print images show older adults using technological devices, even though nearly 69% of people between 55 and 73 own a smartphone.²⁰



Methodology

The primary methodology of this study is content analysis, ideal for systematically analyzing representations in communications, such as films. We analyzed the content of the ten top-grossing films of 2019 in four different countries: Germany, France, the UK, and the US. Our final dataset included 32 films as there was some overlap in the top-grossing films in these countries. The unit of analysis for this study is character. In total, we analyzed 1,235 leading, supporting, and minor characters in these films. More specifically, the dataset includes 36 leading/co-leading characters (referred to as "leading characters"), 472 supporting characters, and 727 minor characters. All reported differences are statistically significant at the .05 level. We generated the data in this report using both expert human coding and machine learning, which we describe in turn.

For expert human coding, a team of ten researchers systematically evaluated the films. Prior to initiating the work, the research team engaged in a total of 9.5 hours of training and codebook development, for a total of 95 training hours. The team also performed a test to measure inter-rater reliability. Inter-rater reliability was achieved in terms of both absolute agreement and Fleiss' Kappa measures.

For machine learning coding, we employed the Geena Davis Inclusion Quotient (GD-IQ), a groundbreaking software tool developed by the Geena Davis Institute on Gender in Media at Mount Saint Mary's University to analyze audio and video media content. Funded by Google.org, the GD-IQ incorporates machine learning technology as well as the University of Southern California's audio-visual processing technologies and is the only software tool in existence with the ability to measure screen and speaking time through the use of automation. This revolutionary tool was co-developed by the Institute and led by Dr. Shrikanth (Shri) Narayanan and his team of researchers at the University of Southern California's Signal Analysis and Interpretation Laboratory (SAIL), along with Dr. Caroline Heldman, Vice President of Research and Insights at the Institute. For more information about the automated tool, please see Appendix A.

Sample Description

In this section we present a description of the sample in terms of character gender, race, LGBTQ+ status, disability status, age, and body size.

As shown in Table 1, characters in the top-grossing films of 2019 do not reflect the general population when it comes to gender. Male characters outnumber female characters two-to-one in the top-grossing films in this study. For context, women make up 51% of the global population.²¹

We also examine screen time and speaking time using the automated GD-IQ



TABLE 1: CHARACTER GENDER

DEMOGRAPHIC BREAKDOWN	PERCENTAGE
MEN	66.9%
WOMEN	32.8%
GENDER NON-CONFORMING	0.3%

tool on non-animated films in the study.²² We find gender gaps in screen time and speaking time.

- Male characters appear on screen twice as often as female characters in the films we analyzed (67.4% compared with 32.6%).
- Male characters speak twice as often as female characters (65.5% compared with 34.5%).

As shown in Table 2, only one-in-five characters in the top-grossing films in our study is a character of color, while the remainder are white characters.²³ For comparison, the average percentage of people of color in the countries in our study is 23.6%, which indicates that, overall, characters of color are equitably represented in the films examined here.

When it comes to screen time and race, white characters appear more often than all characters of color combined (54.2% compared with 45.8%). Among characters of color, Black characters appear most often (32.6%), followed by Southeast Asian characters (10.2%). Asian (3.9%) and Latinx (2.3%) characters rarely appear on screen in these films.

As indicated in Table 3, LGBTQ+ characters are virtually nonexistent in the top-grossing films in this study. Only 1.4% of characters are depicted as LGBTQ+ compared to 10.0% of people globally.²⁴

As shown in Table 4, characters with physical, cognitive, or communication disabilities make up only 2.9% of characters in our study, which is well below the 15% of people with disabilities globally.²⁵

According to the United Nations, 28% of the world's population is age 50+.²⁶ As shown in Table 5, characters ages 50+ are under-represented in the films in our study.

People with large body types make up 39% of the global population.²⁷ As presented in Table 6, characters with large body types are vastly under-represented in the top-grossing films in this study.

