# Cardiovascular Mortality at the Older Ages: An Expert Panel Discussion

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## Executive Summary

As part of its ongoing focus on aging populations, the Mortality and Longevity Strategic Research Program Steering Committee of the Society of Actuaries Research Institute initiated a multi-phase effort to examine mortality patterns at older ages. To guide this initiative, a Project Oversight Group (POG) was established.

The POG's first area of study focused on cancer mortality of older adults, with findings published in a prior report, *Cancer Mortality at the Older Ages*.[1] This second paper focuses on cardiovascular mortality among older adults, drawing on expert insight to explore the interplay of genetic, behavioral, environmental factors.

The foundation of this study was a structured discussion conducted with a panel of cardiovascular medical and research experts on June 9, 2025, via Zoom. The POG developed a targeted set of questions to guide the conversation—these are listed in Appendix A. The resulting discussion highlights the influence of social and clinical factors in cardiovascular disease, emerging trends, , and implications for prevention, care, and insurance.

Panelists included:

- Elyssa DelValle, M.D., Chief Medical Officer, Swiss Re
- Tea Mamaladze, M.D., Medical Director, Hannover Re
- Timothy Adair, Ph.D., Principal Research Fellow, University of Melbourne

Cardiovascular disease (CVD) remains the leading cause of death among older adults in the United States, accounting for approximately 35% of all deaths.[2] While genetics play a foundational role in establishing risk, disease progression is heavily shaped by lifestyle behaviors, environmental exposures, and social determinants of health. This report summarizes key insights from an expert panel discussion on the evolving landscape of cardiovascular mortality at older ages.

Several inherited conditions significantly elevate cardiovascular risk. **Hypertrophic cardiomyopathy**, **familial hyperlipidemia**, and **dilated cardiomyopathy** are among the most prevalent genetic contributors, each with distinct mechanisms and clinical consequences. Early identification through family history, physical signs, and advanced lipid testing—such as **apolipoprotein B** and **lipoprotein(a)**—is critical to risk stratification and prevention. Many cases previously labeled as **idiopathic** may, in fact, reflect undiagnosed familial conditions.

Beyond genetic predisposition, routinely measured metabolic indicators such as **HDL** and **LDL cholesterol** and blood glucose provide valuable information about cardiovascular health. However, advanced markers—such as **apolipoproteins A and B** or **lipoprotein(a)**—can offer a more detailed picture of risk and are gaining traction in both clinical and insurance settings.

Lifestyle behaviors remain among the most powerful modifiable risk factors. Diets high in processed carbohydrates, lack of physical activity, smoking, poor sleep, and chronic stress contribute to insulin resistance, systemic inflammation, and **metabolic syndrome**—all of which heighten cardiovascular risk. Fortunately, behavior change can lead to meaningful improvements in health outcomes, often within a year. The rise of **wearable technology**, **telemedicine**, and real-time health tracking tools has enhanced individual and provider engagement in cardiovascular prevention.

Environmental and socioeconomic factors further influence cardiovascular health, particularly in aging populations. Long-term exposure to pollutants such as secondhand smoke, pesticides, and fine particulate matter has been linked to increased cardiovascular mortality, often through cumulative damage to the lungs and vascular system.

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[1] Society of Actuaries Research Institute. *Cancer Mortality at the Older Ages: An Expert Panel Discussion*. Older Age Mortality Expert Panel Discussion Series (Society of Actuaries Research Institute, 2024), https://www.soa.org/resources/research-reports/2024/older-age-mortality/.
[2] Betzaida Tejada-Vera, Brigham A. Bastian, and Sally C. Curtin, *Deaths: Leading Causes for 2023*, National Vital Statistics Reports, vol. 74, no. 10 (National Center for Health Statistics, Sept. 16, 2025), https://dx.doi.org/10.15620/cdc/174607

Additionally, individuals in lower-income communities often face barriers to care, limited access to healthy food and exercise opportunities, and heightened chronic stress—all of which can delay diagnosis and/or worsen outcomes.

The COVID-19 pandemic had both direct and indirect impacts on cardiovascular health. Many older adults deferred care due to infection concerns, resulting in missed diagnoses and delayed treatment. The virus itself caused direct cardiovascular damage through inflammation and oxygen deprivation. While cardiovascular mortality rates are trending downward, they had not returned to pre-pandemic levels as of 2023.

Looking forward, advances in artificial intelligence, precision diagnostics, **gene editing**, and targeted pharmaceuticals—particularly those focused on **lipoprotein(a)** and inflammatory pathways—hold promise for improving outcomes. Countries like Japan and Singapore illustrate how systemic health infrastructure and cultural behaviors can mitigate cardiovascular risk, especially in older adults.

Despite medical and technological progress, the burden of cardiovascular disease among older adults is likely to remain substantial. Future outcomes will depend not only on innovation but also on addressing differences in access, behavior, and environment—factors that ultimately determine how risk manifests across populations.

