

Kelsey E Bartiss. Evaluating the Readability of Online Consumer Health Information Regarding Macular Degeneration. A Master's Paper for the M.S. in I.S. degree. April, 2013. 33 pages. Advisor: Claudia Gollop

As consumers search for an increasing amount of health information online, it is important for the information that they find to not only be accurate, but written in an appropriate and accessible level of readability. Eight consumer health information websites were selected and a portion of text from each on the topic of macular degeneration, an eye disease that affects many older Americans and can result in the loss of central vision, was evaluated. The readability of the text was calculated using two tests: the Flesch-Kincaid Grade Level Index and the Flesch Reading Ease test. These calculations confirmed expectations that online consumer health information for macular degeneration is incomprehensible for a sizeable segment of the American population. According to the results, this information is written on average at a reading level of nearly the eleventh grade.

Headings:

Readability - - Evaluation

Consumer health information

Macular degeneration

EVALUATING THE READABILITY OF ONLINE CONSUMER HEALTH
INFORMATION REGARDING MACULAR DEGENERATION

by
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Approved by

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I. Introduction

As consumers search for an increasing amount of health information online, it is important for the information that they find to not only be accurate, but written in an appropriate and accessible level of readability. According to the National Adult Literacy Survey, the average American adult reads at the seventh grade level, but more than half of the population of the country reads below the sixth grade level (DuBay 1). Experts have recommended that information about health should be written at a fifth grade level (DuBay 1). But is this the case with online consumer health information?

For this study, eight consumer health information websites were selected and a portion of text from each on the topic of macular degeneration, an eye disease that affects many older Americans, was evaluated. The readability of the text was calculated using two tests: the Flesch-Kincaid Grade Level Index and the Flesch Reading Ease test. The Flesch-Kincaid Grade Level Index test calculates the American grade level of written material (DuBay 26). It is one of the most popular reading ability calculators used today and is currently used by the Department of Defense, the Social Services Administration, and the Internal Revenue Service to calculate the readability of their published materials (DuBay 31, 54). The Flesch Reading Ease Score calculates the difficulty of reading material on a scale of one to one hundred, with a score of one hundred indicating a very easy level of readability, scores between sixty and seventy to be a “standard” reading

level, and scores between zero and thirty to be at a college graduate level (DuBay 21-22).

The goal of this research was to find answers to the following research questions:

1. What is the recommended reading level for consumer health information?
2. Is the reading level for macular degeneration information above, at, or below this level?
3. If the reading level of this information is above the recommended level, by how much is it above?

The objective of this study was to answer these questions in order to gain a better understanding of the accessibility of consumer health information online and see what changes would perhaps need to be made in regards to ease of understanding of the material.

II. Literature Review

Macular degeneration is a condition of the eyes, which results in a partial or complete loss of central vision. This area of vision is damaged as significant amounts of drusen develop under the retinal pigment epithelium and neurosensory retina within the eye (Coleman et al. 1835). Drusen are composites consisting of protein, lipids, and cells (Stone 479). Age-related macular degeneration, or macular degeneration, is an umbrella term that actually consists of different forms of the disease that can be attributed to several different causes (Stone 478).

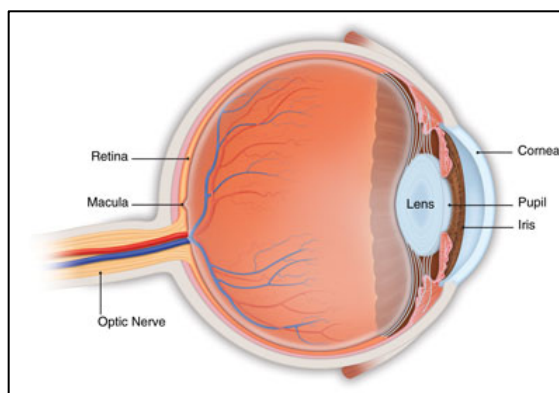


Figure 1 – Anatomy of the Human Eye (unknown)

In the past, it was believed that one single root cause of macular degeneration could be determined. However, this is not the case (Stone 479). Macular degeneration can be attributed to a number of various causes, or in some cases, a combination of them. Patients can live for years without adverse symptoms as the disease develops (Coleman et al. 1835).