TABLE 2: CHARACTER RACE/ETHNICITY

DEMOGRAPHIC BREAKDOWN	PERCENTAGE
WHITE	78.7%
LATINX	1.9%
BLACK	12.5%
ASIAN	2.5%
MIDDLE EASTERN	1.9%
NATIVE AMERICAN/HAWAIIAN/ PACIFIC ISLANDERS	1.4%
SOUTHEAST ASIAN/INDIAN	1.0%
<i>SUMMARY: WHITE CHARACTERS & CHARACTERS OF COLOR</i>	
WHITE CHARACTERS	78.7%
CHARACTERS OF COLOR	21.3%

TABLE 3: LGBTQ+ CHARACTERS

DEMOGRAPHIC BREAKDOWN	PERCENTAGE
HETEROSEXUAL	98.6%
LGBTQ+	1.4%

TABLE 4: CHARACTERS WITH DISABILITIES

DEMOGRAPHIC BREAKDOWN	PERCENTAGE
NON-DISABLED	97.1%
DISABLED	2.9%

TABLE 5: CHARACTER AGE

DEMOGRAPHIC BREAKDOWN	PERCENTAGE
CHILD (0-12)	5.2%
TEEN (13-19)	6.0%
20s	20.9%
30s	25.0%
40s	21.3%
50s	11.1%
60+	10.7%
<i>SUMMARY: CHARACTERS UNDER 50 & 50+</i>	
UNDER 50	78.2%
50+	21.8%

TABLE 6: CHARACTER BODY SIZE

DEMOGRAPHIC BREAKDOWN	PERCENTAGE
NON-LARGE BODY TYPE	89.7%
LARGE BODY TYPE	10.3%

Findings

In this section, we present detailed findings on media representations of older adults (ages 50+). We start with an assessment of representations of women ages 50+, followed by an overview of the Ageless Test. We then provide a profile of older characters more broadly and an analysis of their character prominence, work and leadership, character traits, stereotypes, gender and stereotypes, slurs, depictions of romance and sex. Given that characters are often aged up or down with make-up, angles, and CGI, our evaluation is based on the estimated age of the character as depicted and not the actual age of the actor.

GENDER AND STEREOTYPES: OLDER WOMEN ARE SENILE AND FEEBLE

Three-in-four (74.7%) characters ages 50+ are male, while one-in-four (25.3%) are female. This means that when audiences see older adults on screen, they are overwhelmingly seeing male characters.

When female characters ages 50+ do appear, they are far more likely to be depicted in stereotypical terms than male characters ages 50+ (2.8 stereotypes on average compared with 1.5 stereotypes). We find some notable gender gaps in ageist stereotypes:

- Female characters 50+ are four times more likely to be shown as senile than male characters ages 50+ (16.1% compared with 3.5%). For example, one older female character is shown as homebound, mentally unstable, and unable to take care of herself.
- Female characters 50+ are more likely to be depicted as sickly than male characters ages 50+ (9.7% compared with 5.9%). For example, one female character who is otherwise shown in a serious leadership position is simultaneously depicted as so weak that she is unable to survive to the end of the film.
- Female characters ages 50+ are more than twice as likely to be shown as physically unattractive than male characters ages 50+ (29.0% compared with 12.9%). For example, one female character is shown as having unkempt

hair, hairs growing out of her chin, and only ever shown wearing pajamas.

- Female characters ages 50+ are nearly four times more likely to be shown as feeble than male characters ages 50+ (19.4% compared with 5.9%). For example, one older female character is shown as being so mentally incapable that she is manipulated by her pets.
 - Female characters ages 50+ are more likely to be depicted as lonely than male characters ages 50+ (19.4% compared with 14.1%). For example, one older female character is shown as so lonely that she talks to herself.
- Female characters ages 50+ are seven times more likely to be depicted as homebound than male characters ages 50+ (16.1% compared with 2.4%). For example, many of the female characters we analyzed were never actually shown leaving their homes.
- Female characters ages 50+ are nearly four times more likely to be shown as frumpy than male characters ages 50+ (19.4% compared with 4.7%). For example, older female characters are shown wearing baggy clothing, pajamas, ill-fitting hats, and mismatched clothing.
 - Female characters ages 50+ are twice as likely to be shown as not at all fashionable compared to male characters ages 50+ (29.0% compared with 12.9%). For example, many of the male characters ages 50+ were shown in dapper clothing with coiffed hair, whereas older female characters are typically shown in ordinary clothing or even frumpy apparel.