Terms in bold font can be found in Appendix B – Glossary.

# Section 1: Understanding Cardiovascular Risk

## 1.1 GENETIC AND HEREDITARY INFLUENCES

Genetic factors play a significant role in determining an individual's risk for cardiovascular disease (CVD), particularly among those with a family history of early-onset events. Having a male first-degree relative diagnosed with CVD before age 55 or a female relative before age 65 substantially increases one's own likelihood of developing the condition. The Framingham Heart Study highlighted this connection, showing a 75% increased relative risk with an affected male relative, 60% with maternal history, and 40% when siblings were affected. The highest relative risk was seen in identical twins, underscoring the influence of genetics.[3]

Among the most common inherited contributors to cardiovascular risk are **hypertrophic cardiomyopathy (HCM)**, **familial hyperlipidemia**, and **dilated cardiomyopathy (DCM)**.

**Hypertrophic cardiomyopathy (HCM)** is a hereditary condition in which the heart muscle becomes abnormally thick, particularly in the left ventricle. Despite the heart's shape remaining normal, this thickening reduces the amount of blood the heart can pump with each beat. It can lead to a reduced flow of blood to the heart muscle itself and decreased overall **cardiac output**. In some individuals, the condition causes fainting, irregular heart rhythms, and, in severe cases, sudden cardiac death, especially among young people.

**HCM** can also trigger dangerous **arrhythmias**:

- **Atrial fibrillation**: an irregular and often rapid heartbeat originating in the upper chambers of the heart (the atria), which can increase the risk of stroke due to clots formed by pooled blood.
- **Ventricular tachycardia**: a dangerously fast heartbeat that starts in the lower chambers (the ventricles); if sustained, it may lead to cardiac arrest.
- **Ventricular fibrillation**: a chaotic and disorganized rhythm where the ventricles quiver instead of pumping, requiring immediate intervention like CPR or defibrillation.

Images from **electrocardiograms (EKGs)** may reveal helpful clues for diagnosis. Images such as narrow, sharp spikes (sometimes called "daggers") or deep, pointed dips known as sharp Q waves, suggests the diagnosis of **HCM**. The electrocardiogram findings may reveal helpful clues to suggest thickening of the cardiac muscle and point towards **HCM**. Imaging provided by a cardiac echoscopy, the test that employs ultrasound waves in assessment, is used to detect the significant thickening of the cardiac walls, characterizing **HCM**.

**Familial hyperlipidemia** refers to a genetic tendency toward high **cholesterol** or **triglycerides** in the blood. People with this condition often have a family history of early heart disease. In some cases, fatty yellow deposits (**xanthelasma**) may appear around the eyelids. Blood tests typically reveal high **LDL** ("bad" **cholesterol**), high **apolipoprotein B** (a protein that carries **LDL**), and low **HDL** (commonly called "good" **cholesterol)**. Another important marker is **lipoprotein(a)** or **Lipo(a)**, an inherited substance that does not appear in standard **cholesterol** panels but is strongly linked to early heart attacks.

**Dilated cardiomyopathy (DCM)** is a condition in which the heart's main pumping chamber—the left ventricle—becomes enlarged and weakened. Unlike **HCM**, which involves thickened walls, **DCM** features stretched-out, thinner

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[3] Kolber, M.R., & Schrimshaw, C. (2014). *Family History of Cardiovascular Disease. Canadian Family Physician,* 60(11), 1016. https://pmc.ncbi.nlm.nih.gov/articles/PMC4229162/

walls that impair the heart's ability to contract effectively. This reduces the heart's pumping strength and increases the risk of irregular heartbeats, heart failure and death.

**DCM** has many causes. About 50–70% of cases are **idiopathic** (of unknown cause) or familial (genetically inherited), though many **idiopathic** cases may ultimately prove to be genetic. Other causes include damage from blocked arteries (ischemic), alcohol use, complications of pregnancy (post-partum), side effects of certain drugs (e.g., chemotherapy, antipsychotics), viral infections, and autoimmune diseases like lupus. **DCM** is the most common type of **cardiomyopathy** and a major cause of heart failure in older adults.

In addition to **HCM**, **DCM**, and familial hyperlipidemia, several other hereditary or structural heart conditions contribute to cardiovascular risk. These include:

- **Bicuspid aortic valve**: a birth defect where the aortic valve has only two flaps instead of three, leading to valve narrowing or leakage over time.
- **Rheumatic valvular disease**: damage to the heart valves caused by a prior untreated strep infection.
- Arrhythmogenic right ventricular cardiomyopathy: a rare inherited condition where the right side of the heart becomes weak and prone to **dangerous rhythms**. **Dangerous rhythms**, clinically referred to as life-threatening arrhythmias such as **ventricular tachycardia** and **ventricular fibrillation**, can lead to sudden cardiac arrest.
- **Noncompaction cardiomyopathy**: a congenital disorder where part of the heart muscle is spongy instead of smooth, potentially impairing pumping ability.