One cause of macular degeneration for which there is no prevention is simply aging (Coleman et al. 1835). For some patients, genetics play a role in developing macular degeneration (Coleman et al. 1835). Genetics have the potential to be a contributing factor to increased risk of macular degeneration, and like aging, cannot be helped. Twin and family studies have been conducted to explore the role of genetics in the development of macular degeneration (Querques et al. 594). Medical science first discovered the link between heredity and macular degeneration in the late nineteenth century, before the term “genetics” was even widely used, as it was found that macular degeneration occurred within families (Stone 480-481). However, there isn’t one single gene in particular that increases an individual’s risk of developing macular degeneration (Stone 481). Instead, “high-risk alleles” occur across several locations within an individual’s DNA (Stone 481). While these genetic combinations do not inherently cause the development of macular degeneration, they do contribute to the likelihood of an individual developing the disease during their lifetime (Stone 481). Overall, genetics are the primary cause of approximately 23% of the cases of advanced macular degeneration (Coleman et al. 1838).

Some causes of macular degeneration are entirely preventable, the most prominent of which is smoking (Coleman et al. 1835). There is a proven direct correlation between the quantity of cigarettes a patient smokes and the likelihood of suffering from advanced macular degeneration (Coleman et al. 1836). For smoker patients who have yet to develop macular degeneration, studies have shown that ceasing smoking can decrease the risk of macular degeneration (Stone 483).

A number of previous studies have supported an association between sun exposure and an increased risk of developing macular degeneration, but other studies have not supported this conclusion (Coleman et al. 1838). The degree to which sun exposure influences the development of macular degeneration remains inconclusive and needs to be explored in further research (Coleman et al. 1838).

The effects of macular degeneration on a patient's vision may vary depending on the type and severity of macular degeneration the patient has developed. Individuals can go years without symptoms, until they begin to complain of a combination of general vision loss, central vision loss, changes in color perception, and seeing grids of straight lines that appear wavy (Querques et al. 593). There are three stages of macular degeneration: early, intermediate, and advanced (Coleman et al. 1836).

With early macular degeneration, drusen that have developed within the eye are small to medium sized, and the patient most likely has no noticeable symptoms (Coleman et al. 1836). Once macular degeneration advances to the intermediate level, drusen have become medium to large in size, and it is still possible that the patient hasn't noticed any adverse symptoms of macular degeneration, such as vision loss (Coleman et al. 1836).

During the advanced stages of macular degeneration, the condition can be characterized as one of two forms of the disease: as geographic, called "dry," macular degeneration, or as neovascular, called "wet," macular degeneration (Coleman et al. 1836). With dry macular degeneration, areas of the retina have slowly lost their pigmentation and small blood vessels, resulting in the loss of central vision (Coleman et al. 1836). When a patient suffers from wet macular degeneration, fluids and blood leak as the sensory retina or retinal pigment epithelium detach (Coleman et al. 1836). Wet

macular degeneration is the most common form of macular degeneration (Coleman et al. 1836).

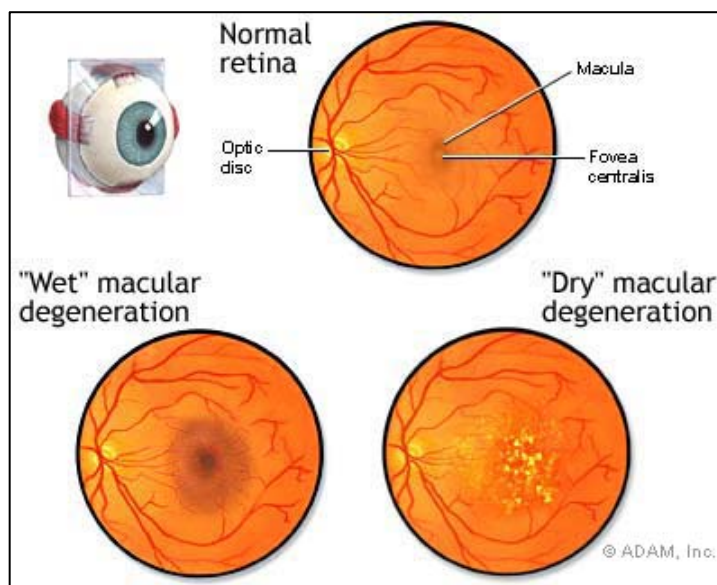


Figure 2 – Macular Degeneration (ADAM)

Macular degeneration is currently the most common cause of blindness in the developed world for individuals over fifty-five years of age of European descent (Coleman et al. 1835). Members of other racial and ethnic groups who are older than fifty-five do develop drusen in their lifetimes, but these individuals have a smaller chance of developing macular degeneration than Caucasians (Coleman et al. 1836). Wet, or neovascular, macular degeneration is the most common cause of severe central vision loss among adults of this age group (Coleman et al. 1836). Smokers in general have a higher risk of developing macular degeneration than non-smokers regardless of race or ethnicity (Stone 478). In total, 10 – 15% of people with macular degeneration experience severe central vision loss (Querques et al. 593).