- Female characters 50+ are twice as likely to be depicted as physically inactive compared with male characters 50+ (19.4% compared with 9.4%). For example, male characters ages 50+ were often portrayed as moving throughout the film, whereas older female characters were more likely to be shown as homebound and engaging in very little physical activity.

THE AGELESS TEST

In this section, we present the findings of the Ageless Test, a measure of how well older women are represented in media. More specifically, this test examines whether women ages 50+ are presented as having fully realized lives rather than serving as scenery in younger people's stories. In order to pass this test, the film must have:

1. At least one female character who is 50+ who matters and is tied into the plot in such a way that their removal would have a significant effect; and
2. That character must be presented in humanizing ways and not reduced to ageist stereotypes.

Only one-in-four films in this study passed the Ageless Test (25%), which means that the vast majority of popular films in this study failed to depict even one prominent, humanized, older female character. A large majority of films (71%) have at least one female character who is 50 or older, but most of these films depicted their older female characters in stereotypical ways.

PROFILE: OLDER ADULTS LESS DIVERSE

Characters ages 50+ are under-represented in the most popular films when compared with the broader population (21.8% compared with 28%). When it comes to the profile of characters ages 50+ versus younger

characters, some significant differences emerge:

- One-in-three (35.3%) characters under 50 are female compared with one-in-four (25.3%) characters 50+. This means that when audiences see female characters on the screen, she is more likely to be a younger woman.
- While a small percentage of characters (0.3%) are depicted as gender non-conforming in films in this study, none of these characters are ages 50+. This is a complete erasure of older gender non-conforming adults in popular films.
- Characters younger than 50 are more likely to be characters of color than characters older than 50 (23.0% compared with 18.8%). This means that when viewers see older characters on the screen, they are less racially diverse than younger characters.
- When it comes to sexuality, characters under 50 are three times more likely to be shown as LGBTQ+ than characters 50+ (1.5% compared with 0.4%). Only one (male) character 50+ is depicted as LGBTQ+, which means that lesbians and transwomen over 50 are completely erased in the films in this study.
- Characters ages 50+ are nearly three times more likely to be depicted as having a disability than younger characters (5.7% compared with 2.0%).
- Characters ages 50+ are twice as likely to be shown with large body types than characters under 50 (20.6% compared with 8.4%). This means that older characters have a more accurate representation of body size than younger characters.

PROMINENCE: OLDER ADULTS RARELY TAKE THE LEAD

Another way of measuring the presence or absence of a group in media is to analyze how many characters are shown in leading versus supporting and minor roles. We find that characters ages 50+

are less likely to be cast in prominent roles than characters under 50:

- Characters under 50 are more than twice as likely to be cast in leading roles than characters 50+ (1.8% compared with 0.8%).
- No women ages 50+ appeared in leading roles in the top-grossing films in the study, while two men ages 50+ were featured as leads.
- Characters ages 50+ are more likely to be shown in supporting roles than younger characters (46.5% compared with 35.1%).

We also measured screen time and speaking time for characters ages 50+, which reflect the same under-representation of older adults:

- Characters ages 50+ constitute 16.9% of screen time in the films we analyzed.
- Characters ages 50+ speak 21.8% of the time that characters are speaking in the film in our study.

WORK AND LEADERSHIP: OLDER ADULTS TAKE THE LEAD

Depictions of work and leadership are important indicators of a character's contribution and value to society.

- Characters under 50 and 50+ are equally likely to be shown as having an occupation, and we find no gender difference in terms of work amongst characters ages 50+.
- Characters 50+ are more likely than characters younger than 50 to be shown as a leader (66.4% compared with 46.4%).
- Male characters ages 50+ are more likely to be depicted as leaders than female characters ages 50+ (68.2% compared with 61.3%).

STEREOTYPES: OLDER ADULTS ARE STUBBORN AND CRANKY

In this section, we summarize the findings of an extensive analysis of

stereotypes and slurs. Over half (56.9%) of characters ages 50+ are depicted with at least one stereotype. On average, characters ages 50+ are depicted with two ageist stereotypes. An analysis of mental, emotional, physical, and appearance-based stereotypes is included here.