Together, these inherited conditions lay the groundwork for cardiovascular risk. However, environmental and behavioral factors often determine if and when and how that risk becomes disease.

### 1.2 LIFESTYLE AND BEHAVIORAL FACTORS

Lifestyle behaviors are among the most significant drivers of cardiovascular disease. Poor diet, especially high intake of processed carbohydrates and sugars, contributes to **insulin resistance** and **chronic inflammation**. These processes are key features of **metabolic syndrome**, a cluster of conditions—that may include high blood pressure, excess abdominal fat, high blood sugar, and abnormal **cholesterol**—substantially increasing the risk of cardiovascular disease.

Physical inactivity, smoking, poor sleep quality, and unmanaged stress also raise the likelihood of developing heart disease. Alcohol consumption, while less impactful than other factors, remains important to monitor, especially in the context of other risk behaviors.

On a positive note, behavior change can lead to rapid improvements. Specific diets, such as the Mediterranean diet (rich in vegetables, whole grains, and healthy fats) and low-carb diets (which reduce refined sugars and improve insulin sensitivity), have shown benefits in **cholesterol** levels, blood pressure, and weight control.

Mental health also plays a critical role. Older adults often experience depression or anxiety due to social isolation or life changes. These conditions are independently linked to higher stress levels, higher risk of CVD and worse outcomes. Fortunately, improvements in diet, exercise, and stress management can significantly reduce cardiovascular risk—even within a matter of months.

### 1.3 ENVIRONMENTAL AND SOCIOECONOMIC CONTRIBUTORS

Environmental exposures and social connections shape cardiovascular health throughout life, with cumulative effects becoming especially evident in older adults. Toxins such as secondhand smoke, pesticides, asbestos, and fine particulate air pollution (PM2.5) can damage the lungs and heart, contributing to increased mortality from cardiovascular causes. Occupational exposures earlier in life may also have long-term consequences.

Socioeconomic status adds another layer of influence. People in lower-income communities often face obstacles to accessing healthcare, nutritious food, safe housing, and spaces for physical activity. These limitations can delay diagnosis and treatment of conditions like high blood pressure or elevated cholesterol. In the United States, gaps in healthcare access and limited eldercare support can contribute to increased cardiovascular risk and poorer outcomes among vulnerable populations.

In summary, cardiovascular risk in older adults arises from a complex interplay of inherited conditions, behavioral factors, and environmental and social determinants. Addressing this risk requires both individual-level intervention and broader systemic support.

# Section 2: Impact of COVID-19 and Population Differences

## 2.1 EFFECTS OF THE COVID-19 PANDEMIC

The COVID-19 pandemic had a profound and multifaceted impact on cardiovascular health, particularly among older adults. One of the most significant effects was the widespread deferral of medical care due to concerns about virus exposure. Many individuals postponed routine check-ups and treatment for existing conditions, which led to delayed diagnoses, missed interventions, and ultimately worse cardiovascular outcomes.

Beyond these indirect effects, COVID-19 also caused direct harm to the heart. The virus triggered inflammation and reduced oxygen delivery to tissues, particularly during severe illness involving pneumonia or acute respiratory distress syndrome (ARDS). This stress on the cardiovascular system contributed to a rise in Type 2 myocardial infarctions—a form of heart attack caused not by blocked arteries, but by an imbalance between the heart's oxygen supply and demand, often brought on by infection or low blood pressure.

Symptoms of COVID-19 often overlapped with those of serious cardiac events, such as chest pain and/or shortness of breath, complicating diagnosis and, in some cases, leading to under recognition of major adverse cardiac events. Even after recovery from the acute COVID-19 infection, many individuals experienced prolonged elevated cardiovascular risk due to lingering inflammation and cardiac strain.

By 2023, national data from the CDC WONDER Online Database noted that cardiovascular mortality rates in the United States had not yet returned to pre-pandemic levels, although they were trending downward. It does not seem likely that there will be a full return to pre-pandemic CVD mortality levels by 2025, given that provisional 2024 data remain 2.4% above 2019 and did not decline from 2023.

## 2.2 LIFE INSURANCE VS. GENERAL POPULATION

Historically, individuals in populations that have life insurance ("insured" populations) have demonstrated lower cardiovascular mortality compared to the general population. This advantage is often attributed to healthier lifestyle choices, better access to healthcare, and more regular medical monitoring among insured individuals.

In more recent years, access and affordability issues are presenting larger challenges to the broader healthcare system, including growing shortages of healthcare providers, reduced continuity of care, and the increasing burden of chronic conditions across all segments of the population. These challenges can affect both insured and uninsured groups.

Life insurance carriers are responding to these challenges with new strategies aimed at maintaining a healthier insured population. Many are investing in wellness initiatives that include access to wearable technology, health tracking apps, and educational resources such as podcasts focused on cardiovascular health. Some insurers are piloting programs for their own employees—such as distributing continuous glucose monitors—as models for broader adoption.