Unfortunately, a cure for macular degeneration has yet to be discovered. This being the case, prevention and patient education are key to lessening the impact of macular degeneration on the adult population (Coleman et al. 1840). It is important to

empower patients to control what factors they can in lessening their risk of developing the disease, such as keeping a healthy body mass index and smoking cessation (Coleman et al. 1840). Previous studies have shown that these preventative measures taken by patients could reduce their chances of developing macular degeneration by half (Coleman et al. 1840).

However, once a patient has developed macular degeneration, there are some treatments currently available to lessen the impact and progression of the disease. For patients at moderate risk of developing macular degeneration and who already have drusen developed within their eyes, taking regular supplements of zinc and antioxidant vitamins can reduce their risk of progressing into advanced macular degeneration by around 25% (Coleman et al. 1835). Taking supplements will not help all patients reduce their risk of developing advanced macular degeneration. It is important to note that this treatment should not be recommended to patients that smoke, as it will increase their risk of lung cancer (Coleman et al. 1840).

Another form of treatment for macular degeneration involves a series of ranibizumab injections into the affected eyes to slow and stop further vision loss (Coleman et al. 1835). For this treatment, the patient has injections on a monthly basis over a period of three months (Querques et al. 595). Ranibizumab injections prevent further blood vessel growth as well as blood vessel leaks within the eye ("Ranibizumab Injection."). Because these injections work to counteract the leaking of blood vessels, they can only be used to treat wet macular degeneration and not dry macular degeneration. Current studies with this form of treatment suggest that it is a safe and effective way to improve and stabilize the vision of the patient (Querques et al. 594-595).

Patients undergoing this treatment will need to continue to visit their doctor for follow-up visits after they finish the series of ranibizumab injections to ensure their vision is remaining stable and not worsening (Querques et al. 595). These injections are intended to stop further vision loss once a patient has already developed wet macular degeneration and are not a preventative treatment.

An additional treatment for patients who have yet to develop advanced macular degeneration involves removing drusen within the eye with a special laser (Coleman et al. 1841). Like ranibizumab injections, this laser treatment is a management, not preventative, strategy for macular degeneration. Not all treatments are effective on all patients. Further research into treatments and cures for macular degeneration are currently underway.

III. Methods

For this research, eight consumer health information websites were chosen. These websites were selected based on a Google search and meeting a basic set of criteria. The Google search was for the term “macular degeneration.” Google was chosen as the search engine because it was the most frequently used search engine available (S. Kalarani and G. V. Uma 135). The search was performed and the list of results returned by Google was reviewed. The websites were required to meet three basic criteria: the owners of the websites must be based in the United States, the website’s primary audience was intended to be consumers, and the website must be credible.

For the purposes of this research, a website would be deemed credible based on Metzger’s basic definition of credibility: “credibility is a multifaceted concept with two primary dimensions: expertise and trustworthiness” (Metzger 2079). Each website within the study group of eight websites was required to be credible and display a high degree of expertise and trustworthiness.

After scrolling through the Google search results, exploring the websites it presented, and evaluating their credibility, eight websites were selected for this study.

These websites were:

- AARP’s Health page
- BrightFocus Foundation
- American Academy of Ophthalmology (eyeSmart)

- John Hopkins
- Mayo Clinic
- Medline Plus
- National Eye Institute
- WebMD.¹

Several of these websites are HONcode certified.

The HONcode is a certification system run by the HON Foundation for online consumer health information. It was the first established ethical evaluation system for websites providing health information to the public through the Internet ("HONcode: the commitment to reliable health and medical information on the internet."). Websites apply for certification and are evaluated based on a rigorous set of criteria outlined in eight principles: describing the credentials of content authors, a commitment to adding to instead of replacing visits to a qualified healthcare practitioner, confidentiality of website users, accurate citations, objectivity, transparency, financial disclosure, and clear advertising policies ("HONcode: the commitment to reliable health and medical information on the internet."). Once a website is certified to be HONcode compliant, it is periodically reviewed to ensure continued adherence to these eight principles ("HONcode: the commitment to reliable health and medical information on the internet. ").