Mental Stereotypes

- One-in-three characters ages 50+ is depicted as stubborn (32.8%).
- One-in-three characters ages 50+ is depicted as cranky (31.9%).
- One-in-ten characters ages 50+ are shown as intolerant or bigoted (10.3%).
- One-in-ten characters ages 50+ are shown as feeble (9.5%).
- 6.9% of characters ages 50+ are depicted as senile.
- 5.2% of characters ages 50+ are shown as stingy.

Emotional Stereotypes

- 15.5% of characters ages 50+ are depicted as lonely.
- 10.3% of characters ages 50+ are shown as socially inactive.
- 5.2% of characters ages 50+ are shown as depressed.

Physical Stereotypes

- 12.1% of characters ages 50+ are depicted as physically inactive.
- 6.9% of characters ages 50+ are depicted as sickly.
- 6.0% of characters ages 50+ are shown as homebound.
- 4.3% of characters ages 50+ are depicted as dependent upon others.

Appearance Stereotypes

- Nearly one-in-five characters ages 50+ is depicted as physically unattractive (17.2%).
- 17.2% of characters ages 50+ are shown as "not at all fashionable."
- 8.6% of characters ages 50+ are depicted as frumpy.

AGEIST SLURS: INFANTILIZING AND OFFENSIVE

Only 4.3% of characters ages 50+ were called an ageist slur, with female

characters more likely to be the target of an ageist slur than male characters (6.5% compared with 3.5%).

The following overtly ageist comments appeared in the films in this study:

- "girl" (said in an infantilizing way to an older white woman)
- "he looks a thousand years old" (said about an older white man)
- "no one knows her age" (said with a demeaning tone to a much older white woman)
- "weariness comes with age" (meant to put down an older white woman)
- "no wonder you have gray hair" (said to an older Black woman)
- "you're useless" (in reference to the age of an older white man)

ROMANCE & SEX: LOVE WITHOUT SEX

Another way that older adults are dehumanized in entertainment media is through depictions of them as asexual or non-sexual beings. We find no age difference in depictions of romance, but significant differences in portrayals of sexual partners and sex scenes.

Romance

Characters under 50 and characters 50+ are about equally likely to be depicted in a romantic relationship (24.4% and 25.0%, respectively).

Sexual Partners

- Characters under 50 are more likely to have at least one sexual partner than characters 50+ (16.6% compared with 9.5%). This means that while characters ages 50+ are just as likely to have a romantic relationship than characters under 50, older characters are shown as less sexual, which indicates a societal aversion to the sexual aspect of older relationships.
- Among characters ages 50+, male characters are more likely to have at least one sexual partner than female characters (10.6% compared with 6.5%).

Sex Scenes

- Characters under 50 are three times more likely than characters 50+ to be depicted in a sex scene (8.4% compared with 2.6%). We find no difference by gender in sex scenes for characters 50+.
- All of the characters ages 50+ are depicted in sex scenes that do not actually show much sexual activity, while 3.6% of characters under 50 are shown in sex scenes with more graphic sexual activity. For example, scenes that cut from two characters making out on a bed to the morning after they have had sex is an example of showing almost no sexual activity. The lack of detail in sex scenes featuring older adults sends the message that their bodies are not as worthy to be shown in sexual ways.



Conclusion

Our analysis in this study demonstrates that entertainment media reinforces ageism in society by erasing and stereotyping older adults, especially for women. Female characters ages 50+ are more likely to be depicted in stereotypical ways than male characters ages 50+ (2.8 versus 1.5 stereotypes on average), and gender gaps abound. Female characters 50+ are four times more likely to be shown as senile than male characters ages 50+ (16.1% compared with 3.5%), and more likely to be shown as sickly (9.7% compared with 5.9%), unattractive (29.0% compared with 12.9%), feeble (19.4% compared with 5.9%), lonely (19.4% compared with 14.1%), homebound (16.1% compared with 2.4%), frumpy (19.4% compared with 4.7%), not at all fashionable (29.0% compared with 12.9%), and physically inactive (19.4% compared with 9.4%). Male characters ages 50+ are more likely to be depicted as intolerant than female characters ages 50+ (11.8% compared with 6.5%).

Only one-in-four films in this study passes the Ageless Test (26.3%), meaning the film features at least one female character who is 50+ who is tied into the plot in a significant way, and is not reduced to ageist stereotypes.