At the same time, advances in risk assessment tools are helping insurers in underwriting cardiovascular risk. Life insurance companies often use data from paramedical exams that include blood and urine testing, typically conducted by specialized laboratory vendors. Initial tests depend on age and amount requirements set by the insurance companies. They take cardiovascular risk into consideration as CVD is a major cause of death. Sometimes, abnormal test results trigger further specialized tests. For example, abnormal fasting blood sugar may trigger the order of the glycosylated hemoglobin test or HBa1C. Presence of medical history of cardiovascular risk factors (HTN, HLP etc) or family history may trigger the need of more specialized tests such as ECG, stress test, NT-proBNP, or even cardiac echo if they were not part of the initial requirements.

In addition, the laboratory vendors are continually developing new test panels to better identify and assess cardiovascular risk. The development of new tests and incorporation of the newer tests used in preventive cardiology are important as they help stratify the risk of the applicants. One example is advanced lipid testing, which can serve as an add-on for applicants to detect cardiovascular risk not detectable through a standard lipid panel. Other specialized panels include those designed to detect nondisclosed smokers as well as heavy alcohol consumers, such as **CDT (carbohydrate deficient transferrin)** and **PEth (phosphatidylethanol) testing**. These are impactful as smoking and abuse of **ethanol alcohol** (the type of alcohol found in alcoholic drinks) contribute to cardiovascular risk assessments.

Other diagnostic tools include imaging technologies that can detect soft **plaque** buildup in the coronary arteries. These imaging results are typically found in an applicant's existing medical records rather than requested by insurers. Advanced imaging methods now use AI to measure **plaque** burden and composition, providing a detailed, quantitative assessment of atherosclerotic disease. These technologies can estimate total **plaque** volume, percent **atheroma**, and **plaque** type. This is important because the traditional coronary artery calcium (CAC) score only detects hardened (calcified) **plaque**, while newer imaging can identify soft, noncalcified **plaque**—the type more likely to rupture and cause a heart attack **(myocardial infarction)** before more visible signs develop.

These innovations are reshaping how insurers understand and manage cardiovascular risk, with the goal of improving both individual health outcomes and overall portfolio performance.

## Section 3: Prevention and Management

### 3.1 PHARMACEUTICAL AND NON-PHARMACEUTICAL INTERVENTIONS

Cardiovascular disease (CVD) can often be delayed or even prevented through a combination of medical treatments and lifestyle modifications. On the pharmaceutical front, several well-established therapies play a central role in reducing risk. **Statins** and **PCSK9 inhibitors** are commonly used to lower **LDL cholesterol** and help stabilize **plaque** in the arteries.

New and emerging treatments are expanding the toolkit for prevention. **GLP-1**/GIP dual agonists, a next-generation class of medications, appear to offer even greater benefits in weight loss and metabolic control. Medications originally developed to manage diabetes—such as **GLP-1 receptor agonists**—have been shown to reduce not only blood sugar, body weight, and related complications, including fatty liver disease and sleep apnea, but also ultimately the risk of heart disease.

In addition, **RNA-based therapies** are being developed to target specific genetic risk factors, such as elevated **lipoprotein(a)**, which is associated with increased cardiovascular risk but is not addressed by standard **cholesterol**-lowering drugs.

Metabolic health plays a particularly important role in cardiovascular outcomes. For example, **Metabolic Dysfunction–Associated Steatotic Liver Disease (MASLD)**—a newly recognized term for fatty liver disease linked to obesity and diabetes—is now seen as an independent predictor of cardiovascular events. Managing **MASLD** is becoming an important component of a broader cardiovascular prevention strategy.

In parallel with pharmaceutical approaches, lifestyle modifications remain essential. Regular physical activity, a balanced and heart-healthy diet, smoking cessation, and effective stress management all contribute to improved outcomes.

### 3.2 BEHAVIORIAL CHANGE AND MONITORING

Behavioral change is a powerful tool in preventing and managing cardiovascular disease. Improvements in diet, exercise, and stress reduction can lead to measurable health benefits within as little as one year—even among individuals with a strong genetic predisposition to CVD. Conversely, unhealthy habits such as sedentary behavior, poor diet, and chronic stress can accelerate the onset of disease, even in those without known risk factors.

Technology is increasingly supporting behavior-driven improvements. Such access can facilitate earlier detection of problems and more timely intervention. Devices such as fitness trackers and continuous glucose monitors (CGMs) enable individuals to monitor key health indicators in real time. These tools, combined with **telemedicine**, provide more consistent and personalized access to care, particularly for older adults or those in assisted living environments.

Beyond individual behavior, policy-level interventions can shape cardiovascular risk across populations. For instance, taxes on sugar-sweetened beverages have been adopted in several countries to curb added sugar consumption and improve cardiometabolic health. Early evidence indicates that these measures are associated with reduced purchases and consumption of taxed beverages, though results vary depending on implementation and enforcement. Over time, such policies may contribute to lower population-level risk factors for obesity, diabetes, and cardiovascular disease.