WEBSITE	HONcode Certified	Government Sponsored	Professional Association	Hospital/ Clinic
AARP Health Page	x			
BrightFocus Foundation	x			
eyeSmart			x	
John Hopkins				x
Mayo Clinic	x			x
Medline Plus		x		
National Eye Institute		x		
WebMD	x			

Table 1 – Website Credibility

For the purposes of this study, the text defining the condition of macular degeneration, the description of the disease, and treatment information were all analyzed. Text was taken during late January of 2013. The level of readability was determined using the Flesch-Kincaid Grade Level Index and the Flesch Reading Ease Score. The Flesch-Kincaid Grade Level Index test calculates the American grade level of written material (DuBay 26). It is one of the most popular reading ability calculators used today and is currently used by the Department of Defense, the Social Services Administration, and the Internal Revenue Service to calculate the readability of their published materials (DuBay 31, 54). The formula for calculating the grade level is: $(0.39 \times \text{average sentence length}) + (11.8 \times \text{average number of syllables per word}) - 15.59$, or $GL = (0.39 \times ASL) + (11.8 \times ASW) - 15.59$ (DuBay 54).

The Flesch Reading Ease Score calculates the difficulty of reading material on a scale of one to one hundred, with a score of one hundred indicating a very easy level of readability, scores between sixty and seventy to be a “standard” reading level, and scores between zero and thirty to be at a college graduate level (DuBay 21-22). How the Flesch Reading Ease is calculated has changed since the test was invented, as the formula has been refined. The Flesch Reading Ease is currently calculated as: $(1.599 \times \text{number of$

one-syllable words per 100 words) – (1.015 x average sentence length in words) – 31.517 (DuBay 22).

The Flesch-Kincaid Grade Level Index and the Flesch Reading Ease Score were used to analyze the text from the eight websites by pasting the text into Microsoft Word for Mac 2011 and running the tests within the word processing program. Due to the limitations within Microsoft Word, the maximum grade level calculated for the Flesch-Kincaid Grade Level Index is 12.0.

NOTES

¹ See Appendix I for website urls and Appendix II for website screenshots.

IV. Website Information

Each of the eight websites used for this study was reviewed for their consumer health information, specifically regarding macular degeneration definitions and treatment options. The information regarding each website, such as the owner and purpose behind the website, was obtained from the website itself. Some websites contained more of this background information than others.

The Health page of the American Association of Retired Persons, or AARP, is owned and managed by AARP, which is a large nonprofit organization with over thirty-seven million members ("About AARP."). Dr. Ethel Percy Andrus founded AARP in 1958 with the goal to “enhance the quality of life for older persons,” a goal to which the Health page contributes ("AARP History."). The health encyclopedia featured on the Health page is powered by Healthline, which is also a HONcode compliant website and is owned by Healthline Networks. Healthline exists to provide consumers with reliable health information for education and also so that patients may better communicate with their doctors ("Healthline.com's Mission Statement.").

The BrightFocus Foundation, which was until very recently known as the American Health Assistance Foundation, was founded in 1973 ("About the BrightFocus Foundation."). As a nonprofit organization, the BrightFocus Foundation promotes research and public education for eye and brain diseases as they work “to save mind and sight” ("About the BrightFocus Foundation."). It is also a HONcode certified website.

eyeSmart is owned and maintained by the American Academy of Ophthalmology (AAO) and is geared towards everyday consumers of health information and promotes general public awareness of eye health and its importance ("About eyeSmart."). The American Academy of Ophthalmology is the largest national association of eye doctors and surgeons in the world ("About eyeSmart."). Through eyeSmart, the AAO educates patients about their personal risk factors for various eye diseases as well as other vision ailments and provides information about prevention, diagnosis, and treatment ("About eyeSmart."). eyeSmart has not been HONcode certified.

Johns Hopkins Medicine is a nonprofit organization and is a system consisting of a hospital, clinics, and a medical school ("About Johns Hopkins Medicine."). Based in Baltimore, Maryland, Johns Hopkins continues to be one of the best hospitals in the country ("Johns Hopkins Medicine Fast Facts."). Their website is not HONcode certified.

The Mayo Clinic is also a nonprofit organization and comprises a network of clinics located in Minnesota, Florida, and Arizona ("About Mayo Clinic."). The Mayo Clinic began as the practice of one physician, Dr. William Mayo, in 1863 and expanded as his two sons joined him ("History of Mayo Clinic."). Dr. William Mayo then took what was then a revolutionary step of asking researchers and other doctors to join them and thus created the first "private integrated group practice," forever changing the practice of modern medicine ("History of Mayo Clinic."). The Mayo Clinic website is HONcode certified.