When it comes to the demographic profile of characters ages 50+ overall in film, characters are overwhelmingly male (74.7%), white (81.2%), and heterosexual (99.4%). Characters ages 50+ are nearly three times more likely to be depicted as having a disability than younger characters (5.7% compared with 2.0%), and twice as likely to be shown with large body types than characters under 50 (20.6% compared with 8.4%).

In terms of prominence, characters under 50 are more than twice as likely to be cast in leading roles than characters 50+ (1.8% compared with 0.8%). No leading characters ages 50+ are female.

We find no age differences in terms of work, but we do find that characters 50+ are more likely than younger characters to be depicted as a leader (66.4% compared with 46.4%). Male characters ages 50+ are more likely to be depicted as leaders than female characters ages 50+ (68.2% compared with 61.3%).

When it comes to character traits, characters 50+ are depicted as smarter (30.2% compared with 19.9%), while characters under 50 years of age are more likely to be shown as funny (50.9% compared with 38.8%).

Older adults in popular films are commonly depicted in stereotypical, degrading ways tied to age. Over half (56.9%) of characters ages 50+ are depicted with at least one stereotype, with two stereotypes per character on average. Older adults are shown as stubborn (32.8%), cranky (31.9%), physically unattractive (17.2%), not at all fashionable (17.2%), lonely (15.5%), physically inactive (12.1%), bigoted (10.3%), frumpy (8.6%), socially inactive (10.3%), feeble (9.5%), senile (6.9%), sickly (6.9%), homebound (6.0%), stingy (5.2%), depressed (5.2%), and dependent (4.3%).

With romance, characters ages 50+ are about equally likely to be depicted in a romantic relationship as younger characters (24.4% and 25.0%, respectively), but less likely to have a sexual partner (16.6% compared with 9.5%). Men ages 50+ are more likely to have at least one sexual partner than female characters ages 50+ (10.6% compared with 6.5%). Characters under 50 are three times more likely than characters 50+ to be depicted in a sex scene (8.4% compared with 2.6%), and all of the sex scenes featuring characters 50+ are not at all graphic, meaning that they show very little actual sexual activity.

Interventions For Content Creators

Here are some specific interventions content creators can commit to in order to improve representations of older adults in entertainment media:

CAST MORE WOMEN AGES 50+

Characters ages 50+ are underrepresented in popular films overall, but especially female characters. Commit to writing and casting more women ages 50+, especially in leading roles where they appear to be almost entirely erased.

INCREASE DIVERSITY IN OLDER CHARACTERS

Characters ages 50+ are notably less diverse than younger characters in terms of race and sexuality. Commit to increasing the number of older characters of color and LGBTQ+ characters in their 50s, 60s, 70s, and older.

AVOID STEREOTYPING OLDER CHARACTERS

Make a firm commitment to avoid degrading stereotypes associated with older adults, the most common being depictions of characters ages 50+ as stubborn, cranky, and physically unattractive. Instead, cast characters ages 50+ in roles originally written for younger characters without changing the dialogue or other aspects of the character. It is especially important to write and cast female characters ages 50+ in ways that avoid ageist stereotypes since they are far more likely to be depicted in this way.

ALLOW OLDER CHARACTERS TO BE SEXUAL

Commit to featuring characters ages 50+ in sex scenes as often as younger characters, and show older characters engaging in sex scenes that actually show sexual activity.

The GD-IQ was funded by Google.org. Incorporating Google's machine learning technology and the University of Southern California's audio-visual processing technologies, this tool was co-developed by the Institute and led by Dr. Shrikanth (Shri) Narayanan and his team of researchers at the University of Southern California's Signal Analysis and Interpretation Laboratory (SAIL), along with Dr. Caroline Heldman.

To date, most research investigations of media representations have been done manually. The GD-IQ revolutionizes this approach by using automated analysis, which is not only more precise, but makes it possible for researchers to quickly analyze massive amounts of data, which allows findings to be reported in real time. Additionally, the GD-IQ allows for more accurate analysis, and because the tool is automated, comparisons across data sets and researchers are possible, as is reproducibility. Automated analysis of media content gets around the limitations of human coding. Beyond the significant advantage of being able to efficiently analyze more films in less time, the GD-IQ can also calculate content detail with a level of accuracy that eludes human coders. This is especially true for factors such as screen and speaking time, where near exact precision is possible. Algorithms are a set of rules of calculations that are used in problem-solving. For this report, we employed two automated algorithms that measure screen time by gender and race, and speaking time of characters by their gender. Here is an overview of the procedures we used for each algorithm.