Taken together, pharmaceutical advancements, lifestyle interventions, and behavior-focused technologies represent a comprehensive and synergistic approach to cardiovascular prevention. Effective strategies target both biological and behavioral pathways, offering individuals and healthcare systems multiple opportunities to improve cardiovascular health and reduce mortality.

# Section 4: International Comparisons and Advances

## 4.1 INTERNATIONAL BENCHMARKS IN CARDIOVASCULAR HEALTH

Countries such as Japan and Singapore have achieved notable success in managing cardiovascular health among older adults, offering valuable lessons for other health systems. Their outcomes reflect a combination of public policy, cultural behaviors, and infrastructure that collectively support long-term well-being.

Japan's population benefits from a diet rich in fish, vegetables, and low levels of processed food. This marine-based dietary pattern is linked to reduced rates of cardiovascular disease. The country also boasts low smoking rates, strong social ties, and environments that support physical activity, such as walkable cities and widespread use of bicycles. Cultural practices that encourage older adults to remain socially engaged—with family, in the workforce, and within communities—may also reduce stress and its impact on heart health.

Additionally, Japan's healthcare system ensures that preventive care and early interventions are widely accessible, helping to manage risk factors before they escalate. That said, Japan does face some challenges, including relatively high rates of stroke, potentially linked to elevated sodium intake in traditional diets.

Singapore similarly integrates health-promoting practices into everyday life. Its health system emphasizes early screening, community outreach, and widespread education, alongside a strong safety net for older adults. Like Japan, Singapore's success appears to be shaped not just by access to care, but also by a public health culture that values prevention and elder support.

Taken together, these international models highlight the importance of health-promoting practices in everyday life combined with clinical interventions and supportive societal structures. Strong infrastructure, accessible healthcare, and positive cultural norms appear to reinforce each other in promoting cardiovascular health in aging populations.

## 4.2 ANTICIPATED ADVANCES IN THE NEXT DECADE

The next decade is poised to bring major advances in the prevention, diagnosis, and treatment of cardiovascular disease. Artificial intelligence (AI) is already beginning to improve the accuracy of ECG interpretations, detect subtle signs of disease earlier, and enhance patient engagement through personalized responsive interfaces. As these tools become more widespread, they are expected to support more proactive, personalized care.

Gene editing technologies, such as CRISPR, offer the potential to address inherited cardiac conditions at their root by correcting the gene mutations that predispose individuals to disease. While these innovations are still in their early stages, the long-term implications are profound.

Pharmaceutical development continues to target previously untreatable risk factors. New therapies designed to lower lipoprotein(a) and modulate inflammatory pathways are under development and may address gaps left by current cholesterol-focused treatments. These breakthroughs are likely to play an especially important role in high-risk individuals whose genetic profiles indicate higher cardiovascular risk.

Wearable technologies are also advancing rapidly. Devices that monitor physical activity, heart rhythm, and glucose provide real-time data that can empower individuals and guide medical decisions. New imaging platforms that visualize soft plaque in coronary arteries enable earlier identification of dangerous buildup that might not yet be visible using traditional calcium scoring.

While the promise of these advances is significant, broad access will likely remain a challenge. There is a risk that new technologies will disproportionately benefit higher-income and better-resourced individuals. Ensuring broad adoption and affordability will be essential for these innovations to make a meaningful population-level impact.

Together, international success stories and emerging innovations point to a future in which cardiovascular disease can be detected earlier, managed more precisely, and potentially prevented in ways that were previously unattainable. However, realizing that potential will require not only technological progress but also thoughtful policy system-wide investment, and widespread adoption.

# Section 5: Future Mortality Trends and Insurance Implications

## 5.1 PROJECTED MORTALITY SHIFTS

Cardiovascular mortality among older adults is expected to evolve over the coming years, shaped by both medical advancements and public health challenges. The prevalence of arrhythmias—particularly atrial fibrillation—is projected to increase significantly. This rise is due to aging populations and greater detection through wearable technologies that enable earlier and more frequent monitoring.

Similarly, the burden of heart failure is likely to grow, driven in large part by sustained increases in obesity, diabetes, and sedentary lifestyles. Despite promising advances in treatment and disease management, the compounding effects of metabolic dysfunction continue to pose a significant threat to cardiovascular outcomes.

Conversely, some forms of cardiovascular disease, such as ischemic heart disease and aortic disease, may decline in incidence. These trends are likely the result of long-term reductions in smoking rates, better management of blood pressure and cholesterol, and the integration of advanced diagnostics and precision therapies into routine care.

Nonetheless, these gains may be offset by rising rates of peripheral artery disease and hypertension—conditions closely tied to metabolic and lifestyle-related factors. If left unaddressed, such trends could undermine broader progress and lead to an overall increase in cardiovascular morbidity.