MedlinePlus is a government website owned by the US National Institute of Health and produced by the US National Library of Medicine ("About MedlinePlus."). This website exists to provide reliable health information to patients and consumers and

is updated on a daily basis by the National Library of Medicine ("About MedlinePlus."). MedlinePlus is not HONcode certified.

The National Eye Institute is also a government entity and is part of the National Institute of Health ("National Eye Institute Mission Statement."). The National Eye Institute was founded by the government in 1968 with the main purpose of conducting and advancing research of eye diseases and conditions in the United States ("National Eye Institute Mission Statement."). The National Eye Institute website is not HONcode certified.

WebMD is a website owned by an organization of the same name. The goal of WebMD is to provide consumers accurate health information and reference materials as well as access to online health communities ("What We Do For Our Users."). It provides the general public in addition to healthcare professionals with current medical reference material that is accessible without a paid subscription("What We Do For Our Users."). WebMD has been designed to help people find current information on healthy living, diseases and conditions, and personal support("What We Do For Our Users."). The website is HONcode certified.

V. Results

After completing the analysis of the selected text of each website and calculating the Flesch-Kincaid Grade Level Index of each section of every website, the following results were discovered. The formula for calculating the grade level is: $(0.39 \times \text{average sentence length}) + (11.8 \times \text{average number of syllables per word}) - 15.59$ (DuBay 54).

WEBSITE	DEFINITION SECTION SCORE	TREATMENT SECTION SCORE	SCORE OF SECTIONS TAKEN TOGETHER	TOTAL WORDS
AARP's Health Page	11.9	11.1	11.5	107
BrightFocus Foundation	12.0	12.0	12.0	350
eyeSmart	12.0	12.0	12.0	1872
Johns Hopkins	9.9	10.2	10.0	363
Mayo Clinic	11.5	12.0	11.7	1092
MedlinePlus	8.1	9.4	9.0	470
National Eye Institute	6.9	7.8	7.5	450
WebMD	10.9	11.6	11.2	735

Table 2 – Flesch-Kincaid Grade Level Index Analysis Results

It was very clear that none of the information on the definition and treatments for macular degeneration for any of these websites was written at or below the recommended fifth grade level for health information or even the commonly recommended seventh grade level for general public information (DuBay 1). The information found on the National Eye Institute's website came the closest to the recommended reading level for health information with a Flesch-Kincaid Grade Level Index of 7.5. The website with the next lowest grade level index was MedlinePlus, whose content scored a 9.0, followed by Johns Hopkins at 10.0. WebMD came next with a score of 11.2, closely followed by AARP's Health page at 11.5 and Mayo Clinic's score of 11.7. The final two websites,

BrightFocus Foundation and eyeSmart, both scored a 12.0 on the Flesch-Kincaid Grade Level Index. Taken as a group, the average Flesch-Kincaid Grade Level Index score for these websites is 10.6, nearly six grade levels above the recommended reading level for the health related material. Word count averaged at 680 words.

In order to gain further understanding of the readability of the material, the Flesch Reading Ease level of the text gathered from each website was also calculated. The Flesch Reading Ease is calculated as: $(1.599 \times \text{number of one-syllable words per 100 words}) - (1.015 \times \text{average sentence length in words}) - 31.517$ (DuBay 22).

WEBSITE	FLESH READING EASE SCORE
AARP's Health Page	50.7
BrightFocus Foundation	19.5
eyeSmart	40.6
Johns Hopkins	55.5
Mayo Clinic	41.7
MedlinePlus	55.6
National Eye Institute	63.2
WebMD	41.4

Table 3 – Flesch Reading Ease Score Analysis Results

For the chosen websites and selected text on macular degeneration, the calculated range of Flesch Reading Ease scores varied from a low of 19.5 to a high of 63.2. The calculated average Flesch Reading ease score between all of the websites was 46.0. The website with the lowest Flesch Reading Ease score, indicating the most difficult text, was BrightFocus Foundation with a score of 19.5. The National Eye Institute had the simplest text and a score of 63.2. This was the only website that fell within the “standard” reading ease range of between sixty and seventy (DuBay 22). Below is a table which compares the Flesch-Kincaid Grade Level Index score, Flesch Reading Ease score, and total word count for each website.