SCREEN TIME ANALYSIS

We compute the screen time of female characters by calculating the ratio of female faces to the total number of faces in the film's visuals. The screen time is calculated using online face detection and tracking with tools provided by Google's machine learning technology. In the interest of precision and time, we estimate screen time by computing statistics over face-tracks (boxes tracking the general outline of each face) instead of individual faces. The face-tracks returned by technology include different attributes of the face with the corresponding time of occurrence in the video. Among the attributes returned for each of the detected faces, we use two parameters - the confidence of the detected face and the system's posterior probability for gender prediction. A threshold of 0.25 was empirically chosen for determining confident face detection.

Due to multiple characters appearing on screen simultaneously, the face-tracks can be overlapping. A gender label is then assigned to each track using the average gender posterior associated with the confident faces in the track. If the average gender posterior probability of the track is greater than 0.5, the track is classified as a "female track," otherwise, it is a "male track." The number of frames with confident face detections in each track is summed up across all tracks to get the total number of faces. The number of female tracks is aggregated to get the total number of faces predicted as female. Finally, the screen time is computed as the ratio between the number of female face detections to the total number of face detections across the length of the movie. Supplementary analysis shows that screen time estimated at frame-level (individual faces) instead of using face-tracks was not significantly different and was comparable. Furthermore, computing the average of gender posterior over tracks has an added benefit of "smoothing out" some of the local gender prediction errors. Face-tracking incorporates temporal contiguity information to reduce transient errors in gender prediction that may occur with analyzing individual faces independently. We performed a similar analysis for character race and screen time.

SPEAKING TIME ANALYSIS

Using movie audio, we compute the speaking time of male and female characters to obtain an objective indicator of gender representation. The algorithm for performing this analysis involves automatic voice activity detection, audio segmentation, and gender classification.

Voice Activity Detection:

Movie audio typically contains many non-speech regions, including sound effects, background music, and silence. The first step is to eliminate non-speech regions from the audio using voice activity detection (VAD) and retain only speech segments. We used a recurrent neural network based VAD algorithm implemented in the open-source toolkit OpenSMILE to isolate speech segments.

Segmentation:

We then break speech segments into smaller sections in order to ensure each segment includes speech from only one speaker. This is performed using an algorithm based on Bayes Information Criterion (BIC), available in the KALDI toolkit. Thirteen-dimensional Mel Frequency Cepstral Coefficient (MFCC) features are used for the automatic speaker segmentation. This step essentially decomposes continuous speech segments obtained in the VAD step into smaller segments to make sure no segment contains speech from two different speakers.

Gender Classification:

The speech segment is then classified into two categories based on whether it was likely spoken by a male or female character. This is accomplished with acoustic feature extraction and feature normalization.

Acoustic Feature Extraction:

We use 13-dimensional MFCC features for gender classification because they can be reliably extracted from movie audio, unlike pitch or other high-level features where extraction is made unreliable by the diverse and noisy nature of movie audio.

Feature Normalization:

Feature normalization is deemed necessary to address the issue of variability of speech across different movies and speakers, and to reduce the effect of noise present in the audio channel. Cepstral Mean Normalization (CMN) is a standard technique popular in Automatic Speech Recognition (ASR) and other speech technology applications. Using this method, the cepstral coefficients are linearly transformed to have the same segmental statistics (zero mean). Classification of the speaker as either male or female is based on gender-specific Gaussian mixture models (GMMs) of the acoustic features. These models are trained on a gender-annotated subset of general speech databases used for developing speech technologies using frame-level features for each gender. The GMM we use in this system has 100 mixture components and is optimized by tuning the parameters in a held-out evaluation set. For a new input segment whose gender label is to be predicted, the likelihoods of the segment belonging to a male or female class are computed based on this pre-trained model. The class with higher likelihood is assigned to the segment as the estimated gender prediction. The total speaking time by gender is then computed by adding together the durations for each utterance classified as Male/Female. This gives us the male and female speaking time in a movie.

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