Currently, cardiovascular disease remains the leading cause of death among older adults in the United States, accounting for roughly 35% of deaths, compared to 22% from cancer. While the mortality gap between these two conditions is gradually narrowing, cancer is not expected to surpass cardiovascular disease as the top cause of death in this age group within the next decade.

Interestingly, the aging baby boomer generation may temporarily influence near-term statistics. This cohort has generally experienced healthier behaviors and better preventive care than previous generations, which may modestly lower cardiovascular mortality in the short run. However, younger generations—who have faced lifelong exposure to poor diet, obesity, and reduced physical activity—may reverse these gains over the longer term.

## 5.2 INDUSTRY IMPLICATIONS AND WELLNESS STRATEGIES

The evolving landscape of cardiovascular risk presents both challenges and opportunities for the life insurance industry. While new medications targeting lipoprotein(a) and inflammatory pathways are promising, their long-term impact will depend on availability and adoption across diverse populations. If barriers to access persist, these innovations may inadvertently widen health differences.

Insurers are looking to refine their underwriting models in response to emerging knowledge of cardiovascular risk. This includes incorporating indicators such as metabolic markers, liver function data, and assessments of chronic stress. In particular, Metabolic Dysfunction–Associated Steatotic Liver Disease (MASLD) has been increasingly recognized as a relevant factor associated with cardiovascular events and is receiving growing attention in risk evaluation.

Wearable technology offers a further opportunity to enhance both risk assessment and member engagement. For example, initiatives like Swiss Re's distribution of continuous glucose monitors to employees reflect a shift toward more proactive health management strategies. Real-time health data allows insurers and individuals alike to identify trends early and take corrective action.

In addition to data-driven risk assessment, insurers may want to consider investing in broader wellness initiatives. These may include programs supporting mental health, physical activity, nutrition, and routine health screenings. Education and sustained engagement are key to helping policyholders make lasting behavioral changes.

There is cautious optimism about the future of CVD mortality with the understanding that improved outcomes require more investment and increased awareness of the importance of healthy habits and lifestyle. By addressing these modifiable risk factors, the risk of CVD development and advancement can decrease. With more data from wearables and other medical technologies, and with the development of AI, there is a greater opportunity for advancing knowledge and using the results for the benefit of both the insured and general populations.

The life insurance industry has an opportunity to play a critical role supporting cardiovascular health—both through risk modeling and as a platform for health promotion. Aligning insurance practices with evolving science and behavioral support strategies offers opportunities for improving outcomes and strengthening portfolio performance.

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## Appendix A: Older Age Mortality Agenda Questions

- What are the causes of cardiovascular disease?  How do they overlap?
  - Genetic/Hereditary?
  - Lifestyle – Diet, exercise, other unhealthy behaviors?
  - Environment – Exposure to toxins (certain specific ones to avoid)?
  - Did COVID-19 and/or Long COVID (including healthcare availability) impact cardiovascular disease, and if so, how?
  - Are there other causes, e.g. socioeconomic, limited access to care, lack of regular checkups?
  - Are there differences between life insurance and general populations?
  - Regarding life insurance underwriting, which factors are most significant in terms of identifying cardiovascular risk, e.g., blood pressure, BMI, cholesterol, family history, etc.  Maybe rank these.

- Can cardiovascular disease be prevented or delayed?
  - If so, how?
  - What drug and non-drug approaches work, and which are better?  Please be specific as to the drug and/or non-drug approaches.
  - Can someone with a genetic predisposition to cardiovascular disease delay or avoid it by healthy behaviors?  Can someone with no genetic predisposition get cardiovascular disease from unhealthy behaviors?
  - How quickly would adopting healthier or unhealthier behaviors affect an individual's cardiovascular disease in a positive or negative way?
  - Does the living arrangement (home, assisted living, etc.), monitoring of the individual, and screenings make a difference on this?
  - Is there a country that you would consider to be the best in terms of least cases, best treatment, etc.?
  - What does this country do differently or is it because of the general health of the population?

- What are the future advances for preventing and treating cardiovascular disease that we can expect in the next 5-10 years and how much impact on mortality will they have?
  - Include drug and non-drug advances.
  - Will these supplement or replace current treatments?
  - Will cardiovascular disease remain the top cause of death for older ages in the future?  Why or why not?
  - What types of cardiovascular disease deaths will we see more and less of in the future and why, e.g., Aortic disease, Arrhythmia, Cerebrovascular disease, Coronary artery disease, Heart failure, Peripheral artery disease, etc.

- How will everything we discussed specifically affect the life insurance industry?  What advice would you give to insurers on designing wellness initiatives to improve cardiovascular health?

- Is there anything else that we didn't discuss that is important to know about?