WEBSITE	FLESCH-KINCAID GRADE LEVEL INDEX	FLESCH READING EASE SCORE	TOTAL WORDS
AARP's Health Page	11.5	50.7	107
BrightFocus Foundation	12.0	19.5	350
eyeSmart	12.0	40.6	1872
Johns Hopkins	10.0	55.5	363
Mayo Clinic	11.7	41.7	1092
MedlinePlus	9.0	55.6	470
National Eye Institute	7.5	63.2	450
WebMD	11.2	41.4	735

Table 4 – Flesch-Kincaid Grade Level Index and Flesch Reading Ease Score Results

As may be seen in the table above, websites with higher Flesch-Kincaid Grade Level scores have lower Flesch Reading Ease scores, indicating a lower level of readability due to more difficult text. Websites with lower Flesch-Kincaid Grade Level scores have higher Flesch Reading ease scores, indicating that the text is easier to read. It is interesting to note that both the BrightFocus Foundation and eyeSmart earned a score of 12.0 on the Flesch-Kincaid Grade Level index, but their Flesch Reading Ease scores differed by 21.1 points. eyeSmart had a much higher word count, but still earned a higher Flesch Reading Ease score, this indicating that eyeSmart's information on macular degeneration is more difficult for readers to understand than BrightFocus Foundation's text. Taking this information into account, it is very likely that both BrightFocus Foundation and eyeSmart scored the same 12.0 on the Flesch-Kincaid Grade Level Index and earned vastly different Flesch Reading Ease scores because the maximum score calculated for the Flesch-Kincaid Grade Level Index within Microsoft Word is 12.0.

VI. Limitations

This study was conducted under a limited timeframe and without any additional monetary resources. All information was collected and analyzed within a three-month period due to the one semester length of the master's paper course for which this paper was written. Had more time been allotted, the study could have included more websites for analysis.

The Flesch-Kincaid Grade Level Index and the Flesch Reading Ease tests were chosen to evaluate the readability of the selected health information not only because they are widely used, but because they come included as a tool within Microsoft Word for Mac 2011 which had already been purchased. Free online readability calculators are available for a select few other tests, but the validity of the tools could not be determined. Software packages that can calculate the readability of text are commercially available but were deemed too costly.

VII. Conclusion

Calculations using both the Flesch-Kincaid Grade Level Index and the Flesch Reading Ease confirmed expectations that online consumer health information for macular degeneration is written at a reading level that makes it incomprehensible for a sizeable portion of the American population. According to the National Adult Literacy Survey, nearly half of Americans have a reading comprehension level below the sixth grade (DuBay 1). It is recommended that consumer health information maintain a reading level at or below the fifth grade, yet the lowest calculated Flesch-Kincaid Grade Level Index score for these eight websites' information on macular degeneration was 7.5, a full two and a half grades above the recommended level for the material.

Websites and their owners need to be made aware that their consumer health information is difficult for many of their users to understand. It is recommended that content be rewritten in order to reach a broader audience. As an increasing number of Americans phase into the age demographic most affected by macular degeneration, it is critically important to ensure that as many people as possible can easily read and understand the information they find about the disease on reliable Internet websites.

Further research on this topic employing a larger sample of websites and analyzing the content written for diseases other than macular degeneration may be a useful addition to the consumer health information literature. Additional research could also use other readability evaluations in addition to the Flesch-Kincaid Grade Level Index

and the Flesch Reading Ease Score in order to compare the results of different readability evaluation methods.

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Appendix I

Website Links

AARP's Health Page	www.aarp.org/health
BrightFocus Foundation	www.brightfocus.org
eyeSmart	www.geteyesmart.org
JohnsHopkins	www.hopkinsmedicine.org/
Mayo Clinic	www.mayoclinic.com
MedlinePlus	www.nlm.nih.gov/medlineplus
National Eye Institute	www.nei.nih.gov
WebMD	http://www.webmd.com

Appendix II

Website Screenshots

The screenshot shows the AARP website's Health page. The header includes links for 'Español', 'In Your State', 'Research', 'Policy', 'AARP Foundation', 'AARP The Magazine', and 'AARP Bulletin'. A red banner below the header contains 'JOIN', 'RENEW', and 'Find a Discount' buttons. The main content area features a 'HIGHLIGHTS' section with links to 'Walgreens', 'Retirement Calculator', 'Teleflora', and 'Spanish Preferred?'. A 'HEALTH ENCYCLOPEDIA' section is prominently displayed, featuring a 'Diseases & Conditions A - Z' index and a 'Healthline' logo. Below this is a 'most popular ARTICLES' section with a list of articles. On the right, there is a 'health TOOLS' section with links to 'Symptom Search', 'Drug Interaction Checker', 'Pill Identifier', and 'Drugs A-Z'. The page also includes a 'DISCOUNTS & BENEFITS' section at the bottom.

AARP's Health page

Test Size: Contrast: Español | Press Room | Contact Us | Sitemap | Sign In | Register

BrightFocus Homepage | About BrightFocus

BrightFocus™ Foundation
The new name for American Health Assistance Foundation

Cure in Mind. Cure in Sight.

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Understanding Macular Degeneration

Risk Factors & Prevention

Symptoms

Screening & Diagnosis

Treatment

Living With Macular Degeneration

Ask an Expert

News Updates

Resources

Give a Gift

Advocate for Change

Get Involved

Research Grants

Special Events

Stay Informed

Get the latest medical and research updates
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About Macular Degeneration

Macular Degeneration Research (MDR), a program of the BrightFocus Foundation funds research on and informs the public about macular degeneration. Since the program's inception, MDR has granted over \$12.5 million supporting basic research into the causes and potential treatments of this incurable disease.

Macular degeneration causes deterioration of the macula, the central area of the retina. The retina is a paper-thin tissue at the back of the eye where light sensitive cells send visual signals to the brain. Sharp, clear, straight-ahead vision is processed by the macula, and damage to it results in blind spots and blurred or distorted vision. Those affected by macular degeneration find many daily activities such as driving and reading, increasingly difficult. Macular degeneration usually affects individuals older than 50 years of age, and scientific evidence shows that genes may play a role in the development of nearly three out of four cases of this devastating eye disease.

Macular degeneration is a major cause of visual impairment in the United States. As many as 11 million Americans have some form of macular degeneration, including both early and later stages of the wet and dry forms. This number is expected to double to nearly 22 million by 2050.

In this section you can find information on...

Understanding Macular Degeneration
For comprehensive information about macular degeneration, current statistics, symptoms and stages, as well as easily understood medical illustrations on how the disease impacts vision...

Symptoms
Blurred central vision and wavy lines on an Amsler grid are potential signs of macular degeneration. [Learn more about these symptoms...](#)

Risk Factors & Prevention
Scientists are unsure of the cause of macular degeneration, but some factors appear to increase the risk of developing the disease. [Learn more about these risk factors and ways to](#)

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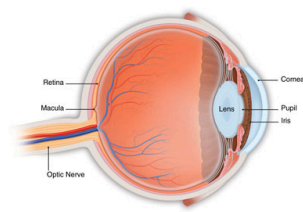
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What Is Age-Related Macular Degeneration?

Age-related macular degeneration (AMD) is a deterioration or breakdown of the eye's macula. The macula is a small area in the retina — the light-sensitive tissue lining the back of the eye. The macula is the part of the retina that is responsible for your central vision, allowing you to see fine details clearly.



The macula makes up only a small part of the retina, yet it is much more sensitive to detail than the rest of the retina (called the peripheral retina). The macula is what allows you to thread a needle, read small print, and read street signs. The peripheral retina gives you side (or peripheral) vision. If someone is standing off to one side of your vision, your peripheral retina helps you know that person is there by allowing you to see their general shape.

Many older people develop macular degeneration as part of the body's natural aging process. There are different kinds of macular problems, but the most common is age-related macular degeneration.

With macular degeneration, you may have **symptoms** such as blurriness, dark areas or distortion in your central vision, and perhaps permanent loss of your central vision. It usually does not affect your side, or peripheral vision. For example, with advanced macular degeneration, you could see the outline of a clock, yet may not be able to see the hands of the clock to tell what time it is.

Causes of macular degeneration include the formation of deposits

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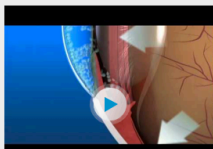
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Age-Related Macular Degeneration (AMD)

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Age-Related Macular Degeneration (AMD)



Normal Vision

Age-Related Macular Degeneration

What is age-related macular degeneration (AMD)?

Age-related macular degeneration (AMD) is a disease that affects an individual's central vision. AMD is the most common cause of severe vision loss among people over 60. Because only the center of vision is affected, people rarely go blind from this disease. However, AMD can make it difficult to read, drive, or perform other daily activities that require fine, central vision.

AMD occurs when the macula, which is located in the center of the retina and provides us with sight in the center of our field of vision, begins to degenerate. With less of the macula working, central vision — which is necessary for driving, reading, recognizing faces, and performing close-up work — begins to deteriorate.