## Appendix B: Glossary of Key Medical and Technical Terms

- **Acute respiratory distress syndrome (ARDS)** – A severe, often life-threatening lung condition where the lungs suddenly fill with fluid, making it very hard for oxygen to get into the bloodstream.
- **Apo(a) -** The *extra protein* that attaches to LDL to form **Lp(a)**. It's different from ApoA1 (despite the confusingly similar name) and resembles a protein involved in clotting. Because of that, apo(a) gives **Lp(a)** its double punch: it can promote both **plaque** buildup and clot formation.
- **Apolipoprotein** - A protein that attaches to fat particles (lipids) in the blood to help move them around the body. Think of it as the *ID tag and steering system* for cholesterol-carrying particles. Different types of **apolipoproteins** guide those particles to different destinations.
- **Apolipoprotein A-I (Apo A-I)** – The main protein found on **HDL** (commonly called "good" cholesterol) that helps remove cholesterol from the arteries. Higher levels are generally *protective* against heart disease.
- **Apolipoprotein B (Apo B)** – The main protein found on low-density **lipoprotein (LDL)** and other "bad" cholesterol particles. Each **LDL** particle carries one ApoB molecule, so **Apo B** levels indicate the *number* of cholesterol-carrying particles that can contribute to **plaque** buildup in arteries. Higher **Apo B** levels are linked to greater cardiovascular risk.
- **Atheroma** – A fatty, cholesterol-rich **plaque** that can build up in the walls of the arteries.
- **Arrhythmia** – An irregular heartbeat. Some types are harmless; others can be dangerous and lead to fainting or sudden cardiac arrest.
- **Atrial fibrillation (AFib)** – A common type of arrhythmia where the upper chambers of the heart beat irregularly, increasing the risk of stroke.
- **Bicuspid aortic valve** – A birth defect where the aortic valve has two flaps instead of the normal three. It can lead to valve narrowing or leakage.
- **Carbohydrate-Deficient Transferrin (CDT) testing** – a blood test used to assess heavy alcohol use over the prior one to two weeks.
- **Cardiac output** – The amount of blood the heart pumps in a minute. It reflects how well the heart is working.
- **Cardiomyopathy** – A disease of the heart muscle that affects its ability to pump blood. Types include hypertrophic, dilated, and noncompaction.
- **Cholesterol** – A fatty substance found in the blood. Some types **(HDL)** are protective, while others **(LDL)** contribute to **plaque** buildup in arteries.
- **Chronic inflammation –** a long-term, low-grade activation of the body's immune system that persists after an initial injury, infection, or stress has resolved. Unlike acute inflammation—which is short-lived and part of normal healing—**chronic inflammation** can quietly damage tissues and blood vessels over time, contributing to diseases such as atherosclerosis, diabetes, and certain autoimmune or degenerative conditions.
- **Chylomicrons –** the largest and fluffiest members of the lipoproteins. They carry cholesterol and **triglycerides** from your intestines to the rest of the body after eating.
- **CRISPR** – A gene-editing technology that allows scientists to alter DNA. It holds promise for treating inherited heart conditions in the future.
- **Dangerous rhythms** - serious disturbances in the heart's electrical activity that prevent it from pumping blood effectively. These include rhythms like **ventricular tachycardia** and **ventricular fibrillation**, which can cause sudden cardiac arrest if not treated immediately.
- **Dilated cardiomyopathy (DCM)** – A condition where the heart's main chamber becomes enlarged and weak, making it harder to pump blood.
- **Electrocardiogram (EKG or ECG)** – A test that records the electrical activity of the heart. It can detect abnormal rhythms and other heart problems.
- **Ethanol alcohol (ETOH)** – the type of alcohol found in beer, wine, and spirits.

- **Familial hypercholesterolemia (FH)** - An inherited condition that causes very high levels of **LDL** cholesterol from birth due to genetic mutations affecting cholesterol clearance. It greatly increases the risk of early cardiovascular disease but can be effectively managed with early detection and treatment. It is typically suspected when LDL-C exceeds 190 mg/dL in adults or 160 mg/dL in children, particularly when accompanied by a family history of premature cardiovascular disease. Diagnosis is confirmed using clinical scoring systems or genetic testing identifying variants in *LDLR*, *APOB*, or *PCSK9.*
- **Familial hyperlipidemia** – A broad term that can describe several inherited lipid disorders — including **FH**, but also others like **familial combined hyperlipidemia** (which raises both **LDL** and **triglycerides**). It's sometimes used casually when the exact lipid abnormality isn't known, but it's not technically precise.
- **Gene editing** – A technique to modify genes, potentially correcting inherited conditions before they cause disease.
- **GLP-1 receptor agonists** – A type of medication originally for diabetes that also helps with weight loss and reducing heart disease risk.
- **HDL (High-Density Lipoprotein)** –It helps remove excess cholesterol from the blood. Often called "good" cholesterol.
- **Hypertrophic cardiomyopathy (HCM)** – A condition where the heart muscle becomes abnormally thick, potentially leading to arrhythmias or sudden cardiac death.
- **Idiopathic** - Describes a condition or disease that arises without a known cause. In other words, it develops spontaneously or from factors that can't yet be identified, even after thorough evaluation. The term is often used when the underlying mechanism remains uncertain despite clear symptoms or diagnosis.
- **Insulin resistance** – When the body doesn't respond well to insulin, leading to high blood sugar and increased risk of diabetes and heart disease.
- **Ischemic heart disease** – A condition caused by narrowed arteries reducing blood flow to the heart. Also known as coronary artery disease.
- **Lipoprotein -** A tiny, flexible particle made of fat and protein that carries cholesterol and **triglycerides** through the bloodstream. The main types are **HDL** (commonly called "good"), **LDL** (commonly called "bad"), **VLDL, and chylomicrons.**
- **Lipoprotein(a)** *(also written as **Lp(a)**).* A special type of **LDL** particle that carries an *extra protein* called **apo(a)**. This add-on makes it more "sticky," so it can build up in arteries and may also interfere with the body's ability to break down blood clots. Levels are mostly set by genetics and don't respond much to diet or exercise.
- **Low-Density Lipoprotein (LDL)** –a type of lipoprotein that transports cholesterol and other fats through the bloodstream. It plays a crucial role in delivering cholesterol from the liver to various tissues and organs in the body, where the cholesterol is used for essential functions such as building cell membranes and producing hormones. High levels can lead to **plaque** buildup in arteries. Often called "bad" cholesterol.
- **Lp(a) -** A shorthand name for **lipoprotein(a)**.
- **MASLD (Metabolic Dysfunction – Associated Steatotic Liver Disease)** – A liver condition linked to obesity and diabetes. It is a growing risk factor for cardiovascular disease.
- **Metabolic syndrome** – A group of conditions—including high blood pressure, belly fat, high blood sugar, and abnormal cholesterol—that increase the risk of heart disease.
- **Myocardial infarction (heart attack)** – Occurs when blood flow to part of the heart is blocked. **Type 2 myocardial infarctions** are caused by oxygen imbalance, not artery blockage.
- **Noncompaction cardiomyopathy** – A rare congenital condition where the heart muscle appears spongy and doesn't function normally, very often leading to weakened pumping, abnormal rythyms, or heart failure.
- **PCSK9 inhibitors** – A newer class of drugs that dramatically lower LDL cholesterol by helping the liver remove it from the blood.
- **Peripheral artery disease (PAD)** – A condition where narrowed arteries reduce blood flow to the limbs, often causing leg pain and increasing heart disease risk.

- **Phosphatidylethanol testing (PEth)** -A blood test for detecting phosphatidylethanol, an alcohol biomarker formed in red blood cells after alcohol consumption. It can be detected in blood for up to 2-4 weeks.
- **Plaque** – A buildup of fat, cholesterol, and other substances in the arteries that can restrict blood flow.
- **Precision medicine** – Medical care tailored to an individual's genetic profile, lifestyle, and risk factors.
- **Rheumatic valvular disease** – Damage to heart valves from rheumatic fever, a complication of untreated strep throat.
- **RNA-based therapies** – Treatments that use genetic material to turn off harmful proteins in the body, now being studied for use in heart disease.
- **Statins** – Cholesterol-lowering drugs that reduce heart attack and stroke risk by lowering LDL and stabilizing plaque.
- **Telemedicine** – Healthcare services provided remotely via phone or video, improving access to care.
- **Triglycerides** – A type of fat found in the blood. High levels can increase heart disease risk.
- **Type 2 myocardial infarction (Type 2 MI)** – A heart attack that occurs when the heart muscle doesn't get enough oxygen because of an imbalance between oxygen supply and demand, rather than from a blocked artery. It's often triggered by another condition—such as severe anemia, infection, arrhythmia, or low blood pressure—that stresses the heart and causes damage to heart tissue even without a classic coronary blockage.
- **Ventricular fibrillation** – A life-threatening heart rhythm in which the lower chambers quiver instead of pumping.
- **Ventricular tachycardia** – A fast, abnormal heart rhythm starting in the lower chambers, which can be dangerous if not treated.
- **Very Low-Density Lipoprotein (VLDL)** – a main transporter of the body's cholesterol and fat. High levels mean the liver is exporting a lot of **triglycerides**.
- **Wearable technology** – Devices like fitness trackers or continuous glucose monitors that help individuals monitor health in real time.
- **Xanthelasma** - Soft, yellowish cholesterol deposits that form under the skin, usually around the eyelids. They're harmless themselves but can signal elevated blood lipids or other underlying lipid disorders, so they sometimes serve as a visible clue to cardiovascular risk.

## About The Society of Actuaries Research Institute

Serving as the research arm of the Society of Actuaries (SOA), the SOA Research Institute provides objective, data-driven research bringing together tried and true practices and future-focused approaches to address societal challenges and your business needs. The Institute provides trusted knowledge, extensive experience and new technologies to help effectively identify, predict and manage risks.

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