What are the different types of AMD?

There are two primary types of AMD:

- Dry AMD**
This type of AMD is the most common. While its cause is unknown, it occurs as the light sensitive cells in the macula slowly deteriorate, generally

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Definition

By Mayo Clinic staff

Definition

Dry macular degeneration is a chronic eye disease that causes vision loss in the center of your field of vision. Dry macular degeneration is marked by deterioration of the macula (MAK-u-luh), which is in the center of the retina. The layer of tissue on the inside back wall of your eyeball.

Symptoms

Dry macular degeneration is one of two types of age-related macular degeneration. The other type — wet macular degeneration — is characterized by blood vessels that grow under the retina in the back of the eye, leaking blood and fluid. Dry macular degeneration is the more common form of the disease.

Dry macular degeneration may worsen your quality of life by causing blurred central vision or a blind spot in your central vision. You need clear central vision for many tasks, such as reading, driving and recognizing faces.

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Definition

By Mayo Clinic staff

Wet macular degeneration is a chronic eye disease that causes vision loss in the center of your field of vision. Wet macular degeneration is generally caused by abnormal blood vessels that leak fluid or blood into the region of the macula (MAK-u-luh). The macula is in the center of the retina (the layer of tissue on the inside back wall of your eyeball).

Wet macular degeneration is one of two types of age-related macular degeneration. The other type — dry macular degeneration — is more common and less severe. Wet macular degeneration almost always begins as dry macular degeneration. It's not clear what causes wet macular degeneration.

Early detection and treatment of wet macular degeneration may help reduce vision loss and, in some instances, improve vision.

[Symptoms >](#)

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Macular Degeneration

Also called: Age-related macular degeneration, AMD

Macular degeneration, or age-related macular degeneration (AMD) is a leading cause of vision loss in Americans 60 and older. It is a disease that destroys your sharp, central vision. You need central vision to see objects clearly and to do tasks such as reading and driving.

AMD affects the macula, the part of the eye that allows you to see fine detail. It does not hurt, but it causes cells in the macula to die. In some cases, AMD advances so slowly that people notice little change in their vision. In others, the disease progresses faster and may lead to a loss of vision in both eyes. Regular comprehensive eye exams can detect macular degeneration before the disease causes vision loss. Treatment can slow vision loss. It does not restore vision.

NIH: National Eye Institute

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Facts About Age-Related Macular Degeneration

This information was developed by the National Eye Institute to help patients and their families search for general information about age-related macular degeneration. An eye care professional who has examined the patient's eyes and is familiar with his or her medical history is the best person to answer specific questions.

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Macular Degeneration Overview

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What is Age-Related Macular Degeneration?

Macular degeneration is the leading cause of severe vision loss in people over age 60. It occurs when the small central portion of the retina, known as the macula, deteriorates. The retina is the light-sensing nerve tissue at the back of the eye. Because the disease develops as a person ages, it is often referred to as age-related macular degeneration (AMD). Although macular degeneration is almost never a totally blinding condition, it can be a source of significant visual disability.

There are two main types of age-related macular degeneration:

- **Dry form.** The "dry" form of macular degeneration is characterized by the presence of yellow deposits, called drusen, in the macula. A few small drusen may not cause changes in vision; however, as they grow in size and increase in number, they may lead to a dimming or distortion of vision that people find most noticeable when they read. In more advanced stages of dry macular degeneration, there is also a thinning of the light-sensitive layer of cells in the macula leading to atrophy, or tissue death. In the atrophic form of dry macular degeneration, patients may have blind spots in the center of their vision. In the advanced stages, patients lose central vision.
- **Wet form.** The "wet" form of macular degeneration is characterized by the growth of abnormal blood vessels from the choroid underneath the macula. This is called choroidal neovascularization. These blood vessels leak blood and fluid into the retina, causing distortion of vision that makes straight lines look wavy, as well as blind spots and loss of central vision. These abnormal blood vessels can also cause a bleed under the retina, which can lead to permanent vision loss.

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Understanding Macular Degeneration – Diagnosis and Treatment

Your ophthalmologist or optometrist will inspect the macula, the portion of the retina that is responsible for your central vision, as part of a comprehensive eye exam. If macular degeneration is suspected, a special photographic procedure using dyes, called fluorescein angiography, may be performed. The test details the pattern of your eye's blood vessels and can detect a variety of abnormalities.

[Read the Understanding Macular Degeneration – Diagnosis and Treatment article >>](#)

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